THE CONTROL OF INFECTIOUS DISEASE IN FIFE C.1855-1950
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Stephen Patterson

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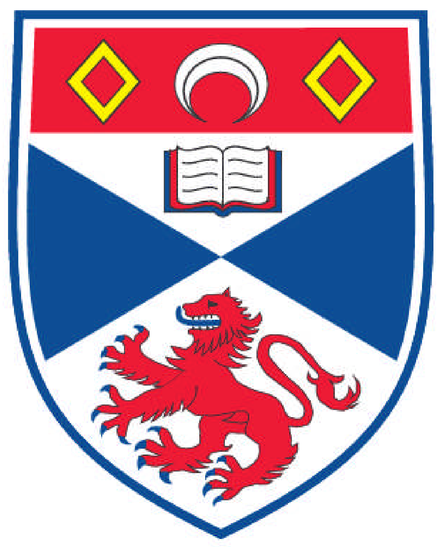

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THE CONTROL OF INFECTIOUS DISEASES IN FIFE c.1855-1950

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April 1989

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Abstract

This thesis is a study of the contribution of public health administration to the control of infectious diseases in Fife during the period c.1855-1950. It is a local study in the social history of medicine which attempts to test the conflicting theories of Thomas McKeown and Simon Szreter about the role of social intervention in mortality decline during the period. It covers the period from the earliest date when civil registration data on mortality from specified causes are available for Fife. During this period mortality from the main infectious diseases in the county declined almost continuously and by 88% from a rate of 606 deaths per 100 000 inhabitants during the years 1855-60. Public health administration is here defined as measures for disease prevention and control administered by local government. Such measures include the provision of adequate water supplies and drainage, improvement of housing, port sanitation, immunisation and the provision of infectious diseases hospitals and child welfare services. The first three chapters of this study include an introduction, a description of the geographical, demographic and economic conditions in Fife during the period and a description of the development of a system of public health administration in the county. This is followed by studies of the main infectious diseases, including smallpox, typhus and typhoid, diarrhoeal disease, diphtheria, scarlet fever, measles and whooping cough, influenza and all forms of tuberculosis. The pattern of mortality from each disease in Fife is described. Then, from the records of local authorities in the county, the role of public health administration in the attempted control of each disease is described and

evaluated. The conclusion assesses the overall contribution of public health administration to the decline in mortality from the main infectious diseases in Fife and suggests the relative importance of different measures in the process of disease control.

Acknowledgements

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Contents

Abbreviations

Local authorities and administrative areas

DC	County District Committee
LA	local authority under the Public Health (Scotland) Act
PB	parochial board
PC	police commission
TC	town council
LTD	large town district
STD	small town district
RD	rural district
SWSD	Special Water Supply District
SDD	Special Drainage District

Public health officials

MOH	Medical Officer of Health
SI	sanitary inspector
TBO	tuberculosis officer
VS	veterinary surgeon

Reports of public health officials

AR	annual report of the Fife County Medical Officer of Health. Each reference includes the year of the annual report and the page number i.e. 1936 AR 17.
D MOH AR	annual report of the Medical Officer of Health for the burgh of Dunfermline. Each reference to the annual reports of burgh Medical Officers and sanitary inspectors includes the year of the annual report and the page number.
K MOH AR	annual report of the Medical Officer of Health for the burgh of Kirkcaldy
K SI AR	annual report of the sanitary inspector for the burgh of Kirkcaldy
Leven MOH AR	annual report of the Medical Officer of Health for the burgh of Leven
St. A MOH AR	annual report of the Medical Officer of Health for the burgh of St. Andrews

Publications

NSA	The New Statistical Account of Scotland (Edinburgh 1845)
OCM	John Walton, Paul B. Beeson and Ronald Bodley Scott (eds.), The Oxford Companion to Medicine (2 vols.; Oxford 1986)
OSA	Sir John Sinclair (ed.), The Statistical Account of Scotland 1791-99 (reissued Wakefield 1978)
RGS	Detailed Annual Reports of the Registrar-General for Scotland
SPH	M.W. Flinn (ed.), Scottish Population History (Cambridge 1977). Each reference is preceded by the surname of the contributor to this volume.

THE CONTROL OF INFECTIOUS DISEASES IN FIFE c.1855-1950

CHAPTER 1

INTRODUCTION

This study attempts to determine the contribution of public health administration to the reduction in mortality from the major infectious diseases in a county of Scotland during the period c.1855-1950. To date, most studies of the history of infectious disease in Britain have concentrated on either national patterns of mortality or the local incidence of particular diseases. [1] The national studies which have appeared have been unable to focus with much precision on particular factors or measures which affected mortality from individual diseases. Local studies of particular diseases are unable to assess the relative importance of such factors and measures in the overall pattern of mortality from all infectious diseases and all causes. However, a local study of the changing effects of all the major infectious diseases is of a scale which permits both the close correlation of changes in mortality from these diseases with local conditions and an assessment of these changes in the overall pattern of mortality in the area of study. By this means, the relative effect of different factors in changes in mortality may be determined. Such, at least, is the theory.

This study considers the effectiveness of public health administration as a factor in the reduction of mortality from infectious disease. The period of the study covers the development of public health administration in Britain from the first year of civil registration in Scotland to the reorganisation of medical services under the National Health Service. During the nineteenth and early twentieth centuries public health administration in Britain developed as a system of preventive medicine. It is here defined as measures for disease prevention and control which were administered by local government. Such measures included the provision of adequate water supplies and drainage, improvement of housing, port sanitation, immunisation and the provision of infectious diseases hospitals and child welfare services. This is a simple working definition based upon the public health functions assumed by local authorities which were relevant to the control of infectious disease, rather than the ideal of public health administration as conceived by the theoreticians of "social medicine". [2]

The general history of public health administration in Britain is well documented. [3] A parallel development in the historiography of health has been quantitative studies in the decline of mortality in Britain during the nineteenth and twentieth centuries. However, few attempts have been made to show the contribution of public health administration to the overall mortality decline. The most thorough analysis of the decline in mortality during the whole period of the development of public health administration is given in the work of Thomas McKeown. [4]

Here it is sufficient to summarise the main conclusions of McKeown and his collaborators, which refer only to England and Wales. During the second half of the nineteenth century the main factors contributing to the decline in mortality were a rising standard of living, of which the most significant feature was an improving diet, improvements in hygiene and a reduction in virulence of the causative organisms of certain infectious diseases, such as scarlet fever. McKeown and Record see the dietary improvements which were part of the rising standard of living as by far the most important factor in mortality decline during this period. They consider that these improvements were responsible for the decline in mortality from tuberculosis and thus for about half the total mortality decline during the period. The reduction in virulence of certain infectious diseases, which occurred independently of any human action, produced c.20-30% of the decline in total mortality, and improvements in hygiene, which reduced exposure to infection, accounted for the remainder of that decline. [5] Medical intervention during the second half of the nineteenth century was seen as effective only in vaccination against smallpox, which made an insignificant contribution to the total mortality decline during the period. [6] During the twentieth century medical intervention, by both immunisation and therapy, became more important, but, according to McKeown, Record and Turner, during the period 1901-71 it was responsible for only one tenth of the reduction in mortality from all causes in England and Wales. Measures which reduced exposure to infection, including the improvement of sanitation and housing, accounted for one sixth of that reduction, but the most important factor remained improvements in nutrition, which,

in their effect upon mortality from airborne infectious diseases, again accounted for half of the total decline in mortality. [7]

McKeown's thesis has been accepted as authoritative by a number of writers but recently has received more critical attention, most notably in an article by Simon Szreter. [8] Szreter questions McKeown's interpretation of the decline in mortality in England and Wales during the second half of the nineteenth century, when over 90% of that decline was due to a reduction in mortality from infectious diseases. [9] Szreter shows that the argument that rising standards of living, as expressed in increases in nutritional consumption, were the main factor in the decline in mortality from infectious diseases was accepted by McKeown by default and without showing any evidence to support this argument. Szreter shows that analysis by McKeown of the late nineteenth-century decline in mortality from tuberculosis, which is the core of the latter's argument that public health measures were not the main factor in the decline of mortality from infectious diseases, is misleading. The decline in mortality from tuberculosis was more likely to be due to improved resistance to that disease consequent on a decline in the incidence of the other major infectious diseases. The decline in such incidence was in turn partly due to public health measures, including vaccination against smallpox, the provision of sanitation and the improvement of housing. These improvements led to the control of water-borne infectious diseases and a decline in the incidence of airborne infections, including pulmonary tuberculosis. [10] Szreter proposes that:

"...human agency, in the form of a gradually negotiated expansion of preventive public health provisions and services at the local level, rather than the impersonal "invisible hand" of inexorably rising nutritional and living standards, should be reinstated at the centre of our attempts to explain the modern decline in mortality." [11]

A critique of McKeown's thesis which is in contrast but reaches similar conclusions to Szreter's historical approach is offered by the demographers Woods and Hinde. [12] Their estimates of changes in life expectation during the late nineteenth and early twentieth centuries and analysis of the range of mortality experience in the different registration districts of England and Wales in 1861 highlight the diversity of age-specific and regional mortality patterns and challenge what Szreter describes as McKeown's "nutritional determinism":

> "Our analysis has shown the overwhelming significance of urban-rural differences and thus the necessity for urban life chances to improve before the national level of mortality can change radically. Urban living conditions improved in the late nineteenth century and began to catch up with rural conditions. From 1900, with the fall in infant mortality, all areas experienced accelerated increase in life expectation. If improvements in nutrition are to be credited with having a major influence on these changes, it must be shown that there were substantial differences between urban and rural diets and that the nutritional level of the urban population accelerated particularly rapidly from the mid nineteenth century. There is very little evidence to support this argument." [13]

Like Szreter, Woods and Hinde consider that during the crucial period of the late nineteenth and early twentieth centuries the development of sanitation and housing were the main factors in the improvement of urban living conditions. Their statistical model reveals "new clues which should change our view of what was possible in the nineteenth century, especially in large towns and cities." [14]

No critique has been offered of the analysis by McKeown, Record and Turner of mortality decline in England and Wales during the twentieth century, in which, as has been seen, the factor of improving nutrition was again considered to be dominant. During the period 1901-71 the reduction of mortality from tuberculosis remained an important component of mortality decline, accounting for over 15% of that decline in England and Wales. Over two thirds of the decrease in tuberculosis mortality in England and Wales during 1901-71 were due to a reduction in mortality from pulmonary tuberculosis. However, whereas McKeown claimed that the reduction in mortality from pulmonary tuberculosis during the nineteenth century was due to improvements in nutrition, that during the twentieth century was also the result of the reduction of levels of infection through the improvement of housing and conditions at work and the segregation of infectious persons in sanatoria. [15] The contribution of public health administration to the reduction in mortality from pulmonary tuberculosis is currently under debate and is an issue in the history of infectious disease in the twentieth century. [16] A further 15% of the overall mortality decline in England and Wales during 1901-71 was caused by the reduction in mortality from what were primarily infectious diseases of childhood, including diarrhoeal diseases (10.4%) and measles and whooping cough (5.1%). [17] The control of these diseases also belongs to the twentieth century and, together with the question of the control of tuberculosis, justifies the extension of the present study to *c.*1950.

McKeown, Szreter and Woods and Hinde consider conditions and draw their evidence only from England and Wales. Demographic change in Scotland during the nineteenth and first half of the twentieth centuries was described by Flinn. [18] His study is wide-ranging but gives only general reasons for mortality decline in Scotland during the period. It contains no critique of McKeown and no estimate of the contribution of public health administration to the reduction in mortality. Systematic comparison of the age-standardised mortality data for Scotland given by Flinn with that for England and Wales given by McKeown *et al.* is thwarted by the different time-spans which their studies cover and the methods of analysis which were used. The calculation of comparative mortality rates for Scotland and England and Wales from data in the reports of the respective Registrars-General for those countries is beyond the scope of this introduction. However, some broad comparisons may be made from the data presented by McKeown and Flinn. [19]

It can be seen that during the period the mortality decline in Scotland paralleled that in England and Wales. Amongst the main infectious diseases, reductions in mortality from smallpox, typhus and typhoid were similar north and south of the border. In Scotland there was also considerable decline in mortality from diarrhoeal diseases and the major airborne infectious diseases throughout the period, although mortality from these diseases remained higher there than in England and Wales. Mortality from all forms of tuberculosis was also slower to decline in Scotland than in England and Wales. [20] The convergence during the early twentieth century of mortality rates from all causes in urban and rural areas, which Woods and Hinde identify as occurring in England and

Wales, also occurred in Scotland. [21] It is beyond the scope of this introduction to consider in any depth the similarities and differences between mortality experience in Scotland and England and Wales. Here it is sufficient to state that the debate between McKeown and his critics over the causes of mortality decline in England and Wales during the nineteenth and early twentieth centuries may be given a British perspective by considering evidence from Scotland.

The researches of Woods and Hinde indicate that interpretations of mortality decline at a national level must take into account the regional variations in mortality experience which combine to form national averages. This point is discussed by Szreter in his proposals for further research into the timing and effects of the implementation of public health legislation:

> "Although national enabling and compulsory legislation occurred at specific points in time, its effective adoption was a locally mediated matter and varied greatly from one local authority to another...These complications of local political and administrative history will confound any attempt to test rigorously the interpretation being offered here through analysis of aggregate national- or even county-level statistics, alone. Properly researched local studies are required, where there is a chance of refining our detailed understanding of the nature of the relationship between the deployment of specific preventive services and facilities and the changing local social and epidemiological patterns. However, these are still all too rare and are unlikely to be perceived as attractive research projects until there has been a conceptual emancipation from the orthodox assumptions regarding the primacy of "nutritional determinism"." [22]

The present study attempts to fulfil Szreter's requirements for a local study of the development of public health administration by considering the work of local authorities in the control of infectious diseases in Fife. Fife has been chosen as the area of study because during the

period c.1855-1950 it was a county of diverse economic and social conditions, including a variety of communities which for much of the period each made their own provision for public health services. Furthermore, by the beginning of the twentieth century there was a sharp dichotomy between the populous industrial west of the county and its sparsely populated, agricultural eastern half. Thus, Fife offers wide scope for considering patterns of urban and rural mortality. The environmental, demographic, economic and social characteristics of Fife and the development of public health administration in the county are described in chapters 2 and 3.

This study of the role of public health administration in the control of infectious diseases in Fife is of a scale which enables historical records of the development of public health administration, including reports by Medical Officers of Health and minutes of local authorities, to be related to mortality data covering a period of sufficient length to show the decline in mortality from all the major infectious diseases. Following Flinn (*Scottish Population History* Table 5.6.4), the infectious diseases which are included in the study of Fife include smallpox, typhus and typhoid, diarrhoeal diseases, diphtheria, scarlet fever, measles and whooping cough, influenza and all forms of tuberculosis. Each disease or grouping of diseases is considered in a separate chapter, in which are described the incidence and measures for the control of those diseases in Fife.

From 1855 information on mortality in Scotland, from all and specified causes at national, regional and subregional levels, is given in the Detailed Annual Reports of the Registrar-General for Scotland (RGS). The information in the reports of the RGS forms the statistical basis of the study of the history of infectious diseases in Fife. However, it contains a number of shortcomings which restrict its usefulness. The problems of using Scottish registration data for a local study of mortality from specified causes during the period are described next.

Under the Registration of Births, Deaths and Marriages (Scotland) Act of 1854 each Scottish county was divided into registration districts, which up to 1911 formed the geographical units of civil registration. [23] The annual reports of the RGS give total mortality from all causes in each registration district in Scotland, as well as the population (or, in intercensal years, estimated population), total births and total marriages in each district. However, up to 1911 figures for mortality from specified causes in areas below county level were only published for those registration districts which comprised the major burghs in Scotland. From 1855 the annual reports of the RGS give for Fife total deaths from specified causes in the county as a whole and the individual registration districts of Dunfermline and Kirkcaldy, which are here defined as large town districts. From 1871 the reports also give aggregate mortality from specified causes in the small town districts and the rural districts of the county. Any registration district containing the whole or part of a burgh or an unincorporated town of over 2 000 inhabitants was defined as a town district; all other districts were rural districts. Large town districts were urban areas of

10 000-25 000 inhabitants, whilst small town districts contained 2 000-10 000 inhabitants. [24] The three groups of registration districts which form the large-town, small-town and rural districts in Fife thus form the three divisions of the county into which mortality from specified causes, as given in the annual reports of the RGS, may be grouped for purposes of analysis. As was stated, for the period from 1855 figures for cause-specific mortality in each of the two large town districts in Fife are available, but up to 1911 the annual reports of the RGS give no such figures for the individual registration districts in the small-town and rural divisions.

An immediate problem of analysing the data for mortality from specified causes in Fife, as given in the pre-1911 annual reports of the RGS, involves accurately determining the populations of the three divisions of the county as defined above. The boundaries of registration districts were not coterminous with burgh boundaries and were not always coterminous with parish boundaries. For part of the period a few registration districts containing burghs, including the Dunfermline, Kirkcaldy and Markinch districts, were divided into urban and rural subdistricts. However, where town districts with burghs contained a landward population and were not divided into urban and rural subdistricts, the extra-burghal population of those districts has been added to the total population of the appropriate town division. Therefore in the period to 1911 the aggregate population of the rural districts may be understated and consequently the death rates for the rural division of Fife may be inflated. The populations of the three urban and rural divisions of Fife are given in the following table.

Table 1.1 Population of the urban and rural divisions of Fife 1851-1951

LTD's; large town districts
STD's; small town districts
RD's; rural districts

	Fife	LTD's	STD's	RD's
1851	153 546	24 472	70 314	58 760
1861	154 770	24 623	71 068	59 079
1871	160 735	27 798	80 513	52 424
1881	171 931	42 186 [A]	90 443	39 302
1891	187 346	46 634	100 758	39 954
1901	218 837	54 043	115 895	48 899
1911 [B]	267 733	67 704	95 703	104 326
1921	292 925	79 490	103 377	110 058
1931	276 368	78 932	94 348	103 088
1951	306 778	93 769	104 299	108 710

Source; see Tables 1,A,1-2

A, From 1878 Dunfermline registration district was no longer divided into urban and rural subdistricts,
B, From 1911 public health districts replaced registration districts as geographical units of civil registration,

The lack of differentiation between the urban and rural parts of town districts also complicates the interpretation of mortality data from the individual large-town districts in Fife. In 1878 the urban and rural subdistricts of the Dunfermline registration district were abolished and thereafter the reports of the RGS give only a total of deaths occurring in Dunfermline burgh and its landward environs. Thus, mortality in the landward mining villages on the outskirts of Dunfermline cannot be separated from that occurring in the burgh itself and the registration district overlaps two separate territories of public health administration. [25] Following the extension of Kirkcaldy burgh in 1876, the Kirkcaldy registration district, which was more or less coterminous with the parishes of Kirkcaldy and Abbotshall, contained only a part of that burgh. Most of the remainder of the population of Kirkcaldy burgh

was in Dysart registration district but was undifferentiated from the population of Dysart burgh and the landward population in that district. [26] Therefore, in contrast to Dunfermline large-town district, which from 1878 contained an element of landward population, from 1876 Kirkcaldy large-town district contained only a part of the population which was governed by the Kirkcaldy burgh authorities.

In 1911 the RGS abolished the old registration districts and adopted the existing public-health districts in Scotland, namely the burghs and County Districts, as the geographical units for vital registration. This change was reported to be "no doubt very desirable, if not indeed essential." [27] From 1911 the large- and small-town divisions of Fife therefore represent the aggregate populations of the the county's two large burghs and its small burghs respectively, and the remaining population of the county constitutes its rural division. Thus, urban and rural mortality may be divided more precisely, but unfortunately by this time such differentiation has become less significant in the study of the history of infectious disease.

Further problems in the analysis of mortality data given in the annual reports of the RGS are caused by changes in the nomenclature and classification of diseases which were used in those reports. These changes were described by Flinn and their effect in the study of infectious diseases in Fife is described in more detail in the chapters on individual diseases which follow below, in particular the chapters on typhus and typhoid, diphtheria and diarrhoeal diseases. [28] The changes in the nosological description of diseases which occurred during the

period were related to advances in medical knowledge and diagnosis. Where possible, the effect of such changes on the stated mortality from infectious diseases is noted, as in the most obvious example, the differentiation of typhus and typhoid.

A final shortcoming of this analysis of mortality from the major infectious diseases in Fife is the use throughout of crude mortality rates. Flinn noted the advantage of an "age- and sex-standardised comparison of mortality [in pinpointing] more exactly than the use of crude rates permits the relative contribution of particular improvements to the general decline [in mortality]." [29] However, the reports of the RGS do not contain sufficient data to permit the calculation of age-specific mortality rates from individual infectious diseases in a county area such as Fife, and in a study which concentrates upon the effect of methods for the control of infectious diseases, in which sex differentiation of cases was unimportant, the calculation of sex-specific mortality rates is of secondary significance and, for reasons of space and time, has been excluded.

Table 1.2 Mortality from all causes (AC) and the major infectious diseases (ID) in Scotland and Fife 1855-1950

Death rate: deaths from specified cause per 100 000 inhabitants

	Scotland				Fife			
	AC	ID	ID as % AC	decl. ID as % decl. AC	AC	ID	ID as % AC	decl. ID as % decl. AC
1855-60	2 087	863	41.4		1 805	606	33.6	
1861-70	2 210	884	40.0	incr.	1 915	639	33.4	incr.
1871-80	2 168	756	34.9	100+	1 866	547	29.3	100+
1881-90	1 924	553	28.7	83.2	1 744	425	24.4	100.0
1891-1900	1 851	523	28.3	41.1	1 672	418	25.0	9.7
1901-10	1 662	404	24.3	63.0	1 452	283	19.5	61.4
1911-20	1 525	309	20.3	69.3	1 299	228	17.6	36.0
1921-30	1 374	225	16.4	55.6	1 224	166	13.6	82.7
1931-40	1 347	157	11.7	100+	1 216	100	8.2	100+
1941-50	1 295	114	8.8	82.7	1 193	70	5.9	100+
1861/70-1941/50				84.2				78.8

Source; See Tables 1.B.1-2 and 1.C.1-2

Figure 1.1 and Table 1.2 show that in both Scotland as a whole and Fife aggregate mortality from the major infectious diseases was in almost continuous decline and made up the bulk of the decline in mortality from all causes throughout the period. This emphasises the potential importance during the period of public health administration, historically the prime responsibility of which was the control of infectious disease. The following chapters consider how and to what extent public health administration contributed to the decline in mortality from the major infectious diseases in Fife.

Chapter 1. The control of infectious diseases in Fife c.1830-1950.
Introduction. Notes

1. A programme for research in the social history of infectious disease is set out in Bill Luckin, "Death and survival in the city: approaches to the history of disease" Urban History Yearbook (1980) 53-62. Some national studies of mortality are referred to below. Local studies of the effects and control of particular infectious diseases are referred to in the following chapters on those diseases in Fife.

2. For a review of the theory of social medicine in the nineteenth and twentieth centuries, see George Rosen, "What Is Social Medicine? A Genetic Analysis of the Concept", in *idem*, From Medical Police to Social Medicine. Essays on the History of Health Care (New York 1974) 60-119 and Jane Lewis, What Price Community Medicine? The Philosophy, Practice and Politics of Public Health since 1919 (Brighton 1986).

3. For bibliographies of the history of public health administration in Britain in the nineteenth and early twentieth centuries, see Anthony S. Wohl, Endangered Lives. Public Health in Victorian Britain (paperback edn. London 1984) 417-29 and Simon Szreter, "The Importance of Social Intervention in Britain's Mortality Decline *c.*1850-1914: a Reinterpretation of the Role of Public Health" Social History of Medicine 1.1 (April 1988) n. 70. For the history of public health administration in Britain in the mid twentieth century, see Lewis op. cit. and the references therein. For the history of public health administration in Scotland, see J.H.F. Brotherston, Observations on the Early Public Health Movement in Scotland (London 1952), Thomas Ferguson, Scottish Social Welfare 1864-1914 (Edinburgh 1958) and Gordon McLachlan (ed.), Improving the Common Weal. Aspects of Scottish Health Services 1900-1984 (Edinburgh 1987).

4. For a bibliography of McKeown's studies of patterns of mortality in England and Wales, see Robert Woods and P.R. Andrew Hinde, "Mortality in Victorian England: Models and Patterns" Journal of Interdisciplinary History 18.1 (Summer 1987) n. 1

5. Thomas McKeown and R.G. Record, "Reasons for the Decline of Mortality in England and Wales during the Nineteenth Century", in M.W. Flinn and T.C. Smout (eds.), Essays in Social History (Oxford 1974) 245-47

6. ibid. 244

7. Thomas McKeown, R.G. Record and R.D. Turner, "An Interpretation of the Decline in Mortality in England and Wales during the Twentieth Century" Population Studies 29 (1975) 422

8. Szreter op. cit. 1-37. Examples of writers who accept McKeown's thesis are given by Szreter. (ibid. 2, 4)

9. ibid. Table (p.8)

10. ibid. 9-18

11. ibid. 5

12. Woods and Hinde op. cit. 27-54

13. ibid. 52-53

14. ibid. 54. For a demographic analysis which takes an intermediate position between the contrasting theses of McKeown and Record and Szreter, Woods and Hinde, see D. Friedlander, Jona Schellekens, E. Ben-Moshe and Ariela Keysar, "Socio-Economic Characteristics and Life Expectancies in Nineteenth-Century England: a District Analysis" Population Studies 39 (1985) 137-51

15. McKeown, Record and Turner op. cit. Table 4, 412

16. For differing views on the reasons for and contribution of public health administration to the decline in mortality from pulmonary tuberculosis during the twentieth century, see Linda Bryder, Below the Magic Mountain. A Social History of Tuberculosis in Twentieth-Century Britain (Oxford 1988) 257-62, *idem*, "The First World War: Healthy or Hungry?" History Workshop Journal 24 (1987) 145-150, Anne Crowther, British Social Policy 1914-1939 (London 1988) 29, Neil McFarlane, "Hospitals, Housing and Tuberculosis in Glasgow" (unpublished paper 1988) 1-34, F.B. Smith, The Retreat of Tuberculosis 1850-1950 (London 1988) ch. 8, J.M. Winter, The Great War and the British People (London 1986) 138-39. My thanks to Neil McFarlane for allowing me to cite his paper.

17. McKeown, Record and Turner op. cit. Table 4

18. M.W. Flinn, "The nineteenth and twentieth centuries", in *idem* (ed.), Scottish Population History (SPH) (Cambridge 1977) 368-420

19. See Thomas McKeown, The Modern Rise of Population (London 1976) Tables 3.1-3.3; McKeown, Record and Turner op. cit. Table 4; Flinn SPH Tables 5.6.8 and 5.6.12

20. See also Smith op. cit. Figure 1

21. Flinn SPH Table 5.5.6

22. Szreter op. cit. 36

23. G.T. Bisset-Smith, Vital Registration. A Manual of the Law and Practice concerning the Registration of Births, Deaths and Marriages (Edinburgh 1907 edn.) 102-03

24. RGS 1871 xi

25. See p. 167-68 below.

26. See Tables 1.A.1.2, 2.C.1-4 and 2.D.1-2

27. RGS 1911 vii

28. Flinn SPH 399-406, "Note on classifications of diseases for Tables 5.6.4-10" (p. 406-08)

29. Flinn SPH 397. However, see also John. M. Eyler, "Mortality Statistics and Victorian Health Policy: Program and Criticism" Bulletin of the History of Medicine 50 (1976) 353-54

CHAPTER 2

THE GEOGRAPHY AND ECONOMY OF FIFE

Introduction

This chapter describes the area of study, including its geography and climate and demographic, economic and social development. It is intended that together with chapter 3, which considers the development of public health administration in Fife, this will provide the necessary background to the studies of the incidence of mortality from and measures for the control of the major infectious diseases in Fife, which form the following chapters.

1. The geography and climate of Fife

> "A peninsula is...formed between the Firth of Tay and the Firth of Forth. Eastwards lies the sea; westwards, the Ochils run from the head of one firth to the head of the other, and so cut off the peninsula from the rest of Scotland." [1]

Most of this area is taken up by Fife. Its basic geography consists of a circular region of lowland around Loch Leven from which radiate three strips of lowland formed by the valleys of the rivers Eden, Leven and Black Devon. These valleys are separated by uplands: the Cleish Hills, the Lomond Hills, the eastern spur of the Ochil Hills in the north of Fife, and the high ground in the east of the region. The coastline of Fife from Newburgh-

on-Tay to Kennetpans, north-west of Kincardine on the Firth of Forth, is ninety-two miles long. [2]

The plain of the River Eden is about thirty miles long. For most of its length the Eden follows a "meandering course over the dead level of the plain" and its total fall is only three hundred feet. [3] From the southern apex of Loch Leven the River Leven flows eastwards to reach the sea at the town of Leven, sixteen miles away. Its tributaries include the Conland and Lothrie Burns and the River Ore. The River Ore joins the Leven a mile west of Cameron Bridge and has as its tributaries the Lochty and Fitty Burns. These streams join the Ore near Thornton and Lochgelly respectively. South of this river system is the small plain formed by the Tiel Burn, which flows into the sea at Kirkcaldy. It is bounded to the south by the igneous hills in the area of Burntisland and Kinghorn.

East of a line between St. Andrews and Elie, the eastern highlands of Fife consist of calciferous sandstone. However, the western part of this area and the western highlands of Fife are formed of carboniferous limestone. Amongst these rocks, but particularly in the south and west of the region, coal measures occur. They extend under the Firth of Forth to connect with the measures of the Midlothian field. On the eastern side of the Fife coalfield, the coal-bearing strata have been broken up by igneous intrusions. Volcanic formations occur throughout the whole region. The Cleish and Lomond Hills are volcanic in origin, and detached from the eastern highlands of Fife "stands the isolated Largo Law..., an intrusive mass of igneous rock which ages of denudation have worn down into [a] Vesuvius-like cone..." [4]

"The soil of Fife", observed Barbieri, "from its irregularity of surface, deepness or rockiness, morass, shelter, or exposure, is necessarily various and includes within its range the luxuriance of Egypt and the barrenness of Arabia." [5] Over much of Fife the soil is a thick layer of boulder clay or till. This has been laid down by glaciation and, where it forms a soil, is "cold, stiff and retentive, supporting in its natural state vegetation of a rushy character." [6] The hills of the eastern highlands have poor soils derived from sedimentary rocks, but more fertile soils are formed from the igneous rocks, both in the east and elsewhere in the region. Where, for example, in east Fife, soils have been formed from igneous rock, richer vegetation may be found on the high ground than on the slopes below, where clay soils occur. The high ground near Dunfermline and the land in the Ore valley are covered with a boulder clay over which lies a thin loam. Stratheden, Strathleven, the Devon valley and some sections of the coast are covered with sands and gravels. These are subsoils on which good loams form. One of the most fertile stretches of such land lies between St. Andrews and Largo. [7]

The climate of Fife has no distinct peculiarities. In comparison with readings for the west coast of Scotland, temperatures in Fife "show a faint approximation to a continental type - slightly colder winters and slightly warmer summers." [8] From temperature readings taken in 1855-95, the station in Fife showing the closest range of temperatures to a mild continental climate was Feddinch Mains, which lies three miles south of St. Andrews and 300 feet above sea level. During autumn there was a slight increase in temperatures in the east of Fife over those recorded in the west of the region. This was due to continental influence. During winter the

influence of the North Sea moderates temperatures in the east of the region. Dr. Adamson of St. Andrews expressed the commonly held view that the climate of his town was "more equable than [that] in the neighbouring inland towns." [9] However, the east coast of Scotland is regarded as having a bracing climate, in contrast to the relaxing climate on the western side of the country. [10]

Most of the rain in Fife comes from the Atlantic and falls on the higher ground in the west of the region. (Table 2.1.1) In east Fife, rainfall is low. Spring is the driest season in Fife due to the prevailing east winds, and most rain falls during the autumn and winter. Higher ground is colder, west-facing slopes are wetter and winds are strongest on the east-facing slopes and in the "funnel-shaped" valleys of the region. [11] The Ochil Hills protect the Devon valley from the north wind, and under the lee of the Lomonds is the area around Markinch, which because of its sheltered position acquired the reputation as "the Garden of Fife". [12] Though possessing such disadvantages as late frosts and snowfalls and sporadic thunderstorms, the climate of Fife is favourable to agriculture, for neither the "rainfall of the wetter west nor the dryness of the warmer east is excessive." [13]

Table 2.1.1 Average rainfall at stations in Fife and Clackmannan c.1866-90

	Height above sea level (feet)	Period of readings	Average rainfall per annum (inches)
Dollar, Clackmannan	178	1866-90	43.4
Loch Leven sluice	365	1866-90	36.1
Ballo reservoir	700	1870-83	42.2
St. Andrews	57	1866-90	29.4
Caabo House, Kingsbarns	50	1870-83	26.8

Sources: 1892 AR Table 1; Laurance J. Saunders, "A Geographical Description of Fife, Kinross and Clackmannan" Scottish Geographical Magazine 29 (1913) 77

Climate was seen to be partly responsible for the presence of certain diseases amongst the population of Fife. In the 1890s, for example, the Fife County Medical Officer, Dr. Nasmyth, anticipated outbreaks of diarrhoea and typhoid during the summer and early autumn, and measles and whooping cough during the colder periods of the year:

> "Death rates occur in the inverse rates of temperature", he wrote. "[The] direct relationship between varying climatic conditions and health is a fact well known to those who suffer from rheumatism, neuralgia, and pulmonary affections...The obituary columns of the newspapers are swelled during the prevalence of low temperatures, and this mainly from the increased mortality amongst the very young, the aged, and the debilitated." [14]

Throughout the centuries the east wind had particularly harassed the people of St. Andrews. In 1697 the air in St. Andrews was described as ""thin and piercing," so that old men coming to the place were "instantly cut off"", and to the writers on St. Andrews in the *New Statistical Account* (1845) the east wind affecting the town was "peculiarly piercing and chilly, and is regarded as injurious to persons of a delicate constitution." [15] It was noted that catarrh and rheumatism were common in St. Andrews at this time. Meanwhile in Kirkcaldy, on "account of the great and sudden variations in the temperature of the atmosphere during the end of spring and the beginning of summer, croup, bronchitis, and other forms of thoracic inflammatory complaints are prevalent..." [16]

However, the Fife climate also had a beneficial aspect, which during the nineteenth century was increasingly appreciated. A contemporary academic's argument for the long summer vacation was that "at St. Andrews the hot weather which set in after April distracted students from their work." [17] On account of the weather there, North

Queensferry was recommended by the Edinburgh surgeon Sir James Simpson as a place of convalescence for his patients, and the "invigorating sea breezes laden with ozone" which were to be enjoyed at St. Andrews were praised by the burgh Medical Officer, Dr. Archibald. [18] From the mid nineteenth century the combination of sunshine, seaside, ozone, golf and railways led to the development of the Fife coast from Burntisland to St. Andrews as a tourist resort. [19]

While the coast of Fife became a pleasure-ground, much of the inland area of the county remained insalubrious due to poor drainage consequent upon its low-lying position and covering of boulder clay. Such were the conditions in Beath parish, as described in the *New Statistical Account*: "Owing to the elevation of the parish, and to the quantity of wet land in and around it, the climate during the greater part of the year is cold and wet." [20] Pont's map of Fife showed that in the seventeenth century much of the region was waterlogged, with many lochs and bogs which have since disappeared. [21] During the eighteenth century land reclamation schemes were undertaken, the most notable of which involved the draining of the 300-acre Loch Rossie, south-west of Collessie. [22] Mining engineers also drained lochs at Banbeath and Durie, near Leven, and near St. Andrews the "swamps and morasses which existed at a former period, in the low grounds, [had] been thoroughly drained" by 1838. [23] "Such extensive draining over the county," wrote Barbieri, "has stopped the continual fogs which exhaled from the lochs, marshes, and peat bogs, that injured crops, and afflicted the people with agues, and still more malignant diseases." [24] By agues Barbieri may have referred to malaria, which during the eighteenth century was common in the eastern

Lowlands of Scotland, particularly in marshy areas, where mosquitoes could breed.

The natural environment of Fife is generally favourable to human health and habitation. The geography of the region has provided many good sites for settlement. Air temperatures are generally mild, although the eastern littoral is exposed to cold winds. In the period prior to widespread development of public utilities, including piped water supplies and drainage, the main disadvantages of the natural environment of the region were low rainfall in the east and poor natural drainage in the central inland area. During the period these factors may have contributed to increased mortality from water-borne and filth-related infectious diseases, particularly typhoid and diarrhoeal diseases.

2. Growth and distribution of population in Fife 1831-1951

There are three main elements in the development of population in Fife during 1831-1951. These include almost continuous growth, a substantial shift of population from rural to urban areas and an accompanying concentration of population in the western half of the county. Details of these developments are given in the tables below.

Table 2.2.1 Population of Fife 1831-1951

	Fife	% *incr.*	% popln. Scotland		Fife	% *incr.*	% popln. Scotland
1831	128 839			1901	218 837	*16.8*	4.9
1841	140 140	*8.8*	5.4	1911	267 733	*22.3*	5.6
1851	153 546	*9.6*	5.3	1921	292 925	*9.4*	6.0
1861	154 770	*0.8*	5.1	1931	276 368	*-5.7*	5.7
1871	160 735	*3.9*	4.8	1951	306 778	*11.0*	6.0
1881	171 931	*7.0*	4.6				
1891	187 346	*9.0*	4.7				

Sources: Fife: Census of Scotland I 17 Table A; Scotland: Flinn SPH Table 5.1.1

Between 1831 and 1951 the proportion of the population of Scotland which lived in Fife remained relatively constant at *c.*5-6%. However, the pattern of population growth in Fife during most of this period was substantially different from that in Scotland as a whole. Whereas throughout Scotland the decadal rate of population growth between 1831 and 1881 averaged over 9%, in Fife it averaged only 6%. [26] However, between 1881 and 1921 this rate in Fife averaged 14.4%, which was more than double the Scottish average for those decades. Between 1921 and 1951 decadal rates of population growth in Fife and in Scotland as a whole were similar, at 2.7% and 2.2% respectively, but during the 1920s, which both in Fife and nationwide was the only decade of population decline during the period, the population decrease in Fife amounted to 5.7% whereas throughout Scotland it was only 0.8%.

In common with the rest of the Scottish Lowlands, population growth in Fife was accompanied by urbanization. [27] During the nineteenth century the urban centres in Fife were the burghs. Burghs were towns which had acquired rights of self-government, either for trading purposes, in the

case of the long-established royal burghs and burghs of barony, or, under legislation passed during the nineteenth century, for purposes of municipal improvement, as in the case of the police burghs. [28] In census reports from 1871 burghs were differentiated according to their size. A burgh containing 10 000-25 000 inhabitants was defined as a large burgh; any other burgh was designated a small burgh. [29] Under the Local Government (Scotland) Act of 1929 a large burgh was defined as any burgh with over 20 000 inhabitants. [30]

Throughout this study, and for the whole of the period which it covers, the definition of large and small burghs has been adopted for the purpose of differentiating Dunfermline and Kirkcaldy from the other burghs in Fife. At the beginning of the period neither Dunfermline nor Kirkcaldy was sufficiently populous to be definable as a large burgh, but during the 1880s both achieved populations of over 20 000 and thereafter remained by far the largest burghs in Fife. (Tables 2.D.1-2) It was not until the 1900s that any other burgh in Fife achieved a population of over 10 000, and it was only at the very end of the period that one other burgh, Buckhaven and Methil, achieved a population of over 20 000, by which time Dunfermline and Kirkcaldy each had populations of over 40 000. The area of the county outwith the burghs is the landward area. [31]

Table 2.2.2 Percentage distribution of population in the burghs and landward area of Fife 1841-1951

	1841	1851	1861	1871	1881	1891	1901	1911	1921	1931	1951
Large burghs	9,0	8,9	8,8	13,7	25,1	26,3	27,1	25,3	27,1	28,6	30,6
Small burghs	18,3	17,9	18,8	23,0	25,6	30,6	33,6	35,8	35,3	34,1	33,2
Burghs with over 5 000 inhabitants	5,6	8,9	12,2	20,8	31,8	30,0	42,7	45,0	48,8	50,5	53,8
All burghs	27,4	26,8	27,6	36,7	50,4	56,9	60,7	61,0	62,4	62,7	63,8
Landward area	72,6	73,2	72,4	63,3	49,6	43,1	39,3	39,0	37,6	37,3	36,2

Source; see Tables 2,2,1 and 2,D,1-2

Table 2.2.2 shows that the period of greatest urbanization in Fife occurred during the second half of the nineteenth century. Between 1861 and 1901 the proportion of the population of Fife which lived in burghs increased by 33%, and from 1881 the two large burghs never contained less than a quarter of the population of the county. Prior to 1861 the proportion of population which lived in the landward area of the county remained almost unchanged at *c.*72%. After 1901 the towns in Fife continued to expand as the population of the county increased, but in both the burghs and the landward area rates of population growth remained constant and there was little further change in the distribution of population between the landward area and the burghs.

However, the process of urbanization in Fife cannot be described in such straightforward terms as the measurement of the distribution of population between the burghs and the landward area. Flinn measured urbanization in Scotland by the proportion of population which lived in

towns of over 5 000 inhabitants. [32] This included both burghs and unincorporated towns of above this size. By 1901 the proportions of the population of all Scotland and of the Eastern Lowlands of Scotland which lived in towns of over 5 000 inhabitants were respectively 57.6% and 59.6%. [33] However, in Fife this proportion amounted to only 42.7%, of which almost two thirds lived in the two large burghs, Dunfermline and Kirkcaldy. [34] By this measure, urbanization in Fife was closer to that in north-eastern Scotland, where by 1901 the proportion of the population which lived in towns of over 5 000 inhabitants amounted to only 37.5%.

As Flinn admitted, urbanization is not easily defined and its measurement by the distribution of population in centres of over 5 000 inhabitants "allows some unquestionable "towns" to escape." [35] A feature of the urban geography of Fife during 1831-1951 was the small size of the majority of the burghs. As late as 1891 only three out of the 26 burghs in Fife had populations of over 5 000 inhabitants, and the fourth largest town in the county was Buckhaven and Methil (population: 6 247), which at the time of the census of that year remained unincorporated. (Table 2.D.1) By 1951 there were nine burghs in Fife with over 5 000 inhabitants, but larger than two of these were Cardenden (population: 8 571) and Kelty (7 750), neither of which was incorporated. [36] By this time some of the unincorporated centres of population in Fife were more urban, in terms of spatial size, size of population and population density, than many of the burghs themselves. The census of 1951 listed ten unincorporated villages in Fife which had

populations of over 2 000 and thus were larger than eight of the burghs in the county. [37]

This leads to a consideration of the third feature of population development in Fife during the period: the increasing concentration of population in the west of the county. All the unincorporated villages which in 1951 had populations of over 2 000 were situated in the western half of the county, but, with the exception of Culross, all the burghs with populations of less than 2 000 were situated in the east of Fife. The division of east and west Fife here follows the boundaries of the four County Districts which were established in Fife under the Local Government (Scotland) Act of 1889. [38] These Districts were formed of groups of parishes. (Table 2.A.1) The parishes which were included in the Dunfermline and Kirkcaldy County Districts constitute the western half of Fife and those in the Cupar and St. Andrews Districts form the county's eastern half. (See Figure 2.3) The following table shows the distribution of population between the two halves of the county during 1831-1951.

Table 2.2.3 Percentage distribution of population between west and east Fife 1831-1951

	1831	1841	1851	1861	1871	1881	1891	1901	1911	1921	1931	1951
West Fife	54,2	55,2	56,7	58,0	58,6	61,4	65,9	71,4	76,2	77,8	78,0	79,5
East Fife	45,8	44,8	43,3	42,0	41,4	38,6	34,1	28,6	23,8	22,2	22,0	20,5

Source: see Tables 2.C.1-4

The shift of population in Fife from a relatively even distribution between the eastern and western halves of the county to a concentration in the western half occurred during the late nineteenth and early twentieth centuries and broadly coincided with the period of greatest population growth and urbanization in the county. Between 1871 and 1911 the proportion of the population of Fife which lived in the western half of the county increased by 17.6%. This was in contrast to increases of only 4.4% in 1831-71 and 3.3% in 1911-51. The shift in population distribution in Fife in 1871-1911 may be further elucidated by comparing population growth in the groups of parishes which formed the four County Districts during that period of greatest change in distribution and the earlier and later periods of less change. (Table 2.2.4)

Table 2.2.4 Percentage population growth in west and east Fife 1831-1951

	1831-71	1871-1911	1911-51
West Fife	32.1	109.0	24.0
South-west Fife	37.1	121.3	16.8
All west Fife	34.6	115.2	20.4
North-east Fife	3.8	-20.9	1.7
East Fife	22.2	12.0	-3.3
All east Fife	13.0	-4.5	-1.6

Source: see Tables 2.C.1-4

Throughout the period, rates of population growth in both west and south-west Fife were similar, with periods of steady growth during 1831-71 and 1911-51 and an intervening period when the populations of both areas doubled in size. In the eastern half of the county the pattern of

decline during the nineteenth century was mainly due to conditions in north-east Fife, where there was little growth during 1831-71 and then a substantial decrease in population during 1871-1911. During these periods the population of the parishes of east Fife was increasing, although at a reduced rate in 1871-1911. The period 1911-51 saw little change in both east Fife and north-east Fife. The changes in levels of population in all parts of Fife during 1831-1951 are considered in more detail in the following sections, where they are related to changes in economic activity during the period.

3. The economic development of Fife 1831-1951

A. 1831-71

In 1831 the population of Fife was 128 839 inhabitants and was evenly distributed between the four quarters of the county as defined in the preceding section. (Tables 2.B.1-4) The varied geographical conditions of the region, with its mild climate, cultivable soils, coal measures, unpolluted rivers and long coastline had permitted the establishment of a wide range of industries. At this time less than a tenth of the population of Fife lived in the burghs of Dunfermline and Kirkcaldy, and much of the industry of the county was located in or nearby a mixture of small communities which were characterised by and sometimes named after the single occupation of the majority of workers who lived there. Examples included Fordell, Coaltown of Balgonie and Coaltown of Wemyss

(coal-mining), West Wemyss (salt-making), Cults (quarrying), Limekilns (lime-burning), Dairsie, Prinlaws and the Kirkcaldy suburbs of Pathhead, Sinclairtown, Gallatown and Linktown (linen), the burghs of the East Neuk (fishing), and St. Andrews (scholarship). [39] As was noted above, a main feature of the human geography of Fife throughout the period was the county's large number of small towns, both incorporated and unincorporated.

During 1831-71 substantial population growth occurred in all the quarters of Fife except north-east Fife. (Table 2.2.4) However, in west Fife virtually all the population growth during 1831-71 (93%) occurred in the parishes of Dunfermline and Beath, whilst the populations of three parishes in this area decreased in size. (Table 2.B.1) By 1871 over 70% of the inhabitants of Dunfermline parish lived in Dunfermline burgh, but the proportion of the population of Beath which lived in the unincorporated town of Cowdenbeath was only 6.4%.

In the parishes of south-west Fife, population growth during 1831-71 was more widespread than in west Fife. (Table 2.B.2) Over 80% of this growth was distributed fairly evenly between seven parishes: Abbotshall, Auchterderran, Burntisland, Dysart, Kirkcaldy, Leslie and Wemyss. Only one parish in south-west Fife showed a decrease in population during the period. In 1871 a total of 30% of the population of south-west Fife lived in the burghs of Kirkcaldy, Burntisland, Dysart, Kinghorn, Leslie and Leven and a further 12% lived in the unincorporated towns of Buckhaven, Lochgelly and Markinch.

During 1831-71 the population in the parishes of east Fife increased by over 22%. (Table 2.B.4) Here growth was largely confined to three areas: the East Neuk (Anstruther Easter, Anstruther Wester, Crail, Kilrenny, Pittenweem and St. Monance); St. Andrews and St. Leonards; and Forgan and Ferry-Port-on-Craig. In seven parishes in east Fife there was a decrease in population during 1831-71. In 1871 over 85% of the population of the parishes of east Fife which had achieved the greatest rates of growth during the preceding four decades lived in burghs or unincorporated towns. [40] St. Andrews, which in 1871 had 6 320 inhabitants, was by far the largest town in the area.

During 1831-71 population growth in the parishes of north-east Fife amounted to less than 4%. (Table 2.B.3) Growth occurred mainly in five parishes: Collessie, Cupar, Falkland, Kemback and Strathmiglo, but in none of these places did it amount to 1 000 persons. In thirteen parishes a decrease in population occurred. In 1871 only 29% of the population of north-east Fife lived in the four burghs in the area.

A major factor in the growth of population in west and south-west Fife during the mid nineteenth century was the mechanisation of the county's textile industry, which was dominated by linen manufacturing. By this process the industry was "finally divorced from agriculture and transformed from an alternative source of income for the rural population to a full-time, essentially urban occupation." [41] Water-powered cotton- and flax-spinning mills had been built at Kinghorn and Kirkland, near Leven, in the late eighteenth century. In Dunfermline and Kirkcaldy, where there were no streams of sufficient volume to power

spinning mills, steam-powered spinning was started in the 1800s. [42] By 1832 there were ten spinning mills in Kirkcaldy and six in Dunfermline and by 1835 there were also six flax-spinning mills in or near the town of Leven. Amongst the latter group were the two largest mills in Fife, the Boase Spinning Company's Hawkslaw works and Neilson and Company's Kirkland mills, each of which employed 600 hands. [43]

The mechanisation of weaving proceeded more slowly. Handloom weaving remained profitable to manufacturers until beyond the 1840s and was a common occupation throughout the county. Textile merchants in Dysart employed looms in places as far away as Ceres and Strathmiglo, yarn from Cupar was woven on looms in Falkland and Leven, and the owners of the Kirkland mills had looms in "every village in the [surrounding] district". [44] In 1836 there were 3 517 handlooms, mostly weaving fine damask linens, in or near Dunfermline and in 1851 a quarter of the total male population in the parishes of Falkland, Kinglassie, Leslie and Markinch was employed in handloom weaving. [45] The first powerlooms in Fife were established in Dunfermline, Dysart and Kirkland during the 1840s. In some places powerloom and handloom weaving continued side by side, as in Freuchie, where in 1860 William Lumsden erected a powerloom factory with one hundred looms but continued to employ 320 handloom weavers. [46] However, there was a rapid expansion of powerloom weaving in the Fife linen industry, which by 1867 operated one quarter of all the powerlooms and employed 15% of all the workers in the Scottish linen and jute industries. [47]

A feature of the factory-based linen industry in Fife, like the cottage industry which preceded it, was its dispersal throughout the county. In 1867 a total of 63% of the mills were located in the main centres of Kirkcaldy and Dysart (18 mills), Dunfermline (5) and along the River Leven (9), but a further 19 mills were located on the River Eden and its tributary, Ceres Burn, and in such places in north-east and east Fife as Auchtermuchty, Falkland, Freuchie, Kingskettle, Ladybank, Strathmiglo and Tayport. [48] However, in eastern Fife the mid nineteenth-century development of the linen industry was not accompanied by much population growth, except perhaps in Tayport. In one place in eastern Fife there was considerable population growth during the period. This was Newport in Forgan parish, which benefited from growth in the textile industry of Dundee. In 1822 the village became the southern terminal of the Tay ferry. "The effect on Newport was dramatic, for it provided [a] bolt hole in which industrialists from Dundee could live clear of their effluent..." [49] During the nineteenth century Newport developed from a village of salmon fishers' bothies into a prosperous, detached middle-class suburb of Dundee.

The other major industry in Fife during the mid nineteenth century was coal-mining. Up to the 1870s coal-mining operations in Fife remained small in scale, but the industry had long been widespread in the county. Fullerton's gazetteer of 1844 noted the existence of coalworks in forty-three locations across Fife from Torry, Blair and Elgin in the west to Drumcarro and Pittenweem in the east. [50] During the late eighteenth century there was some shift in the workforce from the very small mines in eastern Fife to the larger works in the west of the county. [51] This

movement must have continued during the early nineteenth century but would have involved only small numbers of migrants. In 1831 coal-mining in the parishes of Wemyss and Beath occupied only 187 and 44 workers respectively. [52] However, in Beath the opening of new deep mines at Hill of Beath (c.1854), Kelty (1860) and Lassodie (1860) began the process of growth in this parish which from the 1850s led to the great increases in population there. [53]

For much of this period the Fife mining industry remained underdeveloped due to low demand from the local iron industry and a lack of railways linking the inland coalfield to the ports on the coast. Attempts to produce iron in Fife fell short of manufacturers' expectations. During the first half of the century ironworks existed at Balgonie and Oakley, but both had gone out of business by the 1870s. [54] Two blast furnaces were built at Lochgelly in 1847, and in 1850 the Lochgelly Iron Company was formed. During the 1850s more blast furnaces were built at Lochgelly and at Lumphinnans in the neighbouring parish of Ballingry, but in its original form the Lochgelly Iron Company achieved only moderate success. In 1872 "it was admitted that the Lochgelly area was a coal rather than an iron district" and thereafter the Lochgelly Iron and Coal Company, as it became known, concentrated on coal production. [55] At this time the Lochgelly Company was one of a number of medium-sized mining enterprises in central Fife. It operated seven coal works but employed only 472 men, 82 of whom were engaged in the production of pig iron. [56]

In the late eighteenth century some mines in Fife were equipped with waggonways for the transport of coal to the coastal ports. [57] The railway did not come to the county until the 1840s. The Edinburgh and Northern Railway from Burntisland to Cupar and Lindores was opened in 1847 and a branch line from Thornton to Dunfermline was completed in 1849. In 1853 the mines in the Fordell area were linked by rail to the main line from Edinburgh to Perth and Dundee and in 1854 a line from Thornton to Leven was completed. The lines from central Fife to the main line permitted the expansion of coal exports and by the 1850s the importance of Thornton Junction as a route for coal traffic from the west Fife coalfield to Burntisland and Tayport was already established. Burntisland was to become important as both a coal port and a terminal for ferries crossing the Forth. [58] However, a lack of accommodation for coal transport on the Edinburgh, Perth and Dundee Railway still prevented the shipment of large quantities of coal: in 1850 the Lochgelly Iron and Coal Company exported only *c.*200-300 tons per week from Burntisland. [59]

In addition to the staple industries of linen manufacturing and mining, by the mid nineteenth century a wide range of other industries existed in Fife. Some, such as brewing and quarrying, were established throughout the county but served mainly local needs, whilst others, such as whisky distilling, papermaking, floorcloth manufacturing and shipbuilding, were concentrated in a few centres but supplied both the local economy and export markets. However, all these industries operated

on a relatively modest scale and each employed only small numbers of workers.

As well as being a centre of the linen industry in Fife, by the mid nineteenth century the Leven valley was also the main location of paper-making in the county. Here there was clean water for the paper-making process, and access to coal, labour and port facilities. By the 1870s there were five paper mills at work in this area, including Auchmuty (established in 1806), Rothes (1809), Fettykil (1848) and Strathendry (1869), all near Leslie, and Balbirnie (1816), near Markinch. [60] These mills represented *c.*9% of the Scottish paper-making industry. [61] In 1873 a sixth paper mill in Fife was established at Guardbridge, near the mouth of the River Eden. [62] The Rothes mill employed *c.*100 workers in the 1830s and 200 in 1872 but the other Leven mills were not so large. The Balbirnie and Strathendry mills each employed *c.*30-40 workers. [63] Half the workers at the Rothes and Balbirnie mills were women.

The foundations of the Kirkcaldy linoleum industry were set down in 1847, when Michael Nairn opened his first floorcloth works at Pathhead. [64] This industry was an offshoot from linen manufacturing in Kirkcaldy, for the floorcloth was made of a paint-covered base of flax tow yarn. Initially, Nairn's factory was a small concern, with power supplied by "one grey pony", but by the 1860s it was much expanded and employed 200 workers, all of whom were male. [65] During the mid 1860s a second floorcloth works was opened in Kirkcaldy by Messrs. Shepherd and Beveridge. [66] The two Kirkcaldy factories were the only floorcloth works in Scotland.

Early engineering firms in Fife included John White of Auchtermuchty, which was established in the eighteenth century, and Henry Balfour of Leven, which built the Durie Foundry in c.1808 and at this time produced agricultural equipment. [67] Douglas and Grant of Kirkcaldy built steam engines. [68] With the industrial expansion of west Fife, local engineering firms became increasingly important in servicing the mining and textile and other factory-based industries in that area.

Shipbuilding was an old industry in Fife and the major shipbuilders in Burntisland, Kirkcaldy and Dysart and the East Neuk had been established since the mid eighteenth century. [69] The Fife shipyards produced vessels for owners in Aberdeen, Dundee, Glasgow and Zealand, but much of their work, and particularly that of the East Neuk firm of J.N. Miller, involved the provision of craft for the local fishing industry.

The mid nineteenth-century growth of population in the parishes of the East Neuk was largely due to the expansion of herring fishing from the ports there. [70] Here the centres of the fishing industry were Pittenweem, St. Monance and the contiguous small-towns of Anstruther and Cellardyke, which in 1855 were the home ports for 286 (52%) of the fishing boats and 1 324 (63%) of the sea fishermen in Fife. [71] However, the port in Fife with the largest fishing fleet was Buckhaven, which in 1855 had 168 boats and 499 fishermen. Two other centres were Crail (19 boats) and St. Andrews (18) but at this time fishing boats went out in small numbers from every port along the Fife coast from North Queensferry to Tayport.

In 1800 it was estimated that 230 000 acres, or 70% of the land area in Fife were under cultivation. In the fertile coastal zone of the county, wheat, barley, turnips and potatoes were grown, whilst the low-lying, poorly drained inland areas of the west and south-west were given over to natural pasture or oats, peas and beans. Stock included black cattle and a declining sheep population. [72] During the first half of the nineteenth century urban growth in Fife, by increasing demand for food, partially arrested the decline in size of the rural population which had set in during the late eighteenth century. [73] However, between 1831 and 1871 most of north-east Fife and the inland area of east Fife experienced a decrease in population, as did some rural parishes in the western half of the county. Even so, in 1861 a total of 16 000 persons, or 22% of the working population in Fife, were engaged in agriculture, which was second to linen manufacturing as the largest employer in the county. In 1876 the area of Fife under crops, bare fallow and grass amounted to 247 000 acres. [74] Towns whose economies were closely linked to the surrounding rural area included the north-east Fife burghs of Auchtermuchty, Cupar, which was the county town of Fife, Falkland and Newburgh. Of these, only Cupar expanded during the mid nineteenth century, in 1851 achieving a level of population which was not reached again until a century later. Much of this growth was related to the development of linen manufacturing in the town, but it also contained flour mills, bone mills, tanneries, forges and an oil work. [75]

In 1871 the main concentrations of industry in Fife were located in Dunfermline and Kirkcaldy and its suburbs and along the River Leven. These were the centres of the textile industry in Fife. However, as has

been suggested, a characteristic of the industry of Fife during the mid nineteenth century, apart from its diversity, was the generally small scale of individual enterprises. Consequently, industrial development outside Dunfermline and Kirkcaldy was not accompanied by much urbanization. Between 1841 and 1871 the proportion of the population of Fife which lived in the burghs increased by a third, but in 1871 a total of 63% of the county's inhabitants still lived in its landward area. In the western half of Fife, where industrial growth was greatest, 60% of the population still lived in the landward area in 1871, and 41% of the total population of the county still lived in its rural eastern half. In 1871 the appearance of Fife was predominantly rural and, after the textile industry, agriculture remained the main source of employment in the county. However, during the next forty years massive change was to come to west and south-west Fife with the development of the coal industry.

B. 1871-1911

Population change in Fife during 1871-1911 established the urban/rural dichotomy which has been a feature of the geography of the county to the present day. In the western half of Fife, population doubled in size but in the eastern half it decreased by 4%. During this period the total population of the parishes of west Fife increased by over 40 000 and the greatest growth (82% of the total) again occurred in the parishes of Dunfermline and Beath. Most of the remaining growth occurred in

Inverkeithing parish and by the addition to the area of the parishes of Culross and Tulliallan. (Table 2.B.1) In Dunfermline parish, population growth was steady at decadal rates of 8-14% but in Beath the decadal growth rate was never less than 50% and during the 1890s was over 90%. The growth in Inverkeithing was confined to the 1890s (30%) and the 1900s (81%). In 1911 a total of 54% of the population of west Fife lived in the burghs of Dunfermline (36%) and Cowdenbeath (18%) and a further 23% lived in the landward areas of the parishes of Dunfermline and Beath.

In the parishes of south-west Fife, population growth during 1871-1911 amounted to over 69 000 and was concentrated in Auchterderran (20% of the total growth), Ballingry (12%), Kirkcaldy and Dysart (18%), and Wemyss (24%). (Table 2.B.2) In Auchterderran, population growth amounted to *c.*40% in the 1880s and 1890s and to 103% during the 1900s. The population of Ballingry increased by over 80% during the 1890s and by 120% during the 1900s, and the population of Wemyss increased by over 50% in 1871-91 and by 130% in 1891-1911. In the parishes of Kirkcaldy, Dysart and Abbotshall, which were united in 1901, decadal rates of population growth during 1871-1911 were *c.*15-25%. Within the boundaries of the parishes of Auchterderran, Ballingry, Kirkcaldy and Dysart and Wemyss were four burghs, which in 1911 contained almost 54% of the population of south-west Fife; the landward areas of these parishes contained a further 21%. The other centres of population in south-west Fife were Burntisland, Kinghorn, Leslie, Markinch and Scoonie, all of which contained burghs. However, of this group, Kinghorn and Leslie experienced an absolute decline in population during the period

The growth of population in west and south-west Fife during 1871-1911 was almost entirely the result of the expansion of the coal industry in these areas. [76] In 1870 the Fife coal industry had an annual output of 1.5 m. tons and employed 4 500 workers. By 1914 it was producing 10 m. tons of coal per annum and employed 30 000 workers: more than one tenth of the population of Fife. Expansion of the industry was determined by increases in British domestic and industrial demand for coal, the existence in Fife of unexploited coal seams, the establishment in the county of coal companies with sufficient resources to sink new mines and reach the unworked deep measures, and the development of railway and port facilities for the efficient export of coal from the region.

Prior to the 1870s the Fife coal industry was composed of a large number of small companies. The industry continued to support small companies until the interwar period, but by the First World War it was dominated by three large firms: the Fife Coal Company, the Lochgelly Iron and Coal Company and the Wemyss Coal Company. [77] Of these, the Fife Coal Company was by far the largest. Commencing operations in 1872 at the former works of the Beath and Blairadam Colliery Company at Kelty, the Fife Coal Company advanced and grew by swallowing up other companies and developing their pits and works. Between 1887 and 1924 the Fife Coal Company took over nine other coal companies in Fife and during the 1920s acquired the unworked mineral fields of Rothes and Kinglassie. In 1893 it opened the Aitken colliery, near Kelty, which later became the largest coal mine in Scotland, with an annual output of 500 000 tons. By 1913 the Fife Coal Company employed 13 465 workers below and above ground and produced 4.4 m. tons of coal per annum.

The main rival to the Fife Coal Company in the central Fife coalfield was the Lochgelly Iron and Coal Company. The activities of the Lochgelly Company were confined to the parish of Auchterderran, but by 1911 it employed 4 163 men and produced an annual output of 1.75 m. tons. East of Kirkcaldy the main coal-bearing area was located in Wemyss parish, where all the land was owned by the family of Wemyss. The Wemyss Coal Company was the other major power in the Fife mining industry, although it developed later than the Fife and Lochgelly Companies. Prior to 1894 coal in Wemyss parish was worked by leaseholders. In 1894 the laird of the Wemyss lands, Randolph Wemyss, floated the East Wemyss Coal Company for the purpose of exploiting coal measures in the area of the village of East Wemyss and during the ensuing decade the Earlseat, Lochhead and Michael pits were sunk there. In 1905 the Wemyss Company took over the pits worked by the leaseholders Bowman and Company. Its output increased from 371 000 tons in 1902 to *c.*2 m. tons in 1912, when it employed 4 654 workers.

The delayed development of the Wemyss Coal Company was a consequence of Randolph Wemyss' early concentration on the development of Methil as the main coal port in Fife. [78] Up to the late nineteenth century coal was exported from a number of ports along the Fife coast, including Charlestown, St. Davids, Burntisland, Dysart, West Wemyss, Methil, Leven and Tayport. Except for Leven, all of these places continued to export coal up to the First World War, but by this time Burntisland and Methil had become the two main coal ports in Fife. The respective port developments at Methil and Burntisland were made in competition between Mr. Wemyss and the North British Railway (NBR), which built two docks at

Burntisland in 1876 and 1901. Outmanoeuvring the NBR, Wemyss succeeded in establishing Methil as the main coal port in Fife.

As the Fife mining industry expanded, communities on the coalfield grew with an "American rapidity." [79] Nearby new collieries, villages materialised in open country and the villages of Lochgelly, Cowdenbeath and Buckhaven and Methil grew into overcrowded towns. These developments brought with them the environmental and social problems for which the nineteenth- and early twentieth-century mining settlements throughout Britain were notorious. Housing was in short supply, badly built, without amenities and frequently damaged by subsidence. In some mining settlements in Fife, Durland noted two-roomed houses occupied by as many as eight or ten persons and he "found one place where no less than nineteen [were] herded together in three rooms. This in the country!" [80] In Cowdenbeath, water was drawn from street wells and stored in pails, and earth closets were shared amongst several families. [81] Due to the high demand for water at the collieries, domestic supplies were frequently interrupted. The burgh Medical Officer for Cowdenbeath claimed that because of one such drought he was compelled to wash in lemonade. [82] A sewage purification plant constructed by Cowdenbeath burgh council during the 1900s was quickly destroyed by subsidence. [83] The coal industry almost literally undermined standards of public health in its vicinity and, as a result, it was inevitable that in the mining settlements, outbreaks of typhoid and diarrhoeal disease were common. [84]

However, amongst the coalfield communities of Fife conditions might vary considerably. In remote hamlets, such as Westfield and Rabbit Row, where the houses were old and sanitation non-existent, living standards were primitive. Yet, by the turn of the century, the new burghs of the coalfield had developed a civic identity and pride, albeit tinged with wit. Bailie Laing of Cowdenbeath described his town as "the Chicago of Fife" and claimed that its High Street would soon be the equal in grandeur of Princes Street in Edinburgh, at which remark his audience gave "a great laugh". [85] However, in Bank Street in the neighbouring burgh of Lochgelly, which was the rival of Cowdenbeath, the local branch of the Scottish Co-operative Society in 1909 opened a store, the long frontage of which was decorated in a neo-baroque manner, with cornucopia, festoons of fruit and flowers and a corner tower with a clock.

Despite the rapid growth of the new towns on the coalfield, Dunfermline and Kirkcaldy remained the largest centres of population in Fife. Though both burghs had an interest in the coal industry, with pits on their outskirts and miners and their families forming part of their populations, industrial developments in these towns centred on other industries, which were already established there. During the period Kirkcaldy overtook Dunfermline to become the largest town in Fife.

The textile industries of both Dunfermline and Kirkcaldy prospered until the end of the century. Both in Britain and abroad, improving living standards increased demand for Dunfermline's linen damasks. By the 1870s the annual value of the burgh's exports was £1 m., half of which trade

was with the USA. In contrast to linen manufacturing in Dunfermline, the Kirkcaldy textile industry was "more broadly based [with] productions generally less spectacular and as a consequence less susceptible to change." [86] Only one sixth of Kirkcaldy's output of linen ticks, ducks, dowlas, drills, sailcloth and sheetings went to the United States and thus the town suffered less than its neighbour when in 1890 the Americans introduced the protective McKinley tariffs. However, by 1900 growth in the Fife linen industry had ceased.

From the 1860s the linoleum industry in Kirkcaldy became more important and by the turn of the century was competing with the linen industry as the staple of that town. The development of the Dundee jute industry allowed the Kirkcaldy floorcloth manufacturers to obtain the stronger jute in place of flax canvas for the base material of their product, and when in 1876 the patent for linoleum of Frederick Walton of Staines expired, the Kirkcaldy industry was able to expand to full capacity. [87] In 1882 the firm of John Barry, Ostlere and Company was formed and there were eight firms making floorcloth in Kirkcaldy. By the end of the nineteenth century the value of the output of the Kirkcaldy linoleum industry was almost the same as that of the burgh's linen industry, although the latter employed three times as many workers. During the period, two linoleum factories were also established in north-east Fife, at Falkland and Newburgh. [88]

However, the establishment of linoleum manufacturing in north-east Fife was not indicative of any general economic growth in this area. During 1871-1911 all but two parishes in north-east Fife showed a decrease in

population. (Table 2.B.3) The decreases ranged from 5% in Cupar to 50% in Kemback but were generally in the range of 20-30%. During 1871-1911 the population of the parishes of east Fife increased by 12% to *c.*38 000. Most of this growth occurred in existing centres, including St. Andrews, Ferry-Port-on-Craig and Forgan, the population of the last of which more than doubled in size during the period. (Table 2.B.4) The population of Leuchars parish also increased, by 50% to 2 605, as a result of the development of Guardbridge following the opening of the paper mill in that village. However, in the parishes of the East Neuk there was little change in population levels during this period. Nine parishes in east Fife experienced a decline in population, with the greatest decreases occurring in Cameron (32%) and Kilconquhar (26%).

A combination of factors relating to change in agriculture was responsible for the population decline in north-east Fife and much of east Fife. During the late nineteenth century expansion in agriculture in Fife was curtailed by cheap food imports to Britain. [89] Farm work was badly paid and it is probable that many were drawn from the rural east to western Fife by the lure of high wages and a less tedious, urbanized existence in the developing mining industry. The defects of the coalfield environment may have been a deterrent to some, but in rural areas working-class housing was also poor. Finally, developing mechanisation, including the use of horse-drawn mechanical reapers and steam-driven threshing machines, reduced labour requirements in agriculture. [90] Between 1861 and 1911 the numbers employed in agriculture in Fife fell from 14 000 (*c.*22% of the working population of Fife) to 8 300 (7%). [91]

However, the period was a prosperous time for the Fife fishing industry. The construction of the Anstruther Union Harbour in 1866-81 permitted fishermen from all the ports of the East Neuk to use larger boats in local waters. Some meanwhile acquired steam drifters and fished as far south as East Anglia. [92] However, there was little further expansion of the workforce in fishing in Fife, which explains the lack of population growth in the East Neuk parishes during the period. Between 1855 and 1881 the number of boats in the east Fife industry increased by 70% to 571 but the number of fishermen increased by less than 2%. In the west Fife industry the number of boats increased by 30% but the number of fishermen *decreased* by 12%. By 1881 Anstruther and Cellardyke had succeeded Buckhaven as the largest fishing port in Fife. [93]

Finally, the coming of the railway to eastern Fife brought further economic development in the form of tourism. A railway from the Edinburgh-Dundee main line at Leuchars to St. Andrews was opened in 1852. [94] A line between Thornton and Leven was opened in 1854 and was extended to Anstruther in 1863, and in 1887 a rail link was established between Anstruther and St. Andrews. [95] During the nineteenth century the Fife coast on the Forth became popular for sea bathing. The industrial towns of Burntisland and Leven, with their long sand beaches, developed a second identity as holiday resorts, and the extension of the railway opened up the east Fife coast from Largo and Elie to St. Andrews to excursionists from the industrial western half of the county, Edinburgh and Dundee. [96]

From 1852 excursion traffic at St. Andrews was "large, regular and virtually all incoming" and improved the prosperity of a town more "dependent...on dealing in people than in goods." [97] From the mid nineteenth century St. Andrews grew as a centre of both school and university education, "the home of golf" and a place of retirement for the well-to-do. [98] However, although predominantly a middle-class town, St. Andrews also had a strong working-class element in its fisher community.

C. 1911-51

During the nineteenth and early twentieth centuries the leading industries as employers in Fife were successively agriculture, linen and coal. During the period between the two World Wars, mining remained the largest single employer in Fife, but at a much lower level than before the First World War, and now a feature of the economy of the county, in common with that of the rest of industrial Scotland, was unemployment. For example, between 1927 and 1938 the average proportion of insured workers in Fife who were unemployed was 15.3% and during 1931-33 this figure rose to over 20%. [99] However, during this period average levels of unemployment in Fife were below those for Scotland as a whole. According to Smith, this was due to "Fife's relative independence of the heavy industries, outside of coal..." [100]

During 1911-51 population growth in the western half of Fife continued but at little more than a sixth of the rate of the previous forty years. (Table 2.2.4) Among the parishes of west Fife, over 80% of the growth during 1911-51 occurred in Dunfermline parish. (Table 2.B.1) By 1951 a total of 88% of the inhabitants of Dunfermline parish lived within the boundaries of Dunfermline burgh, which in 1911 were extended to incorporate the new town of Rosyth. In Beath, the other major population centre in the area, population decreased by over 2% during 1911-51. This was due to a decrease of over 13% during the 1920s. During this period little change occurred elsewhere in west Fife, except in the parishes of Carnock and Culross, where following the opening of new mines at Blairhall, Comrie and Valleyfield, population increased by 230% and 182% respectively. Most of the population growth in south-west Fife during 1911-51 occurred in Kirkcaldy and Dysart, Wemyss and Ballingry and also Scoonie and Kennoway. (Table 2.B.2) During the 1920s there were population decreases in six parishes in the area and in 1951 three quarters of the population of south-west Fife lived in four parishes: Auchterderran, Ballingry, Kirkcaldy and Dysart and Wemyss.

The interwar period was one of decline for the principal industries of Fife. The Fife linen industry failed rapidly, particularly in Dunfermline, due to the loss of the North American market, competition from Northern Ireland, the dumping of foreign linen goods on British markets and the production of cheaper and more colourful substitutes for bed and table linen. [101] The Depression of the interwar period was a "crushing blow" which destroyed the Dunfermline damask trade. By 1931 only Hay and Robertson Limited and Erskine and Beveridge and Company

were weaving linen in Dunfermline and by 1952 linen manufacturing in the town had been ousted by cotton and rayon. Demand for the coarser linen goods produced in Kirkcaldy and north-east Fife remained more stable and in 1952 there were still eight factories in Kirkcaldy producing cotton ducks, flax canvas, ticks and household textiles. Meanwhile in Dunfermline, silk mills were established in 1925, 1932 and 1952 and in addition to rayon weaving for dress materials, rayon linings for car tyres were also produced there. [102] Altogether there were forty textile firms of various sorts operating in Fife in the early 1950s, but by this time less than 4 000 workers in Dunfermline and Kirkcaldy were employed in textile production.

Progress in the Fife coal industry was interrupted by the First World War, after which coal-mining in Fife, in common with that elsewhere in Britain, went into a long and socially disruptive decline. [103] In 1918 output was two thirds of the 1913 level and was still down in 1939. During the interwar period the industry was dogged by labour disputes, with strikes in 1919, 1920, 1921, 1926, 1930 and 1931, whilst mechanisation and new, more dangerous work methods were introduced by the coal companies in efforts to increase productivity and compete with their English rivals, who were working better-quality coal. [104] In 1924 there were still 30 000 workers employed in the Fife coal industry, but within three years this total had been reduced by a quarter to 22 500. Between 1924 and 1931 the number of coal mines operating in Fife fell from 64 to 27. During the 1930s there was some recovery in the industry with the development of Scandinavian markets and an increase in the London trade and in 1949 Fife-Clackmannnan was the leading coalfield

in Scotland, producing 7.3 m. tons per annum. This success raised hopes for the future, and in the National Coal Board's *Plan for Coal* (1950) the Fife coalfield was designated as the main growth area in the Scottish mining industry. However, within a decade any optimism was dispelled by further pit closures as coal-mining in Fife went into terminal decline. [105]

Although the expansion of the late nineteenth and early twentieth centuries could not be maintained, the fortunes of the other industries in Fife during the interwar period were better than those of the disintegrating linen and coal industries. Up to the Second World War, conditions in the Fife linoleum industry remained stable. In 1938 Fife linoleum firms, with 4 165 operatives, constituted over half of the British industry. [106] They produced 60 m. square yards of linoleum per annum, which was valued at £3.5 m. However, after the Second World War, the Fife linoleum industry also went into decline.

By 1952 all but one of the six paper mills established in Fife during the nineteenth century remained in operation, and a seventh mill, Caldwell's of Inverkeithing, had opened in 1914. [107] They produced an annual output of 80 000 tons of various sorts of paper, ranging from fine esparto printings and technical papers for the photographic and plastics industries to ammunition-cartridge papers and sacks for agriculture. A workforce of 3 000 was employed in this industry, where factory work was considered more attractive than in other industries because it was clean and dry.

From the First World War important industrial developments at Burntisland and Inverkeithing involved the building, servicing and demolition of shipping. During the twentieth century the main shipbuilders in Fife were the Burntisland Shipping Company, which was founded by Wilfrid and Amos Ayre in 1918. This firm built mainly coastal colliers and tramp steamers but also liners and, during the Second World War, submarine patrol boats. [108] Of importance to the urban development of west Fife was the construction of the naval dockyard at Rosyth in 1911-16. Housing for the workers at Rosyth was provided in a pioneering state-aided housing scheme which was to have a considerable influence on the planning of postwar local-authority housing schemes, both in Fife and elsewhere in Scotland. [109] After the Battle of Jutland the Admiralty based the whole of the Grand Fleet in the Firth of Forth, and Rosyth dockyard was in full use for the servicing and repair of warships. It was hoped that the ships at Rosyth would form a large new market for Fife navigation coal. [110] However, during peacetime the yard was underused and from 1926 was manned by a skeleton staff of *c.*1 000 workers. During the Second World War Rosyth dockyard was again in full use, employing 12 000 workers in the repair and refitting of 3 000 ships, including the battleships *Belfast*, *Hood*, *Nelson*, *Warspite* and *Prince of Wales*. However, by 1948 the workforce at Rosyth dockyard had again been reduced, to *c.*8 000. Also located at Inverkeithing and Rosyth were shipbreaking yards. These yards handled the German fleet scuttled at Scapa Flow at the end of the First World War. [111]

During the late nineteenth and the first half of the twentieth centuries the primary function of the engineering industry in Fife remained the servicing of the other industries in the county, and none of the Fife engineering firms ever approached in scale the giant enterprises in the west of Scotland. Industry elsewhere in Fife consisted of a miscellany of enterprises. They continued the local tradition of diverse small-scale industrial activity in small-town and rural locations and included aluminium works at Burntisland, a beet-sugar mill at Cupar, quarrying, sawmilling and woodworking. [112]

During 1911-51 the population of east Fife decreased in size by over 3%. (Table 2.B.4) The only parishes where growth occurred were Elie (16%), Largo (10%), Leuchars (39%), and St. Andrews and St. Leonards (13%). Forgan, which had previously achieved the most substantial growth in this area, now suffered a decline of over 20%. Decreases in population occurred in all the East Neuk parishes except Crail, where there was no change. In north-east Fife the widespread population decline of the late nineteenth and early twentieth centuries continued during the interwar period. (Table 2.B.3) During 1911-51 only three parishes, Cupar, Falkland and Newburgh, achieved growth.

During the interwar period the area of agricultural land in Fife decreased in size by *c.*10% to 227 000 acres, which was equivalent to *c.*70% of the area of the county. [113] The proportion of the county's population which was employed on the land fell from 7% in 1911 to 1.5% (4 500 workers) in 1945. [114] Much of this decrease was the result of the reduction of labour requirements due to further mechanisation,

including the introduction of tractors and electric milking machines. However, in 1946 it was estimated that the withdrawal of the wartime labour of the Women's Land Army and prisoners of war would create a shortage of 900 agricultural workers in Fife. The problems of agriculture in Fife were summed up in the report of the planning advisory committee of Fife County Council: "Put bluntly, agriculture, in its depressed condition, has failed to offer wages at a level to induce men to stay on the land, or housing conditions that satisfy." [115]

Between 1895 and 1913 there was a "great surge" of herring fishing from the east coast of Scotland, but thereafter the herring began to disappear from east coast waters and the Fife fishing industry also went into decline. [116] In 1928 the number of fishing boats in the ports of both east and west Fife was *c.*64% less than in 1881. [117] Much of this change was due to the replacement of the old sailing boats by larger steamers, but in the west Fife ports the decrease in the number of boats was accompanied by a decrease of 76% in the number of fishermen. The former leader amongst the fishing ports in Fife, Buckhaven, had been transformed into a mining town and here only 28 fishermen with 17 boats remained. Between 1881 and 1928 the decline in the number of fishermen in the ports of east Fife amounted to only 20%. However, between 1928 and 1945 the workforce in the Fife fishing industry was reduced from 1 313 persons, of whom 89% were employed in east Fife, to *c.* 500, and despite the adaptation of the industry, to whitefish in Anstruther and Pittenweem and shellfish in Crail, further decline was to follow. [118]

Elsewhere in the eastern half of Fife, isolated developments, including the RAF base at Leuchars, which was established in 1917, the linoleum works at Falkland and Newburgh and the beet-sugar mill at Cupar, contributed to localised growth. There was steady growth in the population of St. Andrews as this town continued its development as an educational centre, tourist resort and place of retirement. By 1931 a long-running decline of population in Cupar had been reversed. This was partly due to the establishment of the beet mill but, more importantly, to the development of the town as the administrative centre of Fife, with a Sheriff Court, tax office and the headquarters of Fife County Council. [119]

This description has concentrated on the history of agriculture and the manufacturing and extractive industries in Fife, for during most of the period they dominated employment in the county and determined the living standards of the majority of its population. The industrial misfortunes of Fife during the period *c.*1911-51 were typical of a local economy over-reliant on heavy industry, the various weaknesses of which included its exploitation of non-renewable assets (coal), vulnerability to foreign competition (coal and linen) and dependence for profitability on the payment of relatively low wages (coal and linen). [120] A feature of such economies, and a reason for the high levels of unemployment which they suffered during the interwar period, was the underdevelopment of service industries. Low wages prevented the creation of demand for services, including retailing, banking, medical treatment, education, legal services and entertainment. Average wages in the service sector were higher than in manufacturing, which in turn increased demand in

areas where the service sector was strong. "A higher service provision, generating more and higher incomes, would have enabled [declining heavy-industrial economies] to readjust less painfully to shifts in their industrial structure..." [121] Economic recovery in "post-industrial" Fife has depended largely on expansion of employment in the service sector, including local government, the National Health Service and commerce, administration and the professions in Edinburgh, for which Fife is a commuter base. However, in 1951 the economic restructuring and middle-class development of Fife were only beginning and the county was still a predominantly working-class society.

Chapter 2. The geography and economy of Fife. Notes

1. Laurance J. Saunders, "A Geographical Description of Fife, Kinross and Clackmannan" Scottish Geographical Magazine 29 (1913) 68

2. 1892 AR 2

3. Saunders op. cit. 70

4. ibid. 71

5. M. Barbieri, A Descriptive and Historical Gazetteer of the Counties of Fife, Kinross and Clackmannan (Edinburgh 1857) 20

6. Saunders op. cit. 75

7. ibid. 76

8. ibid. 77

9. John Adamson, "Report on the Sanitary Condition and General Economy of the Labouring Classes in the City of St. Andrews" (1841), in Reports on the Sanitary Condition of the Labouring Population of Scotland, in consequence of an inquiry directed to be made by the Poor Law Commissioners (HL) (London HMSO 1842; reprinted Irish University Press 1971) 268

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26. Flinn SPH Table 5.1.1

27. ibid. Table 5.1.8

28. W.E. Whyte, Local Government in Scotland (Edinburgh 1936) 5

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34. In 1901 there were no unincorporated towns in Fife with populations of over 5 000. (1901 AR 24, 32, 48, 68)

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36. Census of Scotland 1951 II: Population of Towns and Larger Villages (Excluding Burghs) and of Urban and Rural Areas, Table 1

37. ibid. Table 1. The ten villages were Ballingry (3 380 inhabitants); Cardenden (8 571); East Wemyss (3 528); Glencraig (2 428); Kelty (7 750); Kennoway (3 479); Lochore (3 223); Methilhill (2 777); Oakley (3 591) and Thornton (2 455). The eight burghs were Auchtermuchty (1 330 inhabitants); Crail (1 139); Culross (578); Elie and Earlsferry (1 190); Falkland (1 039); Ladybank (1 149); Pittenweem (1 622) and St. Monance (1 518).

38. 1891 AR 21, 32, 45, 58

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CHAPTER 3

PUBLIC HEALTH ADMINISTRATION IN FIFE

1. The development of public health administration in Fife c.1830-1950

This section describes the changing pattern of local government in Fife between c.1830 and 1950 as it related to public health administration. During the nineteenth century the development of local machinery for public health administration was an uneven process. It involved the allocation of public health duties to agencies of local government which had been instituted for purposes other than and to some extent conflicting with sanitary improvement. Up to the 1890s public health administration at a local level in Scotland consisted of two main elements: emergency measures against the spread of epidemic disease, and ongoing environmental improvement, which mainly involved the provision of adequate water supplies and drainage. Prior to 1867 responsibility for sanitary improvement was divided between different parts of local government. Parochial boards were responsible for the control of epidemic disease, whilst burgh councils oversaw or carried out environmental improvement. This involves a simplification, for in sanitary work in incorporated towns there was considerable overlap of function between parochial and municipal authorities, particularly in the control of epidemic disease. However, in an area such as Fife the function of both the parochial boards and the burgh authorities was until the 1860s extremely limited, and although sanitary legislation was

in force there, it would be an overstatement to say that a system of public health administration existed in the county at this time.

The cholera epidemic of 1832 is seen as a landmark in the history of public health in Britain because it forced the state to accept a responsibility for the organisation of nationwide preventive measures against the spread of epidemic disease. In 1832 Parliament passed emergency legislation for the local adoption of preventive measures against the spread of cholera. [1] However, in Scotland the provisions of this legislation were insufficient to overcome the lack of an established system of public health administration and the reluctance of existing authorities to sanction expenditure for an unfamiliar purpose. Under the Cholera Act of 1832 Boards of Health were set up for the purpose of organising measures against the spread of cholera. In Fife the preventive measures of the local Boards of Health mainly involved the exclusion of vagrants from towns. They were focussed on the towns to which the Boards belonged and were only extended to the parts of the landward area which provided access to the towns. In Fife the Boards of Health were ineffectual in preventing the spread of cholera, which in 1832 caused at least 362 deaths in the county. [2] When the epidemic was past, the Boards of Health were dissolved.

The extension to all parts of Scotland of local-government responsibility for the control of epidemic disease followed the introduction of the Nuisance Removal (Scotland) Act of 1848. In England a first Nuisance Removal Act was passed in 1846, following the publication of Edwin Chadwick's *Report on the Sanitary Condition of the*

Labouring Population of Great Britain (1842) and the findings of the Duke of Buccleuch's Royal Commission on the Sanitary State of Large Towns and Populous Districts (1843-45), both of which revealed to the legislature the problems of uncontrolled urban development and particularly lack of sanitation as major causes of ill health and death. [3] A first Nuisance Removal Act for Scotland was also passed in 1846 but it was only under the Act of 1848, which was passed under the renewed threat of cholera, that advantage was taken of the nationwide system of parochial administration created by the Scottish Poor Law Amendment Act of 1845. [4] Under the Nuisance Removal (Scotland) Act of 1848 inspectors of the poor in parishes and commissioners of police in burghs acquired powers as inspectors of nuisances. The costs of nuisance removal could be met either from the poor rate or by a special assessment for which the Act made provision. In the event of an epidemic, the Board of Supervision, which was the central supervisory body of the Scottish poor law under the 1845 Act, would direct the parochial boards to implement preventive measures based on regulations issued by the English Board of Health. [5] The powers of Scottish local authorities to enforce cleansing measures were increased under the Nuisance Removal Act of 1856. [6] However, like the Acts of 1846 and 1848, the Nuisance Removal Act of 1856 was a permissive measure, which contained little inducement for adoption by a parsimonious parochial board.

In 1848 Fife was divided into sixty-three parishes. (See Figure 2.2) The parishes of Fife were small by Scottish standards and were "so ridiculously hewn into detached pieces in many instances, and the

separate portions thrown sometimes into two or three other parishes, that one is at a loss to discover either the motive or the policy by which their distribution has been regulated." [7] In 1851 the average area of a parish in Fife was eight square miles and the average size of its population was c.2 400 inhabitants. However, many parishes had smaller populations than this. In 1851 there were 31 parishes in Fife each with less than 1 500 inhabitants. In a county where the majority of the population belonged to the industrial or agricultural working class, the rate base in administrative units of this size would be low, and where the primary role of parochial administration was the relief of the poor, further expenditure by the local authority on sanitation was likely to be slight. Unlike the English Poor Law Amendment Act (1834), the Poor Law Amendment (Scotland) Act of 1845 contained no provision for the amalgamation of groups of parishes into unions, in which administration could be carried out more cost-effectively. [8] Therefore, in an area such as Fife, the entrusting of sanitary improvement to the parochial boards was a formula for inertia. [9]

However, during the 1860s the public health responsibilities of the parochial boards were increased. The Vaccination (Scotland) Act of 1863 introduced the compulsory vaccination against smallpox of infants within six months of birth. [10] Under this Act, each parochial board was to appoint a parish vaccinator, who was usually the parochial Medical Officer. In 1867, in places where the Board of Supervision determined they should act as local authorities, parochial boards acquired full responsibilities for public health administration under the Public Health (Scotland) Act of that year. This Act, which was the first

obligatory legislation for public health administration in Scotland, was a wide-ranging measure containing provision for the control of infectious diseases, nuisance removal, improvement of water supplies and drainage, regulation of common lodging houses and control of offensive trades. [11] It compelled local authorities to appoint salaried Medical Officers and sanitary inspectors.

In a number of respects the first Public Health (Scotland) Act was found to be unsatisfactory. Between 1871 and 1891 it was amended six times for such purposes as the increase of assessments, provision of public works loans, hospital provision and the extension of water-supply and drainage districts. [12] Yet the critical defect of the Act was its administration by the parochial boards. In many places in Scotland this administration was virtually non-existent. As a result, non-burghal areas, which included the rural communities of the country but also many densely populated but unincorporated industrial settlements which had sprung up on sites beyond existing burgh boundaries, remained without adequate provision for public health and without the administrative means to secure such provision. Such, at least, were the objections of critics of the parochial system of public health administration. [13]

Developing alongside the parochial system of public health administration was a series of Acts for municipal development in Scotland which was based on the eighteenth-century concept of police and which also contained provision for public health. [14] In Fife, the burghs of Dunfermline and Kirkcaldy each obtained local Police Acts in 1811 and a General Police Act for incorporated towns in Scotland was passed in 1833. [15] Under the Police Acts for Dunfermline and Kirkcaldy the councils in these burghs were empowered to raise assessments of up to 1s. 6d. per pound rental to finance works, including the improvements of water supplies. Under the General Police Act of 1833 the £10 householders in royal burghs and burghs of barony were authorised to elect police commissions, which were empowered to raise assessments to finance watching, lighting, cleansing, scavenging, drainage and the provision of water supplies. [16] The General Police Act was passed in the wake of the 1832 cholera epidemic, the impact of which "is shown in the extended scope of municipal administration" which the Act embodied. [17] There was thus an implicit connection between municipal improvement and public health, but like the Nuisance Removal Acts, the General Police Act was a permissive measure and only applied to towns which already held burgh status. By 1849 it had been adopted by ten of the small burghs in Fife, but only five, including Burntisland, Kinghorn, Leven, Pittenweem and St. Andrews, adopted the whole Act, and only one other, Cupar, adopted its water-supply clauses. [18]

Further Police Acts for Scotland were passed in 1850 and 1862. [19] The Act of 1850 appears to have been little used in Fife. It was adopted in Cupar in 1861 but only for purposes of watching, lighting, cleansing and paving. [20] The inspector of nuisances in Cupar reported that following the adoption of the 1850 Police Act the sanitary condition of the burgh was soon "much improved", but at this time neither underground drainage nor a piped water supply had been installed there. [21] The first general legislation to provide urban authorities in Scotland with extensive powers for improvement was the General Police and Improvement Act of 1862, commonly known as "Lindsay's Act", after its sponsor, Provost William Lindsay of Leith. Lindsay's Act doubled the maximum police assessment leviable to 2s. 6d. and was available to unincorporated towns of as few as 700 inhabitants. [22] It "enabled communities which chose to adopt it to make the sort of...sanitary byelaws which were the very foundations of early Victorian public health." [23] In Fife, police commissions under Lindsay's Act were newly formed in Elie (1864), Leslie (1865), Kinghorn (1873), Auchtermuchty (c.1874), Lochgelly (1877), Ladybank (1878) and Buckhaven, Methil and Innerleven and Cowdenbeath (both 1891), and other burghs which had formed police commissions under the earlier Police Acts also adopted this Act, either in part or fully. [24] By 1901 all the burghs in Fife were under municipal administration. [25]

Like the Public Health (Scotland) Act, the burgh police legislation depended for its effectiveness on the local authorities which administered it. In this respect, important factors included the size and rate of growth of burghs but also perceptions of the need for

improvement. The dates of the appointment of burgh Medical Officers offer a rough indication of the concern of burgh authorities for sanitary improvement. As early as 1853 Dr. James Morris of Dunfermline was "unanimously nominated...to take charge of the medical department" of the police commission of that burgh. [26] This appointment, although part-time, preceded by almost a decade the appointments in 1862/63 of Littlejohn in Edinburgh, Gairdner in Glasgow and Ogston in Aberdeen. [27] In St. Andrews, Dr. John Adamson was officially appointed as burgh Medical Officer in 1867, when the Public Health (Scotland) Act came into force, but he had served as a member of the burgh police commission's water committee since 1853. [28] In Kirkcaldy, where Lindsay's Act was not adopted until 1873, Dr. James Young served as burgh Medical Officer under the Public Health (Scotland) Act. [29]

In many of the small burghs, sanitary work was closely linked to the parochial administration. From the cholera emergency of 1866 the Medical Officer for Cupar parish acted in the same capacity for Cupar burgh, and similar arrangements were adopted at this time in the burghs of Leslie and Leven. [30] In Ladybank (1881), Kinghorn (1885) and Auchtermuchty (1890) the appointment of burgh Medical Officers followed determinations by the Board of Supervision that under the Public Health (Scotland) Act the local authorities in these burghs should be the police commissions and not the local parochial boards. [31] However, appointments of Medical Officers in Lochgelly (1891) and Markinch (1892) were made independently of direction from the Board of Supervision. [32] During the late 1890s one burgh Medical Officer, Dr. John Aitken of Buckhaven, Methil and Innerleven, succeeded in widening his public health practice

by obtaining similar appointments in Ladybank and Lochgelly. [33] However, up to the 1890s all the burgh Medical Officers in Fife were local general practitioners, who carried out local-authority work on a part-time basis.

From the 1890s a feature of the development of public health administration in Fife was the increasing reliance of the small burghs on services provided by the landward authorities. This was a consequence of the centralisation of public health administration in the landward area of Fife under four District Committees of Fife County Council, which was established under the Local Government (Scotland) Act of 1889. [34] The landward area was divided into four administrative Districts, which were named after the principal burghs which were situated, but not included, within those Districts: Cupar, Dunfermline, Kirkcaldy and St. Andrews. (Table 2.A.1) Each District Committee was composed of county councillors and, from 1894, parish councillors, following the replacement of the parochial boards by popularly elected parish councils. [35] In terms of the Act of 1889, the Board of Supervision issued obligatory regulations governing the duties of a full-time County Medical Officer of Health.

The Fife County public health department was based in Cupar and initially consisted of the Medical Officer of Health and four sanitary inspectors, one for each District. [36] The first County Medical Officer of Health for Fife was Thomas Goodall Nasmyth. [37] In the preface to his first full annual report, Nasmyth criticised the "sanitary inertia" of the communities in the County Districts of Fife and the dual system

of public health administration which existed in the county. [38] Under the Burgh Police Act of 1892, the main feature of which was its extensive provision for building regulation, the burghs secured improved powers for public health administration whilst the County authorities remained burdened with the "almost obsolete" Public Health (Scotland) Act of 1867. As a result, "uniform and homogeneous action" in public health administration in the burghs and the landward area was impossible to achieve. [39]

By 1901 the twenty-eight burghs in Fife contained over 60% of the population of the county. The two large burghs were developing their own public health departments, although neither had appointed a full-time Medical Officer of Health. Many of the small burghs retained their own Medical Officers, but some arranged for the County Medical Officer to act as their MOH. This latter group included Elie (1892), Anstruther Easter and Anstruther Wester (1894), Earlsferry and Kilrenny (1895), Culross (1897) and Inverkeithing and Markinch (1899). [40] However, the largest small burghs, including those on the coalfield, where sanitary problems were worst, remained beyond Dr. Nasmyth's control. In a review of the first ten years' work of the Fife County public health department, he again attacked the system which perpetuated the division of responsibility for public health administration in Fife:

> "How would police administration for the detection and suppression of crime succeed in Fife if there were thirty-two separate authorities for the administration of the Police Acts, all acting independently and promiscuously?...If crime cannot be stamped out under a multiplicity of authorities, how is it possible to stamp out epidemic disease, which often originates under conditions of time, space and influences widely separated and removed from the area in which it manifests itself?" [41]

However, between the 1890s and the First World War the responsibilities of local authorities for public health administration were greatly increased, this work became more complex and expensive, and the benefits in efficiency and economy of co-operation between authorities were increasingly appreciated. In 1897 a new Public Health Act for Scotland was introduced. This Act set a standard of public health law for the whole of the country and extended the powers of both central and local public-health authorities. [42] Under the 1897 Public Health Act, the Local Government Board for Scotland, which in 1894 had replaced the Board of Supervision as the central authority for public health administration in Scotland, was empowered to order local authorities to carry out sanitary improvements. [43] The Local Government Board could, for example, compel local authorities to establish infectious diseases hospitals, the provision of which entailed considerable expense. In an area of many small local authorities, such as Fife, the provision of hospital accommodation was achieved most economically by combinations of authorities. By the late 1900s all but three of the burghs in Fife collaborated with the County authorities in five joint infectious-diseases hospital schemes. [44]

Further statutory obligations and considerations of economy and efficiency compelled local authorities to act jointly in other areas of public health administration. In addition to the eight burghs in which Dr. Nasmyth acted as Medical Officer, by 1901 a further ten burghs in Fife employed the services of the food analyst appointed by the County Council. [45] A number of small burghs, including Culross, Inverkeithing, Lochgelly, and Buckhaven, Methil and Innerleven received

water supplies under the Dunfermline District water schemes of 1904-13 and the Kirkcaldy District water scheme of 1913, all of which utilised sources in the Ochil Hills. [46] Under the provisions for sanatorium benefit in the National Insurance Act of 1911 all the small burghs in Fife, together with Kinross County, participated in the Fife County tuberculosis scheme and the establishment of the Fife and Kinross Sanatorium, which was opened in 1919. [47] Under the Venereal Diseases Act of 1917 all the local authorities in Fife and Kinross, including Dunfermline and Kirkcaldy, participated in a single scheme in which medical treatment was provided at centres in Dunfermline, Kirkcaldy and Dundee. [48] Finally, by 1920 eleven small burghs in Fife were participating in the maternity and child welfare schemes which had been established by the four County District Committees under the Maternity and Child Welfare Act of 1918. [49] By the 1920s the centralisation of public health services in Fife was well advanced and some of the smallest burghs had ceased to exist as separate entities in public health administration.

From 1919, when central health administration in Scotland was centralised under the Scottish Board of Health, the government came under pressure to reform local health administration. [50] Amongst the critics of the existing system was the Labour MP for West Fife, William Adamson, who complained that the Scottish Board of Health legislation contained "no attempt...to co-ordinate the local authorities." [51] The movement towards greater centralisation in Scottish public health administration was eventually formalised under the Local Government (Scotland) Act of 1929, a comprehensive reform which was "the climax of

[Minister of Health] Chamberlain's strategy to enlarge and rationalise local government." [52] This Act abolished the County District Committees and placed County public health administration under a single public health committee of the County Council. In Fife the area of the County public health committee's control was redivided into seven administrative County Areas. (Table 2.A.2) The Act left unchanged public health administration in the large burghs, but in the small burghs the County authorities acquired responsibility for a number of public health functions, including maternity and child welfare services; control of infectious diseases, including tuberculosis and venereal diseases; supervision of the milk supply; inspection of food and drugs; control of diseases of animals; and pollution control. [53] The small burghs retained responsibility for their water supplies, drainage, cleansing and housing. The Local Goverment (Scotland) Act of 1929 also united as single burghs the small burghs of Elie and Earlsferry and Anstruther, Easter, Anstruther Wester and Kilrenny. [54] In 1930 another small burgh, Dysart, was absorbed by Kirkcaldy in a boundary extension. [55]

The administrative system established in 1929 was to remain unchanged until the introduction of the Local Government (Scotland) Act of 1973, under which the administrative units of counties and burghs were abolished. [56] However, prior to this upheaval, some of the functions acquired by local-authority public health departments, including medical treatment at child welfare centres and the management of hospitals, were transferred to the National Health Service, whilst within the local authorities the development of specialised departments such as social work and environmental health, with their own leadership, diminished the

formerly presiding role of the Medical Officer of Health. [57] In fact, the Medical Officers of Health were victims of their own success. [58] Their work at national and regional levels had succeeded in creating an infrastructure for what was seen as effective public health administration. The remaining sections of this chapter describe the elements of that infrastructure in Fife which were factors in the reduction of mortality from infectious diseases: sanitation, housing, the notification of infectious diseases, and infectious diseases hospitals.

2. The development of sanitation in Fife

This section considers the development of sanitation in Fife in order to show the dates by which the different divisions of the county had acquired adequate water supplies and drainage. Local-authority supervision of dairy sanitation is also considered. In the chapters on typhoid and diarrhoeal diseases in Fife the development of sanitation, as described here, will be considered as a factor in the decline in mortality from those diseases during the period.

For the purpose of this study an adequate water supply is defined as a supply which was secure from pollution, plentiful under normal circumstances and easily available to consumers. From this it follows that in terms of public health an adequate water supply was likely to be a gravitational supply which was collected on a gathering ground safe

from pollution and conveyed enclosed in pipes direct to the consumer in his home or work-place or wherever the water was needed. Due to the unadvanced state of the practice of water filtration, at least during the nineteenth century, water supplies which at this time were filtered but were taken from gathering grounds vulnerable to pollution cannot be regarded as adequate. The chemical purification of water supplies, which only became available at the end of the period, was also an inadequate substitute for a naturally pure supply. In the 1930s it was considered preferable to find a new water supply rather than chlorinate a suspect existing supply. [59] Water supplies which were most vulnerable to pollution were those drawn from wells, as the Fife County Medical Officer, Dr. Nasmyth, warned in 1892:

> "A well in a village may supply a perfectly pure water, but the fact is, that this is of rare occurrence. The water may be bright, sparkling, transparent, and free from organic or other impurity one day, while the next it may be dangerously polluted..." [60]

In populous places lacking sewerage, wells were liable to pollution by surface drainage, and even in places where sewerage had been installed, well-water, unless carefully covered, was still vulnerable to pollution by rubbish falling into it. In 1911 a survey of wells in the village of Strathmiglo found that two were within a few feet of open drainage conduits, one was "six yards from a grave", and three variously contained tin cans, broken earthenware, waste paper and potatoes. [61] Microscopic techniques for the identification of disease organisms in water samples were not available locally until the 1890s, and unless tests were carried out over a long period, bacteriological examination was not a reliable indicator of the purity of a water supply. [62]

Therefore it was desirable to ensure that water supplies were taken from a source which was known to be safe from pollution, namely an upland gathering ground unpopulated by people or grazing animals. Up to the mid twentieth century very small and isolated communities in Fife continued to receive water supplies from wells, and subterranean water sources remain in use on a small scale in the region even today. [63] Where there were few consumers and pollution of subsoil water was not suspected, a properly constructed well was considered to be a satisfactory source of supply, but wherever possible, such supplies were replaced by connections to a main carrying a gravitational supply. [64]

Tables 3.A.1-2 chart the development of water supplies in the burghs of Fife, including those towns which had yet to acquire burgh status when they obtained adequate water supplies. They show when each burgh carried out a water scheme from which an adequate water supply was obtained. For the purpose of this study a water scheme is defined as involving the construction, on a gathering ground safe from pollution, of an impounding reservoir for the provision of a water supply which would be piped direct to the consumer. Tables 3.A.1-2 provide basic information about the water supplies to each of the Fife burghs during this period, showing where water schemes were carried out. In Table 3.A.3 the information on the development of water supplies by the small burghs is rearranged to show the chronological development of water schemes in Fife and to give an estimate of the total population of the small burghs which was adequately supplied with water during each decade of the period of that development. The provision of adequate water supplies in the large burghs is considered below.

The definition of an adequate water supply involves a considerable generalisation. Because more detailed information is lacking, it is assumed that the construction of a water scheme for a town led to the provision of an adequate water supply to all inhabitants there. However, as the following discussion shows, this was not always so. The water scheme for Kirkcaldy which was completed in 1869 provided an adequate supply to the existing town, but following the extension of the burgh boundaries in 1876 and further growth of the town thereafter, the waterworks for Kirkcaldy were extended under legislation passed in 1881, 1886 and 1896. Similarly, it is assumed that the Craigluscar scheme for Dunfermline provided an adequate supply to the population there in 1871. However, this is unlikely to have been the case, for works for a new water supply to Dunfermline from the Ochil Hills were constructed in 1876-79. Therefore the development of adequate water supplies for Kirkcaldy and Dunfermline occurred *from* rather than *during* the 1860s and was completed by the 1890s.

The water schemes for the coalfield burghs provided only partially adequate supplies, which were frequently interrupted, particularly as a result of a heavy demand for water from the local mining industry. During the 1890s and 1900s there were repeated water shortages in Leven, whilst it was found necessary to increase the supply to Cowdenbeath in 1901 and again in 1918. By the 1890s water shortages were a regular occurrence in Lochgelly and throughout Wemyss parish. [65] In Wemyss these shortages were not fully overcome until the parish received a water supply as part of the Kirkcaldy District Water Scheme of 1913. The supply to Lochgelly remained defective up to the 1950s but was augmented

from the Dunfermline County District and Cowdenbeath burgh supplies. [66] Although water schemes for the burghs and unincorporated towns of the coalfield were completed by the early 1890s, it was not until the First World War that these communities obtained full access to adequate water supplies.

With the exception of Kinghorn, all the west Fife coastal burghs were adequately supplied with water by the late 1870s. A water scheme for Kinghorn was completed in 1893 but had only limited storage capacity. However, the burgh was able to obtain additional supplies from Kirkcaldy. [67] Culross was only transferred to Fife in 1895, by which time it was receiving a water supply from Dunfermline's Glensherup scheme.

Varied conditions and protracted development were also features of the water supplies to the burghs in central Fife. During the 1870s and 1880s the local authorities of Cupar and Newburgh carried out water schemes which have continued to provide adequate supplies to the present day. Auchtermuchty, Falkland, Leslie and Markinch were all situated at the base of the Lomond Hills, from which drained plentiful natural supplies of water. Leslie and Markinch obtained supplies from works established by small private companies in 1854 and 1860 respectively. However, Markinch is regarded as receiving an adequate supply only from 1881, when the town's waterworks were improved by the construction of storage tanks and filters. The town council of Markinch acquired the burgh's waterworks in 1906. Up to the 1900s the water supply to Auchtermuchty was also managed by a private company but was distributed from wells

which during the 1890s the County authorities condemned as a health hazard. [68] Under pressure from Cupar District Committee, control of the Auchtermuchty water supply was transferred to the burgh authority, which completed a water scheme by 1907. During the 1900s the town council of Ladybank also came under official pressure to improve the burgh's water supply, much of which was drawn from artesian wells. Improvements carried out to this supply involved enclosing it in pipes.

All the East Neuk burghs, except Crail, obtained adequate water supplies during the 1880s, as did Newport and Tayport, which both received supplies from Dundee Corporation via a pipe carried across the Tay on the railway bridge. However, St. Andrews was one of the last burghs in Fife to obtain an adequate water supply. After carrying out a number of ill-planned water schemes during the nineteenth century, in 1911 the burgh authorities completed the construction of the Cameron reservoir, which supplies the town to the present day.

Up to the 1890s the local authorities in the landward area of Fife were the parochial boards. The parochial system of public health administration in Scotland, as established under the Public Health (Scotland) Act of 1867, was much criticised for its "sanitary inertia". [69] However, by the 1890s large areas of the landward area of Fife were adequately supplied with water. The full extent of the development of landward water supplies was revealed in a survey carried out by Dr. Nasmyth in the first year of his work as County Medical Officer. "In some of the villages", he wrote, "water is supplied by gravitation, both of excellent quality and quantity, but in many others the supply is from shallow wells in close proximity to houses, and hence liable to danger of serious pollution." [70] Table 3.2.1 shows the availability of adequate water supplies in the landward area of Fife in 1891, as determined by the provision of good gravitation supplies. It represents a generalisation which cannot accommodate certain local peculiarities of water supply but shows that by the 1890s there had been considerable development of landward water supplies, for which the parochial boards could claim much credit. [71]

Table 3.2.1 Percentage of the landward population of Fife receiving gravitation water supplies of good quality 1891

County District	Population receiving good gravitation water-supplies	% total population
Dunfermline	10 127	56.5
Kirkcaldy	6 192	21.7
Cupar	1 248	6.7
St. Andrews	3 295	21.1
Landward area	20 862	26.5
Fife		11.1

Sources: 1891 AR 22-24, 33-34, 57, 67; 1892 AR 51, 67, 78, 87

Between the early 1890s and the 1900s the quality of water supplies in the County Districts of west Fife deteriorated. In these areas conditions of water supply were determined by three main factors: population growth, demand of the local mining industry for water and the disruption of local water supplies by mining operations. In 1897, for example, Dr. Nasmyth reported that in the area of Auchterderran village:

> "there is very soon going to be a water famine owing to the various wells becoming drained by mining operations...In a short time new colliery houses will be erected owing to the development of the coalfields, and the problem is, where are they going to get water?" [72]

During this period further local developments of water supplies in Dunfermline and Kirkcaldy Districts included the utilisation of Loch Glow as a supply for Kelty (1897) and the provision of a new supply for Kinglassie (1911). [73] Elsewhere in these Districts water supplies were taken from ponds, wells, field drains, mine shafts, water carts and, at Lassodie, the tank of a passing railway locomotive. [74] By 1901 little more than 30% of the population of Dunfermline District were adequately supplied with water, in comparison to over 56% in 1891. By 1909 less

than 15% of the population of Kirkcaldy District were adequately supplied, in comparison to over 21% in 1891. [75] Water supplies remained inadequate in most of Dunfermline District until *c.*1910 and in Kirkcaldy District until the First World War, when District Water Schemes utilising sources in the Ochil Hills were carried out. [76]

In much of the County area of east Fife the provision of water supplies remained inadequate until after the Second World War. In this area rainfall was low, and beyond the vicinity of the Lomond Hills natural supplies of water were poor. The rocks of the area held no large subterranean supplies, as was discovered by dowsing and the sinking of boreholes, and there were few sites where reservoirs could be formed. Widespread cultivation of land necessitated the filtration of supplies from local sources. [77] Up to the 1930s the County authorities secured adequate supplies for a number of villages, including Leuchars in 1905 and, after thirty-three years of struggle against the villagers, Strathmiglo in 1925. [78] However, in 1931 Special Water Supply Districts formed under the Public Health (Scotland) Act incorporated only 29% of the landward population of east Fife and in 1935 it was reported that over 30% of that population still depended on dip wells for water supplies. [79] By this date the localised development of water supplies was seen to have failed and Dr. G. Matthew Fyfe, as deputy County Medical Officer with responsibility for east Fife, called upon the County Council to abolish the rural Special Water Supply Districts, "in view of the practical and financial difficulities which attend them." [80] From 1935 water supplies from the Ochil Hills were gradually extended over the whole of east Fife under the Fife Regional Water

Scheme. [81] By 1951 a total of 85.1% of the houses in the landward area of Fife had their own piped water supplies, a further 7.4% were served by shared supplies and only 7.5% were without piped water supplies. [82]

The development of adequate drainage, as defined by the provision of comprehensive sewerage systems, was generally consequent on the provision of adequate water supplies, which were needed for flushing water closets and sewers. However, in some places the expense of water schemes postponed the execution of drainage works, whilst in a few others, where difficulties were encountered in securing adequate water supplies, the development of drainage overtook that work. The two large burghs in Fife were adequately drained by *c.*1900. A first sewerage scheme for Dunfermline was completed in 1870 and improved and extended in the early 1890s. A drainage scheme for Kirkcaldy was commenced in 1881 and completed in 1892. [83] By 1907 only *c.*15 "privy boxes" remained in use in Kirkcaldy, and all the ashpits in the burgh had been abolished. [84] The small burghs which completed drainage schemes by *c.*1900 included Anstruther Easter (scheme completed in 1888), Cupar (mid 1880s), Crail (1900), Elie (1883), Kinghorn (1897), Leven (*c.*1896), Markinch (1894) and St. Andrews (1894). [85] Other towns, such as Burntisland, which were long-established police burghs, had probably completed drainage schemes by this time, but the mining towns which had experienced rapid growth were probably not well drained. In Lochgelly, for example, the inadequacy of the burgh's water supply forced the postponement of drainage works until after 1902. [86] In central and east Fife the burghs of Auchtermuchty, Ladybank and Leslie remained undrained until the late 1900s. [87] It is difficult to determine by

which date all the burghs in Fife were adequately drained but most, if not all, had probably carried out drainage schemes by *c.*1914.

The development of drainage in the landward area of Fife may be more easily followed from the reports of the County Medical Officer and census data. In 1891 none of the villages and hamlets in Cupar District had adequate drainage. In Dunfermline District the villages of Aberdour, Charlestown, Kincardine and Limekilns were well drained, but elsewhere in the District, drainage was by surface channels or non-existent. In Kirkcaldy District only East Wemyss and West Wemyss and in St. Andrews District only Balone, Colinsburgh, Lundin Mill and Wormit were well drained. [88] In comparison to the burghs, the development of drainage throughout the County area was slow. By 1911 there were eighteen Special Drainage Districts in the County area but they contained only 24.3% of the landward population. [89] By 1931 Special Drainage Districts still incorporated only 56.5% of the landward population. [90] However, by 1951 over 90% of the houses in the landward area were equipped with water closets. [91]

In some places the provision of drainage was not preceded by the development of adequate water supplies. Such a problem was identified in St. Andrews at the commencement of a drainage scheme for the burgh in 1864, but it was to be seventeen years after that scheme was eventually completed in 1894 before St. Andrews obtained a plentiful water supply. [92] Where water supplies failed, water closets became a health hazard. In early 1901 demand for water in Cowdenbeath caused daytime water shortages in the mining village of Lumphinnans, which was served by the

Cowdenbeath supply. As a result, 104 water closets in new houses in Lumphinnans were "standing full of excreta, and are choked up for want of water to flush them." [93] Here the development of sanitation endangered health.

Until plentiful water supplies were available for the flushing of drains and water closets, waste disposal was by the ashpit-privy system and scavenging. By the 1860s most of the burghs in Fife had adopted some form of scavenging under the General Police Acts. It is difficult to know how efficiently this work was carried out. During cholera emergencies some local authorities found it necessary to improve scavenging in their towns. [94] However, without the provision of adequate water supplies and drainage, scavenging could have had only a marginally favourable impact upon standards of health.

Finally, a potential area of sanitary defects and source of infection which came under local-authority control in the late 1870s was dairy sanitation. Supervision by public health authorities of milk production in Fife commenced with the introduction of the Dairies, Cowsheds and Milkshops Orders of 1879, 1885 and 1887, which contained regulations governing dairy sanitation and under which local-authority sanitary inspectors in Fife were appointed as inspectors of dairies. [95] However, the work of these early inspectors of dairies was part-time and lowly paid and is unlikely to have led to any great improvement in dairy sanitation in Fife. Such improvement was only achieved under the more intensive control of the County public health department.

The District Committees of Fife County Council first carried out surveys of dairies in the landward area of Fife during the mid 1890s. [96] Many of the dairies in the landward area, which produced most of the milk consumed in Fife, were found to be defective. Out of the 125 dairies in Dunfermline District, for example, a total of 47 did not fulfil bye-law requirements. Under the direction of the local authorities, widespread structural improvements to dairies were carried out. These included the provision of water supplies and sculleries, the cleaning and repair of floors, including the relaying of floors with concrete and the construction of grips (cattle walkways) and drainage channels, the provision of troughs and the improvement of external drainage. [97] However, difficulty was encountered in persuading dairymen to observe bye-laws relating to the cleansing of udders and milkers' hands and to groom cows' flanks and tails, which were often caked with dung. [98] With the increasing concentration of milk production in Fife in larger dairies in the County area, standards of dairy hygiene gradually improved. However, during the period the local authorities' supervision of milk production remained incomplete, for as late as 1945 there were still *c.*1 500 unregistered small dairies in Fife, which purported to supply milk only to neighbours and employees and thus claimed exemption from regulation under the Milk and Dairies (Scotland) Act of 1914. [99] Meanwhile pasteurised milk became widely available in Fife only during the 1930s. [100]

In 1891 a total of almost 60% of the population of Fife was adequately supplied with water. Over 80% of this total lived in the burghs and unincorporated towns. Both the large burghs were adequately supplied

with water by the 1890s and the small burghs were similarly supplied by *c.*1911. Supplies to some small burghs remained defective after this date but the widespread development of water schemes during the preceding half-century meant that alternative sources of supply were usually available when local supplies ran low. The landward mining districts of west Fife suffered a deterioration in the quality of water supplies during the 1890s and early 1900s but by the First World War were adequately supplied from reservoirs in the Ochil Hills. However, supplies from the Ochils were not piped into all parts of east Fife until the 1950s. In general, the development of adequate drainage followed that of water supplies in all divisions of the county. The large burghs were drained by the 1900s, the small burghs probably by the First World War, but many communities in the landward area remained inadequately drained until the interwar period. During the period the large burghs were the most advanced and the rural east of Fife was the most backward in the development of sanitation. How this was reflected in levels of mortality from water-borne and filth-related infectious diseases is considered in the chapters on typhoid and diarrhoeal diseases in Fife.

3. The development of housing in Fife 1861-1951

The "law of density", as propounded by the Registrar-General for England, William Farr, stated that "the nearer people live to each other the shorter their lives are". [101] Crowding spread disease and most commonly occurred in housing. Housing which was overcrowded and also inadequately equipped with amenities was the main locus of infection by the major infectious diseases. In an area such as Fife most cases of the airborne infectious diseases: smallpox, diphtheria, scarlet fever, measles, whooping cough, influenza and pulmonary tuberculosis, were probably caused by contact in domestic environments. Most cases of typhus occurred under such conditions, and the incidence of typhoid and diarrhoeal diseases was largely determined by the condition in houses of water supplies and drainage and facilities for the storage and preparation of food. The development of sanitation in Fife has been considered and the relationship of the incidence of typhoid and diarrhoeal diseases to standards of sanitary facilities and other amenities in housing is considered in the chapters on those diseases. Changes in the form of housing in Fife are also considered at relevant points in the following chapters. This section describes housing conditions in terms of levels of crowding, in Fife as a whole and in the divisions and subdivisions of the county. It considers how levels of crowding in Fife changed during the period and the contribution which local authorities made to the improvement of housing by the reduction of crowding.

The Medical Officer of Health for Glasgow, J.B. Russell, "conclusively demonstrated that the most lethal sort [of crowding] was that measured..., not in persons per acre, but in persons per room." [102] The statistician A.L. Bowley wrote that, in terms of health, density of population "measured with respect to space indoors may well be more important than that with reference to space out of doors, where there is generally ample fresh air..." [103] For Fife data for crowding in terms of persons per room are available from 1861, when, in the first census taken under the authority of the Registrar-General for Scotland, numbers of windowed rooms in houses in parishes and burghs in Scotland were recorded. [104]

No measure of overcrowding in terms of persons per room was applied to housing conditions in Scotland until the early twentieth century. Nineteenth-century burgh police legislation only "set minimum cubic capacities for houses with different numbers of rooms" and the only provisions relating to housing in the Public Health (Scotland) Act of 1897 concerned the framing of bye-laws for the regulation of the construction of dwellings and the limitation of accommodation in common lodging houses. [105] However, in its report of 1917 the Royal Commission on the Housing of the Industrial Population of Scotland determined the extent of overcrowding in Scotland according to a minimum rate of two persons per room (PPR). [106] For statistical purposes Bowley in 1923 assumed a satisfactory level of crowding to be one person per room, which "allows adequate air-space and freedom from jostling..." [107] However, no limit on crowding in terms of persons per room was set down in legislation until 1935, when as one of two tests for

overcrowding (the other involved the separation of the sexes for sleeping) the following scale was established. (Table 3.3.1)

Table 3.3.1 Maximum levels of crowding in houses with different numbers of rooms as permitted under the Housing (Scotland) Act of 1935

House size (rooms)	PPR	House size (rooms)	PPR
1	2	4	7.5 [A]
2	3	5	10
3	5	5+	two persons for every additional room

Source: Marian Bowley, Housing and the State 1919-1944 (London 1945) 143 n. 1

A. Children aged 1-10 were counted as half a unit. Infants were not counted.

Here levels of crowding are considered in the various geographical units into which, for the purposes of this study, Fife has been divided. Following A.L. Bowley, an average level of crowding of one person per room in any geographical unit is taken to indicate a satisfactory level of crowding. Any level of crowding substantially above this figure is taken to indicate a degree of overcrowding and any average level of crowding in excess of two persons per room indicates widespread and serious overcrowding. Levels of crowding in Fife during the period are considered for the county as a whole, in comparison with Scotland, for the large-town, small-town and rural divisions of the county, and for seven subdivisions, into which the burghs have been divided according to their geographical location and, where comparable, their socio-economic characteristics. (Tables 3.B.1-2) Because of the nature of the data relating to crowding levels, the divisions of Fife are here defined by

the boundaries of the burghs and landward area of the county rather than by those of the urban and rural registration districts.

As measured by persons per room, crowding is not a clear indicator of the potential vulnerability of a population to widespread attack by airborne infectious disease. It does not take into account the age composition of populations, which is important in determining levels of mortality from pulmonary tuberculosis and the infectious diseases of childhood. [108] However, in the present study, crowding, as measured by persons per room, is the only quantitative means of describing concisely the range of housing conditions which existed during the period in Fife.

Table 3.3.2 Levels of crowding in Scotland and Fife 1861-1951

Persons per room	1861	1871	1881	1891	1901	1911	1921	1931	1951
Scotland	1,79	1,69	1,59	1,52	1,48	1,45	1,42	1,27	1,05
Fife	1,66	1,55	1,48	1,42	1,38	1,44	1,41	1,24	1,03
Fife large burghs	1,72	1,74	1,71	1,62	1,51	1,48	1,40	1,23	1,03
Fife small burghs	1,55[A]	1,50	1,44	1,33	1,24	1,24	1,23	1,07	0,91
Fife landward area	1,74	1,41	1,29	1,32	1,39	1,62	1,51	1,33	1,09

Source; Scotland; Census of Scotland 1951 III Table 5; Fife; ibid, 1951 I 17 Table 20

A, Incomplete data, See Tables 3,A,1-2

Figure 3.A.1 and Table 3.3.2 show average levels of crowding in Scotland as a whole and Fife during 1861-1951. Between 1861 and 1901 levels of crowding in both Scotland and Fife declined by c.17%, with the average level of crowding in Fife remaining 7% below the national average.

However, whereas in Scotland there was continuous decline in levels of crowding during the period, between 1901 and 1911 levels of crowding in Fife increased to 1.44 PPR and thereafter differed by less than 2% from those in Scotland as a whole. Between 1911 and 1951 average levels of crowding in Scotland and Fife declined by *c.*28% to one person per room, which, as has been stated, may be regarded as an adequate level of crowding.

The average levels of crowding in both Scotland and Fife obviously conceal regional and subregional variations. Differences in levels of crowding in the divisions of Fife are shown in Figure 3.A.2. Up to 1911 levels of crowding in the large burghs of Fife remained above the level of crowding for the county as a whole by 10%. Thereafter they were almost identical to the county average. During the period levels of crowding in the large burghs of Fife declined almost continuously and by 40% to one person per room. A similar consistency and rate of decline in crowding (41%) was achieved in the small burghs. Here levels of crowding were always below the county average, by *c.*6% in 1861-1901 and by *c.*13% in 1911-51. Yet, as will be seen, this favourable pattern of housing conditions was not representative of all the small burghs in Fife. By contrast with the urban divisions, levels of crowding in the landward area of the county fluctuated, forming a curve with a switchback pattern. From a relatively high level in 1861 crowding in the landward area had fallen by 1881 to the lowest level achieved in any division of Fife during the second half of the nineteenth century. However, between 1881 and 1911 it increased by 26% to the highest level in any division. Between 1911 and 1951 levels of crowding in the landward area of Fife

declined by 33% but remained the highest in all the Fife divisions. However, by 1951 levels of crowding of approximately one person per room had been achieved in all the divisions of Fife.

Some explanations for the variations in levels of crowding in the divisions of Fife may be found in considering conditions within those divisions. Figure 3.A.3 shows that the relatively high level of crowding in the large burghs during the second half of the nineteenth century was due mainly to conditions in Dunfermline, where in 1871 levels of crowding stood at 1.87 PPR. However, between 1861 and 1911 crowding in Dunfermline decreased by 18.6%, which was precisely twice the rate of decrease in Kirkcaldy during the same period. From 1911, when levels of crowding in Dunfermline and Kirkcaldy were virtually identical, to 1951 crowding in each of the two large burghs declined by c.30%.

Figure 3.A.4 shows the contrast between levels of crowding in the coalfield burghs and the other groups of small burghs. The coalfield burghs were the only group of burghs where at any time during the period levels of crowding exceeded two persons per room. In Buckhaven and Methil, Cowdenbeath and Lochgelly crowding remained at this level almost continuously from 1871, when figures for these towns are first available, to 1921. (Table 3.B.1) In Leven, which was situated on the coalfield but not dominated by the mining industry to the same extent as the other three coalfield burghs, conditions were more favourable and miners' housing of a low quality occupied only one quarter in the town. [109] During the nineteenth century only one other burgh in Fife exhibited housing conditions which were as bad as in the main coalfield

burghs. This was the fishing village of Cellardyke, which formed the main portion of the extended burgh of Kilrenny and where levels of crowding remained above two persons per room until 1901. By contrast, levels of crowding in the contiguous burghs of Anstruther Easter and Anstruther Wester never exceeded 1.5 PPR. In the other groups of small burghs levels of crowding ranged from fair to very good, although within those groups there were some burghs, such as Dysart, Inverkeithing and Newburgh, where, for part of the period at least, conditions were substantially worse than average. Quarters of poor housing also existed in small burghs where the general level of crowding was relatively good. The example of Leven has already been given. St. Andrews, where average levels of crowding were amongst the best in Fife, had a slum quarter which was occupied by the burgh's fisher population. [110]

Table 3.B.3 shows levels of crowding in the landward areas of selected parishes in west and east Fife. The west Fife parishes include the four main coal-mining parishes in the county. The east Fife parishes were agricultural parishes, although Leuchars parish also included the village of Guardbridge, which grew following the opening of the paper mill there during the 1870s. During the period the average level of crowding in the landward areas of the four mining parishes in Table 3.B.3 was 60% above that in the four parishes in east Fife. Throughout the period this differential increased, from 33.7% in 1861 to 90.6% in 1911. In 1911 the differential in crowding between the two halves of the landward area as a whole was only 49%, although by 1921 it had increased to 60%. (Table 3.B.4) However, by 1951 the average level of crowding in west Fife had fallen to only 1.15 PPR.

What may be loosely described as the industrial/agricultural dichotomy of working-class housing conditions in the small-town and rural divisions of Fife presents a problem in the interpretation of cause-specific mortality data. Up to 1911 only aggregate data are available for cause-specific mortality in the registration districts which form the small-town and rural divisions of Fife. Thus, it is impossible to identify the registration districts within those divisions where there occurred high levels of mortality from specified causes which raised the mortality rate for the whole division. As a division, the small burghs exhibited levels of crowding which until the 1920s ranged between the adequate level of one person per room and two persons per room, which indicated widespread overcrowding. However, as Figure 3.A.4 shows, during the period it was only in the coalfield burghs that average levels of crowding of 1.5 PPR were greatly exceeded. In the landward area widespread overcrowding occurred only in the mining districts there. Given the high levels of crowding which existed in the coalfield burghs and landward mining districts at this time, it may therefore be assumed that in the small-town and rural divisions high levels of mortality from airborne infectious diseases were related to housing conditions on the coalfield.

The variations in housing conditions within the small-town and rural divisions of Fife and the impossibility of breaking down the cause-specific mortality data for those divisions, as given to 1910 in the annual reports of the RGS, mean that conclusions about the influence of housing conditions upon the incidence of mortality from infectious diseases in those divisions must be largely impressionistic. However,

the data on crowding levels clearly show the main features of change in housing conditions in the divisions of Fife during the period. In the large burghs levels of crowding, which during the second half of the nineteenth century were worse in Dunfermline than Kirkcaldy, were in continuous decline. Amongst the small burghs, by far the worst conditions were experienced in the coalfield burghs, where levels of crowding remained above two persons per room until 1921, after which they fell steeply. Amongst the other groups of small burghs, crowding was at much lower levels and was in almost continuous decline. In the landward area levels of crowding were in steep decline up to 1881, due to rural depopulation but also to the improvement of rural housing. [111] However, from 1881 landward crowding levels increased sharply, due to population growth on the coalfield, and did not begin to fall again until 1911. What is most striking is comparison of the patterns of crowding levels in the divisions and subdivisions of Fife before and after 1921. Prior to that date these patterns show considerable fluctuation. However, after 1921 decline in levels of crowding is continuous in all parts of the county. The contribution of public health administration to the reduction of levels of crowding in Fife is considered next.

The involvement of local authorities in Fife in problems of housing provision dates from the introduction in 1862 of the General Police and Improvement Act (Lindsay's Act), which was the first legislation to make comprehensive provision for the regulation of building in Scotland. Local authorities which adopted Lindsay's Act could frame and enforce bye-laws relating to all aspects of building construction. Burgh

authorities' responsibility for building regulation was made obligatory under the Burgh Police Act of 1892. However, equivalent powers for building regulation in landward areas only became available under the Public Health (Scotland) Act of 1897, certain proposals relating to the building clauses of which were contributed by Fife County Council. [112]

From the 1860s burgh authorities and from the late 1890s the County District Committees in Fife were active in the enforcement of building standards. In some of the burghs this duty was the responsibility of the Dean of Guild Court. [113] The Dean of Guild Court was an ancient institution of Scottish urban government which was responsible for building regulation and town planning. By the mid nineteenth century the Dean of Guild Courts had fallen into disuse, but in many burghs they were revived following the introduction of Lindsay's Act and the later burgh police legislation. By 1898 at least twelve burghs in Fife had appointed Deans of Guild and by 1912 this number had risen to 26. [114] However, prior to the First World War no local authority in Fife directly promoted the provision of additional housing. A number of authorities, including the police commissions of Kirkcaldy, Elie, Inverkeithing and Leven and Kirkcaldy District Committee, considered proposals for housing schemes under the Housing of the Working Classes Act of 1890 and the Housing and Town Planning Act of 1909, but these plans came to nothing. [115] In fact, it is arguable that the authorities' enforcement of building regulations restricted the provision of additional housing by imposing additional construction costs. Between 1861 and 1898 the provision of sanitary fittings and other basic improvements such as were specified in building bye-laws

increased the cost of housing in Scotland by 25%. [116] Therefore prior to the First World War local authorities could have made no contribution to the reduction of crowding in Fife.

Up to the First World War house-building in Fife was carried out solely by private enterprise. [117] Most of the demand for housing in Fife came from the working classes, in the industrial burghs, on the coalfield and in the agricultural districts. However, by the late 1900s the provision of working-class housing in Scotland had been brought to a virtual halt by a combination of adverse factors, including the inefficiency of the Scottish building industry, high interest rates, the high price of land and labour and the additional costs which were imposed by municipal building regulation. [118] As was noted, up to this time local authorities in Fife had shown little interest in alleviating the overcrowding which existed in many parts of the county by providing additional housing under the housing legislation then in force. However, following the decision of the Admiralty in 1903 to build a naval dockyard at Rosyth and provide a new town for the accommodation of workers at the yard, Dunfermline burgh council became the first local authority in Fife which, through investment and planning, contributed directly to the provision of working-class housing in the county. [119]

The government envisaged Rosyth as a model development under the Housing and Town Planning Act of 1909, whilst Dunfermline burgh council, which in 1911 obtained an extension of Dunfermline's boundaries for the incorporation of Rosyth, was concerned that the new town should not become the "happy hunting ground of the jerrybuilder." [120] Because no

satisfactory offers for building the new town were received from private contractors, in 1914 the state formed a limited company, the Scottish National Housing Company (SNHC), specifically for the purpose of building Rosyth. The majority shareholder in the SNHC was Dunfermline burgh council and in terms of the Housing Act of 1914 the Company received a loan of £900 000 from the Local Government Board. Under the Housing (Rosyth Dockyard) Act of 1915 Dunfermline burgh council was empowered to authorise the execution of the housing scheme at Rosyth by the approved agency, the SNHC, which agreed to build 3 000 houses within six years from March 1915. [121] In both the timing and the method of its development Rosyth marks the transition in Britain from the building of mass housing by the free market to the provision of such housing by the state.

The trough in the building cycle, the emergence of housing as a social and political issue and the demands of the British war economy during the First World War forced the government to change its housing policy, first by the imposition during the war of rent control, which was maintained in a succession of Acts throughout the interwar period, and then by the introduction in 1919 of the first of a series of Housing Acts which provided for state-subsidised house-building by local authorities. [122] It was a measure of the success of the housing legislation of the period that local authorities in all the burghs of Fife, from Dunfermline and Kirkcaldy to Culross and Falkland, were able to build houses and reduce levels of crowding. Widespread house-building by local authorities in Fife occurred in spite of the limitations of the

Scottish building industry and frequent shortages of labour and building materials. [123]

By 1951 the process of rehousing the population of Fife was incomplete. Pockets of overcrowding and defective housing remained to be cleared. In 1953 over 55% of the 3 646 unfit houses and over 31% of the 2 203 overcrowded houses in the landward area of Fife were located in Lochgelly County Area. [124] In many towns there still remained slum quarters, such as Lower Methil, Aitken Place and Carlow Place in Leven and the fisher quarter in St. Andrews, where many houses were defective, levels of crowding were higher than average and standards of health were considered to be inferior. By the 1940s some of the local-authority housing in Dunfermline was also overcrowded. [125] However, throughout Fife the period 1921-51 saw the greatest improvement in housing as measured by levels of crowding. During 1871-1921 the average level of crowding in the burghs declined by 18.5% to 1.32 PPR but during 1921-51 it declined by 26.5% to 0.97 PPR. (Table 3.3.2) The average level of crowding in the Fife burghs in 1951 was slightly better than the levels for Scotland (1.05 PPR) and the east central division of Scotland (1.02 PPR). [126] In the landward area of Fife crowding declined by 13.2% to 1.51 PPR in 1861-1921 but by 27.8% to 1.09 PPR in 1921-51.

In most of the burghs in Fife the great majority of new houses provided during *c.*1919-50 were built by local authorities. In Scotland building by local authorities during 1920-50 contributed a total of 76.3% of all new houses. [127] Although no comprehensive figures are available, it seems that in most of the burghs in Fife the contribution of local-

authority building in the total provision of new housing during the period was as high as or higher than the national average. Estimates have been made from total numbers of houses, as given in the Census, and local-authority house-building, as given by Smith in *The Third Statistical Account*. The local-authority contribution to new housing amounted to over 87% in Kirkcaldy, up to 80% in Buckhaven and Methil, Leven and St. Andrews and virtually all of such housing in Markinch, Pittenweem and even the middle-class resort town of Elie and Earlsferry. Private building made a substantial contribution in only two burghs, Newport and Dunfermline. The conditions in Dunfermline, where between 1919 and 1948 a total of 46% of new houses was built by private enterprise, were exceptional. [128] In the landward area virtually all house-building during *c.*1919-50 was undertaken by the local authorities and occurred in the landward mining areas of west Fife. During 1919-39 Fife County Council built 3 851 houses, 96% of which were located in west Fife. [129] This total amounted to *c.*75% of the additional houses which were provided in the landward area of Fife during 1921-51. [130] In addition, between 1945 and 1949 the County Council completed a further 1 923 permanent and 955 temporary houses, whilst private enterprise in the landward area completed only 110 houses. [131]

Thus, the contribution of public health administration to the reduction of crowding in Fife, in the burghs and the landward area, is simple to describe. Prior to the First World War local authorities in Fife made no such contribution. From the 1860s their enforcement of building bye-laws improved standards of house construction but would have caused building costs to increase and probably restricted the provision of additional

housing. However, after the First World War virtually all house-building in Fife was carried out by local authorities and in much of the county overcrowding was eliminated. How the housing developments which were carried out by the local authorities in Fife affected levels of mortality from airborne infectious diseases is considered in the following chapters.

4. The notification of infectious diseases and the provision of infectious diseases hospitals in Fife

Up to the First World War levels of domestic crowding in Fife were relatively high and housing conditions were both a major factor in the spread of infectious diseases and unfavourable to the home treatment of persons suffering from such diseases. In such conditions the provision of infectious diseases hospitals was seen as an important means of controlling the spread of and reducing mortality from the major infectious diseases. A precondition of a system of hospitalization of infectious-diseases patients which would be effective in limiting the spread of those diseases was the establishment of a system for the thorough notification of cases of infectious disease. Local authorities could not control the spread of endemic infectious disease without a system of notification by which general practitioners would notify local Medical Officers of Health of cases of such disease which came to their attention. However, such a system of notification was only likely to work if the encouragement of payment was made to local practitioners to

notify. The potential expense of thorough notification of infectious diseases and a lack of hospital accommodation discouraged most local authorities in Fife from introducing notification prior to the Infectious Diseases (Notification) Act of 1889.

Prior to 1889 schemes for the notification of infectious diseases were contemplated in a few places in Fife, but the adoption of such measures was unusual. In 1875, when scarlet fever was prevalent in Scotland, the police commission of Kirkcaldy proposed to issue all GP's in the burgh with postcards for the notification of cases of that disease to the local authority, which would pass the information on to the local school-board officer. That official was then to ensure that children notified as suffering from scarlet fever were kept away from schools in Kirkcaldy. [132] It is presumed that this notification scheme in Kirkcaldy lapsed once the scarlet fever epidemic was past. In 1881 the burgh Medical Officer for Cupar, Dr. Whitelaw, proposed that GP's in the burgh should furnish the local authority with reports, at monthly intervals or more frequently, of cases of infectious disease which they attended, "so that the spread of such disease might be checked". [133] Dr. Whitelaw suggested that, as in Edinburgh and Aberdeen, the practitioners should be paid 2s. 6d. for each report, which proposal decided the Cupar authority to reject his scheme.

In 1885, following a typhoid epidemic in Leven, a GP in that burgh, Dr. Lyall, offered to report to the local authority all cases of infectious disease occurring in his practice, in return for a payment at the same rate as GP's in Edinburgh received for notification. This offer was

accepted by the Leven police commission but later withdrawn by Dr. Lyall. Instead, teachers in Leven were provided with printed forms for the purpose of notifying the burgh MOH, Dr. Crole, when children were absent from school due to illness. [134] The introduction of this notification scheme showed Leven to be in advance of the other burghs in Fife in this aspect of public health administration, and the burgh was also one of the first in the county to introduce a notification scheme under the Infectious Diseases (Notification) Act, which it adopted in 1890. [135] However, it appears that the first place in Fife to adopt a scheme for the notification of infectious diseases was the rural and largely infection-free parish of Kinglassie. In 1881 it was agreed that the parochial Medical Officer for Kinglassie, Dr. Hay, should report to the local authority all cases of infectious disease which occurred in the parish. [136] However, the notification scheme in Kinglassie involved no payments to doctors. Up to 1890 the only cases of infectious disease which were notified in Kinglassie were occasional isolated outbreaks of scarlet fever.

The Infectious Diseases (Notification) Act of 1889 represented the beginnings of what some termed "the new public health", in which the emphasis of public health administration shifted from environmental improvement to personal health care. [137] Its adoption, writes Wohl:

> "marks a commitment by local authorities to preventive medicine that obviously went well beyond the improvement of drains and sewers, water supplies and paving, all of which, loosely speaking, could come under the heading of "town improvements", or "civic beautification"." [138]

However, while the Infectious Diseases (Notification) Act set a new standard for public health administration, it contained no inducement

for adoption by local authorities which had previously shunned notification. The Act was a permissive measure and set a payment of 2s. 6d. by a local authority for each notification certificate received from private practitioners. [139] Its adoption by local authorities in Fife was slow and incomplete.

Like Leven, Kirkcaldy adopted the Notification Act in 1890, but in that year the police commissions of both Cupar and Dunfermline voted against adoption. The Dunfermline commission reversed its decision in 1893, but in Cupar the vote of 1890 was unanimous and stood until 1897 when under the Public Health (Scotland) Act of that year notification of infectious diseases became compulsory throughout Scotland. [140] In 1892 the police commission of Lochgelly decided against adopting the Notification Act. However, in 1893 it offered 2s. 6d. per patient to medical practitioners who reported cases of smallpox occurring in the burgh. [141] In Markinch notification was adopted at the suggestion of the burgh MOH, Dr. Wood, following an epidemic of scarlet fever in 1896. [142] Notification was also adopted in Anstruther Easter (1891), Elie and St. Andrews (both 1894) and by all the District Committees of Fife County Council soon after their formation in 1890, but was not introduced voluntarily in either Auchtermuchty or Ladybank. [143]

The main factor in local authorities' decisions regarding the adoption of infectious-diseases notification was the availability or the perception of the need for infectious-diseases hospital accommodation. In 1892, for example, in reply to an inquiry from the Board of Supervision, Ladybank police commission stated that "in the

circumstances of Ladybank, with an absence of crowding and the isolation of most of the Houses, there was little or no need for an infectious diseases Hospital", and, as has been seen, this burgh did not adopt notification voluntarily. [144] The introduction of the Infectious Diseases (Notification) Act of 1889 was followed by the development of infectious diseases hospitals throughout Fife. In this the county was typical of developments in Britain as a whole, where "the period of greatest expansion [of such accommodation], the "rush into bricks and mortar,"...was between 1890 and the First World War." [145] However, in Fife an important factor in the development of infectious diseases hospitals was the centralisation of public health administration in the landward area under the four County District Committees which were established by the Local Government (Scotland) Act of 1889.

The construction of a hospital was beyond the means and the needs of most of the pre-1889 local authorities in Fife. During cholera emergencies small isolation hospitals were established by the parochial boards of Dunfermline and Cupar and the burgh authorities of Kirkcaldy and Leven and during the 1880s other such hospitals were built in St. Andrews burgh and Wemyss parish, the latter being paid for by the local laird and industrialist, Randolph Wemyss. [146] However, these hospitals each had accommodation for no more than 10-15 patients, were in some cases ill-equipped for their purpose and served only a small proportion of the population of Fife. In 1891 the Wemyss hospital, with its *c.*15 beds, was the only infectious diseases hospital in the County area of Fife, which had a population of over 80 000. [147]

The Public Health (Scotland) Act of 1867 provided for the combination of two or more contiguous local authorities in order to meet the expense of the construction of an infectious diseases hospital (IDH) for the joint use of those authorities. [148] However, up to the 1890s the administrative geography of Fife, with its patchwork of parishes and burghs, was an obstacle to such agreements and there was little attempt by local authorities in the county to combine for the purpose of building IDH's. Following criticism in 1877 and again in 1883 by the Board of Supervision's Medical Officer, Dr. Littlejohn, of the existing isolation hospital in Kirkcaldy, the Kirkcaldy police commission considered schemes for a new IDH, including one to be built in combination with neighbouring burghs, negotiations for which dragged on into the 1890s. [149] In 1888, also following criticism by Dr. Littlejohn of its existing IDH, Dunfermline police commission proposed combining with Dunfermline parochial board and neighbouring parishes in the provision of a joint IDH. [150] However, this plan was superseded by the formation of Dunfermline County District.

Dunfermline police commission's proposal of 1888 for a joint IDH anticipated an agreement which was made four years later between the local authorities for Dunfermline County District and the burghs of Dunfermline, Cowdenbeath and Lochgelly and which secured the establishment of the West Fife Joint Infectious Diseases Hospital at West Baldridge, near Dunfermline. This hospital, which was opened in 1894, was regarded as a model scheme under the Public Health (Scotland) Act and its design was praised by the Board of Supervision and Dr. Littlejohn. Meanwhile the County Medical Officer, Dr. Nasmyth, praised

the "diplomatic skill" of the chairman of Dunfermline District Committee, Lord Elgin, in the difficult and protracted negotiations between the participating local authorities regarding apportionment of the cost of the scheme. [151] It may be argued that, rather than the introduction of the Infectious Diseases (Notification) Act, it was the contribution of the newly established "big brother" authority, Dunfermline District Committee, which was decisive in achieving the completion of the West Fife IDH scheme.

Up to 1909 the other three County District Committees in Fife led in the establishment of four more joint IDH schemes. By that date such schemes provided IDH accommodation for the whole of the County area and all but six of the burghs in Fife. (Table 3.C.1) (Buckhaven, Methil and Innerleven burgh later withdrew from the Kirkcaldy District Joint IDH scheme and built its own IDH at Cameron Bridge.) A survey of 1893 recommended a standard of 10 beds per 10 000 inhabitants as an adequate level of IDH accommodation. [152] Table 3.C.2 shows that by 1911 levels of IDH accommodation which were as good as or better than this standard had been achieved in some parts of Fife but that in Dunfermline and Kirkcaldy Districts there was a severe shortage of IDH beds. This shortage was reported by the County Medical Officer, who stated in 1910 that the want of hospital accommodation in Dunfermline District "has rendered the work of checking the spread of infectious disease extremely difficult and unsatisfactory." [153] However, within a few years the IDH's serving Dunfermline and Kirkcaldy Districts were extended and the bed shortage there was to some extent alleviated. [154] The priorities of treatment in the new IDH's in Fife were indicated in the plans for

the hospitals for Kirkcaldy District and Buckhaven and Methil burgh, where separate wards were designated for patients suffering from diphtheria, scarlet fever and typhoid. [155] By the end of the First World War smallpox hospitals and tuberculosis sanatoria had also been built in Fife. These hospitals are described in chapters 4 and 12 below.

Relations between the authorities participating in the IDH schemes in Fife were often difficult, particularly where, as amongst the burghs in Cupar District, the need for an IDH was questioned. In 1898 it was reported that only Auchtermuchty and Falkland had agreed to take shares in the District IDH at Auchtermuchty, and up to 1902 Auchtermuchty, where the establishment of the hospital had been fiercely opposed, sent no patients there. [156] At this time the usefulness of IDH's was also questioned by some medical authorities. [157] With the decline in mortality from the major infectious diseases, the lifespan of most of the IDH's in Fife in their original role was to be relatively short. By 1948 accommodation for infectious-diseases patients in Fife was centralised in three hospitals: the Victoria Fever Hospital in Kirkcaldy, the West Fife Infectious Diseases Hospital and the new hospital at Cameron Bridge, which was opened in 1939. [158] The contribution which infectious diseases hospitals made to the control of infectious diseases in Fife is considered in the following chapters.

Chapter 3. Public health administration in Fife. Notes

1. R.J. Morris Cholera 1832. The Social Response to an Epidemic (London 1976) 72-73

2. Scottish Record Office GD 364 bundle 1294 Hope of Luffness MSS Reports by Mr. Jamieson, Sheriff Substitute, respecting the Constabulary Force established by the Cholera Board for the District of Cupar 8 March 1832; Charles Creighton, A History of Epidemics in Britain (Cambridge 1894) II 813; M.W. Flinn (ed.), Scottish Population History (Cambridge 1977) 369 n. 3

3. Anthony S. Wohl, Endangered Lives. Public Health in Victorian Britain (London 1984) 147-48

4. J.H.F. Brotherston, Observations on the Early Public Health Movement in Scotland (London 1952) 94-95

5. Stephanie Blackden, "The Board of Supervision and the Scottish Parochial Medical Service 1845-95" Medical History 30 (1986) 147; Brotherston op. cit. 95

6. Further emergency sanitary legislation was passed during the 1860s. However, although intended to be applied there, the Sewage Utilisation Act of 1865 and the Sanitary Act of 1866 were of little use in Scotland because they were framed without account being taken of the peculiarities of the Scottish legal system. (Thomas Ferguson, Scottish Social Welfare 1864-1914 (Edinburgh 1958) 155; G.F.A. Best, "Another Part of the Island", in H.J. Dyos and Michael Wolff (eds.), The Victorian City. Images and Realities (paperback edn. London 1978) 392)

7. M. Barbieri, A Descriptive and Historical Gazetteer of the Counties of Fife, Kinross and Clackmannan (Edinburgh 1857) 21

8. Blackden op. cit. 147

9. Wohl op. cit. 200

10. W.J. Brock, The Sanitary Laws of Scotland and Principles of Public Health (Edinburgh 1905) 166

11. 30 and 31 Vict. ch. 101

12. Thomas Goodall Nasmyth, "The Public Health (Scotland) Act 1897" Juridical Review 10 (1898) 13. The author of this article is wrongly described by Best as a "complacent lawyer". He was, in fact, the County Medical Officer of Health for Fife. (Best op. cit. 394 n. 12)

13. For a contemporary discussion of the defects of the Public Health (Scotland) Act of 1867, see W.C. Spens, "On the Necessity of a General Measure of Legislation for Scotland with regard to Public Health" Proceedings of the Royal Philosophical Society of Glasgow 11 (1877-79) 129-44

14. George Rosen, "The Fate of the Concept of Medical Police 1780-1890", in *idem*, From Medical Police to Social Medicine. Essays in the History of Health Care (New York 1974) 152-53

15. 51 Geo. III ch. 35; 51 Geo. III ch. 61; 3 and 4 Will. IV ch. 46

16. G.S. Pryde, "The Scottish Burgh of Barony in Decline 1707-1908" Proceedings of the Royal Philosophical Society of Glasgow 77.4 (1948-49) 60

17. ibid. 60

18. R.M. Urquhart, The Burghs of Scotland and the Burgh Police (Scotland) Act 1833 (3 and 4 Will. IV ch. 46) (unpublished typescript deposited in the University of St. Andrews Muniments 1985) Table 2

19. 13 and 14 Vict. ch. 33; 25 and 26 Vict. ch. 101

20. Cupar PC minutes 22 March 1861

21. ibid. 16 August 1861

22. T.C. Smout, A Century of the Scottish People 1830-1950 (London 1986) 41

23. Best op. cit. 393

24. Elie, Liberty and Williamsburgh PC minutes 30 December 1864; Leslie PC minutes 29 September 1865; Kinghorn PC minutes 18 September 1873; Auchtermuchty PC minutes 13 May 1874; Lochgelly PC minutes 26 January 1877; Ladybank PC minutes 12 January 1878; Robert Holman, History of Cowdenbeath (Dunfermline 1941) 31

25. Census of Scotland 1911 I 17 Table 6. A single exception was St. Monance, which belatedly acquired burgh status in 1932. (Census of Scotland 1951 I 17 Table 10)

26. Dunfermline PC minutes 13 July 1853

27. Brenda M. White, "Medical Police, Politics and Police: the Fate of John Roberton" Medical History 27 (1983) 419 n. 66

28. St. Andrews PC minutes 17 August 1853, 14 October 1867. Back in 1841 Adamson compiled a report on St. Andrews for Chadwick's survey. (Adamson, "Report on the Sanitary Condition and General Economy of the Labouring Classes in the City of St. Andrews" op. cit.)

29. Kirkcaldy TC minutes 20 October 1873

30. Cupar PC minutes 21 August 1866; Leslie PC minutes 20 August 1866; Leven PC minutes 29 August 1866

31. Ladybank PC minutes 12 April 1881; Kinghorn PC minutes 14 December 1885; Auchtermuchty PC minutes 14 July 1890

32. Lochgelly PC minutes 10 August 1891; Markinch PC minutes 20 April 1892

33. The Medical Directory for 1900 (London 1900) 1400

34. 52 and 53 Vict. ch. 50

35. Blackden op. cit. 147

36. 1891 AR 17-18

37. Nasmyth, who was born in 1856, came from Auchterderran. Since 1879 he had worked as a general practitioner in Cowdenbeath and as parochial Medical Officer for Beath parish. In 1886 he obtained a diploma in public health from Cambridge University and in 1890 published a hurriedly written *Manual of Public Health and Sanitary Science*. The timely publication of the latter, subtitled *A practical guide...for the use of County Councillors, Members of District Committees and their Officers*, no doubt helped Nasmyth to secure the post of County Medical Officer of Health for Fife. (Obituary, Fife Free Press 23 January 1937; The Medical Directory for 1892 (London 1892) 1290; Thomas Goodall Nasmyth, A Manual of Public Health and Sanitary Science. A practical guide to the Public Health (Scotland) Act, 1867, and the Local Government (Scotland) Act, 1889, for the use of County Councillors, Members of District Committees and their Officers (Edinburgh 1890))

38. 1892 AR i

39. ibid. i

40. The Medical Directory for 1900 (London 1900) 1579. In 1899 Dr. Aitken of Buckhaven, who was already burgh Medical Officer in three widely separated towns in Fife, stood against Nasmyth for the Markinch appointment. (Markinch PC minutes 6 February 1899)

41. Thomas Goodall Nasmyth, "Public Health Administration in Fife: a Ten Years' Retrospect" Edinburgh Medical Journal 8 (1901) 387

42. See Nasmyth, "The Public Health (Scotland) Act, 1897" 13-23

43. John S. Gibson, The Thistle and the Crown. A History of the Scottish Office (Edinburgh HMSO 1985) 36

44. See p. 112-14 below.

45. Nasmyth, "Ten Years' Retrospect" 388-89. These burghs included Auchtermuchty, Cowdenbeath, Dysart, Falkland, Leslie, Leven, Newburgh, Newport, St. Andrews and Tayport.

46. See p. 86-87 below.

47. See p. 373 and 376 below.

48. 1915-19 R 22-23

49. 1915-19 R 24; 1920 AR 24

50. Sir John Brotherston and John Brims, "The Development of Public Medical Care 1900-48", in Gordon McLachlan (ed.), Improving the Common Weal. Aspects of Scottish Health Services 1900-84 (Edinburgh 1987) 60-62

51. Quoted in ibid. 61

52. Anne Crowther, British Social Policy 1914-39 (London 1988) 49

53. W.E. Whyte, The Local Government (Scotland) Act, 1929 (Edinburgh 1929) 14-18

54. ibid. 86

55. Census of Scotland 1931 Table 1

56. Edward Page and Arthur Midwinter, "Remoteness, Efficiency, Cost and the Reorganization of Scottish Local Government" Public Administration 58 (1980) 443

57. Jane Lewis, "The Roots of Community Medicine" Bulletin of the Society for the Social History of Medicine 38 (June 1986) 56-57; Margot Jeffreys, "The Transition from Public Health to Community Medicine: the Evolution and Execution of a Policy for Occupational Transformation" Bulletin of the Society for the Social History of Medicine 39 (December 1986) 48, 52

58. Jeffreys op. cit. 52

59. Bill Luckin, Pollution and Control. A social history of the Thames in the nineteenth century (Bristol 1986) 49-50; Neville M. Goodman, "Enteric Fevers in Great Britain. Recent Outbreaks and their Lessons" Lancet 1933 II 772; 1939-45 R 147

60. 1892 AR 11

61. 1911 AR 81-82

62. 1892 AR 11-13; G.S. Parkinson, A Synopsis of Hygiene (ninth edn. London 1947) 515-16

63. An example of a subterranean water source presently in use in Fife is the borehole at Balmalcolm, near Kingskettle.

64. See, for example, the recommendations regarding well construction in Parkinson op. cit. 488-90

65. Leven PC minutes 10 March 1905, 21 August 1908; Holman op. cit. 36; Lochgelly PC minutes 17 February 1890, 17 June 1893; 1895 AR 58-59; Kirkcaldy District Committee. Wemyss Water Committee minutes 25 March 1895, 2 November 1898, 13 September 1899

66. 1946 AR 130; 1949-53 R 200

67. 1939-45 R 184

68. 1897 AR 31

69. Thomas Ferguson, Scottish Social Welfare 1864-1914 (Edinburgh 1958) 166

70. 1891 AR 5

71. The gravitation supply to the village of Oakley, which has been included in Table 3.2.1, was poorly distributed due to a shortage of wells, the use of which rendered the supply vulnerable to pollution. The west end of the village of Torryburn, which has been excluded from the table, was supplied by wells but the east end of the village was supplied by a gravitation system. The table also excludes the villages of Dundonald (Kirkcaldy District), Newton of Falkland (Cupar District) and Balone and Wormit (St. Andrews District), which also received good gravitation supplies but for which no population figures are available.

72. 1897 AR 46

73. 1897 AR 37; 1911 AR 119

74. Kirkcaldy District Committee minutes 28 March 1896, 15 March 1902, 30 May 1903, 22 February 1905; 1892 AR 69; 1901 AR 61-65; 1903 AR 64, 85; 1904 AR 63; 1909 AR 67; Ferguson op. cit. 185

75. 1909 AR 65-70

76. 1910 AR 49; 1913 AR 82, 110

77. 1896 AR 11; 1936 AR 84

78. St. Andrews District Committee minutes 14 July 1905; 1925 AR 45

79. Census of Scotland 1931 I 17 Table 7; 1935 AR 86

80. 1934 AR 98

81. 1935 AR 88; 1949-53 R 175

82. Census of Scotland 1951 I 17 Table 26

83. See Tables 5.3.3-4 (p.166)

84. K SI 1907 AR

85. Anstruther Easter PC minutes 13 March 1888; Cupar PC minutes 4 June 1883; University of St. Andrews Muniments B10/14/665 Crail burgh, plans of public works 1899-1900; Elie, Liberty and Williamsburgh PC minutes 26 April 1883; Kinghorn PC minutes 8 March 1897; Leven PC minutes 3 February 1896; Markinch PC minutes 2 April 1894; St. Andrews PC minutes 14 May 1894

86. Andrew S. Cunningham, The Parish of Auchterderran: its Rise and Progress (Dunfermline 1902) 19

87. Cupar District Committee minutes 2 May 1905; Ferguson op. cit. 184; Kirkcaldy District Committee minutes 30 March 1907 Report by Dr. Nasmyth on the drainage of Leslie

88. 1891 AR 22-24, 44, 57, 67

89. Census of Scotland 1911 I 17 Table 12

90. Census of Scotland 1931 I 17 Table 8

91. Census of Scotland 1951 I 17 Table 26

92. St. Andrews PC minutes 18 May 1864; St. A MOH 1911 AR 2

93. Kirkcaldy District Committee minutes 12 January 1901 Sanitary inspector's report

94. See, for example, Kilrenny PC minutes 18 December 1848 and 24 September 1853

95. Brock op. cit. 283-85. For the appointment of sanitary inspectors as inspectors of dairies in Fife see, for example, Leslie PC minutes 14 April 1879; Dunfermline PC minutes 4 November 1886; Kirkcaldy PC minutes 13 September 1886; Dysart PC minutes 25 January 1887; Ladybank PC minutes 8 March 1887; Kilconquhar LA minutes 12 May 1888; St. Monance LA minutes 23 November 1888

96. 1894 AR 45, 56; 1898 AR 23-24

97. Kirkcaldy District Committee. Dairies Committee minutes 31 October 1903; Cupar District Committee. Meadowwells Dairy Committee minutes 13 November 1906

98. 1904 AR 32

99. 1939-45 R 133

100. See p. 406-08 below for a description of the development of milk pasteurisation in Fife.

101. Quoted in Richard Rodger, "The Victorian building industry and the housing of the Scottish working class", in Martin Doughty (ed.), Building the Industrial City (Leicester 1986) 165

102. Best op. cit. 402

103. A.L. Bowley, "Death-rates, Density, Population, and Housing" Journal of the Royal Statistical Society 86 (1923-24) 517

104. Census of Scotland (1861) Population Tables and Report. Number of the Inhabitants, Families, Children at School, Houses, and Rooms with Windows, in the Civil Counties and Parishes, Registration Counties and Districts, Burghs, Towns, Villages and Islands of Scotland (Edinburgh 1862) xi

105. Rodger op. cit. 163; 60 and 61 Vict. ch. 38 cl. 92, 181

106. Report of the Royal Commission on the Housing of the Rural and Urban Industrial Population of Scotland (Cd. 8731) (Edinburgh HMSO 1917) 292. The measurement of overcrowding by a minimum rate of two persons per room was first adopted by a local authority, London County Council, in 1891. (Smout op. cit. 35)

107. Bowley op. cit. 517

108. Neil McFarlane, "Housing, Hospitals and Tuberculosis in Glasgow" (unpublished paper 1988) 4-5

109. 1936 AR 39

110. John Adamson, "Report on the Sanitary Condition and General Economy of the Labouring Classes in the City of St. Andrews" (1841) op. cit.

111. See n. 117 below for sources for rural housing conditions in Fife.

112. 1898 AR 18-22

113. Richard Rodger, "The Evolution of Scottish Town Planning", in George Gordon and Brian Dicks (eds.), Scottish Urban History (Aberdeen 1983) 75-81

114. Report on the Judicial Statistics of Scotland for the Year 1898 (Cd. 28) (Edinburgh HMSO 1900) Table 39; Report on the Judicial Statistics of Scotland for the Year 1912 (Cd. 7164) (Edinburgh HMSO 1914) Table 37; John Frew (ed.), Building for a New Age. The architects of Victorian and Edwardian St. Andrews (Crawford Centre for the Arts, University of St. Andrews 1984) 9

115. Kirkcaldy TC Health Committee minutes 4 December 1913; Kirkcaldy TC minutes 24 September 1915 Report by Mr. Lumsden and Mr. Braid on the housing question (June 1915); Elie, Liberty and Williamsburgh PC minutes 10 March 1890; Susan Gleave, The influence of the Garden City Movement in Fife 1914-23, with particular reference to Rosyth (unpublished M. Phil. thesis, University of St. Andrews 1987) 183-85, 222; 1910 AR 63-64

116. Rodger, "Scottish Town Planning" 81; *idem*, "Victorian building industry" 187

117. For house-building in Dunfermline and Kirkcaldy during the late nineteenth and early twentieth centuries, see Richard Rodger, Scottish urban house-building 1870-1914 (unpublished Ph. D. thesis, University of Edinburgh 1976) Table 4, *idem*, "Victorian building industry" Table 28 and Colin M. Bain, The Social Impact of Kirkcaldy's Industrial Revolution 1810-76 (unpublished Ph. D. thesis, University of Guelph 1973) 175. For house-building on the Fife coalfield, see Veronica O'Halloran, The Housing of Miners in Fife 1870-1930 (forthcoming Ph. D. thesis, University of St. Andrews). For house-building in the fishing burghs of Fife, see John Frew and David Adshead, "Fisher tenement design in Cellardyke and the north east Fife coastal burghs 1862-1905" Scottish Industrial History 9.1-2 (1986) 36-57. For building in St. Andrews, see Frew (ed.) op. cit. For the development of rural housing during the period, see Graeme Whittington, "The Imprint of Former Occupations and the Improver Movement on House Types in Fife" Folk Life 5 (1967) 52-57 and Alexander Fenton, "The Housing of Agricultural Workers in the Nineteenth Century", in T.M. Devine (ed.), Farm Servants and Labour in Lowland Scotland (Edinburgh 1984) 198-205.

118. Rodger, "Victorian building industry" 172-73, 185-88, 193; Mark Swenarton, Homes Fit for Heroes. The Politics and Architecture of Early State Housing in Britain (London 1981) 31

119. Gleave op. cit. 31

120. Tom Begg, 50 Special Years. A Study in Scottish Housing (London 1987) 46; Glasgow Herald 19 June 1912, quoted in Begg op. cit. 46

121. Swenarton op. cit. 44-47; Gleave op. cit 83-84; Begg op. cit. 47

122. M.J. Daunton, introduction to *idem* (ed.), Councillors and tenants: local authority housing in English cities 1919-1939 (Leicester 1984) 2-15; Marian Bowley op. cit. Appendix I

123. For local-authority house-building in Fife up to the 1950s, see Gleave op. cit., John Frew, Housing for Heroes. Council House Building in Central, East and North-East Fife 1919-1923 (Kirkcaldy 1987), *idem*, Fit Habitations. Early Council House Development in St. Andrews 1920-1929 (Crawford Centre for the Arts, University of St. Andrews 1985), Alexander Smith, The Third Statistical Account of Scotland. County of Fife (Edinburgh 1952) and Fife Looks Ahead. The Report of Fife County Council Planning Advisory Committee (Edinburgh 1946).

124. 1949-53 R 149

125. D MOH 1948 AR 79

126. Census of Scotland 1951 III 11

127. Begg op. cit. Appendix A

128. D MOH 1948 AR 80

129. Smith op. cit. 130

130. Census of Scotland 1921 Tables 27 F-I; Census of Scotland 1951 I 17 Table 19

131. Smith op. cit. Table 12

132. Kirkcaldy PC minutes 26 January and 9 February 1875

133. Cupar PC minutes 8 April 1881 Letter from Dr. William Whitelaw (3 March 1881)

134. Leven PC minutes 2 February and 11 April 1885

135. ibid. 24 February 1890

136. Kinglassie LA minutes 27 May 1881

137. John M. Eyler, "Scarlet Fever and Confinement: the Edwardian Debate over Isolation Hospitals" Bulletin of the History of Medicine 61.1 (Spring 1987) 1. Notifiable diseases under the Infectious Diseases (Notification) Act included smallpox, cholera, typhus, relapsing fever, typhoid, diphtheria, scarlet fever, erysipelas and puerperal fever.

138. Wohl op. cit. 137

139. Brock op. cit. 256-57

140. Kirkcaldy PC minutes 13 January 1890; Dunfermline PC minutes 9 July 1890, 13 March 1893; Cupar PC minutes 21 April 1890, 5 November 1897

141. Lochgelly PC minutes 10 October 1892, 26 January 1893

142. Markinch PC minutes 7 September 1896

143. Anstruther Easter PC minutes 11 August 1891; Elie, Liberty and Williamsburgh PC minutes 13 April 1894; St. Andrews PC minutes 16 April 1894; 1891 AR 14

144. Ladybank PC minutes 3 October 1892

145. Eyler op. cit. 2

146. Reverend Peter Chalmers, Historical and Statistical Account of Dunfermline II (Edinburgh 1859) 322; Kirkcaldy LA minutes 24 July 1866; Cupar PB minutes 3 September 1866; Leven PC minutes 13 August 1866; 1891 AR 53

147. 1891 AR 27, 39, 53, 65

148. Thomas Goodall Nasmyth, "Dunfermline and West Fife Sanatorium" Edinburgh Medical Journal (December 1892) 544

149. Kirkcaldy PC minutes 17 September 1877 Letter from Dr. Littlejohn about lack of hospital accommodation in Kirkcaldy; ibid. 19 June 1883 Dr. Littlejohn's report on hospital accommodation in Kirkcaldy (12 June

1883); Dysart PC minutes 11 May 1893; Kinghorn PC minutes 3 March and 8 May 1893

150. Dunfermline PC minutes 6 July and 24 October 1888

151. Nasmyth, "Dunfermline and West Fife Sanatorium" 544-45

152. Eyler op. cit. 2

153. 1910 AR 52

154. 1912 AR 136; 1914 AR 60; Fife County Council. Public Health Committee minutes 6 June 1930

155. 1901 AR 60; Buckhaven, Methil and Innerleven TC minutes 6 January 1913

156. 1894 AR 34; 1898 AR 35; 1902 AR 47

157. For a full description of the debate on the usefulness of infectious diseases hospitals, see Eyler op. cit. 1-24

158. 1939-45 R 110

CHAPTER 4

SMALLPOX IN FIFE

1. Inoculation and vaccination

In Scotland during the eighteenth century smallpox was "by far the worst epidemic killer, particularly of small children." [1] Investigations during the second half of the century by Alexander Monro primus in Edinburgh and Robert Watt in Glasgow showed that smallpox accounted for *c.*10-19% of deaths at all ages and up to a third of all deaths amongst children under ten. [2] In Scotland inoculation against smallpox, a practice which was introduced to England in the 1720s, was first used in 1733, when 360 persons in Dumfries were inoculated. [3] However, this was not followed by the widespread adoption of inoculation in Scotland. In 1764 Monro stated that only 5 553 Scots were known to have received inoculation. [4] After Edward Jenner published his work on vaccination in 1798, this practice was "almost immediately taken up by Scottish doctors" and replaced inoculation, where that had been adopted, as the means of protecting against smallpox in Scotland. [5]

Yet evidence from Fife in the *Old Statistical Account* shows that at least by the 1790s inoculation against smallpox was widely, although not universally, adopted. In Kirkcaldy parish, inoculation was practised with the "happiest effect", whilst in Cupar parish few infants "now die of smallpox, as inoculation, under the direction of excellent

practitioners, daily gains ground." [6] In a number of parishes in east Fife, including Anstruther Wester, Creich, Kilconquhar, Largo, Leuchars and St. Monance, there was widespread or increasing use of inoculation. [7] In other parishes progress was less. In Scoonie "the people's prejudices against [inoculation] are gradually subsiding", but although in Aberdour inoculation had been adopted by the middle classes, "the common people are still averse to it." [8] Working-class resistance to inoculation was also reported from the parishes of Carnock, Dalgety, Markinch and Wemyss. Some refused inoculation on grounds of expense whilst others professed religious scruple against it, as in Leuchars parish, where subsequently the people were converted:

> "They are now come to look upon it as a religious duty to adopt the practice; and not a few of them, when a lancet loaded with matter was procured for them, innoculated [*sic*] their own children." [9]

The reports in the *Old Statistical Account* show that during the late eighteenth century the population of Fife was in the process of adopting inoculation as an effective protection against smallpox, particularly amongst children. In some parishes inoculation had been widely adopted but in others resistance to the practice remained strong. Opposition to inoculation occurred mainly amongst the working classes and was on stated grounds of either cost or religious scruple. However, it also involved an element of class friction and suspicion of doctors. In Dalgety parish, where a large proportion of the population were miners, not even "the evident instances of its salutary effects, often exhibited by the medical gentlemen in this quarter, reconcile them to [inoculation]" [10] Yet, despite the existence of such strong opposition to inoculation during the 1790s, one cannot agree with Macdonald's

generalisation for central Scotland in *c.*1800 that in Fife "inoculation was too little practised to have any real effect." [11] The reports in the *Old Statistical Account* from the parishes of Anstruther Wester, Creich, Cupar, Kirkcaldy, Largo and St. Monance all told of the saving of life which had resulted from inoculation. It is likely that, but for Jenner's discovery, the adoption of inoculation against smallpox would have been as widespread as that of vaccination was to be.

The discovery of vaccination was soon welcomed in the centres of medical learning in Scotland. Free vaccination was introduced in Glasgow in 1801, a Vaccine Institute was opened in Aberdeen in 1803, and also in 1803 the College of Surgeons in Edinburgh sent to all the parish ministers in Scotland a circular letter describing the advantages of vaccination and urging the adoption of this practice. [12] Vaccination became widely used in Scotland and its effects were visible within a decade. In a survey carried out in conjunction with the 1811 census by the census administrator John Rickman a total of 66 parishes out of the 634 reporting "mentioned the introduction of vaccination and the reduction, if not the elimination of smallpox as a cause of population growth since 1801." [13]

In Fife during the early nineteenth century vaccination was widely and effectively adopted, for which, in one town at least, there was a public expression of gratitude. In 1808 the town council of Kirkcaldy offered the freedom of the burgh to Edward Jenner "for the discovery of vaccine inoculation from which such important benefit to mankind has already resulted and from which more extensive blessings are still to be

expected." [14] An outbreak of smallpox at North Queensferry in 1811-12 demonstrated to the local population the advantages of vaccination. [15] A large proportion of the inhabitants of North Queensferry had been vaccinated prior to this outbreak and others were vaccinated during its course. The outbreak involved 46 cases, all of whom were children, and there were seven deaths:

> "When the epidemic was over there were only nine persons in the village, most of them aged, who had neither had smallpox or cowpox. Those who had been vaccinated numbered 132 [in a population of 390]; while of those "formerly vaccinated" only two were included among the 46 children who caught smallpox in 1811-12." [16]

However, the hopes attending the introduction of vaccination were soon tempered by the realisation that vaccination did not provide lifelong immunity to smallpox. In Scotland this weakness of vaccination was exploited by an anti-vaccination movement, led by Dr. Thomas Brown of Musselburgh, who in 1809 published *An Inquiry into the Antivariolous power of Vaccination*, but confidence in vaccination was still not easily swayed. [17] During the nationwide smallpox epidemic of 1817-19, in which Fife was one of the worst-hit areas, some commentators described mild cases of smallpox occurring in previously vaccinated individuals as a separate disease, which they called "hornpox". [18] Yet some, such as Dr. Mudie of St. Andrews, were hard-pressed to maintain the spurious distinction between smallpox and "hornpox". "Many of the cases occurring after vaccination so much resembled smallpox", he wrote, "that, if my mind had not been prejudiced against the possibility of such an occurrence, I should have pronounced the eruption to have been of a variolous nature." [19]

Table 4.1.1 Cupar smallpox epidemic 1817. Cases and deaths

	Cases		Deaths	
	Total cases	Severe cases	Total deaths	% all cases
Vaccinated	54	46	1	2
Unvaccinated	16	14	6	38
Total	70	60	7	10

Source: Henry Dewar, Account of an Epidemic Smallpox which occurred in Cupar in Fife in the Spring of 1817 and the Degree of Protecting Influence which Vaccination Afforded... (Cupar 1817) 7-8

The question of the efficacy of vaccination was examined in Fife by Dr. Henry Dewar in a study of an epidemic of smallpox at Cupar in 1817. [20] This epidemic involved seventy cases, of which no less than 54 were previously vaccinated individuals, and was notable for its severity, amongst both unvaccinated and vaccinated cases. (Table 4.1.1) This led Dr. Dewar to ask whether vaccination in Cupar had been properly carried out. Only ten of the vaccinations were performed by medical men; the rest had been carried out by midwives, clergymen or neighbours. However, upon obtaining, where possible, descriptions of the vaccinations and of the reactions which they produced, Dewar found no proof that vaccination was less effective if performed by lay persons instead of medical practitioners. Asserting that in all cases the disease in the Cupar epidemic was "genuine smallpox", he concluded: "It is evident that [vaccination] did not ultimately prove a certain preventive of an attack of smallpox..." However, where it did not afford absolute protection, vaccination at least mitigated the effects of smallpox. In the Cupar epidemic only one of the vaccinated cases died, and Dewar noted another smallpox outbreak in Fife, at Crossford, near Dunfermline, where all the previously vaccinated cases recovered but two of those who were

unvaccinated died. In conclusion he urged that "Vaccination ought still to be valued and universally recommended." [21]

It is not known how widespread was vaccination against smallpox in Fife in the period prior to the introduction of compulsory vaccination. The volume of the *New Statistical Account* for Fife (1845) contains no reference to either smallpox or vaccination, which perhaps suggests that by this time vaccination was commonplace and had succeeded in reducing smallpox mortality to insignificant levels. [22] Legislative provision for vaccination in Scotland was made in 1863, when compulsory vaccination of infants within six months of birth was introduced. [23] In Scotland, wrote Flinn, the Vaccination Act of 1863 "very nearly disposed of smallpox for good", for here vaccination under this measure was even more thorough than in England. [24] Whilst noting that between 1872 and 1883 less than 5% of births in England went unvaccinated, Lambert remarks that even "at this peak, the [English] system never matched the completeness of the Scottish one..." [25] During the 1870s in Scotland as a whole the proportion of infants born and surviving during each year who received vaccination was 96.2%. In Fife the vaccination system was even more thorough, for here the proportion of surviving infants who received vaccination amounted to 98.1%. [26] This high rate of vaccination was achieved despite problems of public co-operation in the mining districts and was sustained into the 1890s. In 1892, for example, the proportion of surviving infants in the Fife County Districts who received vaccination was *c.*96-97%. [27]

Yet, as Hardy writes, throughout Britain "vaccination alone was not entirely responsible for the reduction in smallpox mortality." [28] Vaccination did not confer total immunity to smallpox, vaccinations were not always performed competently and it was never possible to vaccinate the whole population of a large area, such as a city or a county, and particularly all the adults in any such population. By the mid nineteenth century it was recognised that further measures were necessary if the eradication of smallpox in Britain was to be complete. The following section describes the other measures for the control of smallpox which were adopted in Fife.

2. Smallpox in Fife c.1855-1942

During the years for which figures are available, mortality from smallpox in Fife was concentrated in the period 1855-74 (506 deaths). No further deaths from smallpox occurred in Fife until 1885-94 (16) and after that period further serious mortality from smallpox in the county occurred in only 1921 (7) and 1942 (7). [29] Even during the period of high mortality from smallpox in the mid nineteenth century the overall effect of the disease in Fife was mild in comparison to that in Scotland as a whole. During the period 1851-81 Fife contained 5.0% of the population of Scotland but during 1855-75 the county suffered only 3.0% of the national smallpox mortality. (Table 4.2.1)

Table 4.2.1 Mortality from smallpox in Scotland and Fife 1855-75

Total deaths	Scotland	Fife	% smallpox deaths in Scotland occurring in Fife
1855-60	5 041	83	1.7
1861-65	4 962	231	4.7
1866-70	493	5	1.0
1871-75	6 338	187	3.0
1855-75	16 834	506	3.0

Source: RGS 1855-75

Although by the mid nineteenth century smallpox was controlled by vaccination, it remained a greatly feared disease. In Fife further outbreaks of smallpox forced local authorities to adopt preventive measures such as were previously employed only during cholera emergencies. During the epidemic of smallpox in Scotland in 1871-73 there were 184 deaths from the disease in Fife. In Dunfermline, where during 1871-72 the burgh Medical Officer, Dr. Morris, carried out vaccination and re-vaccination, only five deaths from smallpox occurred, but in Kirkcaldy an epidemic developed which resulted in thirty deaths. [30]

Smallpox was brought to Kirkcaldy from Dundee in June 1871. The disease spread through the burgh and the epidemic lasted for "over a year". The parts of Kirkcaldy worst affected were Rodger's Close, Collier's Row, Stewart's Lane, Fysh Wynd and Malcolm's Wynd, which were situated on the landward side of the main street through the burgh. Thirty of the 214 cases in the epidemic occurred in Rodger's Close, and out of six cases occurring in Malcolm's Wynd there were five deaths. The burgh sanitary

inspector, Mr. Arnott, wrote that "these places have been the seats of the disease from their crowded condition and the confined nature of the houses." From January 1872 the burgh's cholera hospital at Harbour Head was used to isolate the smallpox patients, who were removed there in a cab. Nine of the dead were infants, eight of whom had not been vaccinated. Apart from these cases, "all those afflicted - with one or two exceptions - were vaccinated."

Table 4.2.2 Case mortality in the Kirkcaldy smallpox epidemic 1871-72

	Cases	Deaths	Case mortality
Kirkcaldy	214	30	14%
Cupar 1817	70	7	10%

Sources: Kirkcaldy: Kirkcaldy PC minutes 6 August 1872 Report by the burgh sanitary inspector on the smallpox epidemic in Kirkcaldy; Cupar: Table 4.1.1 above

In both the Cupar and Kirkcaldy smallpox epidemics case mortality was relatively low. (Table 4.2.2) It compares, for example, with case mortality of 38% amongst patients at the London Smallpox Hospital during 1836-51 and of 18.5% amongst smallpox admissions to the hospitals of the Metropolitan Asylums Board during 1870-79. [31] Despite the prevalence of the more virulent form of smallpox during the epidemic period of the early 1870s, case mortality in both the noted epidemics in Fife would have been lower had all those who were affected with the disease been vaccinated. [32] However, the Kirkcaldy epidemic showed clearly enough that vaccination alone could not prevent the spread of the disease. As Mr. Arnott wrote, "the epidemic has...borne testimony to the truth of the opinion now pretty generally entertained that isolation is the best

remedy." [33] The practice of isolating patients as a means of controlling the spread of smallpox was used during the eighteenth century but lapsed during the early nineteenth century, when it was believed that smallpox could be eradicated by vaccination. However, when the defects of vaccination as a sole means of smallpox prevention became known, the practice of isolating patients was reinstated, in which process the publication of James Young Simpson's *A proposal to stamp out smallpox* (1868) was influential. [34]

During the mid nineteenth century there was little hospital accommodation in Fife for cases of infectious disease. In response to the cholera emergencies of 1848-49 and 1866 small infectious-diseases hospitals were built at Dunfermline, Kirkcaldy, Cupar and Leven. [35] However, due to fears of cross-infection of other patients, cases of smallpox were sometimes refused admission to these hospitals. The reluctance of the infectious diseases hospitals in Fife to admit cases of smallpox forced local authorities to adopt makeshift measures for the isolation of such patients, sometimes with chaotic results. In 1886 at Cowdenbeath a girl with smallpox, who had been refused admission to hospital, was removed by the parochial Medical Officer, Dr. Nasmyth, to an empty house in an isolated row of cottages in the village. [36] However, she was soon driven out of this row by the head of the single family which lived there:

> "The father of the girl, who had accompanied her to the improvised hospital, was bleeding from a wound on his head...[The] head of the family I mentioned as residing in the row...[objected] naturally to smallpox being brought near him and his family... I was acting for the good of many, he for the few. The weapon he used was a hand-saw..." [37]

In this incident the father's assailant was locked up by the police and the patient was returned to isolation in the row of cottages. The family which lived there refused an offer of vaccination and treated Nasmyth "as one who had wronged them very much", but his action in this incident was praised by the Registrar-General for Scotland. [38] During a smallpox emergency in 1888 Beath parochial board secured a site for a temporary hospital near Cowdenbeath on the estate of Foulford, but it does not appear that any hospital was ever built there. [39] Arrangements for the isolation of smallpox cases were also makeshift in the neighbouring township of Lochgelly. During smallpox emergencies in 1871, 1876 and 1881 the local authorities in Lochgelly made ready first the town hall and then the local school as isolation wards for patients. [40] In 1893 Kirkcaldy police commission refused a request from Lochgelly police commission for the accommodation of smallpox patients from Lochgelly in the former's hospital at Harbour Head. [41] A subsequent proposal for a joint hospital for Lochgelly and Cowdenbeath came to nothing, but later in 1893 Kirkcaldy District Committee agreed to admit patients from Lochgelly to its infectious diseases hospital at East Wemyss. [42]

Small hospitals for the separate accommodation of smallpox cases were eventually provided by the County District Committees in Fife. At the time of the building of the Dunfermline District Infectious Diseases Hospital, which was opened in 1894, a prefabricated Doecker hospital was obtained for use in the event of the importation of cholera into Fife from Hamburg. [43] This hospital, which was situated at Muircockhall, well away from the main infectious-diseases hospital in Dunfermline

District, was later made available for smallpox cases. Due to the prevalence of smallpox in Glasgow and the west of Scotland during the early 1900s the Local Government Board advised local authorities throughout Scotland to provide smallpox hospitals. [44] The Board suggested that in order to reduce the cost of providing such hospitals, local authorities could combine for this purpose. In Fife Dr. Nasmyth, as County Medical Officer, advocated the combination of the small burghs in west Fife with the Kirkcaldy and Dunfermline District Committees in the provision of a single smallpox hospital. [45] In 1902 two smallpox hospitals were erected in Fife, at Fosterton, ½ mile west of the new Kirkcaldy District Infectious Diseases Hospital at Strathore, and at Williamstead, near Guardbridge, in St. Andrews District. [46] Like the Kirkcaldy District Infectious Diseases Hospital, the smallpox hospital at Fosterton served both the Kirkcaldy County District and a number of the small burghs in that District. The hospital for St. Andrews District, which also served Cupar District and the burghs in both the eastern County Districts, was located near Guardbridge as an immediate response to an outbreak of smallpox which occurred in that village during 1902. Both hospitals were examples of the small prefabricated hospitals of wood and corrugated iron which were manufactured by Messrs Speir of West Regent Street, Glasgow. [47]

During the early 1900s there were only occasional outbreaks of smallpox in Fife and the smallpox hospitals were little used. In 1903 one case of smallpox was admitted to the hospital at Fosterton, and the hospital at Williamstead was prepared to receive cases from Dundee, where the disease was prevalent. [48] In 1904, when there was "great anxiety

during the whole year owing to the presence of Smallpox in various counties and towns in Scotland", there were only nine cases of the disease in the County Districts of Fife. [49] In Kirkcaldy, where there were ten cases of smallpox during 1903 and one death from the disease (an "anti-vaccinator") in 1904, the hospital at Harbour Head was reopened. [50]

In addition to its later role as a general isolation hospital for the burgh of Kirkcaldy, the Harbour Head hospital, which, as its name indicates, was located at the seaward end of Kirkcaldy harbour, was a feature of early port sanitary administration in Fife. Port sanitary administration was an important element in the prevention of smallpox, for by the early twentieth century, if not before, it was apparent that the disease was no longer indigenous to Britain. [51] Henceforth it was possible to control smallpox by containing it at its points of entry to the country. General provision for port sanitary administration in Scotland was first made in the Public Health (Scotland) Act of 1867. [52] However, there is no evidence that under this Act the parochial and burgh administrations in the parishes and burghs of Fife which contained seaports carried out any regular port sanitary administration. As was noted, the Harbour Head hospital was built during the cholera emergency of 1866. Nor is there any evidence that at any time during the period a seaport was the point at which the smallpox virus was brought into Fife. However, during the cholera emergency of 1893 a system of sanitary administration for the Fife ports was organised by the County public health department. [53] Local general practitioners were appointed to

act as port Medical Officers at the seaports in the landward area. They had powers to inspect ships, remove sick persons onboard ships to hospital, disinfect ships and carry out other necessary preventive measures.

Employed in conjunction with other preventive measures, the port sanitary administration in Fife was an effective means of controlling the spread of smallpox. In 1894 Dr. Nasmyth declared "a subject for congratulation...the immunity which [Dunfermline] District enjoyed when smallpox threatened our seaboard" during the epidemic of that year in Leith. [54] In 1902, when smallpox was widespread in Scotland but not in Fife, a ship from London arrived in Methil roads, where the port Medical Officer, Dr. Caskie, found one case of the disease amongst the crew. [55] The sick crewman and four others on the ship were removed to the smallpox annexe of the Kirkcaldy District Infectious Diseases Hospital, the ship was disinfected and new clothing was provided for the rest of the crew. Also in 1902 a ship plying between London and Grangemouth landed a sick sailor at his home town of Kincardine. [56] In this case the man had already reached his house before he was seen by the port Medical Officer, Dr. Nairn Lea, but was there diagnosed as suffering from smallpox and was removed to the smallpox annexe of the Dunfermline District Infectious Diseases Hospital. The sailor's house in Kincardine, which consisted of only two rooms but contained eight other persons, was disinfected and its occupants were re-vaccinated. As it already contained many of the sailor's contacts, it was turned into a reception centre for further cases of the disease, but none occurred. Given the conditions of crowding which existed in the sailor's house, in this

instance the containment of infection was probably the consequence of widespread vaccination rather than the belated intervention of the port Medical Officer.

It was less easy for local authorities in Fife to control the importation of smallpox by land routes into the county, for there was no system equivalent to port sanitary administration by which road traffic could be watched. In 1893, for example, a tramp carried smallpox from Edinburgh to Alloa and thence into Fife, where he passed through Dunfermline, Kirkcaldy and ten villages and hamlets before being found, diagnosed and removed to the infectious diseases hospital at East Wemyss. [57] However, during this journey he infected no other person. Common lodging houses occupied by itinerants were regarded as potential sources of smallpox infection. Most towns in the county contained such establishments, which were supervised by the sanitary authorities, but there are few records to suggest that they were a major public-health hazard. During the smallpox emergency of 1871 the police commission of Leslie rejected a recommendation by the Board of Supervision that the lodging houses in the burgh be registered as common lodging houses in terms of the Public Health (Scotland) Act. [58] At this time there were ninety houses with lodgers in Leslie, but these houses were the homes of respectable families, and their lodgers, most of whom were mill-workers, were long-stay residents.

However, mill-workers in the linen and paper industries in Fife were regarded as particularly susceptible to smallpox. During the smallpox emergency of 1871 it was reported that many workers at the mills in the

Leslie area had not been vaccinated. [59] Handbills warning of the need for vaccination were posted in Leslie and at the mills near the town, and mill-owners were informed of the urgent need for vaccination of their employees. It was found that the rags which formed the raw material for these industries could harbour the disease virus. During the 1870s and 1880s numerous instances of the spread of smallpox amongst workers in paper mills by suspected rag infection were reported by Medical Officers throughout Britain. [60] In Fife in 1894 four cases of smallpox occurred amongst mill-workers living at Kirkland and employed at a flax mill in Leven. [61] Although in this case the disease could have been brought from Leith, where there was an epidemic of smallpox, Dr. Nasmyth believed that infection in the Kirkland outbreak occurred "through the medium of Russian flax, which is well known to be a vehicle for smallpox contagion." [62] In 1902 there was an outbreak of smallpox at Leslie which involved thirteen cases, one of whom died. Nasmyth suggested that here a flax worker was the source of the infection. [63] Also in 1902 an outbreak of smallpox occurred amongst operatives at the Guardbridge paper works, where the first case of the disease was a rag sorter. [64] During this outbreak, in which there were only four cases and no deaths, all the rag workers at the Guardbridge works were re-vaccinated. In a county where by the late nineteenth century smallpox was rarely encountered, outbreaks of the disease amongst mill-workers in Fife appear to have been relatively common. [65] In these outbreaks infection may have occurred through the medium of infected rags, although in no case was this proven. However, in each outbreak the disease was contained by the enforcement of preventive measures, including isolation of cases and re-vaccination of contacts.

However, as Hardy writes, the decline of smallpox "removed any urgency for protection" and, despite an epidemic of the disease in Scotland in 1904, within a few years compulsory vaccination against smallpox was abolished under the Vaccination Act of 1907 and the vaccination system gradually broke down. [66] Medical authorities in Fife saw the abandonment of compulsory vaccination as premature, for smallpox had not been eradicated. The County Medical Officer, Dr. Yule, criticised the 1907 Act for encouraging objection to vaccination, which usually arose from the "slight inconvenience and...the small fee" involved in the procedure rather than from any medical or conscientious grounds. [67]

Dr. Yule's misgivings about the non-enforcement of vaccination were realised in 1912, when there was an epidemic of smallpox in Kirkcaldy and Dysart. [68] In this outbreak there were 42 cases and two deaths, and Dr. Yule praised the Kirkcaldy burgh Medical Officer, Dr. McIntosh, for preventing the spread of the disease to the landward area. [69] However, the difficulties which smallpox could still cause to medical services were shown in 1921, when the disease was prevalent in England and there was another outbreak in Fife. The first case in Fife, which occurred in Kirkcaldy burgh, "died and was buried without having been diagnosed..." [70] Between January and May 1921 the District Committees in Fife provided emergency vaccination free of charge to "many thousands". [71] In 1922 Dr. Yule again drew attention to neglect of vaccination. Such carelessness, which was widespread in west Fife, was:

> "...a foolishly ignorant policy, in the interests of both the individual and the State and which has only one ending. The outbreak of smallpox, if sufficiently near, usually ensures emergency vaccination. Emergency vaccination usually spells bad vaccination." [72]

However, there were no further deaths from smallpox in Fife until 1942, when the disease was brought there from Glasgow, where it was again prevalent. [73] The outbreak was mainly confined to Methilhill, where there were 26 cases. All cases were removed to the smallpox hospital at Fosterton, where attempts were made to treat some of them with a "convalescent serum" obtained from the blood of those patients who were recovering from smallpox. The results of this treatment, which appeared to shorten the duration of the illness, were reported to be "encouraging but not conclusive". [74] Meanwhile in an emergency campaign a total of 76 326 persons in Fife, a quarter of the population of the county, received vaccination. To avoid interference with working hours, many of the vaccinations were performed at collieries and factories. The most difficult part of the local authorities' work to control the spread of smallpox in the Methilhill outbreak was the detection and supervision of all persons who had been in contact with the cases of the disease. With the assistance of the local press and radio, appeals were made for contacts to come forward. Once located, the contacts were vaccinated and placed under domiciliary quarantine. [75] In this way the outbreak was contained.

Hardy concludes that "because of prejudice, apathy, ignorance, and absence of enforced re-vaccination, [vaccination] could never have been the sole instrument in the disappearance of [smallpox]." She emphasises the importance of the "establishment in the 1870s and early 1880s of a coherent national preventive structure", including isolation of patients, port sanitary administration and, from the 1890s, compulsory notification of infectious diseases, in limiting the depredations of

smallpox. [76] However, in Fife there were no major epidemics of smallpox after the 1870s but a preventive structure against the disease was not fully established until the 1890s and 1900s. As the above examples have shown, measures for the administrative control of smallpox in Fife worked well, protecting the county when the disease was prevalent elsewhere in Scotland and containing outbreaks when these occurred. However, up to the turn of the century routine vaccination was widespread in Fife and emergency vaccination was an important preventive measure in the smallpox emergencies of 1871, 1902, 1921 and 1942. Together with the scattered nature of most of the communities in the county and their relative isolation from the cities of Scotland, vaccination was the main factor in the low incidence of smallpox in Fife. As Dr. Nasmyth wrote in 1894:

> "...within the past few years we have had as much opportunity for conflagrations of smallpox as you would have by putting lighted matches in haystacks, but in each case the blaze was easily suppressed. This was due in great part to notification and hospital treatment, but also, in probably greater part, due to a protected population through vaccination well done." [77]

Chapter 4. Smallpox in Fife. Notes

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4. Razzell op. cit. 95

5. OCM 1415; Smout op. cit. 254

6. Sir John Sinclair (ed.), The Statistical Account of Scotland 1791-1799 (reprinted Wakefield 1978) X: Fife 214, 511

7. ibid. 30, 182, 460, 567, 615, 738

8. ibid. 25, 761

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10. ibid. 241

11. T.R. MacDonald, The practices of inoculation and vaccination in Scotland 1750-1850, and their influence on mortality from smallpox in Scotland (unpublished M.A. dissertation, University of Edinburgh 1972) 22

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14. Quoted in K MOH 1947 AR 7

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16. ibid. II 585

17. Hamilton op. cit. 170

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19. P. Mudie M.D. to Dr. John Thomson 18 October 1818, quoted in John Thomson, An Account of the Varioloid Epidemic which has lately prevailed in Edinburgh and other Parts of Scotland (Edinburgh 1820) 240

20. Henry Dewar, Account of an Epidemic Smallpox which occurred in Cupar in Fife in the Spring of 1817 and the Degree of Protecting Influence which Vaccination Afforded... (Cupar 1817)

21. ibid. 8, 26-29, 32, 35

22. The New Statistical Account of Scotland (Edinburgh 1845) IX: Fife

23. W.J. Brock, Sanitary Laws of Scotland and Principles of Public Health (Edinburgh 1905) 166. Legislative provision for vaccination in England was first made in 1840 and compulsory vaccination of infants was introduced there in 1853. (R.J. Lambert, "A Victorian National Health Service: State Vaccination 1855-71" Historical Journal 5.1 (1962) 2, 3)

24. SPH 395

25. Lambert op. cit. 13 n. 57

26. RGS Annual reports on vaccination 1870-79

27. RGS 1878 Appendix: Extracts from the Registrar's notes relative to the working of the Vaccination Act (Auchtertool parish); 1894 AR 23-24

28. Anne Hardy, "Smallpox in London: Factors in the Decline of the Disease in the Nineteenth Century" Medical History 27 (1983) 115

29. RGS 1855-1950

30. Dunfermline PC minutes 9 March 1871, 29 June 1872; Kirkcaldy PC minutes 6 August 1872 Report by D. Arnott, burgh sanitary inspector, on the smallpox epidemic in Kirkcaldy. The following description of the epidemic in Kirkcaldy is taken from this report.

31. Hardy op. cit. Tables 2 and 13

32. G.S. Parkinson, A Synopsis of Hygiene (ninth edn. London 1947) 70; Hardy op. cit. 115-16

33. Kirkcaldy PC minutes 6 August 1872 Mr. Arnott's report op. cit.

34. Hardy op. cit. 122-23

35. See p. 111 above.

36. Thomas Goodall Nasmyth, "Sanitary Difficulties in Scotland" The Sanitary Record 15 September 1886, 112

37. ibid. 112

38. ibid. 112

39. Beath LA minutes 12 April and 11 May 1888

40. Auchterderran PB minutes 31 May 1871; Lochgelly PC minutes 15 December 1876, 13 June 1881

41. Kirkcaldy PC minutes 13 February 1893

42. Lochgelly PC minutes 26 January 1893

43. 1892 AR 60

44. Thomas Ferguson, Scottish Social Welfare 1864-1914 (Edinburgh 1958) 382

45. 1901 AR 45

46. 1902 AR 85, 101

47. Brock op. cit. end-papers: "Speirs' Iron & Wood Buildings". The hospital at Fosterton had accommodation for twelve patients.

48. 1903 AR 1

49. 1904 AR 1

50. K SI 1903 AR 17; K MOH 1904 AR 7-8, 17

51. Hardy op. cit. 135

52. 30 and 31 Vict. ch. 101 cl. 38, 52-54

53. 1893 AR 22-27

54. 1894 AR 47

55. Ferguson, Scottish Social Welfare 380; 1902 AR 75

56. ibid. 68

57. 1893 AR 68-69

58. Leslie PC minutes 2 October 1871

59. ibid. 2 October 1871

60. 1902 AR Appendix: H.F. Parsons, "Outbreak of Smallpox among Rag Sorters at the St. Mary Cray Paper Mills, and on the Precautions which can be taken for preventing the spread of Infection from Rags"; H.E. Corbin, "Smallpox among Cotton Operatives" Proceedings of the Royal Society of Medicine 8.2. (1915) 89-107

61. 1894 AR 64

62. ibid. 64

63. 1902 AR 86-90

64. ibid. 100-01

65. See also Nasmyth, "Sanitary Difficulties" 112; Dysart PC minutes 17 January 1893

66. Hardy op. cit. 115; Lambert op. cit. 1

67. 1911 AR 64. See also D MOH 1907 AR 7-8

68. 1912 AR 113-14, 137

69. ibid. 113

70. 1921 AR 22

71. ibid. 23

72. 1922 AR 36-37

73. 1939-45 R 73-79

74. ibid. 74, 119 Final report by Dr. Fleming, medical superintendent of the Thornton Infectious Diseases Hospital

75. ibid. 76-79

76. Hardy op. cit. 138

77. 1894 AR 24

CHAPTER 5

TYPHUS AND TYPHOID IN FIFE

1. The differentiation of typhus and typhoid

Prior to 1865 the annual reports of the Registrar-General for Scotland (RGS) give only combined figures for deaths from typhus and typhoid under the heading of typhus, which was here used as a composite term covering all "Gastric and allied fevers". [1] However, from 1865 the RGS divided mortality from the typhus group of diseases amongst four diseases: typhus, enteric fever (typhoid), relapsing fever and simple continued fever. The most common diseases in this group were typhus and typhoid. Typhus is a louse-borne disease usually contracted through the infection of a skin lesion. Typhoid is spread via the ingestion of infected water, milk or food or by contact with an infected person or a carrier. A symptom common to typhus and typhoid is a red macular rash, although the typhoid rash is "quite distinct" from that seen in typhus. [2] A distinguishing feature between the two diseases is the diarrhoea which occurs in typhoid cases and sometimes leads to intestinal haemorrhage; in typhus there is no diarrhoea. The form of relapsing fever occurring in temperate regions was like typhus in being transmitted by the human body louse but produced different symptoms from typhus, including haemorrhage and jaundice. [3] Simple continued fever may be regarded as synonymous with typhoid.

The definition of typhus and typhoid as specific diseases was a gradual process which spanned most of the nineteenth century. Typhoid was distinguished from typhus by the French physician Bretonneau in 1828 and named *fiévre typhoide* by his compatriot Louis in 1829. [4] The two diseases were differentiated "in terms of distinctive lesions" by the American pathologist Gerhard in 1837. [5] From 1842 Farr's category of typhus included "dothinenteric fever", after *dothiénentérie*, the name given by Bretonneau to typhoid. [6] It is generally regarded that in Britain the difference between typhus and typhoid was established by William Jenner, professor of pathological anatomy at University College London, who published a series of papers on the subject in 1849-51. However, in Scotland typhus and typhoid were first differentiated by Robert Perry, a physician at Glasgow Royal Infirmary, who published his *Observations on Continued Fever* in 1836. [7] The typhoid bacillus was first described by the German pathologist Eberth in 1880 and isolated by his compatriot Gaffky in 1884. The transmission of typhus was first explained by the French pathologist Charles Nicolle only in 1909. [8]

The causative organism of relapsing fever was discovered by the German physician Obermeier in 1868. [9] However, as relapsing fever and typhus are both transmitted by the body louse and are therefore the product of the same environmental conditions, it is reasonable and convenient here to consider them both under the heading of the more common disease. Likewise, mortality from simple continued fever may be grouped with that from typhoid. Murchison wrote: "Simple continued fever is rarely, if ever, fatal in this country. The numerous deaths from simple fever recorded weekly by the Registrar-General are due for the most part to

enteric fever with latent abdominal symptoms." [10] Here mortality from typhoid also includes all deaths from paratyphoid. Paratyphoid was first described by Achard and Bensaude in 1896 and the paratypoid bacilli A and B were isolated by Schottmüller in 1900-01. [11] However, in the reports of the RGS mortality from paratyphoid was differentiated from that due to typhoid only from 1921, by which time typhoid and paratyphoid had ceased to be a threat to public health. The following sections consider the reasons for the decline in mortality from typhus and typhoid in Fife.

2. The decline of typhus in Fife c.1865-1918

During the 1860s first typhus (1863-65) and then typhus and relapsing fever (1869-70) were prevalent in Scotland. [12] During 1866-70 there were 9 350 deaths from these diseases in Scotland, but epidemic conditions were concentrated in the cities and Greenock and during this quinquennium the proportion of all Scottish mortality from typhus and relapsing fever which occurred in Fife was only 3%. [13] Even during the 1860s local authorities in Fife appear to have ignored the danger of a typhus epidemic, for no local records relating to this problem have been found, and there are few local references to typhus during later decades. Therefore discussion of the decline of typhus in Fife is largely speculation upon the fact that during the 1870s the typhus death rate in Fife, like that in Scotland as a whole, plummeted and that by the mid 1890s the disease had all but vanished from the county. (Figure

5.1 and Table 5.2.1) The Scottish experience of typhus during the period was summarised by Flinn:

> "Though conquered by 1920, typhus had lingered on as a minor killer until the very end of the nineteenth century. Commonly associated with the large industrial town - and its incidence in Glasgow in the 1830s and 1840s provides ample support for this view - typhus proved relatively more lethal in small towns than in large, and accounted for a similar proportion of deaths in rural areas as in large towns." [14]

Table 5.2.1 Mortality from typhus in the divisions of Fife 1866-1900

Death rate (DR): deaths from specified cause per 10 000 inhabitants

	LTD's		STD's		RD's	
	DR	% *decr.*	DR	% *decr.*	DR	% *decr.*
1866-70	3.1		n.a.		n.a.	
1871-80	1.4		0.9		1.5	
1871-75	2.1		1.7		2.3	
1876-80	0.7	*67.6*	0.2	*87.4*	0.7	*67.7*
1881-90	0.1		0.1		0.1	
1891-1900	-		-		-	

Source: RGS 1866-1900

The data for typhus mortality in Fife are inadequate to test Flinn's generalisation about typhus in Scotland. During the short period for which there are comparable data, typhus death rates in the divisions of Fife were indeed similar in the large-town and rural districts of the county but were 32% *lower* in the small town districts. (Table 5.2.1) However, what is more significant is that within the decade 1871-80 typhus death rates in Fife declined by over 74% throughout the county and by over 87% in the small town districts. Even if the occurrence of

typhus in Fife during the late 1860s was part of the nationwide epidemic, which burnt itself out in 1870, this does not explain why within two decades a disease which during the mid century was probably to some degree endemic in Fife had all but vanished from the county. The various theories which have been proposed as explanations for the incidence of typhus and its decline in Britain during the late nineteenth century will be summarised and then tested against the available information on typhus in Fife.

Most writers on typhus have accepted that the incidence of the disease was closely related to social conditions, that poor hygiene and nutrition increased the danger of infection and that typhus was therefore a disease of the poor. Post relates the epidemic of typhus and relapsing fever in Britain in 1817-19 to famine conditions then prevalent in Europe. [15] McKeown and Record cite improved living conditions as the main factor leading to the disappearance of typhus in England and Wales during the late nineteenth century. [16] Particularly important were improved standards of hygiene, which reduced contact with the louse vector of the disease and began to take effect from the 1870s, and better diet, the influence of which upon resistance to typhus was appreciable somewhat later. [17] In 1894 Creighton wrote that "food has been for a long time cheap and wages good...So long as our cheap supplies of food, fuel and clothing are uninterrupted, there is small chance of typhus or relapsing fever." [18]

Wohl stresses the combined effect of a range of environmental improvements in hastening the decline of typhus. [19] In order to explain the sharp decline in typhus mortality during the 1870s, he considers that there was a weakening of the infective organism, *Rickettsia prowazeki*, but argues that typhus declined at a slower rate in Belfast, Dublin, Sunderland and Liverpool than elsewhere in Britain because in these cities sanitary improvement was retarded and "widespread poverty and filth co-existed." [20] Improvements in water supplies, sewerage and nuisance removal and the increased use of cotton clothing and bedding, which were more easily washed than woollen articles, are all cited by Wohl as helping to get rid of typhus.

Luckin discounts the provision of improved water supplies and housing as important factors in the decline of typhus. In those working-class districts of east and central London where typhus was common the disease disappeared at least a decade before more than half the population there gained permanent access to a water supply and two decades before any attempt was made to alleviate overcrowding in these districts. [21] He can show no evidence that there were any improvements in the diet of the poor during the late nineteenth century which increased the latter's resistance to typhus, and he disagrees with Wohl that the infective organism became less virulent, for during the 1890s typhus case-mortality ran at *c.*25-40%, which was as high as during the epidemic period of the 1860s. However, "there can be little doubt that improved sewerage was a necessary, though not a sufficient, condition for the eradication of epidemic typhus." [22]

Instead, Luckin traces the decline of typhus in England to changing patterns of Irish immigration into the country. In a comparison of twenty-two conurbations in England and Ireland it is shown that during the 1870s it was only in Belfast and Dublin that mortality from typhus fell by less than 60% from levels in the 1860s of *c.*80-130 deaths per 100 000 inhabitants. [23] In both those cities the fall was only 26%, and it was also lower than average in those English cities: Sunderland (64%) and Newcastle (78%), and Liverpool (73%) and Manchester (78%), which had the closest contacts with Ireland. [24] Once the epidemic of 1869-70 had spent itself, typhus could only regain epidemic scale "by a large-scale movement of infected lice-carrying individuals from centres of population where there continued to be a high incidence of the disease." [25] From the 1860s Irish immigration to England and Wales fell away, the Irish population there stabilised at half a million persons and a recurrence of epidemic typhus in England in the 1880s, which the periodicity of previous epidemics anticipated, did not occur:

> "This remission is more likely to be understood by an analysis of short-term fluctuations in rates of migration from Ireland to urban England than through a generalised appeal to a supposedly monolithic and nationally uniform sanitary revolution." [26]

Can Luckin's arguments that changes in typhus mortality were determined mainly by improvements in drainage and movements of Irish immigrants be tested at a local level against the evidence from Fife? The earliest municipal drainage schemes in Fife were carried out between the 1860s and the 1890s. The first scheme in Dunfermline, which incorporated some of the burgh's suburbs, was carried out between 1864 and 1870, and an outfall to the Firth of Forth was constructed in *c.*1874-76. [27] Annual

mortality from typhus in Dunfermline ceased in 1876, although two deaths from the disease occurred there in 1878. Annual mortality from typhus in Kirkcaldy ceased in 1878, but here a comprehensive drainage scheme for the whole burgh was only carried out during the period 1880-92. [28] However, some parts of Kirkcaldy, including Pathhead, Sinclairtown and Gallatown, were drained during 1870-74. [29]

Data for the incidence of typhus in individual small burghs in Fife are almost non-existent. The reports of the RGS for 1868-70 include figures for deaths from different causes in Dysart, Cupar and St. Andrews. In Dysart during this period there were no fewer than 21 deaths from typhus, but that burgh was drained in 1871-72, and following Dysart's reappearance in the reports of the RGS in 1881, in the category of large town districts, only one further death from typhus was recorded in the burgh, in 1884. [30] During 1868-70 there were five deaths from typhus in Cupar, which was not drained until 1878-83. [31] Work on a drainage scheme for St.Andrews began in 1864 and during the years 1868-70 only one person died from typhus in that burgh. [32] The deaths from typhus in Dysart, Cupar and St. Andrews during 1868-70 were more likely to be marginal effects of the nationwide epidemic than due to any environmental conditions under which typhus might have been endemic in these towns. Other small burghs where extensive drainage works were carried out included Leven (c.1860-90), Elie (1885-86), Anstruther Easter (1886-88) and Markinch (1891-94). [33] In the growing mining towns of Buckhaven and Methil, Cowdenbeath and Lochgelly no comprehensive drainage schemes were carried out, although some improvements were made in all these places, mostly in the late 1880s.

[34] In these towns wage levels, and therefore presumed standards of nutrition, were relatively high, but sanitary conditions were poor. If the "sanitary revolution" theory of the incidence of typhus is correct, it might be expected that in the Fife mining towns the disease would have persisted into the 1890s.

The last death from typhus in the rural districts of Fife occurred in 1884, and the County Medical Officer's reports for 1892-99 record only one notification of the disease, in 1898 in an isolated part of Kirkcaldy District. [35] However, in the County Districts there were many places, including a number of expanding mining settlements, where by the turn of the century few drainage improvements had been carried out and environmental conditions might have favoured the spread of typhus, had the disease been introduced there.

It is difficult to prove a direct link between major improvements in drainage and the decline of typhus in Fife, but in some towns in the county, such as Dunfermline and Dysart, the timing of sanitary improvements and the disappearance of typhus coincide. Drainage facilitated the disposal of excrement and other liquid and semi-liquid wastes, and in many places its provision, together with piped water supplies, presumably led to quick improvements in personal hygiene and a reduction in the local population of body lice. As a result, the scope for contact between carriers or reservoirs of typhus and uninfected persons via the louse vector was reduced. However, during the 1870s sanitary improvement in Fife had not advanced far. By 1881 both the large burghs but only 28% of the total population of the small burghs

received adequate water supplies. By 1891 only 27% of the landward population received adequate water supplies. [36] Nor is it likely that there was any substantial improvement in living standards in Fife during the 1870s. The rural population was decreasing in size, the main industries in the large burghs had passed through their period of greatest expansion, and with the Fife Coal Company only commencing operations in 1872, the main development of the county's mining industry was to yet to occur. [37] Finally, changes in housing conditions in Fife could have made little difference to the incidence of typhus there, for during the 1870s the average level of crowding in the county declined by less than 5%. [38]

More research would be required before any firm conclusions could be made about the influence of Irish immigration on public health in Scotland. Flinn noted "some evidence that the incidence of typhus...increased in Glasgow during the first half of the nineteenth century at a pace disproportionate to the growth of population in the city," but offered no explanation for this. [39] However, by *c.*1820 a total of 10% of the population of Glasgow were Irish-born, and the Glasgow physician, Robert Perry, who differentiated typhus and typhoid, suggested that typhus was "of Irish origin." [40] In 1849, following the famine in Ireland and the typhus epidemics of 1847-48, the managers of the Royal Infirmary in Edinburgh proposed "more stringent measures to prevent the importation of paupers and vagrants from Ireland." [41] Fife had a "significant concentration" of Irish by 1851, with Irish immigrants forming 4% of the population of Dunfermline in that year. [42] However, after 1851 Irish immigration to Scotland decreased and

from the 1880s there was a "reduction of the Irish-born population of such magnitude as to indicate substantial emigration." [43] There is a broad correlation between the movements of Irish and the incidence of typhus in Scotland.

Immigrants from the Scottish Highlands may also have been significant as carriers of typhus. The reports of the *Old Statistical Account* show that typhus was prevalent in Highland parishes during the late eighteenth century and Hamilton notes the effect upon typhus incidence in Glasgow of "the periodic influx of starving or malnourished Highlanders or Irish seeking work..." [44] Greenock, which was "the chief seat of typhus...in Scotland" in 1863-64, had a high proportion of both Highlanders and Irish in its population. [45] During the late nineteenth century typhus persisted in the Western Isles, "with their insanitary black houses." In 1896 the MOH for Ross and Cromarty referred to the presence of the disease there as "a blot on a fair picture" and recommended that every infected house should be burned down. [46]

If it is accepted that the communities in Ireland and the Scottish Highlands which during the nineteenth century provided the mass of working-class immigrants to the central Scottish industrial belt were also hotbeds of typhus, it might be asked how it was possible for persons who were supposedly suffering from typhus to succeed in travelling from these places to the urban areas of Scotland without being detected or dying whilst on their journey. The answer to this was that typhus would be carried not by active cases of the disease but by disease reservoirs. The only known reservoir of *R. prowazekii* is man,

and interepidemic survival of the infective organism in typhus is due to its persistence in the tissues of recovered patients, in whom recrudescence (known as Brill-Zinsser disease) may occur. [47] "From these recrudescent cases", wrote Zinsser, "epidemics can start under conditions of general louse infestation." [48] It was not even necessary for the immigrant carriers of typhus to be louse-infested, although it is possible that many of them were. Those arriving in urban Scotland would become louse-infested soon enough upon moving into the filthy slums which received the immigrant poor in Glasgow and other towns. [49] The lice would absorb the blood of the typhus carriers and the transmission of the disease would begin. However, it still required the existence of large numbers of persons with open wounds upon their bodies before an outbreak of typhus could develop into an epidemic. Such conditions would occur amongst populations of the poor during periods of want, such as trade depression, when food prices increased, levels of nutrition fell, living and working conditions led more rapidly to exhaustion, and skin conditions, including suppurating boils and sores and spilt lips, became common. It was the interaction of all these factors which created the breeding ground for typhus. As Luckin writes, the epidemiology of typhus was "complex, socially traumatic and threatening..." [50]

There are few typhus case-histories from Fife. The first infectious-diseases hospitals in the county for which records survive were only opened in the 1890s. However, two cases involving the deaths of public health officials from typhus give an idea of the conditions under which the disease could occur in Fife. In 1877 the Medical Officer of Health

for Kirkcaldy, Dr. J.W. Morrison, died from typhus after treating a tramp who was lying sick with the disease in a common lodging house. [51] In 1882 Robert Stobie, the sanitary inspector for St.Andrews, contracted typhus in the course of investigating an outbreak amongst the fisher population of that burgh. [52] These cases show how, despite general improvements in sanitation, isolated outbreaks of typhus could still occur in those parts of towns where houses were dirty and possibly overcrowded, where there were low standards of health and hygiene amongst the inhabitants and where there had been contact with a typhus carrier. The last fatal outbreak of typhus in Fife, which involved three deaths at Buckhaven and Methil in 1918, probably occurred under such circumstances. [53] It is also suggestive that the abovementioned outbreaks in Fife in 1877 and 1882 both originated amongst travellers of different kinds. Any future historical studies of typhus will need to follow Luckin's example in considering the influence of migration in the epidemiology of this disease.

3. The decline of typhoid in Fife *c.*1855-1950

The pattern of the decline in typhoid mortality in Fife was similar to that in Scotland as a whole, which in turn was similar to that in England and Wales. [54] A period of substantial decline during the 1870s and 1880s from death rates of *c.*37-40 deaths per 100 000 inhabitants was followed by little further progress during the 1890s, when in Fife typhoid still caused an average of over thirty deaths per annum.

However, during a further period of decline up to the 1930s minimal levels of mortality were achieved. During the latter decade there were only ten deaths from typhoid in Fife. Between the 1870s and the 1930s typhoid mortality in Scotland and in England and Wales, as measured by quinquennial death rates, showed continuous decline. However, the course of typhoid mortality in Fife was notable for increases which occurred during the late 1870s and the late 1890s. (Figure 5.1)

In his study of the decline of typhoid in London during the second half of the nineteenth century Luckin explains the control of the disease as due to a range of measures which began to take effect from the 1870s. These included the filtration of water supplies, the supervision of food and milk production, the introduction of the compulsory notification of typhoid, the increased hospitalization of cases of the disease and the use of bacteriological analysis as a means of diagnosis. [55] He emphasises the importance in the control of typhoid in London of the collaboration between the analytical chemist Edward Frankland and William Farr of the English General Register Office in securing cleaner water supplies for the metropolis and of the influence of the Metropolitan Association of Medical Officers of Health in securing improved standards of food and milk production. A further factor in the decline of typhoid mortality was vaccination, which was first used in the early twentieth century. [56]

The aim of this section is to compare changes in typhoid mortality in Fife with development of sanitation and to consider the effect of other factors in the reduction of that mortality. [57] As was noted, the

pattern of the decline of typhoid mortality in Fife was similar to that in Scotland and in England and Wales. This uniformity would suggest that differences in such mortality at subregional levels were unlikely to be significant, which in the long term was probably true. However, study of the variations in typhoid mortality in an area such as Fife permits the closer identification of reasons for the changing incidence of typhoid and of the problems which were encountered in controlling the disease. It may, for example, explain why during the 1890s the decline in typhoid mortality decelerated and in Fife was temporarily reversed. Variations in death rates from typhoid in the divisions of Fife during the period of the greatest decline in mortality from the disease are shown in Figure 5.2 and the following table.

Table 5.3.1 Mortality from typhoid in Fife and the divisions of Fife 1866-1920

Death rate (DR); deaths from specified cause per 10 000 inhabitants

	Fife		LID's		SID's		RD's	
	DR	% decr.	DR	% decr.	DR	% decr.	DR	% decr.
1866-70	5.0		6.4		n.a.		n.a.	
1871-80	4.0	*20.0*	3.1	*51.6*	3.2		6.2	
1881-90	1.9	*52.5*	1.6	*48.4*	1.7	*46.9*	2.6	*58.1*
1891-1900	1.5	*21.1*	1.3	*18.8*	1.5	*11.8*	1.9	*26.9*
1901-10	0.7	*53.3*	0.9	*30.8*	0.4	*73.3*	1.0	*47.4*
1911-20	0.3	*57.1*	0.2	*77.8*	0.2	*50.0*	0.3	*70.0*
% decrease per decade 1866/71-1920		*40.8*		*45.5*		*45.5*		*50.6*

Source; RGS 1866-1920

During the period 1866-1920 mortality from typhoid in Fife declined at an average decadal rate of over 40%. However, between decades in this

period, rates of decline were either considerably greater or less than this average. Between the quinquennium 1866-70 and the decade 1871-80 typhoid mortality in Fife declined by only 20% and this decrease was almost entirely due to a reduction in mortality in the large town districts. Between the late 1860s and the 1870s the small-town and rural districts of Fife together could have achieved a decrease in typhoid mortality of less than 9%. As Figure 5.2 shows, between 1871-75 and 1876-80 typhoid mortality in the small-town and rural districts actually increased. However, during the late 1860s by far the highest typhoid mortality rates occurred in the large town districts of Fife, although the highest rates here were later exceeded in the rural districts. The other period of below-average reductions in typhoid mortality in Fife was the 1890s. In this decade the smallest reductions were achieved in all three divisions of the county, and in the small town districts the decadal decrease in mortality was less than 12%. In fact, as Figure 5.2 shows, between 1891-95 and 1896-1900 typhoid mortality in the large-town and small-town districts of Fife actually increased. In each division the greatest decadal decreases in typhoid mortality amounted to 70% or more and occurred after the turn of the century, by which time the death rate from typhoid in Fife was less than a fifth of that during the late 1860s.

Table 5.3.2 Mortality from typhoid in Dunfermline and Kirkcaldy large town districts 1866-1920

Death rate (DR): deaths from specified cause per 10 000 inhabitants

	Dunfermline		Kirkcaldy	
	DR	% decr.	DR	% decr.
1866-70	5.1		7.6	
1871-80	3.1	*39.2*	3.1	*59.2*
1881-90	2.3	*25.8*	1.0	*67.7*
1891-1900	0.9	*60.9*	1.8	*-80.0*
1901-10	0.9	-	0.7	*61.1*
1911-20	0.2	*77.8*	0.3	*57.1*
% decrease per decade 1866-1920		*40.7*		*33.0*

Source: RGS 1866-1920

There were considerable differences in the circumstances of the decline in typhoid mortality in the large town districts of Dunfermline and Kirkcaldy. (Figure 5.3 and Table 5.3.2) The typhoid death rate in Kirkcaldy during 1866-70 was, from the available data, the highest quinquennial rate in any part of Fife during the period. It was 49% above the rate for Dunfermline and 53% above the county average for that quinquennium. However, between 1866-70 and 1886-90 mortality from typhoid declined by over 89% in Kirkcaldy, in comparison to a decline of 58% in Dunfermline, and in the latter quinquennium the typhoid death rate in Kirkcaldy was less than 38% of that in Dunfermline. However, during the 1890s typhoid mortality in Kirkcaldy increased by 80% from its level during the 1870s and was double the rate in Dunfermline. Thus, the average death rate from typhoid in the large town districts of Fife in the 1890s, during which there appeared to be a relatively modest decline in typhoid mortality in this division, in fact concealed changes

over the previous decade in typhoid mortality in Dunfermline and Kirkcaldy which covered a range of 141%. During the late 1900s there was a further divergence of typhoid mortality in the two large town districts, with a sharp increase in the death rate in Dunfermline. However, this increase was from a low level and amounted to little more than a quarter of that which occurred in Kirkcaldy during the previous decade. From 1911 mortality from typhoid in Dunfermline and Kirkcaldy declined at similar rates and was virtually eliminated by the late 1920s.

Some of the differences in the decline of typhoid in Dunfermline and Kirkcaldy during the second half of the nineteenth century may be explained by variations in the development of water supplies and drainage in these towns. Such development in the burghs of Dunfermline and Kirkcaldy is summarised in Tables 5.3.3-4 (p.166), where it is related to changes in typhoid mortality in Dunfermline and Kirkcaldy large town districts. Up to the 1890s there is a good correlation between sanitary developments and changes in typhoid mortality rates in both Dunfermline and Kirkcaldy. The development of water-supply and sewerage schemes was followed by decreases in the mortality rate from typhoid. However, sanitary improvements remained incomplete, particularly where householders were slow to connect properties to main drains, and typhoid was not eliminated. In 1880, for example, an outbreak of typhoid occurred in Buchanan Street in Dunfermline:

> "The House has no Water Closet, and contaminated matter coming from [the patient] having to be emptied out into the street grating, there is considerable risk of infection spreading." [58]

Table 5.3.3 Mortality from typhoid in Dunfermline large town district as related to sanitary developments in Dunfermline burgh 1866-1900

Death rate (DR): deaths from specified cause per 10 000 deaths from all causes

	Typhoid DR		Development of sanitation
1866-70	5.1	1866	Craigluscar reservoir completed
		1870	first sewerage scheme completed
1871-80	3.1	1876	Act for Glensherup reservoir
		*c.*1876	sewage outfall to Firth of Forth completed
1881-90	2.3	late 1880s	sewerage becoming overloaded
1891-1900	0.9	1893	sewerage improvements completed

Sources: water supply: Arthur Silverthorne, London and Provincial Water Supplies, with the Latest Statistics of Metropolitan and Provincial Waterworks (London 1884) 130-31; sewerage: Dunfermline PC minutes 1864-93

Table 5.3.4 Mortality from typhoid in Kirkcaldy large town district as related to sanitary developments in Kirkcaldy burgh 1866-1900

Death rate (DR): deaths from specified cause per 10 000 deaths from all causes

	Typhoid DR		Development of sanitation
1866-70	7.6	1869	first water scheme (Ballo and Drumain reservoirs) completed
1871-80	3.1		
1881-90	1.0	1881	Act for Harperlees reservoir
		1880s	sewerage scheme in progress
		1886	Act for Holl reservoir
1891-1900	1.8	1892	sewerage scheme completed
		1896	Act for Arnott reservoir

Sources: water supply: Colin M. Bain, The Social Impact of Kirkcaldy's Industrial Revolution 1810-76 (unpublished Ph. D. thesis, University of Guelph 1973) 158; Kirkcaldy and Dysart Waterworks Acts 1867, 1881, 1886, 1896; sewerage: Kirkcaldy PC minutes 1874-85

During the 1880s the sewerage in Dunfermline became overloaded and began to fail and the decline in typhoid mortality in that district slowed down. However, during the 1890s the reduction in typhoid mortality in Dunfermline accelerated after the engineers Messrs Leslie and Reid completed improvements to the burgh's drainage system. [59]

Yet, were these developments related? There is an alternative explanation for the difference in typhoid mortality rates in Dunfermline and Kirkcaldy during the 1880s. In the annual reports of the RGS up to 1878 mortality in the burghal part of Dunfermline registration district was separated from that in the landward area of that district, but from that year only a combined total of deaths in the burghal and landward parts of the Dunfermline registration district was given. [60] For the quinquennia to 1875 Figure 5.3 and Table 5.3.2 show mortality from typhoid in only the burghal part of the Dunfermline registration district, but from 1876-80 they include typhoid mortality in the district's landward area as well. This area included a number of mining villages which did not benefit from the sanitary improvements carried out in Dunfermline burgh up to the late 1870s.

One such village was Kingseat, which lay 2½ miles north-east of Dunfermline. In 1876 there was an epidemic of typhoid in Kingseat which involved seventy cases and one death. [61] This epidemic was investigated by the Medical Officer to the Board of Supervision, Dr. Littlejohn, and the Dunfermline burgh Medical Officer, Dr. Morris. The latter organised measures against the further spread of typhoid in Kingseat. However, sanitary facilities in Kingseat remained primitive,

for the village was not served by Dunfermline's water supply from Craigluscar and was not connected to the burgh's new supply from Glensherup. In 1882 the burgh sanitary inspector for Dunfermline, Mr. Stuart, reported that the water supply to Kingseat was defective. The burgh surveyor held discussions with the local coalmaster about ways of improving this supply. [62] Although public health officials from Dunfermline advised on sanitary matters in Kingseat from the 1870s, this village remained outwith the burgh boundaries of Dunfermline and that town's system of sanitation until the late 1880s. [63] Nevertheless, the RGS reported deaths from typhoid in Kingseat as in effect occurring in the area of public health administration which covered Dunfermline burgh. Therefore the difference between typhoid mortality in Dunfermline and Kirkcaldy during the 1880s is most likely to be due to the inflation of the death rate for Dunfermline large town district by the inclusion of deaths in mining villages in the landward area of that district. [64]

No such explanation can account for the difference in typhoid mortality in Dunfermline and Kirkcaldy during the 1890s, nor is one necessary. By the 1890s availability of hospital accommodation had become an important factor in measures for the further reduction of typhoid mortality. [65] Isolation of cases was necessary in the control of typhoid, which could be transmitted by direct infection from person to person, and the value of infectious diseases hospitals for this purpose was well illustrated in the contrasting responses of the burgh authorities of Dunfermline and Kirkcaldy to typhoid epidemics in their towns during the 1890s. [66] In 1895 there was an epidemic in Dunfermline in which four persons died. [67] However, mortality in this epidemic might have been greater had it

not been for the removal of cases to the new infectious diseases hospital in Dunfermline, which was opened in 1894. [68] In 1896 an epidemic of typhoid occurred in Kirkcaldy. It involved 191 cases and twenty deaths and pushed the quinquennial mortality rate from typhoid in Kirkcaldy up to a level last encountered during the late 1870s. The Kirkcaldy typhoid epidemic of 1896 was investigated by Dr. Littlejohn. There "can be no doubt", he wrote, "that the crowning disaster in this Epidemic was the want of a Hospital where the first few cases could have been rapidly isolated and the disease, in all probability, stamped out." [69]

The typhoid epidemics which occurred in Dunfermline and Kirkcaldy during 1895 and 1896 both had their origins in infected milk which was supplied from dairies in the landward area. [70] By the 1890s an estimated 80% of the burghal population of Fife received adequate water supplies, which were obtained from unpopulated gathering grounds largely secure from pollution and were piped directly to consumers. [71] Such supplies were unlikely to cause outbreaks of typhoid, still less lead to epidemics of the disease. The improvement of water supplies also reduced the risk of contamination of milk at dairies. However, by the 1890s the control of milk production, particularly in the landward area, from which the burghs obtained most of their milk supplies, had hardly begun and in some dairies the neglect of basic sanitary measures was total. In 1899 an outbreak of typhoid in Thornton, which involved thirteen cases and two deaths, was traced to milk supplied from a dairy on the outskirts of the village. [72] Thornton village had received a piped water supply from Kirkcaldy burgh's Lothrie main since the late 1870s. However, the

dairy was situated beyond the end of the village water-main, and rather than use the nearest tap, workers there found it more convenient to take water from a nearby burn. This burn received Thornton's sewage and was the source of contamination of the milk at the dairy. However, the practice of taking water from the burn for use in the dairy continued even after the typhoid outbreak in Thornton and was only stopped when a sample of milk from the dairy was found to contain a minnow. Satisfactory standards of dairy sanitation were achieved in the larger dairies in Fife by the 1920s but pasteurised milk only became widely available in the county during the 1930s and the work of many smaller dairies remained unregulated up to the 1950s. [73] However, it seems that milk-borne typhoid had been eradicated in Fife by the end of the First World War. Perhaps the last outbreak of milk-borne typhoid in Fife occurred in Kirkcaldy burgh in 1918. [74] It involved seven cases and one death. The source of infection was traced to the dairy at Wester Bogie, milk from which was also the cause of the typhoid epidemic in Kirkcaldy in 1896.

In the large town districts of Fife typhoid had become relatively uncommon by the 1900s. In Dunfermline, sanitary conditions were good. In 1910 the burgh Medical Officer, Dr. Macgregor, explained the recent resurgence of the disease in the town as due to "pit typhoid" i.e. typhoid caused by the drinking of mine water, in the mining suburb of Townhill. [75] In 1911 the Medical Officer for Kirkcaldy, Dr. McIntosh, reported that the burgh had not been severely troubled by typhoid since the epidemic of 1896:

"No doubt the comparative freedom from outbreak of this disease is due in large measure to the good water supply, the almost universal water carriage of all sewage, and the very efficient scavenging of the town." [76]

As no information is available on deaths from specific causes in individual small-town districts during the second half of the nineteenth century, only general conclusions can be drawn about the reduction of typhoid mortality in this division of Fife. However, there is a clear correlation between the development of water supplies and the decline of typhoid in the small town districts. By *c.*1880 five of the small burghs in Fife had carried out water schemes. (Table 3.A.3) During the 1880s nine more small burghs and the unincorporated towns of Buckhaven, Cowdenbeath and Markinch received water supplies from water schemes. As Table 5.3.5 shows, this decade saw the greatest development of water supplies to the small burghs and unincorporated towns of Fife and a substantial fall in mortality from typhoid in the small town districts of the county. By contrast, during the 1890s only three more small burghs carried out water schemes and the fall in typhoid mortality in the small town districts was only 11.8%. By 1911 all the small burghs in Fife had carried out water schemes and typhoid mortality in the small town districts had fallen to only 0.2 deaths per 10 000 inhabitants, which was the lowest rate yet achieved in any division of Fife.

Table 5.3.5 Mortality from typhoid in the small town districts of Fife as related to the development of water supplies in the small burghs (S) and unincorporated towns (T) of Fife 1871-1910

Death rate (DR): deaths from specified cause per 10 000 inhabitants

	Typhoid mortality STD's			Provision of water supplies		
			:	population of ST adequately supplied as % of population		
	DR	% *decr.*	:	of all ST		% *incr.*
1871-80	3.2		:	(1881)	28.1	
1881-90	1.7	*46.9*	:	(1891)	63.7	*126.7*
1891-1900	1.5	*11.8*	:	(1901)	73.5	*15.4*
1901-10	0.4	*73.3*	:	(1911)	100.0	*36.1*

Source: Table 3.A.3

It is difficult to determine the chronology of the development of drainage in the small burghs of Fife but it is probable that all these towns were adequately drained by *c.*1914. [77] However, although the improvement of drainage was important in the prevention of typhoid, the provision of piped water supplies from sources secure from pollution was the main factor in the development of sanitation as a means of eliminating the disease. Even in St. Andrews, where the incidence of typhoid was low, it was the provision of an adequate water supply rather than a comprehensive system of sewerage which produced what was for that burgh a substantial reduction in outbreaks of the disease. Whilst a sewerage scheme for the burgh was completed in 1894, St. Andrews did not acquire an adequate water supply until 1911. [78] The reports of the burgh Medical Officer of Health show that during the eighteen years between 1894 and 1911 there were thirty cases of typhoid in St. Andrews, half of which occurred in two outbreaks in 1902 (11 cases) and 1907 (5).

[79] Two cases in 1896 were due to a "faulty connection of a house drain with [a] main sewer". In other cases, including the outbreak of 1907, typhoid was imported from such places as Dundee, Glasgow, Callender and Peterhead, which indicates that the role of St. Andrews as a tourist resort was a factor in the incidence of typhoid in the burgh. [80] However, in the decade after it completed a water scheme only five cases of typhoid occurred in St. Andrews, in comparison to the previous decade, when there were 21 cases of the disease. [81]

In comparison to scarlet fever or tuberculosis, sources of infection in cases of typhoid were relatively easy to trace. However, as the Kirkcaldy burgh Medical Officer, Dr. Hay, wrote in 1939, because of the multiplicity of factors which could affect the incidence of typhoid:

> "it is not always possible to prove conclusively the source of... infections, and the investigator's deductions in this respect may be taken as those which appeared most likely from a mass of circumstantial evidence." [82]

Sometimes the cause of outbreaks of typhoid remained unknown. In a minor outbreak in Dunfermline District in 1894 the County Medical Officer, Dr. Nasmyth, was unable to identify a specific source of infection against which to take preventive action. [83] Sometimes attempts to locate sources of infection led to quarrels amongst public health officials and local authorities. In 1904 St. Andrews District Committee disputed the attribution by the MOH for Pittenweem, Dr. Flaxman, of a landward milk supply as the cause of a typhoid epidemic in Pittenweem. [84] The dairy in question, which was situated at Ovenstone Farm, was inspected by Dr. Nasmyth and Mr. Young, a veterinary surgeon employed by St. Andrews District Committee. [85] They made a favourable report on the dairy and

the District Committee resolved to take no action to prevent milk produced there from being supplied to the public. [86] The burgh council of Pittenweem went so far as to appeal against this decision in the Fife Sheriff Court, but the case involved no legal issue and was dismissed. [87] Evidence from a whole group of experts, including Dr. Nasmyth and Mr. Young, Charles Hunter Stewart, the professor of public health at Edinburgh University, Dr. Dittmar of the Local Government Board and Dr. Templeman, MOH for Dundee, indicated that insanitary conditions in Pittenweem were the most likely cause of typhoid in that burgh. [88] Here the improvement of water supplies, which had occurred in the 1880s, was alone insufficient to eliminate the threat of typhoid.

Between the 1870s and the 1900s mortality from typhoid in the divisions of Fife was highest in the rural districts of the county. The main feature of the curve for mortality from typhoid in the rural districts is the peak which occurs during the late 1870s and which is followed by a sharp drop in mortality during the 1880s. (Figure 5.2) The curve for typhoid mortality in the rural districts then follows the pattern of mortality in the urban divisions, but at average decadal rates 44% above the latter, until the late 1900s, when for the first time since the 1870s an urban division suffered the highest typhoid mortality in the county. The high mortality from typhoid in the rural division of Fife was largely an effect of the development of the coalfield and poor sanitary conditions in the mining villages there. Such conditions were encountered by Dr. Nasmyth during his career as a general practitioner and Medical Officer in the parish of Beath. [89] He related the incidence of typhoid in Beath to the poor siting of housing,

overcrowding in two-roomed houses in miners' rows, the destruction of drainage by subsidence and the use of sewage-polluted streams as sources of drinking water. The poor sanitary conditions and the high incidence of typhoid during the 1870s in the mining village of Kingseat in Dunfermline parish have already been described.

However, between 1876-80 and 1891-95 mortality from typhoid in the rural districts of Fife fell by 73% to 1.9 deaths per 10 000 inhabitants. This was largely the result of the work of the parochial boards in Fife in improving water supplies to the landward mining districts. By 1891 an estimated 27% of the landward population of Fife, including 57% of the population in Dunfermline District and 22% of that in Kirkcaldy District, received adequate water supplies. (Table 3.2.1) In the parishes of Beath and Wemyss the parochial boards carried out water schemes, including the formation of reservoirs. However, during the 1890s and the early 1900s the quality of water supplies to the landward mining districts of west Fife probably deteriorated. [90] During this period the spread of typhoid in the landward area was controlled by the removal of an increasing proportion of cases of the disease to hospital. In Dunfermline and Kirkcaldy Districts the proportion of cases of typhoid who were hospitalized increased from 26% in 1892-95 to 83% in 1906-10. (Table 5.B.4) However, as Figure 4.4 shows, increasing hospitalization had no effect on typhoid case-mortality.

The last epidemic of typhoid in the landward area of Fife occurred in 1903 in the mining parish of Ballingry. [91] Here, in what was in effect two simultaneous epidemics, a total of 146 cases and fifteen deaths

occurred. The places worst affected were Lochore village (88 cases) and the Mary Pit Row (25). The disease was transmitted by contaminated water supplies. The example of this epidemic illustrates the primitive condition of the water supplies which still served some mining communities in Fife and how easily typhoid could spread there. The supply to the Mary Pit came overground from a nearby spring and was polluted by ashpit drainings from cottages ¼ mile to the north, where a separate case of typhoid had occurred. The supply to Lochore flowed in an open ditch through woods and fields but near the village was collected in a tank and passed through a filter into a pipe. However, before reaching the village the pipe also fed some cattle troughs. Dr. Nasmyth, as County Medical Officer, found that the water supply to Lochore village had been contaminated by boys suffering from mild typhoid who defecated into the cattle troughs, from which there was some feedback into the main pipe. [92] The outbreak in the Ballingry epidemic which occurred in Lochore, Nasmyth wrote, "dwarfed anything I have ever had the unfortunate experience of being connected with." [93]

Adequate water supplies were carried to all parts of the landward area of Fife from water schemes utilising sources in the Ochil Hills in Perthshire. [94] Supplies from these sources were piped to most parts of Dunfermline District by c.1910 and to Kirkcaldy District during the 1920s. However, piped water supplies from the Ochil Hills were not received in any part of the landward area of east Fife until the 1930s and were not piped to most parts of that area until the 1950s. During the First World War and the early 1920s, whilst the new water schemes for the western County Districts were still under development, mortality

from typhoid in the rural division of the county remained somewhat above that in the urban divisions, but from the mid 1920s, in the rural districts as in the urban divisions of Fife, typhoid caused only sporadic and insignificant mortality. (Figure 5.2)

By the 1900s medical intervention was seen as an important means of achieving further reductions in typhoid mortality. The experience of the Ballingry epidemic of 1903, in which infection was spread by undiagnosed mild cases of typhoid, led Dr. Nasmyth to call on general practitioners in Fife to make more use in diagnosis of the Widal agglutination test, which was developed during the 1890s. "An outbreak of typhoid might be prevented by the discovery of an ill-defined typhoid case by this test...", he wrote. [95] The importance of the early isolation of cases had been shown during the 1890s in the epidemics in Dunfermline and Kirkcaldy, in which the lack of adequate hospital accommodation in Kirkcaldy was a crucial factor in the spread of typhoid in that burgh. A new infectious diseases hospital for Kirkcaldy was opened in 1899 and during the period 1903-12 a total of 88% of the 107 cases of typhoid which occurred in the burgh were removed to hospital. [96] During 1910-11 typhoid patients in Kirkcaldy who were removed to hospital remained there for an average of 37 days. [97] If a typhoid patient was removed to hospital in good time, it was unlikely that he would die, but some cases of the disease still eluded the medical authorities until it was too late. A fatal case which occurred in Kirkcaldy in 1910 "had been suffering for nearly 3 weeks before coming to Hospital, had had severe attacks of haemorrhage, and was extremely ill on admission." [98]

The medical treatment of typhoid in Fife remained largely unchanged from the 1880s, when Dr. Nasmyth described the methods which he used as a general practitioner in Beath. [99] Where possible, he isolated each patient in a well-ventilated room, which contained separate beds for day and night use. Rest and feeding with milk were prescribed in a treatment similar to that which he used for patients suffering from stomach ulcers. In typhoid patients any departure from this regime usually led to relapse. However, the diet could be varied by adding to the milk either lime water, potash or soda. Nasmyth had also found that the patients appreciated the addition of ice to the milk, and to cases with little diarrhoea he fed beef tea. Medicinal treatment was "of second-rate importance to the dietary", but Nasmyth used quinine and salicylic acid to control temperature and in cases where ulceration was slow to heal he had given turpentine, although, he admitted, without success. However, he claimed to "have been fortunate in not losing two per cent" of the typhoid cases which he treated, "and many were of a very severe type." By the standards of the period this case mortality was extremely low. [100]

More than half a century after Nasmyth's description of his typhoid treatment the superintendent of the County infectious diseases hospital at Thornton reported that there had been "no significant change in the methods of [treating typhoid], except that it is not considered necessary now to restrict the diets so rigorously as formerly." [101] Cases of typhoid required a long stay in hospital and skilful nursing during the acute stage of the disease. However, little further treatment was possible, for typhoid was uninfluenced by sulphonamides or

penicillin, and chloramphenicol, an antibiotic which was effective against the disease, was not yet available. Vaccination against typhoid, which was first used successfully in the protection of British troops during the First World War, was rarely used in Fife. [102] By the time a vaccine became available, typhoid in Fife had been controlled by other means and the need for an immunisation campaign against the disease was largely obviated. In 1937 family contacts of a fatal case of typhoid in Dunfermline were vaccinated with Felix TAB serum. [103]

During the late 1920s death rates from typhoid in all three divisions of Fife fell below 0.1 deaths per 10 000 inhabitants. By 1939 it was possible for the Medical Officer for Kirkcaldy, Dr. Hay, to write that typhoid had been "infrequently met with by the majority of young practitioners." [104] However, two cases which had recently occurred in Fife showed how occasionally the disease could still expose remaining sanitary defects, thwart medical services and claim lives. In Kirkcaldy a boy aged eight died of typhoid after eating raw cockles gathered from the burgh's foreshore, which was well known to be heavily polluted with sewage. [105] Meanwhile in Dunfermline a man had returned home after serving in the Spanish Civil War:

> "He stated that he had suffered from diarrhoea since the day he left Spain, but was receiving treatment from his doctor. He looked ill...and was immediately removed to hospital, where he soon presented a textbook description of typhoid fever. Death ensued..." [106]

In Fife, as in most of Britain, mortality from typhoid was reduced mainly by the improvement of water supplies. The provision of underground drainage and efficient scavenging also contributed to the decline in typhoid mortality but was of secondary importance to the

development of abundant water supplies which were collected on unpolluted gathering grounds and conveyed to consumers directly and enclosed in pipes. However, in a few places, such as Pittenweem, where drainage and scavenging were neglected, the improvement of water supplies did not eliminate the threat of typhoid. The large burghs and most of the small burghs of Fife were adequately supplied with water by or during the 1880s and experienced a corresponding fall in typhoid mortality. This was contemporaneous with similar developments in other urban areas of Scotland, in England and Wales and also in urban areas of France. [107] Up to the late 1900s mortality from typhoid in the rural division of Fife declined more slowly. Although it is impossible to separate typhoid mortality rates in the mining and the agricultural districts of the rural division during this period, it seems clear enough from the qualitative evidence that the relatively high level of mortality in that division of Fife was the product of conditions in the landward mining districts of west Fife. From the turn of the century improvements in dairy sanitation contributed to the reduction of milk-borne typhoid but pasteurised milk only became widely available in Fife during the 1930s, by which time typhoid was all but eradicated in the county.

Although Dr. Nasmyth claimed a very low case-mortality for his treatment of typhoid, probably the most important contribution of medical intervention to the control of the disease was the removal of patients to hospital. Luckin notes that by the 1890s hospital treatment was important in the control of typhoid in London and that 30% of metropolitan cases of typhoid were hospitalized. [108] From the 1890s

increasing numbers of typhoid cases were removed to the new infectious diseases hospitals in Fife. Between 1892-95 and 1911-14, for example, the proportion of cases of typhoid in the Fife County area who were removed to hospital increased from 13% to 78%. (Table 5.B.4) The value of infectious diseases hospitals in the control of typhoid was shown in the contrasting consequences of outbreaks of the disease in the burghs of Dunfermline and Kirkcaldy during 1895-96. However, the increasing hospitalization of cases of typhoid appears to have had no effect on case mortality in the disease. Diagnosis of typhoid may have improved following Nasmyth's appeal for greater use of the Widal test, although there is no proof of this, but during the period no chemotherapy for typhoid was available and in Fife the use of typhoid vaccine was negligible. Thus, the control of typhoid in Fife was an achievement of the prevention rather than the cure of disease, and in this the main factor was the provision of adequate water supplies. However, there remains the question, which cannot be answered here, of how far public health officials were directly involved in the improvement of water supplies in Fife during the late nineteenth century and thus to what extent the control of typhoid in the county was actually an achievement of the local public-health administration.

Chapter 5. Typhus and typhoid in Fife. Notes

1. See, for example, RGS 1864

2. Bill Luckin, "Evaluating the sanitary revolution: typhus and typhoid in London 1851-1900", in Robert Woods and John Woodward (eds.), Urban Disease and Mortality in Nineteenth-Century England (London 1984) 104

3. OCM 1227

4. OCM 155, 680

5. Richard Harrison Shryock, The Development of Modern Medicine (Wisconsin 1979 edn.) 171

6. Margaret Pelling, Cholera, Fever and English Medicine 1825-1865 (Oxford 1978) 93-94, 94 n. 1

7. George Rosen, "Disease, Debility and Death", in H.J. Dyos and Michael Wolff (eds.), The Victorian City. Images and Realities (London 1973) 631, 633

8. Shryock op. cit. 286, 319

9. Rosen op. cit. 632

10. Charles Murchison, A Treatise on Continued Fevers in Great Britain (third edn. London 1884) 682; Luckin op. cit. 105

11. Adam Patrick, The Enteric Fevers 1800-1920 (Edinburgh 1955) 34-36

12. Charles Creighton, A History of Epidemics in Britain (Cambridge 1894) II 210

13. ibid. 209, 216

14. Flinn SPH 411

15. John D. Post, "Famine, Mortality, and Epidemic Disease in the Process of Modernization" Economic History Review 29 (1976) 30-31

16. T. McKeown and R.G. Record, "Reasons for the Decline of Mortality in England and Wales during the Nineteenth Century", in M.W. Flinn and T.C. Smout (eds.), Essays in Social History (Oxford 1974) 242

17. For the decline of typhus in Glasgow as an indicator of improved living standards and resistance to infection, see David Hamilton, "The nineteenth-century surgical revolution - antisepsis or better nutrition?" Bulletin of the History of Medicine 56 (1982) 39

18. Creighton op. cit. 215, quoted in Rosen op. cit. 634

19. Anthony S. Wohl, Endangered Lives. Public Health in Victorian Britain (London 1984) 126-27

20. ibid. 126

21. Luckin op. cit. 111-16

22. ibid. 113

23. ibid. Table 5.2

24. Wohl notes the persistence of typhus in four of these cities, but although he refers to an earlier paper by Luckin ("Typhus and typhoid in London, 1851-1900", unpublished paper read at the annual conference of the Urban History Group, Cambridge University 1976) he makes no mention of the latter's theories regarding Irish immigration in relation to the spread of typhus.

25. Luckin op. cit. 115

26. ibid. 116

27. Dunfermline PC minutes 1864-76

28. Kirkcaldy PC minutes 1880-92

29. Dysart PB minutes 1870-74

30. ibid. 1871-72

31. Cupar PC minutes 1878-83

32. St.Andrews PC minutes 1864-70

33. See p. 88 above.

34. Lochgelly PC minutes 26 September 1882, 1885, 1891; Beath LA minutes 12 November 1886, 7 September 1888; Wemyss LA minutes 3 February 1887, 8 August 1889

35. 1898 AR 58

36. See Table 3.2.1 above.

37. See p. 42-48 above.

38. See Table 3.3.2 above.

39. Flinn SPH 396

40. Flinn SPH 455; Archibald L. Goodall, "Glasgow's place in the distinction of typhoid and typhus fevers" Bulletin of the History of Medicine 28 (1954) 142

41. Thomas Ferguson, The Dawn of Scottish Welfare (Edinburgh 1948) 121

42. Flinn SPH 457, 467

43. ibid. 457. Ferguson noted an outbreak of typhus in Midlothian which occurred at the late date of 1897 and in which the infection was brought from Ireland. (Thomas Ferguson, Scottish Social Welfare 1864-1914 (Edinburgh 1958) 387)

44. Ferguson, Dawn of Scottish Welfare 119; Hamilton op. cit. 35 n. 18

45. Creighton op. cit. 209; Lobban SPH 474

46. Ferguson, Scottish Social Welfare 386-87

47. OCM 1402

48. Hans Zinsser, Rats, Lice and History (Boston 1935) 235

49. G.F.A. Best, "Another Part of the Island. Some Scottish Perspectives", in H.J. Dyos and Michael Wolff (eds.), The Victorian City. Images and Realities (paperback edn. London 1978) 399

50. Luckin op. cit. 118

51. Kirkcaldy PC minutes 5 October 1877

52. St.Andrews PC minutes 18 April 1882

53. RGS 1918

54. Luckin op. cit. 107; Neville M. Goodman, "Enteric Fevers in Great Britain. Recent Outbreaks and their Lessons" Lancet 1933 II 771 (Figure 1)

55. ibid. 116-18

56. Goodman op. cit. 769

57. The development of water supplies and drainage in Fife is described in chapter 3 above. Here reference will be made only to developments in sanitation where they relate directly to the incidence of typhoid in Fife.

58. Dunfermline PC minutes 19 February 1880

59. ibid. 8 May 1893

60. RGS 1878

61. Dunfermline PC minutes 24 April 1876

62. ibid. 5 June 1884

63. Dunfermline PC minutes 12 September 1887

64. A similar effect occurs in mortality rates from diarrhoeal diseases and pulmonary tuberculosis in Dunfermline large town district during the 1880s. See Figures 6.3 and 11.4 below.

65. Luckin op. cit. 117

66. G.S. Parkinson, A Synopsis of Hygiene (ninth edn. London 1947) 121

67. 1895 AR 53

68. 1894 AR 46

69. Scottish Record Office HH58/7 Report by Dr. Littlejohn on the typhoid epidemic in Kirkcaldy (9 December 1896)

70. 1895 AR 53; 1896 AR 46-48; D MOH 1896 AR; Dr. Littlejohn's report op. cit.

71. See 91-92 above.

72. 1899 AR 60-63

73. See p. 90-91 above.

74. Kirkcaldy TC Health Committee minutes 4 April 1918

75. D MOH 1910 AR

76. K MOH 1911 AR 21

77. See p. 88-89 above.

78. See p. 89 above.

79. St. Andrews burgh MOH annual reports 1894-1911

80. ibid. 1897, 1907, 1908

81. ibid. 1912-21

82. James R.W. Hay, "Sporadic Infections due to B. Typhosus" British Medical Journal 1939 I 211

83. 1894 AR 47-48

84. 1904 AR 93-108

85. St. Andrews District Committee minutes 3 October 1904

86. 1904 AR 94

87. ibid. 94-98

88. 1904 AR 95-96, 99; St. Andrews District Committee minutes 12 June 1905

89. Thomas Goodall Nasmyth, "Notes on an Outbreak of Enteric Fever" Edinburgh Medical Journal (1880) 499-504

90. See p. 85-86 above.

91. 1903 AR 84-94

92. 1903 AR 85-89, 94

93. 1903 AR 86

94. See p. 87 above.

95. 1903 AR 18. The diagnostic agglutination test for typhoid was developed by the bacteriologists Gruber, Grünbaum and Widal in 1896. This test was based on the discovery by the French bacteriologist Widal that "the blood serum of a patient with typhoid fever caused a culture of typhoid bacilli to lose their motility and to agglutinate - to clump together." (Stanley Joel Reiser, Medicine and the Reign of Technology (Cambridge 1978) 136)

96. Kirkcaldy burgh MOH annual reports 1903-12

97. K MOH 1911 AR 64

98. K MOH 1910 AR 18

99. Nasmyth, "Outbreak of Enteric Fever" op. cit. 504

100. Jan R. McTavish, "Antipyretic Treatment and Typhoid Fever: 1860-1900" Journal of the History of Medicine and Allied Sciences 42.4 (October 1987) 491-92; see also Figure 5.4

101. 1939-45 R 119 Final report by Dr. Fleming, medical superintendent of the Thornton Infectious Diseases Hospital

102. Parkinson op. cit. 120; OCM 1478

103. D MOH 1937 AR 24

104. Hay op. cit. 211

105. ibid. 211

106. ibid. 211-12

107. Flinn SPH Table 5.6.6; Goodman op. cit. 769; Jean-Pierre Goubert, "Public hygiene and mortality decline in France in the 19th century", in Tommy Bengtsson, Gunnar Fridlizius and Rolf Ohlsson (eds.), Pre-Industrial Change, The Mortality Decline and Short-Term Population Movements (Stockholm 1984) 158

108. Luckin op. cit. 117

CHAPTER 6

DIARRHOEAL DISEASES IN FIFE

1. The classification and aetiology of diarrhoeal diseases

During the late nineteenth century the development of public concern over the increasing rate of infant mortality in Britain drew attention to the problem of mortality from diarrhoeal diseases. [1] Mortality from diarrhoeal diseases occurred primarily amongst infants and was a major cause of death in that age group. For example, in 1891-1900 a total of 83.7% of all deaths in Scotland from diarrhoea and dysentery, mortality from which diseases was undifferentiated at this time, occurred in infants. [2] In 1906-15, by which time diarrhoeal disease mortality in Scotland had fallen by over 36% from its level during the 1890s, diarrhoea and enteritis still caused 11.5% of all infant mortality there, or 1 616 infant deaths per annum. [3] A feature of the epidemiology of diarrhoeal diseases was their high incidence during summer months, when they might cause as much as 75% of all infant mortality. [4] In fact, infant mortality rates from diarrhoeal diseases were probably understated. A common cause of death in such cases was convulsions, which were themselves frequently given as a primary cause of infant death. [5] However, at this time diarrhoeal diseases were poorly defined and their aetiology was not fully understood.

Mortality from diarrhoeal diseases includes all deaths which were recorded in the annual reports of the Registrar-General for Scotland (RGS) as due to a group of causes, of which the most commonly diagnosed were diarrhoea and enteritis. The identification of this mortality by the composite term of diarrhoeal diseases is necessary because during the period the individual causes of death in this category were ill-defined in diagnostic terms and their classification by the RGS was subject to a number of changes. Today the main terms formerly used in the diagnosis of diarrhoeal diseases refer only to symptoms. Diarrhoea is "an abnormal increase in the frequency and/or the liquidity of the stools" and enteritis is "a non-specific term embracing any condition involving inflammation or irritation of part of the intestine." [6] Nevertheless, the category of diarrhoeal diseases has been retained in the classification of diseases to the present day. [7]

The definition of diarrhoeal diseases as diagnosed in the late nineteenth and early twentieth centuries was a problem for both contemporary investigators and recent historians. In 1899 the Royal College of Physicians appointed a committee to advise on the classification of deaths from diarrhoeal diseases. [8] The committee recommended the abolition of such terms as "gastro-enteritis", "muco-enteritis" and "gastric catarrh" and the use instead of a common term, "epidemic enteritis". Up to 1900 the reports of the RGS included a category of diarrhoeal diseases, which included simple cholera and diarrhoea and dysentery and in which mortality from the latter two diseases was undifferentiated. Deaths from enteritis were recorded in the category of digestive diseases. In 1901 the category of diarrhoeal

diseases was abolished and mortality from such diseases was recorded in the category of general diseases, which now included deaths from epidemic diarrhoea, infective enteritis, diarrhoea (not otherwise defined) and dysentery. The diseases of the digestive system now included enteritis (not infective) and gastro-enteritis. [9] At the turn of the century the classification of diarrhoeal diseases in Scotland remained confused and confusing.

As Luckin writes, the clear definition of diarrhoeal diseases is "relevant both to the quantitive parameters of the disease [and] notions of the dominant mode of spread." [10] However, such a definition is not easily achieved. In his study of causes of death in Scotland, Flinn admitted, with reference to the category of diarrhoeal diseases, that "on account of the complexities of the registration of poorly diagnosed and closely related diseases, this group may not in the end be consistent throughout the period covered." [11] In this study the definition of diarrhoeal diseases is that adopted by the RGS in 1911. [12] It includes all mortality from diarrhoea and enteritis, in persons of all ages. Mortality from dysentery is included but that due to gastritis is excluded.

At the turn of the century, problems of the classification of mortality from diarrhoeal diseases reflected a limited scientific understanding of how these diseases were spread. The complexity of the aetiology of diarrhoeal diseases was discovered and elucidated in research carried out between the 1860s and *c.*1910. This research was divided between epidemiological and bacteriological studies, of which the former were

more effective in proposing means for the control of diarrhoeal diseases. Up to 1945 the attempts of bacteriologists to identify a single causative organism of diarrhoea were inconclusive. [13] For the purpose of describing the mechanism of the spread of diarrhoeal diseases and showing when effective knowledge of that mechanism finally became available to public health authorities, an outline is given of the epidemiological research into diarrhoeal diseases which was carried out in Britain during the period.

Early studies by Budd, Ord, Snow and Greenhow cast doubt on miasmatic explanations of the incidence of diarrhoea. [14] In his study of 1860 Greenhow identified diarrhoea as a disease of infancy and childhood, and both he and Budd (1873) emphasised the "importance of the faecal-oral route as a mode of spread." [15] They considered that diarrhoea was transmitted in contaminated water, but Greenhow believed that it could also be spread through the air. [16] By 1866 Sir John Simon was able to claim that the provision of adequate water supplies and sewerage would lead to a reduction in mortality from both typhoid and diarrhoea, but in 1889 Edward Ballard argued that, unlike cholera and typhoid, diarrhoea was not primarily a water-borne disease. [17]

Ballard emphasised the relationship between the incidence of diarrhoea and ground conditions, including soil temperatures. [18] He observed that mortality from diarrhoea was likely to be higher in habitations where the underlying and surrounding ground was loose soil than in those which stood on solid rock. His theory of the transmission of diarrhoea was a mixture of germ theory and miasmatism. He advised that in order to

prevent diarrhoea the foundations of houses should be secured against "telluric emanations" and that milk should be protected from contamination, both in dairies and the home. [19] Early research by Arthur Newsholme also stressed the relationship of the incidence of diarrhoea to soil and atmospheric conditions. [20] The environment which bred such infection was soil contaminated with faeces. Infected milk spread diarrhoeal infection and was most often contaminated in the home. Sheridan Delépine agreed that faecal pollution of cow's milk was a main cause of diarrhoea but thought that the milk was usually contaminated at the dairy or in transit and before it reached the home. He believed that the main source of infection was cow dung. [21] Nevertheless, by 1900 it was generally agreed that diarrhoea was spread along the faecal-oral route of infection and that the principal mode of transmission was infected food, especially milk.

The precise nature of the causative organism in diarrhoea remained unknown but at about this time the missing link in the chain of infection was identified. In Britain, studies during the 1900s by Nuttall, Niven, Newsholme and Nash revealed that pathogenic bacteria were transmitted from ashpits and dungheaps to food and milk in the course of the breeding and feeding activities of *Musca domestica*, the common house-fly. [22] In feeding on faeces, flies would pick up bacteria, which were ingested or adhered to their bodies. [23] In alighting and feeding on human food, the flies would deposit the bacteria, particularly in the process of vomiting up enzymes, by which they liquefy food prior to consumption. Flies lay their eggs in organic matter, including dung and human excrement. During warm weather the

breeding cycle of the fly, which normally spans 22-25 days, is shortened to as little as 8-11 days. The fertility of the fly and the danger of its infection of human food are thus proportionately increased and this was why mortality rates from diarrhoeal diseases were commonly highest during summer months and higher in hot summers than in cold.

Other factors in the incidence of diarrhoeal diseases were also studied. Diarrhoea mortality rates in back-to-back houses and houses with through ventilation were compared, but a study published in 1910 by Darra Mair, which concentrated on ventilation and lighting of working-class housing, found no direct relationship between housing conditions and the incidence of diarrhoeal disease. [24] However, the home was seen as the locus of the most effective control of diarrhoeal infection. In a study conducted in 1903-05 Newsholme found that children who were fed on condensed milk suffered greater mortality from diarrhoea than did those fed on fresh cow's milk. At the time this confirmed his belief that most diarrhoeal infection occurred in the home, but the results were nevertheless difficult to explain, for condensed milk was known to be more hygienic than untreated cow's milk. However, once the fly vector of diarrhoea was known, it was realised that, because it was sweetened, condensed milk was more attractive to flies and therefore more likely than cow's milk to become infected in the home. [25] Finally, research by Peters, which was also published in 1910, showed that whilst almost all the mortality from diarrhoeal diseases occurred amongst infants, at any time up to 10% of the population might suffer attacks of these diseases, "with a hundred times as many cases as fatalities." [26]

By 1910 the main features of the transmission of diarrhoeal diseases were known. Diarrhoeal diseases were mainly spread by contaminated food and milk, most commonly infected by flies, which thrived in areas where sanitation was defective. The structural condition of housing was not a factor in the spread of diarrhoeal diseases but the home was the main locus of infection. Diarrhoeal diseases affected all age groups but killed mostly infants. How this knowledge was put to use in reducing mortality from diarrhoeal diseases in Fife is described below.

2. The incidence of mortality from diarrhoeal diseases in Fife 1855-1950

The pattern of mortality from diarrhoeal diseases in Fife showed sharp fluctuations but no permanent fall during the second half of the nineteenth century. (Figure 6.1) Then, from a high level which remained almost constant during the 1890s, the death rate from diarrhoeal diseases (DDDR) in Fife went into a steep decline which continued until the 1920s, when mortality rates began to increase again. This pattern of diarrhoeal disease mortality followed that for Scotland as a whole during the period but remained below the Scottish average at almost consistent levels of *c.*30% less during 1861-1900 and *c.*45% less during 1901-50. (Table 6.2.1)

Table 6.2.1 Mortality from diarrhoeal diseases in Scotland and Fife 1861-1950

Death rate (DR): deaths from specified cause per 100 000 inhabitants

	Scotland		Fife		: Fife DR as
	DR	% change	DR	% change	: % Sc. DR
1861-70	95.0		57.8		: 60.8
1871-80	90.5	-4.7	65.8	13.8	: 72.7
1881-90	72.0	-20.4	53.1	-19.3	: 73.8
1891-1900	84.0	16.7	60.6	14.1	: 72.1
1901-10	64.5	-23.2	36.6	-39.6	: 56.7
1911-20	45.5	-29.5	23.7	-35.3	: 52.1
1921-30	24.0	-47.3	11.1	-53.2	: 46.3
1931-40	20.5	-14.6	11.6	4.5	: 56.6
1941-50	19.0	-7.3	12.4	6.9	: 65.3
% change					
1861-1900		-11.6		4.8	
1901-1950		-70.5		-66.1	

Source: see Tables 1.B.1 and 1.C.1

Mortality from diarrhoeal diseases in the divisions of Fife showed contrasting patterns during the second half of the nineteenth and the first half of the twentieth centuries. (Figure 6.2 and Table 6.2.2) Up to the 1900s there were considerable differences in DDDR levels between the three divisions of the county. During the 1870s and 1880s decadal DDDR's in the large town districts and the rural districts were similar and an average of 75% above DDDR's in the small town districts. It is noticeable that although the 1890s were a period of increased mortality from diarrhoeal diseases in Scotland as a whole, in Fife it was only in the small town districts of the county that a similar increase occurred. However, DDDR's in the rural districts of Fife were above the average rate for Scotland as a whole during the 1880s and decreased very little during the 1890s. In the large town districts of Fife there was a decadal decrease in DDDR's of 11% during the 1890s. However, between the

quinquennia 1891-95 and 1896-1900 DDDR's in the large town districts also increased. The trough in mortality from diarrhoeal diseases between the late 1870s and the 1890s in both Fife and Scotland as a whole may be an effect of a period of cool summers, when the multiplication of *Musca domestica* would have been less. However, this is only a conjecture.

Table 6.2.2 Mortality from diarrhoeal diseases in the divisions of Fife 1861-1950

Death rate (DR): deaths from specified cause per 10 000 inhabitants

	LTD's		STD's		RD's		range
	DR	% change	DR	% change	DR	% change	DR's
1861-70	7.3		n.a.		n.a.		
1871-80	8.5	*16.4*	4.9		8.5		*3.6*
1881-90	6.5	*-23.5*	3.9	*-20.4*	7.3	*-14.1*	3.4
1891-1900	5.8	*-10.8*	5.8	*48.7*	7.1	*-2.7*	1.3
1901-10	3.7	*-36.2*	3.8	*-34.5*	3.3	*-53.5*	0.5
1911-20	1.7	*-54.1*	2.3	*-39.5*	2.9	*-12.1*	1.2
1921-30	0.8	*-52.9*	0.9	*-60.9*	1.5	*-48.3*	0.7
1931-40	1.0	*25.0*	1.2	*33.3*	1.2	*-20.0*	0.2
1941-50	1.2	*20.0*	1.2	-	1.3	*8.3*	0.1

Source: see Table 6.A.1

The increase in DDDR's in the small town districts between the 1880s and the 1890s was the only such increase to occur in any division of Fife during the period 1881-1930. It was probably related to accelerating population growth in the Fife mining districts, including the Beath and Wemyss registration districts, which were transferred from the rural to the small-town division in 1881. The effect of this transfer on mortality rates is similar to that seen in the curves for DDDR's in Dunfermline and Kirkcaldy, where between the quinquennia 1876-80 and 1886-90 mortality rates in Dunfermline declined more slowly than in Kirkcaldy. (Figure 6.3) From 1878 deaths in the landward and burghal

parts of Dunfermline registration district were no longer separated in the reports of the RGS, with the result that in Dunfermline LTD mortality rates from certain causes, including typhoid and diarrhoeal diseases, were inflated by the inclusion of mortality in the landward mining villages of Dunfermline registration district, where, in comparison to Dunfermline burgh, sanitary conditions were inferior. [27]

Finally, the peak DDDR of 11.3 deaths per 10 000 inhabitants which occurred in Kirkcaldy during 1871-75, and which was the highest DDDR to be recorded anywhere in Fife during the period, may have been the result of a combination of defective sanitation and high summer temperatures. (Figure 6.3) Peak mortality from diarrhoeal diseases in Dunfermline also occurred during this quinquennium but at a rate 22% below that in Kirkcaldy. At this time death rates from typhoid in Kirkcaldy were also high. (Figure 5.3) During 1866-75 typhoid mortality in Kirkcaldy averaged 6.0 deaths per 10 000 inhabitants, which was over 40% above the average in Dunfermline and 38% above that for all Fife. However, by the early 1890s levels of typhoid mortality in both LTD's had fallen to low levels which were not achieved for diarrhoeal disease mortality until after the First World War.

In the late 1890s there began a sharp decline in mortality from diarrhoeal diseases in all the divisions of Fife which continued until the late 1920s. This fall was briefly reversed in the small town districts during 1901-05 and in the rural districts during 1911-15. The latter increase may have been an effect of the enlargement in 1911 of the group of diarrhoeal diseases in the reports of the RGS by the

addition of a number of diseases to the category of enteritis. Alternatively, it may have been a consequence of the hot summer of 1911. [28] Between 1891-1900 and 1921-30 DDDR's decreased by over 84% in the urban districts and by 80% in the rural districts. However, during 1921-30 the rural DDDR remained over 68% (6.5 deaths per annum) above the average rate in the urban districts, and it was only in the rural districts that any further decline was achieved in DDDR's up to 1950. By that time DDDR's were at a similar low level in all divisions of the county. Despite the fact that these rates were somewhat greater than those achieved in the urban districts during the 1920s, which was a period of population decline in Fife, it was apparent that existing measures for the control of mortality from diarrhoeal diseases had achieved maximum effectiveness. The nature of these measures is described below.

3. The reduction of mortality from diarrhoeal diseases in Fife

By 1910 epidemiological research in Britain had elucidated the aetiology of diarrhoeal diseases and suggested means by which these diseases could be controlled. This knowledge was quickly assimilated by public health authorities in Fife. In the reports of the County Medical Officer for Fife, flies were first identified as transmitters of disease in 1911. [29] Handbills containing a description of the behaviour of flies and details of how to combat them were distributed to the public. [30] Beyond this, the public health authorities in Fife adopted no specific

measures for the control of diarrhoeal diseases, which were not notifiable. In 1919 the County Medical Officer, Dr. Yule, reported that many of the 95 infant deaths due to diarrhoeal diseases which occurred in the County area during 1915-19 were due to parental carelessness or ignorance, but he also noted that the average working-class housing in Fife contained no provision for the hygienic storage of food and milk. [31] By 1926 a considerable decline in DDDR's had occurred in the County area. This Dr. Yule attributed to the increased provision of water closets and ventilated larders in houses and to improvements in infant-feeding methods, which had been brought about by the work of the County health visitors. [32] The effects of these and other factors in the reduction of mortality from diarrhoeal diseases in Fife are considered below.

In the reduction of mortality from diarrhoeal diseases the development of sanitation was important in eliminating the ashpits and middens which were potential sources of bacterial infection and the breeding grounds of flies. Requisite improvements included the replacement of privies and ashpits by water closets and underground drainage and the provision of piped water supplies for flushing the water closets. The development of sanitation in Fife had, of course, been in progress for a number of decades before the insect vector of diarrhoeal disease was positively identified. However, throughout the county this development had proceeded unevenly.

The development of sanitation in Fife has been described above in section 3.2. Here it is sufficient to summarise the main developments

which occurred during the period. The two large burghs in Fife were adequately drained by *c.*1900. By 1902 only a few ashpits remained in Dunfermline, and almost all outside privies in the burgh had been abolished by 1906. By 1907 only *c.*15 "privy boxes" remained in use in Kirkcaldy, and all the ashpits in the burgh had been abolished. [33] It is difficult to determine by which date all the burghs in Fife were adequately drained, but most, if not all, had probably carried out drainage schemes by *c.*1914. In comparison to the burghs, the development of drainage throughout the County area was slow. By 1911 there were eighteen Special Drainage Districts in the County area but they contained only 24.3% of the landward population. By 1931 Special Drainage Districts still incorporated only 56.5% of the landward population. However, by 1951 over 90% of the houses in the landward area were equipped with water closets.

However, as was noted in section 3.2, where the development of drainage and the installation of sanitary fittings was not preceded by the provision of adequate water supplies, water closets could themselves become health hazards. Lack of plentiful water supplies also inhibited the development of personal hygiene, which has been shown to be a factor in the incidence in humans of the bacillus *Shigella*, one of the main causative organisms of diarrhoeal disease. [34] By the mid 1870s Dunfermline and Kirkcaldy had carried out water schemes which with few additions have served those towns to the present day. By 1891 over 77% of the population of the burghs in Fife were adequately supplied with water and by the First World War all the burghs in the county had secured adequate supplies. Water supplies were inadequate in most of

Dunfermline District until *c.*1910 and in Kirkcaldy District until the First World War, when District water schemes utilising sources in the Ochil Hills were carried out. However, in eastern Fife the provision of water supplies remained inadequate until after the Second World War.

Inadequacy of water supplies prevented the development of modern standards of sanitation in the rural areas of Fife, as the deputy County Medical Officer, Dr. Fyfe, wrote in 1933:

> "Children are educated in schools regarding the necessity for habits of cleanliness. They return home to houses where sinks, water-closets and a sufficiency of hot water are unknown. Few realise the discomfort and hardship suffered by rural households through lack of modern water-carriage fitments." [35]

However, from 1935 water supplies from the Ochil Hills were gradually extended to the whole of eastern Fife under the Fife Regional Water Scheme. By 1951 a total of 85.1% of the houses in the landward area had their own piped water supplies, a further 7.4% were served by shared supplies and only 7.5% were without piped water supplies.

Scavenging became less important in the development of hygiene as more places acquired water closets, underground drainage and piped water supplies. However, it seems unlikely that the effects of scavenging ever had much influence in the reduction of mortality from diarrhoeal diseases, for during the second half of the nineteenth century, when water supplies and drainage in Fife were only partially developed and scavenging was the primary means of nuisance removal, there was no permanent decline in mortality from diarrhoeal diseases.

A further prerequisite for the improvement of domestic hygiene was the provision of housing with sufficient accommodation for washing and the

hygienic storage and preparation of food. During the second half of the nineteenth century the most common type of working-class housing in Fife, for miners, urban industrial workers, farm workers and fishermen, was the cottage. [36] The cottages in Fife had evolved from the traditional "but and ben" dwelling and most consisted of only two rooms. Their kitchens were difficult to keep clean, particularly where, as in many places, they were used as sleeping quarters. The practice of using the kitchen as sleeping quarters was common in agricultural and fishing communities as well as amongst miners. [37] Where, as in many mining settlements, coal-houses were lacking, coal and firewood were stored under the kitchen bed, and where there were no wash-houses, clothing and sheets were washed in the kitchen. [38] As Dr. Yule observed, in many old houses there was also little provision for the storage of food. In rural cottages, food was commonly kept in a wall press adjoining the fireplace. [39] In miners' housing of the old type even this accommodation might be lacking.

Further problems regarding the use of kitchens in working-class housing were caused by subletting, which was prevalent in the mining districts and persisted throughout the period. Where, as in Wemyss parish, three-roomed houses were common, the sharing of such houses by two families was tolerable, for, at least in theory, each family could have equal use of the kitchen. [40] However, occupants of the sublet room in two-roomed houses would be denied access to the kitchen facilities when the kitchen occupants settled at night and locked the kitchen door. It was usually young married couples, often with children, who occupied such sublet

rooms. As Dr. Yule, wrote, such an existence caused standards of housekeeping to disintegrate:

> "To young couples, starting life in one room seems to have rather disastrous results on the habits of the young women. Many of them seem to lose all notion of method or orderliness and get into careless, slovenly habits which are not easily eradicated later on." [41]

Where houses were overcrowded, difficult to keep clean and lacking adequate facilities for food storage, washing and waste removal, diarrhoeal infection was likely to be a common complaint not just in infants but in persons of all ages. The reduction in levels of crowding which occurred in all the divisions of Fife during the 1870s and 1880s and then during 1921-51 would have contributed to the reduction in mortality from diarrhoeal diseases. Between 1881 and 1911 levels of crowding in the landward area of Fife increased by over 25% to 1.62 persons per room. (Table 3.3.2) This reversal, which was related to the growth of population on the coalfield, would have been an important factor in the sharp increase in mortality from diarrhoeal diseases which occurred during the 1880s in the rural division of the county. (Figure 6.2) Here high levels of mortality from diarrhoeal diseases persisted until the turn of the century, after which differences in DDDR's between the divisions of Fife were relatively small.

During the interwar period state-aided house-building was widespread in Fife and by 1951 levels of crowding in all the divisions of the county had been reduced to averages of c.1 person per room. There was also an increase in the average size of houses. Between 1921 and 1951 the proportion of the population of Fife which lived in houses of only two

rooms declined by over half to 20.1%. During this period the proportion of the county's population in three-roomed houses increased by a third to 35.5% and that in four-roomed houses doubled to 28.8%. [42] The new local-authority housing in Fife was well-equipped with domestic utilities. The houses which were completed at Rosyth by 1919 each had a kitchen, a scullery with larder, coal-store and boiler, and a water closet. [43] The houses completed at Falkland in 1922 included a range of fittings which facilitated domestic hygiene:

> "A self-fitting boiler, in which water can be heated in a quarter of an hour and with a tap to draw off water, will make washing day a pleasure for Falkland house-wives. Large tubs and sinks, and a fixture for a gas cooker,...are further conveniences; while the roof...is hung with an excellent clothes pulley. Opening off the scullery is a stone cellar, and a spacious shelved pantry [and] a coal-cellar (in the house, yet close to the back door, to prevent coal dust being carried into the house)..." [44]

Not all working-class housing in Fife was as well-equipped as this, but by 1951 only 3% of houses in the county were without kitchen sinks. [45] During the period there was a radical improvement in the standard of working-class housing in Fife, both in the alleviation of overcrowding and in the provision of domestic utilities. The improvement of housing was an important factor in the reduction of mortality from diarrhoeal diseases, and one which seems to have been underrated by historians.

According to Winter, the decline in mortality from diarrhoea and enteritis in Britain during the 1930s can be located "fairly confidently...in advances in purification and refrigeration of food and especially of the milk supply." [46] As was noted above, Délepine, who was the professor of pathology at Owens College, Manchester, believed

that a major cause of infant diarrhoea was contaminated milk, that such milk was most commonly infected at the dairy and that the most common source of milk infection in dairies was cow dung. The contamination of milk could be eliminated by improvements in dairy sanitation and more hygienic methods of milk production.

The development of dairy sanitation in Fife is described in section 3.2. Local authorities in the county could have effected little improvement in dairy sanitation prior to the turn of the century. Thereafter the strict enforcement of byelaws relating to dairy sanitation gradually led to improvements in standards of milk production, particularly in the landward area, where most of the milk consumed in Fife was produced and where the County public health department strictly enforced dairy regulation. However, during the period the local authorities' supervision of milk production remained incomplete, for as late as 1945 there were still *c.*1 500 unregistered small dairies in Fife, which purported to supply milk only to neighbours and employees and thus claimed exemption from regulation under the Milk and Dairies (Scotland) Act. Milk-borne dysentery remained a threat, although not a great danger to life. In 1927, for example, an epidemic of milk-borne Sonne dysentery occurred in St. Andrews. [47] It involved 150 cases but no deaths.

Pasteurisation was the surest means of securing the purity of milk at source. However, it was not until the 1930s that pasteurised milk was widely available in Fife, by which time DDDR's throughout the county had fallen to their lowest level during the period and were increasing again. [48] This fact tends to disprove Winter's suggestion that the

purification of milk was a major factor in the reduction of mortality from diarrhoeal diseases. Furthermore, up to the 1950s milk supplies remained vulnerable to contamination in the home. Few, if any, working-class homes were equipped with refrigerators, and public health officials continued to report instances of the careless storage of milk. [49] In 1935, for example, a sanitary inspector in Dunfermline Area reported:

> "I have seen milk stored in an uncovered flat dish, with the cream on the top dust- and soot-laden, and on the housewife being questioned on how she disposed of the dust on top, she replied that she "skimmed" it off before using the milk." [50]

In the context of an explanation of the decline in mortality from diarrhoeal diseases in Fife, this section has described the role of public health authorities in the development in the county of an infrastructure for hygienic living. From the turn of the century sanitary development was accompanied by health education, which was aimed particularly at teaching methods of hygiene to mothers with infants. It was thought that this would produce great reductions in mortality from diarrhoeal diseases, most of which occurred amongst infants. The careless storage of milk was an example of the neglect against which the infant welfare movement in Britain had campaigned since the late nineteenth century. An early consensus of the infant welfare movement was that the main underlying cause of high rates of infant mortality was maternal ignorance. [51] This was manifested particularly in the careless feeding of infants, which was seen as the chief cause of high infant mortality from diarrhoeal diseases. [52] Early attempts to overcome maternal ignorance of proper methods of child

care, including feeding, involved the dissemination of information in leaflets and public lectures, but following the introduction in 1907 of the Notification of Births Act, local authorities began to appoint health visitors to carry out this work. [53]

Health visiting was seen as a more forceful means of health education, which would seek out the mothers who were unlikely to attend lectures or read leaflets on child care and which would attend to the individual needs of both mothers and infants in their own homes. The first health visitors in Fife were appointed by Dunfermline and Kirkcaldy District Committees and Kirkcaldy town council in 1910. [54] In 1918 the Local Government Board recommended that local authorities should employ one health visitor per 400 births in their areas, but in 1934 the Ministry of Health's recommendation was for one visitor per 250-280 births. [55] The following table shows the developing provision for health visiting in Fife, which by the 1930s was well within these official recommendations.

Table 6.3.1 Health visitors employed by local authorities in Fife c.1910-50

HV; health visitor

	Fife County area			Dunfermline burgh			Kirkcaldy burgh		
	HV's	Births	Births per HV	HV's	Births	Births per HV	HV's	Births	Births per HV
1910	2 [A]	2 401	1 201	n.a.			1	679	679
1919	8	2 458	307	n.a.			3	834	278
1930	21	2 090	100	3	587	196	n.a.		
1950	25	4 022	161	11	738	67	10	896	90

Sources: Fife County Medical Officer's reports 1910, 1915-19, 1930, 1950; Dunfermline burgh Medical Officer's reports 1930, 1950; Kirkcaldy burgh Medical Officer's reports 1910, 1919, 1950

A, Dunfermline and Kirkcaldy Districts only

The main task of the health visitors was to supervise improvement of infant feeding in their districts. They tried to encourage breast feeding, teaching mothers the best methods of doing this and how to care for their breasts. In the mining districts the timing of weaning of children was usually dependent on maternal health. Breast abcesses caused by lack of cleanliness and overfeeding from a single breast often led to the premature cessation of breast feeding. Where weaning occurred too soon it was a major danger to infant health, but sometimes weaning was long delayed. From Dunfermline District it was reported that some infants were weaned at three months due to poor maternal health resulting from poor diet, bad home conditions or too frequent childbearing. [56] However, other mothers in this District would breast feed their children for as long as eighteen months or even two years. [57]

In Kirkcaldy burgh the local authority provided mothers with boat-shaped infant-feeding bottles, with the result that by 1911 the practice of feeding infants from the insanitary rubber-tubed feeding bottles had all but ceased. [58] However, the burgh Medical Officer, Dr. McIntosh, emphasised that breast feeding was best for infants and that infants fed in this way were least likely to suffer from diarrhoea. Long-tubed bottles were still much in use in Dunfermline District in 1912, and also popular there were dummy teats, which were "frequently dipped in a sugary mess to give them a palatable taste; they fall on the floor and collect dust. Flies settle on them and they are never cleaned, except perhaps on a dirty apron." [59] In Kirkcaldy District, infants who were artificially fed usually received cow's milk. The milk was frequently diluted and fortified with an addition of fat: either cream or olive oil, in order to modify it to the composition of human milk. [60] This addition of fat to the milk was beneficial in largely obviating the dosing of infants with purgatives such as castor oil, which may also have caused diarrhoeal disease. [61] In Lochore and Glencraig, infants were often fed on Nestlé's Milk. [62] Newsholme's research had shown that condensed milk was particularly attractive to flies, and its use as infant food was criticised by public health officials. [63] However, it was possible that mothers in the Lochore-Glencraig area chose to use condensed milk because it kept longer than fresh milk and also because the supplies of cow's milk in this area were known sources of typhoid. [64] Here poor methods of infant feeding were the result not of maternal ignorance but of environmental defects which embraced sanitation, housing and the milk supply.

By the mid 1930s the County Medical Officer, Dr. Yule, could claim that "the number of infants entirely breast fed is very much greater than was the case, say, ten years ago". [65] He attributed this improvement to "the talks the nurses give to the nursing mothers, and wherever possible the expectant mothers are also advised [of] their duty [in] the early feeding of the infant." [66] During 1934-37 the proportion of infants throughout the Fife County area who were entirely breast fed was 76%, whilst 20% were artificially fed and the remaining 4% received a mixture of artificial and breast feeding. The following table shows that these rates of breast and artificial feeding were relatively uniform throughout the County area.

Table 6.3.2 Percentage distribution of methods of feeding of infants seen by health visitors in the Fife County area 1934-37

	Breast	Artificial	Mixed	Total infants
Dunfermline Area	75.1	22.0	2.9	1 539
Kirkcaldy Area	76.5	21.3	2.2	1 200
Cowdenbeath-Lochgelly Area	81.1	16.1	2.8	3 443
Wemyss Area	78.5	18.3	3.4	2 364
Western Fife County area	77.8	19.4	2.8	8 546
Cupar Area	77.8	18.1	4.1	1 132
St. Andrews Area	75.8	17.9	6.3	915
Anstruther Area	68.6	26.4	5.0	519
Eastern Fife County area	74.1	20.8	5.1	2 566

Source: Fife County Medical Officer's annual reports 1934-37

The fact that by the mid 1930s the highest proportion of breast fed infants in the Fife County area was to be found in Cowdenbeath-Lochgelly Area, the centre of the Fife coalfield, may be regarded as an achievement of the health visitors, who since the First World War had concentrated in particular upon improving infant-feeding methods here. Some control had also been achieved over the weaning of infants in the mining areas, with the removal of the extremes which had previously characterised this process. By 1933 about half of the infants in western Fife were weaned at 8-9 months, 20% were weaned at 3-6 months and the remainder at under 3 months. [67]

In eastern Fife breast feeding was general throughout the landward area. In Cupar Area infants were normally breast fed until the ninth or tenth month, but it was noted that where mothers worked at milking cows, their infants were bottle fed on cow's milk. [68] Meanwhile, as Table 6.3.2 shows, the part of the County area where levels of breast feeding were lowest was Anstruther Area, where the proportion of infants who were breast fed during 1934-37 was 18% less than in Cowdenbeath-Lochgelly Area. In Anstruther Area breast feeding was only continued for as long as the health visitor was in attendance:

> "The Health Visitor usually finds on her third visit [when the infant was about six weeks old] that the baby is getting two bottle feeds per day - usually on the advice of the granny - the excuse being that "the mother's milk is hungry"." [69]

Where nursing mothers in eastern Fife were engaged in paid employment, in agriculture or such work as fish processing, the exertion which this involved led to an early cessation of lactation and consequent resort to

artificial feeding of infants. However, the relatively low rate of breast feeding in Anstruther Area during the 1930s is unlikely to have had an adverse affect on infant survival rates there. During 1931-40 there were only five deaths due to diarrhoea in Anstruther and Kilrenny and Pittenweem and the average infant-mortality rate in these towns was only 44.5 deaths per 1 000 births, which was 35% below that for Fife as a whole (68.3). [70] If to a certain extent the mothers in these burghs resisted attempts by health visitors to encourage breast feeding of infants, the health visitors could nevertheless claim credit for improved hygiene in the artificial feeding of infants.

Up to the 1940s the most important factor determining the proportion of infants who were breast fed in a particular area was maternal health as determined by the level of employment of nursing mothers in industry or agriculture. Where such employment was low, as in the mining districts, the proportion of infants who were breast fed was relatively high, as in Cowdenbeath-Lochgelly Area during the 1930s. Where the level of female employment was higher, as it probably was during the 1930s in the rural parts of St. Andrews Area and the fishing burghs of Anstruther Area, the proportion of breast fed infants was lower. However, by the 1940s the attitude of some women in Fife to breast feeding was quite different. In 1946 Dr. Elsie Scott, the Medical Officer for Wemyss Area reported that "mothers do not desire to breast feed their infants. [The] main reason for this is that it curtails their pleasure in the evenings. Some of the young women have recently explained that they do not wish to lose their figures." [71] By the 1950s breast feeding in the Fife County area was in decline, as the following table shows:

Table 6.3.3 Percentages of breast fed infants amongst total infants seen at first by health visitors in the Fife County area 1949-53

	% br-fed 1949-53	Total infants 1949-53	% br-fed 1934-37	*% difference 1934-37/1949-53*
Dunfermline Area	55,6	2 804	75,1	*-26,0*
Kirkcaldy Area	68,4	1 895	76,5	*-10,6*
Cowdenbeath-Lochgelly Area	52,3	5 905	81,1	*-35,5*
Wemyss Area	55,1	4 101	78,5	*-29,6*
Western Fife County area	57,9	14 705	77,8	*-25,5*
Cupar Area	68,2	1 757	77,8	*-12,3*
St. Andrews Area	65,7	1 735	75,8	*-13,3*
Anstruther Area	65,9	897	68,6	*-3,9*
Eastern Fife County area	66,6	4 389	74,1	*-9,6*

Source: 1949-53 R 16-17

In 1949-53 the proportion of infants in the Fife County area who were breast fed was 17% less than in 1934-37, and the proportion who received mixed feeding in 1949-53 amounted to only 4.5%. [72] The decrease in breast feeding between 1934-37 and 1949-53 was over two and a half times greater in the industrial areas of the western Fife County area than in the eastern Fife area. The greatest decrease occurred in Cowdenbeath-Lochgelly Area, which during 1934-37 had the highest rate of breast feeding in the County area. The smallest decrease occurred in Anstruther Area, which had the lowest rate during 1934-37. In 1953 the County Medical Officer, Dr. Fyfe, noted a number of factors which by this time discouraged women from breast feeding their babies. These included early discharge from maternity hospital, pressure of household duties, lack of privacy in overcrowded housing, especially the sublets which were still common in the mining districts, and the advice of neighbours. [73]

Infants fed on dried milk were generally heavier, and were therefore thought by many mothers to be healthier, than breast fed infants. Dr. Fyfe also noted that a woman would cease to breast feed her child where she had a job and that, as Dr. Scott reported, many women stopped breast feeding because they believed it would spoil their figures.

The decline in breast feeding in Fife occurred despite the increasing dissemination of health education which encouraged nursing mothers to breast feed their babies. In Fife there were stronger factors than supposed maternal ignorance which determined how mothers fed their infants. The influence of health visitors, whose role was primarily educational, was circumscribed by the economic, environmental and cultural influences to which the working-class population of the county was subject. The same can be said of the influence of the child welfare centres in Fife, which were opened in the large burghs, the coalfield burghs and St. Andrews during the 1920s but were only established throughout the county during the 1930s. [74] From the 1930s, when breast feeding was in decline in Fife, mortality from diarrhoeal diseases in the county began to increase. This confirms the correlation of breast feeding rates and rates of mortality from diarrhoeal diseases in areas of low living standards but suggests that the role of health visiting in the reduction of such mortality was slight. [75]

The development of sanitation was the primary factor in the reduction of mortality from diarrhoeal diseases in Fife. This confirms the conclusions of other studies of diarrhoeal diseases, including the work of McKeown and Record, Buchanan and Luckin. [76] As Luckin writes, it

was "this long-term transformation...rather than any specific epidemiological initiative, or the adoption by working people of the advice too earnestly thrust upon them by "sanitary visitors" which may finally have led to the elimination of the disease." [77] The effect of lack of sanitation in increasing mortality from diarrhoeal diseases can be seen, in particular, in the high levels of mortality in Kirkcaldy LTD during early 1870s and the small town districts of Fife during the 1890s. However, between the late 1890s and the 1920s the widespread improvement of water supplies and drainage led to a sharp fall in mortality from diarrhoeal diseases in Fife. The somewhat higher mortality rates in the landward area than in the urban areas of Fife between the First World War and the early 1930s may be related to the relative backwardness of sanitary progress in the landward area.

Yet the development of sanitation was only the basis for a wider improvement in standards of domestic hygiene in Fife, the effects of which were most clearly seen in the reduction in mortality from diarrhoeal diseases. In the improvement of domestic hygiene important factors were the development of housing and the provision of health education for mothers with infants. Levels of crowding were reduced and working-class homes were provided with kitchens and sculleries, with sinks, water boilers, washing pulleys and ventilated larders, and also with outside coal-stores. During the period such developments in housing were almost continuous, although during the late nineteenth and early twentieth centuries housing conditions in the landward area deteriorated, with the result that at this time the highest mortality rates from diarrhoeal diseases occurred there. The influence of child

welfare services was important in encouraging the more hygienic artificial feeding of infants and particularly in abolishing the use of the long-tubed feeding bottle. However, from the 1930s the decline in the proportion of infants being breast fed probably contributed to the increase in mortality from diarrhoeal diseases which occurred up to the 1950s. This setback marked the limit of the effectiveness of public health administration in the control of diarrhoeal infection.

The contribution of other elements of public health administration and of medical services to the decline in mortality from diarrhoeal diseases was probably slight. From the turn of the century the improvement of dairy sanitation may have contributed to some reduction of infection but pasteurised milk was only widely available in Fife from the 1930s, by which time mortality from diarrhoeal diseases in the county had fallen to its lowest level. During the 1930s the introduction of rehydration therapy and sulphaguanadine provided effective treatments for dysentery and enteritis, but up to the 1950s the use of these treatments was also insufficient to bring about any reduction in mortality rates from diarrhoeal diseases. [78] Finally, although it can be assumed that the environmental improvements which have been mentioned brought about a massive reduction in the incidence of diarrhoeal diseases, it is probable that as general standards of infant health improved an increasing proportion of infants survived attacks of such diseases. Improved nutrition, including increased protein intake, would have been the main factor in any improvement in the ability of infants to withstand diarrhoeal infection. [79] Health education was probably important in securing improvements to the diet of infants but the extent

of its influence, as measured against economic factors, would be difficult to determine.

Diarrhoeal diseases in Fife. Appendix

The following is the text of a handbill warning of the dangers of fly-borne infection, which was issued by the Fife County public health department from 1911.

"FLIES

"Flies in the house are a great danger. They carry disease, especially to infants.

"Flies breed in privies, manure heaps, and ashpits. They live among filth, germs, and infectious material of all kinds.

"From these haunts they make their way to Houses; and poison people's food.

"They may poison the Baby by getting into its milk. The germs they are covered with float off into the milk. The Baby may take Diarrhoea and die.

"Before flies feed, they vomit. The vomited matter may be filth from a privy, discharge from a case of infectious disease, or putrid fluid from a dead animal. Thus any food that a fly alights on may be left polluted with foul juices. Such food gives people Enteric Fever and causes illness in other ways.

"The following precautions are earnestly advised for the safety of all concerned.

"All food, especially the baby's milk, should be kept covered so that flies cannot get at it.

"All tables and shelves should be kept clear of crumbs and waste morsels, so that flies may not be attracted.

"The whole House should be kept clean and the floors well swept and washed.

"Refuse food, and other perishable refuse, should be burned in the kitchen fire. Other household refuse should be placed in the ash-pit, or ash-bin, without spilling on the yard.

"The ash-pit, stable-pit, and privy should be frequently cleared and limewashed, so as to keep flies from breeding in them.

"The ash-bin cover should fit closely for the same reason.

"In shops and places where food is sold, prepared or consumed, all food should be carefully screened or otherwise protected against Flies, and all refuse should be disposed of in a speedy and inoffensive manner.

"Flies, whenever they appear in the house, should be actively dealt with. They should be caught by fly-traps or fly-papers, and killed without mercy by every known method. If this is not done, they may bring disease and death on the household.

"Everybody during the fly season should help in the work of killing flies."

Chapter 6. Diarrhoeal diseases in Fife. Notes

1. Deborah Dwork, War is Good for Babies and Other Young Children. A History of the Infant and Child Welfare Movement in England 1898-1918 (London 1987) 23-26

2. Flinn SPH Table 5.6.7

3. Infant Mortality in Scotland. The Report of a Sub-Committee of the Scientific Advisory Committee to the Department of Health for Scotland (Edinburgh HMSO 1943) Table 12

4. Anthony S. Wohl, Endangered Lives. Public Health in Victorian Britain (London 1984) 22-23

5. F.B. Smith, The People's Health 1830-1910 (London 1979) 85

6. OCM 312, 343

7. Samuel H. Preston, Nathan Keyfitz and Robert Schoen, Causes of Death. Life Tables for National Populations (New York 1972) 5

8. Dwork op. cit. 27

9. RGS 1900; RGS 1901

10. Bill Luckin, Pollution and Control. A social history of the Thames in the nineteenth century (Bristol 1986) 101

11. Flinn SPH 407 "Notes on classification of diseases for Tables 5.6.4-5.6.11"

12. RGS 1911 xxvii

13. For the history of bacteriological research in the aetiology of diarrhoeal diseases, see Dwork op. cit. 41-44, 50. See also Benjamin Kramer and Abram Kanof, "Diarrhea in children: a historical review" Journal of Paediatrics 57 (1960) 773-80

14. Luckin op. cit. 108-10

15. ibid. 109, 110

16. George Rosen, "Disease, Debility and Death", in H.J. Dyos and Michael Wolff (eds.), The Victorian City. Images and Realities (London 1973) 638

17. ibid. 639; Luckin op. cit. 111

18. Dwork op. cit. 37

19. ibid. 37-38

20. ibid. 38

21. ibid. 39-41

22. ibid. 45-48

23. Ian Buchanan, "Infant Feeding, Sanitation and Diarrhoea in Colliery Communities, 1880-1911", in Derek J. Oddy and Derek S. Miller (eds.), Diet and Health in Modern Britain (London 1985) 161

24. Dwork op. cit. 32-35

25. ibid. 39, 46-47

26. ibid. 49

27. For a fuller description of the sanitary conditions in the burghal and landward parts of Dunfermline registration district, see p. 167-68 above.

28. Flinn SPH 407-08 "Notes on classification of diseases for Tables 5.6.4-5.6.11"; Buchanan op. cit. 171

29. 1911 AR 68-70

30. For the text of this handbill, see Appendix (p. 218) below.

31. 1915-19 R 5

32. 1926 AR 12

33. D MOH 1902 AR; D MOH 1906 AR; K SI 1907 AR

34. Louis J. Verhoestraete and Ruth R. Puffer, "Diarrhoeal disease with special reference to the Americas" Bulletin of the World Health Organization 19 (1958) 33, 38-40

35. 1933 AR 90-91

36. Graeme Whittington, "The Imprint of Former Occupations and the Improver Movement on House Types in Fife" Folk Life 5 (1967) 52, 54

37. 1892 AR 71; 1934 AR 34 Cupar Area health visitor's report; Peter F. Anson, Fishing Boats and Fisher Folk of the East Coast of Scotland (London 1930) 100

38. 1909 AR App. IV (167)

39. 1928 AR 42

40. 1933 AR 35

41. 1937 AR 41-42

42. Census of Scotland I 17: 1921 Table 27; 1951 Table 19

43. Susan Gleave, The influence of the Garden City Movement in Fife 1914-23, with particular reference to Rosyth (unpublished M. Phil. thesis, University of St. Andrews 1987) 104-05

44. St. Andrews Citizen 22 July 1922, quoted in John Frew, Housing for Heroes, Council-House Building in Central, East and North-East Fife 1919-23 (Kirkcaldy Museums 1987) 9

45. Census of Scotland 1951 I 17 Table 26

46. J.M. Winter, "Infant Mortality, Maternal Mortality and Public Health in Britain in the 1930s" Journal of European Economic History 8 (1979) 451

47. G. Matthew Fyfe, "Milk-Borne Sonne Dysentery" Journal of Hygiene 26.3 (August 1927) 271-78. When he reported this epidemic, Dr. Fyfe was burgh Medical Officer for St. Andrews and bacteriologist at the James Mackenzie Institute for Clinical Research in that town. He claimed that this was the first outbreak of milk-borne Sonne dysentery to be recorded in medical literature since *Bacterium dysenteriae* Sonne was first isolated in 1915.

48. The development of milk pasteurisation in Fife is described below in the chapter on tuberculosis (p. 406-08)

49. Tom Begg, 50 Special Years, A Study in Scottish Housing (London 1987) 117. In its proposals of 1943 for the internal planning of local-authority housing, the Scottish Special Housing Association recommended that houses were provided with refrigerator recesses.

50. 1935 AR 118

51. Carol Dyhouse, "Working-Class Mothers in England 1895-1914" Journal of Social History 7 (1978) 248

52. Dwork op. cit. 26

53. Jane Lewis, The Politics of Motherhood, Child and Maternal Welfare in England 1900-39 (London 1980) 105

54. 1910 AR 59, 72; K MOH 1910 AR 16

55. Lewis op. cit. 106

56. 1912 AR 129

57. ibid. 129. See also 1911 AR 131; 1913 AR 134

58. K MOH 1911 AR 39

59. 1912 AR 129. This quotation, which is taken from a report by the Dunfermline District health visitor Nurse Robertson, is possibly an account of conditions in Fife but is lifted from p. 247 of *Infant Mortality. A Social Problem* (London 1906) by George Newman. (Wohl op. cit. 25 n.73)

60. Dyhouse op. cit. 255

61. 1913 AR 133; A.B. Calder, Lectures on Midwifery for Midwives (London 1906) 141

62. 1913 AR 133

63. Dyhouse op. cit. 256

64. Edith Whetham, "The London milk trade 1900-30", in Derek Oddy and Derek Miller (eds.), The Making of the Modern British Diet (London 1976) 66; Dwork op. cit. 46-47; 1900 AR 54-55

65. 1935 AR 35

66. ibid. 35

67. 1933 AR 35

68. 1932 AR 39

69. ibid. 39

70. RGS 1931-40

71. 1946 AR 11

72. 1949-53 R 16

73. 1926 AR 63

74. K MOH March 1920 R; K MOH June 1924 R; D MOH 1926 AR 16-17; 1930 AR 41

75. Verhoestraete and Puffer op. cit. 44-46

76. T. McKeown and R.G. Record, "Reasons for the Decline of Mortality in England and Wales during the Nineteenth Century" in M.W. Flinn and T.C. Smout (eds.), Essays in Social History (Oxford 1974) 243; Buchanan op. cit. 169-72; Luckin op.cit. 114

77. Luckin op. cit. 114

78. 1939-45 R 119 Final report of Dr. Fleming, medical superintendent of the Thornton Infectious Diseases Hospital; Thomas McKeown, R.G. Record and R.D. Turner, "An Interpretation of the Decline in Mortality in England and Wales during the Twentieth Century" Population Studies 29 (1975) 416

79. Verhoestraete and Puffer op. cit. 42-43, 48

CHAPTER 7

DIPHTHERIA IN FIFE

1. Diphtheria and croup

Diphtheria was first described as a specific disease and named in 1826, by the French physician Bretonneau. [1] However, it was not until 1857, when the disease was pandemic in Britain and Europe, that deaths from diphtheria were recorded under that name in the annual reports of the Registrar-General for Scotland (RGS). [2] Before this date, deaths from diphtheria were recorded by the RGS as due to croup. The modern use of the term "croup" is as a description for "respiratory tract infections in young children characterized by stridulous breathing" and is "vague in meaning". [3] The identification of diphtheria as "croup" dates from the publication in 1765 of Francis Home's *An enquiry into the nature, cause, and cure of the croup*, in which the disease which Bretonneau later called diphtheria was defined and named according to only one of its most prominent symptoms. [4] During the late eighteenth century croup became a term commonly used to distinguish diphtheria from scarlet fever, which was known as sore throat. [5] In Fife, for example, croup was reported to be prevalent in Cupar at this time. [6] However, in other parts of Scotland, diphtheria was known as putrid sore throat. [7]

Even after the introduction in the reports of the RGS of the separate heading of deaths from diphtheria, deaths from croup continued to be recorded there in the category of infectious diseases. In Fife, for example, *c*.30-50 deaths per annum were reported as due to croup until the mid 1890s. However, during that decade the discoveries of European bacteriologists transformed understanding of diphtheria and rendered untenable any distinction between diphtheria and croup. [8] At this time, according to Creighton, "laxity of diagnosis [was] greater perhaps in throat disorders than in any other class of diseases...", and in 1901, in order to secure to diphtheria the fuller attribution of the deaths which it caused, the RGS introduced to the category of respiratory diseases the headings "membranous laryngitis (not diptheritic)" and "croup (not spasmodic or membranous)". [9] After this date "croup" ceased to be of significance as a putative cause of death in Scotland. [10]

However, the nineteenth-century differential diagnosis of diphtheria and croup was not random. Figure 7.4 shows mortality from diphtheria and croup in Fife during quinquennia between 1856 and 1900. Between the 1850s and the mid 1890s the level of deaths in Fife which were reported as due to croup fluctuated relatively little in comparison to that of reported mortality from diphtheria. There seemed to be an even although declining level of croup mortality, upon which peaks of diphtheria mortality were superimposed. The types of diphtheria bacilli which were present during epidemics of the disease were the more virulent strains *gravis* and *intermedius*. [11] In these forms of diphtheria, death was usually caused by toxaemia and exhaustion. However, it is possible that

the form of diphtheria which persisted between epidemics was the milder *mitis* type. Diphtheria *mitis* also caused deaths, but these were usually due to obstruction of the larynx or trachea, a cause of death which could be clearly distinguished from that in epidemic diphtheria and for which, in the absence of methods of bacteriological analysis, the differential diagnosis of croup would have seemed appropriate. [12] During the 1890s, following the discovery of the causative organism of diphtheria and the toxin which the diphtheria bacillus released, diphtheria became clearly defined according to bacteriological principles and the diagnosis of croup was superseded. [13] The decline during the 1890s in the use of croup as a term in the diagnosis of diphtheria in Fife is clearly seen in Figure 7.4.

2. The incidence of mortality from diphtheria in Fife 1855-1950

Throughout this section mortality from diphtheria in Fife up to 1901 refers to all deaths given by the RGS as due to diphtheria and croup. The periodicity of high mortality from diphtheria in Fife is shown in Figure 7.1. It can be seen that the pattern of mortality from the disease in Fife was broadly similar to that in Scotland, which suffered in the diphtheria pandemic of the late 1850s and a further period of epidemics during the 1890s and the first two decades of the twentieth century. [14] It is also clear from Figure 7.1 that, despite periods of epidemic mortality, the trend of diphtheria mortality in Fife was like that in Scotland in showing a continual decline from the period of peak mortality which occurred during the mid nineteenth century.

Diphtheria was primarily a disease of and cause of death in childhood and early teenage. Infants derived immunity to the disease from their mothers but this protection disappeared by the age of *c.*9 months. Thereafter immunity was acquired as a result of infection, much of which was subclinical. [15] Diphtheria was mainly a cause of death in the 0-14 age range. During the decades 1861-70, 1891-1900 and 1931-39 a total of 96.3% of diphtheria mortality in Scotland occurred in the 0-14 age range, with over 74% of that mortality occurring between the ages of 0 and 4. [16] During the nineteenth century environmental factors were considered to be important in the incidence of diphtheria. During the diphtheria epidemic of the late 1850s in England and Wales death rates were higher in rural than in urban areas. [17] As a result, diphtheria became characterised as a disease of rural areas, and in accordance with miasmatic theories of infection the incidence of diphtheria became associated with low-lying damp environments and poor sanitation. However, with the prevalence of diphtheria in London during the 1890s, the "law of incidence of diphtheria upon town and country...", Creighton wrote, "has become a good deal confused." [18]

Table 7.2.1 Mortality from diphtheria in the divisions of Fife 1855-1950

Death rate (DR): deaths from specified cause per 10 000 inhabitants

	LTD's		STD's		RD's	
	DR	% decr.	DR	% decr.	DR	% decr.
1855-60	4.2		n.a.		n.a.	
1861-70	7.5	-78.6	n.a.		n.a.	
1871-80	5.1	32.0	3.9		6.4	
1881-90	4.7	7.8	2.6	33.3	4.1	35.9
1891-1900	3.1	34.0	3.4	-30.8	4.2	-2.4
1901-10	2.5	19.4	1.1	67.7	2.1	50.0
1911-20	2.4	4.0	2.4	-118.2	1.5	28.6
1921-30	0.5	79.2	0.8	66.7	0.9	40.0
1931-40	0.3	40.0	0.6	25.0	0.3	66.7
1941-50	0.3	-	0.3	50.0	-	100.0
Average DR						
1871-1900	4.3		3.3		4.9	
1901-50	1.2		1.0		1.0	

Source: see Table 7.A.1

Figure 7.2 and Table 7.2.1 show that during 1871-1900 average mortality from diphtheria in the rural division of Fife was 48.5% above that in the small-town division and 14% above that in the large-town division. However, environmental factors appear to be unimportant in explaining these differentials. There is no correlation between levels of crowding in the divisions and mortality from diphtheria during this period. (Figure 3.A.2 and Table 3.3.2) In any case, the effect of housing conditions on diphtheria mortality in a population would have been modified by the age structure of that population. It is probable that the proportion of children aged 0-14 in the populations of the urban, mining and agricultural working-class districts of Fife, where families were relatively large in size, was significantly greater than that in the small town division and that this was the reason for the similar

mortality levels from diphtheria in the large-town and rural divisions and the lower level in the small town division of Fife during the second half of the nineteenth century. [19] It is beyond the scope of this study to include an analysis from census data of the age structure of the populations of the divisions of Fife. During the first half of the twentieth century there was little difference between average diphtheria mortality rates in the Fife divisions. However, average diphtheria mortality rates in Fife during this period were only a quarter of the rates during 1855-1900.

Table 7.2.2 Mortality from diphtheria in Dunfermline and Kirkcaldy large town districts 1866-1920

Death rate (DR): deaths from specified cause per 10 000 inhabitants

	Dunfermline		Kirkcaldy	
	DR	% decr.	DR	% decr.
1855-60	3.3		5.2	
1861-70	6.9	*-109.1*	8.1	*55.8*
1871-80	4.6	*33.3*	5.5	*32.1*
1881-90	4.2	*8.7*	5.2	*5.5*
1891-1900	2.6	*38.1*	3.5	*32.7*
1901-10	2.4	*7.7*	2.6	*25.7*
1911-20	1.7	*29.2*	3.0	*-15.4*
1921-30	0.5	*70.6*	0.4	*86.7*
1931-40	0.3	*40.0*	0.3	*25.0*
1941-50	0.2	*33.3*	0.3	-
Average DR				
1855-1900	4.3		5.5	
1901-50	1.0		1.3	

Source: see Table 7.A.1

During 1855-1900 the average rate of diphtheria mortality in Kirkcaldy was 28% above that in Dunfermline. This was mainly due to higher rates of mortality in Kirkcaldy during interepidemic troughs. Figure 7.3 shows

that during the peak periods of diphtheria mortality in Fife there was little difference between the death rates in Dunfermline and Kirkcaldy until the early twentieth century. The main factors in the variations between diphtheria mortality in Dunfermline and Kirkcaldy must have been differences in the age structure of and levels of immunity in the respective populations. If levels of crowding were an important factor in determining levels of diphtheria mortality, one would have expected higher levels of mortality in Dunfermline than in Kirkcaldy during this period. (See Figure 3.A.3) During 1901-50 the average diphtheria mortality rate in Kirkcaldy was 30% above that in Dunfermline, although the average rate for both burghs during this period was less than a quarter of that during 1855-1900. However, during 1911-20 diphtheria mortality in Kirkcaldy was 79% above that in Dunfermline. The reasons for this surprising difference, in which wartime problems of public health administration in Kirkcaldy were an important factor, are considered below (p.245-48).

In the period for which figures are available, diphtheria mortality in the small burghs of Fife was concentrated in the towns on the coalfield. Between 1911 and 1920, which was the last period of high mortality from epidemic diphtheria in Fife, a total of 70.5% (141) of the deaths from diphtheria which were reported in the small burghs occurred in Buckhaven and Methil, Cowdenbeath, Leven and Lochgelly. Buckhaven and Methil was the last small burgh in Fife to experience high mortality from diphtheria. Here during 1939-45 there were nineteen deaths due to diphtheria *gravis*. [20]

The periodicity of diphtheria epidemics and the general decline in diphtheria mortality up to the 1900s, which was the period prior to effective medical intervention against the disease, may be explained by the prevalence of the different forms of diphtheria. High mortality during the epidemic periods was due to the prevalence of the more virulent *gravis* and *intermedius* types of the disease, whilst during the interepidemic periods diphtheria *mitis* prevailed and caused fewer deaths. The changing prevalence of diphtheria *mitis* and *gravis* may be explained as the result of the process of lysogenization, by which toxin production in diphtheria bacilli is determined by levels of infection of the bacilli by a bacterial virus, diphtheria phage ß. [21] The prevalence of diphtheria *mitis* led to a natural reduction in mortality from diphtheria because "if only *mitis* strains were present in the community, most children would become immune as a result of light infections..." [22] The general trend of diphtheria mortality in Fife during the second half of the nineteenth century was a decline in mortality from diphtheria *mitis* with superimposed periods of mortality due to the more virulent strains of the disease, against which resistance was less. This process of decline in diphtheria mortality continued into the twentieth century, when it was accelerated by the introduction of medical controls against the disease. The following section describes the introduction of such controls against diphtheria in Fife.

3. Measures for control of diphtheria in Fife

In their early efforts to control diphtheria, public health officials in Fife attempted to relate the incidence of the disease to environmental factors. They based their ideas about the aetiology of diphtheria upon the miasmatic theory of infection, which stated that infectious diseases were spread by "terrestrial exhalations or vapours", and sought the cause of the disease mainly in soil conditions and defects of drainage. [23] The use by public health doctors in Fife of miasmatic theory to account for outbreaks of diphtheria continued into the twentieth century, but from the 1890s the theory was modified to accommodate new discoveries about the disease. During the 1890s and 1900s the actual practice of controlling diphtheria developed according to the principles of germ theory and its "associated technology", bacteriology. [24] By bacteriological methods it was possible to precisely identify diphtheria bacilli in infected persons, who could then be removed to hospital and treated. Consequently public health services made increasing use of swab tests for identifying cases of diphtheria, infectious diseases hospitals for the isolation of patients and antitoxin as a cure for the disease. As public health officials learnt of new developments in the knowledge of infectious diseases and came to understand germ theory, it became increasingly clear to them that the miasmatic theory could not adequately explain the aetiology of diphtheria or of any other infectious disease. Yet adherence to the miasmatic theory, which Luckin describes as "that most resilient of nineteenth-century paradigms", was slow to die out. [25] The process by which the miasmatic theory fell

from favour in Fife may be followed in reports of diphtheria outbreaks in the county right up to the First World War.

In 1887 there was a severe epidemic of diphtheria, involving thirty cases and ten deaths, in the well-to-do neighbourhood of Park Avenue and Comely Park in Dunfermline. [26] In a search for the cause of this epidemic, the burgh authorities carefully inspected the drainage in the vicinity of the outbreak. It was found that sewer gas could infiltrate the nearby High School, which was attended by children from some of the infected families, and that there were a number of built drainage channels in the area, which, unlike glazed fireclay pipes, were not self-cleaning and could harbour pockets of gas. [27] As no superior knowledge of the aetiology of diphtheria was available to the Dunfermline local authority, the latter was led by this evidence to accept a miasmatic explanation for the diphtheria epidemic in Comely Park.

However, by the 1890s the causative organism of diphtheria and the ability of that organism to produce a toxin had been discovered. From the middle of that decade diphtheria antitoxin was being mass produced, although not in Britain. [28] Even if doctors in Britain were not able immediately to use the new method for the treatment of diphtheria, they could not ignore the developments which had occurred in the understanding of the disease. Reports of three outbreaks of diphtheria in the Fife County area during the 1890s illustrate the waning of the belief of the County Medical Officer, Dr. Nasmyth, in the miasmatic doctrine. In reporting an outbreak of diphtheria at Strathmiglo in 1892

Nasmyth stated that the "connection between dampness of the soil and outbreaks of Diphtheria is well established..." [29] However, in describing two outbreaks at East Wemyss in 1894 he was more equivocal, citing the lack of drainage in the village as leading "directly or indirectly...to the occurrence of diphtheria", and in a report on an outbreak at Pitlessie in 1896 he placed the role of the village school as a centre of infection above that of the village's various sanitary defects as factors in the spread of diphtheria. [30] Nasmyth was aware of modern developments in bacteriology. He equipped a private laboratory, where by 1894 he was testing samples for the presence of diphtheria bacilli, and in 1896 his researches led him to correspond with the histologist Professor Emmanuel Klein of University College London. [31]

By the turn of the century, germ theory had overthrown miasmatic theory in the scientific debate over the aetiology of infectious disease, but in doing so it was seen to compromise arguments for sanitary improvement. [32] Raymond writes:

> "By improving control of infectious disease and promising effective cures, bacteriological work was blunting the edge of the epidemic weapon and weakening the...case for extensive (and expensive) preventive measures of general sanitation." [33]

Therefore, wherever it was possible and necessary, public health officials in Fife sustained the use of miasmatic explanations of the spread of infectious disease, including diphtheria, as arguments for further improvements to sanitation. In a report of 1901 on the nuisance caused by a ditch which flowed into Loch Gelly and contained the sewage of Cowdenbeath, Dr. Nasmyth's statement that "emanations from sewage

cause sore throats and lead to Diphtheria..." was intended primarily as a means of influencing Kirkcaldy District Committee to act against the problem of river pollution. [34] In a report on outbreaks of diphtheria at North Queensferry in 1910, the County Medical Officer, Dr. Macewen, argued that the spread of the disease could not be "ascribed to any one factor..." and suggested that various sanitary defects at North Queensferry had a generalised influence upon the incidence of diphtheria in the village: "...its low-lying situation, the difficulty which it experiences in disposing of sewage, and the insanitary condition of the school, may all tend to foster the disease once it has been introduced." [35]

In 1911 the County Medical Officer, Dr. Currie, reported that during the summer drought of that year an outbreak of diphtheria occurred at Coaltown of Wemyss. The village was experiencing water shortages at this time, and when its water supply was restored the incidence of diphtheria there diminished. "I regard the association as probably coincidental", Dr. Currie wrote, "but think it worthy of mention...", for it served to emphasise the urgent need for improvements to the Wemyss water supply. [36] Following an outbreak of diphtheria in the same year at Colinsburgh, house drains throughout the village were inspected and many defects were found. "Though Diphtheria does not spring directly from defective drains", Currie wrote, "there can be no doubt that sanitary flaws of this nature are prejudicial to health." [37] Although the County Medical Officer here virtually admitted that the incidence of diphtheria and defective sanitation in a locality were unrelated, he nevertheless urged sanitary improvement in the context of a report on a

diphtheria outbreak. Was such an argument to be questioned by a local authority, it would have been difficult to maintain, but it served its purpose in the case of Colinsburgh, where following the investigation of the diphtheria outbreak, improvements were made to the flushing of the village drains.

Dr. Currie's reports of 1911 were probably the last in which a doctor in Fife related incidence of diphtheria to sanitary conditions in order to promote the improvement of the latter. By this time the development of sanitation in the county and the growth of knowledge about the transmission of infectious diseases had finally rendered miasmatic theory obsolete. However, as late as 1918 Dr. McGlashan of the Kirkcaldy Medical Association blamed poor sanitary conditions for an outbreak of diphtheria at Hill Place in Kirkcaldy. [38] This allegation was part of a protracted dispute between the Medical Association and the public health department of Kirkcaldy over the management of diphtheria in the burgh during the absence of the burgh MOH on war service. As the miasmatic argument was here used against and not by a public health department, it was easy to refute. The burgh sanitary inspector, Mr. Braid, replied by stating that there were no sanitary defects at the tenement which was the scene of the diphtheria outbreak in Hill Place and wrote: "I am not aware that any medical man of standing seriously believes that the bacillus of diphtheria can be obtained from either sewage or sewer air." [39]

A popular belief was that certain animals, such as cats and horses, could spread diphtheria to humans. [40] In searches for diphtheria bacilli Dr. Nasmyth dissected cats in his private laboratory and attempted to grow bacilli from samples collected from ulcers on a cow's teats. [41] The cats which Nasmyth examined were a suspected source of infection in the 1894 diphtheria outbreak amongst children at East Wemyss:

> "In the first household attacked by diphtheria", he wrote, "I found ...that two cats had been ill prior to the outbreak; they had been breathing quick, wheezing, and coughing. The people having read of a connection between a disease in cats and diphtheria, at once killed the cats, and they were sent to me for subsequent examination... There was a very strong suspicion (it amounted to no more) that the cats were the first to be affected with diphtheria, and afterwards communicated it to the children." [42]

Nasmyth's investigations of animal sources of diphtheria infection were unsuccessful and discontinued. However, because it was known that diphtheria could be transmitted in infected milk, dairy cattle remained under suspicion as sources of infection. When in 1909 an outbreak of diphtheria in Kirkcaldy was traced to infected milk supplied from a dairy at Nether Stenton, swabs were taken from both the throat of the dairyman and the scars of vesicles found on two cows. [43] However, only the swab from the dairyman yielded diphtheria bacilli.

By *c.*1910 the argument that specific environmental factors favoured the spread of diphtheria had fulfilled whatever usefulness it might have had in promoting sanitary improvement. However, such arguments had made no contribution to the prevention of diphtheria and were well known to be fallacious. "Judged by results alone, it seems to me that we have been too much inclined in the past to lay the burden of Diphtheria on

drainage defects and sanitary shortcomings", wrote Dunfermline's Medical Officer, Dr. Macgregor, in 1910. "[We] have not given due consideration to the truths of bacteriological research." [44] By this time, measures for the control of diphtheria in Fife were concentrated entirely upon human sources of infection and were concerned with the containment and cure of the disease rather than its prevention.

In the period before immunisation eradicated diphtheria, control of the disease was dependent upon accurate diagnosis, the administration of antitoxin and the removal of cases to hospital, all at the earliest opportunity. However, in its early stages diphtheria was usually a difficult disease to identify by physical examination alone. Due to the initial mildness of its symptoms it could easily be overlooked, and the symptom of a sore throat was sometimes misconstrued as scarlet fever. In an outbreak in 1905 at Cowbakie in St.Andrews District, for example, diphtheria was wrongly diagnosed as laryngitis. [45] As diphtheria was usually insidious in its onset, bacteriological analysis of throat swabs was thought to be the surest method of early diagnosis. Doctors in the County Districts of Fife were taking swabs from sore throats in suspected cases of diphtheria from *c.*1903. However, this procedure was not always carried out effectively. Dr. Nasmyth, who at this time tested the swabs from the County Districts himself, complained that in some cases the swabs were not being taken soon enough. Sometimes attending doctors first treated the throats of suspected diphtheria cases with a strong antiseptic, which diminished the chances of obtaining diphtheria bacilli in any subsequent throat swabbing. [46]

From *c.*1907 all morbid products from the County Districts of Fife were sent for analysis by the Clinical Research Association in Dundee. The Dundee Association's charge for the examination of diphtheria throat swabs, plus telegraphic notification of results, was a relatively expensive 4s. per patient, but as all charges for swabs taken in the Fife County area were paid by the District Committees, swab tests involved no financial hardship to either doctors or their patients. [47] Nevertheless, many doctors in Fife were slow to make use of this service and within the landward area considerable variations developed in the practice of throat swabbing in suspected cases of diphtheria. In 1910 the County Medical Officer, Dr. Dewar, upbraided doctors in Kirkcaldy District for failing to send swabs to Dundee. None had been received from the District, although during the year 125 cases of diphtheria were notified there, whereas from St.Andrews District, where only nineteen cases of the disease were notified, 34 swabs had been received. [48]

During 1908-11 diphtheria was widespread in Kirkcaldy District. It is therefore likely that by 1910 local practitioners in the District were well practised in identifying diphtheria by physical examination alone and were alert to the dangers of delaying treatment of what they knew to be cases of the disease whilst waiting for the confirmation of a bacteriological analysis. No harm would be done to a patient by the early administration of antitoxin in a case which proved not to be diphtheria, but where treatment was postponed and the disease developed, a case was more likely to be severe and result in death or permanent damage to the heart and the nervous system. [49] As the burgh Medical Officer for Dunfermline wrote of diphtheria in 1909: "In no disease that

I know of is it more incumbent upon the medical man to give his patient the benefit of the time-honoured maxim "If in doubt, treat for the worst."" [50]

By contrast with the practice in Kirkcaldy District, in some parts of St. Andrews District throat swabbing was undertaken with thoroughness. In 1911 a total of 164 (74%) of the 221 throat swabs taken in the County area that year came from St. Andrews District, where following an outbreak of diphtheria at Colinsburgh, mass swabbing was initiated by Dr. Bryson, a local GP. Swabs were also taken from the throats of patients ready to be discharged from the District infectious diseases hospital at Ovenstone, near Pittenweem, and in addition to the County work, Lord Balcarres carried out swab tests at his own expense on all the tenants on his estate near Colinsburgh. [51]

Due to a lack of local laboratory facilities and inadequacies of communications, the practice of throat swabbing in the diagnosis of diphtheria was not wholly effective in Fife, particularly in areas where the disease was widespread. Nevertheless, by the late 1900s more cases of diphtheria were being identified, and some believed that this was the result of bacteriological analysis. "[Now] that microscopic assistance is so freely taken advantage of in deciding doubtful cases," wrote Dunfermline's MOH, Dr. Macgregor, "Diphtheria is found to be a much commoner malady than was formerly believed." [52] However, from the evidence from Fife, it seems probable that this increase in the identification of cases of diphtheria was due as much to the greater prevalence of the disease during the early twentieth century, the

Registrar-General's requirement from 1901 of greater precision in the differential diagnosis of diphtheria and respiratory diseases, and improvements in diagnosis of diphtheria by physical examination.

From the turn of the century, diagnosis of diphtheria was increasingly followed by the removal of patients to hospital. Between 1896-1900 and 1911-14 the proportion of diphtheria cases in the Fife County area who were hospitalized rose from 7% to 70%. (Figure 7.5 and Table 7.A.4) There was some variation between the four County Districts in the rates of hospitalization of diphtheria cases. By 1911-14 over 70% of all diphtheria cases in the Dunfermline, Kirkcaldy and St. Andrews County Districts were removed to hospital, but the total for Cupar District was only 53%. However, of all the County Districts, it was Cupar District which had the lowest case mortality from diphtheria by this time. The greatest fall in diphtheria case-mortality, as shown in Figure 7.5, occurred prior the greatest increases in the hospitalization of diphtheria patients. However, those increases occurred during a period when diphtheria was widespread in all the County Districts except Cupar District and when hospital accommodation was used to capacity. Had the incidence of the disease in the County Districts during 1911-14 been as low as during the 1890s, case mortality might have fallen even lower than the rate of 10% which was achieved at this time. (Tables 7.A.3-4) During the interwar period it became normal to remove most cases of diphtheria to hospital. During 1919-29 over 92% of all diphtheria cases in the County Districts were hospitalized, and between 1929 and 1939 all but four of the 819 diphtheria cases occurring in Dunfermline burgh during that decade were treated in hospital. [53] Case mortality was

low, amounting to 5.5% in the County area during the 1920s and only 1.2% in Dunfermline during the thirties.

Hospitalization of cases of diphtheria in Fife contributed to the reduction of case mortality in the disease mainly by preventing the spread of infection but was also of value in cases where complications developed. Sometimes tracheostomies were performed on hospitalized cases of diphtheria in order to relieve obstruction of breathing, as at the St.Andrews burgh fever hospital in 1904. [54] However, in the treatment of diphtheria tracheostomy was probably abandoned with the introduction of antitoxin therapy. The removal to hospital of a severe case of diphtheria was ineffective unless antitoxin was administered at some stage in the treatment, and preferably at the earliest stage, when most probably the patient was still in his home.

Behring first described diphtheria antitoxin in 1890 but it was only following the publication of Roux's researches in 1894 that diphtheria antitoxin began to be widely used. Germany, France and the USA began the mass production of diphtheria antitoxin during the mid 1890s. However, in Britain diphtheria antitoxin was first used only in *c.*1904. [55] Treatment of diphtheria by antitoxin was introduced in Fife during 1905-11. In 1903 Dr. Nasmyth advised local authorities to provide diphtheria antitoxin for use in cases receiving home treatment. "It would ensure the speedy application of this valuable preventative and curative agent", he wrote, "and it would certainly lead to the lowering of the mortality of the disease." [56] In 1910 the Local Government Board issued a circular encouraging local authorities to issue free

antitoxin. It pointed out that expenditure by local authorities for this purpose was competent in terms of the Public Health (Scotland) Act. [57] Kirkcaldy District Committee had introduced the distribution of free antitoxin in necessitous cases in 1908, and in 1911 the Dunfermline, Cupar and St.Andrews District Committees also agreed to make such provision. [58] In the intimation of these schemes to local GP's, the County Medical Officer explained that:

> "it is the desire...to facilitate the prompt administration of antitoxin. It is not proposed to depart in any way from the practice of removing Diphtheria patients to hospital, but patients awaiting removal should receive antitoxin, whenever possible, at home, prior to removal." [59]

In Dunfermline burgh, diphtheria antitoxin was in use from 1905. The burgh Medical Officer, Dr. Morris, reported that the "results of antitoxin treatment have fully justified the most sanguine expectations and nothing could be more gratifying to the Sanitary Authorities than the great diminution of the Death Rate in this most dreaded disease." [60] In 1906 he declared that the "early use of antitoxin has robbed diphtheria of its fatal power." [61] However, in Kirkcaldy burgh the question of the administration of antitoxin to diphtheria patients led to a disagreement between the local authority and the general practitioners in the town. In 1908 the local authority offered to supply free antitoxin to those patients who were afterwards removed to the burgh's infectious diseases hospital. [62] The burgh Medical Officer acted as medical superintendent of the infectious diseases hospital but, as he had numerous other duties to perform, was not always in attendance there. As only the medical superintendent of the infectious diseases hospital was authorised to administer diphtheria antitoxin to the

hospital's patients, the danger existed of considerable delay in providing antitoxin to a patient who did not receive this treatment prior to removal to hospital. [63] The Kirkcaldy authority's proposal for the provision of free antitoxin was an attempt to limit its distribution of antitoxin to only necessitous cases. Patients were identified as such by their need for hospital accommodation, because of which it was assumed that their home conditions were unlikely to permit effective domiciliary treatment and that therefore they were poor.

Kirkcaldy town council's scheme for the supply of free antitoxin only to patients subsequently removed to hospital was opposed by Dr. Macnab of Dysart, who argued that it was not always possible to obtain parents' consent to the removal of a sick child to hospital and that the local authority "do not expect us to use threats to the parents before we can use the anti-toxin free..." [64] Another practitioner in Kirkcaldy suggested that the Kirkcaldy authority adopted the practice of the County authorities of Lanarkshire and Forfar, which supplied free antitoxin to necessitous cases without stipulating that such cases be removed to hospital. [65] Kirkcaldy town council subsequently agreed to this proposal and left it to the general practitioners to decide which cases were necessitous and should receive antitoxin at the local authority's expense. [66] However, the general practitioners in the burgh did not co-operate in this scheme. In 1911 Kirkcaldy's Medical Officer, Dr. McIntosh, reported that the free antitoxin was "not taken advantage of [by the town's doctors] to any great extent, most of the cases being sent to the Hospital for isolation and treatment." [67]

Although by the First World War local authorities had the means to control diphtheria, the epidemic cycle of the disease had not been broken. Even where facilities for the diagnosis and treatment were fully available, control of diphtheria could still be complicated. During 1914-20 there was an epidemic of diphtheria in Kirkcaldy involving 1 233 cases and 103 deaths. (Figure 7.6 and Table 7.A.5) This epidemic exemplified a range of problems which local authorities still faced in managing diphtheria and which in Kirkcaldy had been foreshadowed by the dispute over the provision of free antitoxin.

Despite the availability in Kirkcaldy of the full range of facilities for the diagnosis, control and treatment of diphtheria, including bacteriological analysis, hospital accommodation and free antitoxin, the medical authorities there failed to control the epidemic spread of the disease in the burgh during the First World War. As a result, in November 1917 the Local Government Board sent Dr. Frederick Dittmar to investigate the conditions under which the Kirkcaldy diphtheria epidemic had developed. Dittmar found that swabs had not been taken from the contacts of diphtheria patients and that there were delays in the removal of diphtheria cases to the hospital and in the administration of antitoxin there. [68] The key to the problem was the absence of Kirkcaldy's Medical Officer of Health, Dr. McIntosh, who was away on war service. As a result, the burgh fever hospital was managed by three local practitioners working in rotation. Under this system there were times when the hospital was in the charge of only the matron, who had

authority to neither order out the ambulance to collect patients nor treat them with antitoxin upon their arrival at the hospital.

The Kirkcaldy Medical Association, whose members were responsible for running the infectious diseases hospital in Dr. McIntosh's absence, sought to defend itself against charges of mismanaging the hospital during the diphtheria epidemic. The Association's secretary, Dr. McGlashan, accused the burgh public health department of assisting the spread of diphtheria by causing delays in the removal of patients to the hospital and failing to remedy sanitary defects in parts of the town where outbreaks of the disease had occurred. These charges were countered in a detailed statement issued in January 1918 by Dr. McIntosh's deputy, the burgh sanitary inspector, Mr. Braid. [69]

Mr. Braid gave evidence that diphtheria patients were being discharged from the hospital whilst still in an infectious condition. One such patient was said to have infected three persons after being discharged from the hospital, but Dr. McGlashan cited the negative result of a swab test as proof that that patient was no longer infectious. However, Mr. Braid showed that the patient had been tested no less than 24 days after being discharged from the hospital, by which time he was free of infection. According to the hospital registers, between 1916 and early September 1917 less than 12% of diphtheria cases admitted to the infectious diseases hospital were being kept there for more than four weeks and that over 65% were being discharged after 21 days or less. However, after the Local Government Board began its investigations in

Kirkcaldy, the proportion of diphtheria cases remaining in hospital for over four weeks rose to 73%. [70]

Following the appointment of Dr. Dittmar to investigate the diphtheria epidemic in Kirkcaldy, the local authority determined to "make every effort to get Dr. M'Intosh, the burgh MOH, recalled from the army..." However, an application to this end was rejected by the Scottish Medical Service Emergency Committee. [71] Following Dittmar's report, which was made in January 1918, it was agreed that the matron of the burgh's infectious diseases hospital should be permitted to administer diphtheria antitoxin. A proposal by Dr. McGlashan that general practitioners in Kirkcaldy be remunerated for swabbing the throats of contacts of diphtheria cases was also adopted. [72] However, the differences between the Medical Association and the burgh authorities were not resolved. The former maintained its criticism of the public health department for the delays in removing diphtheria cases to the hospital, whilst the town clerk believed that it was the rotation system of management of the hospital by the general practitioners which was at fault. "...I should like to say that it has all along been my opinion that the fever hospital cannot be successfully managed except under the charge of one medical man responsible to the town...", he wrote. [73] He requested that the Medical Association withdraw its complaints against the public health department, but this the Association refused to do.

The problems which the Kirkcaldy burgh authorities encountered in controlling diphtheria during the First World War emphasised the importance of the efficient administration of the relatively simple

measures which were needed to control the disease and which had already been adopted in the burgh. However, as Figure 7.7 shows, throughout the Kirkcaldy diphtheria epidemic of 1914-20 the great majority of cases were removed to hospital and case mortality was continually in decline from prewar levels of 12-13%. The admission of such a high proportion of cases to hospital, where they were treated with antitoxin, was undoubtedly the reason for the low case-mortality, amounting to 8.4%, which was achieved during the epidemic. However, hospital accommodation was limited and the consequence of this high rate of hospitalization was the early discharge of patients in order to make way for new admissions. This policy was partly responsible for the perpetuation of the epidemic and led to the dispute between the medical authorities in the burgh. This dispute underlined the importance of the Medical Officer of Health as a central authority with a responsibility for the protection of the whole community rather than only a group of patients. The problems caused by Dr. McIntosh's enforced absence from Kirkcaldy show that, against Winter's assumption, the "military drain on civilian medical care" during the First World War did have ill effects on civilian health. [74]

A diphtheria epidemic in Kirkcaldy during 1909-10 was a further illustration of the mainly administrative problems which local authorities, especially those in burghs, faced in the control of diphtheria. (Figure 7.6) The main source of infection in this epidemic was a contaminated milk supply from a dairy in the landward area. [75] The Kirkcaldy burgh authorities could only secure the curtailment of this supply through the co-operation of Kirkcaldy District Committee,

which fortunately acted swiftly to close the offending dairy at Nether Stenton. [76] However, despite the decontamination of the Nether Stenton dairy and the closure of two schools in Kirkcaldy which were identified as centres of infection within the burgh, the diphtheria epidemic there continued into 1910. The burgh infectious diseases hospital was unable to accommodate all the cases of diphtheria occurring in the town at this time, and some had to be removed to the Kirkcaldy District infectious diseases hospital at Thornton. [77]

During the interwar period, administration of controls against diphtheria in Fife became increasingly effective and the disease caused few deaths. The Medical Officer for Dunfermline, Dr. Reekie, noted that the control of diphtheria mortality was also assisted by a general improvement in public attitudes:

> "It would appear that there is now a better understanding in the public mind regarding the dangers of the disease, medical advice is sought earlier for ailing children, and antitoxin is administered more promptly and liberally." [78]

However, public attitudes in Fife, as in most of Scotland, had not developed sufficiently to accept as desirable the total eradication of diphtheria, which became possible during the 1920s with the mass production of immune serum against the disease. Behring had developed an immunising agent against diphtheria by 1913. This consisted of a toxin-antitoxin mixture. During the 1920s safer and more powerful diphtheria vaccines, including the alum-precipitated toxoid, were developed by Ramon and others. In 1908 Schick developed a simple skin test for susceptibility to diphtheria. The Schick test could be used to identify

persons requiring diphtheria immunisation and determine the results thereof. [79]

Limited programmes of diphtheria immunisation were commenced by the local authorities in Edinburgh and Aberdeenshire in 1924, but despite encouragement from the Department of Health for Scotland, few other authorities followed this lead. [80] In Fife, diphtheria immunisation was first advocated by the County Medical Officer, Dr. Yule, in 1926 and was carried out in some parts of the county during the late 1920s and the 1930s. [81] However, it was only in St. Andrews that diphtheria immunisation was provided on a regular basis at this time. Here free immunisation was available at the burgh infectious diseases hospital from 1928. [82] During the 1930s Dr. Matthew Fyfe, as deputy County Medical Officer with responsibility for east Fife, urged other local authorities in the area to adopt diphtheria immunisation. He warned that another diphtheria epidemic was due and that because of the low incidence of diphtheria since the last epidemic, few children born then had acquired natural immunity to the disease. Dr. Fyfe also drew local authorities' attention to the economic advantage of immunisation, noting that the average cost of maintaining a diphtheria patient in the St. Andrews burgh infectious diseases hospital was almost £13 whereas the cost of immunisation was only 2s. 5d per person. [83]

During the 1930s other places in Fife followed the example of St. Andrews by offering free immunisation, but the extent of this service was restricted by limited public demand. School medical services drew attention to the particular vulnerability of school populations to

outbreaks of diphtheria and in 1934 two hundred children at Leslie Public School were immunised. [84] In 1935 there was an outbreak of diphtheria involving five cases amongst children attending the village school in Leuchars. As a result of the scare which this outbreak caused, 96 children from Leuchars were presented for immunisation. [85] However, the concern in this village was not communicated to the inhabitants of the surrounding neighbourhood, as Dr. Fyfe noted:

> "Aware that the type of diphtheria was mild and having absolute confidence in the ability of the hospitals to cure the infected, they could not understand the necessity for taking precautions against a disease, the dangers of which were apparently remote." [86]

As in Leuchars during 1935, an outbreak of diphtheria in St. Monance in 1936 precipitated a demand for immunisation and 83 children there were vaccinated. Here the headmaster at the local school was influential in persuading parents to accept the immunisation of their children. He talked to the schoolchildren about the desirability of immunisation and distributed copies of a leaflet which gave a description of the vaccination procedure. [87] Dr. Fyfe reported that the number of children in St. Monance receiving diphtheria immunisation in 1936 amounted to only half of the school and pre-school population in the burgh, but he remarked that in view of the "recognised antagonism of fishing communities...to such preventive measures, it was satisfactory and encouraging to find so many parents consenting." [88] In 1936 diphtheria immunisation was first carried out on a small scale in the working-class districts of west Fife. In Lochgelly Area a total of 187 children were immunised at school clinics. [89]

In Dunfermline, diphtheria immunisation was introduced in 1938. That year 44 children in the burgh received immunisation after giving positive results in Schick tests. [90] In 1939 Dr. Reekie advocated the widespread immunisation of children in Dunfermline. [91] He noted that the advent of war had increased the need for mass immunisation, for the large-scale movement of children in evacuation schemes rendered the control of diphtheria by established means more difficult. However, by 1940 a total of only 405 children in Dunfermline had received immunising injections against diphtheria, and of that number only 159 had completed immunisation. [92] In Kirkcaldy only 36 children had received diphtheria immunisation by 1940. [93]

The resurgence of diphtheria *gravis* during 1939-40 further increased the urgency for widespread immunisation against diphtheria. Because means for the complete control of diphtheria were now available, the increase in mortality from the disease which occurred at this time, and which was not limited to deaths amongst children, was seen as an avoidable failure of public health administration. In his report on the work of the County infectious diseases hospital at Thornton during 1941-45, the superintendent, Dr. Fleming, described an adult case of diphtheria *gravis* in which there was a rapid and intense development of symptoms and which, despite the injection of 100 000 units of antitoxin, within a few days ended in death:

> *"The spectacle of a previously healthy young adult dying suddenly from an overwhelming toxaemia due to an avoidable disease causes one to question the wisdom of allowing any freedom in the matter of immunisation."* [94]

As a result of the sudden increase in diphtheria in Scotland during 1939-40 and wartime problems such as increasing demands upon manpower and the movement of large numbers of children in evacuation schemes, a national campaign of diphtheria immunisation was commenced in 1941. Free immunisation materials were distributed to local authorities by the Department of Health for Scotland. [95] Quick progress was made in the immunisation campaign in the Fife County area, where by the end of 1941 over 36 000 children had been received immunisation. [96] In order to encourage the presentation of the remaining children for immunisation, parents were visited by school doctors, and the County health visitors distributed information cards about the campaign. [97] Between 1941 and 1945 the County authorities provided diphtheria immunisation to a total of 28 390 schoolchildren and 19 313 pre-school children: an estimated 63% of the children at risk from diphtheria in the County area. [98] In Dunfermline meanwhile, a total of 94% of the schoolchildren and 78% of the pre-school children had received diphtheria immunisation by December 1944. [99] Four years later Dr. Reekie was able to report the ultimate success of diphtheria immunisation in Dunfermline:

> "For the first time in the history of Dunfermline no case of diphtheria occurred during the year. This reflects the general acceptance by parents of diphtheria immunisation as a preventive measure. Great credit for this satisfactory state of affairs is due to the Health Visitors, whose individual contacts in the homes of the people have proved so effective." [100]

Between 1941 and 1944 the public health department in Kirkcaldy provided diphtheria immunisation to a total of 5 527 schoolchildren and 2 410 pre-schoolchildren, and further immunisations in the burgh were carried out by local GP's. [101] In 1944 the burgh Medical Officer, Dr. Hay,

reported that amongst immunised children no deaths from diphtheria had occurred and wrote that it was "within the realms of possibility that diphtheria could be stamped out entirely..." [102] The last death from diphtheria in Kirkcaldy occurred in 1949.

Within a few years mass immunisation against diphtheria had achieved impressive results in the County area as well. In Cowdenbeath in 1947 not a single case of diphtheria was confirmed. The County Medical Officer, Dr. Fyfe, attributed this absence to the effects of immunisation in a town where during the 1930s and early 1940s there had been an average of about twenty cases of diphtheria each year. [103] The last diphtheria black-spot in Fife was Buckhaven and Methil, where during 1939-45 there were 342 cases of the disease. Amongst these, diphtheria *gravis* caused nineteen deaths, seventeen of which occurred in unimmunised persons. [104] In 1946 there were 26 cases of diphtheria in Buckhaven and Methil, but this figure fell to six in 1947 and to only two in 1948, and here too by the early 1950s diphtheria had virtually disappeared. [105]

Why was mass diphtheria immunisation not adopted sooner in Fife? The first factor working against this was public indifference. The interwar period, when means of mass immunisation against diphtheria became available to local authorities in Scotland, was a trough in the epidemic cycle of the disease. Diphtheria prevailed in a mild form at this time and was usually adequately treated by the administration of antitoxin. During the 1930s some public health officials tried to secure wider immunisation against diphtheria by attempting to promote public demand

for it. In 1935, for example, Dr. Fyfe recommended that parents in Cupar and Falkland press local doctors for the introduction of immunisation schemes. [106] However, most people had little to fear from diphtheria, and it was significant that the only place in Fife where during the 1930s immunisation against the disease was carried out on a regular basis was the largely middle-class town of St. Andrews.

In contrast to Dr. Fyfe, who, as Medical Officer for the Eastern Division of Fife, constantly promoted diphtheria immunisation during the 1930s, the Medical Officer for the mining districts of the Western Division, Dr. McGillivray, in his reports made no proposals for the adoption of immunisation. Presumably it was considered not worthwhile to attempt to stimulate public demand in these districts for diphtheria immunisation. Lingering suspicions amongst the working class of vaccination and of intervention by public health officials may have reinforced the non-acceptance of diphtheria immunisation. During the interwar period public indifference to diphtheria immunisation was reinforced by the scepticism of much medical opinion, in which the attitude of Dr. Fyfe was an enlightened exception. [107]

However, there was little or no outright public hostility to diphtheria immunisation, as its rapid success during the 1940s revealed. Had local authorities in Fife introduced immunisation campaigns at an earlier date, there is no reason to suppose that they would have been less successful. However, all the authorities in the county had made considerable investments in infectious diseases hospitals, to which by the 1920s most cases of diphtheria were removed and where they usually

received effective treatment. Even if diphtheria was eradicated by immunisation, and some were probably sceptical that this could be achieved, the infectious diseases hospitals would still be needed for the treatment of other diseases. Therefore investment in mass immunisation against diphtheria, in addition to that for the tried methods of controlling the disease, seemed unjustified.

A locally financed diphtheria immunisation campaign in Fife would not have been expensive. In 1934 the public health committee of Fife County Council estimated its capital expenditure during the following five years at £500 000, which was to be spent on Special Districts, housing, hospitals and clinics, and the purification of the River Leven. [108] By Dr. Fyfe's estimate of 1932 the cost of immunising against diphtheria all the children of school and pre-school age in the Fife County area would have been *c.*£10 000. Therefore a diphtheria immunisation campaign in the Fife County area, if carried out over a five-year period, would have consumed only 2% of the County public health budget. If money was available for the purification of the River Leven, which had no life-saving value, then expenditure on diphtheria immunisation was also within the County authorities' means.

How much did the measures adopted by public health administration in Fife contribute to the decline in diphtheria mortality, which, although punctuated by increases during epidemic periods, continued from the 1860s to the 1950s? Means for controlling diphtheria were available from the 1890s, during which decade public health officials in Fife gradually abandoned fallacious miasmatic theories of the aetiology of the disease.

From the late 1890s an increasing proportion of diphtheria patients were removed to hospital and during the 1900s bacteriological analysis and antitoxin therapy were introduced in the diagnosis and treatment of diphtheria. Swab testing was found to be of limited usefulness in the diagnosis of diphtheria, although it was considered to be of value in determining the spread of the disease amongst contacts. Negative evidence from Kirkcaldy shows that the management of diphtheria cases by the prompt administration of antitoxin and their removal to hospital was effective in reducing mortality from the disease. Here during the diphtheria epidemic of 1914-20 these measures were not adequately employed, diphtheria became widespread and levels of mortality increased. It may be supposed that had adequate facilities for the control of diphtheria been available in Kirkcaldy during the First World War, the diphtheria mortality rate in the burgh during 1916-20 would have been reduced from 3.59 deaths per 10 000 inhabitants to a level closer to the rate of 1.65 which occurred in Dunfermline during that quinquennium: a difference of 54%. (Table 7.A.1) Swab testing, antitoxin treatment and hospitalization of patients were widely used in the control of diphtheria in Fife during the 1920s, when mortality from the disease reached a new low level. However, this period was also a trough in the epidemic cycle of diphtheria in Scotland.

If the extent of the contribution of public health administration to the control of diphtheria in Fife up to the 1920s is unclear, what is certain is that during the interwar period the disease could have been eradicated by immunisation. Yet, despite the availability and relative cheapness of diphtheria immunisation and its advocacy by the County

Medical Officers, Drs. Yule and Fyfe, this measure received only limited use in Fife until the Second World War, when emergency conditions and the resurgence of diphtheria *gravis* convinced central government of the need for a nationwide immunisation campaign in Britain. Thus, in the measures which they used for the control of diphtheria and the timing of their introduction, local authorities in Fife were probably typical of the majority in Scotland. Once they had invested in the provision of antitoxin therapy and hospital accommodation, and diphtheria mortality had fallen to new low levels, the efficacy of existing measures seemed proven and, against a background of doctors' scepticism and public indifference, immunisation was not much used until it was provided free by central government. However, it was mass immunisation campaigns which from the 1940s were responsible for the eradication of diphtheria in Fife.

Chapter 7. Diphtheria in Fife. Notes

1. George Rosen, "The Acute Communicable Diseases", in Walter R. Bett (ed.), The History and Conquest of Common Diseases (Norman, Oklahoma 1954) 17-18; Charles Creighton, A History of Epidemics in Britain (Cambridge 1894) II 738

2. Creighton op. cit. 736; RGS 1857. The term "diphtheria" was introduced to British medicine in 1857 by Godfrey. (G.M. Howe, Man, Environment and Disease (Newton Abbot 1972) 191 n. 4)

3. George Rosen, "Disease, Debility and Death", in H.J. Dyos and Michael Wolff (eds.), The Victorian City. Images and Realities (London 1973) 653 n. 86

4. Rosen, "Acute Communicable Diseases" 15

5. Creighton op. cit. 715

6. Thomas Ferguson, The Dawn of Scottish Welfare (Edinburgh 1948) 135

7. Creighton op. cit. 717-18

8. Rosen, "Acute Communicable Diseases" 19-21

9. Creighton op. cit. 743; RGS 1901

10. The old diagnoses of diphtheria did not die out immediately. Dr. Niven of Newburgh, who had worked as a GP in Fife since the 1870s, reported a case of "membranous croup" at Luthriebank in 1902, and in 1908 Dr. Macnab of Dysart referred to diphtheria as "diphtheritic croup". (1902 AR 48; Kirkcaldy TC minutes 12 January 1909 Letter from Dr. Macnab to the Town Clerk of Kirkcaldy (12 December 1908))

11. Rosen, "Acute Communicable Diseases" 25

12. ibid. 25. Sir Macfarlane Burnet and David O. White, Natural History of Infectious Disease (fourth edn. Cambridge 1972) 193, 198-99

13. In 1883 the German bacteriologist Klebs announced his discovery of the bacteria which caused diphtheria. Klebs' findings were confirmed and extended by Löffler in 1884. In 1888-90 the French bacteriologists Roux and Yersin published their proof that the diphtheria bacillus produced a toxin. (Rosen, "Acute Communicable Diseases" 19-20; W.D. Foster, A History of Medical Bacteriology and Immunology (London 1970) 71-74)

14. Rosen, "Acute Communicable Diseases" 19

15. Burnet and White op. cit. Figure 23

16. M.W. Flinn (ed.), Scottish Population History (SPH) (Cambridge 1977) Table 5.6.7

17. Creighton op. cit. 741. See also Robert Woods and P.R. Andrew Hinde, "Mortality in Victorian England: Models and Patterns" Journal of Interdisciplinary History 18.1 (Summer 1987) Table 4. Unfortunately Flinn (SPH) gave no data for the incidence of diphtheria in urban and rural areas of Scotland. However, Creighton noted that in 1862 there were 617 deaths from diphtheria in the mainland rural areas of Scotland but only 360 deaths in urban areas of the country. (Creighton op. cit. 741)

18. Creighton op. cit. 741

19. T.C. Smout, A Century of the Scottish People 1830-1950 (London 1986) Table 8

20. RGS 1911-20; RGS 1939-45

21. Burnet and White op. cit. 199-201

22. Rosen, "Acute Communicable Diseases" 25

23. Rosen, "Disease, Debility and Death" 635

24. Jean Raymond, "Science in the Service of Medicine: Germ Theory, Bacteriology and English Public Health 1860-1914", paper presented at the conference "Science in Modern Medicine", Manchester University, April 1985, 1

25. Bill Luckin, Pollution and Control. A social history of the Thames in the nineteenth century (Bristol 1986) 70

26. Dunfermline PC minutes 16 March 1887 Report on the health of Dunfermline by Mr. Campbell, inspector for the Board of Supervision (14 March 1887)

27. ibid. 21 March and 28 and 29 April 1887

28. Jonathan Liebenau, Medical Science and Medical Industry. The Formation of the American Pharmaceutical Industry (London 1987) 50-53

29. 1892 AR 93

30. 1894 AR 68; 1896 AR 24. A drainage scheme was carried out at East Wemyss during 1894 but was not completed when the outbreaks of diphtheria occurred there. (1894 AR 68) Raymond quotes a passage from an article by Nasmyth in *Public Health* (1895-96, 4), in which he argued that whether "the part that sewer gas plays in the causation of diphtheria is secondary or primary matters very little..." and which she gives as evidence of the process by which Medical Officers gradually adapted their ideas to the new realities of germ theory. (Raymond op. cit. 14) This comment by Nasmyth originally appeared in his report on diphtheria at East Wemyss in 1894. (1894 AR 65-66)

31. 1894 AR 8; 1896 AR 21; Raymond op. cit. 6. Nasmyth's laboratory researches during the 1890s are described below.

32. Simon Szreter, "The Importance of Social Intervention in Britain's Mortality Decline c.1850-1914: a Re-interpretation of the Role of Public Health" Social History of Medicine 1.1 (April 1988) 32

33. Raymond op. cit. 13

34. Kirkcaldy DC minutes 3 July 1901

35. 1910 AR 56

36. 1911 AR 48

37. ibid. 142

38. Kirkcaldy TC minutes 24 February 1918 Statement by Mr. Braid, burgh sanitary inspector, on Letters...from the Secretary of the Medical Association (25 January 1918)

39. Kirkcaldy TC minutes 24 February 1918 Statement by Mr. Braid op. cit. For this dispute between the Kirkcaldy public health department and the Kirkcaldy Medical Association, see p.246-47below.

40. Creighton op. cit. 719; G.S. Parkinson, A Synopsis of Hygiene (ninth edn. London 1947) 54

41. 1894 AR 8; 1896 AR 21

42. 1894 AR 67

43. Kirkcaldy DC minutes 14 April 1909

44. D MOH 1910 AR 2

45. St. Andrews DC minutes 10 April 1905

46. 1903 AR 17-18

47. Cupar DC minutes 1 October 1907. The Dundee Association charged 2s. 6d. for testing blood samples from suspected typhoid cases and 2s. for sputum examinations.

48. 1910 AR 33

49. Parkinson op. cit. 55; OCM 313

50. D MOH 1909 AR

51. 1911 AR 67, 140-43

52. D MOH 1909 AR

53. Fife County Medical Officer's annual reports 1919-29; Dunfermline burgh Medical Officer's annual reports 1929-39

54. Rosen, "Acute Communicable Diseases" 22; St. Andrews MOH 1904 AR; 1939-45 R 117 Final report by Dr. Fleming, medical superintendent of the Thornton Infectious Diseases Hospital

55. Richard Harrison Shryock, The Development of Modern Medicine (Wisconsin 1936) 298; Rosen "Acute Communicable Diseases" 21; John Woodward, "Medicine and the city: the nineteenth-century experience", in Robert Woods and John Woodward (eds.), Urban Disease and Mortality in Nineteenth-Century England (London 1984) 78

56. 1903 AR 36-37

57. 1910 AR 38

58. 1908 AR 63; 1911 AR 37

59. 1911 AR 76

60. D MOH 1905 AR 2-3

61. D MOH 1906 AR

62. Kirkcaldy TC minutes 12 December 1908; K MOH 1910 AR 12

63. ibid. 14 January 1909. Letter from the Town Clerk of Kirkcaldy to the Local Government Board (29 December 1908)

64. ibid. 14 January 1909. Letter from Dr. Macnab of Dysart op. cit.

65. ibid. 14 January 1909. Letter from the Town Clerk of Kirkcaldy to the Local Government Board op. cit.

66. ibid. 14 January 1909

67. K MOH 1911 AR 27

68. Kirkcaldy TC minutes 24 February 1918. Report of the Clerk to Kirkcaldy Town Council (18 February 1918)

69. ibid. 24 February 1918 Statement by Mr. Braid op. cit.

70. Dr. Watt of the Local Government Board carried out an initial investigation into conditions in Kirkcaldy on 7 September 1917. (ibid. 24 February 1918. Report of the Clerk to Kirkcaldy Town Council op. cit.

71. Kirkcaldy TC Health Committee minutes 20 November and 18 December 1917

72. Kirkcaldy TC minutes 24 February 1918. The maximum payment for throat swabbing was to be 5s. per family.

73. ibid. 24 February 1918

74. J.M. Winter, "Aspects of the Impact of the First World War on Infant Mortality in Britain" Journal of European Economic History 11 (1982) 724; *idem*, The Great War and the British People (London 1985) 186

75. Kirkcaldy TC Health Committee minutes 15 April 1909

76. Kirkcaldy DC minutes 14 and 16 April 1909

77. Kirkcaldy TC Health Committee minutes 21 June 1909

78. D MOH 1929 AR 8

79. Foster op. cit. 149-54

80. Thomas Scott Wilson, "Public Health Services", in Gordon McLachlan (ed.), Improving the Common Weal. Aspects of Scottish Health Services 1900-84 (Edinburgh 1987) 300-01

81. 1926 AR 22

82. 1935 AR 80. See also 1931 AR 128; 1932 AR 129; 1933 AR 117

83. 1932 AR 97

84. 1934 AR 79

85. 1935 AR 80

86. ibid. 80

87. 1936 AR 78

88. ibid. 78

89. ibid. 188

90. D MOH 1938 AR

91. D MOH 1939 AR 13

92. D MOH 1940 AR

93. K MOH 1940-44 R Appendix II

94. 1939-45 R 116 Final report by Dr. Fleming, medical superintendent of the Thornton Infectious Diseases Hospital

95. 1939-45 R 79; Scott Wilson op. cit. 301

96. 1939-45 R 79

97. Fife County Council. Public Health Committee minutes 4 November 1941

98. 1939-45 R 79

99. D MOH 1945 AR 10

100. D MOH 1948 AR 32

101. K MOH 1940-44 R Appendix II

102. ibid. 23

103. 1947 AR 149-50

104. 1939-45 R 172-73

105. 1946 AR 136; 1947 AR 148; 1948 AR 108; 1949-53 R 190

106. 1935 AR 109, 110

107. Foster op. cit. 154

108. Fife County Council. Public Health Committee. Capital expenditure subcommittee minutes 24 January 1934

CHAPTER 8

SCARLET FEVER IN FIFE

1. Incidence of mortality from scarlet fever in Fife

Scarlet fever is caused by infection with types of Group A haemolytic streptococcus which produce erythrogenic toxins. These toxins cause the red skin rash which is characteristic of severe cases of the disease. A person who has survived an attack of scarlet fever is immune to erythrogenic toxin but may still develop streptococcal throat infections and, in doing so, transmit haemolytic streptococci to others. [1] During the period streptococcal infection was widespread, particular sources of such infection could be difficult or impossible to identify and its development into scarlet fever in susceptible populations was difficult to control. Children were most at risk from scarlet fever because they had had less opportunity than adults of acquiring immunity to the disease. Like diphtheria, scarlet fever was mainly a cause of death in the 0-14 age range. During the decades 1861-70, 1891-1900 and 1931-39 a total of 94.6% of mortality from scarlet fever in Scotland occurred in the 0-14 range, with 69.7% of that mortality occurring between the ages of 0 and 4. [2]

Table 8.1.1 Mortality from scarlet fever in Scotland and Fife 1861-1920

Death rate (DR): deaths per 100 000 inhabitants

	Scotland		Fife	
	DR	*% decr.*	DR	*% decr.*
1855-85	80.3		63.5	
1886-1900	20.3	*74.7*	16.7	*73.7*
1901-20	9.3	*54.2*	7.1	*57.5*

Source: see Tables 1.B.2 and 1.C.2

Figure 8.1 shows that, except for an increase in mortality in Scotland during the late 1860s, the patterns of mortality from scarlet fever during 1855-1950 in Fife and all Scotland were similar. Mortality rates from scarlet fever in Fife were generally lower than but declined at similar rates to those in Scotland as a whole. (Table 8.1.1) The main features of the patterns of mortality from scarlet fever in Fife and all Scotland were a steep decline between the late 1870s and the mid 1880s and then a period of steady decline punctuated only by an increase in mortality during the First World War and leading to the virtual disappearance of scarlet fever as a cause of death during the 1940s.

Because scarlet fever was primarily a disease of childhood, the effect of crowding as a factor in the incidence of mortality from the disease would be modified by the age structure of the populations which it affected. Therefore, it might be expected that during the second half of the nineteenth century mortality in Fife from scarlet fever, like that from diphtheria, would be highest in the large-town and rural divisions of the county and lower in the small town division. However, such variations are only visible in the short period for which figures are

available prior to the steep decline in mortality from scarlet fever during the 1870s and 1880s. In the large town districts mortality from scarlet fever was high during the 1860s (10.7 deaths per 10 000 inhabitants) but during the 1870s fell to only 3.3 and, apart from a peak of 4.7 during the early 1880s, never again rose above two deaths per 10 000 inhabitants. (Table 8.A.1) During 1871-75 mortality from scarlet fever in the rural division was 11.8 deaths per 10 000 inhabitants, which was twice the rate in the small town,division during that quinquennium. During the 1880s mortality rates from scarlet fever in the large-town and rural districts averaged 3.4 deaths per 10 000 inhabitants, which was 31% above the rate of 2.6 in the small town division. The available data indicate a differential in mortality from scarlet fever in favour of the small town division. It may be possible to correlate this differential with variations in the age structure of the populations of the divisions. However, after the 1880s the divisions of Fife showed little variation in levels of mortality from scarlet fever, which throughout the county were low. (Figure 8.2)

The patterns of mortality from scarlet fever in the large town districts of Dunfermline and Kirkcaldy were similar, although their respective periods of peak mortality were staggered. (Figure 8.3) This shows that despite the high infectivity of scarlet fever, it was not inevitable that severe epidemics of the disease would spread through all the major urban areas of the county simultaneously. The highest quinquennial mortality rate from scarlet fever in Dunfermline LTD (20.7 deaths per 10 000 inhabitants) occurred in 1861-65. During 1864 a total of 97 deaths from scarlet fever occurred there, in comparison to only 20

deaths in Kirkcaldy LTD. Peak quinquennial mortality from scarlet fever in Kirkcaldy LTD occurred in 1866-70 (14.8), with 64 deaths in 1866, in which year only one death from the disease occurred in Dunfermline LTD. [3] In both large-town districts the last year of high mortality from scarlet fever was 1882, when there were 52 deaths from the disease in Dunfermline and 26 in Kirkcaldy. [4] Thereafter annual mortality from scarlet fever in these districts never rose above eleven deaths (Dunfermline LTD 1897, 1910). Thus, as with mortality from diphtheria (Figure 7.3), there is no differential in mortality from scarlet fever between the two Fife LTD's after 1878, when the reports of the RGS no longer give separate figures for mortality in the urban and rural subdistricts of Dunfermline LTD. This suggests that, in contrast to typhoid and diarrhoeal diseases, there were no conditions in the landward mining districts of Fife which predisposed to higher mortality from diphtheria and scarlet fever there than in the large town districts of the county.

Clearly, the main problem in this study of scarlet fever in Fife is to explain the great reduction in mortality from the disease which occurred in all parts of the county during the 1870s and 1880s. What was the contribution of public health administration to this reduction and what was the subsequent role of local authorities in the control of scarlet fever in Fife, particularly following the establishment throughout the county of infectious diseases hospitals?

2. Measures for the control of scarlet fever in Fife

McKeown and Record and George Rosen explain the sharp fall in mortality from scarlet fever which occurred in England during the second half of the nineteenth century as due to a decline in the virulence of the causative organism of the disease. According to Rosen, scarlet fever increased in virulence during the 1830s, and during the following forty years it caused "frequent and severe epidemics in Europe and America." [5] Then, during the 1880s, mortality from scarlet fever went into rapid decline:

> "changes in [its] behaviour...appear to be largely independent of the environmental changes...and there is no reason to differ from the general opinion that they have resulted from a change in the nature of the disease. This change was probably due mainly to variation in the virulence of the haemolytic streptococcus rather than to modification of man's response to it." [6]

For Scottish evidence McKeown and Record's explanation of the late nineteenth-century decline in mortality from scarlet fever is accepted by Flinn and supported, for example, by the observation of the County Medical Officer for Aberdeenshire, Dr. Watt, who in 1892 reported that "of late years scarlet fever had assumed a much milder type, with fewer complications, than formerly." [7] Figure 8.4 shows the periodicity of mortality from scarlet fever in Fife when the disease caused many deaths and the abrupt change which occurred in this pattern after 1882, when the periods of *c.*150-250 deaths per annum ceased. At this stage it may safely be said that any demographic or environmental changes in Fife were unlikely to have had much influence in this transformation. The population of Fife was increasing in size and its age structure could

not have been changing dramatically. (Table 2.2.1) Between 1861 and 1881 levels of crowding in the county declined by only 11%. (Table 3.3.2) Sanitary conditions had no bearing on the incidence of scarlet fever. Any influence which demographic and environmental factors had upon mortality from scarlet fever could have contributed little to its decline in Fife, where between 1881-85 and 1886-90 death rates from the disease decreased by 56.3%. (Table 1.B.2) The evidence of attempts by local authorities in Fife to control outbreaks of scarlet fever is considered next in order to determine what influence preventive measures had upon the reduction in mortality from this disease.

One of the earliest records of a local authority's response to an epidemic of scarlet fever in Fife is contained in the minutes of the Board of Supervision. When in 1874 and 1875 scarlet fever "raged in epidemic form in many parts of Scotland", the Board of Supervision issued to local authorities instructions for controlling the disease. [8] Authorities were advised to close schools in order to prevent the spread of scarlet fever amongst schoolchildren and from them into the wider community. In December 1874 an epidemic of scarlet fever developed in Wemyss parish. Despite a threat by the Board of Supervision to "remedy the gross evils" existing there, the local authorities in Wemyss refused to close the schools in the parish. [9] This was a failure to take preventive measures for which the Board could not "imagine any rational motive...", but it was not an isolated example of such apparent neglect in the face of what was then the most lethal of all the acute infectious diseases. [10]

During 1875 schools also remained open in Kirkcaldy, but here the notification of scarlet fever was adopted in order to ensure that children with the disease were kept away from the schools in the burgh. Scarlet fever caused fourteen deaths in Kirkcaldy during 1875 (DR: 10.0 deaths per 10 000 inhabitants). [11] In October 1882, when the disease was again widespread in Scotland, the Board of Supervision urged the police commissioners of Kirkcaldy to provide hospital accommodation as a precaution against the development of an epidemic in the burgh. However, the Kirkcaldy police commission refused to equip a hospital for the accommodation of cases of scarlet fever. [12] There was no suggestion of isolating cases in the burgh's cholera hospital, perhaps because that building was in use as a warehouse. [13] During 1882 there were 26 deaths from scarlet fever in Kirkcaldy (DR: 16.2). One can suppose that had the local authority provided sufficient facilities for the isolation of early cases of the disease which occurred in the burgh, this mortality might have been reduced. In the winter of 1886-87 the Kirkcaldy police commission again refused to take preventive measures against scarlet fever, rejecting a request from the burgh Medical Officer, Dr. Gordon, for the closure of schools in the town due to the prevalence of scarlet fever and measles. [14] However, during 1887 there were only two deaths from scarlet fever in Kirkcaldy.

During 1882 an epidemic of scarlet fever also developed in Cupar. [15] The burgh Medical Officer, Dr. Whitelaw, advised the police commission of Cupar to arrange for the closure of schools in the town and, once the schools had been reopened, to prevent children of infected families from attending school without a medical certificate. Dr. Whitelaw also

offered to furnish periodic reports on the incidence of infectious diseases in Cupar, and in order to provide him with information for these reports, the burgh police commission agreed to pay local GPs for notification. [16]

However, during August 1882 the schools in Cupar remained open and scarlet fever continued to spread in the burgh. Dr. Whitelaw reported a mortality rate of 22% amongst cases of scarlet fever in Cupar and recommended the closure of eight Sunday schools there. The police commission requested from the Board of Supervision clarification of the local authority's powers for the isolation of patients and the removal of infected children to hospital. [17] However, the authority then took no further action to control the epidemic until October, when on Dr. Whitelaw's advice it agreed to close schools in Cupar. Unfortunately, the schoolteachers in Cupar failed to co-operate with the police commission and none of the three schools in the burgh was immediately closed. Of those schools, Dr. Whitelaw advised that the Baxter Institute could remain open but that Burnside School and the Madras Academy were centres of infection and should be closed. The Madras Academy was closed, but the principal of Burnside School denied that her school was a centre of infection and refused to suspend classes. Burnside School was eventually closed during part of November. [18] In late November the police commission agreed to Dr. Whitelaw's request for an extension by three months of notification of scarlet fever. By notification, Dr. Whitelaw stated, "it has been possible to adopt precautions and to restrict the spread of infection which must otherwise have been impracticable." [19]

By January 1883 the epidemic of scarlet fever in Cupar was over, although outbreaks of the disease continued in the burgh. [20] The epidemic had resulted in 35 deaths. Measured against the population of the burgh in 1881, this produced the extremely high death-rate of 69.9 deaths per 10 000 inhabitants. The Board of Supervision's inspector, Mr. Campbell, strongly criticised the local authority in Cupar for its failure to isolate cases of scarlet fever. The parish isolation hospital, which stood on the outskirts of the burgh, would have been suitable for this purpose:

> "The Sanitary Inspector reports...that [the] hospital...is made use of by the Parochial Board but never by the Burgh. The reason for this I am at a loss to comprehend; in no disease is a hospital of more importance to a community than in scarlet fever, the most infectious one with which we are affected. Prompt isolation of the first case or two in the Burgh might have been the means of stamping out the disease on its first appearance." [21]

During the 1870s and 1880s the attempts of local authorities in Fife to control outbreaks of scarlet fever were ineffective. In the above examples, from a large burgh, a small burgh and a populous parish in the landward area, local authorities were unresponsive to pressure from their Medical Officers and the Board of Supervision to close schools and provide hospital accommodation. In Kirkcaldy in 1875 and Cupar in 1882 the local authorities adopted notification of scarlet fever. However, without the enforcement of school closure and the isolation of early cases, notification was of little value in the control of scarlet fever. In Cupar and Kirkcaldy school closure was not fully enforced and available hospital accommodation was not put to use. During the 1870s and 1880s local authorities in Fife were reluctant to take responsibility for the organisation and expense of preventive measures

against scarlet fever. They appeared to be both negligent and uncertain of their public-health duties, as was revealed in their communications with and censure by the Board of Supervision. The influence of public health administration upon the reduction of mortality from scarlet fever in Fife during the 1880s was, at the most, slight. However, given the nature of the transmission of scarlet fever, in which persons suffering from only streptococcal throat infection could infect with scarlet fever those who had no immunity to the latter disease, it is doubtful if that disease could ever be controlled by administrative means. This problem was not appreciated until well into the twentieth century, as will be shown.

Between 1881-85 and 1901-05 the death rate from scarlet fever in Fife declined by 90%. (Table 1.B.2) Thereafter the disease caused relatively few deaths in the county but remained widespread in a mild form. Between 1892 and 1914 case mortality from scarlet fever in the Fife County Districts was only 2.3% but during this period an annual average of 406 cases of the disease occurred in these Districts. (Figure 8.5 and Table 8.A.3) In 1912 the County Medical Officer, Dr. Yule, remarked on the mildness of the scarlet fever then encountered and the difficulty of diagnosing cases of the disease, some of which were referred to only as "sore throat". He doubted whether "such sore throats are capable of conveying Scarlatina to others...", but this was a mistaken assumption. [22]

During the 1880s Emmanuel Klein, in the course of investigating outbreaks of milk-borne scarlet fever, showed that the disease was caused by streptococcal infection. However, his research was overlooked by contemporaries. As early as 1901 Arthur Newsholme, as Medical Officer of Health for Brighton, suggested that scarlet fever might be conveyed by persons suffering from only sore throat, but it was not until the 1920s that researchers in Britain and the USA fully elucidated the aetiology of scarlet fever. [23] In Fife the new understanding of the aetiology of scarlet fever was recognised, for example, by the burgh Medical Officer for Dunfermline, Dr. Reekie, who reported in 1927 that the spread of scarlet fever there was due to "some cases of "sore throat", which were in fact mild atypical scarlet fever, and as such were for some time unrecognizable." [24] Such cases were only identified at the desquamation stage of the disease, by which time they would have had maximum opportunity to pass on their infection. Thus, although scarlet fever had lost most of its killing power, it remained difficult to control.

This problem was well illustrated in 1908, when an outbreak of scarlet fever in Kirkcaldy was traced to an infected milk supply from a dairy outside the burgh at Templehall. [25] The Templehall dairy was first inspected on 6 and 7 May by the County Medical Officer, Dr. Nasmyth, and the sanitary inspector for Kirkcaldy County District, Mr. Low. They found no sanitary defects at the dairy and Nasmyth reported no history of "*any* illness" there. However, two dairymaids at Templehall were "only cursorily examined, as they treated the request to examine their throats as a joke."

In Kirkcaldy new cases of scarlet fever continued to occur. The majority had obtained milk from the Templehall dairy, which the burgh Medical Officer, Dr. Mackay, himself inspected on 12 May. He also could find nothing wrong there, but did not examine the dairymaids. As the Kirkcaldy burgh sanitary inspector, Mr. Braid, maintained that the source of the developing scarlet fever epidemic in Kirkcaldy was the milk supply from Templehall, on 26 May the dairy was inspected for a third time, by Dr. Mackay and Mr. Braid, together with the new County Medical Officer, Dr. Dewar. At this inspection one of the dairymaids was found to be "desquamating slightly about the ankles..." She was removed to the Kirkcaldy District infectious diseases hospital and the dairy premises were disinfected, but as no other person at the dairy or the adjoining Templehall Farm showed symptoms of scarlet fever, the milk supply from Templehall was not curtailed.

In Kirkcaldy further new cases of scarlet fever were notified and once again the milk supply from Templehall was incriminated. On 11 June Drs. Dewar and Mackay again inspected the dairy and this time found that the second dairymaid was suffering from sore throat. She was removed to the infectious diseases hospital and milk production at the dairy was suspended until the end of the month. Thirteen subsequent cases of scarlet fever in Kirkcaldy were attributed not to the Templehall milk supply but to contacts with other cases, and the epidemic in the burgh, which involved 102 cases but no deaths, was at last brought under control.

Outbreaks of scarlet fever in Fife which were caused by infected milk supplies were reported up to the mid 1920s. [26] From the 1890s the worst outbreak of milk-borne scarlet fever in Fife was probably the Kirkcaldy epidemic of 1908. Improvements in dairy sanitation would have made little contribution to the reduction of the streptococcal infection of milk, sources of which infection included both man and cattle. [27] Pasteurization was the only effective means of eliminating streptococcal bacteria in milk. Pasteurized milk became increasingly available in Fife from the early 1930s. However, there is no evidence that the problem of milk-borne scarlet fever was a stimulus to the greater provision of pasteurized milk in Fife or that public health authorities in the county were particularly active in promoting the adoption of pasteurization by dairies in the county. [28]

During the late nineteenth and first half of the twentieth centuries local authorities in Fife concentrated their efforts to combat scarlet fever upon the administrative control of the disease, including the detection and isolation of cases. As scarlet fever was primarily a disease of children, much emphasis was placed upon developing the awareness of parents of its dangers and their co-operation with the preventive measures adopted by the local authorities. However, as Ferguson wrote, throughout Scotland the prevention of scarlet fever was "seriously hindered by the prevailing parental indifference and the superstition that the disease was a necessary incident of child life." [29] In Fife it was common for public health officials to complain of such attitudes amongst parents. Public complacency about the problem of scarlet fever probably increased as the disease declined in severity.

During the epidemic of scarlet fever in Cupar in 1882, the burgh Medical Officer, Dr. Whitelaw, reported that "several persons have actually been sleeping with their children who were laid down with scarlet fever, and going forth to their work through the day, and [that] others have been nursing their sick and attending to their ordinary work alternately." [30] Dr. Whitelaw criticised this behaviour, but as the local authority in Cupar failed to remove cases of scarlet fever to hospital, people had little option but to treat the sick in their homes and between going about their daily business. However, during outbreaks of scarlet fever the sick themselves were often permitted to leave their houses. In 1891 the burgh Medical Officer for St. Andrews, Dr. Huntington, reported that it was "a matter of almost daily experience during epidemics of Scarlet Fever of late years to see sufferers desquamating in the streets and spreading the disease far and wide." [31] In the outbreak at Blebo Craigs and Dura Den in 1892 Dr. Nasmyth criticised parents who "allowed children desquamating from scarlatina to mingle with others...", and in 1906 the burgh Medical Officer for Leven, Dr. Graham, made a similar complaint against parents there. [32]

It was possible that scarlet fever was popularly supposed to have lost its infectiousness at the desquamation stage. However, the County public health department sought to educate the public in the facts of the disease as it was then understood. It issued notices warning of the dangers of scarlet fever and the threat of prosecution, with penalties of £2-10, in cases where public behaviour assisted the spread of the disease. [33] In 1898 Kirkcaldy District Committee started proceedings against two sets of parents in Kirkland and Dundonald who let children

suffering from scarlet fever play in public. In 1899 the same authority took action against a woman in Thornton who was found washing the clothing of scarlet-fever patients in a public wash-house. In 1894 the County authorities started proceedings against persons in Forfar who sent infected clothing to Dunfermline District. [34]

By 1900 Dr. Nasmyth was able to report that, with regard to scarlet fever, householders were "getting alive to their duties, and children are not permitted to return to school from infected houses until they have a clearing certificate." [35] However, in 1908 in Leven, Dr. Graham still complained that preventive regulations against scarlet fever were being ignored, with "far too much coming and going from and to infected houses." [36] In 1909 the County Medical Officer, Dr. Dewar, criticised parents for not notifying "missed" mild cases of scarlet fever:

> "To the question: Was any rash observed? the usual answer is, I did not look for any. Except when it is changed once a fortnight, the typical under-garment of the school child of humble class does not readily permit of the inspection of the chest." [37]

Dewar also noted that in the generally crowded conditions of housing in populous districts of the County area it was difficult to isolate a case of scarlet fever. [38] In 1895 Dr. Nasmyth drew attention to a defect of the old Public Health (Scotland) Act, which did not enforce the hospitalization of a case of scarlet fever if that case could be isolated in one room of even a small house. [39] He called for more frequent hospitalization of scarlet fever cases. Under the Public Health (Scotland) Act of 1897 local authorities could order the removal to hospital of a person suffering from infectious disease if that person

was "so lodged that proper precautions cannot be taken for preventing the spread of the disease..." [40] In 1908 Dr. Dewar advocated the removal to hospital of cases of scarlet fever where home conditions were unsatisfactory for the purpose of isolation. However, he noted that determining which cases should be removed and which should be left at home was a difficult task "demanding discretion and impartial judgement..." [41]

Figure 8.5 shows that from the early 1890s the proportion of notified cases of scarlet fever in the Fife County Districts who were removed to hospital increased steadily and by *c.*1908 amounted to almost 60%. Amongst the County Districts the highest rate of hospitalization of cases of scarlet fever in 1906-10 was 66.6% in Cupar District. (Table 8.A.4) Due to the high incidence of the disease in Dunfermline and Kirkcaldy Districts, the rate of removal there during 1906-10 was somewhat lower, at 57.6%, and was lowest of all in St. Andrews District, where it amounted to only 50%. Here, in an area where levels of crowding were low, a greater proportion of cases of scarlet fever could be effectively isolated in the home. By 1906-10 the rate of removal of cases of scarlet fever to infectious diseases hospitals was almost 90% in Kirkcaldy and over 60% in Leven and St. Andrews, three burghs for which figures are available. (Table 8.A.5) During the interwar period removal of cases to hospital became the standard means of dealing with scarlet fever in Fife. During 1920-29 a total of 93% of the 4 339 cases of scarlet fever in the Fife County Districts was removed to hospital.

Between 1926 and 1940 the proportion of the 3 328 cases of scarlet fever occurring in Dunfermline burgh who were hospitalized was 98.4%. [42]

Due to the continuing prevalence of scarlet fever in Fife, the infectious diseases hospitals in the county were often hard-pressed to accommodate all cases for the whole time during which they were infectious. In 1910 the average duration of hospital treatment of scarlet fever patients in Kirkcaldy, for example, was a relatively long period of 47 days. [43] In 1911, when scarlet fever was widespread in Fife, the hospitals serving the County area filled up with patients and many cases had to be treated at home. [44] Meanwhile, because symptoms of the disease were often indistinct and pressure on accommodation forced hospitals to discharge cases as soon as possible, many cases were returned to the community whilst still infectious. Following similar instructions issued by Dunbartonshire and Stirlingshire County Councils, the County authorities in Fife advised parents on the quarantining after discharge from hospital of children who had suffered from scarlet fever. [45] If possible, the children were to live in a house away from other children for at least a fortnight or were to avoid close contact with other children. They were to remain away from school and other children's assemblies for at least a fortnight, be bathed every night and, warmly clothed, spend as much time as possible in the open air.

The problem of the continuing infectiousness of cases of scarlet fever who were discharged from hospital was common throughout Britain and raised doubts about the value of hospitalization in the control of the disease. [46] Such doubts were reinforced by the expense of keeping such

patients in hospital. In 1926 the County Medical Officer, Dr. Yule, estimated that the weekly cost of maintaining a scarlet fever or diphtheria patient in hospital in Fife was £3. [47] At that time the annual cost of the hospital treatment of such cases in the Fife County area amounted to *c.*£10 000. This was an expense which the County authorities were concerned to reduce, but as no reliable method of immunisation against scarlet fever was developed, isolation of cases remained the means of dealing with the disease. In 1948, for example, 98% of the 689 cases of scarlet fever occurring in the County area of Fife, which by this time included the small burghs, were removed to hospital. [48] However, during the 1940s the proportion of scarlet fever cases in Kirkcaldy who were removed to hospital was less than half that in the County area. Between 1940 and 1946 only 46% of all cases and in 1950 only two out of the 39 cases of scarlet fever in the burgh were removed to hospital. [49] In Kirkcaldy conditions in the home may have been more favourable to the domiciliary isolation of cases of scarlet fever than in much of the landward area and many of the small burghs. However, of more importance was the availability from this time of new means of treating scarlet fever which rendered obsolete the hospitalization of patients.

The primary reason for the removal of cases of scarlet fever to hospital was to isolate them from the rest of the community. However, in hospital such cases received medical treatment as this became available. In 1909 the MOH for Leven, Dr. Graham, operated on a boy of five who developed cellulitis and a neck abscess following a bout of scarlet fever. [50] The treatment of scarlet fever with streptococcal antitoxin was

introduced in the 1920s. [51] In 1927 Dr. Graham recommended the administration of antitoxin in all cases of scarlet fever who were admitted to hospital within 48 hours of the first attack and by 1929 he administered antitoxin in every case of the disease. [52] However, by the 1940s the superintendent at the Thornton Infectious Diseases Hospital, Dr. Fleming, only administered antitoxin in severe cases, of which there were few. [53] By this time sulphonamides and penicillin were available for the treatment of scarlet fever, but were used by Dr. Fleming only in treating secondary infections resulting from the disease, such as otitis. He relied on a non-interventionist approach to the treatment of scarlet fever. Patients were kept in hospital for four weeks, three of which were spent in bed:

> "Herein lies the value of hospitalization of children with scarlet fever. The rest and warmth, essential in the first ten days or so for the prevention of complications, can easily be enforced in hospital. Even in the best homes and with capable parents, this is difficult to achieve when the child begins to feel well." [54]

The decline in mortality from scarlet fever in Fife was due mainly to a decline in the virulence of the causative organism of the disease during the 1880s. Prior to the 1890s local authorities in Fife made no effective contribution to the control of scarlet fever. However, by the interwar period as great a proportion as 90% of notified cases of scarlet fever in the county were removed to hospital. Yet hospitalization itself does not seem to have contributed to the reduction in case mortality from scarlet fever and was of only partial value in controlling the spread of the disease. Most of the dissemination of scarlet fever was caused by mild or asymptomatic cases, who were not notified and removed to hospital. Research during the

interwar period showed that amongst a healthy population the proportion of asymptomatic carriers of Group A haemolytic streptococcus amounted to at least 7% and sometimes as much as 40%. [55]

The spread of milk-borne scarlet fever in Fife was only controlled from the 1930s, when pasteurized milk became increasingly available in the county. The small further reductions in mortality from scarlet fever which occurred in Fife between the 1890s and the 1940s may have been related to improving standards of child health, which increased ability to withstand infection, and the reduction of infection due to reductions in levels of crowding. From *c.*1919 local authorities contributed to these developments by establishing child welfare services and carrying out state-aided housing schemes. [56] As well as reducing levels of crowding, improvements in housing were also important in improving conditions for the home treatment of cases of scarlet fever. The eventual elimination of mortality from scarlet fever was probably due to the introduction of sulphonamide therapy, although in Fife Dr. Fleming considered the administration of antitoxin to be more important than the use of either sulphonamides or penicillin in the treatment of severe cases of the disease. Loudon suggests the possibility of a further decline in the virulence of the haemolytic streptococcus from the 1930s. [57]

Chapter 8. Scarlet fever in Fife. Notes

1. Leonard G. Wilson, "The Historical Riddle of Milk-Borne Scarlet Fever" Bulletin of the History of Medicine 60 (1986) 322

2. Flinn SPH Table 5.6.7

3. RGS 1864, 1866

4. RGS 1882

5. George Rosen, "Disease, Debility and Death", in H.J. Dyos and Michael Wolff (eds.), The Victorian City. Images and Realities (London 1973) 652

6. T. McKeown and R.G. Record, "Reasons for the decline of mortality in England and Wales during the nineteenth century", in M.W. Flinn and T.C. Smout (eds.), Essays in Social History (Oxford 1974) 243

7. Flinn SPH 410; Thomas Ferguson, Scottish Social Welfare 1864-1914 (Edinburgh 1958) 407

8. Ferguson op. cit. 406

9. Scottish Record Office (SRO) HH26/10 Board of Supervision. Chairman's Minute Book No. 10 (1874-75) 17 December 1874

10. SRO HH25/4 Board of Supervision (public health) Minute Book (1873-74) 24 December 1874

11. See section 3.4 (p. 108) above; RGS 1875

12. Kirkcaldy PC minutes 2 and 9 October 1882

13. ibid. 11 September 1882 Report by Alexander Campbell, inspector to the Board of Supervision, on the state of Kirkcaldy (17 July 1882); ibid. 15 January 1883

14. ibid. 13 December 1886, 10 January 1887

15. Cupar PC minutes 10 August 1882

16. ibid. 10 August 1882

17. ibid. 30 August 1882

18. ibid. 11, 13, 17 and 20 October and 23 November 1882

19. ibid. 23 November 1882

20. ibid. 2 February 1883 Report by Alexander Campbell, inspector to the Board of Supervision, on the epidemic of scarlet fever in Cupar (18 January 1883)

21. ibid. 2 February 1883 Mr. Campbell's report op. cit.

22. 1912 AR 30-31

23. Wilson op. cit. 326-30, 337-42; John M. Eyler, "The Epidemiology of Milk-borne Scarlet Fever: the Case of Edwardian Brighton" American Journal of Public Health 76.5 (May 1986) 581; W.D. Foster, A History of Medical Bacteriology and Immunology (London 1970) 174-75

24. D MOH 1927 AR 5

25. Kirkcaldy TC minutes 25 August 1908 Report by Dr. Dittmar of the Local Government Board on the epidemic of scarlet fever in Kirkcaldy (21 July 1908). The following description of this epidemic is taken from this report.

26. For reports of outbreaks of milk-borne scarlet fever in Fife, see 1892 AR 92-93; 1895 AR 65; 1900 AR 40-41; St.A MOH 1906 AR; 1907 AR 87; Kirkcaldy TC minutes 25 August 1908 Dr. Dittmar's report op. cit.; 1912 AR 134, 165-67; 1913 AR 143-44; Leven MOH 1914 AR; 1925 AR 47; D MOH 1926 AR

27. Wilson op. cit. 325-36; Eyler op. cit. 582

28. The development of milk pasteurization in Fife is described in chapter 12 (p. 406-08) below.

29. Ferguson op. cit. 407

30. Cupar PC minutes 17 October 1882

31. St.A MOH 1891 AR

32. 1892 AR 93; Leven MOH 1906 AR 7-9

33. An example of a public notice warning of scarlet fever is given in 1911 AR 35-36

34. Kirkcaldy DC minutes 10 September 1898, 28 January 1899; 1894 AR 48-49

35. 1900 AR 29

36. Leven MOH 1908 AR 8

37. 1909 AR 24

38. ibid. 24

39. 1895 AR 53-54

40. Quoted in W.J. Brock, Sanitary Laws of Scotland and Principles of Public Health (Edinburgh 1905) 40

41. 1908 AR 17

42. Fife County Medical Officer's annual reports 1920-29; Dunfermline burgh Medical Officer's annual reports 1926-40

43. K MOH 1910 AR 18. The average length of hospital treatment for cases of other acute infectious diseases in Kirkcaldy during 1910 was as follows:

typhoid	31 days	measles	21
diptheria	22	erysipelas	17

44. 1911 AR 34

45. 1909 AR 26-27

46. John M. Eyler, "Scarlet Fever and Confinement: the Edwardian Debate over Isolation Hospitals" Bulletin of the History of Medicine 61.1 (Spring 1987) 18-19

47. 1926 AR 11

48. 1948 AR 52

49. K MOH 1940-44 R 22; K MOH 1945 AR 13; K MOH 1946 AR 44; K MOH 1950 AR 19

50. Leven MOH 1909 AR 7

51. Wilson op. cit. 340

52. Leven MOH 1927 AR; Leven MOH 1929 AR

53. 1939-45 R 116 Final report by Dr. Fleming, medical superintendent of the Thornton Infectious Diseases Hospital

54. ibid. 116

55. Irvine Loudon, "Puerperal fever, the streptococcus and the sulphonamides 1911-1945" British Medical Journal (August 1987) 487-88

56. See chapter 6 (p. 207-14) and section 3.3 above.

57. Loudon op. cit. 489; *idem*, "Maternal Mortality 1880-1950: Some Regional and International Comparisons" Social History of Medicine 1.2 (August 1988) 199-200

CHAPTER 9

MEASLES AND WHOOPING COUGH IN FIFE

1. The incidence of mortality from measles and whooping cough in Fife 1855-1950

Measles and whooping cough are separate diseases, with different causative agents and symptoms. Measles is a viral infection, the symptoms of which include skin rash, high temperature, headache, inflammation of the respiratory tract, photophobia and conjunctivitis. [1] Whooping cough is an infection of the respiratory tract caused by the bacterium *Bordetella pertussis* and characterised by prolonged spasms of coughing and the whoop heard on inspiration. [2] Measles and whooping cough both confer lifelong immunity. They are also similar in being predominantly diseases of early childhood, in being recognised as "social" diseases, with "death-rates which are highest in the lowest [social] classes", and because they were the last amongst the common infectious diseases which public health authorities in Britain attempted to control. [3] For these reasons they were often referred to jointly in literature on public health. [4] For purposes of comparing the combined efforts by local authorities in Fife to control measles and whooping cough, the conjoined consideration of these diseases has been retained here.

Table 9.1.1 Age distribution (%) of total mortality from measles and whooping cough in Scotland during selected decades

	Measles		Whooping cough	
	u. 1	0-4	u. 1	0-4
1861-70	46.1	94.3	65.6	97.2
1891-1900	54.3	95.8	72.4	98.2
1931-39	63.1	97.2	80.3	99.3

Source: Flinn SPH Table 5.6.7

During the nineteenth and first half of the twentieth centuries measles and whooping cough were mainly causes of death amongst infants and young children. If it is assumed that the age distribution of mortality from measles and whooping cough, as given in the sample decades in Table 9.1.1, represents the trend of that mortality in Scotland during the whole period 1861-1939, then virtually all deaths from measles and whooping cough occurred in the 0-4 age range whilst an increasing proportion occurred amongst infants. In Fife, mortality rates from measles and whooping cough were generally lower than in Scotland as a whole, but between 1855 and 1950 these diseases caused 12.9% of all mortality in Fife from the main infectious diseases, including tuberculosis, and remained major killers in the county until after the First World War. (Figures 9.1-2 and Table 1.B.2))

Table 9.1.2 Mortality from measles and whooping cough in Scotland and Fife 1861-1950

Death rate (DR): deaths from specified cause per 100 000 inhabitants

	Measles				Whooping cough			
	Scotland		Fife		Scotland		Fife	
	DR	% decr.	DR	% decr.	DR	% decr.	DR	% decr.
1861-70	42.0		25.4		69.5		41.6	
1871-80	36.0	*14.3*	27.7	*-9.1*	63.0	*9.4*	48.5	*-16.6*
1881-90	38.5	*-6.9*	21.9	*20.9*	61.5	*2.4*	39.6	*18.4*
1891-1900	47.0	*-22.1*	23.7	*-8.2*	52.0	*15.5*	32.8	*17.2*
1901-10	33.5	*28.7*	17.4	*26.6*	44.5	*14.4*	28.0	*14.6*
1911-20	29.5	*11.9*	15.6	*10.4*	34.5	*22.5*	25.1	*10.4*
1921-30	20.5	*30.5*	9.4	*39.7*	20.0	*42.0*	16.8	*33.1*
1931-40	8.5	*58.5*	4.3	*54.3*	10.5	*47.5*	5.7	*66.1*
1941-50	1.5	*82.4*	1.3	*69.8*	4.0	*61.9*	2.4	*57.9*
% decrease								
1861-1910		*20.2*		*31.5*		*36.0*		*32.7*
1911-50		*94.9*		*91.7*		*88.4*		*90.4*

Sources: see Tables 1.B.2 and 1.C.2

During the second half of the nineteenth century there was a marked contrast between the patterns of mortality from measles in Fife and Scotland and between 1861 and 1910 the decline in mortality from that disease in Scotland was only two thirds of that in Fife. (Table 9.1.2) However, between 1911 and 1950 the decline in measles mortality both in Fife and nationwide amounted to over 90%. During both 1861-1910 and 1911-50 the rates of decline in mortality from whooping cough in Fife and Scotland as a whole were similar and amounted to over 30% and *c.*90% respectively.

Before considering the reasons for the long-term decline in mortality from measles and whooping cough in Fife, an explanation is given for the increase in mortality from measles in Scotland during the late nineteenth century and the absence of such an increase in Fife. It has been suggested that increases in mortality from measles which occurred in Britain during the second half of the nineteenth century were related to increased school attendance following the introduction of compulsory elementary education. Wohl notes that in England, where Education Acts for this purpose were passed in 1870 and 1880, "a controversy raged over [their] impact...upon increased morbidity" from scarlet fever and measles. [5] Marilyn and Colin Pooley claim that in late nineteenth-century Manchester the "increase in measles fatalities was probably due to the increased exposure of a susceptible population consequent upon the crowding of children into elementary schools." [6]

Figure 9.1 shows the sharp increase in quinquennial mortality rates from measles which occurred in Scotland between 1876-80 and 1891-95 and may be related to the introduction of compulsory elementary education there under the Education (Scotland) Act of 1872. However, that Act made provision for the compulsory education of children from only the age of five. [7] During the 1890s, when mortality from measles in Scotland increased by 22% over the previous decade, the proportion of all measles deaths in Scotland which occurred amongst children between the ages of five and nine was only 3.5%, in comparison to 96% amongst

children below the age of five. [8] This proportion was also less than in 1861-70, which was prior to the introduction of compulsory elementary education in Scotland but when a total of 4.5% of all measles deaths in the country occurred in the 5-9 age group. Therefore the concentration of children in elementary schools did not lead to great increases in measles mortality amongst schoolchildren themselves. However, it must certainly have led to increased morbidity from measles in schools, with the result that more schoolchildren conveyed measles to their pre-school-age brothers and sisters, in whom such infection was more likely to lead to death and who therefore died in greater numbers. [9] It may be supposed that from the 1890s the introduction of compulsory burgh police legislation, with its provisions for the appointment of burgh Medical Officers of Health, and the centralisation of public health administration in landward areas under the Local Government (Scotland) Act of 1889 quickly led to improvements in preventive measures against measles and the termination of the rise in mortality from the disease which had continued since the 1870s. However, this is an unresearched subject.

If the effect of increased school attendance following the introduction of compulsory elementary education is a possible explanation for the late nineteenth-century pattern of measles mortality in Scotland as a whole, that explanation does not account for the experience of measles mortality in Fife at this time. At no time during the second half of the nineteenth

century did quinquennial mortality rates from measles in Fife show a sustained increase and during most of the 1870s and 1880s they were in decline. (Figure 9.1) As the previous two chapters have shown, there is no evidence of exceptional efficiency in preventive action against airborne infectious diseases in Fife during the late nineteenth century. It seems unlikely that in a county in which most of the population was gathered in small towns and villages, most of which had their own elementary schools, non-attendance at schools was high. It is probable that the late nineteenth-century increase in measles mortality in Scotland was mainly a phenomenon of the cities, but this is an unresearched subject. [10]

In contrast to mortality from measles in Fife, the pattern of mortality from whooping cough follows the pattern of mortality in Scotland as a whole, albeit at a much lower level up to the 1920s and with more pronounced fluctuations. (Figure 9.2) Decadal mortality rates, as given by Flinn, show that between the 1860s and the 1900s mortality rates from whooping cough in Scotland were highest in the cities, followed by the large towns and then the small towns, and were lowest in rural districts. [11] This explains the differential in levels of mortality from whooping cough in Fife, where most of the population lived in small-town and rural districts, and Scotland as a whole. The fluctuations in mortality from whooping cough are probably explained by the epidemic cycle of the disease, the periodicity of the spread of which is "connected with variations in the

quality of the contagium." [12] However, despite such apparent changes in the virulence of *Bordetella pertussis*, there is no evidence that the long-term decline in mortality from whooping cough may be related to any permanent reduction in the virulence of the causative organism. [13] Elementary school attendance was not a factor in the incidence of mortality from whooping cough in Scotland. From the 1870s there was no increase in mortality from the disease which could be related to the introduction of compulsory elementary education under the Education (Scotland) Act of 1872. (Figure 9.2) It is probable that particularly in the crowded housing conditions which were widespread in Scotland most children had acquired immunity to whooping cough by the time they reached school age. [14]

If school attendance was unimportant as a factor in the spread of measles in Fife, what were the conditions which determined levels of mortality from measles in the county? Were the conditions affecting mortality from measles also responsible for the much higher levels of mortality from whooping cough which occurred there? It has already been suggested that up to the 1900s levels of urbanization were a factor in the difference between levels of mortality from whooping cough in Fife and Scotland as a whole. Writing about measles, Halliday stated that:

> "The extent to which diffusion among children below school age takes place must depend in some measure on the nature of...housing conditions, both as regards structure and as regards the social characteristics of the inhabitants." [15]

Were the variations in housing conditions, as measured by levels of crowding, and the varying social conditions which existed in the urban-industrial, mining and agricultural districts of Fife reflected in differences in levels of mortality from measles and whooping cough in the three divisions of the county? The information provided in Figures 9.3-4 and Table 9.1.3 is inconclusive.

Table 9.1.3 Mortality from measles and whooping cough in the subdivisions of Fife 1861-1950

Death rate: deaths from specified cause per 10 000 inhabitants

	Measles				Whooping cough			
	LTD's	STD's	RD's	*range*	LTD's	STD's	RD's	*range*
1861-70	3,7	n.a.	n.a.		5,9	n.a.	n.a.	
1871-80	3,9	1,8	3,7	*2,1*	6,6	3,1	7,2	*4,1*
1881-90	1,3	2,0	2,6	*0,6*	4,5	3,7	4,4	*0,8*
1891-1900	2,3	2,8	1,7	*1,1*	3,1	2,8	4,8	*2,0*
1901-10	1,3	2,2	1,2	*1,0*	3,0	3,1	2,1	*1,0*
1911-20	1,3	1,7	1,6	*0,4*	2,5	2,3	2,8	*0,5*
1921-30	1,0	0,7	1,1	*0,4*	1,3	1,8	1,9	*0,6*
1931-40	0,3	0,4	0,6	*0,3*	0,5	0,7	0,5	*0,2*
1941-50	0,1	-	0,3	*0,3*	0,2	0,2	0,2	-

Source: see Tables 9,A,1 and 9,B,1

Figures 9.3 and 9.4 show that up to the 1890s mortality from measles and whooping cough was generally lower in the small town division than in the large-town and rural divisions of Fife. Although comparative data are available for only two decades prior to the 1890s, a similar advantage in the small town division was noted in patterns of mortality from diphtheria and scarlet fever during this period. It was suggested that that

advantage was an effect of variations in the age structure of the populations of the divisions rather than of differences in levels of crowding. However, during the 1890s mortality from measles increased in all three divisions and was highest in the small town division. This high level of mortality from measles in the small town division was probably related to conditions in the coalfield burghs, where the age structure of and levels of immunity in the population, standards of child health and levels of crowding were presumably most favourable to high case-mortality in that disease. From the turn of the century levels of mortality from measles in all the divisions of Fife fell as sharply as they had risen during the preceding decade. From the First World War there was relatively little variation in mortality from measles in the divisions of Fife and throughout the county the decline in mortality from the disease was almost continuous.

During the second half of the nineteenth century mortality from whooping cough in Scotland was generally highest in urban areas and lowest in rural areas. However, even during periods of high mortality from whooping cough in Fife, such levels of mortality did not occur simultaneously in all susceptible populations in the county. During the late 1870s high mortality from whooping cough occurred in the large-town and rural divisions but, as Figure 9.6 shows, this high level of mortality in the large town division occurred only in Kirkcaldy LTD, which suggests that at this time high mortality from whooping cough was due to

localised epidemic conditions in Kirkcaldy and its landward environs. During the quinquennium 1876-80 high mortality from whooping cough in Kirkcaldy LTD occurred in 1876 (20 deaths), 1879 (22) and 1880 (15). [16] Sharp fluctuations in mortality from whooping cough continued in the divisions of Fife up to the interwar period. Such changes were most pronounced in the rural division, where there was a sharp increase in mortality during the First World War. From the First World War there was little difference in mortality rates from whooping cough in the divisions of Fife. From the mid 1920s mortality from whooping cough went into a steady decline in all three divisions of the county and the fluctuations in death rates from the disease ceased.

The high levels of mortality from whooping cough which occurred periodically in the rural division of Fife and which are in contrast to the low average levels of mortality from the disease in rural districts of Scotland as a whole may be related to conditions in the landward mining districts of Fife. From 1911 the annual reports of the RGS provide data on mortality from specified causes in the individual burghs and County Districts of Fife. Tables 9.A.3 and 9.B.3 give death rates from measles and whooping cough in different burghs, which are grouped according to their socio-economic characteristics, and the County Districts in Fife during the period 1911-50. By *c.*1930 mortality from these diseases had fallen to low levels throughout the county, but prior to that date the pattern of

mortality from both diseases is characterised by particularly high levels in the coalfield burghs and mining districts of the landward area. Mortality from measles and whooping cough was also relatively high in the large burghs until the late 1920s, but the figures for the quinquennium 1911-15 hint that prior to 1911 mortality from whooping cough was also high in the agricultural burghs of central Fife and the fishing burghs of the East Neuk.

Why did mortality from measles and whooping cough decline at all in the period prior to the First World War? One factor which would have contributed to a decline in mortality from these diseases independently of any preventive measures was the natural immunity which exposure to infection conferred. Spink argues that in the USA the decline in mortality from measles during the interwar period was the result of the increasing concentration of population in urban areas and the increase in natural immunisation due to more widespread exposure to measles which resulted from this movement. [17] However, the incidence of measles and whooping cough was also affected by factors associated with the "poverty complex", including high levels of crowding and poor nutrition. Smith notes that measles was "commonly believed to be a disease of the poor", that case mortality in measles increased where subjects were undernourished and that even in the mid twentieth century the disease was "endemic" in English mining villages. [18] Such factors also affected the incidence of whooping cough. As late

as 1976 it was stated that in Glasgow and probably throughout Britain "the persistence of whooping cough in some areas is more strongly correlated with adverse socio-economic conditions than with lack of [artificial] immunisation." [19] Evidence from Fife shows the apparent effect of living standards on the incidence of mortality from measles and whooping cough in Fife. During the first half of the twentieth century there were considerable differences in death rates from these diseases between industrial, mining and other types of burghs and between the landward mining and agricultural districts of the county.

Did public health administration have any effect in reducing mortality from these diseases? It has been suggested that improved public health administration was responsible for terminating the increase in mortality from measles in Scotland during the 1890s. A similar effect is not evident in Fife, where no such increase occurred. Nevertheless, from the 1890s local authorities in Fife directed attention to the problem of controlling measles and whooping cough. The following section describes and attempts to evaluate this work.

2. Measures for the control of measles and whooping cough in Fife

Up to the Second World War public health authorities in Fife played a largely indirect role in the control of measles and whooping cough in the county. Throughout the period there was no compulsory or county-wide scheme for the notification of these diseases and most of the work of the public health authorities in their attempted control of measles and whooping cough involved educating the public, particularly teachers and parents, in awareness of the dangers of infection amongst children.

Ferguson noted that many local authorities in Scotland adopted notification of measles under the Infectious Diseases (Notification) Act of 1889 but soon afterwards abandoned it, "mainly on the ground that the outlay associated with notification was disproportionate to its practical value..." [20] In a burgh in Fife, notification of measles and whooping cough appears to have been first adopted in 1885, as part of a general scheme for the notification of infectious diseases amongst schoolchildren in Leven. [21] However, the burgh records of Leven give no indication of the duration of this scheme or whether it was in any way effective in preventing the spread of infectious disease.

Prior to the introduction of the Infectious Diseases (Notification) Act of 1889 no other burgh authority in Fife followed the example of Leven in establishing a system of notification of infectious disease amongst schoolchildren. However, in most places outbreaks of measles amongst schoolchildren were reported to the local authorities, which sometimes

attempted to control the spread of the disease by enforcing the closure of schools. Sometimes pressure to close schools was resisted. During the winter of 1886-87, when measles and scarlet fever were prevalent in Kirkcaldy, the local authority rejected a request by the burgh MOH, Dr. Gordon, for the closure of schools in order to prevent the spread of these diseases. [22] In Dunfermline, school closures due to outbreaks of measles were reported by the burgh Medical Officer in 1894, when three schools were closed, and in 1898 and 1907. [23] In 1904 the burgh Medical Officer for St. Andrews, Dr. Huntington, reported the prevalence of measles in three schools in the burgh but did not state whether any of these schools had been closed. [24] In 1911 the local authority in Kirkcaldy received reports from headmasters of three hundred cases of whooping cough in schools in the burgh. [25] However, by this time school closure was no longer considered by public health authorities to be a satisfactory means of dealing with outbreaks of measles and whooping cough.

With the introduction of the compulsory medical inspection of schoolchildren under the Education (Scotland) Act of 1908, the Fife County Medical Officer, Dr. Dewar, expressed the hope that measles and whooping cough would be "seriously grappled with and their diffusion checked." [26] He urged headmasters to prevent children with measles from returning to school until ten days after they had recovered from the disease. In Kirkcaldy the burgh Medical Officer reported that some "teachers in infant schools are careful to exclude children with nasal catarrh and coryza [common cold] when measles is known to exist, and that this is an important aid in checking an outbreak." [27] However,

because of its limited effectiveness, the complete closure of schools was no longer favoured as a preventive measure against the spread of infectious disease. In 1909 Dr. Dewar reported that both the Scotch Education Department and the Local Government Board had advised against such measures. [28] Yet, where in the 1880s local authorities encountered difficulty in securing school closures during epidemics, now there was difficulty in persuading school boards to give up this practice. The closing of schools for short periods during outbreaks of infectious disease continued into the 1920s. Measles outbreaks, for example, led to the closure of Balcurvie infant school for a few days during 1913 and Dunino public school for five days during 1925. [29] In 1912 the Fife County Medical Officer, Dr. Yule, suggested that mortality from measles would probably be reduced if children began school later in life. [30] Where infants were being sent to school this was a possibility, but they formed a small proportion of the total school population susceptible to infection with measles, and as was suggested in the previous section, most of the mortality from measles and also whooping cough occurred amongst children who still remained at home. It was therefore a main concern of public health authorities in their attempts to control the effects of measles and whooping cough to educate parents in the more careful management of children who contracted these diseases.

A number of writers have noted the generally casual attitudes of British parents in dealing with children suffering from measles and whooping cough. [31] The evidence of public health officials attests that such attitudes were common amongst parents in Fife. In 1911 the Kirkcaldy

burgh Medical Officer, Dr. McIntosh, remarked that parents showed little regard for the danger to children from measles and stressed that children should be protected from the disease for as long as possible. [32] As children grew older the chances of their dying from measles diminished, Dr. Yule noted in 1912: "with every additional year of life beyond the second, the mortality [from measles] rapidly falls, an obvious indication of the saving of life which results from postponing, if possible, the attack..." [33] Parents were reported to be similarly complacent in their management of whooping cough. "Parents generally do not look on this disease as requiring much care", wrote Dr. McIntosh in 1911. [34] In 1891 Dr. Huntington reported six deaths from whooping cough in St. Andrews and warned of the possibility of prosecutions under the Public Health (Scotland) Act against parents who allowed children with mild whooping cough to attend school. [35] In 1909 Dr. Dewar reported the case of a child who had been allowed to make a rail journey across Fife whilst suffering from a severe attack of whooping cough. [36] In 1927 Dr. Reekie of Dunfermline described the thinking behind the apparent wilful neglect by parents of children suffering from measles and whooping cough:

> "The fact that measles and whooping cough are diseases that kill appears to be an aspect which the average parent fails to grasp; they are not considered of much consequence and are regarded in the light of inevitable childish ailments which have to be "got over". Owing to this attitude of mind, children have been known to be wittingly exposed to infection." [37]

Care of children with measles or whooping cough was important not only to prevent patients from dying but also to prevent those who survived from suffering complications as a result of infection. The main cause of

death in these diseases were respiratory conditions, the development of which were "directly attributable to lack of proper attention at home." [39] During the epidemic of measles in Dunfermline in 1898 it was reported that the type of the disease was "severe and pulmonary complications accounted for over twenty deaths." [40] Complications in measles and whooping cough could include bronchitis and pneumonia, which, if they did not cause death, could lead to permanent damage to the respiratory system. [41] Such damage was thought to be a predisposing cause of tuberculosis in later life. [42] Other complications in measles included ophthalmia, otitis media and enteritis, and an attack of whooping cough could also lead to convulsions, which might result in damage to the nervous system. [43]

By the 1920s public health authorities in Fife were beginning to contemplate direct measures for the control of measles and whooping cough. By this time mortality from the other main infectious diseases, except diphtheria, diarrhoeal diseases and tuberculosis, had been reduced to insignificant levels. The recent establishment of school medical services and the appointment of health visitors throughout the county made it possible to keep the susceptible child population under surveillance and see that cases of measles and whooping cough received proper treatment in their homes. However, the establishment of a system for the control of measles and whooping cough required the introduction of a formal system for the notification of these diseases, as was advocated by Dr. Yule in his report for 1915-19. [43] He pointed out that by this time mortality from measles and whooping cough in Fife was

twice as high as that due to diphtheria, typhoid and scarlet fever, all of which remained compulsorily notifiable. However, in 1924, in response to a circular from the Scottish Board of Health on the control of measles and whooping cough, the County authorities in Fife determined not to adopt compulsory notification of these diseases or to appoint additional health visitors specifically for the purpose of treating them. [44] A similar response to the Board of Health's circular was made by the Kirkcaldy burgh Medical Officer, Dr. McIntosh, who was of the opinion that, where it had been adopted, notification of measles had "not proved of much benefit". [45] However, he proposed a partial system of notification of both measles and whooping cough, under which the first case in each house was reported in order that home conditions of the patients could be investigated. [46] In Dunfermline such a system for the partial notification of measles and whooping cough was introduced in 1927. [47]

Dr. McIntosh also considered unnecessary the appointment in Kirkcaldy of visiting nurses specifically for the purpose of treating measles and whooping cough. [48] Due to the pressure of their other responsibilities it was impossible for the three health visitors in Kirkcaldy to carry out such work, but he proposed that during epidemics of measles and whooping cough home treatment of cases might be provided by the staff of the burgh infectious diseases hospital. The burgh Medical Officer for Dunfermline, Dr. Reekie, stated that it was "essential" to have domiciliary nursing of cases of measles and whooping cough during epidemics. [49] In Dunfermline the home treatment of these diseases had been introduced by 1932, when nurses of the Dunfermline, Rosyth and

Kingseat Nursing Associations made a total of 942 visits to cases of measles and 150 visits to cases of whooping cough. [50] During the 1930s the domiciliary nursing of cases of measles and whooping cough in Dunfermline may have contributed to reduction of the death rate from these diseases to a lower level than occurred in Kirkcaldy during that decade. (Figure 9.5 and 9.6)

In Kirkcaldy small numbers of cases of measles and whooping cough were admitted to the burgh infectious diseases hospital from the early 1900s. Between 1904 and 1924 seventy cases of measles and two cases of whooping cough were hospitalized there. [51] With the decline of the other main infectious diseases more hospital beds became available for the treatment of measles and whooping cough. In 1924 Dr. McIntosh reported that by this time one ward at the infectious diseases hospital in Kirkcaldy was often vacant and that, if epidemics of other diseases did not occur, there was room at the hospital to accommodate twelve children suffering from measles or whooping cough. [52] In 1911 an outbreak of measles occurred amongst workers at the Rosyth naval base who were living in the crowded common-lodging houses at Jamestown, near Inverkeithing. [53] The early cases in this outbreak were removed to the West Fife Infectious Diseases Hospital at Dunfermline. During 1912 there was a recurrence of measles at the Jamestown lodging houses, as a result of which a Speirs prefabricated hospital was erected at the West Fife Infectious Diseases Hospital for use as a measles pavilion. [54] The Rosyth measles outbreaks were unusual in occurring amongst adults, a circumstance which indicated special provision for treatment.

Children suffering from measles or whooping cough were usually only removed to hospital when "the nature of the illness or the housing conditions and home-care were such as to jeopardise the patient's chance of recovery." [55] In 1925 it was reported that in the County area the only whooping cough patients who were admitted to hospital were those suffering from *sequelae* such as pneumonia. [56] In the 1940s measles and whooping cough patients removed to hospital were usually those suffering from severe bronchopneumonia, which did not respond to sulphonamide treatment. [57] Open-air treatment was regarded as the most effective remedy in such cases and could only be carried out effectively under hospital conditions. Cases of whooping cough in which convulsions were a complication were also removed to hospital, where they were treated by lumbar puncture (tapping of the cerebrospinal fluid). [58] The number of cases of measles and whooping cough removed to hospital was always small. However, the selection during the interwar period of the most severe cases of these diseases for hospital treatment was an important complement to the improvement in the home treatment of measles and whooping cough which occurred at this time. Removal to hospital saved the lives of those cases which were unlikely to survive even improved home treatment and therefore helped to reduce mortality from measles and whooping cough to the lowest possible level under the socio-economic and environmental conditions then prevailing in Fife.

The success of diphtheria immunisation in Scotland led to the introduction by some local authorities of immunisation against whooping cough. By 1950 Fife County Council and the burgh councils of Dunfermline and Kirkcaldy were amongst twenty-five Scottish authorities which

carried out whooping cough immunisation. [59] Immunisation against whooping cough was introduced in the Fife County area in December 1942. [60] It was aimed to complete a series of four immunising injections in infants between the ages of four and six months, but children over the age of one were not refused immunisation. However, here parental attitudes regarding the prevention of whooping cough were again found to be unhelpful. Difficulty was encountered in getting parents to present children for the four immunising injections at weekly intervals. Consequently, some children received a double-dose injection followed by a second of the same strength not less than four weeks later. By 1950 a total of 6 025 children in the Fife County area had received a first immunising injection against whooping cough. [61] Of that number 91% had received a second injection but only 15% had received a third injection. Therefore, unless most of the immunised children received the double-dose injections, there must be some doubt as to the early efficacy of the Fife County immunisation campaign against whooping cough. Triple vaccination against diphtheria, whooping cough and tetanus, which is the form of protection against these diseases in use to the present day, was introduced throughout Scotland during the early 1960s. However, combined immunisation against diphtheria and whooping cough in Fife was first carried out in the Lochgelly-Auchterderran area in 1947. [62] Vaccination against measles was also introduced in Scotland during the 1960s but was only partially successful. In 1987 there were plans to introduce in Britain a new triple vaccination against measles, mumps and rubella. [63]

What part of the reduction in mortality from measles and whooping cough in Fife can be attributed to the efforts of public health authorities to control these diseases? McKeown *et al.* see nutritional standards as determining levels of mortality from measles, although they do not regard standard of living as a factor in rates of infection from this disease. [64] Preston *et al.* cite the twentieth-century decline in mortality from pneumonia, which was the most common complication in measles, as an important factor in the decline in mortality from the latter disease, particularly after the introduction of sulphonamide therapy during the 1930s. [65] Misregistration of mortality in which the primary cause of death was measles may have led to the understatement of the decline in mortality from this disease. The same could be true of mortality from whooping cough, in which pneumonia was also a common cause of death. Thomson identified better child health and nutrition, better housing and the decrease in family size as factors in the decline in mortality from whooping cough. [66] However, there may have been an inverse relationship between levels of crowding and incidence of whooping cough:

> "Available evidence points to a higher incidence rate amongst children in better-class houses. This may be due to a higher level of observation and notification, but there is a possibility of more atypical cases, with resultant immunity, taking place in more crowded surroundings." [67]

Administrative measures to prevent the spread of measles and whooping cough were ineffective. By the First World War local authorities in Fife had abandoned school closure as a means of dealing with measles and whooping cough and switched their attention to educating parents in the better care of children who were suffering from these diseases. During

the interwar period this work became part of the developing provision for child welfare in Fife, including health visiting and child welfare clinics. [68] Between 1911 and 1950 infant mortality in Fife declined by 47% to 50.3 deaths per 1 000 live births. [69] Between 1915 and 1943 combined infant mortality from measles and whooping cough in the Fife County area declined by 69% to 2.2 deaths per 1 000 live births. [70] The health of pre-school children over one year of age would also have shown improvement during this period. Some of this improvement in child health, by which the ability to withstand infection was increased, may be attributed to the work of the child welfare services in Fife.

An accompanying improvement during the interwar period, for which the local authorities in Fife gain most credit, was in the development of housing. The effect of the reduction in levels of crowding upon rates of infection in measles and whooping cough is unclear. However, reductions in crowding and the provision of larger houses would have facilitated the better home treatment of patients. [71] Further improvements in the treatment of cases of measles and whooping cough included the provision from the 1920s of hospital accommodation for such patients and the introduction during the 1930s of sulphonamide drugs, both in hospitals and home treatment, which was carried out by GP's. During the 1940s the introduction of immunisation against whooping cough marked the beginning of effective preventive measures against this disease, but similar measures for the control of measles have still to be introduced. It may be concluded that prior to the First World War the contribution of public health administration to the reduction in mortality from measles and whooping cough in Fife was insignificant. However, during the

interwar period and the 1950s public health administration probably made a substantial although indirect contribution to that decline.

Chapter 9. Measles and whooping cough in Fife. Notes

1. OCM 693

2. ibid. 1035. *Bordetella pertussis* was first observed by the French bacteriologists Bordet and Gengou in 1900 and cultivated by them in 1906. (H.J. Parish, A History of Immunization (Edinburgh 1965) 243)

3. W.S. Craig, Child and Adolescent Life in Health and Disease (Edinburgh 1946) 342

4. See, for example, 1909 AR 28; Kirkcaldy TC Health Committee minutes 1 April 1924 Report on measles and whooping cough by the burgh Medical Officer of Health; D MOH 1927 AR 8

5. Anthony S. Wohl, Endangered Lives. Public Health in Victorian Britain (London 1984) 130

6. Marilyn E. Pooley and Colin G. Pooley, "Health, society and environment in Victorian Manchester", in Robert Woods and John Woodward (eds.), Urban Disease and Mortality in Nineteenth-Century England (London 1984) 67. See also James L. Halliday, An Inquiry into the Relationship between Housing Conditions and the Incidence and Fatality of Measles. Medical Research Council Report No. 120 (London HMSO 1928) 6-7 and F.B. Smith, The People's Health 1830-1910 (London 1979) 147-48

7. T.C. Smout, A Century of the Scottish People 1830-1950 (London 1986) 219

8. Flinn SPH Table 5.6.7

9. Halliday op. cit. 6

10. For a detailed description of how measles was spread in the urban conditions of Glasgow, see Halliday op. cit. For school attendance in Scotland in 1871, see R.D. Anderson, "Education and the state in nineteenth-century Scotland" Economic History Review 2nd. series 36 (1983) Table 3

11. Flinn SPH Table 5.6.6

12. D. Thomson, "Whooping Cough - A Review" Monthly Bulletin of the Ministry of Health 12 (1953) 96

13. ibid. 94

14. ibid. 96

15. Halliday op. cit. 7

16. RGS 1876, 1879, 1880

17. Wesley W. Spink, Infectious Diseases. Prevention and Treatment in the Nineteenth and Twentieth Centuries (Minnesota 1978) 183

18. Smith op. cit. 143. See also Halliday op. cit. 31

19. W.R. Bassili and G.T. Stewart, "Epidemiological evaluation of immunisation and other factors in the control of whooping cough" Lancet 1976 I 471

20. Thomas Ferguson, Scottish Social Welfare 1864-1914 (Edinburgh 1958) 410

21. See p. 109 above.

22. Kirkcaldy PC minutes 13 December 1886, 10 January 1887

23. D MOH 1894 AR; D MOH 1898 AR; D MOH 1907 AR

24. St. A MOH 1904 AR

25. K MOH 1911 AR 29

26. Ferguson op. cit. 570; 1909 AR 28

27. K MOH 1911 AR 28

28. 1909 AR 44-45

29. 1913 AR 103; 1925 AR 62

30. 1912 AR 39

31. Halliday op. cit. 9; Smith op. cit. 146; Wohl op. cit. 18

32. K MOH 1911 AR 28

33. 1912 AR 39. See also 1922 AR 12, 1923 AR 9-10

34. K MOH 1911 28

35. St. A MOH 1891 AR

36. 1909 AR 29

37. D MOH 1927 AR 8

38. G.S. Parkinson, A Synopsis of Hygiene (ninth edn. London 1947) 69

39. D MOH 1898 AR

40. 1909 AR 28-29; K MOH 1912 AR 45

41. John Brownlee, "Public Health Administration in Epidemics of Measles" British Medical Journal 1920 I 535; D MOH 1927 AR 8

42. Parkinson op. cit. 66; Halliday op. cit. 27; 1939-45 R Final report by Dr. Fleming, medical superintendent of the Thornton Infectious Diseases Hospital

43. 1915-19 R 8

44. 1924 AR 42

45. Kirkcaldy TC Health Committee minutes 1 April 1924 Report on measles and whooping cough op. cit.

46. ibid. 1 April 1924 Report on measles and whooping cough op. cit.

47. D MOH 1927 AR

48. Kirkcaldy TC Health Committee minutes 1 April 1924 Report on measles and whooping cough op. cit.

49. D MOH 1927 AR 8

50. D MOH 1932 AR

51. K MOH reports 1904-24

52. Kirkcaldy TC Health Committee minutes 1 April 1924 Report on measles and whooping cough op. cit.

53. 1911 AR 88-90

54. 1912 AR 111

55. 1924 AR 42

56. 1925 AR 62

57. 1939-45 R 119 Final report by Dr. Fleming, superintendent of the Thornton Infectious Diseases Hospital

58. ibid. 119

59. Thomas Scott Wilson, "Public Health Services", in Gordon McLachlan (ed.), Improving the Common Weal. Aspects of Scottish Health Services 1900-84 (Edinburgh 1987) 302

60. 1939-45 R 81-82

61. Fife County Medical Officer's annual reports 1939-50

62. Scott Wilson op. cit. 303; 1947 AR 71

63. Scott Wilson op. cit. 305-07

64. Thomas McKeown, R.G. Record and R.D. Turner, "An Interpretation of the Decline of Mortality in England and Wales during the Twentieth Century" Population Studies 29 (1975) 414

65. Samuel H. Preston, Nathan Keyfitz and Robert Schoen, Causes of Death. Life Tables for National Populations (New York 1972) 2-3

66. Thomson op. cit. 94, 97

67. ibid. 101

68. For the development of child welfare services in Fife, see chapter 6 (p. 207-14) above.

69. RGS 1911-50

70. Fife County Council. Public Health Committee minutes 3 July 1944 Report by the Medical Officer of Health on Infant Mortality in Fife (15 May 1944)

71. For state-aided housing improvements in Fife, see section 3.3 and chapter 6 (p. 203-04) above.

CHAPTER 10

INFLUENZA IN FIFE

1. The incidence of mortality from influenza in Fife 1855-1950

Preston *et al.* note that "deaths ascribed to influenza usually result directly from the complication of pneumonia..." [1] Therefore it is likely that in Scotland many deaths in which influenza was the primary cause were registered as due to pneumonia. However, up to 1921 the annual reports of the Registrar-General for Scotland (RGS) provide no means of differentiating mortality from pneumonia in which influenza was the primary cause from other pneumonia mortality. Therefore mortality from influenza here includes all deaths as given in the annual reports of the RGS in which influenza figured in the registered cause of death. From 1921 it includes those deaths in which influenza was given as a joint cause, such as "influenzal pneumonia".

Table 10.1.1 Mortality from influenza in Scotland and Fife 1855-1950

Death rate (DR): deaths from specified cause per 100 000 inhabitants

	Scotland	Fife	: % difference : DR's
1855-60	12.0	7.3	: -39.2
1861-70	7.0	5.6	: -20.0
1871-80	3.5	2.9	: -17.1
1881-90	3.5	2.0	: -42.9
1891-1900	32.5	31.9	: -1.9
1901-10	13.5	12.2	: -9.6
1911-20	11.5	10.9	: -5.2
1921-30	36.5	38.8	: +6.3
1931-40	27.5	22.9	: -16.7
1941-50	9.5	7.1	: -25.3

Sources: see Tables 1.B.2 and 1.C.2

The pattern of mortality from influenza in Fife during the period 1855-1950 is dominated by the effect in the county of the pandemics of 1889-90 and 1918-19 and subsequent epidemics. [2] The pattern of mortality from influenza in Fife during the period is virtually identical with that in Scotland as a whole. (Figure 10.1) During *c.*1855-90 average levels of influenza mortality in Fife were 30% below the national average. (Table 10.1.1) However, in both Fife and Scotland as a whole during this period, mortality from influenza was declining to a low level from rates of *c.*10 deaths per 100 000 inhabitants in 1855-60, when the disease was widespread in Europe and also North and South America and caused a "slight epidemic" in Scotland in 1857. [3] Deaths recorded as due to influenza during this interepidemic period may have been misdiagnosed cases of common cold, which was commonly known as "influenza" at this time. [4]

The influenza pandemic of 1889-90 reached Scotland in late 1889. In 1890 influenza made its way into Fife soon after its arrival in December 1889 in Leith, where the disease was imported from Riga. [5] Influenza first appeared at Burntisland and then spread to Kirkcaldy, Leven, Elie, St. Monance, Anstruther and Crail, where a first case was reported on 12 January 1890. A local practitioner in Crail, Dr. Saunders, reporting to Dr. Parsons of the Local Government Board, suggested that the disease had been carried to Crail on the wind, which was not impossible but unlikely. [6] What is clear is that even in an only moderately populous area such as Fife, influenza could spread rapidly, for within a few days the disease had reached the remote eastern tip of the county. However, during 1890-91 Fife suffered only 5% of the 3 197 deaths from influenza in Scotland, and between 1892 and 1900 only 4% of the 12 785 influenza deaths in Scotland occurred in Fife. During the pandemic of 1918-19 and the subsequent epidemic period of 1920-29 influenza mortality in Fife was respectively 5.5% (171 deaths) and 6.3% (1 092 deaths) of that in Scotland as a whole. The 1920s was the only decade during the period when average mortality from influenza was higher in Fife than in Scotland as a whole.

Figure 10.2 shows the distribution of influenza mortality during 1855-1950 in the different divisions of Fife. The most striking feature is the great excess of mortality in the rural districts over that in the large-town and small-town districts during the 1890s. This is in contrast to the pattern of influenza mortality in the county during the pandemic of 1918-19 and the subsequent epidemics during the 1920s and 1930s. Then peak mortality also occurred in the rural districts but at

this time was only slightly above the highest levels in the large-town and small-town districts, and the decline in influenza mortality from peak levels in the rural districts occurred about five years before that in the urban divisions.

How can one explain the contrasting patterns of rural mortality due to influenza in Fife during the epidemic periods of the 1890s and the 1920s and 1930s and the similarity of the patterns for the urban districts during these periods? Figure 10.3 shows that during the 1890s influenza mortality rates were somewhat higher in Kirkcaldy than in Dunfermline, which, with Parson's description of the eastward spread of influenza in the county during early 1890, might suggest that the disease was most prevalent in the southern coastal areas and the rural east of Fife. However, given the rapidity with which influenza could spread in any direction, it is unlikely that it would have affected the more densely populated western half of the county less severely than the east at this time.

In any case, data given by Flinn show that the pattern of higher influenza mortality in rural districts than in urban districts of Fife during 1890s reflected conditions in Scotland as a whole, as did the absence of such a pattern in the county during the 1920s. During 1891-1900 the average mortality rate from influenza in the mainland rural districts of Scotland (31 deaths per 1 000 from all causes) was almost twice as high as that in the urban districts (16). [7] In Fife this difference, calculated from influenza deaths per 10 000 inhabitants, amounted to 126%. However, during 1921-30 the average mortality rate

from influenza in the mainland and insular rural districts of Scotland, which were undifferentiated by Flinn, was, at 32 deaths per 1 000 from all causes, only 23% above that in the urban areas. In Fife the average influenza mortality rate (influenza deaths per 10 000 inhabitants) in the rural districts during 1921-30 was only 0.8% above that in the urban districts of the county.

The excess of influenza mortality in the rural districts of Fife cannot have been directly related to standards of health or levels of crowding there. During the 1890s average levels of crowding in Fife were lower in the rural districts than in the large town districts and about the same as in the small town districts. [8] General standards of health and nutrition were unlikely to have been worse in the rural districts than in the urban districts. [9] Therefore during the 1890s the infectivity of influenza could not have been greater and the ability of persons to withstand infection could not have been less in the rural districts of Fife than in the urban districts. However, the factor of immunity to influenza has yet to be considered.

The difference in the patterns of influenza mortality in the divisions of Fife during the 1890s and the 1920s and 1930s is explained by the "unique and extraordinary feature" of the age distribution of mortality in the 1918-19 pandemic, in which worldwide the greatest levels of mortality: over 20%, occurred in the 15-35 age group. [10] This was in direct contrast to the age distribution of mortality in the influenza pandemic of 1889-90, when levels of mortality exceeding 15% only occurred amongst persons over the age of 55. [11] As was noted, during

the 1890s and the 1920s the distribution of influenza mortality in the divisions of Fife reflected that in the rural and urban areas of Scotland as a whole. Figures given by Flinn show that in 1891-1901 the proportion of the population in rural areas of Scotland aged over 65 was 65% greater than that in the towns and cities of Scotland. [12] By contrast, during 1921-31 the proportion of the population in the rural areas of Scotland in the 15-64 age group was only 4.7% less than that in the towns and cities of the country. The correlation between the different age-specific distribution of mortality during the periods of influenza epidemics in the 1890s and the 1920s and the varying distribution in the rural and urban areas of Scotland of the different age groups which were most vulnerable during these epidemics is clearly demonstrated.

The reason for the unusual age distribution of mortality in the influenza pandemic of 1918-19 is not known. During the pandemic some of the highest mortality and case-mortality rates due to influenza were recorded in such countries as the USA and India rather than in war-worn Europe. Winter notes "the observation of a number of military doctors that stronger and more robust men succumbed to the disease more quickly than weaker men..." [13] He therefore concludes that the phenomenon of highest mortality amongst young adults and the middle-aged during the 1918-19 pandemic was not the result of a general undermining of health due to the stresses of war. Burnet and White compare the 1918-19 pandemic with that of 1781-82, when a contemporary writer observed: "Children and old people either escaped the influenza entirely or were

affected in a slight manner." [14] However, they offer no explanation for the peculiar age distribution of mortality in the 1918-19 pandemic.

Katz relates the high influenza mortality amongst young adults in the USA during the 1918-19 pandemic to levels of immigration from rural Europe during the late nineteenth and early twentieth centuries. [15] The majority of European immigrants to the USA during this period were in the 14-44 age group and, because they came from rural areas, were unlikely to have developed immunity to influenza through previous exposure to the disease. Furthermore, poor living and working conditions in the United States weakened their resistance to influenza. Meanwhile the low mortality amongst the aged during the pandemic of 1918-19 was the result of immunity acquired in previous epidemics. This theory may explain the contrasting patterns of age-specific influenza mortality during the epidemic periods of the 1890s and 1920s in Scotland, for between 1891 and 1911 the country received over 20 000 immigrants from Europe. [16] However, by this reasoning a more simple explanation may be given for the different age distribution of mortality during the periods of epidemic influenza in Scotland during the 1890s and 1920s. It may be that the aged in the Scottish population of the 1920s had acquired immunity to influenza during the epidemic period of the 1890s but that the aged in the population during that latter epidemic period had acquired no such immunity, for by the 1890s most of those who had acquired immunity to influenza during the previous epidemic period during the 1850s were already dead. However, this is another unresearched area in the history of infectious disease in Britain.

2. Influenza and public health administration in Fife

Ranger writes that the influenza pandemic of 1918-19 "is hardly an episode in conventional medical history at all [because] the influenza viruses still defy medical science." [17] There is as yet no story of the conquest of influenza and, as with the study of the attempts in Britain to control cholera, a consideration of the response of public health administration to epidemics of influenza deals mainly with the ineffectiveness of that response. In the reports of the Fife County Medical Officers the problem of influenza was first discussed in 1909, when Dr. Dewar complained of the vague use of the term in death certification:

> "I have made no attempt to tabulate or even to estimate the frequency of the occurrence of "Influenza", or the deaths attributed to this cause. Such statistics would be of no value. For "Influenza", as used in common talk or in certificates of death, is not the virulent illness of widespread and fulminating epidemic type described in the medical text-books as spreading like a tornado over Europe some five or six times in the course of the last century, but by a process of degeneration has come to mean nothing more than "febrile disorder of unknown or undifferentiated type". With feverish illnesses lasting from a few days to a few weeks it therefore only indicates (as with the term "cardiac failure" in the case of sudden deaths) that to the certifying practitioner the means of completing a diagnosis were awanting." [18]

At this time it was impossible to conclusively diagnose isolated cases of influenza. The disease virus had yet to be discovered and the symptoms of the disease, which included fever, catarrh, prostration and in old people the *sequela* of pneumonia, were common to other infections, such as the common cold. [19] However, influenza was easily identifiable by its epidemiological characteristics. There would be a sudden

appearance of many cases with the abovementioned symptoms, the disease would remain prevalent for a few weeks and would then disappear. However, by the time it was realised that such an outbreak was an influenza epidemic it was too late to attempt to control it by the isolation of first cases. As in scarlet fever, the problem of the spread of the disease was exacerbated during an epidemic by numbers of mild or symptomless cases of subclinical infection, who did not become ill but could nevertheless transmit the disease to others. [20] Under such conditions it was futile to attempt to control an influenza epidemic by administrative means. Public health authorities in Fife were never obliged to do this, for influenza has never been a notifiable disease.

Action against influenza by public health authorities in Fife was limited to issuing warnings to the public, occasional school closures and the hospitalization of selected cases, including those who developed pneumonia. Under the Public Health (Influenza) Regulations of 1918, which remained in force until May 1919, local authorities posted warnings to inhabitants of the spread of influenza and issued advice on treatment of the disease. [21] In 1935 the burgh Medical Officer for Dunfermline, Dr. Reekie, criticised influenza patients for not appreciated the seriousness of their illness at its onset. [22] As a result, some patients suffered relapses and developed pneumonia. In an epidemic of influenza in Dunfermline during the winter of 1936-37, when it was estimated that half the population of the burgh was affected with the disease and whole families and the staff of shops and factories became ill, Dr. Reekie wrote that the spread of influenza had been assisted by the crowding of people in Christmas shopping and New Year's

festivities. [23] During 1919 many schools in the County area were closed as a precaution against the spread of influenza and in 1924 Kilmany public school was closed for eight days due to the prevalence of "an infectious condition of an influenzal nature." [24] However, of the school closures in 1919 the County Medical Officer, Dr. Yule, remarked: "Whether [they] played any part in the prevention of the spread of infection I am not prepared to say."

In 1920 the Scottish Board of Health authorised local authorities to remove to hospital those cases of influenzal pneumonia whose home conditions did not permit satisfactory domiciliary treatment. [25] In 1922 a ward at the Kirkcaldy burgh infectious diseases hospital was set aside for such cases of both influenza and influenzal pneumonia. [26] From 1927 acute influenzal pneumonia became a notifiable disease. [27] On the basis of health visitors' reports on home conditions, Medical Officers of Health determined which notified cases of influenzal pneumonia should be hospitalized. In 1935, for example, out of a total of 62 cases of influenzal pneumonia notified in the Fife County area, 27 (44%) were removed to hospital. [28] At about this time sulphonamide drugs, including sulphapyridine and sulphathiazole tablets, became available for the treatment of pneumonia. After 1941 penicillin was used in cases which did not respond to the sulphonamide treatment. With the new drugs the home treatment of pneumonia, including the influenzal type, became easier, but the superintendent of the Thornton Infectious Diseases Hospital, Dr. Fleming, still recommended hospital treatment of all forms of pneumonia:

> "...it is always difficult, even in the best private home, for the patient to have adequate fresh air, which is still a vital part of the treatment of pneumonia - especially in young children. Sulphonamide treatment, to be successful, must be given in full doses every four hours - an unpleasant ordeal for a patient with nausea - and it is common experience that a recalcitrant patient can be helped through the difficult stage of the first few days more successfully in hospital than at home." [29]

During the 1930s influenza remained widespread in Fife and mortality rates from the disease were high, averaging 23 deaths per 100 000 inhabitants. From *c.*1935 the use of sulphonamide drugs made a considerable contribution to the reduction of mortality from influenza complicated by pneumonia. [30] In Fife much of this treatment was administered by general practitioners, but, particularly in west Fife where poor housing and overcrowding were widespread, a sizeable proportion of notified cases of influenzal pneumonia was removed to hospital. During 1939-45, for example, a total of 64% (353 patients) of such cases in the Fife County area was removed to infectious diseases hospitals, and in the west Fife County area the proportion hospitalized was 74% (291 patients). [31] Thus, by the end of the period, public health authorities in Fife were making a useful contribution to the cure of influenza and its *sequelae*, if not to the prevention of the disease.

Influenza in Fife. Appendix

The following is the text of a poster distributed under the Public Health (Influenza) Regulations of 1918 by the Medical Officer of Health for the burgh of Leven.

INFLUENZA

By order of the Local Government Board, I am asked to bring the following points before the members of the community, as a guide and help in combating and preventing the spread of the INFLUENZA Epidemic:

1. The acutely infectious nature of Influenza;

2. The shortness of the incubation period; this is probably within 48 hours of exposure to infection;

3. The stage at which the infectivity is greatest is at the beginning of the attack;

4. The advisability of going to bed the moment the symptoms of "cold in the head", or headache, or fever, supervene;

5. The value of Cleansing Gargles or Mouth Washes or Nasal Washes as a preventive; for example, a dilute solution of Condy's Fluid (or Permanganate of Potash), to which a pinch of Common Salt has been added;

6. The urgency of procuring Medical Advice at the earliest possible moment;

7. The extreme danger and fatality of complications or sequels, such as Pneumonia;

8. The risk of going into crowded places;

9. The need for free ventilation of bedrooms day and night, whether occupied or unoccupied;

10. The fact that Influenza is spread mainly by direct infection from person to person;

11. The danger of diffusing the disease by coughing, or sneezing, and the need for personal attention to this fact;

12. The simplest method of disinfecting articles, such as handkerchiefs, is by boiling.

BY ORDER OF THE LOCAL GOVERNMENT BOARD

LEVENBANK, LEVEN,
7th October, 1918.

R. BALFOUR GRAHAM, F.R.C.S., D.P.H., etc., Edin.;
Medical Officer of Health for the Burgh of Leven

Chapter 10. Influenza in Fife. Notes

1. Samuel H. Preston, Nathan Keyfitz and Robert Schoen, Causes of Death. Life Tables for National Populations (New York 1972) 5

2. W.I.B. Beveridge, Influenza: the Last Plague. An Unfinished Story of Discovery (London 1977) 30

3. Charles Creighton, History of Epidemics in Britain (Cambridge 1894) II 392

4. Beveridge op. cit. 11; 1909 AR 31-32

5. H. Franklin Parsons, Local Government Board. Report on the Influenza Epidemic of 1889-90 (London HMSO 1891) 12

6. ibid. 12; Beveridge op. cit. 48

7. Flinn SPH Table 5.6.6

8. See Table 3.3.2

9. See p. 5 above.

10. Beveridge op. cit. 31; Sir Macfarlane Burnet and David O. White, Natural History of Infectious Diseases (fourth edn. Cambridge 1972) 205

11. Burnet and White op. cit. Figure 25

12. Flinn SPH Table 5.2.4 Age structure, by regions 1861-1931 (both sexes)

13. J.M. Winter, The Great War and the British People (London 1986) 121

14. Quoted in Burnet and White op. cit. 203

15. Robert S. Katz, "Influenza 1918-19: a Study in Mortality" Bulletin of the History of Medicine 48 (1974) 416-22

16. Flinn SPH 457-58

17. Terence Ranger, "The Influenza Pandemic in Southern Rhodesia" Bulletin of the Society for the Social History of Medicine 39 (December 1986) 38

18. 1909 AR 31-32

19. Burnet and White op. cit. 202. The influenza virus was first isolated in 1933 by the English researchers Andrewes and Smith. There are three types of influenza virus, A, B and C. The most common virus is type A, but type B may also cause epidemics and leads to a severe condition known as Reye's syndrome, which involves the degeneration of the brain, liver and kidneys. Influenza in pregnant women may result in congenital defects in the offspring. (Beveridge op. cit. 7-10, 16-17)

20. Beveridge op. cit. 13

21. G.S. Parkinson, A Synopsis of Hygiene (ninth edn. London 1947) 80; see appendix (p.327) above.

22. D MOH 1935 AR 14

23. 1937 AR 14

24. 1915-19 R 27; 1924 AR 32

25. Leven MOH 1920 AR 1

26. Kirkcaldy TC minutes K MOH January 1922 R

27. Parkinson op. cit. 81

28. 1935 AR 47

29. 1939-45 R 117 Final report of Dr. Fleming, medical superintendent of the Thornton Infectious Diseases Hospital. In hospital, empyema (the collection of pus in the pleural cavity) in pneumonia cases was treated by aspiration of the pus and the instillation of penicillin solution into the drained cavity.

30. Beveridge op. cit. 14

31. 1939-45 R Appendix, Table 2

CHAPTER 11

TUBERCULOSIS IN FIFE

Introduction

The aim of this chapter is to describe the changes in the level and distribution of mortality from tuberculosis in Fife during the period *c.*1861-1950. In this and the following chapters some of the problems of controlling tuberculosis are described and, as far as is possible, the work of the local-authority tuberculosis schemes in Fife is evaluated. However, analysis of age- and sex-specific mortality from tuberculosis is beyond the scope of this study and there is opportunity here only to touch upon the relationship between the incidence of tuberculosis and changing conditions of housing and work and other factors in the epidemiology of the disease in Fife. These aspects of the history of tuberculosis in Fife are interrelated and could be elucidated only by further detailed research.

1. Mortality from tuberculosis in Fife *c.*1861-1950

Mortality from tuberculosis here refers to all deaths due to the following causes, as given in the annual reports of the Registrar-General for Scotland (RGS): pulmonary tuberculosis; tuberculous meningitis; abdominal tuberculosis; and other forms of tuberculosis,

including tuberculosis of the bones and joints, lymph nodes and skin. [1] The latter three forms of tuberculosis make up the category of non-pulmonary tuberculosis. A number of historians have noted that during the nineteenth century many deaths in which tuberculosis was the primary cause were certified as due to bronchitis and that in order to determine more accurately the extent of mortality from tuberculosis in Britain at this time it is necessary to add to the certified tuberculosis mortality a proportion of the deaths attributed to bronchitis. [2] However, it is impossible from the available data to determine the proportion of such mortality which should be transferred to tuberculosis. This study follows Flinn in categorising as mortality from tuberculosis only those deaths from the various forms of the disease which were recorded as such in the reports of the RGS. [3]

Table 11.1 Mortality from all forms of tuberculosis in Scotland and Fife 1861-1950

DR: deaths from specified cause per 100 000 inhabitants

	Scotland		Fife			
	DR	% *decr.*	DR	% *decr.*	:	Fife DR as % Sc. DR
1861-70	378.5		247.4		:	65.4
1871-80	354.0	*6.5*	240.2	*2.9*	:	67.9
1881-90	278.5	*21.3*	223.0	*7.2*	:	80.1
1891-1900	239.0	*14.2*	203.1	*8.9*	:	85.0
1901-10	211.0	*11.7*	159.8	*21.3*	:	75.7
1911-20	158.0	*25.1*	121.0	*24.3*	:	76.6
1921-30	106.5	*32.6*	77.7	*35.8*	:	73.0
1931-40	77.0	*27.7*	48.8	*37.2*	:	63.4
1941-50	76.5	*0.6*	45.2	*7.4*	:	59.1
% decr. 1861-1900		*37.6*		*17.9*		
% decr. 1901-50		*63.7*		*71.7*		

Sources: Scotland: RGS 1950 Table 40; Fife: RGS 1861-1940

During the second half of the nineteenth century the decline in mortality from tuberculosis in Fife occurred at about half the rate of that in Scotland as a whole. (As Figure 11.1 shows, during the late 1850s tuberculosis mortality in Fife actually increased.) However, during this period levels of tuberculosis mortality in Fife were always well below those in Scotland as a whole, although at the turn of the century this differential was reduced to only 15%. (Figure 11.1 and Table 11.1) The greatest difference in rates of decline in tuberculosis mortality in Scotland as a whole and Fife during the second half of the nineteenth century occurred during the 1880s, when the rate for Scotland fell by over 20% but that for Fife fell by only 7%. This difference is probably related to the above-average population growth in Fife, which from the 1880s accompanied the expansion of the mining industry in the county. (See Table 2.2.1) However, the questions of why there was such a big difference at this time between tuberculosis mortality rates in Scotland as a whole and Fife and why, in the absence of a cure for and measures to control tuberculosis, these rates were falling are more difficult to answer.

McKeown's argument that improved nutrition was the chief cause of the long-term reduction in tuberculosis mortality in England and Wales has been refuted by Szreter, who, like Cronjé, cites the interaction of multiple factors, including conditions in the home and at work, diet and debility caused by other diseases, as determining levels of tuberculosis mortality. [4] The latter factor is considered by Szreter to be of particular importance in the decline in mortality from pulmonary tuberculosis. Given that during this period the great majority of

persons had undergone primary infection with the tubercle bacillus, in either its human or its bovine forms, mortality from tuberculosis was determined by levels of resistance to the disease. Such resistance was:

> "a dependent function of the general intensity and frequency of *other* debilitating diseases. Many of these were themselves killers but only of a certain proportion of their infected victims, leaving the remainder weakened and prey to late breakdown disease from a previous primary TB infection." [5]

Such other debilitating diseases included the main infectious and respiratory diseases which plagued urban existence during the mid nineteenth century. Mercer suggests that attacks of smallpox, scarlet fever, measles and whooping cough were particularly dangerous in activating latent tuberculous infection. [6] Of those infectious diseases which have been considered in the earlier chapters of this study, it has been seen that during the second half of the nineteenth century death rates in Fife from smallpox, typhus, measles, whooping cough and diarrhoeal diseases were substantially less than the national average, whilst rates from typhoid, scarlet fever and influenza were only marginally less and the rate from diphtheria was slightly greater. The lower incidence of some of these diseases in Fife may have contributed to the lower incidence of tuberculosis mortality there than in Scotland as a whole.

Whilst general levels of disease in a population determined the biological factor of resistance to tuberculous infection, levels of infection themselves were determined by environmental factors. Comparative data for environmental conditions affecting the incidence of tuberculosis in Fife and Scotland as a whole is sparse. However, a

factor where during the second half of the nineteenth century conditions were consistently if only modestly more favourable in Fife than in Scotland as a whole was the level of crowding in housing, as measured by persons per room (PPR). Between 1861 and 1901 average levels of crowding in Scotland as a whole and Fife each declined by 17% to 1.48 and 1.38 PPR respectively and during that period the average level of crowding in Fife was 7.4% less than that in Scotland as a whole. (Table 3.3.2) The improvement of housing by both the expansion and the regulation of building is considered by Rodger to be a more important factor than the improvement of living standards, as measured by real incomes, in securing the decline in mortality which occurred in Scotland during the second half of the nineteenth century. [8]

Differences in forms of housing between Fife and other parts of Scotland, particularly the cities, were also important. In Kirkcaldy, for example, tenements were rarely of more than two storeys and the houses in such buildings had separate external entrances, those of which were in the upper storeys being reached by outside stairs and open balconies. [9] In such structures contact between occupants was less than in the larger city tenements, in which houses were reached by enclosed common stairs, passageways and landings. [10] However, elsewhere in Fife housing conditions were amongst the worst in Scotland, both in terms of crowding and in structure, and were a factor in high levels of tuberculosis mortality. Some examples of such housing conditions in the small burghs and mining districts of the county are given below. Related to housing as a factor in tuberculous infection were conditions at work. [11] There is little information concerning the

relationship of working conditions to the incidence of tuberculosis in Fife, but some suggestions concerning variations in conditions between occupational groups are also given below.

In contrast to the period prior to 1900, when virtually no direct action was taken to control tuberculosis in Scotland, and that from *c.*1950, when the disease was effectively prevented and treated by vaccination and chemotherapy, the first half of the twentieth century was the period of the control of tuberculosis by administrative means, both in Scotland and the rest of Britain. [12] The apparent success of this method of combating tuberculosis may be seen in the substantial decrease in mortality from the disease which occurred throughout Scotland between *c.*1911 and the Second World War. (Figure 11.1) Compulsory schemes for the administrative control of tuberculosis were fully established in Scotland following the introduction of the National Insurance Act of 1911, with its provisions for sanatorium benefit, and of compulsory notification of pulmonary tuberculosis in 1912. [13] However, those factors which were responsible for the decline in tuberculosis mortality during the second half of the nineteenth century continued to operate into the twentieth century and accounted for the sharp drop in such mortality in Fife during the 1900s, by which time, as will be seen, local authorities in the county had made little attempt to control tuberculosis.

Table 11.2 Mortality from pulmonary and non-pulmonary tuberculosis in Fife 1861-1950

DR: deaths from specified cause per 100 000 inhabitants

	PTB		NTB		
	DR	% decr.	DR	% decr.	PTB DR as % all TB DR
1861-70	178.3		69.2		72.1
1871-80	169.1	*5.2*	71.0	*-2.6*	70.4
1881-90	162.6	*3.8*	60.4	*14.8*	72.9
1891-1900	141.0	*13.3*	62.1	*-2.8*	69.4
1901-10	98.8	*29.9*	61.0	*1.8*	61.8
1911-20	71.8	*27.3*	49.1	*19.5*	59.3
1921-30	51.4	*28.4*	26.3	*46.4*	66.2
1931-40	35.2	*31.5*	13.6	*48.3*	72.1
1941-50	34.8	*1.1*	10.4	*23.5*	77.0
% decr. 1861-1900		*20.9*		*10.3*	
% decr. 1901-50		*64.8*		*83.0*	

Source: RGS 1861-1950

Tuberculosis existed in different forms, levels of mortality from which were determined by varying factors. Figure 11.2 and Table 11.2 show how mortality from tuberculosis in Fife was divided between the pulmonary and non-pulmonary forms of the disease. During the second half of the nineteenth century deaths from pulmonary tuberculosis amounted to over 70% of all mortality from tuberculosis in Fife. However, whilst the late nineteenth and early twentieth centuries saw a rapid decline in mortality from pulmonary tuberculosis in Fife, except during the 1880s mortality from non-pulmonary forms of the disease declined little and during *c.*1901-20 accounted for almost 40% of all tuberculosis mortality in the county (142 deaths per annum). However, from the First World War mortality from non-pulmonary tuberculosis in Fife went into a sharp decline and represented a decreasing proportion of all tuberculosis

mortality there. The distribution of mortality from pulmonary and non-pulmonary tuberculosis in Fife is considered below and some explanations are offered for the variations in such mortality which occurred in the different divisions of the county.

Table 11.3 Mortality from pulmonary tuberculosis in the divisions of Fife 1861-1950

DR; deaths from specified cause per 10 000 inhabitants

	LID's		STD's		RD's		
	DR	% decr.	DR	% decr.	DR	% decr.	DR range
1861-70	21,2		n,a,		n,a,		
1871-80	20,6	*2,8*	12,3		23,3		11,0
1881-90	18,4	*10,7*	12,6	*-2,4*	21,9	*6,0*	9,3
1891-1900	15,5	*15,8*	11,7	*7,1*	18,6	*15,1*	6,9
1901-10	12,1	*21,9*	7,5	*35,9*	12,8	*31,2*	5,3
1911-20	8,4	*30,6*	7,4	*-1,3*	6,2	*51,6*	2,2
1921-30	6,0	*28,6*	5,3	*28,4*	4,4	*29,0*	1,6
1931-40	3,9	*35,0*	3,9	*26,4*	2,9	*34,1*	1,0
1941-50	3,8	*2,6*	3,4	*12,8*	3,3	*-13,8*	0,5
% decr. 1861/71-1900		*26,9*		*17,1*		*20,2*	
% decr. 1901-50		*68,6*		*54,6*		*74,2*	

Source; RGS 1861-1950

During the second half of the nineteenth century mortality rates from pulmonary tuberculosis in the divisions of Fife were highest in the rural districts of the county. (Figure 11.3) This is in contrast to the respective evidence of Cronjé and Flinn for the urban and rural districts of England and Wales and the town and mainland rural districts of Scotland. [14] Their data show that during the second half of the nineteenth century mortality from pulmonary tuberculosis was 17.1% lower in the rural districts of England and Wales and mortality from all forms

of tuberculosis was 12.9% lower in the mainland rural districts of Scotland. The high level of mortality from pulmonary tuberculosis in the rural districts of Fife may be an effect of the inflation of death rates in that division in the period prior to 1911. This is a result of the underestimation of the population of the rural division of the county due to the inclusion of the landward populations of town districts in the town divisions. [15] It may also be an effect of misdiagnosis, which Cronjé considers was common in rural areas, where "medical facilities were...rudimentary." [16] However, during the nineteenth century, when the diagnosis of tuberculosis was unaided by tuberculin tests and radiography, it is unlikely that there was a difference between standards of diagnosis in the town and rural districts of Fife which was sufficient to produce significantly greater error in the identification of causes of death in the rural areas. As will be suggested, it is possible that, at least during the late nineteenth century, misdiagnosis of tuberculosis was more likely to occur in urban areas.

The high mortality rate from pulmonary tuberculosis in the rural division of Fife may have been an effect of conditions in the landward mining districts. In particular this is suggested by the increase in mortality in the rural division during the early 1870s, which coincided with the formation of the Fife Coal Company in 1872 and an influx of mineworkers to central Fife. (Figure 11.3) However, in an investigation of conditions in mines and the health of miners in Beath parish in the 1880s Thomas Goodall Nasmyth, who was then Medical Officer for that parish, found that the incidence of pulmonary tuberculosis amongst miners was relatively low. [17] During 1876-87 the average mortality

rate in Beath from pulmonary tuberculosis in males, virtually all of whom were miners, was 10.1 per 10 000 inhabitants, which was 39% below the mortality rate from pulmonary tuberculosis for the whole population of Fife during 1871-90. However, the mortality rate from pulmonary tuberculosis amongst women in Beath was 17.2, which was slightly greater than that county average. This suggests the importance of housing conditions as a factor in the incidence of pulmonary tuberculosis in the rural division of Fife. Nasmyth observed that the housing in Beath parish was "indifferent, and overcrowding prevails to a considerable extent." [18] Cronjé notes that in England the female advantage over males in mortality from pulmonary tuberculosis, which was evident in urban areas, was reversed in rural areas, where during 1851-1900 average death rates amongst females were over 6% above those amongst males. "The crucial factor for [rural] women may have been conditions in the home...and their health must have been greatly affected by housing conditions." [19]

From the data in the reports of the RGS it is impossible to determine relative levels of mortality from pulmonary tuberculosis amongst women in the mining and agricultural districts of the rural division of Fife. Nor is it possible to identify the factors which determined those relative levels of mortality. During the second half of the nineteenth century the housing conditions of both mineworkers and agricultural workers in Fife were relatively poor, but were generally worst in mining communities, which commonly had the highest levels of crowding in the county. [20] (Table 3.B.3) However, the resistance to tuberculosis amongst women in mining and agricultural communities may have been

undermined by other different factors. Amongst the main occupational groups in Scotland miners produced families of the largest average size, although families of agricultural workers were also relatively large. [22] In 1881 average family size in Beath was 5.0 persons, whereas in the agricultural parish of Ceres it was only 3.8 persons. [23] Cronjé suggests a correlation between high fertility rates and high levels of tuberculosis amongst women in two of the main mining regions of England and Wales, Durham and South Wales. [24] A further factor which differed between mining and agricultural communities was relative levels of female employment, which were high in agricultural communities and low in mining communities. [25] Hard work in the fields might weaken resistance to tuberculosis, whilst the milking of cows increased the risk of pulmonary infection by the bovine tubercle bacillus, although such infection was rare. [26] However, the lack of employment for women in mining communities did not necessarily reduce their chances of developing active tuberculosis, for it meant that they remained in their crowded homes, which were a major locus of infection. During the second half of the nineteenth century the high level of mortality from pulmonary tuberculosis in the rural division of Fife was probably caused by excessive mortality amongst females in mining communities, but it is possible that such mortality amongst women in agricultural communities was also relatively high. However, the available data, as given in the reports of the RGS, are insufficient to test these assumptions fully.

Table 11.4 Mortality from pulmonary tuberculosis in Dunfermline and Kirkcaldy large-town districts 1861-1950

Death rate (DR): deaths per 10 000 inhabitants

	Dunfermline		Kirkcaldy			
	DR	% *decr.*	DR	% *decr.*	:	DR range
1861-70	22.4		20.1		:	2.3
1871-80	22.6	*-0.9*	18.6	*7.5*	:	4.0
1881-90	21.0	*8.6*	15.8	*15.1*	:	5.2
1891-1900	16.9	*19.5*	14.1	*10.8*	:	2.8
1901-10	12.7	*24.9*	11.6	*17.7*	:	1.1
1911-20	9.1	*25.4*	7.7	*33.6*	:	1.4
1921-30	6.3	*30.8*	5.7	*26.0*	:	0.6
1931-40	4.1	*34.9*	3.7	*35.1*	:	0.4
1941-50	3.4	*17.1*	4.2	*-13.5*	:	0.8
% decr. 1861-1900		*24.6*		*29.9*		
% decr. 1901-50		*73.2*		*63.8*		

Source: RGS 1861-1950

The curves for mortality from pulmonary tuberculosis in Dunfermline and Kirkcaldy LTD's during the second half of the nineteenth century are distinguished by the two peaks of mortality in the curve for Dunfermline, which contrast with a relatively steady decline in mortality in Kirkcaldy. (Figure 11.4) The first peak may be related to levels of crowding in Dunfermline, which grew worse during the 1860s and during 1861-81 were 15% above levels in Kirkcaldy. (Figure 3.A.3) The second peak may be an effect of the lumping together from 1878 of mortality in Dunfermline burgh and the landward mining villages of Dunfermline registration district. This can be shown by the exceptionally high level of mortality from pulmonary tuberculosis which occurred amongst females in Dunfermline registration district from the

late 1870s. (Table 11.5) During 1855-75 average mortality rates from pulmonary tuberculosis amongst females in the large-town districts of Fife were 17% above the mortality rates from the disease amongst males in those districts. However, during the period 1876-1900 the pulmonary tuberculosis mortality-rate amongst females in the Kirkcaldy district was only 6.5% above that amongst males in both large-town districts, whereas that rate amongst females in the Dunfermline district was over 44% higher. This difference is further proof of the particular susceptibility of females in mining communities to pulmonary tuberculosis, for no other factor can account for the lack of decrease in mortality from the disease amongst females in Dunfermline registration district in comparison to mortality rates amongst females in the Kirkcaldy district and amongst males in both large-town districts.

Table 11.5 Mortality from pulmonary tuberculosis amongst males and females in Dunfermline and Kirkcaldy large-town districts 1855-1900

Death rate (DR): deaths per 10 000 inhabitants

	Dunfermline		Kirkcaldy	
	males	females	males	females
1855-75	10.1	11.6	8.7	10.3
1876-1900	7.9	11.1	7.5	8.2
% decr.	*21.8*	*4.3*	*13.8*	*20.4*

Source: RGS 1855-1900

Why was there an overall decline in mortality from pulmonary tuberculosis in Dunfermline and Kirkcaldy during the second half of the nineteenth century? Here, in disagreement with McKeown and Record, one

may argue that, at least at this local level, housing and working conditions were significant factors. [27] During this period levels of crowding in these towns declined by 13% and 9% respectively. (Table 3.B.1) These seem to represent only modest improvements in housing standards, but given the evidence from the mining communities of a correlation between high levels of crowding and high levels of mortality from pulmonary tuberculosis, any reduction in crowding was likely to produce some reduction in that mortality. A further factor may have been the decline in factory employment in the textile industries of Dunfermline and Kirkcaldy. In Kirkcaldy flax spinning went into decline during the 1880s, and from *c.*1890 expansion in the Dunfermline linen industry ceased. [28] Other factors which were probably of some importance include the improvement of diet and of resistance to tuberculosis by the elimination of other diseases, but no evidence is available to indicate their influence. However, medical intervention, in the form of the isolation in hospital of active cases of the disease, played no part. Small infectious-diseases hospitals in Dunfermline and Kirkcaldy were reserved for the accommodation of cases of the acute infectious-diseases and the surgical hospitals which were opened in both burghs during the 1890s also offered no treatment for cases of tuberculosis. [29]

In Dunfermline and Kirkcaldy, as in the rest of Fife, preventive measures for the control of tuberculosis were introduced during the early twentieth century. Between 1911-20 and the late 1930s mortality from pulmonary tuberculosis in the two burghs declined substantially and at similar rates. However, from the late 1930s mortality from pulmonary

tuberculosis began to increase again. The Medical Officer of Health for Kirkcaldy, Dr. Hay, could offer no precise explanation for this setback:

> "The War undoubtedly raised the numbers [of tuberculosis cases] but in the light of experience of the previous World War the incidence should have returned to normal by 1948. Up to and including 1948 there was no special difficulty in accommodating patients in the Burgh's sanatorium, nor was it necessary during the War to clear sanatorium beds for other purposes. The diagnostic facilities at the Dispensary were always excellent and no delay was experienced in receiving early cases from the general practitioners in the Burgh. A "pilot" experiment in mass radiography was applied to two big industrial firms and there was no evidence that early cases were escaping the vigilance of the general practitioners, One can therefore assume that there is nothing other than a real increase in the incidence of tuberculosis in Kirkcaldy." [31]

A factor which might account for the increase in mortality from pulmonary tuberculosis in Kirkcaldy during and immediately after the Second World War was immigration, either from rural areas, where resistance to infection was lower, or, alternatively, from areas where rates of infection were higher. In Scotland during the war Blacklock "observed typical childhood acute primary pulmonary lesions more often in the adult than formerly, due, I think, to the greater number of rural dwellers coming to work in factories in urban areas." [32] Winter considers that the movement of rural migrants to work in urban war industries was a factor in the increase in tuberculosis mortality which occurred in Britain during the First World War. [33] However, in the immediate postwar period a large number of miners from Lanarkshire also settled in Kirkcaldy, where a special development of 300 houses was built for them at Sauchenbush. [34] Up to the Second World War mortality rates from all forms of tuberculosis in the Western Lowlands were over 33% above such rates in the Eastern Lowlands. [35] However, wartime immigration as a cause of increased tuberculosis mortality in Scotland

as a whole during the Second World War was discounted by Springett, who noted that the decline in that mortality was arrested prior to the war and compared conditions in Scotland then to the interruption in tuberculosis mortality decline which occurred in England and Wales, but not in Scotland, at the time of the First World War. He suggested that increased tuberculosis mortality in Scotland at the time of the Second World War was the result of an increase in rates of primary infection amongst young adults, which was related not to local environmental factors but to the changing age-specific pattern of tuberculosis mortality in the country as a whole. [36]

During the second half of the nineteenth century mortality from pulmonary tuberculosis in the small town districts of Fife was over 44% less than in the large-town and rural districts of the county. (Figure 11.3 and Table 11.3) This contrast may also be related, at least in part, to housing conditions, for during this period levels of crowding in the divisions of Fife were generally lowest in the small town districts as a group. (Figure 3.A.2) However, the small town districts contained a wide range of towns, in which there was considerable variation in housing conditions and other factors, such as conditions at work. Analysis of mortality from pulmonary tuberculosis in the individual small burghs is possible only for the period from 1911, by which date mortality from the disease was in steep decline but when huge differences in such mortality still existed between certain towns in Fife. Mortality rates from pulmonary tuberculosis in the burghs of Fife during 1911-50 are given in Table 11.6.1 (p.357) and summarised in Table 11.6.2 below.

Table 11.6.2 Mortality from pulmonary tuberculosis and levels of crowding in the burghs of Fife 1911-50

Death rate (DR): deaths from specified cause per 10 000 inhabitants
Average level of crowding (PPR): persons per room

	DR	PPR
Large burghs	5.5	1.28
Coalfield burghs	5.1	1.66
West Fife coastal burghs	6.2	1.20
Central Fife burghs 1	3.6	1.15
Central Fife burghs 2	5.2	0.99
East Neuk burghs	6.1	0.87
North east Fife burghs	5.1	0.82
All small burghs	5.2	1.12

Source: RGS 1911-50

During the period 1911-50 mortality rates from pulmonary tuberculosis in the large town division and three of the six subdivisions of the small town division of Fife were in a range of 5.1-5.5 deaths per 10 000 inhabitants. Within those subdivisions relatively high mortality rates occurred in Lochgelly (6.2), Tayport (5.9) and Cupar (5.8). The only subdivision where mortality was markedly lower than average included Leslie (3.8) and Markinch (3.5). The only burgh which recorded a lower mortality rate than either of those burghs was Elie and Earlsferry (2.3). However, mortality from pulmonary tuberculosis in Elie and Earlsferry was uncharacteristic of the East Neuk burghs, which as a group formed one of the two subdivisions with above-average mortality rates. Amongst the East Neuk burghs such mortality was high in Crail (7.8), Pittenweem (7.2) and Anstruther and Kilrenny (7.0). However, the small town subdivision with the highest mortality rate from pulmonary tuberculosis during 1911-50 was the group of west Fife coastal burghs,

where average mortality was over 72% above the combined rate for Leslie and Markinch. The high mortality rate in the west Fife coastal burghs was entirely due to conditions in Inverkeithing, where during the period mortality from pulmonary tuberculosis ran at 8.4 deaths per 10 000 inhabitants, a rate which was last exceeded in the small town districts as a whole during the late 1890s.

As Table 11.6.2 suggests, there is no clear correlation, between mortality from pulmonary tuberculosis and levels of crowding in the small town subdivisions. Nevertheless, housing conditions were undoubtedly a factor in the incidence of the disease in these towns. A feature of all the burghs in Fife where mortality from pulmonary tuberculosis was exceptionally high was their close-built character. In Lochgelly two-roomed miners' houses predominated and there was much subletting, and Inverkeithing was the only small burgh in Fife where large tenements were common. [37] The old quarters of Anstruther and Kilrenny, Crail and Pittenweem were also crowded sites, in which small houses were packed into the spaces between narrow streets and wynds. The old town of Anstruther Easter was described as "a perfect Rosamond's bower of little streets, disposed after the pattern of a box of "spillikins"..." [38] Given the general conditions of overcrowding which existed in all these places right up to the Second World War, such environments maximised the chances of contact with carriers of tuberculosis, both amongst members of families living in single houses and between them and persons in the nearby streets. Such conditions in the towns of Fife may be compared with those in a town in North Wales, described by Chalke in 1933, where the incidence of tuberculosis was

high. "Narrow streets, cul-de-sacs and courts produced the greatest number of cases." [39] From the 1920s the inhabitants of the old overcrowded towns were slowly rehoused in new suburban housing estates, which had fixed levels of crowding (although these were sometimes exceeded) and where daily contact with and between tuberculous persons was reduced. When compared with the conditions which they replaced, it is clear that the new housing schemes, virtually all of which were built by local authorities, were an important element in the control of tuberculosis in Fife. [40]

However, housing was only a part of a complex of social factors determining the incidence of tuberculosis. Also involved were patterns of employment and their effects upon living standards. Amongst the small town subdivisions the coalfield burghs had the highest level of crowding but the equal lowest pulmonary tuberculosis mortality-rate. Although, with the exception of Leven, housing in these towns remained relatively poor, since the late nineteenth century it had improved considerably, with the probable result that there was a substantial fall in female mortality from pulmonary tuberculosis. By contrast, the effect of improvements in housing in the fishing burghs was perhaps cancelled by continuing high levels of female employment in such work as fish processing. In the fishing communities the physical demands of work on nursing mothers caused an early cessation of lactation, with the result that during the mid 1930s the Anstruther County Area, which included the burghs of Anstruther and Kilrenny, Crail and Pittenweem, had the highest level of artificial feeding of infants in the whole County area of Fife. [41] The exertion of work, allied to the socio-economic effects of

decline in the fishing industry, may also have caused high levels of pulmonary tuberculosis mortality amongst females in the fishing burghs. Female health may have been the main factor in the high rate of pulmonary tuberculosis mortality in Inverkeithing, which during the 1930s was unusual amongst the west Fife coastal burghs in suffering a sharp increase in infant mortality. [42] In commenting on this mortality the deputy County Medical Officer, Dr. McGillivray, drew attention to the poor health of mothers in Inverkeithing. [43]

The above examples are sufficient to illustrate the complexity of the epidemiology of pulmonary tuberculosis. Not only was incidence of the disease determined by multiple factors but the combination of factors, and the degrees to which they exerted their effect, varied between relatively small groups of cases: between towns, between occupational and age groups in those towns and between the sexes in those groups. Causes of the variations in pulmonary tuberculosis mortality in towns such as the burghs of Fife could only be fully identified by more detailed research, for which the data in the annual reports of the RGS are inadequate.

The epidemiology of non-pulmonary tuberculosis presents a separate problem involving a major additional factor to those determining the incidence of pulmonary tuberculosis. However, in its mode of spread and rate of decline one form of non-pulmonary tuberculosis showed considerable similarity to the pulmonary disease. Figure 11.5 shows mortality from the different forms of non-pulmonary tuberculosis in Fife

up to 1930, after which date the annual reports of the RGS no longer give separate figures for mortality from these diseases. During the second half of the nineteenth century the greatest mortality from the forms of non-pulmonary tuberculosis in Fife was caused by tuberculous meningitis, the average mortality from which, at a rate of 34.6 deaths per 100 000 inhabitants, was more than twice that for either abdominal tuberculosis (15.7) or the other forms of the disease (15.3). The curve for mortality from tuberculous meningitis is similar to that for pulmonary tuberculosis (Figure 11.2) in showing an almost continuous decline in mortality during the period, although at only about a quarter of the level of the latter disease.

The non-pulmonary forms of tuberculosis, including tuberculous meningitis, were predominantly diseases of childhood. [44] Most cases of tuberculous meningitis were infected with the human strain of the tubercle bacillus, which entered the body via the lungs. Surveys in Scotland cited by Blacklock showed that such infection occurred in 82-96% of cases of the disease. [45] In children, in whom, in comparison to adults, resistance to tuberculosis was low, such a pulmonary infection which began to spread advanced rapidly and usually resulted in death when it reached the nervous system. Cases of tuberculous meningitis usually died in as short a time as 3-6 weeks of diagnosis. [46] Amongst the 116 infants in western Fife which were reported to have died from tuberculosis during 1911-14 and 1918-20 only 0.9% died from pulmonary tuberculosis, whereas 49.2% died from tuberculous meningitis. [47] Most such "cerebral deaths", Blacklock wrote, "should be included with tuberculosis of the respiratory system..." [48] Thus, the incidence of

tuberculous meningitis, as primarily a pulmonary infection, was determined by conditions similar to those affecting the incidence of pulmonary tuberculosis, hence the similarity of the curves for mortality from these diseases in Fife. (As will be suggested, the peak which occurs during the 1890s in the curve for mortality from tuberculous meningitis in Fife may be an effect of wrong diagnosis.) Important factors in the incidence of tuberculous meningitis included home conditions and familial contacts. An investigation in Scotland cited by Blacklock showed that in a sample of 144 child cases of tuberculous meningitis where infection was by the human type of bacillus, 92% were infected by familial contacts, including parents, siblings, grandparents and aunts and uncles. [49] The danger of infection from such contacts was exacerbated by high levels of crowding.

The curves for mortality in Fife from abdominal and other forms of non-pulmonary tuberculosis, including tuberculosis of the bones and joints, lymph nodes and skin, follow a similar course, which, unlike the curve for tuberculous meningitis, shows no trend of decline until after the First World War. (Figure 10.5) Unlike tuberculous meningitis, the abdominal and other forms of non-pulmonary tuberculosis were usually caused by the bovine tubercle bacillus, which "almost always entered the body in milk and infected by way of the throat or intestine." [50] Blacklock showed that in a sample of cases of forms of non-pulmonary tuberculosis prevalent in Scotland, over 70% of cases of tuberculosis of the abdomen and of the cervical glands were caused by infection with the bovine form of the disease. [51]

Table 11.7 Mortality from non-pulmonary tuberculosis, excluding tuberculous meningitis, in the divisions of Fife 1861/71-1930

Death rate (DR): deaths per 10 000 inhabitants

	LTD's	STD's	RD's
Average DR 1861/71-1900	1.77	1.32	1.86
Average DR 1901-30	1.71	1.25	1.38
% decr.	*3.4*	*5.3*	*25.8*

Source: RGS 1861-1930

In an investigation carried out in Scotland in 1941-43 Blacklock found that amongst rural inhabitants 53% of cases of non-pulmonary tuberculosis were due to infection with the bovine tubercle bacillus. This compared with only 40% of such cases amongst urban inhabitants. "The rural inhabitant is more liable to bovine infection than the urban...", he wrote. [52] Country dwellers lived in closer proximity to cows and drank more infected milk than the inhabitants of towns. Rural populations also had a lower resistance to all forms of tuberculosis due to the lower incidence amongst them of primary pulmonary infection, which, if the site of such infection healed, conferred some immunity to further infection. Table 11.7 shows that during the late nineteenth century mortality from non-pulmonary tuberculosis, excluding tuberculous meningitis, was highest in the rural districts of Fife, but only by a small margin from the large town districts. The relatively high mortality from these forms of non-pulmonary tuberculosis in the rural districts may have been an effect of the rustic conditions identified by Blacklock but equally may have been due to conditions in the landward

mining districts. However, it is notable that between 1855-1900 and 1901-30 by far the greatest fall in mortality from the mainly milk-borne forms of non-pulmonary tuberculosis occurred in the rural districts. It is most likely that this was an effect of rural depopulation and the reduction in the agricultural labour force, for, as will be shown in the following chapter, by 1930 no significant advances had been achieved in Fife in the purification of milk supplies or the elimination of tuberculous infection in cattle. [53]

However, it is also possible that the mortality figures for non-pulmonary forms of tuberculosis, as given in the annual reports of the RGS, are unreliable and contain a large element of misdiagnosis. Reference has been made to the problem of the diagnosis of tuberculosis during the nineteenth century. Dubos noted that during this period "many wasting diseases of the chest - cancer, silicosis, various lung abscesses - were confused with tuberculosis". [54] During the late nineteenth century the Registrar-General classified tuberculosis as a constitutional disease, like cancer. Such a classification would have encouraged the confusion of cancer with tuberculosis. It may be significant of the diagnostic practices of doctors in Fife that in 1892 Dr. Nasmyth, as County Medical Officer, should have noted that in Cupar County District the "death-rate from Phthisis is high...and the death-rate from Cancer is very high..." [55]

Confusion may have been even more common in the diagnosis of non-pulmonary tuberculosis, in some forms of which symptoms were difficult to interpret by physical examination alone. [56] As late as 1925, for

example, the Fife County tuberculosis officer, Dr. McGillivray, reported that doctors frequently misdiagnosed as non-pulmonary tuberculosis the symptom of swollen neck glands, which was more often caused by scarlet fever, measles, whooping cough, septic tonsils or even dental decay. [57] How is one to explain the apparent massive increase in mortality from non-pulmonary tuberculosis which occurred in the large town districts of Fife during the 1890s? (Figure 11.6) Such an increase was recorded in both large-town districts and for all forms of non-pulmonary tuberculosis. (Tables 11.E-G.1) There was no corresponding increase in mortality in the small-town and rural districts. It is suggested that under the influence of the growing interest in tuberculosis during the late nineteenth century, the reports of 1895 and 1898 by the Royal Commissions on Tuberculosis and the amendment in 1899 of the Dairies, Cowsheds and Milkshops Order by the inclusion of a clause relating to tuberculous cattle, doctors in the main urban centres of Fife adopted a new approach to the problem of non-pulmonary tuberculosis and became over-zealous in their diagnosis of what they saw as the various forms of this disease. [58] In the other divisions of Fife the doctors were perhaps less receptive to new ideas.

As well as being difficult to diagnose, tuberculosis was a chronic disease which was uncontrollable by the preventive methods developed during the late nineteenth century for the control of the acute infectious diseases. [59] In most of its forms, tuberculosis was slow to develop and a person might carry the disease for a number of years before dying from it. A patient in whom tuberculosis became quiescent would not be removed from a tuberculosis scheme's register as

"recovered" until a further five years had elapsed. [60] Sources of tuberculous infection were difficult to trace. A tuberculosis officer in Fife complained that it was "usually difficult or impossible" to trace sources of pulmonary infection. [61] Detection of sources of infection in cases of the non-pulmonary disease was no easier, for the cycle of infection fully embraced both man and beast. According to Blacklock, it was even possible for cows to be infected with the bovine strain of the tubercle bacillus by man. [62]

Nineteenth- and early twentieth-century society was riddled with tuberculosis. Because of this it may be seen as misleading in explaining the epidemiology of the disease to place too much emphasis on variations in death rates over short intervals or between small communities. Using the birth-cohort method of analysing mortality data and referring mainly to England and Wales, Springett interpreted the decline in tuberculosis mortality by reference to changes in nationwide levels of mortality and to levels of primary infection in childhood. [63] Short-term changes in tuberculosis mortality at regional levels were seen as determined less by local factors, such as the immigration of groups of either susceptible or infective individuals, than by long-term changes in nationwide patterns of infection. Such long-term changes were themselves the result of environmental improvements, particularly those which led to the reduction in mortality from other diseases. [64] However, the relationship of these improvements to the reduction of mortality from tuberculosis was indirect, for they were embodied only in a population's increased resistance to the disease. Burnet and White stress genetic

constitution as a factor in determining an individual's susceptibility to tuberculosis. [65]

Given the importance of biological factors in determining the spread of tuberculosis, it might be asked how solely administrative controls contributed to reducing mortality from tuberculosis in the period before medical agencies were able to actually cure this disease. However, whilst biological factors determined resistance to infection, actual levels of infection were determined by environmental conditions. [66] Most of the population in an urban society sustained a primary infection with the tuberculosis bacillus but only a small proportion developed tuberculosis from this infection alone. [67] In the limitation of infection effective local action to reduce tuberculosis mortality was therefore a possibility. The following chapter considers and attempts to evaluate the administrative measures for the control of tuberculosis which were adopted in Fife.

Table 11 6.1 Mortality from pulmonary tuberculosis in the burghs of Fife 1911-50

Death rate (DR); deaths from specified cause per 10 000 inhabitants
Average level of crowding (PPR); persons per room

	Total deaths	DR	PPR
Large burghs		5,5	1,28
Dunfermline	834	5,6	1,25
Kirkcaldy	905	5,3	1,31
Coalfield burghs		5,1	1,66
Buckhaven and Methil	347	5,0	1,68
Cowdenbeath	262	4,8	1,88
Leven	130	4,5	1,19
Lochgelly	162	6,2	1,87
West Fife coastal burghs		6,3	1,20
Burntisland	113	5,3	1,08
Inverkeithing	113	8,4	1,41
Kinghorn	42	5,1	1,12
Central Fife burghs 1		3,7	1,15
Leslie	36	3,8	1,21
Markinch	26	3,5	1,08
Central Fife burghs 2		5,2	0,99
Auchtermuchty	25	4,8	0,90
Cupar	109	5,8	0,90
Falkland	17	4,9	0,99
Ladybank	24	5,1	1,10
Newburgh	46	5,3	1,05
East Neuk burghs		6,1	0,87
Anstruther and Kilrenny	100	7,0	1,03
Crail	37	7,8	0,76
Elie and Earlsferry	13	2,3	0,64
Pittenweem	50	7,3	1,04
North east Fife burghs		5,0	0,82
Newport	66	4,9	0,62
St. Andrews	149	4,3	0,83
Tayport	76	5,9	1,00

Sources; RGS 1911-50; Table 3,B,1-2

Chapter 11. Tuberculosis in Fife. Notes

1. In the annual reports of the RGS mortality from tuberculosis was classified as follows: from 1855 under the heading of tubercular diseases and including phthisis (pulmonary tuberculosis), hydrocephalus (tuberculous meningitis), tabes mesenterica (abdominal tuberculosis) and scrofula (tuberculosis of the cervical lymph nodes); from 1883 under the heading of constitutional diseases and including phthisis, tuberculous meningitis, tabes mesenterica, other forms of tuberculosis and scrofula; from 1901 under the heading of general diseases and including pulmonary tuberculosis and phthisis (not otherwise defined), tuberculous meningitis, tuberculous peritonitis, tabes mesenterica, lupus, tuberculosis of the other organs, general tuberculosis and scrofula; from 1911 as including pulmonary tuberculosis, phthisis, tuberculous meningitis, abdominal tuberculosis and other forms of tuberculosis; and from 1930 as including tuberculosis of the respiratory system, and other forms of tuberculosis, deaths from which were undifferentiated.

2. Flinn SPH 388; Simon Szreter, "The Importance of Social Intervention in Britain's Mortality Decline *c.*1850-1914: a Re-interpretation of the Role of Public Health" Social History of Medicine 1.1 (April 1988) 15, 16, 16 n. 43; Linda Bryder, Below the Magic Mountain. A Social History of Tuberculosis in Britain in the Twentieth Century (Oxford 1988) 104-05. The problem of wrong diagnosis of tuberculosis continued up to the mid twentieth century.

3. Flinn SPH 396, 398, 414

4. Szreter op. cit. 13-14; Gillian Cronjé, "Tuberculosis and mortality decline in England and Wales 1851-1910", in Robert Woods and John Woodward (eds.), Urban Disease and Mortality in Nineteenth-Century England (London 1984) 97-101

5. Szreter op. cit. 17

6. A.J. Mercer, "Relative Trends in Mortality from Related Respiratory and Airborne Infectious Diseases" Population Studies 40 (1986) 133

7. Census of Scotland 1951 I 17 Table 20, III Table S

8. Richard Rodger, Scottish urban house-building 1870-1914 (unpublished Ph. D. thesis, University of Edinburgh 1976) 479-80

9. Kirkcaldy TC minutes 15 February 1915 Report by the burgh sanitary inspector on housing in Kirkcaldy

10. Richard Rodger, "The Victorian building industry and the housing of the Scottish working class", in Martin Doughty (ed.), Building the Industrial City (Leicester 1986) 155

11. George Rosen, "Disease, Debility and Death", in H.J. Dyos and Michael Wolff (eds.), The Victorian City. Images and Realities (London 1973) 643-46

12. Sir Macfarlane Burnet and David O. White, Natural History of Infectious Disease (fourth edn. Cambridge 1972) 217, 220, 222

13. Thomas Ferguson, Scottish Social Welfare 1864-1914 (Edinburgh 1958) 431; see section 12.1 below.

14. Cronjé op. cit. Table 4.11 (deaths per 1 000 inhabitants); Flinn SPH Table 5.6.6 (deaths per 1 000 from all causes)

15. See p. 11 above.

16. Cronjé op. cit. 96

17. Thomas Goodall Nasmyth, "The Air of Coal Mines" British Medical Journal 1888 II 229

18. ibid. 229

19. Cronjé op. cit. 94

20. Thomas F. Dewar, Report on the Housing of Miners in Fifeshire prepared on the instruction of the Local Government Board, in 1909 AR Appendix IV (158); Graeme Whittington, "The Imprint of Former Occupations and the Improver Movement on House Types in Fife" Folk Life 5 (1967) 52-54

21. Census of Scotland 1881 I 17 Table 1

22. T.C. Smout, A Century of the Scottish People 1830-1950 (London 1986) Table 8; Peter N. Stearns, "Working-Class Women in Britain 1890-1914", in Martha Vicinus (ed.), Suffer and Be Still. Women in the Victorian Age (Bloomington, Indiana 1973) 107

23. Census of Scotland 1881 I 17 Table 1

24. Cronjé op. cit. 99-100. Mercer argues that during the second half of the nineteenth century in England and Wales as a whole levels of fertility were not a significant factor in the incidence of tuberculosis in females. (Mercer op. cit. 130 n. 12)

25. Smout op. cit. 80, 176; Stearns op. cit. 108

26. Cronjé op. cit. 99; John W.S Blacklock, "The Epidemiology of Tuberculosis" British Medical Journal 1947 I 711

27. T. McKeown and R.G. Record, "Reasons for the Decline of Mortality in England and Wales during the Nineteenth Century", in M.W. Flinn and T.C. Smout (eds.), Essays in Social History (Oxford 1974) 239

28. See p. 47-48 above; Cronjé op. cit. 99

29. Kirkcaldy Cottage Hospital, annual reports 1890-99; Dunfermline Cottage Hospital, annual reports 1894-99

30. K MOH 1947 AR 7

31. K MOH 1950 AR 15

32. Blacklock op. cit. 708

33. J.M. Winter, The Great War and the British People (London 1985) 139. Bryder considers that deterioration of nutritional standards was a more important factor than migration from rural to urban areas in the increase in tuberculosis mortality in England and Wales during the First World War. (Linda Bryder, "The First World War: Healthy or Hungry?" History Workshop Journal 24 (1987) 146-49)

34. Alexander Smith, The Third Statistical Account of Scotland. The County of Fife (Edinburgh 1952) 479

35. Flinn SPH Table 5.6.5 (deaths per 1 000 from all causes)

36. V.H. Springett, "An Interpretation of Statistical Trends in Tuberculosis" Lancet 1952 I 577-78, 579

37. Census of Scotland I 17: 1921 Table 28, 1931 Table 27; 1936 AR 38; Smith op. cit. 358

38. Henry Farnie, The Fife Coast from Queensferry to Fifeness (Cupar 1860), quoted in David Adshead, Anstruther Easter, Wester and Cellardyke: a case study of architectural development in the East Neuk of Fife c.1850-1900 (unpublished M. Litt. thesis, University of St. Andrews 1986) 3 n. 5

39. G.S. Parkinson, Synopsis of Hygiene (ninth edn. London 1947) 94. The report to which Parkinson referred was H.D. Chalke, Report of an Investigation into the Causes of the Continued High Death Rate from Tuberculosis in Certain Parts of North Wales (Cardiff 1933)

40. See p. 105-07 above.

41. 1934 AR 34; 1935 AR 35; 1936 AR 40; 1937 AR 42

42. RGS 1931-40

43. 1933 AR 76

44. Cronjé op. cit. 80, 81; Sir Robert Philip, "An Address on the Causes of the Decline in Tuberculosis Mortality" British Medical Journal 1928 I Table 5

45. Blacklock op. cit. 708-09

46. Bryder, Below the Magic Mountain 190

47. RGS 1911-14, 1918-20. These are the only years for which data on infant mortality from specified causes in Fife are available in the reports of the RGS.

48. Blacklock op. cit. 709

49. ibid. 708

50. Burnet and White op. cit. 214

51. Blacklock op. cit. Table 5

52. ibid. 710-11

53. See p. 56 above; see section 12.2.F below.

54. René and Jean Dubos, The White Plague. Tuberculosis, Man and Society (London 1953) 5

55. 1892 AR 95

56. Dubos op. cit. 6

57. 1925 AR 25

58. See p. 364 below.

59. Burnet and White op. cit. 213

60. 1946 AR 74

61. 1938 AR 13 Report by County executive tuberculosis officer

62. Blacklock op. cit. 708

63. Springett op. cit. 521-25, 575-79. A statistical model designed to show the influence of both cohort effects, such as improved nutrition and resistance to infection, and period effects, such as the introduction of effective medical treatment, in the reduction of mortality from tuberculosis is described in James J. Collins, "The Contribution of Medical Measures to the Decline of Mortality from Respiratory Tuberculosis: an Age-Period-Cohort Model" Demography 19.3 (August 1982) 409-27

64. Szreter op. cit. 16-17; Collins op. cit. 411

65. Burnet and White op. cit. 216-17

66. Mercer op. cit. 130-31

67. Burnet and White op. cit. 214

CHAPTER 12

MEASURES FOR THE CONTROL OF TUBERCULOSIS IN FIFE

Introduction

In the preceding chapter the incidence of mortality from tuberculosis in Fife was described and, as far as was possible, the main factors determining the distribution of and changes in this mortality were identified. It was noted that intervention by public health authorities in the prevention of tuberculosis in Fife did not occur until the early twentieth century, when administrative measures for the control of the disease were introduced. The following chapter describes measures for the administrative control of tuberculosis, how and when such measures were adopted by local authorities in Fife and at what point, if any, public health services began to make an effective contribution to the reduction of mortality from tuberculosis in the county.

1. The establishment of measures for the control of tuberculosis in Fife

The system for the administrative control of tuberculosis which was adopted throughout Britain was first developed in Edinburgh by Dr. Robert Philip. [1] Philip stressed that in the control of tuberculosis it was inadequate for medical agencies merely to treat patients and to delay action against the disease until tuberculosis sufferers came

forward for treatment. In order to maximise their chances of recovery and prevent them from infecting others, persons suffering from tuberculosis had to be located as soon as possible after they contracted the disease and continuously supervised thereafter. [2] An infrastructure had to be established which enabled local authorities to exercise such control. Philip urged that tuberculosis control should be a separate and well-defined department of public health administration. [3] The operational centre of an anti-tuberculosis campaign, as envisaged by Philip, was the dispensary:

> "It was devised to serve as the centre of all other anti-tuberculosis activities, the clearing-house where patients could be sorted out for home or sanatorium treatment or relegated to a hospital for advanced cases, and from which could be maintained continuous medical supervision, the betterment of home surroundings, after-care, and the search for incipient cases among contacts. All this was accomplished by an accurate system of examination and records, the supply of medicines, disinfectants, food and clothing, instruction as to the mode of life and prevention of infection, and regular home visitation by a doctor and a staff of specially trained nurses." [4]

In 1887 Philip succeeded in establishing an anti-tuberculosis dispensary, the Victoria Dispensary for Consumption, at Bank Street in central Edinburgh. This was followed by the foundation of the Victoria Hospital Tuberculosis Trust and the opening in 1894 of the Royal Victoria Hospital for Consumption at Craigleith, on the outskirts of Edinburgh. In 1900 Edinburgh Corporation agreed to reserve fifty beds for advanced cases of tuberculosis at its City Fever Hospital and in 1910 the basic system of tuberculosis control in Edinburgh as planned by Philip was completed by the establishment at Springfield, near Lasswade, of a farm colony for the after-care of patients who had been discharged

from hospital. At the Springfield colony "suitable cases could consolidate their recovery and...learn an open-air trade." [5]

State involvement against tuberculosis dated from the 1890s. Royal Commissions on Tuberculosis reported in 1895 and 1898, and in 1899 the Dairies, Cowsheds and Milkshops Order was amended by the inclusion of a clause relating to diseases of cattle of "such disease of the udder as shall be certified by a veterinary surgeon as tubercular." [6] However, although as far back as 1890 Philip had originally emphasised the importance of notification in any system of tuberculosis control, official resistance existed to the introduction of compulsory notification of tuberculosis. [7] Noting that during the second half of the nineteenth century, mortality from tuberculosis in Scotland had declined without the assistance to medical agencies of notification of the disease, the Local Government Board for Scotland stated that, in its view, "experience of the working of notification of tuberculosis of the lungs ought to be acquired along voluntary rather than compulsory lines..." [8]

Voluntary notification of pulmonary tuberculosis was introduced in Edinburgh in 1903, but by 1905 only eight other local authorities in Scotland had adopted this measure. [9] In Glasgow the Medical Officer of Health was notified of some cases of tuberculosis by lists of attendances at dispensaries in the city, although these were not anti-tuberculosis dispensaries on the Edinburgh model, and by the results of bacteriological examinations of sputum samples which were carried out by the city public-health department. However, there was no system of

voluntary notification of cases of tuberculosis by medical practitioners in Glasgow. Meanwhile, apart from Edinburgh, by 1905 only the counties of Lanarkshire and Inverness and the burgh of Leith had provided any hospital or sanatorium accommodation for cases of tuberculosis. [10]

Despite their proximity to Edinburgh, where Philip's pioneering work in the administrative control of tuberculosis was carried out, local authorities in Fife were not amongst the leaders in the establishment of schemes for tuberculosis control in Scotland. In 1899 the Local Government Board, in its "new interest" in the problem of tuberculosis, drew the attention of the police commissioners of Cupar to what it considered to be excessive mortality from pulmonary tuberculosis in that burgh. [11] At this date the Board had issued no guidance to local authorities on methods of tuberculosis control and the Cupar commissioners did not act upon its communication. However, also in 1899, "in view of...the very infectious nature of Phthisis," Kirkcaldy District Committee instructed the County Medical Officer, Dr. Nasmyth, to "draw up a short tract on the subject for general circulation in the District." [12] Nasmyth discussed the problem of tuberculosis in his annual report of 1902. [13] He contrasted the measures which local authorities had adopted for the control of scarlet fever, which was rarely fatal, with their neglect of tuberculosis, in which "nearly all cases...die", and he appealed to the District Committees to take preventive measures against an endemic disease, the spread of which was assisted by living and working conditions:

> "There are few families without experience of tuberculosis: swollen glands, ulcerated skins, stiffened and useless joints, the emaciation cough, night sweats, [the] hectic flush of consumption, [and] the deaths which run up the mortality rates to, in some cases, one sixth of the total. The causes are well known: low-lying, damp, badly lighted, badly ventilated, overcrowded dwelling houses, factories and workshops [which are] overcrowded, badly ventilated and lighted..., the breathing in these of already-breathed air, the breathing of air laden with the dust of industrial operations..., the consumption of food, milk and flesh infected with tubercle bacilli, the breathing of air polluted with dust derived from the lungs of persons suffering from consumption." [14]

However, despite this appeal from their Medical Officer, up to 1905 the County District Committees in Fife took no action against the spread of tuberculosis. The disease also received little attention from local authorities in the burghs of the county. In 1904 the burgh Medical Officer of Kirkcaldy, Dr. Mackay, wrote of the need for a general dispensary in the burgh but made no reference to the control of tuberculosis. However, also in 1904, Kirkcaldy parish council was investigating the question of sanatorium provision in Kirkcaldy burgh. [15] In 1905 voluntary notification of cases of pulmonary tuberculosis by doctors and notification of deaths due to tuberculosis by the local Registrar were introduced in St. Andrews in order that infected premises could be disinfected. [16] However, no such measures were adopted by this date in the other burghs in Fife.

In March 1906 the Local Government Board issued to local authorities in Scotland a circular on the question of tuberculosis control. The circular defined tuberculosis as an infectious disease, accordingly drew the attention of the authorities to their responsibilities for the control of the disease under the Public Health (Scotland) Act and

advised that they establish anti-tuberculosis schemes on the Edinburgh model. [17] In response to the circular, a meeting of the Fife Medical Association and the Fife branch of the British Medical Association passed a resolution calling for the establishment of a scheme for tuberculosis control in Fife, and in October 1906 Dr. Nasmyth prepared a memorandum on the notification of pulmonary tuberculosis and the examination of the morbid products of tuberculosis. [18]

In 1907 the local authorities in Fife met in various conferences to discuss the question of the administrative control of tuberculosis. However, at these conferences:

> "very diverse opinions [were] expressed, and if there was to be any uniform course of action decided on, the standard of agreement would have to be a minimum one and compulsory notification of Pulmonary Phthisis and sanatorium treatment would have to be left out of it." [19]

With disagreement over the necessity of such basic elements of tuberculosis control there was at this stage little hope for the establishment of a county-wide tuberculosis scheme in Fife. Nevertheless, the local authorities issued a joint memorandum on the control of tuberculosis, the provisions of which were basically the same as those included in the more detailed report of 1909 which was prepared by Nasmyth's successor, Dr. Dewar, and is summarised below. [20] Meanwhile the four County Districts in Fife agreed to introduce a system for voluntary notification of pulmonary tuberculosis, which took effect from 1 October 1907. In addition, information leaflets were issued to the public and there were public lectures on tuberculosis, which drew large attendances. [21] However, after three months' trial the County

notification system produced notifications of only four cases of pulmonary tuberculosis. [22]

As the conferences of 1907 showed, both the Medical Officers and the local authorities in the burghs of Fife held varying opinions about the problem of tuberculosis control. In 1906 the new burgh Medical Officer for Dunfermline, Dr. Macgregor, advocated the adoption of compulsory notification of tuberculosis in that burgh and proposed that Dunfermline participated in a joint sanatorium scheme for the whole of Fife. [23] However, in 1907 he wrote that as "compulsory notification infers the possession of a Sanatorium to make it a practical success, we are not yet in a position to enforce it...", and suggested that Andrew Carnegie endow Dunfermline with a sanatorium. [24] Dunfermline eventually adopted the compulsory notification of pulmonary tuberculosis in July 1909 but no sanatorium was ever built there. [25]

In 1906 the town council of Kirkcaldy issued its *Instructions to Consumptives* and in 1908, in contrast to the local authority in Dunfermline, it completed the building of a sanatorium. Kirkcaldy's sanatorium, which provided accommodation for fourteen patients, was located on the outskirts of the town at the burgh infectious-diseases hospital. [26] In 1910 the burgh Medical Officer, Dr. McIntosh, claimed that Kirkcaldy was the first town in Britain to build a "municipal sanatorium" but reminded the burgh council that compulsory notification of tuberculosis had still not been adopted in Kirkcaldy and that only when this was done would the burgh obtain full benefit from the other measures for the control of tuberculosis which had been introduced. [27]

The burgh council of St. Andrews adopted voluntary notification of pulmonary tuberculosis in 1908 but rejected a proposal by the burgh Medical Officer, Dr. Huntington, for the establishment of a tuberculosis ward at the burgh infectious-diseases hospital. [28] However, in Leven, the burgh Medical Officer, Dr. Graham, expressed his opposition to both compulsory notification of tuberculosis and the provision of sanatorium treatment at public expense. [29] He favoured some form of voluntary notification "which did not in any way interfere with the liberty or privacy of the patient" and believed that in the control of tuberculosis much could be achieved by health education and "without going to the great expense of providing treatment, whether in sanatoria or elsewhere." [30] Leven town council was of the opinion that even voluntary notification of tuberculosis was unnecessary and it was not until 1909 that Dr. Graham reluctantly agreed that notification of tuberculosis was desirable. [31] In 1909 voluntary notification of tuberculosis was adopted in Leven, as was notification, by the local Registrar, of deaths from the disease. [32] The latter Dr. Graham described as "locking the stable door after the horse is stolen". [33]

Throughout Scotland local authorities were generally slow to respond to the Local Government Board's call for the establishment of tuberculosis schemes. During 1907 a total of 41% of the population came under schemes for notification of pulmonary tuberculosis, but of that total only 14% were under schemes of compulsory notification. [34] Compulsory notification was adopted in Edinburgh in 1907 but was not adopted in Glasgow until 1910. [35] In 1909 the proportion of the population of Scotland under compulsory notification schemes increased to *c.*44%. [36]

As was noted, Dunfermline adopted compulsory notification of pulmonary tuberculosis in 1909, as did three of the County Districts in Fife, together with some of those burghs where the County Medical Officer, Dr. Dewar, was Medical Officer of Health. (Table 12.1.1)

Table 12.1.1 Adoption of compulsory notification of pulmonary tuberculosis by County Districts and small burghs in Fife 1909

	Date of commencement	Duration of scheme	Population (1911)
Cupar District	March 1909	1 year	15 806
Kirkcaldy District	"	"	42 027
St.Andrews District	"	"	15 096
Anstruther Easter	January 1909	indefinite	1 147
Anstruther Wester	"	"	552
Kilrenny	"	"	2 557
Auchtermuchty	March 1909	1 year	1 396
Leslie	October 1909	"	2 142
Total			80 723

Source: 1909 AR 88

The County Districts and burghs in Fife for which Dr. Dewar was Medical Officer of Health and where compulsory notification of pulmonary tuberculosis was adopted in 1909 contained about 30% of the population of the county. However, during the part of that year when pulmonary tuberculosis was a notifiable disease in these areas, only ninety cases were reported. "In view of the number of deaths annually ascribed to Phthisis within the areas specified...", Dewar wrote, "this total is a surprisingly small number." [37] General practitioners remained to be convinced that there was much use in notifying cases of pulmonary tuberculosis to the local authorities. However, it was only in 1912, following the introduction of the National Insurance Act with its

provisions for sanatorium benefit, that the Local Government Board determined to make notification of pulmonary tuberculosis compulsory throughout Scotland. [38] Compulsory notification of non-pulmonary tuberculosis was introduced in Scotland in 1914. [39]

In his report of 1909 Dr. Dewar made proposals for the administrative control of pulmonary tuberculosis in Fife. [40] He advised that tuberculosis should be compulsorily notifiable in those parts of the county which had not yet adopted notification, and in those places which had adopted notification for only a limited period, the duration of the scheme was to be extended. Consideration of the problem of isolating cases was to be deferred. No proposal was made for the establishment of dispensaries, but health visitors were to be appointed who would visit all tuberculosis cases in the populous parts of Dunfermline and Kirkcaldy Districts, and the County Council would arrange with district nursing associations for local association nurses to visit cases elsewhere in the county. Following the death of a patient, the premises where he died were to be disinfected. This would include thorough cleaning, steam disinfection and spraying. The restrictive sections of the Public Health (Scotland) Act which concerned the movements of the infectious sick in the community were to be enforced with the "greatest mildness" in the case of tuberculosis patients. General practitioners and the relatives and guardians of patients were to advise the County public health department on the further needs of tuberculosis sufferers, and charitable agencies in the county and burghs were to be requested to

co-operate in the work of tuberculosis control, "in the public interest as much as for the benefit of the individuals concerned."

In 1909 the County Medical Officer himself carried out some supervision of tuberculosis patients in their own homes. [41] In this work he received help from the Medical Officers who had been appointed by the school boards in Fife and who had a responsibility to assist in public health work. [42] Patients visited by public health officials were issued with disinfectants, sputum flasks, and printed and verbal instructions on how to prevent the spread of their infection. Houses in which there had been a death from tuberculosis were disinfected. [43] From 1910 the two health visitors appointed to the Dunfermline and Kirkcaldy Districts took up duties as tuberculosis nurses in these areas. [44] However, because of their other duties, the County Medical Officer, the school Medical Officers and the health visitors could only supervise tuberculosis cases in the County area on an occasional basis and could have made only a tiny contribution to the control of the disease. Nevertheless, a start had been made.

The provision under the National Insurance Act of 1911 of sanatorium benefit for insured persons who were suffering from tuberculosis placed an obligation upon both central and local government to establish full schemes for tuberculosis control. [45] Sanatorium benefit covered the treatment and supervision of insured persons with tuberculosis by general practitioners and in sanatoria and dispensaries. [46] Under the National Insurance Act the public acquired the right to treatment for tuberculosis, but an agreed method of providing this treatment was still

lacking. Consequently in 1912 the goverment appointed a Departmental Committee on Tuberculosis (the Astor Committee) with the task of devising a model scheme for tuberculosis control. [47] Meanwhile, following the introduction of compulsory notification of pulmonary tuberculosis in Scotland, the Local Government Board in May 1912 issued the circular "Public Health No.3" on tuberculosis control. Following the recommendations of this circular, all the burghs in Fife, with the exception of Dunfermline and Kirkcaldy, joined Fife County Council's nascent tuberculosis scheme. [48] In July, when the National Insurance Act came into force, the County Medical Officer, Dr. Currie, submitted his report on the requirements of Fife County regarding tuberculosis control. [49]

Reporting in 1912 and 1913, the Astor Committee, of which Dr. Philip was a member, advised that, wherever possible, Philip's Edinburgh scheme should be the model for tuberculosis control throughout Britain. [50] It emphasised the primacy of the dispensary in any tuberculosis scheme but noted that a dispensary "is not necessarily a building. Dispensary work in suitable areas may be conducted by means of domiciliary visits." [51] There was a need for sanatorium treatment for patients whose "working capacity was likely to be restored", but no special hospital accommodation was necessary for advanced cases of tuberculosis, who could be isolated in specially reserved parts of general hospitals. [52] The Committee recommended that hospital accommodation for tuberculosis cases should be at a level of one hospital or sanatorium bed for every 5 000 persons. [53] The Committee also recommended that, in order to keep down building costs, sanatoria were situated in remote locations,

where land prices were low. This was in disagreement with the views of Dr. Philip, who advocated that sanatoria should be near the dispensary systems which provided them with patients. The isolation of sanatoria necessitated the division of responsibility in tuberculosis schemes between the clinicians who were sanatorium superintendents and the public health specialists who worked in the community as tuberculosis officers. [54] Philip warned that this division could lead to limitations of outlook, particularly amongst the sanatorium doctors. Such division of responsibility was a feature of the Fife County tuberculosis scheme, but whether it had any detrimental effect on the operation of that scheme is unclear.

The Fife County tuberculosis scheme was established along the lines set out in Dr. Currie's report of 1912 and under the direction of his successor, Dr. Yule. [55] Currie proposed that the staff of the County tuberculosis scheme should include the County Medical Officer as principal tuberculosis officer (TBO), two full-time executive TBO's, and six nurses, who would divide their duties between the tuberculosis scheme and the school medical service. The TBO's would inspect patients in their home surroundings, advise the Insurance Committees which administered the sanatorium benefit and either treat patients at dispensaries or arrange for GP's to provide domiciliary treatment. Dr. Currie suggested that dispensaries be established at seven places in the area of the County scheme and that under the County dispensary system treatment for tuberculosis should come "within the reach not merely of insured persons recommended for sanatorium benefit...but of all cases of

phthisis in the combined area who would otherwise be unprovided for."

[56]

Following the recommendations of the Astor Committee, Currie reckoned that Fife, excluding Dunfermline and Kirkcaldy, would require forty hospital and sixty sanatorium beds for tuberculosis cases, although he anticipated that this estimate for sanatorium accommodation would prove to be too low. Until a plan could be agreed for the provision of a sanatorium in combination with either the large burghs in Fife or some neighbouring counties, sanatorium accommodation could be provided in the largely unused smallpox hospitals which had been erected in the county during the 1900s. As sanatorium accommodation became available, domiciliary treatment of tuberculosis would be phased out.

Finally, Dr. Currie advised that standards of housing in Fife be continually improved, with the enforcement of building bye-laws for the through ventilation of apartments, that inspection of milk and meat production be carried out and that there should be thorough examination of the contacts of tuberculosis cases and also of feeble-looking children. In the latter work, the role of the county's school medical service was important.

However, the full County tuberculosis scheme envisaged by Dr. Currie never materialised: a later County Medical Officer, Dr. Fyfe, was still requesting the setting up of anti-tuberculosis dispensaries in 1946. [57] Under the Fife County scheme the MOH acted as principal TBO, but only one executive TBO was appointed. [58] The TBO's were assisted by

the district health visitors, who acted as tuberculosis nurses. By 1919 the four District Committees in Fife employed a total of eight health visitors. [59] Upon receiving a notification, the TBO would visit the patient in his home and then report the results of his inspection to the Insurance Committee or, if the patient was not insured, the local District Committee. [60] Hospital accommodation for tuberculosis cases in the County area was soon found to be essential, for home conditions there were bad and "practically every patient is of the social status in which a term of institutional treatment would prove advisable..." [61]

At the beginning of the County scheme all cases of tuberculosis, except those who were terminally ill, were offered a stay in hospital. [62] Hospital accommodation was initially provided at the infectious diseases hospitals at Ovenstone (6 beds for females); St. Michael's Wood (14, males); Strathore (38, males); and Fosterton (18, females) [63] In 1913 the County Councils of Fife and Kinross combined for the purpose of establishing a sanatorium, a site for which was obtained at Glenlomond in Kinross-shire. [64] This sanatorium was completed in 1917 and, after serving for two years as a military "Neurasthenic Hospital", was opened to civilian tuberculosis patients in May 1919. [65]

As large burghs, Dunfermline and Kirkcaldy established their own tuberculosis schemes. In 1913 the burgh Medical Officer for Kirkcaldy, Dr. McIntosh, made a full report of his proposals for a tuberculosis scheme for the burgh. [66] He proposed the establishment of a dispensary, the extension of the burgh sanatorium and the appointment of a tuberculosis nurse, together with other improvements such as the

provision of revolving shelters in the sanatorium grounds, light outdoors work as occupational therapy for the sanatorium patients and open-air classes for schoolchildren. An anti-tuberculosis dispensary was opened in Kirkcaldy in 1914 and a tuberculosis nurse for the burgh was appointed in 1915. [67] Dr. McIntosh himself acted as TBO for the burgh.

A new sanatorium for Kirkcaldy costing £9 647 was completed in 1922. [68] It contained 24 beds and, together with the accommodation in the old sanatorium, gave the burgh in 1921 a bed: population ratio of 1:1 073, which was almost 60% better than the ratio in the Fife County scheme. The new sanatorium was used for cases of pulmonary tuberculosis, and patients from other tuberculosis schemes, including Roxburgh and Zetland County Councils and also Dunfermline, were sometimes accommodated there. [69] From 1921 the original sanatorium in Kirkcaldy was reserved for the accommodation of cases of non-pulmonary tuberculosis. [70]

By contrast with Kirkcaldy, the tuberculosis scheme in Dunfermline was slow to develop. It was only in 1926 that a temporary anti-tuberculosis dispensary was set up, using rooms in the City Chambers which previously had been used for child welfare clinics. [71] The accommodation here was totally unsatisfactory for a dispensary, being cramped, ill-lit and virtually unventilated, but it was not until 1932 that the dispensary was moved to the new offices of the public health department in Douglas Street. [72] A tuberculosis nurse for Dunfermline was only appointed in 1927, although by 1929 all three health visitors in the burgh were also

acting as tuberculosis nurses. [73] Here too, the burgh Medical Officer acted as TBO.

Prior to 1926 tuberculosis cases from Dunfermline were hospitalized in a number of sanatoria, including Glenlomond, which between 1922 and 1926 accommodated 26 patients from the burgh. [74] In May 1926 Dunfermline became a partner in the Stirling and Clackmannan Joint Sanatorium in the Ochil Hills. [75] The burgh Medical Officer, Dr. Reekie, praised the local authority of Dunfermline for making this agreement but wrote that "it is only a partial solution [to] our tuberculosis problem..." [76] The Ochil Hills sanatorium only took early adult cases of pulmonary tuberculosis. It had no facilities for treating advanced pulmonary cases, non-pulmonary cases or children suffering from either form of the disease. Tuberculosis cases from Dunfermline which could not be admitted to the Ochil Hills sanatorium were treated at a number of institutions elsewhere in the country, including the sanatoria at Kirkcaldy; Noranside, near Forfar; and Manor Valley, near Peebles; the Princess Margaret Rose Hospital in Edinburgh; and Preston Hall village settlement at Aylesford in Kent. [77] However, this dispersal of Dunfermline's hospitalized tuberculosis cases was unsatisfactory, both for the Dunfermline local authority, which had to negotiate with other authorities for the provision of hospital accommodation, and for the patients themselves, who were far from home. Furthermore, hospitalization of all patients was still not achieved, for "no sanatorium appears to want the advanced cases belonging to another authority." In 1927 Dr. Reekie wrote that the question of the hospitalization of tuberculosis cases from Dunfermline presented "an

acute problem to which there is no other solution than the provision of our own treatment facilities..." [78] However, the existing tuberculosis scheme in Dunfermline appeared to achieved a reduction in the tuberculosis death rate there without the use of a local sanatorium, the need for a sanatorium in the burgh decreased and none was ever built.

By the mid 1920s the administrative control of tuberculosis in Fife was extended to the whole population of the county in three separate schemes. However, despite the statutory provisions of the National Insurance Act and the recommendations of the Departmental Committee on Tuberculosis, all three of the tuberculosis schemes in Fife differed in composition. The Fife County scheme had its own sanatorium accommodation but no dispensaries, the Dunfermline scheme ran a dispensary but had no sanatorium, and only the Kirkcaldy scheme had both a dispensary *and* a sanatorium. How these schemes worked and whether their different composition led to any variation in the care provided is considered below.

2. The administrative control of tuberculosis in Fife

Introduction

This section considers the work of local authorities in Fife in their management and treatment of tuberculosis patients in the community, as distinct from sanatoria. It describes the extent of this work, problems of diagnosis, and the attitudes of public health officials to the relationship of tuberculosis to housing conditions and conditions at work. There then follow sections on the work of the County sanatorium at Glenlomond, the control of bovine tuberculosis in Fife and the introduction of chemotherapy, vaccination and mass radiography in the control of tuberculosis in the county.

A. Domiciliary and dispensary supervision of patients

Upon receiving notification of a case of tuberculosis, the staff of a tuberculosis scheme usually made their first contact with a patient in his home, which thereafter became the locus of supervision and treatment, unless the patient was removed to a sanatorium. The necessity of the domiciliary supervision of tuberculosis cases in the County area of Fife was described by the County Medical Officer, Dr. Dewar, in 1910:

> "The importance of such work can hardly be overestimated. Many of the people visited have not the slightest idea of the rudiments of ordinary household management, far less of the manner in which a patient suffering from so fatal and distressing a disease should be looked after. They generally have a dread of fresh air, and windows and doors are kept carefully closed, so that the atmosphere on entering the small rooms where the whole family, when not at work,

assemble, is close and overpowering in character. If Phthisis can be spread by aerial transmission it will have every chance to do so under the circumstances. It is sometimes very difficult to convince such people of the necessity of open windows and the beneficial effects to be derived from fresh air and sunlight..." [79]

During the early period of the Fife County tuberculosis scheme, emphasis was placed upon the training of patients, either in their homes or in the sanatorium. The health visitor would advise a patient on the reorganisation and ventilation of the rooms of his house in order to "turn the patient's room into a small sanatorium as far as possible." [80] From 1919 the County authorities provided open-air shelters to cases who it was thought would benefit from this and if suitable sites for the shelters were available near the patients' houses. [81]

County patients received additional nourishment, including extra milk, eggs, oatmeal, butcher meat, cod-liver oil and malt. [82] By 1930 in necessitous cases in Kirkcaldy and Dunfermline Districts whole households were receiving additional nourishment, for it was recognised that only in this way could their resistance to tuberculosis be maintained. [83] In 1921 the provisions for domiciliary medical treatment contained in section 41 (3) of the National Insurance Act of 1913 were adopted by all the authorities in the County scheme except the burghs of Burntisland, Markinch and St.Andrews. This measure enabled GP's to prescribe drugs to tuberculosis patients at the County's expense. In 1922, for example, a total of 136 patients were provided with medicines to the value of £82. [84]

In 1920 cases of tuberculosis of the joints, most of whom were children, received general hospital treatment, including the immobilisation of the diseased joints in plaster. [85] In 1930 a total of c.20% of all cases of cervical tuberculosis and 32% of cases of abdominal tuberculosis under the County scheme were operated on in general hospitals. [86] Some cases of non-pulmonary tuberculosis also received operative treatment at Glenlomond following the opening of an operating theatre there in 1932. [87] In 1924 patients from Fife suffering from tuberculosis of the skin (lupus) were sent to the Edinburgh Royal Infirmary, where they received the "sunshine" cure for lupus at Sir Norman Walker's Arc Light Clinic. [88] In 1925 the Lochgelly Iron and Coal Company donated four 10-amp carbon-arc lamps to Glenlomond, which henceforth carried out its own treatment of lupus. [89] In 1933 children suffering from non-pulmonary tuberculosis who had been discharged from Glenlomond were treated in their homes with inunctions of tuberculin, a culture of the tubercle bacillus first developed by Robert Koch. [90] When the provision of this treatment was found to be too time-consuming for the staff of the County scheme, it was transferred to a number of school clinics in the county. [91] Of all these treatments only the surgical removal of foci of infection was likely to arrest the progress of the disease and therefore they can have made little contribution to the reduction in mortality from non-pulmonary tuberculosis.

In 1920 the County Council's executive TBO, Mary L. David, reported that the main duties in her work were the the visitation of current notifications, the revisitation of old cases and duties imposed by the Ministry of Pensions, for which from March 1920 TBO's acted as medical

referees. [92] The pressure of this work, and the extensive travelling which it involved, meant that few non-pulmonary cases were visited. However, Dr. David stressed the importance of the revisitation of domiciliary patients and the contribution in this work of the health visitors, ten of whom were employed by the County Council by this time. "The patients require visiting and revisiting to stimulate them to keep up hygienic conditions in the home", she wrote. [93] By 1930 the County tuberculosis staff were able to give more attention to contacts of cases of pulmonary tuberculosis. [94] The TBO and health visitors tried to keep contacts under observation for as long as possible, although it was recognised that full surveillance of all contacts was impossible to achieve. Nevertheless, as the system of the administrative control of tuberculosis developed, it gradually became more thorough.

Up to 1930 the monitoring of tuberculosis in the area of the County scheme was rendered more difficult by unevenness of administrative provision. The County scheme was thought to be administered less efficiently in the participating burghs than in the County Districts, where the County health visitors acted as tuberculosis nurses. Some burghs, such as Leven, employed their own health visitor, whilst others had none. [95] Because of their imperfect control of the tuberculosis scheme in the small burghs the County authorities had difficulty in obtaining accurate information about the incidence of tuberculosis in these towns. In 1926, in commenting on the number of tuberculosis cases which were only notified after death, the County executive TBO, Dr. McGillivray, noted that returns for the whole area of the County scheme were incomplete. [96] Only those burghs where the County Medical

Officer, Dr. Yule, was MOH made returns; figures for the larger of the small burghs, which had their own part-time Medical Officers of Health, were unknown. [97]

The problem of uneven authority and difficulties of information-gathering in the County tuberculosis scheme were solved when under the Local Government (Scotland) Act of 1929 all responsibility for the control of infectious diseases in the small burghs was transferred to the County authorities. [98] A further centralising measure of the Local Government Act was the transfer of control of school medical services from the school boards to the County authorities and the town councils of the large burghs. This was advantageous to the tuberculosis schemes, for now, as the burgh Medical Officer for Dunfermline reported, the "survey of the health of all children is undertaken by one authority, from birth to the school-leaving age". [99] The chances of identifying early cases of tuberculosis in this group were thereby increased.

In 1920 Dr. David proposed the establishment of tuberculosis centres where ambulant cases could receive treatment and be weighed. [100] In 1921, in order to examine ex-servicemen under the Ministry of Pensions' tuberculosis scheme, Dr. McGillivray held weekly clinics at the County public health department's offices in Cupar. [101] During the late 1920s the superintendent of Glenlomond, Dr. Munro, and Cowdenbeath burgh council each proposed the establishment of dispensaries, to which suspected cases of tuberculosis could go for diagnosis and advice. [102] However, the County tuberculosis scheme continued instead to work on a system where "the home is the unit" and the TBO was an "itinerant

dispensary", and despite the later demands of Dr. Fyfe, no fixed dispensaries were ever established. [103] During the interwar period the steep decline in mortality from tuberculosis suggested that existing arrangements were sufficient for the control of the disease. As Dr. Yule wrote in 1934, the system of domiciliary visitation had, "so far as it goes, worked satisfactorily and efficiently..." [104]

Apart from sanatorium provision, it was only in the provision of dispensaries that the tuberculosis schemes in the burghs of Dunfermline and Kirkcaldy differed significantly from the County scheme, although, as has been seen, Dunfermline was slow in establishing its tuberculosis scheme and it was not until 1932 that satisfactory accommodation was found for the burgh's dispensary. While the Dunfermline dispensary was badly located, it was more useful as a base from which tuberculosis doctors and health visitors could carry out domiciliary work than as a centre to which patients could be drawn for treatment and advice. [105] However, with its move to new premises and the improvement of its facilities, Dunfermline's dispensary became more important as a centre for diagnosis. In 1937 the burgh Medical Officer, Dr. Reekie, reported that the early notification of tuberculosis was increasing and that doctors in Dunfermline were making full use of the dispensary for the diagnosis of doubtful cases. [106] This would have been regarded as a particular success in any scheme for the administrative control of tuberculosis, for the early diagnosis of the disease was a source of considerable difficulty. The experience of this problem in Fife is considered next.

B. Diagnosis of tuberculosis

In the administrative control of tuberculosis the early notification of cases was a vital precondition for restricting the spread of the disease. However, the early diagnosis of tuberculosis by physical examination alone was often difficult, if not impossible, to achieve. Pulmonary tuberculosis might reveal itself soon enough by causing a lung to haemorrhage, but equally the disease could be active in a patient for many months before it caused him discomfort or produced symptoms visible to the naked eye. [107] Even when symptoms of tuberculosis did appear, general practitioners sometimes misdiagnosed and treated them as bronchitis or "bloodlessness". [108] Doctors often confused pulmonary tuberculosis with influenza, and the superintendent at Glenlomond, Dr. Munro, reported cases of syphilis and endocarditis being sent there by the County authorities. [109] Sometimes persons were sent to Glenlomond who were not sick at all. The Ministry of Pensions' provisions for benefits for tuberculous ex-servicemen were open to abuse where patients were able to collect their own sputum sample and post it to the medical authorities for examination. "The practice of handing a patient a sputum-collecting outfit to be posted allows of substitution," wrote Dr. Munro, "and this is possible in an effort to obtain unjustly compensation or pension." [110]

Sputum examinations were themselves an unreliable means of identifying tuberculosis. Negative results of such tests did not necessarily exclude the presence of tuberculosis and sometimes tests had to be repeated a number of times before a safe diagnosis could be made. [111] Sputum

tests carried out on patients admitted to Glenlomond in 1919 produced positive results in only 34% of the cases. [112] However, from 1921, when the laboratory at Glenlomond was fully equipped and sputum samples were treated in a centrifuge, the test results began to correspond more closely with diagnoses made by physical examination. "Quite a number of seemingly negative specimens have been found positive...", wrote Dr. Munro. [113] In 1934 the County authorities began to use the Mantoux tuberculin test on contacts of known tuberculosis cases and in 1936 the County's executive TBO, Dr. Lundie, advocated the use of the Mantoux test in the examination of all schoolchildren in Fife. [114]

The use of the Mantoux test on contacts and Dr. Lundie's proposal for its use on schoolchildren were part of the County authorities' attempt to achieve widespread early diagnosis of tuberculosis. Where the identification of the disease depended on patients' willingness to approach medical agencies and on diagnosis by GP's, many cases of tuberculosis remained unknown to the County authorities until it was too late to help them. Of the deaths from tuberculosis which occurred in the Fife County area during 1936, for example, eighteen cases (20%) were not notified during life, and in 1937 a total of 26 such cases (c.30%) were not notified. [115] However, a total of 36% of these deaths occurred in cases of tuberculous meningitis, a disease which progressed rapidly and was invariably fatal. [116]

Used in conjunction with tuberculin testing, X-ray examination offered the best means of diagnosing tuberculosis. The County Medical Officer, Dr. Yule, welcomed radiography as a means of quick diagnosis of

tuberculosis and in 1925 advocated its widespread use in routine examinations. [117] In 1924 X-ray equipment was installed at Glenlomond, where at first it was only used in the selection of patients for artificial pneumothorax (deflation of a diseased lung). [118] Initially, Dr. Munro questioned the effectiveness of X-rays in the diagnosis of tuberculosis:

> "To exclude tuberculosis is no easy matter. I do not pin my faith to an X-ray film. I prefer to have the patient under observation, to note his response to effort, to have repeated bacteriological investigation of all discharges..." [119]

However, by 1927 Dr. Munro had modified his opinion of radiography. He wrote of its particular usefulness in identifying cases of bronchiectasis (pathological dilatation of the bronchi) and forms of surgical tuberculosis. [120] By 1930 numbers of doubtful cases of tuberculosis were being sent to Glenlomond for X-ray examination. [121] In 1930 the executive TBO for Fife, Dr. Leask, called for an expansion of X-ray facilities in the County scheme and in 1937 Dr. Reekie of Dunfermline urged that in the interests of the early diagnosis of tuberculosis GP's in the burgh make better use of X-ray facilities. [122] In the Fife County tuberculosis scheme the use of X-ray examination did not become widespread until after the Second World War. During 1942-45 the average number of County patients which received X-ray examination each year was 410, but during 1946-48 this number increased to 1 260. The number of contacts who were X-rayed also increased. In 1943 the number of contacts who were X-rayed in the County scheme was only 47 but in 1947 it was 360, of whom twenty were found to have pulmonary tuberculosis. [123] In 1943-44 agreements were made with

the general hospitals in Dunfermline, Kirkcaldy, Cupar and St. Andrews for County patients to receive X-ray examinations there. [124] The X-rays taken at these hospitals were sent to the County TBO for interpretation. Meanwhile X-ray examination of out-patients also continued at Glenlomond. This was in spite of the scepticism of Dr. Munro, whose attitudes increasingly exemplified the isolation of the sanatorium doctor, of which Dr. Philip had warned. In 1942 the County public health committee called upon Dr. Munro to give his opinion of the recent increase in tuberculosis in Fife:

> "He did regard the rise in the number of cases in Fife as serious. He thought little was to be gained by mass radiology [*sic*]." [125]

C. Tuberculosis and housing

Poor housing was one of a group of factors which rendered a population vulnerable to tuberculosis, but, particularly as a manifestation of poverty, it was generally thought to be the most important precondition for the spread of the disease. Parkinson, for example, cited studies of conditions in Glasgow, Liverpool, Tyneside and North Wales which emphasised the correlation between overcrowding and high incidence of pulmonary tuberculosis. [126] In the section on the distribution of tuberculosis in Fife the relationship of tuberculosis mortality to poor housing conditions was shown. It was clear that in some parts of the county, cramped housing conditions and overcrowding were common factors in otherwise dissimilar areas where tuberculosis mortality was high. This section considers the attitudes of public health doctors in Fife to this problem.

Through their domiciliary supervision of tuberculosis patients it was clear to most public health officials in Fife that their efforts to control the spread of tuberculosis would be continually undermined as long as overcrowding remained widespread. In his proposals of 1912 for the Fife County tuberculosis scheme Dr. Currie wrote:

> "Few working-class houses are sufficiently spacious to permit of home treatment...from the onset of illness to recovery [and] few are sufficiently hygienic to offer much hope of continued progress when patients return to them after improvement in health has been gained by residence in a sanatorium." [127]

In his report on a tuberculosis scheme for Kirkcaldy, Dr. McIntosh emphasised the problems caused by inadequate housing in the burgh. Like Dr. Currie, he bemoaned the waste of sanatorium treatment on patients who were forced upon discharge to return to the conditions in which they had succumbed to tuberculosis. [128] Such conditions included one- and two-roomed dwellings, together with poor diet and poor working conditions. Because Kirkcaldy's sanatorium was situated in the town, Dr. McIntosh suggested that it was used as a "night camp" for those "whose housing was such that sanatorium conditions could not be maintained in their sleeping apartment..."

In his report for 1925 Dr. McGillivray, as executive TBO in the Fife County scheme, related incidence of tuberculosis to conditions of overcrowding in Fife by comparing the housing conditions of the 507 new cases of the disease which were seen during the year. (Table 12.2.1)

Table 12.2.1 Distribution according to size of house of cases of tuberculosis from the Fife County area notified during 1925

Size of house (rooms)	Total cases		Average number of persons residing in houses of this size
single-roomed houses or sublet rooms	44	(8.7%)	4.5
2	354	(69.8%)	5.7
3	65	(12.8%)	6.0
4+	44	(8.7%)	4.0

Source: 1925 AR 27 Report of County executive TBO

In 1921 a total of 46% of the population of Fife were living in houses of two rooms, and less than 4% were living in one-roomed houses. [129] In the figures presented by Dr. McGillivray a disproportionately large number of cases of tuberculosis occurred in two-roomed houses, which emphasised the connection between overcrowding and the spread of the disease. However, Dr. Munro of Glenlomond discounted any link between housing conditions and the incidence of tuberculosis. In considering the figures given by Dr. McGillivray in 1925, he wrote that "however bad the housing may be, the real factor is that spread is linked up with foci of disease in the house, and not with the house." [130]

Dr. Munro's dismissal of overcrowding as a factor in the incidence of tuberculosis was an idiosyncratic view which reflected his rural isolation at Glenlomond. The importance in tuberculosis control of the provision of good housing was apparent to the TBO's working in the community and they followed with interest the development of local-authority housing schemes throughout Fife. In 1933, for example, Dr. Lundie wrote: "The rapid improvement of housing both in urban and rural areas is one of the most cheering sites to be observed from the point of

view of prevention of tuberculosis." [131] The tuberculosis schemes in Fife had little direct influence upon rehousing of the working classes in the county. Occasionally patients were assisted in finding better accommodation, and some families containing cases of tuberculosis were given priority in the allocation of new housing. [132] In 1937 Dunfermline burgh council began a policy of rehousing families with tuberculosis sufferers and by 1940 had rehoused forty families. [133] The tuberculosis cases in these families were to have rooms to themselves, and in order to encourage them to use the extra room only for this purpose the families were given four-roomed houses at the rent of a three-roomed house. The County authorities designated Halbeath as an area for the preferential rehousing of tuberculous families, although it was later found that this policy led to a particularly high rate of infection amongst children in the village. [134]

Tuberculosis was not as infectious as diphtheria, scarlet fever, whooping cough or measles, and by the observance of a strict domestic regime, such as was described in Kirkcaldy town council's *Instructions to Consumptives* (1906) and promoted by the domiciliary supervision of patients, it was thought to be possible for a person with active tuberculosis to effectively limit the infection of his cohabitants. [135] However, in a small crowded house containing such a case of tuberculosis, it was likely that eventually all the other occupants would become heavily infected. In 1946 the County Medical Officer, Dr. Fyfe, noted the case of a girl of fifteen with advanced pulmonary tuberculosis, all of whose seven brothers and sisters developed the disease. "The house was small and badly overcrowded", he wrote, "the risk of heavy infection was high." [136]

D. Tuberculosis and conditions at work

Public health officials in Fife made little comment about the influence of conditions at work upon the incidence of tuberculosis. They had little knowledge of this problem and no real power to tackle it. The susceptibility of certain occupational groups to tuberculosis was unproven and was not systematically investigated at a local level. It was beyond the means of the tuberculosis schemes in the county to carry out inspection of workplaces in addition to their existing work of domiciliary supervision. Also, there was no legislation equivalent to the Housing Acts which local authorities could enforce for the improvement of working conditions sufficient to bring about a significant decrease in the incidence of work-related tuberculosis. Legislation regulating conditions in heavy industry was administered by the Home Office factory inspectorate, which had no formal links with the public health departments of local authorities. [137] Local authorities administered the Factory and Workshops Act (1901), but this was done in a routine manner and without any attention to the possible incidence of tuberculosis amongst employees. [138]

However, the question of the relationship of the incidence of tuberculosis to occupation in Fife was not completely disregarded by doctors in the county. Dr. Nasmyth's investigation of conditions in mines and the health of miners in Beath parish in the 1880s has been cited. [139] In his report of 1902 as County Medical Officer, Nasmyth made general references to working conditions as a cause of tuberculosis, and during the operation of the tuberculosis schemes in Fife, medical staff repeatedly encountered cases of the disease for

which conditions at work were more to blame than conditions in the home. In 1932, for example, Dr. Lundie reported a case where a mother "attributed her son's breakdown in health to his having performed "time and a half" duties for a long time." [140] During 1930 Home Office medical inspectors carried out seven examinations of workmen in Fife under the Sandstone Industries (Silicosis) Scheme of 1929. Silicosis (pneumoconiosis due to inhalation of silica particles) was thought to be a predisposing cause of tuberculosis. The County TBO, Dr. Leask, reported these examinations, which were carried out in terms of the Workmen's Compensation Act (1897), but made no comment about their usefulness in relation to tuberculosis control. [141] Any ideas that it was profitable to focus measures for the prevention of tuberculosis upon particular industries were dismissed by the Glenlomond superintendent, Dr. Munro, who in 1929 wrote that "T.B. is no respecter of position." [142] However, during the 1950s mass radiography for tuberculosis was focused upon particular industries in Fife, in Kirkcaldy, as the burgh Medical Officer, Dr. Hay, reported in 1950, and at a National Coal Board radiography unit, which in 1959 X-rayed *c.*4 000 persons. [143]

Up to the 1950s the schemes for the administrative control of tuberculosis in the community in Fife involved the location, supervision and limited treatment of cases of the disease. From the 1930s diagnosis of tuberculosis improved with the increasing use of radiography and tuberculin tests. Throughout the interwar period supervision of patients in their own homes became more effective as housing improved with the development of local-authority housing schemes and as numbers of public health staff increased. For example, between 1919 and 1930 the number of health visitors employed by the County authorities increased from 8 to

21 and between 1930 and 1948 the number employed by the Dunfermline burgh authorities increased from 3 to 11. [144] The increased centralisation of the County scheme under the Local Government (Scotland) Act of 1929 also increased efficiency, as did the use of dispensaries in the large-burgh schemes and the participation of the school medical services in all three tuberculosis schemes in the county. The most effective treatment of the disease at this time was probably the surgical removal of foci of infection in cases of non-pulmonary tuberculosis, but operations of this type were carried out on only small numbers of patients. [145] However, the most beneficial effect of the schemes for the administrative control of tuberculosis was the limitation of infection by the removal from overcrowded houses of the most infectious cases of the disease. [146] Such cases were placed in sanatoria, where attempts were made to treat them. The following section describes the work of the Fife and Kinross Sanatorium at Glenlomond.

E. The Fife and Kinross Sanatorium at Glenlomond

The Fife and Kinross Sanatorium was situated in an isolated position on the edge of the Lomond Hills, two miles east of Milnathort and seven miles north of Lochgelly. The location of the sanatorium was described by the County Medical Officer, Dr. Yule:

> "The site is high, sandy and dry; the gravitation water supply, obtained at a level of about 1 100 feet on Bishop Hill, is ample, of low degree of hardness, and above suspicion; the buildings are substantial and comfortable, and are reported convenient in working. In view of the elevation of the site and open exposure to south and west, the open-air principle has not been carried to that extreme

> which makes, on occasion, the winter season a purgatory to the sanatorium patient." [147]

In 1919 accommodation at Glenlomond consisted of 112 beds in three main buildings. For ambulant cases there were two two-storey blocks, each with two six-bed and four two-bed wards on each floor. A single-storey ward housed advanced cases. It comprised two six-bed wards and twenty beds in alternating single- and double-bed wards. A movable partition in the corridor of this ward allowed the redistribution of ward space according to changing ratios of the sexes amongst the patients. [148] The accommodation at Glenlomond gave Fife and Kinross a sanatorium bed: population ratio of 1: 1 904, which was 10% better than the Scottish average for 1919. [149]

At variance with the recommendations of the Astor Committee, which advised that sanatorium accommodation should be reserved for early cases of tuberculosis; Glenlomond served principally for the isolation of acute cases. This reflected the realities of the tuberculosis problem in Fife, where the disease was widespread and hospital accommodation was scarce, but there was local criticism of the extravagance of establishing a sanatorium when tuberculosis was an incurable disease.

[150] Dr. Yule was forced to write in defence of Glenlomond:

> "Although it is impossible to allocate to...several factors their individual share in the decline of the tuberculosis mortality, I feel assured that the outlay on Glenlomond was money well spent. The institution has functioned as a preventive, curative and most impressive educational agency in the action hitherto taken against the disease." [151]

In 1921 the executive TBO for Fife, Dr. McGillivray, reported that a stay in the sanatorium was at least useful as a means of training a patient, for there a tuberculous person would be taught how to avoid infecting others by unshielded coughing and sneezing and the spraying out of bacilli. [152] However, the sanatorium also made continuous attempts to restore its patients' health. As most of the patients at Glenlomond were advanced cases, the importance of rest was emphasised. The superintendent, Dr. Munro, wrote: "It must be rest only at the outset, for it is a rare thing for an early afebrile case to reach this Sanatorium." [153] Later, those patients who were able, progressed to light work on Glenlomond's home farm, which was also useful in supplying the sanatorium with fresh food.

An ordinary diet was provided, but children and cases with much wasting were also given cod-liver oil and Roboleine, a vitamin preparation. [154] In 1920 Dr. Munro prescribed various drugs to his patients, including tuberculin in cases showing signs of improvement, Spengler's Immune Serum where tuberculin was contraindicated, creosote, arsenic, and injections of iodine and guaiacol. Tuberculin produced the most favourable results, the best being in children, and treatment of glands by tuberculin ointment was also introduced. [155] However, Munro's hopes for these treatments soon waned. In 1921 he wrote that "drugs are only used for some special indication" and henceforth concentrated his attention on other therapies. [156]

A treatment which Dr. Munro was eager to use in cases of pulmonary tuberculosis was artificial pneumothorax, or collapse therapy. This was a method of deflating a diseased lung in order to rest it. By means of a hollow needle inserted through the chest wall, air was passed into the potential space (the pleural cavity) between the layers of the pleura, the membrane surrounding the lung. As the pleural cavity filled, the pulmonary layer of the pleura was pushed outwards and forced the elastic lung to collapse. [157] By periodically refilling the pleural cavity with air, the lung could be kept at rest. Only patients capable of breathing through one lung could be chosen for this treatment, and selection of such patients at Glenlomond was impossible until X-ray equipment had been installed there. However, with the help of a grant of £300 from the Miners' Welfare Fund, Glenlomond received X-ray equipment in 1924 and Dr. Munro went to Brompton Hospital in London to study the procedure for the induction of artificial pneumothorax. [158] After the first year when this treatment was carried out at Glenlomond he reported that artificial pneumothorax was of limited usefulness:

> "Treatment by artificial pneumothorax has been undertaken here only in patients in whom the ultimate outlook was unfavourable. With three exceptions [out of eleven cases], the outlook for those patients in whom pneumothorax was complete has been decidedly improved." [159]

In 1926 Dr. Munro estimated that no more than 2% of all cases in Glenlomond could ever benefit from collapse therapy, but after further experience of using this treatment he became more enthusiastic and claimed that artificial pneumothorax was the "greatest aid to the Sanatorium regime in the arrest of progress in pulmonary tuberculosis..." [160] However, in a review of the work carried out at

Glenlomond to 1947 Dr. Munro's successor, Dr. B.W. Anderson, wrote that collapse therapy was not fully exploited there. [161] He noted that it was not until 1945 that a visiting thoracic surgeon, Mr. Bruce Dick of Hairmyres Hospital, East Kilbride, was appointed to Glenlomond and that only then was an arrangement made for cases from Fife requiring major thoracic surgery to be sent for treatment to the Thoracic Unit at Hairmyres. [162]

The first accommodation for children at Glenlomond was the prefabricated ward which had previously been used to accommodate cases of tuberculosis at the St.Andrews District Infectious Diseases Hospital at Ovenstone. The "Ovenstone Hut" was moved to Glenlomond in 1921. In 1937 a new children's ward was opened at the sanatorium. The majority of cases of surgical tuberculosis which were treated at Glenlomond occurred in children. Treatment for this form of the disease consisted of actinotherapy by mercury quartz lamps and some surgical intervention. In 1932 the sanatorium was provided with an operating theatre, but this was used mainly for the induction and refilling of artificial pneumothorax and for minor surgery. From the mid 1940s a visiting orthopaedic surgeon, Mr. R.I. Stirling of Edinburgh, held clinics at Glenlomond but did not perform operations there. In 1946 the Scottish Hospitals Survey reported that Glenlomond was unfavourably situated because of its isolation from operating facilities. [163]

In his report for 1939-45 the County Medical Officer, Dr. Fyfe, noted that due to the decline in tuberculosis in Fife, the accommodation at Glenlomond had been underused for several years. [164] However, with the

increased incidence of tuberculosis during the war and the immediate postwar period, the demand for hospital accommodation for cases of the disease increased and Glenlomond was once more in full use. In 1948 Dr. Fyfe wrote that the lack of hospital beds for tuberculosis cases in Fife was the "real black spot" in measures for the control of the disease. [165] At Glenlomond this problem was exacerbated by shortages of resident nursing staff due to the remoteness of the sanatorium and a lack of accommodation there. [166] Some cases of tuberculosis from Fife were accommodated at the infectious diseases hospital at Cameron Bridge, where tuberculous meningitis was treated, and at the pleurisy unit at Bridge of Earn Hospital, near Perth, and Tor-Na-Dee Sanatorium, near Aberdeen. [167]

In considering the development of sanatoria in Britain to 1914 Worboys writes that the "effectiveness of the sanatorium treatment was always problematical" and that "during the 1900s the educational role of the sanatorium came to dominate the therapeutic." [168] Initially, the training of tuberculosis patients for their return to the community was the main active role of Glenlomond Sanatorium. However, as facilities there were expanded, the sanatorium developed as a centre for diagnosis and treatment. As Dr. Anderson wrote in 1947, "Glenlomond now resembles a hospital much more than it does the original Sanatorium..." [169] Unfortunately, the isolation of Glenlomond, which caused problems of access and staffing, prevented its full development as a treatment centre for tuberculosis. Though cases of tuberculosis continued to be accommodated there, the existence of other treatment centres and the advent of chemotherapy meant that the days of Glenlomond in its

appointed role were numbered. In 1960 the last tuberculosis patients left Glenlomond, which was then turned into a home for the mentally handicapped. [170]

E. The control of bovine tuberculosis in Fife

The consumption of milk from cows suffering from bovine tuberculosis was a prominent cause of tuberculosis in man. Infection of humans with the bovine tubercle bacillus usually occurred in the alimentary tract and could result in tuberculosis of the abdomen, the nervous system, the joints and bones and the glands. The bovine bacillus could also cause pulmonary tuberculosis. In 1937 it was estimated that *c.*4-8% of all cases of pulmonary tuberculosis in Scotland were of bovine origin. Blacklock found that inhabitants of rural areas were more susceptible to bovine tuberculosis than were town dwellers and that the greatest proportion of such infection occurred in eastern Scotland, where 27% of all cases of tuberculous meningitis and 54% of all cases of surgical tuberculosis were infected with bovine strains of the disease. [171]

In Scotland the first legislative provision for the veterinary inspection of cattle for the purpose of identifying tuberculous animals was made in the Dairies, Milkshops and Cowsheds Order of 1899 and the Burgh Police Act of 1903. [172] Further legislation followed the refutation by the Royal Commission on Tuberculosis (1901-11) of Koch's claim that the bovine tubercle bacillus was harmless to humans and the

publication in 1913 of the findings of Departmental Committee on Tuberculosis regarding bovine tuberculosis. [173] Under the Milk and Dairies (Scotland) Act of 1914 local authorities received powers to appoint veterinary surgeons who would work full-time as inspectors of dairy cattle. The First World War delayed the commencement of the operation of this Act, which did not come into force until 1925. That year also saw the introduction of a Tuberculosis Order, which made provision for the notification and slaughter of cattle suffering from open or advanced tuberculosis. [174]

Some local authorities in Fife had employed veterinary surgeons in the general inspection of dairies and cowsheds since the 1880s. However, the inspection of cattle specifically for signs of tuberculosis was only undertaken in the county following the introduction of the Dairies Order of 1899. For example, veterinary surgeons were employed in St. Andrews District during the 1890s as part-time inspectors under the Public Health (Scotland) Act of 1897 and the Contagious Diseases (Animals) Acts but did not begin to inspect cows for tuberculosed udders until 1900. Regulations for the veterinary inspection for tuberculosis amongst cows in burghs were included in the Burgh Police Act of 1903, although burgh authorities could (but presumably did not) adopt the 1899 Order. Leven, for example, appointed a veterinary inspector on a part-time basis in 1904, and in his annual report for that year the burgh Medical Officer, Dr. Graham, drew attention to the need for the identification of tuberculous animals amongst the milch cows which were kept in the town. Veterinary inspection for tuberculous cows in the dairies of Kirkcaldy burgh began in 1908. [175]

Tuberculosis of the udder was relatively simple for a trained inspector to identify. Part of the udder became hard, and the milk drawn from it might appear thin and watery with a greyish colour. As the disease progressed, the milk became "an amber-coloured fluid with flocculent material floating in it." [176] However, some tuberculous cows did not exhibit such symptoms but nevertheless produced infected milk. The only sure way of detecting tuberculous cattle was by carrying out tuberculin tests on herds. [177] However, under the Milk and Dairies (Scotland) Act of 1914 such tests could only be carried out with the written consent of the owner of the cows involved, which is one reason why tuberculin testing was not much used in Fife until the late 1930s. [178]

The veterinary inspection of dairy cattle in Fife, even by physical examination alone, was a task which could not be adequately dealt with by part-time inspectors, but it was beyond the means of most local authorities to make full-time appointments for this work. Following the introduction of the Milk and Dairies (Scotland) Act in 1925, Fife County Council led negotiations with other local authorities in the county for the appointment under the Act of a full-time veterinary inspector for the whole of Fife. In 1926 agreement was reached for the appointment of an inspector for the whole county, excluding the large burghs, and Mr. R.D. Anderson FRCVS was elected to this post. [179] The Fife County veterinary service continued until 1938, when under the Agriculture Act of 1937 responsibility for the veterinary inspection of dairy cattle was transferred to the Ministry of Agriculture and Fisheries. [180]

Each year between 1927 and 1937 the Fife County veterinary inspector made c.800 visits to dairies in the landward area and small burghs and carried out c.16 000 inspections of cattle there (an average of approximately two inspections per cow). [181] This workload, which involved the inspection of an average of c.50 animals per day, was a further reason why tuberculin testing of herds was not carried out. Tuberculin tests were time-consuming to perform, three days being required in which to make the necessary double injection and obtain a reaction. It would have been difficult for the overworked County veterinary inspector to organise a programme of such tests on dairy cattle in Fife. [182]

Animals found to be suffering from bovine tuberculosis in its various forms, including tuberculosis of the udder, tuberculous emaciation and chronic cough, were condemned in terms of the Tuberculosis Order of 1925. Each year between 1928 and 1937 the County veterinary inspector condemned an average of 65 tuberculous cattle, c.40% of which had tuberculosis of the udder. [183] However, the proportion of cattle condemned was always very small, amounting to less than 1% of the total dairy cattle in the county, and made little contribution to the eradication of bovine tuberculosis in Fife. In 1937 Dr. Yule wrote that the proportion of cows in ordinary dairy herds in Fife which could pass a tuberculin test "must be relatively small compared to the actual number of animals yielding milk", but as few tuberculin tests were carried out in the county the full extent of this problem remained unknown. [184]

In their attempts to control bovine tuberculosis the County authorities were constrained by the provisions of the Tuberculosis Order of 1925, which, wrote Dr. Yule in 1936, was "a totally inadequate means of preventing the production of tuberculosis-infected milk." [185] Even if a tuberculous animal was identified, there was no certainty that it would be removed from a herd producing milk. Under the 1925 Order an infected animal had to be in an advanced stage of tuberculosis before it could be destroyed, by which time it had probably infected other cattle. [186] In any herd licensed under the Milk (Special Designations) Order of 1936 infected animals, once identified, had to be got rid of quickly, otherwise the licence would be revoked, but they were usually disposed of on the open market, where they "find a ready sale to some unsuspecting dairyman in need of a good milch cow..." [187]

Better provisions for the control of bovine tuberculosis were included in the Agriculture Act of 1937, under which special payments were made to the keepers of herds which remained tubercle-free and more flexible arrangements were introduced for the removal of diseased animals. [188] The Agriculture Act required dairymen to notify to a veterinary inspector any cow which *appeared* to be suffering from tuberculosis and permitted the inspector to arrange for the slaughter of such animals upon only his *suspicion* that they were infected. Dr. Fyfe praised the provisions of the 1937 Agriculture Act, under which a "uniform system of inspection freed from the risk of personal or financial influences has...been created and the eradication of tuberculosis among dairy herds is at last a possibility." [189] He also welcomed the transfer of veterinary inspection to the Ministry of Agriculture: "The greater

vigilance with which supervision of dairy herds is now being undertaken is a source of much satisfaction." [190]

Whilst the Fife County veterinary service struggled to root out tuberculous cattle from dairy herds, dairies in the county slowly expanded their production of purer milks in terms of the Milk (Special Designations) Order of 1923. Pasteurised milk became widely available in Fife during the 1930s. According to Smith, the Buckhaven Co-operative Society was producing clean milk before the First World War, but it is unlikely that there was much, if any, production of pasteurised milk in Fife prior to the introduction of the 1923 Order, under which it was classified as a designated milk. [191] Pasteurised milk is not mentioned in the County Medical Officers' reports until the mid 1920s. In 1926 the County executive TBO, Dr. McGillivray, recommended the pasteurisation of milk as the best means of protection against milk-borne tuberculosis. "Where the milk supply is mixed", he wrote, "and the source uncertain, pasteurisation is by far the safest course..." [192] By 1928 pasteurised milk was available in some parts of west Fife, where it was produced by the Co-operative Societies in Buckhaven and Dunfermline. However, in 1931 pasteurised milk was still not sold anywhere in east Fife. [193]

The local Co-operative Societies in Fife managed the distribution of pasteurised milk, particularly to the working-class districts of west Fife. By 1936 only the Buckhaven Co-operative Society held a producer's licence for pasteurising milk, which was carried out at its premises at 99 Randolph Street. However, in west Fife there were thirty shops which

held licenses for the sale of pasteurised milk. All but one of these shops were run by local Co-operative Societies, including the societies in Buckhaven (2 shops), Burntisland (1), Cowdenbeath (3), Dunfermline (4), Dysart (2), Leven (1), Lochgelly (9), Methil (6) and Pathhead and Sinclairtown (1). The Lochgelly Equitable Co-operative Society sold pasteurised milk in four shops in Lochgelly burgh and others in Bowhill, Crosshill, Dundonald, Glencraig and Lochore, and the Methil Co-operative Society sold this milk in two shops in Methil and others in Aberhill, Denbeath and Leven. In east Fife in 1936 pasteurised milk was sold in Co-operative Society shops in Auchtermuchty, Cupar, Guardbridge and St.Andrews (2) but nowhere else in that area.' [194]

A single pasteurising plant was in operation in Dunfermline burgh in 1939. In 1946 in Kirkcaldy there were two licensed pasteurisers and two dealers licensed to sell pasteurised milk. In that year a pasteurising plant was also installed at the Scottish Wholesale Co-operative Society's creamery at Dysart. By 1958 there were three pasteurising plants in use in the Fife County area. [195] Pasteurised milk was the designated milk most widely marketed in Fife up to the Second World War and was the only designated milk which was drunk in any quantity by the working classes there. Pasteurisation of milk was probably responsible for the greatest reduction of milk-borne tuberculosis in Fife before the widespread introduction of tuberculin testing of dairy herds during the 1940s.

In the controversy over the value of pasteurisation which was fought out during the 1930s, a number of leading public health officials in Fife sided with the anti-pasteurisation faction, in which a leading figure was Sir Robert Philip. [196] Dr. Yule thought that tubercle bacilli in milk could sometimes resist heat treatment, although this could only happen if pasteurisation was carried out inefficiently, and that pasteurisation impaired both the nutritional content and the flavour of the milk, which made it less popular with consumers. [197] Even where pasteurisation produced germ-free milk, the nutritional value and taste of which were unaffected, it was still seen as an expedient which deterred the production by efficient dairying of clean milk from herds which were tuberculosis-free. Dr. McGillivray wrote that pasteurisation of milk "will kill the ordinary dirt germs but it does not eliminate the actual dirt and it is therefore necessary to keep the cows and the dairy premises in a thoroughly clean state." [198] In 1935 Dr. Fyfe criticised the provisions of the forthcoming Milk Order of 1936 for setting "a premium...upon [the production of pasteurised milk] to the exclusion of clean milk produced without artificial treatment." [199] Such attitudes amongst public health doctors in Fife may have retarded the development of facilities for milk pasteurisation in the county during the 1930s.

A few dairies in Fife began the production of tuberculin-tested milk during the late 1920s. Under the Milk (Special Designations) Order of 1923 the County authorities in Fife granted the first licence for the production of Grade A (Tuberculin Tested) milk to the Wemyss Castle Dairy in 1926. By 1928 dairies at Wester Balrymonth, near St. Andrews, and Hospital Mill at Springfield were producing certified milk, which

was the purest form of designated milk. By 1936 two more dairies in east Fife were producing certified or tuberculin-tested milk but, apart from the Wemyss Castle Dairy, there were no producers of these milks in west Fife and tuberculin-tested milk found only a small market in this part of the county. [200] People were reluctant to switch from the cheaper forms of milk. In 1944 it was noted that although St. Andrews was well supplied with tuberculin-tested milk, still a large proportion of its inhabitants used milk which was not even pasteurised. [201] Up to the Second World War the distribution of tuberculin-tested milk in Fife could have made little contribution to the reduction of bovine tuberculosis in humans there.

During the Second World War the incentive for dairy farmers to produce tuberculin-tested milk increased when in 1944 the subsidy under the Agriculture Act was increased from 2¼d to 4d. [202] In Fife the improved subsidy brought about rapid and widespread improvements in an industry which hitherto had shown itself largely resistant to change. During 1939-45 the number of registered dairies in Fife decreased by *c.*5% to 356 dairies, but there was a greater than fivefold increase in the number of producers of tuberculin-tested milk in the county, as the following table shows. [203]

Table 12.2.2 Producers of tuberculin-tested milk in Fife 1939-45

Producers in Fife	Eastern Division	Western Division
1939	6	7
1945	29	45

Source: 1939-45 R 131

Together with pasteurisation, tuberculin testing carried out on a wide scale led to the greatest improvement in the quality of milk during this period and to the reduction of the incidence of bovine tuberculosis in humans. Blacklock cited the widespread establishment of tubercle-free dairy herds in western Scotland and the pasteurisation of almost all the milk which was consumed in Glasgow as the main reasons why during the 1940s the incidence of bovine tuberculosis in humans was almost as low in that region as in the far north of Scotland and far lower than in any of the eastern regions of the country. By 1947 there were 127 producers of tuberculin-tested milk in Fife with herds containing 50% (4 448 cows) of all dairy cattle in the county. By 1953 tuberculin-tested milk was produced by 95% of all dairies in Fife. [204]

G. The introduction of chemotherapy, vaccination and mass radiography in the control of tuberculosis in Fife

In 1938 there were only 73 deaths from tuberculosis in Fife, which was the lowest annual total of deaths from the disease ever recorded in the county. Thereafter tuberculosis mortality rates began to increase again. The increase in tuberculosis mortality in Fife during the Second World War was considered to be the consequence of fatigue rather than deficiencies in diet. Under the wartime controls of the Ministry of Food, working-class diet was supplemented and thought to be generally good. Children's diet was reinforced by the distribution of priority milk, school meals, milk at school, and the issue of orange juice and

cod-liver oil to pre-school children. [205] However, the resurgence of tuberculosis continued into the immediate postwar period. In 1946 the incidence of and mortality from tuberculosis in Fife were higher than in any year since 1932. "In considering the whole question of tuberculosis", wrote the County Medical Officer, Dr. Fyfe, "the predominant feeling is one of frustration." [206] Under existing methods little could be done to control the disease unless patients were hospitalized, but due to the postwar shortage of nurses this was difficult to achieve. In the County area, Dr. Fyfe stated, tuberculosis could only be controlled by the improvement of hospital accommodation and nursing, the improvement of housing and the provision of dispensaries. [207] In Kirkcaldy the scheme for the administrative control of tuberculosis had been particularly efficient, but here too there was an increase in tuberculosis mortality during the war. By 1950 it seemed that the system of the administrative control of tuberculosis had reached the limits of its effectiveness and that there remained a residuum of infection activating the latent disease which would never be destroyed by administrative controls alone. As Clayson remarks, it was therefore fortunate that new methods of controlling tuberculosis became available at his time. [208]

The first effective chemotherapy for tuberculosis was streptomycin, which was discovered in 1944. [209] Streptomycin, Dr. Fyfe wrote in 1946, "is certainly the most promising of all the drugs tried against the tubercle bacillus and constitutes the one bright gleam on the horizon." [210] Patients from Fife were first treated with streptomycin in 1947, but received this treatment at Bangour Hospital in West Lothian

(2 cases) and the City Hospital in Aberdeen (1). [211] As methods for both the surgical and chemotherapeutic treatment of tuberculosis advanced, Fife fell behind in the provision of hospital accommodation for this work. Thus, it was timely that provisions for the hospital treatment of patients from Fife in hospitals outside the county should be formalised under the National Health Services Act, which came into operation in July 1948. [212] Under the National Health Service all hospital treatment for patients from Fife, including cases of tuberculosis, was administered by the Scottish South-Eastern Regional Hospital Board.

From 1948 the responsibilities of local-authority tuberculosis schemes were limited to prevention of the disease and the after-care of patients. In Fife no significant provision was made for the after-care of patients, but during the late 1940s and the 1950s there were important developments in tuberculosis prevention. [213] In November 1950 the first programme of mass BCG vaccination was carried out in Fife. [214] It involved 280 children in the Halbeath-Crossgates area, where a survey carried out in 1948 had revealed a large number of previously unknown child cases of tuberculosis. [215] All negative reactors to tuberculin tests were vaccinated. Although small in scale by comparison with later programmes, the Halbeath-Crossgates scheme must have been one of first mass BCG vaccination programmes to be carried out anywhere in Scotland. In Fife, further surveys of children were carried out in the Buckhaven area in 1951-52, and in April 1953 BCG vaccination was introduced for all school-leavers in the county. [216]

Fife County Council and Kirkcaldy burgh council were amongst the pioneering local authorities in Scotland in the use of mass radiography for the detection of tuberculosis. In September 1953 a survey of 2 003 fifteen year-olds in Fife was carried out at five mass radiography centres in the county. As a result of this survey, 50% of the examined children received BCG vaccination. [217] A Mass Radiography Community Survey in Fife in 1954-59 X-rayed a total of 140 597 persons, or 66% of the population of the County area. This survey was so effective that Fife was omitted from the national radiography campaigns which were carried out in Scotland in 1957-58. The wartime experiment in mass radiography in Kirkcaldy was noted above. [218] By 1954 the introduction of chemotherapy, vaccination and mass radiography had transformed the old administrative system of tuberculosis control in Fife.

3. Tuberculosis in Fife. Conclusion

In both Fife and Scotland as a whole the period c.1855-1950 saw an almost continuous decline in mortality from tuberculosis. However, between the 1860s and the turn of the century mortality from all forms of tuberculosis in Fife was 24% below that in Scotland as a whole and during the first half of the twentieth century it was 27% below the Scottish average. It is difficult to explain the consistently lower rate of tuberculosis mortality in Fife than in Scotland as a whole. Important factors included lower incidence of a number of the main acute infectious diseases and lower levels of crowding in Fife. Other factors

which were probably important included diet and conditions at work, but there is little or no information on their relationship to the incidence of tuberculosis in Fife. During the second half of the nineteenth century mortality from pulmonary tuberculosis in Fife was highest in the rural districts of the county. This was probably due to conditions affecting female inhabitants in the Fife mining districts. Here housing conditions were an important factor, as they were in the relatively low level of mortality which occurred at this time in the Fife small town districts. However, interpretation of changes in mortality from tuberculosis during the nineteenth century may be limited by the factor of misdiagnosis. Dubos noted that because of the suspected inaccuracy of data from this period, medical statisticians usually took 1900 as a base line for the study of long-term trends in tuberculosis mortality. [219] Furthermore, tuberculosis is a chronic disease, the changing mortality from which can only be fully understood by reference to long-term trends in mortality at a national level.

The contribution of local authorities in Fife to the reduction of tuberculosis mortality during the first half of the twentieth century was probably substantial. Measures for the administrative control of tuberculosis in Fife began to take effect from the end of the First World War. Those adopted in the burgh of Kirkcaldy may have been effective from an earlier date, for here a sanatorium was opened in 1908. The administrative control of tuberculosis contributed to the accelerated decline in mortality from pulmonary tuberculosis which occurred during the interwar period. During 1911-40 the decadal rate of decline in mortality from this form of tuberculosis was 26%, in

comparison to only 10% during 1861-1910. (Table 11.1.1) The tuberculosis control schemes were understaffed. Only the Fife County scheme, which was the sixth largest tuberculosis scheme in Scotland, had a full-time tuberculosis officer. [220] However, during the period Fife County Council and the large-burgh authorities greatly expanded their teams of health visitors, who acted as tuberculosis nurses. There was only limited expansion of facilities for tuberculosis control during the period. No sanatorium was built for Dunfermline burgh and no fixed dispensaries were established in the Fife County scheme, although from 1930 the latter was rendered more efficient by increased centralisation under the Local Government (Scotland) Act. Up to the late 1930s the sharp decline in tuberculosis mortality rates justified the maintenance but not the expansion of the existing infrastructure for control of the disease. However, new methods of diagnosis and prevention were adopted as they became available. The Fife County tuberculosis scheme was amongst the first in Scotland to begin mass radiography and BCG vaccination.

Local authorities in Fife also contributed to the reduction in mortality from tuberculosis by the development of housing schemes under the housing legislation of the interwar period and late 1940s. Between 1919 and 1950 virtually all building of working-class housing in Fife was carried out by local authorities. [221] Between 1921 and 1951 levels of crowding throughout Fife were reduced by 27% to one person per room. During the same period the proportion of the county's population living in two-roomed houses decreased from 42% to 20% whilst that in houses of three or more rooms increased from 54% to 79%. [222] As levels of

crowding decreased, levels of infection diminished and the incidence of tuberculosis was reduced. The progressive elimination of the two-roomed house as a form of dwelling was particularly important. Dr. McGillivray's survey of 1925 showed that although houses of this type contained the same average number of persons as three-roomed houses the incidence of tuberculosis in two-roomed houses was over four times greater. Where there was a case of active tuberculosis in a two-roomed house the spread of tuberculosis amongst the occupants could only be prevented by the removal of that case to a sanatorium. However, the relatively low incidence of tuberculosis in houses of three or more rooms suggests that in such housing, where an additional room was available, much could be achieved in the limitation of infection by domiciliary supervision: turning "the patient's room into a small sanatorium as far as possible", and perhaps also by the provision of open-air shelters. Thus, given a minimum standard of housing, domiciliary supervision was perhaps more useful than Bryder allows. [223] However, in one instance the provision of local-authority housing led to an increase in tuberculosis. The preferential rehousing of tuberculous families in Halbeath concentrated sources of infection in that village and caused a high level of infection amongst children. Of 834 children aged 5-15 in Halbeath who were tuberculin-tested a total of 58% gave positive reactions. This compared, for example, with a total of only 37% positive results in a survey of 344 children in that age group which was carried out in St. Andrews in 1944. [224]

Amongst the non-pulmonary forms of tuberculosis, the decline in mortality from tuberculous meningitis, which mainly affected children, was determined by the same factors which produced the decline in mortality from pulmonary tuberculosis. It was suggested that most of the decline in mortality from the milk-borne forms of non-pulmonary tuberculosis which occurred in Fife up to c.1930 was due not to public health measures but to rural depopulation and the decreasing size of the agricultural labour force. From the 1930s the purification of milk supplies in Fife also contributed to the decline of these diseases, but for this public health authorities in the county could claim little credit. During the debate on the merits of milk pasteurisation in that decade the County Medical Officer, Dr. Yule, and his deputies, Drs. Fyfe and McGillivray, all voiced reservations about this process which may have served to retard the development of pasteurisation facilities in Fife.

The expansion of tuberculin testing of dairy herds, although encouraged by the County authorities, occurred as a result of incentives offered to dairy farmers under the Agriculture Act of 1937, the provisions of which were not administered by public health departments. In comparison to a major dairying county like Ayrshire, where tuberculin testing of dairy herds was widespread by the First World War, dairy farmers in Fife were unprogressive and, except in the area of dairy sanitation, which did not affect the incidence of bovine tuberculosis, were largely resistant to pressure from local authorities to improve methods of milk production. This was partly due to a lack of demand from the county's largely working-class population for the more expensive designated milks.

Widespread improvement occurred only when the economic incentives to produce tuberculin-tested milk became irresistible. Therefore, in the control of milk-borne forms of non-pulmonary tuberculosis in Fife the attitudes and role of public health officials were less important than those of dairy farmers and also of the Scottish Co-operative Society, which marketed pasteurised milk.

In their role of isolating the most infectious cases of tuberculosis from the rest of the community, sanatoria were seen as an effective means of controlling the spread of tuberculosis. However, they could do little to cure the disease. Clayson notes that prior to the introduction of chemotherapy at least 65% of cases of pulmonary tuberculosis discharged from sanatoria were "still expectorating tubercle bacilli". [225] Glenlomond never developed much beyond its primary role as an isolation hospital for advanced cases, although some operative treatment and research were carried out there. Its isolation contributed to the mistakenness of the views of its superintendent, Dr. Munro, on such questions as the relationship of tuberculosis to housing and conditions at work and the value of radiography in diagnosis. By the 1940s the isolation of Glenlomond had become a crucial disadvantage to its role as a treatment centre, as Munro recognised:

> In "the actual treatment of [tuberculosis] the ideal is to secure for every sufferer from tuberculosis the advantage of the available resources of specialised treatment...To secure this the pooling of resources over wider areas is essential." [226]

The contribution of sanatoria to the reduction of tuberculosis mortality in Fife would be difficult to quantify, but it may be of significance to

compare the death rates from tuberculosis in Dunfermline and Kirkcaldy LTD's. Kirkcaldy had its own sanatorium with a high bed: population ratio, but Dunfermline sent patients to sanatoria belonging to other local authorities, including Kirkcaldy, and was unable to hospitalize as many of its cases of tuberculosis as was desirable. Between 1911-15 and 1936-40, when, following the introduction of compulsory notification, the sanatorium in Kirkcaldy would have been in full use, death rates from tuberculosis were lower there than in Dunfermline. (Figure 11.4) It seems unlikely that the lower tuberculosis mortality rate in Kirkcaldy could be accounted for by differences in standards of housing because from 1911 there was a difference in levels of crowding between the two burghs of less than 5%, and this difference was in favour of Dunfermline. (Figure 3.A.3) As was stated, the major difference in provisions for tuberculosis control in the two burghs was in the availability of sanatorium accommodation. By equipping their own sanatorium, the burgh authorities in Kirkcaldy were able to remove from the community more infectious cases of tuberculosis than was possible in Dunfermline. Thus, each year during 1911-40 the tuberculosis scheme in Kirkcaldy was able to save more lives than the scheme in Dunfermline.

Tuberculosis in Fife. Appendix

Royal Burgh of Kirkcaldy. Instructions to Consumptives

From 1906 the town council of Kirkcaldy issued to tuberculosis sufferers in the burgh a health guide entitled *Instructions to Consumptives* (Kirkcaldy 1906), the text of which is given below.

"Instructions to Consumptives

"Your Three Chief Wants are Fresh Air, Rest and Good Food

"1. Fresh Air.

You cannot have too much fresh air, and you should try to spend at least eight hours a day out of doors. When indoors keep the bed and sitting rooms as nearly like the outside air as possible by keeping the windows wide open. Never sleep with the windows shut, however cold may be the weather. A draught is much less dangerous than a stuffy room; indeed some draught or current of air is necessary to good ventilation. Avoid all crowded rooms such as theatres, concerts, and public meetings.

"2. Rest.

One great danger to persons affected with or recovering from Consumption is the tendency to take too violent exercise. At first it is best to spend several hours of the day sitting or lying out of doors, well wrapped up in cold weather and sheltered from the wind. Later on gentle walks may be taken, and the distance walked gradually increased week by week. If your temperature goes up you are exerting yourself too much. If it goes up above 100° you should spend most of the day resting. If your temperature remains normal and your weight increases you may gradually increase your exercise.

"Running, jumping and all heavy or dusty work are forbidden.

"Always rest for an hour before or after meals.

"3. Temperature.

Take your temperature in the mouth three times a day - before breakfast, after dinner, and at bedtime - and record it in your diary. Wash the thermometer in cold water immediately after using it, and keep it in a jar of disinfectant.

"4. Weight.

Weigh yourself, if possible, once a week, and keep a record of your weight.

"5. Food.

The ordinary full meals of a healthy person should be taken. Eat slowly, and try to finish your meal, even if you do not feel hungry. Drink two or three pints of boiled milk daily, and avoid alcoholic stimulants unless specially ordered by the doctor.

"Milk is a complete food; but there is no real nourishment in wine, spirits, beer, or stout.

"6. Precautions against infection.

Phlegm contains the germs of Consumption, and must never be allowed to dry and get into the dust of the house.

"When indoors spit into a mug, and when out of doors into a pocket spitoon. Empty the mug and the spitoon into the fire, and rinse well with hot water. Keep a little disinfectant in the mug and spitoon. Disinfectant solution may be made of izal - two teaspoonfuls to a pint of water; or carbolic acid - two teaspoonfuls to a pint of water. After coughing, the lips may be wiped with pieces of rag, which should be burned at once, or with a handkerchief kept in a linen bag, and not loose in the pocket, or under the pillow. Used handkerchiefs should be boiled daily and the bag once a week.

"Consumptives must not be kissed on the lips.

"If these precautions are taken, and the room kept airy, light and clean, there is not much risk of infection.

"Another person may share such a room, but not the same bed."

Chapter 12. Measures for the control of tuberculosis in Fife. Notes

1. "The Edinburgh Tuberculosis Scheme 1887-1937" Edinburgh Medical Journal 44 (1937) 287

2. ibid. 287

3. Thomas Ferguson, Scottish Social Welfare 1864-1914 (Edinburgh 1958) 429

4. "Edinburgh Tuberculosis Scheme" op. cit. 288

5. Christopher Clayson, "Tuberculosis", in Gordon McLachlan (ed.), Improving the Common Weal. Aspects of Scottish Health Services 1900-84 (Edinburgh 1987) 386-87; "Edinburgh Tuberculosis Scheme 1887-1937" op. cit. 286-88, 290-92

6. The Dairies, Cowsheds and Milkshops Order of 1899, Article III, in W.J Brock, Sanitary Laws of Scotland and Principles of Public Health (Edinburgh 1905) 228

7. "Edinburgh Tuberculosis Scheme" op. cit. 288

8. Ferguson op. cit. 426

9. Clayson op. cit. 389; Ferguson op. cit. 428; Carolyn Pennington, "Tuberculosis", in Olive Checkland and Margaret Lamb (eds.), Health Care as Social History. The Glasgow Case (Aberdeen 1982) 98-99

10. Ferguson op. cit. 424, 428-29

11. Ferguson op. cit. 423; Cupar PC minutes 9 February 1899

12. Kirkcaldy DC minutes 25 February 1899

13. 1902 AR 5-12

14. 1902 AR 11

15. K MOH 1904 AR 5-6

16. St. A MOH 1905 AR

17. "Edinburgh Tuberculosis Scheme" op. cit. 290. The circular included a paper by Dr. Philip describing dispensary-centred schemes for the control of tuberculosis.

18. 1906 AR 8-16

19. 1907 AR 9-10

20. 1907 AR 10-13; 1909 AR Appendix I (87-106)

21. 1907 AR 15

22. ibid. 17

23. D MOH 1906 AR

24. D MOH 1907 AR 9

25. D MOH 1909 AR

26. See Appendix (p.420-21) below for the text of Kirkcaldy town council's *Instructions to Consumptives*; K MOH 1908 AR

27. K MOH 1910 AR 14. Kirkcaldy town council was one of a number of local authorities in Scotland to provide limited sanatorium accommodation in c.1908. (Ferguson op. cit. 430)

28. St. A MOH 1908 AR

29. Leven MOH 1906 AR 3

30. ibid. 4

31. Leven MOH 1906 AR 4; Leven MOH 1909 AR 11-12

32. Leven MOH 1909 AR 11-12

33. ibid. 11

34. Ferguson op. cit. 430

35. Clayson op. cit. 389

36. Ferguson op. cit. 431

37. 1909 AR 89

38. Ferguson op. cit. 431

39. Clayson op. cit. 389. In England all forms of tuberculosis became compulsorily notifiable in 1912. (G.S. Parkinson, A Synopsis of Hygiene (ninth edn. London 1947) 96)

40. 1909 AR Appendix I (87-106)

41. This work was carried out under section 66 (1) of the Public Health (Scotland) Act, which provided for the domiciliary treatment of cases of infectious disease. At this time the Local Government Board made available a tuberculosis maintenance grant for the provision in these cases of medicine, extra nutrition and comforts. (Clayson op. cit. 390)

42. 1909 AR 31

43. ibid. 96; 1912 AR 42

44. 1910 AR 23, 59, 72

45. Thomas Scott Wilson, "Public Health Services", in McLachlan (ed.) op. cit. 296

46. Clayson op. cit. 390. Parliament voted grants in aid of the cost of the treatment of tuberculosis in 1911 and 1912, and a further fixed annual grant was made from 1920 when sanatorium benefit ceased to be available under the National Insurance Act and local authorities became responsible for the cost of their tuberculosis schemes. The grant made in 1911 amounted to £1.5 m., of which £158 000 went to Scotland. Local authorities in Fife received c.9% of the Scottish grant. (Wilson op. cit. 296; 1912 AR 43)

47. Clayson op. cit. 390

48. 1912 AR 45-46. Under section 80 (4) of the National Insurance Act, Insurance Committees, which were responsible for the administration of sanatorium benefit, were appointed for every county, and in Scotland, for every burgh with a population in 1911 of over 20 000. In its circular of May 1912 the Local Government Board advised that the areas of local-authority tuberculosis schemes should be coterminous with those of the Insurance Committees. (ibid. 43, 45)

49. ibid. 42

50. "Edinburgh Tuberculosis Scheme" op. cit. 290

51. Clayson op. cit. 390-91; Interim Report of the Departmental Committee on Tuberculosis (London HMSO 1912), quoted in 1912 AR 45

52. Clayson op. cit. 391

53. 1912 AR 45

54. ibid. 391; Christopher Clayson, "Sir Robert Philip and the Conquest of Tuberculosis" British Medical Journal 1957 II 1504

55. 1912 AR 40-56

56. ibid. 50

57. 1946 AR 76

58. 1912 AR 52

59. 1912 AR 52; 1915-19 R 36, 40, 44, 48

60. 1912 AR 55. Under the Public Health (Tuberculosis) Act of 1921 free treatment for tuberculosis was extended to the whole population of England and Wales. In Scotland tuberculosis schemes continued to be administered in terms of the Public Health (Scotland) Act. (Linda Bryder, Below the Magic Mountain. A Social History of Tuberculosis in Twentieth-Century Britain (Oxford 1988) 70)

61. 1912 AR 54

62. 1913 AR 29

63. ibid. 36

64. Glenlomond Sanatorium medical superintendent's annual report for 1919. The work of Glenlomond Sanatorium is described in section E below.

65. ibid.

66. Kirkcaldy TC minutes 14 February 1913 Report on Parliamentary Grant for Sanatorium Purposes

67. Kirkcaldy TC minutes K MOH February 1914 R, K MOH March 1915 R

68. K MOH 1922 AR

69. Kirkcaldy TC minutes K MOH December 1922 R

70. Kirkcaldy TC Health Committee minutes 18 April 1921

71. D MOH 1926 AR

72. D MOH 1927 AR 14; D MOH 1931 AR 18

73. D MOH 1927 AR ; D MOH 1929 AR

74. Glenlomond Sanatorium medical superintendent's annual reports 1922-26

75. D MOH 1926 AR 11

76. ibid. 12

77. D MOH 1926 AR 12; D MOH 1929 AR 19; D MOH 1935 AR

78. D MOH 1927 AR 15

79. 1910 AR 23

80. 1920 AR 22 Report of County executive TBO

81. 1919 AR 22

82. 1921 AR 28 Report of County executive TBO

83. 1930 AR 22

84. 1922 AR 22

85. 1920 AR 22 Report of County executive TBO

86. 1930 AR 26 Report of County executive TBO

87. See p. 399 below.

88. 1924 AR 20-21

89. Glenlomond Sanatorium superintendent's annual report for 1925, 11. Further references to these reports are abbreviated to "Gl" followed by the date of the report and the page number of the reference.

90. 1933 AR 19 Report of County executive TBO; Dubos op. cit. 104

91. 1934 AR 18 Report of County executive TBO

92. 1920 AR 21-23 Report of County executive TBO

93. ibid. 22

94. 1930 AR 24 Report of County executive TBO

95. Leven MOH 1923 AR

96. 1926 AR 28 Report of County executive TBO

97. In 1923 the burgh Medical Officer for Leven, Dr. Graham, reported that the burgh health visitor, who was also the tuberculosis nurse, made monthly reports on tuberculosis in Leven to both himself and Dr. Yule. (Leven MOH 1923 AR)

98. W.E. Whyte, The Local Government (Scotland) Act, 1929 (Edinburgh 1929) 14

99. D MOH 1932 AR 23

100. 1920 AR 23 Report of County executive TBO

101. 1921 AR 27 Report of County executive TBO

102. Gl 1926 AR 29; 1927 AR 27

103. 1934 AR 18 Report of County executive TBO; ibid. 15

104. ibid. 15

105. D MOH 1928 AR 14

106. 1937 AR 16-17

107. 1930 AR 23; Dubos op. cit. 119

108. ibid. 23

109. 1932 AR 24; Gl 1922 AR 7

110. G1 1924 AR 9-10

111. 1921 AR 30

112. G1 1919 AR

113. G1 1921 AR 6

114. 1934 AR 18 Report of County executive TBO; 1936 AR 18 Report of County executive TBO. The Mantoux test was an intradermal tuberculin test devised by the French physician Charles Mantoux in 1908. During the 1940s the Mantoux test was adopted as the standard skin test for tuberculosis in Britain. (OCM 689; Parkinson op. cit. 104)

115. 1936 AR 17; 1937 AR 18

116. 1936 AR 17

117. 1925 AR 21-22

118. G1 1924 AR 7

119. G1 1925 AR 17

120. G1 1927 AR 49

121. 1930 AR 23

122. 1930 AR 23 Report of County executive TBO; D MOH 1937 AR 17

123. 1946 AR 73; 1947 AR 77

124. 1939-45 R 96

125. Fife County Council Public Health Committee minutes 22 April 1942

126. Parkinson op. cit. 93-94

127. 1912 AR 51

128. Kirkcaldy TC minutes 14 February 1913 Report on Parliamentary Grant for Sanatorium Purposes. The same opinion was also expressed by Dr. Macdonald, the burgh Medical Officer for Leven. (Leven MOH 1913 AR)

129. Census of Scotland 1921 I 17 Table 27

130. G1 1929 AR 8

131. 1933 AR 19 Report of County executive TBO

132. 1933 AR 18 Report of County executive TBO

133. D MOH 1937 AR 16; D MOH 1940 AR

134. 1949-53 R 118

135. See Appendix 1 below.

136. 1946 AR 74

137. Helen Jones, "An Inspector Calls: Health and Safety at Work in Interwar Britain", in Paul Weindling (ed.), The Social History of Occupational Health (Beckenham 1985) 225, 231

138. Brock op. cit. 171

139. See p. 358-40 above.

140. 1932 AR 24 Report of County executive TBO

141. 1930 AR 25 Report of County executive TBO; Linda Bryder, "Tuberculosis, Silicosis and the Slate Industry in North Wales 1927-1939", in Weindling (ed.) op. cit. 111-12, 120

142. Gl 1929 AR 9

143. See p. 344 above; 1954-58 R 120

144. 1915-19 R 36, 40, 44, 48; 1930 AR 40-41; D MOH 1930 AR 28; D MOH 1948 AR

145. Bryder, Below the Magic Mountain 256

146. Anne Crowther, British Social Policy 1914-1939 (London 1988) 29

147. 1919 AR 21

148. Gl 1919 AR

149. Clayson op. cit. 394

150. Fife Herald 24 February 1926

151. 1921 AR 25-26

152. Ibid. 29

153. Gl 1924 AR 3

154. Gl 1920 AR 5

155. Gl 1920 AR 4-5; Gl 1923 AR 5; Gl 1924 AR 5

156. Gl 1921 AR 5. New drug treatments were tested at Glenlomond as they became available. In 1924, at the request of the Medical Research Council, Professor Dreyer's Diaplyte Vaccine was tried out on fifty patients. "There was nothing to be said in favour of this treatment", Dr. Munro reported. "Indeed I had to pronounce it inert, that is not

even capable of doing harm." The Medical Research Council also paid for a laboratory research programme directed by W.J. Tulloch, professor of bacteriology at University College Dundee, which made use of samples from patients at Glenlomond. It was planned to grow one hundred strains of tubercle bacilli "and to try and type these out serologically, and finally to try and prepare therapeutic sera to the types." Work on this programme continued throughout the 1920s and its results were published in articles in *Tubercle*. (Gl 1922 AR 9; Gl 1924 AR 4)

157. OCM 1111, 1112

158. Gl 1924 AR 7

159. Gl 1925 AR 8

160. 1926 AR 8; 1929 AR 20

161. Gl 1947 AR 2

162. ibid.; 1939-45 R 95. Mr. (later Professor) John Anderson of Dundee Royal Infirmary was appointed as consultant surgeon to Glenlomond in 1922. He performed thoracoplasty (removal of ribs to allow the lung to collapse) in a few cases from Glenlomond where artificial pneumothorax had been unsuccessful. A further operation of this sort, which involved crushing the phrenic nerve in order to paralyse one side of the diaphragm, was being performed on Glenlomond patients during the 1940s, but not at the sanatorium itself. (Gl 1922 AR 9; Gl 1925 AR 9; Gl 1944-45 R 10)

163. Gl 1921 AR 6; Gl 1926 AR 11; Gl 1932 AR 37; Gl 1937 AR 6; 1939-45 R 95

164. 1939-45 R 88

165. 1948 AR 57

166. Gl 1947 AR 3. Plans to build a new nurses' home at Glenlomond were abandoned in 1939 due to the outbreak of war.

167. 1946 AR 73; 1948 AR 62

168. Michael Worboys, "The Development of the Sanatorium Treatment for Consumption in Britain 1880-1914" Bulletin of the Society for the Social History of Medicine 35 (December 1984) 42-43

169. Gl 1947 AR 3

170. Glenlomond Hospital, register of patients 1919-63 (Fife Health Board 11/5/1)

171. Rosen, "Disease, Debility and Death" 648; Clayson, "Tuberculosis" 405; Parkinson op.cit. 92; Blacklock op. cit. 710-11

172. Brock op. cit. 151-54, 228

173. John Francis, "The Work of the British Royal Commission on Tuberculosis 1901-1911" Tubercle 40 (1959) 127; Clayson, "Sir Robert Philip" 1504

174. 1925 AR 41; Parkinson op.cit. 394

175. Dunfermline PC minutes 4 November 1886; Kirkcaldy PC minutes 13 September 1886; St. Andrews DC minutes 14 March 1898, 9 July 1900; Leven TC minutes 1 February 1904; Leven MOH 1904 AR; K SI 1908 AR 13

176. 1929 AR 42 Report by Mr. Anderson, Fife County veterinary inspector

177. Parkinson op.cit. 391

178. The leading county in the fight to eliminate bovine tuberculosis in Scotland was Ayrshire, where tuberculin testing was carried out on a wide scale prior to the First World War and the creation of disease-free herds became a question of pride and rivalry amongst dairy farmers. By 1914 a total of 88% of the dairy herds in Ayrshire were tuberculin tested. (J.A. Symon, Scottish Farming Past and Present (Edinburgh 1959) 330; Blacklock op.cit. 710)

179. 1926 AR 42

180. 1937 AR 52; 1938 AR 30

181. See, for example, 1929 AR 56

182. Parkinson op.cit. 391. In 1935, when the burghs of Dunfermline and Kirkcaldy requested to join the County veterinary scheme, the County authorities proposed to appoint additional inspectors, but this plan was superceded by the transfer of responsibilities for veterinary inspection to the Ministry of Agriculture. (1935 AR 49)

183. Fife County Medical Officer's annual reports 1928-37 Reports by Mr. Anderson, Fife County veterinary inspector

184. 1937 AR 67

185. 1936 AR 97

186. 1937 AR 67

187. ibid. 67

188. James Mackintosh, "The Evolution of Milk Production", in Agriculture in the Twentieth Century. Essays on Research, Practice and Organization presented to Sir Daniel Hall (Oxford 1939) 419

189. 1937 AR 100

190. 1938 AR 31

191. Smith op. cit. 558; 1926 AR 28

192. 1928 AR 44; 1931 AR 69, 92

193. 1931 AR 110-11, 123-24; 1936 AR 70-71

194. 1936 AR 70-71, 98

195. D MOH 1939 AR 94 Report of burgh SI; K MOH 1946 AR 55-56 Report of burgh SI; 1954-58 R 132

196. Bryder, Below the Magic Mountain 135-36. For the debate on pasteurisation, see also Magnus Pyke, Food and Society (London 1968) 76-80 and the sources referred to therein.

197. 1935 AR 62-63

198. 1933 AR 67

199. 1935 AR 105. Under the Milk (Special Designations) Amendment Order (Scotland) of 1944 improved regulations for the heat treatment of milk and the definition of tests of pasteurised milk, including tests for the post-pasteurisation contamination of milk, were introduced. (1939-45 R 132)

200. 1926 AR 42; 1928 AR 43-44; 1935 AR 65; 1936 AR 70

201. Elenora J. Simpson, "Patch-Testing in an East Coast Town" British Medical Journal 1944 I 286

202. Sir John Brotherston and John Brims, "The Development of Public Medical Care 1900-48", in Gordon McLachlan (ed.), Improving the Common Weal. Aspects of Scottish Health Services 1900-84 (Edinburgh 1987) 83

203. 1939-45 R 131

204. Blacklock op.cit. 710; 1947 AR 121-23; 1949-53 R 135-37

205. 1939-45 R 85, 88-89, 123

206. 1946 AR 75

207. ibid. 76-77; 1947 AR 79

208. K MOH 1950 AR 19; Clayson, "Tuberculosis" 400

209. Streptomycin is an antibiotic produced from the soil organism *Streptomyces griseus*. It was discovered by the American microbiologist Selman Waksman. Further developments in antituberculous agents included para-aminosalicylic acid (PAS), which was discovered by Lehmann in 1946, and isoniazid, which was introduced in 1952 and proved to be the most effective of the early chemotherapies for tuberculosis. (OCM 1345, 1448, 207)

210. 1946 AR 77

211. 1947 AR 75

212. 1948 AR 63

213. See 1947 AR 79-81 for the problem of the rehabilitation of tuberculosis patients in Fife.

214. 1949-53 R 118-19. The anti-tuberculosis vaccine Bacille Calmette-Guérin (BCG), which is "a permanently attenuated strain of the bovine tuberculosis bacillus", was developed at the Pasteur Institute in Paris by the microbiologists Leon Calmette and Camille Guérin from 1906. It was first used in human and veterinary medicine during the 1920s, but only came into general use after the Second World War, with the United Kingdom being one of the last countries to adopt it. In 1950 the Department of Health for Scotland approved the use of BCG vaccination against tuberculosis in persons who were at special risk of contracting the disease, such as nurses and contacts of cases, but by 1952 most of the local authorities in Scotland had introduced wider-ranging BCG schemes under the provisions of section 27 of the National Health Services Act. (OCM 121; Bryder, Below the Magic Mountain 138-42; 1949-53 R 116-17; Clayson, "Tuberculosis" 403)

215. 1949-53 R 118

216. ibid. 119

217. ibid. 120

218. 1954-58 R 119-20; see p. 344 above. For mass radiography for tuberculosis in Scotland, see Clayson, "Tuberculosis" 399-400

219. Dubos op. cit. 186

220. G. Lissant Cox, "Co-ordination and Regionalisation of Tuberculosis Services in England, Wales and Scotland" Public Health 54.9 (June 1941) 158

221. See chapter 3 section 3 above.

222. Census of Scotland I 17: 1921 Table 27; 1951 Table 19

223. Bryder, Below the Magic Mountain 142, 148

224. 1949-53 R 118; Simpson op. cit. Table 1

225. Clayson, "Sir Robert Philip" 1504

226. Quoted in Lissant Cox op. cit. 159

CHAPTER 13

THE CONTROL OF INFECTIOUS DISEASES IN FIFE c.1855-1950. CONCLUSION

Between 1855 and 1950 the mortality rate from the main infectious diseases in Fife fell almost continuously and by 89% to 70 deaths per 100 000 inhabitants. The explanation of this decline in mortality is complex. As Zinsser wrote, each infectious disease is a "biological individual" with its own aetiological identity. [1] Different factors or combinations of factors were responsible for the decline of each of the main infectious diseases. This conclusion reviews the reasons for the decline in mortality from each of those diseases in Fife and then considers the degree to which public health administration in the county influenced that decline. It considers the reasons for differences between the divisions of the county in the reduction of mortality from the main infectious diseases. To facilitate this analysis, the main infectious diseases have been divided into four groups: the so-called "filth" diseases, including typhus, typhoid and diarrhoeal diseases; airborne infectious diseases of childhood, including diphtheria, scarlet fever, measles and whooping cough; all forms of tuberculosis; and other infectious diseases, including smallpox and influenza. The diseases have been categorised here according to their main modes of transmission, their prevalence within a particular age group or whether they were acute or chronic infections.

Figure 13.1 shows the pattern of mortality in each of the four disease groups during the period. In each of the three groups which during the mid nineteenth century caused the greatest mortality the trend of decline in mortality is obvious. The curve for the fourth group shows epidemic periods of smallpox and influenza, neither of which diseases, unlike the others considered in this study, was endemic in Fife. For the purpose of estimating the percentage contribution of public health administration to the total decline in mortality from the main infectious diseases in Fife the period has been divided at the quinquennia 1891-95 and 1921-25. Table 13.1 gives the quinquennial mortality rates from each of the main infectious diseases at the beginning and end of each of the three subperiods and the percentage of the total decline in mortality from the main infectious diseases which is represented by any decline in mortality from an individual disease. From this data an estimate is made of the percentage contribution of public health administration to the reduction in mortality from these infectious diseases in Fife.

Figure 13.2 shows the pattern of mortality from filth diseases in the divisions of Fife. It shows considerable differences between the divisions up to only the late 1890s. As was described in chapters 5 and 6, the high levels of mortality from these diseases which occurred in the rural and large-town divisions during the late nineteenth century indicate that conditions in the industrial large burghs and the landward mining districts of Fife were most conducive to the spread of typhoid and diarrhoeal diseases. However, the pattern of mortality from typhus was similar throughout the county. A sharp decline in mortality from

typhus occurred simultaneously in all divisions of the county during the 1870s. The decline in mortality from typhus in Fife predated the widespread provision of abundant piped water supplies. Thus it occurred before any improvement in standards of personal hygiene which such provision might have brought about. Although improvements in sanitation in Fife may have led to some reduction in typhus mortality up to the 1880s, by *c.*1880 sanitary development in the county was insufficient to permit any improvement in personal hygiene coextensive with the decline in typhus mortality which occurred. It was suggested that a correlation existed between fluctuations in typhus mortality in Scotland as a whole and patterns of immigration to the central Scottish industrial belt from Ireland and the Scottish Highlands. The present study has provided no data to test this hypothesis, which would be a suitable subject for further research. Hardy's study of typhus in London discounts immigration as a factor in the incidence of mortality from the disease. [2] The evidence from Fife is inadequate to counter Hardy's argument. However, it is clear that public health administration made no direct contribution to the elimination of mortality from typhus in Fife.

Chapter 5 showed that in the town districts of Fife the greatest reduction in mortality from typhoid occurred during the 1880s and coincided with the greatest municipal activity in the improvement of water supplies. In the landward area there was also a sharp decline in typhoid mortality during the 1880s. Much credit for this latter improvement must be due to the parochial boards, especially those in west Fife, which carried out improvements to landward water supplies. The development of drainage and scavenging assisted but was subordinate

to the improvement of water supplies in the reduction of mortality from typhoid. The decline in typhoid mortality which occurred in Fife up to the 1890s may be attributed to improvements in sanitation carried out by local authorities.

The further decline in typhoid mortality which occurred during the remainder of the period was due to continuing sanitary development and also to the isolation of typhoid patients in infectious diseases hospitals. The value of isolation of cases in the control of typhoid was seen most spectacularly in the contrasting experiences of outbreaks of the disease in Dunfermline and Kirkcaldy in 1895 and 1896. Hospitalization of cases was probably important in securing a continuation of the decline in typhoid mortality in the County Districts of west Fife during the 1890s, when quality and quantity of water supplies in that area deteriorated. The relative backwardness of the landward area of Fife in the development of sanitation probably also accounts for the higher level of mortality from filth diseases which occurred there than in the urban divisions of the county during the 1920s. (Figure 13.2) The decline of typhoid in Fife during the whole period may be attributed to the work of public health administration. It amounted to 21.4% of the total decline in mortality from the main infectious diseases during 1855-91 and to 5.6% during 1891-1921. (Table 13.A)

Explanation of the decline in mortality from diarrhoeal disease in Fife is more complicated. Sanitary improvements during the late nineteenth century must surely have brought about some reduction in diarrhoeal

disease mortality in Fife. In the large burghs the decline in mortality from diarrhoeal disease coincided with the development of piped water supplies and underground drainage. However, in Fife as a whole any such improvement was cancelled by other factors, including the deleterious effect on child health of urban expansion in the landward mining districts and perhaps hot summers during the 1890s, when flies, the main transmitter of diarrhoeal disease, would have bred in profusion. As a result, during the late nineteenth century there was almost no permanent decline in mortality from diarrhoeal disease in Fife. In contrast to the control of typhoid, the control of diarrhoeal disease by sanitary improvement was more dependent upon the development of underground drainage than water supplies, although the plentiful provision of the latter was important in this context as a factor in the development of personal hygiene and for flushing drains. With local exceptions, the development of drainage tended to follow the provision of adequate water supplies. As was noted in chapter 3, it is difficult to identify limiting dates for the development of adequate drainage in all the towns in Fife, but it is probable that this process was not completed until the First World War, more than a decade after most towns in the county had secured adequate water supplies. This differential accounts for the delay in the decline of diarrhoeal disease mortality in Fife in relation to the decline in mortality from typhoid in the county. (Table 13.A)

Other factors influenced the decline in mortality from diarrhoeal disease in Fife. These included the quantity and quality of housing, standards of maternal and child health and standards of health education. Quality of milk supply, as determined by standards of milk

production, and standards of medical and hospital care were found to be insignificant as factors in the decline of diarrhoeal disease mortality in Fife and its subsequent slight increase from the late 1920s. This latter finding corresponds with other studies. Illich, for example, states: "Reduction in diarrhoeal diseases is brought about by a better water supply and sanitation, never by curative intervention." [3] From the First World War the work of local authorities in Fife was developed to include the promotion of health education to nursing mothers, the provision of maternal and child welfare services and house-building. However, the contribution of this work to the decline in diarrhoeal disease mortality up to the late 1920s, when the lowest death rate was achieved, would have been small. Between the 1930s and the 1950s there is a correlation between the increase of diarrhoeal disease mortality and the decline of breast feeding in Fife. This may be regarded as a failure, albeit an inevitable failure, of the child welfare services in the county. The contribution of individual factors to the decline in mortality from diarrhoeal disease in Fife is uncertain but it may be assumed that that decline was largely if not entirely due to the various efforts of public health administration to improve environmental conditions and control this disease. The greatest decline in mortality from diarrhoeal disease occurred during the period 1891-1921, when it amounted to over 19% of the total decline in mortality from the main infectious diseases in Fife.

The pattern of mortality from the airborne infectious diseases of childhood in Fife is like that of filth diseases in the county in showing substantial differences between the divisions of the county only

up to the late 1890s. (Figure 13.2) During the late nineteenth century treatment by medical practitioners in Fife may have contributed to the some reduction in mortality from airborne infectious diseases, although this is another unresearched subject, but up to the 1890s local authorities in Fife made no effective contribution to that reduction. As was seen in chapters 7, 8 and 9, preventive measures against diphtheria, scarlet fever and measles which were adopted prior to the 1890s were ineffective, being based on an imperfect understanding of the aetiology of those diseases. No such measures were adopted for the attempted control of whooping cough. Up to the 1890s the main factors in the decline in mortality from diphtheria were natural immunisation against the disease and perhaps the fluctuating prevalence of diphtheria *gravis*. Natural immunisation was probably the main factor in the decline in mortality from whooping cough, whilst the decline in mortality from scarlet fever was due to a decrease in the virulence of the disease during the 1880s. There was no significant decline in mortality from measles during 1855-91.

Up to *c.*1890 the decline in mortality from the airborne infectious diseases of childhood, which amounted to 56.5% of the total decline in mortality from the main infectious diseases during 1855-91, was due to natural self-limiting factors. These factors continued to operate during the later part of the period. With the development of housing in Fife during the period, reductions in levels of crowding may have led to reductions in levels of infection from these diseases. However, the effect of this factor would have been modified by the age structure of the populations affected. Differences in age structure of the

populations of the divisions of Fife probably account for differences between those divisions in mortality rates from the airborne infectious diseases of childhood. However, analysis of the age structure of the different populations at risk is beyond the scope of this study. It would form another suitable subject for further research.

From the 1890s local authorities in Fife adopted new measures for the control of the airborne infectious diseases of childhood. The first of these measures was the increasing use from the 1890s of infectious diseases hospitals for the isolation of cases of diphtheria and scarlet fever. There is evidence, including negative evidence from the Kirkcaldy diphtheria epidemic of 1914-20, that the early isolation of cases of diphtheria and the early administration of diphtheria antitoxin were effective in limiting outbreaks of the disease. However, due to the high infectivity of scarlet fever and its spread by cases of subclinical streptococcal throat infection, hospitalization of scarlet fever cases was of little value in limiting the spread of that disease. The hospitalization of cases of measles and whooping cough, which was first adopted during the 1900s and more widely employed during the interwar period, was similarly ineffective. During the period neither measles nor whooping cough was compulsorily notifiable. Hospital treatment of all the airborne infectious diseases of childhood was beneficial to the patients themselves, but the available data show no decline in case mortality resulting from such treatment. From the late 1920s scarlet fever was sometimes treated with antitoxin.

At the end of the period immunisation against diphtheria and whooping cough was introduced in Fife. Immunisation against diphtheria, which was introduced in 1941, was responsible for the eradication of the disease during the 1950s. However, immunisation against whooping cough was initially less effective and could have made little contribution to the decline in mortality from that disease up to 1950. No measures for immunisation against scarlet fever or measles were introduced during the period. It may be concluded that in Fife measures for the prevention of the airborne infectious diseases of childhood were only effective in the case of diphtheria, which disease was controlled by removal of cases to hospital and antitoxin treatment and was eliminated by immunisation. Measures for the control of diphtheria took effect from the late 1890s when an increasing proportion of cases was removed to hospital. However, the extent to which the subsequent decline in mortality from the disease should be attributed to measures adopted by public health administration or to natural factors is uncertain. The administrative control of scarlet fever, measles and whooping cough on a wide scale was impossible due to the high infectivity of those diseases. However, such controls as were adopted probably had a limited life-saving value. During the interwar period the provision of health education through child welfare services and the improvement of housing may have been beneficial in the control of the airborne infectious diseases of childhood by improving home conditions for the treatment of those diseases.

No measures for the prevention of pulmonary tuberculosis were adopted by local authorities in Fife prior to the late 1900s. The explanation of the late nineteenth-century decline in mortality from pulmonary

tuberculosis, in Scotland as in Fife, is a complex question which cannot be fully answered here. In most of its forms tuberculosis is a chronic disease. Study of long-term trends in mortality by birth-cohort analysis offers the best hope of explaining patterns of mortality from pulmonary tuberculosis. However, such an analysis is impossible from the data contained in the annual reports of the Registrar-General for Scotland (RGS). The late nineteenth-century decline in mortality from pulmonary tuberculosis was probably a consequence of increased resistance to infection, which may have resulted from nutritional improvements, natural immunisation and the decline of other infectious diseases, especially smallpox, scarlet fever, measles and whooping cough, and of reductions in levels of infection, which were due to reductions in levels of crowding.

Up to the First World War there were great differences in levels of mortality from tuberculosis in the divisions of Fife. These differences mainly reflect differences in levels of mortality from pulmonary tuberculosis. (Figures 13.4 and 11.3) In chapter 11 it was argued that high levels of mortality from pulmonary tuberculosis in the rural division were due to high incidence of mortality from the disease amongst females, particularly in the landward mining districts. The low level of mortality in the small town division is difficult to explain because up to 1911 the annual reports of the RGS do not contain data for individual towns within that division. However, data for individual small burghs in Fife as given in the annual reports of the RGS from 1911 suggest some correlation between levels of mortality from pulmonary

tuberculosis and levels of crowding in those towns. However, this is an underresearched area.

From the interwar period the population of Fife was served by three tuberculosis schemes. With the increasing use of tuberculin tests and radiography during the 1930s and 1940s the tuberculosis schemes in Fife became increasingly efficient in diagnosis. However, the effectiveness of these schemes in treating and controlling the spread of tuberculosis remains in doubt. Writing about Glasgow, McFarlane argues that measures for the administrative control of tuberculosis, including sanatoria, were of no life-saving value. [4] The data used in this study of Fife are insufficient to counter McFarlane's arguments. However, it seems that the use of local sanatoria for the segregation from the community of the most infectious tuberculosis sufferers, a role for which the sanatoria were not originally intended, must have been of some importance in reducing levels of infection in the community. The lack of a sanatorium serving Dunfermline burgh may have been a factor producing a higher interwar mortality rate from pulmonary tuberculosis there than in Kirkcaldy burgh. Probably of more importance in the limitation of tuberculous infection in Fife was the development of working-class housing, including the reduction of crowding and the provision of larger houses, in which domiciliary cases of tuberculosis could be more effectively separated from other occupants.

F.B. Smith suggests that the late nineteenth- and early twentieth-century decline in mortality from pulmonary tuberculosis in England and Wales and Scotland occurred independently of any preventive measures. He

notes the prediction of 1908 by H.C. Wilbur that without medical intervention "tuberculosis would disappear in 1945 if the nineteenth-century trend was projected..." [5] However, in Scotland this trend was broken in the late 1930s. In a statistical interpretation of mortality data Springett argued that the interruption in the decline in mortality from pulmonary tuberculosis which occurred in Scotland as a whole during the late 1930s and the 1940s was an effect of the age-specific incidence of the disease and was due to the movement of the age at which most primary infection occurred from childhood to adolescence. [6] By the mid twentieth century persons were living longer before they became infected with tuberculosis. Springett suggested that due to the age structure of the population at risk this change had the paradoxical effect of increasing mortality rates from pulmonary tuberculosis.

The reason for and timing of the interruption of the decline in mortality, in both Fife and Scotland as a whole, suggests that environmental improvements, viz. the development of housing and the removal of the most infectious persons to sanatoria, were of use in limiting infection but that by the late 1930s these measures had achieved maximum effectiveness and other measures were needed to bring about further reductions in mortality from pulmonary tuberculosis. However, had it not been for the introduction of measures for the administrative control of pulmonary tuberculosis and state-aided house-building the levelling of the decline in mortality from pulmonary tuberculosis would have occurred earlier, perhaps during the 1920s. Therefore the interwar decline in mortality from pulmonary tuberculosis in Fife may be attributed to both the direct and indirect efforts of

public health administration to control the disease. This amounted to about 16% of the total decline in mortality from the main infectious diseases in Fife during the period 1921-50. (Table 13.A)

No provision was made for the control of non-pulmonary tuberculosis by public health administration in Fife until the First World War, when this form of tuberculosis became notifiable and was treated under the County tuberculosis schemes. Some cases of non-pulmonary tuberculosis may have been treated in surgical hospitals in Fife during the period prior to the First World War, but any such treatment, if it was successful, made little impact upon the mortality rate from the disease, which declined little until the 1920s. It is suggested that the decline in mortality from tuberculous meningitis, which was a disease most commonly caused by pulmonary infection, was due to similar factors to those which caused the decline in mortality from pulmonary tuberculosis. Thus the decline in mortality from tuberculous meningitis which occurred in Fife during the interwar period may be attributed to the work of public health administration in reducing levels of pulmonary tuberculous infection in the community.

The majority of cases of other forms of non-pulmonary tuberculosis were caused by milk-borne infection of bovine origin. Prior to the 1930s any decline in mortality from these forms of tuberculosis in Fife may have been a consequence of rural depopulation. No effective measures for the control of bovine tuberculous infection of milk supplies were adopted in Fife until the 1930s, when pasteurized milk became widely available in the county and when under the Agriculture Act of 1937 farmers received

incentives to eliminate tuberculous cattle from dairy herds. During the 1930s the County authorities in Fife, which administered the area where most of the milk consumed in the county was produced, were unconvinced of the value of milk pasteurization, whilst the Agriculture Act was adminstered by the Ministry of Agriculture. Thus, with the exception of the control of tuberculous meningitis, public health administration played only a marginal role in the reduction of mortality from non-pulmonary tuberculosis in Fife. After 1930 the annual reports of the RGS no longer differentiate mortality from tuberculous meningitis from that due to other forms of non-pulmonary tuberculosis. Thus it is impossible to estimate the share of the decline in mortality from non-pulmonary tuberculosis which may be attributed to the work of public health administration.

The reduction of mortality from smallpox was the first and most thorough achievement of public health administration. It was the result of vaccination reinforced by measures of administrative control. Smallpox became insignificant as a cause of death in Fife after the 1870s.

Influenza became a major cause of death in Fife during the 1890s and reappeared in epidemic form during the interwar period. It was not a notifiable disease and was uncontrollable by administrative means. Hospitalization of cases effected some life-saving but this occurred on only a small scale and made no significant contribution to the reduction in mortality from the disease, which occurred with the ebb of epidemic waves and natural immunisation.

What was the percentage contribution of public health administration to the decline in total mortality from the main infectious diseases in Fife? For the period 1855-91 this question is relatively simple to answer. The work of public health administration in Fife was responsible for the reduction in mortality from three of the main infectious diseases: typhoid, diarrhoeal disease and smallpox. The decline in mortality from these diseases amounted to 28.7% of the total decline in mortality from the main infectious diseases in Fife during 1855-91. (Table 13.1) Most of this decrease was due to the reduction in mortality from typhoid. This estimate is close to that given by McKeown and Record for the contribution of improvements in hygiene to the decline in mortality from all causes in England and Wales, of which 90% was due to the decline in mortality from infectious diseases, during the second half of the nineteenth century. [7]

This conclusion disagrees with Szreter's argument, as applied to the example of Fife, that during the second half of the nineteenth century public health administration played a wider role in the reduction of mortality. Criticising the lack of proof in McKeown's claim that the decline in mortality from tuberculosis in England and Wales during the second half of the nineteenth century was due to improvement in standards of nutrition and thus in resistance to the disease, Szreter argues that an important factor in this reduction of mortality was the population's increased resistance to tuberculosis as a "knock-on" effect of the decline in mortality from other infectious diseases. [8] According to Szreter, the decrease in mortality from these diseases was

largely due to the efforts of public health administration to control them.

Most of Szreter's sources are for English urban areas, where public health administration was perhaps more advanced than in Fife. As has been seen, during the second half of the nineteenth century the only substantial contribution of local authorities in Fife to the reduction in mortality from infectious diseases was the control of typhoid. Apart from the control of smallpox, which amounted to only 6.8% of the total mortality decline from the main infectious diseases during the period, public health administration in Fife made little or no contribution to the control of those diseases, including scarlet fever, measles and whooping cough, which were supposed to be predisposing causes of tuberculosis. [9] Furthermore, apart from a fall in mortality from tuberculous meningitis, there is no corresponding fall in mortality from tuberculosis during the period which might have resulted from the control of the diseases which were its predisposing cause. (Table 13.A) McKeown's "nutritional determinism" may be fallacious but the evidence from Fife does not support Szreter's theory of the indirect contribution of public health administration to the decline in mortality from tuberculosis. The area of mortality decline which was identified by McKeown as due to nutritional improvement and changes in the virulence of causative organisms is an unresearched subject and one for which lack of data may make research impossible. However, it is clear that up to the 1890s social intervention in the mortality decline in Fife was only effective in sanitary improvement and vaccination against smallpox.

The evidence on the decline in mortality from infectious diseases in Fife does correspond with the findings of Woods and Hinde for England and Wales, which show a convergence of life expectation in urban and rural areas during the late nineteenth and early twentieth centuries. [10] A convergence of falling mortality levels is seen in each of the three main disease groups in the present study. In the groups of filth diseases and airborne infectious diseases of childhood the convergence occurs during the late 1890s. (Figures 13.2-3) For all forms of tuberculosis it occurs at the time of the First World War. (Figure 13.4) However, in each case the highest rates during the period preceding convergence almost invariably occur in the rural districts of Fife and never in the small town districts. (In the introduction to this study (p. 11) it was noted that due to the problems of calculating the population of the rural division of Fife up to 1911, it is possible that the mortality rates calculated for the rural division are somewhat inflated.)

Had this analysis of mortality from the main infectious diseases in Fife derived solely from the annual reports of the RGS it would have produced a result contradicting the evidence given by Woods and Hinde. Such a conclusion would have merely exposed the inadequacies of the data as given in the reports of the RGS, which up to 1911 contain no means of differentiating mortality in the landward mining districts of Fife from that in agricultural districts of the county and mortality in the small burghs of the industrial west of Fife from that in the burghs of the rural east. As was shown in chapters 2 and 3, by the 1880s the rural division of Fife contained a sizeable urban area where conditions of

sanitation and housing were the worst in the county. It was the improvement of environmental conditions in both the landward mining districts and the large burghs of Fife which led to the convergence of mortality rates from filth diseases in the divisions of the county. The reduction of levels of crowding was probably an important factor leading to the convergence of mortality levels from tuberculosis. What led to the convergence of mortality levels from the airborne infectious diseases of childhood is less clear. Perhaps it was improvements in the general health of urban children and their increasing resistance to or ability to withstand infection. However, there is no evidence which could confirm this argument.

To what extent was public health administration in Fife responsible for the equalising of mortality levels in town and country? It has been shown that the development of sanitation and from the 1890s the provision of hospital accommodation was important in reducing mortality from filth diseases. Szreter suggests that from the second half of the nineteenth century local authorities played an increasingly important role in the improvement of housing. [11] In chapter 3 it was argued that the enforcement of building bye-laws, although encouraging the building of sanitary houses, probably restricted the provision of additional housing by raising building costs. With the exception of Dunfermline burgh council, which began building at Rosyth in 1915, local authorities in Fife did not start building houses themselves until 1919. Prior to that date the action of local authorities in enforcing building bye-laws may have restricted the reduction of crowding and thus the reduction of the incidence of airborne infectious diseases and pulmonary tuberculous

infection. Szreter recognises this possibility. [12] During the period, levels of crowding in Fife as a whole fell almost continuously, but prior to the interwar period local authorities in the county did not assist in this process.

Did public health administration in Fife become more effective in reducing mortality from the main infectious diseases during the first half of the twentieth century? During the period 1891-1921 its main achievements were the sharp reduction in mortality from diarrhoeal disease, which accounted for over 19% of the decline in mortality from the main infectious diseases during that period, the continuing control of typhoid and the control of diphtheria. It is impossible to know what proportion of the decline in mortality from diphtheria was due to measures adopted by local authorities for the control of that disease. However, it is clear that during 1891-1921 the efforts of public health administration in Fife were again effective in securing at least a quarter of the total decline in mortality from the main infectious diseases during that period.

During 1921-50 the effect of the work of public health administration extended to include the control of tuberculosis. It has been suggested that because the local authorities in Fife were responsible for virtually all house-building in the county from the First World War to *c.*1950, they should take the credit for the limitation of pulmonary tuberculous infection which the progressive reduction of crowding in the population of Fife brought about. The local authorities' provision of sanatorium accommodation assisted in this process. This agrees with the

conclusions of McKeown *et al.* for England and Wales. [13] The decline in mortality from pulmonary tuberculosis in Fife during this period amounted to 16.2% of the total decline in mortality from the main infectious diseases. Together with their work in the control of diphtheria, diarrhoeal disease, typhoid and smallpox, during the period 1921-50 the work of local authorities in Fife again contributed about one quarter of the total decline in mortality from the main infectious diseases in the county. It is also suggested that an indirect benefit of the the authorities' development of child welfare services and housing may have been some contribution to the reduction in mortality from scarlet fever, measles and whooping cough.

During each of the three periods considered here the work of local authorities is credited with contributing about one quarter of the total reduction in mortality from the main infectious diseases in Fife. Did public health administration in Fife achieve as much as might have been expected of it in the control of infectious disease? Except in the work of vaccination against smallpox, the early burgh and parochial administration of public health was ramshackled and ineffective. Medical Officers were local GP's, who worked for local authorities on a part-time basis. Up to c.1890 the parochial Medical Officer for Beath, Dr. Nasmyth, was probably the only doctor in Fife who had obtained a diploma in public health. Outside the large burghs, sanitary inspectors also worked part-time. For example, the sanitary inspector for the burgh of Dysart, William Lindsay, also had duties as police constable, burgh superintendent, collector of assessments, burgh surveyor, billet master, firemaster, inspector of roads and treasurer under the Public Health

Act. [14] Measures for the control of the common infectious diseases were hamstrung by ignorance of aetiology. In most places in Fife local authorities lacked the resources to build hospitals themselves and the will to combine with other authorities to carry out this work cost-effectively. Without hospitals for the isolation of patients, measures for the administrative control of infectious diseases could not be put into effect and, except against diphtheria, were of little value in any case. Local authorities made no contribution to the reduction of crowding. The achievement of local authorities in Fife in the period to the 1890s was the development of sanitation. However, such improvement was usually made in response to water shortages rather than outbreaks of infectious disease and was frequently initiated by commercial or industrial interests. In major works of sanitary improvement in Fife the most important official was the sanitary engineer, who was sometimes imported from Edinburgh. [15] Medical Officers and sanitary inspectors played only a supervisory role in this work and up to the 1890s the control of typhoid in Fife was more a by-product than the main object of the improvement of water supplies in the county.

Public health administration in Fife was put on a firmer footing with the establishment of the County public health department under the Local Government (Scotland) Act of 1889 and the appointment of Dr. Nasmyth as County Medical Officer, the first full-time MOH in Fife. As was shown in chapter 3, the establishment of the County department marked the beginning of a process of centralisation of public health administration in Fife which was formalised in a series of legislation culminating in the Local Government (Scotland) Act of 1929. Did these developments

render more effective the control of infectious disease by local authorities in Fife? The County authorities promoted further, much-needed sanitary development in those parts of Fife, particularly the landward area, where commercial-industrial interests in the development of water supplies were inoperative. By the late 1920s mortality from typhoid was virtually eliminated and that from diarrhoeal disease was brought to its lowest level during the period. Under the centralising influence of the County District Committees burgh and County authorities combined for the purpose of building infectious diseases hospitals and a tuberculosis sanatorium. These establishments were of some use in the control of typhoid and airborne infectious disease.

Yet for much of the period the County public health department operated with only a small staff consisting of Dr. Nasmyth and a handful of sanitary inspectors. Much of the work of inspection, decision-making and report-writing was carried out by the County Medical Officer himself. It may indicate the scale of public health enterprise in Fife during the 1890s to note that at this time Nasmyth performed his rounds in the county on a bicycle. [16] His annual reports testify to the great volume of work which was carried out each year by the County Medical Officer and his small team of assistants. Only part of that work was directly related to the control of infectious diseases. In time and with the acquisition of further duties, the staff of the main public health departments in Fife increased in size. By 1950 the County department included twelve Medical Officers, seven sanitary inspectors, 91 nurses and health visitors, and dentists, orthopaedic staff, social workers and part-time consultant physicians. [17] In that year the staff of the

Kirkcaldy burgh public health department numbered 43 persons. [18] However, much of this expansion occurred after the greatest reductions in mortality from the main infectious diseases in the county.

In the control of infectious disease perhaps the greatest achievement of local authorities in Fife during the first half of the twentieth century was the rehousing of much of the population of the county under the various housing legislation which came into force from 1919. This work went ahead despite the chronic inefficiency of the Scottish building industry and frequent shortages of labour and materials. The working-class population of Fife was provided with houses of a decent size and which were equipped with decent amenities. The main effect of public health administration throughout the period was the improvement in Fife of working-class domestic life, in the industrial burghs, on the coalfield and in the agricultural districts. It helped to create an environment in which resistance to disease could be nurtured and levels of infection were reduced.

This study has concentrated on the contribution of public health administration to the decline in mortality from infectious disease. It is estimated that during the period the work of public health administration was responsible for about one quarter of the decline in mortality from the main infectious diseases which occurred in Fife. During the period a great area of mortality from infectious diseases therefore remained beyond the control of public health administration and declined independently of any measures for disease control which local authorities introduced. What were the factors which caused this

decline? The problem of the role of nutrition in mortality decline remains to be solved. It is suggested here that Szreter's refutation of McKeown's "nutritional determinism" is not conclusive but that sources for the further study of this problem might be lacking. [19] However, further research on a smaller scale than the present study might provide some answers. Further studies of the history of infectious disease could be based most usefully at a micro-environmental level of, say, a small group of parishes and use as their primary source material the unpublished data in civil registers. [20] They would focus on the lives of the victims of infectious disease and consider such factors as family size, child health, housing conditions, conditions of work and unemployment, and public attitudes to the control of infectious disease. The present study has taken a wider perspective and concentrated on a single factor in mortality decline. Whilst disagreeing with Szreter about the limits of social intervention in the reduction of mortality from infectious disease, this study of the control of infectious diseases in Fife nevertheless demonstrates the importance of public health administration in this process.

Chapter 13. The control of infectious diseases in Fife c.1855-1950. Conclusion. Notes

1. Hans Zinsser, Rats, Lice and History (Boston 1935) vii

2. Anne Hardy, "Urban famine or urban crisis? Typhus in the Victorian city" Medical History 32 (1988) 401-25

3. Ivan Illich, Limits to Medicine. Medical Nemesis: the Expropriation of Health (London 1976) n. 12

4. Neil McFarlane, "Hospitals, Housing and Tuberculosis in Glasgow" (unpublished paper 1988) 1-34

5. F.B. Smith, The Retreat of Tuberculosis 1850-1950 (London 1988) 238

6. V.H. Springett, "An Interpretation of Statistical Trends in Tuberculosis" The Lancet 1952 I 577

7. See p. 3 above.

8. Simon Szreter, "The Importance of Social Intervention in Britain's Mortality Decline *c.*1850-1914: a Re-interpretation of the Role of Public Health" Social History of Medicine 1.1 (April 1988) 14

9. See p. 333 above.

10. Robert Woods and P.R. Andrew Hinde, "Mortality in Victorian England: Models and Patterns" Journal of Interdisciplinary History 18.1 (Summer 1987) 27-54

11. Szreter op. cit. 28-29

12. ibid. n. 87

13. Thomas McKeown, R.G. Record and R.D. Turner, "An Interpretation of the Decline of Mortality in England and Wales during the Twentieth Century" Population Studies 29 (1975) 411-12

14. Dysart LA minutes 25 January 1887

15. The development of a number of water schemes in Fife was carried out by the engineer John Sang of Kirkcaldy. Engineers from outside Fife who worked on sanitary projects in the county included John Buchanan, James Leslie, D. Menzies and John Paterson, all of Edinburgh, and William Robertson Copland of Glasgow. Chemical analysis of water sources in Fife was frequently carried out by Drs. Stevenson Macadam and Falconer King of Edinburgh and Professor Penny of Glasgow. See notes to Table 3.A.2 for sources for the development of water schemes in Fife.

16. Kirkcaldy DC Finance Committee minutes 11 July 1896

17. 1949-53 R iv-vii

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Abbreviations:

DC: District Committee
LA: local authority under the Public Health (Scotland) Act
PC: police commission
TC: town council

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