

The Importance of Social Intervention in Britain's Mortality Decline c.1850–1914: a Re-interpretation of the Role of Public Health.¹

By SIMON SZRETER*

SUMMARY. It continues to be generally accepted that the iconoclastic research work of Professor Thomas McKeown and associates conclusively demonstrated that the medical establishment—including all the efforts of the public health movement—played only a minor role in the grand historical and demographic drama of the period, the secular decline in national mortality levels. According to McKeown's apparently authoritative analysis and interpretation of the available epidemiological statistics, the mortality decline in England and Wales can be primarily accounted for by the benevolent 'invisible hand' of gradually rising living standards, particularly in the form of increases in per capita nutritional consumption. The coherence of this view is brought into question by a critical re-examination of the supporting evidence and arguments presented by McKeown *et al.* It is anticipated that for many of those not closely acquainted with the 'McKeown thesis', the fragility of the case may come as something of a surprise. An alternative interpretation of the same epidemiological evidence then forms the basis for a revisionist account which directs attention to the leading role played by the public health movement and its locally administered preventive health measures in combating the urban congestion created by industrialization.

KEYWORDS: Britain, living standards, local government, mortality decline, nutrition, public health, social intervention.

I. Introduction

Dr John Tatham of the General Register Office, looking back in 1905 over more than half a century's achievements by the public health movement since the passing of the first Public Health Act of 1848, found it necessary deprecatingly to remind his readers that 'it will be well to utter a caution at this stage against the prevalent tendency to attribute to the results of sanitary administration alone the whole of the life-saving which has taken place . . .'.² As most undergraduates today in medicine or modern history will know, it is now widely considered that this confidently expressed belief, that directed

¹ This is a revised and expanded version of Discussion Paper No. 121, in the series issued by the Centre for Economic Policy Research (CEPR). I am grateful to the editors and the anonymous referees of this journal for their helpful suggestions, and also to Sir George Godber for much valuable comment and stimulation. The terms 'Britain' and 'British' are frequently employed instead of the tiresome use of 'England and Wales', with apologies to the Scots since most of the evidence discussed relates only to the area south of the Tweed.

² *Supplement to 65th Annual Report of the Registrar-General* (PP, 1905, XVIII), p. xii. John Francis Walkingame Tatham (1844–1924), FRCP, a former Medical Officer of Health for Salford (1873–88) and Manchester (1888–93), was William Farr's second successor, after William Ogle (1827–1912), at the General Register Office (GRO), holding the key post of Superintendent of Statistics 1893–1908.

* *Gonville and Caius College, Cambridge CB2 1TA.*

human agency informed by medical and sanitary science was the principal source of improvement in the nation's health, has been apparently conclusively deflated and debunked by the historical epidemiological research project of Professor Thomas McKeown and associates.

The strong currency which McKeown's new orthodoxy continues to enjoy was illustrated recently by a leading article in the *British Medical Journal* which concluded that improving nutrition—the essence of the 'McKeown thesis'—is still the best explanation we have for the historical fall in mortality in Britain.³ The main purpose of this article will be to argue that McKeown's analysis of the empirical data has been misleading and to show that closer attention to the crucial elements of his own quantitative evidence in fact confirms the essential spirit of Tatham's contemporary assessment. It will be urged that the public health movement working through local government, rather than nutritional improvements through rising living standards, should be seen as the true moving force behind the decline of mortality in this period.

Professor Thomas McKeown's *The Modern Rise of Population* was published in 1976 as an accessible summary of over two decades of painstaking empirical work, applying the insights of current medical and epidemiological knowledge to a historical analysis of Britain's detailed national series of death records.⁴ This work achieved something of a conceptual revolution in the disciplines of history and medicine, overturning a long-standing general orthodoxy regarding the importance of medical science and the medical profession in bringing about the decline in mortality which accompanied industrialization in Britain.⁵ It effectively demonstrated that those advances in the science of medicine which form the basis of today's conventional clinical and hospital teaching and practice, in particular the immuno- and chemo-therapies, played only a very minor role in accounting for the historic decline in mortality levels. McKeown simply and conclusively showed that many of the most important diseases involved had already all but disappeared in England and Wales before the earliest date at which the relevant scientific medical innovations occurred.

It should be stressed at the outset that this achievement of McKeown's work,

³ S. C. Farrow, 'McKeown Reassessed', *BMJ* 294, (1987), 1631–2. It was somewhat surprising to see repeated in Farrow's review certain critical assumptions of the 'McKeown thesis' which have now been rendered obsolete by the important findings of historical demographic work: E. A. Wrigley and R. S. Schofield, *The Population History of England 1541–1871, A Reconstruction* (London, 1981). In particular, the statement early on in the review that 'The rise [in population] is generally agreed to have been caused by a fall in mortality rather than an increase in birth rates' is precisely the opposite of our new understanding of these matters since 1981.

⁴ The major earlier reports of this research were: T. McKeown and R. G. Brown, 'Medical Evidence Related to English Population Changes in the Eighteenth Century', *Pop. Studies*, ix (1955), 119–41; T. McKeown and R. G. Record, 'Reasons for the Decline of Mortality in England and Wales during the Nineteenth Century'; *ibid.*, xvi (1962), 94–122; T. McKeown, R. G. Record, and R. D. Turner, 'An Interpretation of the Decline of Mortality in England and Wales during the Twentieth Century', *ibid.*, xxix (1975), 391–422.

⁵ This previous orthodoxy derived principally from historical documentation in two works, both published in 1926: G. T. Griffith, *Population Problems of the Age of Malthus* (Cambridge, 1926); M. C. Buer, *Health, Wealth and Population in the Early Days of the Industrial Revolution* (London, 1926).

in deflating the historical claims of one particular section of the medical profession and its 'high tech' invasive and biochemical medicine, remains unaffected by the arguments set out below. McKeown's unanswerable point is precisely that this modern kind of applied medical science virtually did not exist during the period addressed here. However, in addition to this *negative* finding that the forward march of modern 'scientific medicine' cannot be given the credit for the historical fall in mortality, McKeown also propounded a *positive* explanatory thesis. He claimed that his analysis of the epidemiological evidence showed that the major factor responsible was 'a rising standard of living, of which the most significant feature was improved diet'.⁶ It is this distinct positive thesis, regarding the overwhelming importance of nutritional improvements derived from a rising standard of living in driving mortality decline, which is the subject of criticism in what follows.

As a result of this strong nutritional thesis, combined with the impact of McKeown's devastating case against the pretensions of the 'technocratic' section of the post-war medical profession, the notion seems to have spread like a contagion that all medicine, the medical profession and, in fact, organized human agency in general had remarkably little to do with the historical decline of mortality in Britain until the inter-war period at the earliest. Although 'municipal sanitation' and 'hygiene improvements'—in other words, the public health movement addressed by this article—were identified by McKeown as positive influences, their impact and effects were deemed to be very much of a secondary and merely reinforcing kind. McKeown believed that his empirical work on the nineteenth-century evidence had conclusively established this in two ways. First, that part of the mortality decline supposedly attributable exclusively to increased nutrition was claimed to have occurred earliest, whereas public health measures came along relatively late in the day, when the momentum of declining mortality was already established. Secondly, that on etiological grounds, according to the available epidemiological records tracking changes in the incidence of different causes of death, sanitary measures could only have had at the maximum the potential to eliminate roughly a quarter of all deaths, whereas rising nutritional standards had probably been responsible for about twice that proportion.⁷ Thus, nutritional improvements were unequivocally presented as the prime moving and primary sustaining forces in accounting for the Victorian mortality decline. However, it is shown below that neither of these arguments can be sustained on a careful re-examination of the historical evidence.

Britain's history in this respect has been seen as something of an exception by development economists and demographers, since the wider, cross-national comparative work of Samuel Preston has demonstrated that for almost all other countries it has been upward shifts in the level of medical technology and services available and the successful introduction of public health measures

⁶ McKeown and Record, 'Reasons for the Decline', p. 120.

⁷ McKeown, *The Modern Rise of Population* (London, 1976), chap. 9 'Conclusions'. See McKeown and Record, 'Reasons for the Decline', pp. 118–22 for the original statements.

which have been markedly more significant than rising per capita incomes (a gross proxy for rises in the general standard of living) in accounting for their falling levels of mortality.⁸ But social and economic historians have never found it conceptually difficult to treat the experience of the first industrial nation as a special case. In this respect, the supposedly predominant importance of the airborne disease, respiratory tuberculosis (TB, 'consumption', and phthisis are its common synonyms), has always been emphasized by McKeown as the key to Britain's unique mortality decline.

Thus, although the most recent collection of essays to be published on the British mortality decline contained a welcome examination of several public health aspects, its editors still found it necessary to concede that Britain in particular 'differs from the norm because of the high incidence of respiratory tuberculosis', and that rising living standards may therefore have been important here 'without the relationship being both a necessary and a universal one'.⁹ McKeown's authority is generally endorsed, even by those engaged in research on various aspects of public health in Britain. It is agreed that, 'In terms . . . of aggregate and cause-specific mortality and the environmental determinants of the reduction in deaths from infectious diseases during the nineteenth century, the work of Thomas McKeown is central'.¹⁰ It is broadly assumed, after McKeown, that, whatever their research might indicate regarding occasional local or episodal advances, the public health movement *in the aggregate* was not particularly instrumentally effective in achieving its aims, whatever the fond delusions of those who devoted their lives to this work, such as John Tatham.

But is the British case, indeed, the exception? How strong is either the evidence that respiratory TB was the dominant component leading national mortality trends, or the argument that this component was driven primarily by changing nutritional inputs? Are there alternative interpretations consistent with the data analysed and presented by McKeown? What might the existence

⁸ See, in particular, S. H. Preston, 'The Changing Relation between Mortality and Level of Economic Development', *Pop. Studies*, xxix (1975), 231-48; S. H. Preston, *Mortality Patterns in National Populations* (New York, 1976). Another early report of this comparative work was: S. H. Preston and V. E. Nelson, 'Structure and Change in Causes of Death: an International Summary', *Pop. Studies*, xxviii (1974), 19-51; S. H. Preston and E. van de Walle, 'Urban French Mortality in the Nineteenth Century', *ibid.*, xxxii (1978), 275-97 was also an important pioneering comparative local study illustrating the impact of differing public health measures on mortality rates in three French cities.

⁹ R. I. Woods and J. Woodward (eds.), *Urban Disease and Mortality in Nineteenth Century England* (London, 1984), p. 32. See also, for instance, the useful introductory essay to the subject by J. M. Winter, 'The Decline of Mortality in Britain 1870-1950' in T. Barker and M. Drake (eds.), *Population and Society in Britain 1850-1980* (London, 1982), pp. 101-20. This provides a particularly judicious introduction to the field, observing many flaws in the 'McKeown thesis' and yet still coming down firmly in favour of living standards and nutrition as the driving-force behind mortality decline. But note that in Woods's most recent work there has been a decided shift away from any sympathy with the 'McKeown thesis'. See below, n. 75, and also R. Woods and R. Hinde, 'Mortality in Victorian England: Models and Patterns', *Jnl. Interdisc. History*, xviii (1987), 27-54.

¹⁰ B. Luckin, *Pollution and Control. A Social History of the Thames in the Nineteenth Century* (Bristol, 1986), p. 2.

of such an alternative imply for our social and medical history of modern Britain? These are the questions which it is intended to address here.

This paper has, therefore, three sequential aims. First, to identify and delineate the essential argument and evidence presented by McKeown in favour of nutrition. Secondly, to subject this to critical scrutiny. Thirdly, to offer the outline of an alternative revisionist interpretation of the onset of Britain's modern mortality decline. This will suggest 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 mortality decline in Britain. There is, therefore, much more scope in this field of modern British history than has perhaps been previously appreciated for fruitful exchange between, on the one hand, social historians of medicine, public health, and local government and, on the other hand, demographic and economic historians of large-scale social change.

II. *The 'McKeown Thesis'*

In its fully developed form, McKeown originally presented a grandiose all-encompassing thesis accounting for Britain's demographic growth since the early eighteenth century and the subsequent rise in world population as a whole. It was decreases in mortality, rather than any significant increase in fertility which was claimed to have been mainly responsible and this, in turn, was primarily due to an increasing per capita nutritional intake.¹¹ However, this ambitious general explanation was based on a number of purely speculative premises regarding the characteristics of the pre-industrial demographic regime. These have since been radically undermined as a result of the revolutionary empirical findings that have emerged from the recent work of demographic historians, utilizing the quantitative information contained in Britain's parish registers, dating back to the mid-sixteenth century.¹²

It has, for instance, been shown first that the rapid population growth associated with initial industrialization in Britain was principally due to rising fertility (mainly as a result of earlier marriage), rather than to falling mortality.¹³

¹¹ McKeown tends to refer rather imprecisely to expansions in the 'food supply'. However, it is clearly acknowledged in at least one place in the 1976 text that the essential meaning intended is that of increases in per capita nutritional consumption: 'Whether the population was *better fed* in the eighteenth and nineteenth centuries is . . . central . . . in this context . . . whether nutrition improved during the period' (emphasis added), *Modern Rise*, p. 130.

¹² The work of the ESRC Cambridge Group for the History of Population and Social Structure, systematically exploiting a 4% sample of the 10,000 parochial registers of baptisms, burials, and marriages in England and Wales, has put our understanding of the changing demography and economy of British society in the period before the first census, 1541-1801, at an entirely new level of sophistication. The major publication to date has been: Wrigley and Schofield, *Population History*.

¹³ *Ibid.*, chaps. 7 and 10; see also J. A. Goldstone, 'The Demographic Revolution in England: a Re-examination', *Pop. Studies*, xi (1986), 5-34, for an important further refinement of this interpretation.

Secondly, although there was indeed a fall in mortality in the course of the eighteenth century, it was of a scale quite within the bounds of previous pre-industrial fluctuations in the sixteenth and seventeenth centuries. The relatively low level of mortality attained by the 1820s after a century of improvement was the same as that previously experienced in the late sixteenth century. Thereafter, overall mortality ceased to fall for almost half a century throughout the central decades of the mid-nineteenth century.¹⁴ Thus, the notion which underpinned McKeown's grand thesis, that there had been a single movement of continuous and uninterrupted mortality decline across the last three centuries, can no longer be considered valid. Nevertheless, despite the obsolescence of this grand version of the McKeown thesis, the substantial empirical work of analysis which he and his team performed on the national death registration data for the subsequent period from 1837 onwards seems to have ensured that McKeown's nutritional thesis has continued to enjoy an authoritative status at least with respect to that part of the improvement in the nation's health which is known to have occurred during the Victorian and Edwardian periods. Attention is, therefore, confined here to a detailed reassessment of this remaining aspect of the 'McKeown thesis': his interpretation of the civil registration data.

The analysis of death-rates in nineteenth- and twentieth-century Britain which was presented by McKeown *et al.* is based on a uniquely detailed historical source material. These are the returns of deaths classified by age and certified cause of death which are available for the entire population of Britain, excluding Scotland, from July 1837 onwards.¹⁵ Details about the numbers dying from each disease by age and sex was combined with comparable information regarding the total population alive at each of the national censuses taken every ten years to produce a series of age-specific, cause-specific death-rates, published decennially by the Registrar-General in a special supplement.¹⁶

The summary results of McKeown's analysis of this data were presented in a series of tables in chapter 3 of *Modern Rise*. The accompanying table, (page 8), is directly derived from this information, based on age-standardized death-rates for the most important individual diseases which can be identified. It shows how much the changing incidence of each disease has contributed to the overall fall in recorded mortality that has occurred between approximately 1851 and 1971, dividing up that overall amount of change into the percentage which occurred before and after 1901.

¹⁴ Wrigley and Schofield, *Population History*, chaps. 7 and 10.

¹⁵ The GRO was established by parliamentary statute in 1836 for the express purpose of administering a nationwide compulsory system of vital registration in England and Wales. Acts for Scotland and for Ireland followed in 1854 and 1863, respectively. For further details on the system's development, see in particular D. V. Glass, *Numbering the People* (Farnborough, 1973).

¹⁶ McKeown's summary analysis commences with the years 1848-54 because of certifying and recording inadequacies in the early years. Of course nosological practices have changed dramatically over the last 150 years. A good example of this is typhus, a disease spread by the body louse, and typhoid fever, which is due to a water-borne microbe. In this case their similar names reflect the fact that they were at one time indistinguishable to medical science; they were not separated in the R.-G.'s reports until 1869: McKeown, *Modern Rise*, p. 50.

McKeown grouped the individual diseases into four broad etiological categories, according to what modern medical science understands to be the main pathways of transmission involved in the spread of each particular disease. Three of McKeown's four categories relate to diseases which are due to the invasion of the human host by a micro-organism, meaning usually bacteria or a virus. First, there is the airborne category of diseases, where the microbes in question can simply float about in suspension in the air usually associated with tiny droplets of water vapour or saliva spray from the exhalations of infected victims or carriers. Secondly, there are the diseases caused by water- and food-borne microbes. Thirdly, there is a small residual category of other diseases also attributable to micro-organisms, where the vector of transmission is neither air- nor food- nor water-borne. These include strictly contagious diseases, that is, those passed by direct contact between animals and humans (e.g. plague, typhus) or just between humans (e.g. sexually transmitted diseases). Finally, there is the category of afflictions which are not micro-biotically caused, such as congenital defects and the degenerative diseases which are associated with the normal processes of ageing (subject, of course, to modification by lifestyle, diet, and overall environment). These include cancers and coronary heart diseases as the most significant examples. As can be seen from the table below, the first two categories are by far the most important in the earlier stages of the mortality decline with which we are here concerned.

With this simple but very useful classification system established, McKeown went on to argue that any observed fall in the incidence of a disease must be due to one of the following five causes:

- (i) an autonomous decline in the virulence of the micro-organism itself;
- (ii) an improvement in the overall environment so as to reduce the chances of initial exposure to potentially harmful organisms. This could either be:
 - (a) as a result of scientific advances in immunization techniques;
 - (b) through a public health policy designed to sanitize the urban environment—McKeown calls this 'municipal sanitation' or 'hygiene improvements';
- (iii) an improvement in the human victims' defensive resources *after* initial exposure to hostile organisms. This could occur either:
 - (a) through the development of effective scientific methods of treating symptoms;
 - (b) via an increase in the level and quality of the exposed population's average nutritional intake, that is better and more abundant food, thereby improving the individual's own natural defences.

McKeown's strategy in presenting his argument was to assess each of these five candidate 'causes' of mortality decline in turn, regarding their possible proportionate contributions to the overall observed fall in mortality levels.

First, he dealt with (i) the possibility that there might have been a spontaneous change in the virulence of some of the infective micro-organisms (chapter 4 of *Modern Rise*). In fact the discussion of this issue was far from conclusive for

England and Wales. Standardized Death Rates/million:

Rate/million for all causes:		
1848/54: 21,856	1901: 16,958	1971: 5,384
Of total reduction 1848/54-1971:		
	% occurring 1848/54-1901	% occurring 1901-1971
<i>Airborne micro-organisms:</i>		
Respiratory tuberculosis	9.0	8.5
Scarlet fever; diphtheria*	4.0	2.0
Smallpox	1.5	—
Other	1.0	5.5
Bronchitis, pneumonia, influenza	+3.0	10.0
<i>Water/Food-borne micro-organisms:</i>		
Cholera; diarrhoea	3.5	7.5
Typhoid; typhus**	5.0	1.0
Other	1.0	3.5
<i>Other micro-organisms:</i>		
(principally 'convulsions' before 1901)	4.5	8.0
<i>Other conditions:</i>		
(not micro-organisms)	2.5	23.0
Total (all causes)	30.0	70.0

Source: adapted from T. McKeown, *The Modern Rise of Population*, chap. 3. All figures rounded to nearest 0.5 per cent and, therefore, do not sum exactly to 100 per cent.

* These two diseases were not separately distinguished until 1855. All of the reduction before 1901 was due to declining incidence of scarlet fever, as diphtheria did not begin to fall until the turn of the century, when antitoxin treatment began (McKeown, *Modern Rise*, pp. 56 and 98).

** Typhus should be in the 'Other micro-organisms' category, but was not distinguished from typhoid before 1869. However, much the greatest part of the reduction before 1901 is attributable to typhoid alone, occurring from the 1870s onwards. See *45th Annual Report of the Registrar-General, Supplement* (PP, 1884-5, xvii), p. xiii.

the simple reason that in some very important cases there is no current scientific consensus whilst in others the historical evidence is inadequate for a clear assessment to be made.¹⁷ When in 1962 McKeown and Record had originally presented their analysis of the data for 1851-1901, they had cautiously concluded that this aspect 'may have been responsible for not less than one-fifth of the total improvement and—as a very rough estimate—for not more than one-third'.¹⁸ Following this, in his 1976 text McKeown was willing to allow that two of the airborne diseases, scarlet fever and influenza, probably declined

¹⁷ To take an important example, Sir Robert Philip concluded that natural immunity to respiratory tuberculosis can be inherited to some extent across generations. G. Clayson, 'Sir Robert Philip and the Conquest of Tuberculosis', *BMJ*, ii (1957), 1505. See also McKeown, *Modern Rise*, pp. 83-5. However, since we do not know what the prior pattern of incidence was before the mid-nineteenth century, there is no way of assessing the dimensions of this effect on the subsequent patterns: those that we are observing in the R.-G.'s data series from 1848 to 1854 onwards.

¹⁸ McKeown and Record, 'Reasons for the Decline', p. 119.

spontaneously in this manner.¹⁹ However, in his 1976 conclusion the impression was given, by taking a wider sweeping perspective including the eighteenth and twentieth centuries as well, that this factor was relatively insignificant and could be more or less ruled out as a significant component of the mortality decline.²⁰

Next, chapter 5 dealt with what was called the medical contribution, by which was meant first, scientific advances in protective immunization and secondly, scientific advances in chemotherapy and hospitalized treatment of sufferers, that is, (ii)(a) and (iii)(a), respectively. Hospitals were dismissed outright, referring back to an article published in 1955, which had concluded that at least until the hospital reforms in the last third of the nineteenth century prompted by Florence Nightingale's highly critical revelations in her *Notes on Hospitals*, 'on balance the effects of hospital work in this period were probably harmful'.²¹ The chapter then proceeded to demonstrate for each of the major diseases in turn that, with the exception of smallpox and diphtheria, the dates at which either effective immunization procedures or scientific medical treatments first became available were often far too late in time to be able to account for all but the last few percentage points of the overall decline of the disease. This was certainly true of respiratory tuberculosis, measles, and scarlet fever; and broadly true for whooping cough and the bronchitis, pneumonia, and influenza group. All had been declining very considerably in incidence long before effective chemotherapy or other scientific techniques had become available.

Having eliminated in this fashion both aspects of advances in medical science, McKeown was now left with just two possible causal factors out of the original five, to account between them for the lion's share of the decline in mortality. In trying to adjudicate between them the grouping of individual diseases into etiological categories now played a crucial role in the apparent demonstration that nutritional improvement was much more significant than sanitary and hygienic measures. The argument presented was as follows.²² It can only have been the water- and food-borne diseases which could have been controlled by municipal sanitation and similar preventive public health measures in the nineteenth and early twentieth centuries. Airborne diseases by contrast could not be prevented in this way from spreading or from occurring. It was admitted that isolation of individuals with symptoms might have some net effect, but then the efficacy of the hospitals had already been roundly dismissed, whilst it

¹⁹ McKeown, *Modern Rise*, pp. 82-3, 89.

²⁰ cf. *ibid.*, chap. 9 'Conclusions', points 4 and 6 on p. 153, with references cited in previous two footnotes.

²¹ *Ibid.*, p. 150 referring to p. 119 of McKeown and Brown, 'Medical Evidence'. It is to be noted that this harsh judgement is not one that has been entirely endorsed by more recent research. See, for instance, S. Cherry, 'The Hospitals and Population Growth: the Voluntary General Hospitals, Mortality and Local Populations in the English Provinces in the Eighteenth and Nineteenth Centuries', Parts 1 and 2, *Pop. Studies*, xxxiv (1980), 59-75 and 251-66.

²² The overall strategy in the presentation of the argument in *Modern Rise* is not explicitly set out in the manner summarized here. However, it can be discerned by consulting the following pages: 53, 73-4, 91-2, 110-17, 126-7, 128, 152-4, 159.

was pointed out that many airborne diseases could be carried and spread by persons not even manifesting symptoms. McKeown argued, therefore, that any real decline in the incidence of mortality from the airborne category of diseases could *only* be the result of improvements in the potential victim's resistance to the disease by virtue of an improved nutritional and dietary status, since the chances of initial exposure to the disease could not be affected by public health preventive measures, whilst all other possibilities had now been excluded. Therefore, it followed that if the historical evidence showed a greater decline in the airborne diseases category then this indicated a greater role for nutritional improvement, whilst the larger the fall in the water- and food-borne category of diseases the more significant the role of public health and hygiene measures.

Using this a priori argument, McKeown's data apparently showed that the airborne category of diseases was responsible for about twice the percentage share of the total reduction in death-rates in both periods, before and after 1901. Accordingly, this constituted irrefutable evidence that above all else it has been improvements in nutritional intake brought about by rising living standards, rather than any other factor—including public health measures—which has been the most important cause of the decline in mortality in Britain. And, of course, McKeown felt it legitimate to extrapolate this finding backwards into the eighteenth century, too, on the assumption that the mortality decline was a unitary process across all three centuries.

III. Critique of McKeown's Interpretation

First, as has been pointed out by many others, the weight of presumption in favour of improvements in nutrition as the primary causal factor in the registered mortality decline emerged merely by default, as a result of the sceptical devaluation of other factors including medical intervention, rather than because of any convincing positive evidence in its favour. Indeed, whenever such positive evidence has been examined either for the eighteenth or nineteenth centuries, it has failed to provide any convincing support for McKeown's hypothesis.²³ The presumption was in fact achieved by a rhetorical sleight of hand using the logic of the argument by exclusion—the (in)famous analogy with the eliminatory detective method of Sherlock Holmes.²⁴ Of the five 'suspect' causal factors which McKeown cross-examined, the 'culprit'—nutritional improvement through a rising standard of living—was left to last. As a result, the evidence for or against it was never subjected to the same highly critical appraisal which each of the other four candidate factors received. It therefore benefited accordingly in the estimation of its relative importance,

²³ P. E. Razzell, 'An Interpretation of the Modern Rise of Population in Europe: A Critique', *Pop. Studies*, xxviii (1974), 5–17. D. J. Oddy, 'Working Class Diets in Late Nineteenth Century Britain', *Ec.H.R.*, xxiii (1970), 314–23.

²⁴ McKeown and Record, 'Reasons for the Decline', p. 94; McKeown, *Modern Rise*, p. 128.

since what the others lost through sceptical downgrading, it inevitably gained by the zero-sum rules of the argument by exclusion.²⁵

Secondly, and related to this, the argument by exclusion is only legitimate if *all* the suspects have been correctly identified and are separately examined. But here 'the standard of living' acts very much as a conceptual, residual catch-all, simply subsuming by fiat a variety of other possible factors, which are, therefore, not explicitly addressed in the analysis. Thus, Caldwell has recently complained that McKeown:

identified potential change in health inputs with medical discoveries and attempted to show that these were of little consequence . . . He implicitly included everything else . . . under material progress. Similarly, he did not consider the expansion of the health infrastructure, although admittedly there was probably little in the way of additional medical technology to import and no political thought of creating a universal free health service.²⁶

Although a simplification, Caldwell's main thrust is sound: the form and economistic terminology of McKeown's argument by exclusion has resulted in the suppression of any explicit consideration of the *independent* role of those socio-political developments which were responsible for such hard-won improvements as those in working conditions, housing, education, and various health services. One might at least have expected in a study coming out so strongly in favour of nutrition as the major factor that there would at the very least have been some detailed consideration given to the history of food adulteration and the battle for its regulation and control. But all this is blandly subsumed under the economistic term, 'standard of living'. McKeown's interpretation of the epidemiological evidence has, therefore, been crucially misleading in suggesting that these social, cultural, and political dimensions can quite properly be conceived merely as the automatic corollary of changes in a country's per capita real income. However, as will be demonstrated below, even without altering McKeown's own analytical categories, reappraisal of the same detailed epidemiological evidence in fact leads to quite the opposite conclusions.

In his interpretation of the data, McKeown was particularly impressed with the importance of the overall long-run decline of the single airborne disease, respiratory tuberculosis (TB). In 1848-54 this had been the most lethal single cause of death, accounting for 13.3 per cent of all deaths occurring at that time. Furthermore, McKeown claimed that TB was in fact already in a process of decline at the date when the Registrar-General's (R.-G.) data series began.²⁷ When taken in combination with the fact that all the other airborne diseases contributed importantly to the overall reduction in mortality, taking the period 1848 to 1971 as a whole, and also with the apparent demonstration that neither

²⁵ See Woods and Woodward (eds.), *Urban Disease*, chap. 1, for a helpful graphical illustration of this point.

²⁶ J. C. Caldwell, 'Routes to Low Mortality in Poor Countries', *Population and Development Review*, xii (1986), p. 205.

²⁷ McKeown, *Modern Rise*, p. 68.

clinical medicine nor municipal sanitation could account for the decline in such airborne diseases, these observations led McKeown to stress strongly the part played by nutritional improvement in the overall modern mortality decline, as we have seen. However, if attention is concentrated more closely on the nineteenth century, McKeown's own evidence provides far from unequivocal support either for the contention that a fall in airborne disease is the leading epidemiological feature of the period, or for the derivative conclusion that this could *only* be primarily the reflection of general improvement in dietary standards and nutritional levels.

According to McKeown's analysis the annual standardized death-rate per million living in England and Wales fell from about 22,000 in the mid-nineteenth century to about 5,400 by 1971, with 30 per cent of this overall reduction occurring before 1901. On referring to the above table and the notes at the foot (see p. 8), we can see that the initial stages of the fall, before 1901, were mainly the result of the reduced incidence of five individual causes of death. First, respiratory tuberculosis appears to have been responsible for about two-sevenths of the nineteenth-century decline. Secondly, typhoid (sometimes referred to as 'enteric fever') accounted for a further one-seventh of the fall as a result of dramatic decline from the 1870s. Thirdly, scarlet fever virtually vanished and so accounted for an almost similar fraction of the decline. Fourthly, the elimination of cholera alongside a considerable fall in diarrhoeal diseases also accounted for almost a one-seventh part of the reduction. Finally, a somewhat problematic cause of death, 'convulsions', contributed again about one-seventh part. It is likely that much of the apparent fall in this latter category represented more accurate classification of infant deaths to other causes, notably diarrhoea, to which category, therefore, some part of this reduction should be re-allocated.²⁸

Apart from respiratory TB, therefore, there were two other airborne diseases which declined very significantly in the nineteenth century, scarlet fever and smallpox. However, neither of these can be used to support the nutrition hypothesis, although they are within the airborne category. It has long been recognized that human intervention, in the form of inoculation starting in the eighteenth century and then vaccination, quarantining, and isolation procedures in the nineteenth century, must be granted the major role in the case of smallpox.²⁹ As for scarlet fever, McKeown is prepared to acknowledge that the epidemiological evidence strongly suggests that this was in all probability a disease which burned itself out spontaneously.³⁰ But most disconcerting of

²⁸ *Ibid.*, p. 61; Luckin, *Pollution and Control*, p. 103.

²⁹ P. E. Razzell, 'Population Change in Eighteenth Century England: a Re-appraisal', *Ec.H.R.*, xviii (1965), 312-32. *Id.*, *The Conquest of Smallpox* (Firle, 1977). See also A. Hardy, 'Smallpox in London: Factors in the Decline of the Disease in the Nineteenth Century', *Med. History*, xxvii (1983), 111-38. Hardy emphasizes the *continuing* importance throughout the nineteenth century of public health officials' vigilance in finally eradicating the disease in the face of relative public apathy.

³⁰ McKeown, *Modern Rise*, pp. 82-3. There was a probable shift in the immunological complexion of the population which did not suit the streptococcal bacteria involved (*Strep. pyogenes*).

all for McKeown's general interpretation, is the behaviour of the composite airborne category, 'bronchitis, pneumonia and influenza', which has so far been omitted from the discussion. This was the second most important cause of death in 1848-54, accounting for 10.25 per cent of all deaths. It actually registered a very considerable *absolute increase* in mortality of well over 20 per cent down to 1901. By the turn of the century this category was clearly the most important single killer, contributing over 16 per cent of all deaths, a greater proportion of the total than respiratory TB had represented in the mid-nineteenth century.

Thus, McKeown would have us treat the airborne diseases as a single unitary group, which between them accounted for about half of the decline in mortality before 1901 and would have us believe that nutritional improvements, made possible by a rising standard of living, can alone be considered responsible for the large-scale reduction of the group as a whole. Yet, on closer examination, we find that this completely ignores the important contrary trend exhibited by one of the two most lethal disease categories in the group. Furthermore, we find that the nutrition argument applies almost exclusively to only one of the several diseases within the group, respiratory TB.

But how strong is McKeown's case that even this one disease's reduction was due to rising living standards and food consumption *alone*? First, contrary to McKeown's sweeping assertion, it should be pointed out that overall exposure of the population to airborne diseases would have been affected by the general level of crowding and ventilation in domestic or working environments. Droplet-transmitted airborne diseases will spread most effectively where humans are in close and unventilated proximity with the exhalations of victims or carriers. It is most probable that overcrowded conditions of living, sleeping, and working became more prevalent as industrialization and urbanization intensified. The reversal of this trend was not simply the by-product of rising real wages but more the result of a complicated history of struggle and pressure for relevant clauses in Factories and Workshops Acts, Housing, and Crowding Acts, and the enforcement of building regulations and by-laws (see below). Thus incidence of airborne diseases probably was influenced by certain public health and preventive measures. Secondly, the etiology of respiratory TB is a highly complex one, which is far from completely understood.³¹ Although it is probable that absence of malnutrition in a population is a necessary condition for the elimination of tuberculosis mortality altogether, it is equally probable that danger is decreased if other risk factors are reduced: particularly, frequency of incidence of other infectious diseases; but also overcrowding, lack of sunlight, air ventilation, and various occupational hazards.³² Thus, G. Cronjé has found adult male rates of TB mortality consistently above female rates in urban registration counties 1871-1900, yet

³¹ See, for example, A. R. Rich, *The Pathogenesis of Tuberculosis* (2nd edn. Oxford, 1951). A new general historical study by L. Bryder of TB in Britain in the twentieth century is to appear shortly.

³² H. D. Chalke, 'Some Historical Aspects of Tuberculosis', *Public Health*, lxxiv (1959), 93.

the reverse situation in rural counties, where rates were generally a little lower.³³ Such anomalous sex differentials seem to suggest that general nutritional factors were less important than certain sex-specific activities in determining the relative incidence of TB.³⁴ Cronjé notes that urban men were on average much more exposed to the uncontrolled atmospheres of overcrowded factories and workshops than either their womenfolk or the rural men; whilst rural women were on average more subjected to childbearing than their urban counterparts during this period of urban fertility decline.³⁵ It would certainly seem presumptuous, therefore, to attribute a long-term reduction in TB mortality to one single factor, such as improving nutritional standards.

What, then, were McKeown's grounds for this bold assertion? The critical factor was the apparent empirical finding that respiratory TB was already declining from the late 1830s and 1840s, before any other major disease had begun to fall (apart from smallpox which had probably been on the wane since the latter part of the eighteenth century). This chronological priority in TB's decline was vitally important for McKeown's interpretation. First, it effectively ruled out the possible influence of urban environmental improvements, since these cannot be seriously claimed for the 1830s and 1840s. However, it is of even greater importance in establishing the plausibility of a strong 'nutritional determinism' thesis for the following reason. Tuberculosis often takes a lethal hold where an individual has already been weakened by attack from a previous infection by another category of disease, notoriously so with whooping cough. Thus, any general decrease in the incidence of *other* diseases would probably have a secondary 'knock-on' effect in reducing the number of temporarily weakened individuals available to fall victim to TB. It is also generally true, vice versa, that the presence of TB impedes an individual's capacity to resist attack from other diseases, so that a prior decline in TB could also be claimed to exert a secondary influence, facilitating the decline of other diseases. Therefore, the apparent discovery that TB led in the general decline of disease incidence means that in addition to the primary influence that rising standard of living had in reducing this airborne disease through enhanced nutritional defences, it can be claimed that in all probability there was an additional knock-on effect on other diseases.

As so often in matters of causation, precise chronology, therefore, becomes extremely important. How robust is this all-important empirical finding regarding TB's chronological priority? McKeown's 1976 text merely offers it

³³ G. Cronjé, 'Tuberculosis and Mortality Decline in England and Wales 1851-1910', pp. 79-101 in Woods and Woodward (eds.), *Urban Disease*. See pp. 93-4 and 99-100.

³⁴ Indeed, the available evidence suggests that working-class wives tended to sacrifice their own dietary requirements to maintain their husbands' health and morale, as the family's main breadwinner. See, for example, Oddy, 'Working Class Diets', pp. 320-1; J. Burnett, *Plenty and Want* (rev. edn., London, 1983), pp. 161, 185; M. Pember Reeves, *Round About a Pound a Week* (London 1913), chap. 10.

³⁵ Of course, this should not be taken to mean that repeated child-bearing alone can cause greater susceptibility to TB. However, in combination with the generally unsatisfactory environment in which the majority of the labouring population continued to live, it may well have been a significant factor.

as an assertion that 'The number of deaths from tuberculosis fell rapidly from 1838, and this disease was associated with nearly half of the total decrease of the death rate during the second half of the nineteenth century'.³⁶ The evidence and primary research, upon which this view was based, is contained in the earlier article of 1962. An examination of the evidence originally adduced there by McKeown and Record to demonstrate the early decline of TB is, in fact, far from convincing.

Their detailed analysis of 'this treacherous evidence' (their own words),³⁷ provided by the cause-specific vital registration data of deaths for the individual years 1838-50, cautioned that reliable and robust conclusions regarding TB trends could only be made on the basis of a joint consideration of the movements in both the phthisis (respiratory TB) and bronchitis figures aggregated together. This was specifically because of the inadequacy of distinction between the two causes of death by contemporary certifying authorities.³⁸ Particularly damaging to the validity of any inference in favour of a trend decline in TB was the possibility of 'changes in certification (especially from tuberculosis to bronchitis)'.³⁹ From such a consideration the authors concluded that although the direction of change during the period 1838-46 was entirely uncertain, it could confidently be asserted that there was a definite fall in TB mortality in the years 1847-50 because both diseases were falling together during this brief period.⁴⁰ However, on the basis of this microscopic examination it was then unjustifiably asserted that the fall across these 4 years was the commencement of a general and sustained drop in TB mortality continuing for the rest of the century. The authors omitted to mention at this point in the analysis that their own graph, entitled 'Secular trend in mortality from consumption or phthisis' and printed five pages earlier, showed a strong resurgence of mortality from respiratory TB over the ensuing 5 years after 1850 and thereafter no clear trend decline until after 1866-7.⁴¹ In other words, 1847-50 was merely a short-term fluctuation and not a major turning-point in the trends. So, there is, in fact, no good evidence for TB's chronological priority in the mortality decline. And in any case, there had always been the claim of the much earlier, medically induced decline in smallpox, the quantitative importance of which McKeown failed to acknowledge. Although smallpox did not appear to be a predominant factor in the civil registration returns which McKeown analysed, this was precisely because it had already been beaten back considerably by the 1830s.

³⁶ McKeown, *Modern Rise*, p. 68. There is a similar assertion on p. 56.

³⁷ McKeown and Record, 'Reasons for the Decline', p. 113.

³⁸ As late as 1860 possibly as many as 20 per cent of all deaths were still being registered without any certificate from a medical practitioner. This situation was formally remedied by the 1874 Registration Act. See J. M. Eyler, *Victorian Social Medicine: The Ideas and Methods of William Farr* (Baltimore, 1979), p. 62; Glass, *Numbering the People*, p. 188.

³⁹ McKeown and Record, 'Reasons for the Decline', p. 113.

⁴⁰ *Ibid.*, p. 112.

⁴¹ *Ibid.*, Fig. 9 on p. 108. Great care should be taken when inspecting this graph, as the authors have included a suppositional pecked line for the period 1838-47, despite their own warnings against placing any reliance on that information. It is this invalid pecked line which gives the impression of an apparently obvious fall in train before 1866-7.

All the evidence of medical testimony in the eighteenth and early nineteenth centuries suggest that it had been a major scourge, especially of childhood.⁴²

Finally, there still remains to be taken into account the strong counter-trend, already remarked upon, which the increasingly lethal bronchitis group of airborne respiratory diseases exhibited throughout the rest of the nineteenth century. This constitutes the most awkward and serious general caveat on the validity of McKeown's airborne/'nutritional determinism' interpretation, however it is explained. Either this anomalous 20–25 per cent increase in the incidence of bronchitis group fatalities has to be simply accepted as genuine, in which case it constitutes a direct contradiction of the view that a general fall in airborne diseases is the principal epidemiological feature of the nineteenth century and so the whole case falls to the ground. Or else it could perhaps be argued, in view of McKeown's own warnings regarding imprecision of certification and the likelihood of transfers between the two categories, that this rise was not real and should be offset against the apparent decrease in reported TB death-rates.⁴³

However, even this expedient would be no less damning for the 'McKeown thesis'. According to the above table, the remaining drop in pulmonary (respiratory) TB, after subtraction of the increase in bronchitis fatalities, would only be 6 per cent of the total fall, or one-fifth of the 30 per cent reduction which occurred before 1901. This would then be only of the same order of absolute magnitude as either the typhoid/typhus reduction (5 per cent) or the cholera/diarrhoea reduction, if the latter's figure of 3½ per cent were to be inflated by, say, one-third part of the fall attributed to 'convulsions'.⁴⁴ Thus, with the anomalous rise in bronchitis group fatalities properly acknowledged, the classic sanitation diseases come to the fore in quantitative terms. These two water/food-borne categories would between them be responsible for at least 8½ per cent and perhaps 10 per cent of the overall mortality decline. That is one-third part of the nineteenth-century reduction, or over half as much again as that attributable to the airborne combination of TB and the bronchitis group. Furthermore, the much later date suggested here for onset of phthisis decline (after 1866–7 at the earliest, or perhaps even later once the effect of adding back in the bronchitis group has been properly taken into account), implies that the fall in respiratory TB itself may have been a secondary and derivative effect of earlier, or at least concomitant, falls in the sanitation diseases, rather than vice versa.

Improvement in respiratory TB would, then, no longer appear to have been either the chronologically prior or the quantitatively predominant feature of the nineteenth-century mortality decline in England and Wales. According to

⁴² Razzel, *The Conquest of Smallpox*.

⁴³ Such an interpretation would also satisfy an independent reason for treating the two diseases together, supplied by informed contemporary medical opinion: Dr John Hogg specifically pointed out, in his work of 1860, that whilst bronchitis was often recorded as the actual cause of death, in many cases active tuberculosis was the crucial predisposing factor. J. Hogg, *Observations on the Prevention of Consumption* (London, 1860), p. 41.

⁴⁴ See discussion in text at n. 28.

the logic of McKeown's own arguments, the foregoing would indicate a primary role for sanitary reform and public health measures, rather than rising nutritional levels or living standards. The changing incidence of mortality from respiratory TB in Victorian Britain, rather than being cast in the role of a leading and determining influence, can be seen as 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.⁴⁵ This conceptualization of mortality from TB, as essentially a secondary effect of the aggregate incidence of other infectious and sanitation diseases, is strongly suggested by William Farr's early analyses of the rural-urban differentials in cause-specific mortality patterns. Although respiratory TB was the largest single cause of death at that time, Farr observed that wherever the overall death-rate was relatively high, as in most urban and industrial registration districts, this was not primarily because of enhanced risks of respiratory TB, which was only about 20-25 per cent more lethal in the towns as against the countryside.⁴⁶ By contrast certain other major killers were about 200 per cent more lethal, and it was these which reflected the primary risks of city life. They included notably 'convulsions' ('a frequent intercurrent symptom in diarrhoea' noted Farr),⁴⁷ hydrocephalus, teething, gastro-enteritis, diarrhoea, 'typhus' (i.e. both typhus and typhoid), smallpox, measles, and the bronchitis group of respiratory diseases.⁴⁸ Farr specifically pointed out that the latter's high incidence was a result of the common *sequelae* of frequent measles and influenza epidemics in the cities.⁴⁹ According to this analysis, therefore, the peculiarly pernicious disease pattern of the urban districts in the late 1830s was not so much due to differentially excessive respiratory TB, but to problems caused by absence of sanitation and hygiene, taking a particularly high toll at birth and in early infancy, and compounded by certain frequently epidemic infectious diseases.

⁴⁵ I am grateful to Sir George Godber for pointing out to me that this would be in accord with clinical experience of the nature of respiratory TB gained in the course of the twentieth century. For instance, a London survey of 1930 cited by Cronjé ('Tuberculosis and Mortality Decline', p. 81) found TB still present in 82 per cent of 14- to 15-year-olds. This suggests that most urban adolescents and adults in the nineteenth century would have already suffered and survived a primary infection in early childhood. Actual death from TB, which was especially high in the age groups 15 to 35 in the nineteenth century, would usually, therefore, have been the result of subsequent breakdown disease, rather than a first contact, and would be triggered by a weakening in the body's normal equilibrium as a result of the strains imposed by other non-lethal disease episodes. It is certainly interesting to note that the two recorded phthisis peaks of 1853-5 and 1866 both coincided with cholera epidemics, although this was apparently not true of the largest cholera crisis of all, that of 1848-9.

⁴⁶ *1st Annual Report of the Registrar-General* (hereafter *ARRG*), (PP, 1839, xvi), pp. 108-18; *5th ARRG* (PP, 1843, xx1), p. 408.

⁴⁷ *1st ARRG*, p. 110.

⁴⁸ *Ibid.*, see especially Tables C and D, pp. 148-51; *5th ARRG*, pp. 403-5.

⁴⁹ *1st ARRG*, p. 111.

IV. *An Alternative Interpretation: Urban Congestion Remedied by Social Intervention*

Thus, according to the reinterpretation of McKeown's epidemiological evidence proposed above, it is no longer the decline of airborne diseases as a unitary category which appears to be the predominant and leading characteristic of changing mortality patterns in nineteenth-century England and Wales, but rather the behaviour of the classic sanitation and hygiene diseases. There can be little doubt that the first two-thirds of the nineteenth century witnessed an increasing incidence of such diseases, which was directly attributable to the unplanned proliferation of overcrowded cities and towns lacking even the most basic sanitary facilities such as proper water supply and waste disposal systems.⁵⁰ Conversely, the ensuing disappearance of water-borne diseases in the last third of the century was due to the eventual provision of adequate sanitary facilities, long delayed but finally implemented. McKeown himself noted of the nineteenth century:

. . . the appearance of cholera, possibly for the first time, leaves little doubt that . . . hygienic conditions deteriorated. The rapid movement of population from country to towns must have led to deterioration of hygiene and increased exposure to diseases spread by water and food.

so that,

Mortality from these infections . . . did not begin to decline until there were improvements in water supplies and sewage disposal, in England and Wales from the seventh decade . . . [of the nineteenth century].⁵¹

Between 1801 and 1871 the rate of urban growth in Britain was quite unprecedented, both in the provinces and the metropolis. At the commencement of the nineteenth century no provincial town contained as many as 100,000 inhabitants. By 1871 there were seventeen cities over this size on mainland Britain, apart from London. Glasgow and Liverpool each numbered around half a million, whilst the capital had tripled to over three million.

National aggregate mortality patterns only indirectly reflect the full impact of this period of intensive but chaotic and disorganized urban expansion on the nation's health. According to the best single summary measure currently available, Wrigley and Schofield's series for the expectation of life at birth (e_0), an upward secular trend dating from either the 1680s or 1730s (depending on how one chooses to interpret the behaviour of the index across that period), whereby average life expectancy at birth rose from around 30 years to about 40 years, then slowed to a halt at the end of the first quarter of the nineteenth century. For about half a century, from the 1820s until the 1870s, there was virtually no perceptible further improvement. Thereafter, a gradual rise to about 47–8 years by the end of the century, followed by a somewhat faster

⁵⁰ Even as late as 1851, Birmingham (population 233,000) still had only 8 miles of mains sewers. By comparison, the square mile of the City of London, with only about half the population, had already constructed about 45 miles of sewers by this time. R. J. Lambert, *Sir John Simon and English Social Administration 1816–1904* (London, 1963), pp. 81–2.

⁵¹ McKeown, *Modern Rise*, pp. 68–9.

rise, to just over 60 years by 1931.⁵² Paradoxically—for McKeown's thesis—it had been almost exactly at this same point in time, when the long eighteenth-century rise in life expectancy had stalled to a halt, that a concomitant eighteenth-century *fall* (or at best stagnation) in national aggregate real wages was reversed and there had begun a trend of continual, although not continuous, improvements in average real wages throughout the rest of the nineteenth century.⁵³

McKeown entirely discounted the possibility of any chronological discontinuity of this sort, assuming instead a reasonably direct long-term correlation between uninterrupted upward trends in economic growth, food supply, rising living standards, and improving mortality levels (his own mortality data did not extend back beyond 1838 and the course of demographic movements over the previous couple of centuries was largely a matter of conjecture in the 'pre Wrigley-and-Schofield' era).⁵⁴ The explanation of the inverse relationship is not, however, difficult if it is simply accepted that the relative state of insalubrity in the expanding urban environments, rather than improvements in average real wages or the food supply, must have been the more predominant factor influencing national mortality trends in the nineteenth century. The historical process of industrialization was able to generate massive productivity gains as a result of innovations in the technology of production, most of which entailed a geographically more intensive demand for labour than had hitherto existed. It is no paradox, therefore, but simply two sides of the same coin that this process could simultaneously engender higher wages for the industrial workers and their families congregating at the places where these new enterprises were emerging, yet also simultaneously exert a negative influence on their average life expectancy because of the crowded and chaotic living conditions prevalent in the mushrooming towns and cities created by the rapidly expanding employment opportunities.

The stationary national figure for expectation of life at birth across the second and third quarters of the nineteenth century merely summarizes the nation's average mortality experience, urban and rural populations aggregated together. This quite certainly belies wide geographical divergences in experience. Those remaining in the countryside were very probably continuing to experience the

⁵² Wrigley and Schofield, *Population History*, chap. 6. The protracted nineteenth-century discontinuity was not known to McKeown in 1976, who assumed that there was a linear trend of continuous fall in mortality down to the present day beginning at some point in the mid-eighteenth century. For twentieth-century figures, see Table 1 of Winter, 'Decline of Mortality'.

⁵³ Real wage trends form the best available single index for historical changes in 'the standard of living' in McKeown's sense, since they aim to measure changes in average money wage-rates deflated by a cost-of-living factor, in which subsistence food prices play a predominant role (especially the price of wheat, as bread was the main staple at this time). M. W. Flinn, 'Trends in Real Wages 1750-1850', *Ec.H.R.*, xxvii (1974), 395-413, first identified the second decade of the nineteenth century as a turning point, due primarily to falls in food prices. Recent econometric work has substantially confirmed this chronology: P. H. Lindert and J. G. Williamson, 'English Workers Living Standards', *Ec.H.R.* xxxvi (1983), 1-25; 88-92 (comment by Flinn). Of course, regional variations are also very important: see, for example, E. W. Hunt and F. W. Botham, 'Wages in Britain during the Industrial Revolution', *Ec.H.R.*, xl (1987), 380-99.

⁵⁴ See McKeown, *Modern Rise*, pp. 64-5 for his own conjectures on the subject.

trajectory of slow but steady improvement which had characterized the second half of the eighteenth century. By contrast those who migrated to the expanding towns and cities to bring up their families—a rapidly growing proportion of the national aggregate throughout this period—must have experienced a real fall in life expectancy on so doing.⁵⁵ Such a divergence in rural and urban experiences during the first half of the nineteenth century was clearly indicated in the results of William Farr's famous pioneering construction of comparative life-tables for Liverpool, London, and rural Surrey. Average expectations of life at birth in c.1841 were found to be a respectable 45.1 in Surrey, a worrying 36.7 in London, and an appalling 25.7 in Liverpool, a city that had already more than tripled in size since the first census of 1801.⁵⁶

Whilst increasingly huge populations continued to concentrate ever more intensively in townships growing into cities but lacking the appropriate social overhead capital to preserve—let alone promote—health, then morbidity and mortality risks inevitably proliferated. Equally inevitably, these multiplying and compounding health hazards could only be alleviated through the appropriate social and political responses: the technical development of, and proper deployment of, precisely that infrastructure which was previously largely unnecessary. For instance, despite its rapid growth and the unhealthy overcrowded conditions which this implied, a mains sewer system for London as a whole, which dumped the waste securely downstream of its population, was not completed until 1865—the first such large-scale integrated system in the country. This followed a long period of extremely harmful, highly localized initiatives by the property-owning classes. They were the first to install their own water-flushing closets in large numbers from the 1770s onwards; but in the absence of a mains sewage system, these were simply allowed to empty

⁵⁵ Note that this point stands regardless of whether or not there was an *absolute* deterioration in urban conditions during this period, which is a matter of dispute. It is perfectly possible arithmetically to show that although the national average figure for life expectancy ceased to rise across these decades, nevertheless, each registration district around the country *could* have recorded continual improvement throughout. This simple paradox can occur if the different districts all start with somewhat varying figures and it happens to be the case that those with the lowest life-expectancy figures experience disproportionate growth in their population sizes over time, whilst those with higher figures correspondingly shrink (at least relatively) in population size. This is broadly what happened at this time as a result of migration from the countryside to the towns. The figure for the overall national average expectation of life is weighted by the relative population sizes of each district and is, therefore, strongly influenced by such an underlying shift in overall population composition towards residence in relatively high mortality districts. R. I. Woods has produced some estimates, which illustrate precisely this possibility during the period 1801–61: see Table 3 of 'The Effects of Population Redistribution on the Level of Mortality in Nineteenth-Century England and Wales', *Jnl. Ec. History*, xlv (1985), 645–51. However, it must be stressed that Woods's table offers only hypothetical estimates of *possibilities* for this earlier period, since unfortunately the censuses before 1851 are not reliable sources for detailed trends in individual districts. Furthermore, and against the implications of Woods's exercise, must be set the evidence of probably the only town for which adequate data is agreed to be available (as a result of the private initiative of the local physician, John Heysham). This in fact shows a significant increase in mortality across the period: W. A. Armstrong, 'The Trend of Mortality in Carlisle Between the 1780s and the 1840s: A Demographic Contribution to the Standard of Living Debate', *Ec.H.R.*, xxxiv (1981), 94–114.

⁵⁶ 5th ARR (PP 1843, XXI), pp. 33–7.

into the nearest culvert or river, from which much of the town's population in turn took their drinking water.⁵⁷ Unfortunately, this development was to be repeated in other cities and towns around the country in the course of the nineteenth century.⁵⁸ The lethal lesson was only slowly learned that selective sanitation for the upper classes alone was not a sufficient panacea in the prevention of water-borne disease.

Sewering alone, without commensurate attention to the purity of the water supply, could prove a downright liability, as was tragically demonstrated by London's final cholera epidemic of 1866–7, immediately following the completion of London's sewers system. This was the last such epidemic and it was the famous occasion on which William Farr was able, using a method pioneered at the previous outbreak of 1853/4, to trace precisely the culprit. By dividing London into districts according to the different companies supplying water, the problem was narrowed down to the East London Waterworks Co., who were illegally supplying water from the Old Ford reservoir in Bethnal Green, which was contaminated by the recently completed West Ham sewage system.⁵⁹ This is a perfect example of the kind of medical science in the public health field, which was vital in stimulating what McKeown loosely calls 'municipal sanitation' or 'hygiene'. The narrow definition of medical intervention, as either scientific discovery or the effects of clinical and hospital practices only, misleadingly understates the importance of medical men, and human agency in general, in bringing about the nineteenth-century decline in mortality. Sanitarians contributed by convincing public opinion of the need for strategic measures to improve the urban environment (the particular contribution of the GRO), by demonstrating the practical worth and feasibility of such schemes, and then by administering their operation.

The period from the late 1830s to 1875 has come to be seen as encompassing a 'heroic age' of pioneering advances in public health activism and legislation. The era began with probing investigations by medical men such as William Farr at the GRO, Drs Arnott, Kay, and Southwood Smith, stimulating the formulation by Edwin Chadwick of his ambitious programme, 'The Sanitary Idea', which eventually issued in the first Public Health Act of 1848. Despite the notorious reaction which this provoked amongst those jealous to protect their local influence and power against the apparent encroaching intentions of a Chadwickian centralizing state and despite Chadwick's fall from office, energetic central direction of public health affairs by Sir John Simon still continued.⁶⁰ Royston Lambert long ago showed that the check to central

⁵⁷ L. B. Wood, *The Restoration of the Tidal Thames* (London 1982), p. 19.

⁵⁸ See, for example, F. B. Smith, *The People's Health* (London, 1979), p. 227.

⁵⁹ See Eyler, *Victorian Social Medicine*, pp. 118–19. Luckin, *Pollution and Control*, pp. 88–95, has provided the most detailed recent account of this incident and the water company's successful subsequent evasion of legal retribution.

⁶⁰ Sir John Simon was London's first Medical Officer of Health (1848–58) and then Chief Medical Officer to the Privy Council (1858–71) and finally, the first Chief Medical Officer to the Local Government Board from its statutory inception in 1871. The superb, if somewhat partisan, biography by Royston Lambert is the standard work: Lambert, *Sir John Simon*.

government activism supposedly represented by the 1858 Local Government Act was only relative and not absolute, more in spirit than fact.⁶¹

It has generally been considered that this dynamic phase petered out with the creation of the Local Government Board in 1871 resulting in the subordination within that institution of expansionary and interventionist public health interests to the reactionary, conservative instincts of an upper administrative staff drawn mainly from the Poor Law Board. After 4 years of increasing frustration at the restrictions being imposed on his medical staff, John Simon resigned in 1875, marking the formal end of this 'heroic' period.⁶² Although important scientific developments in preventive medicine and epidemiology of course continued, the period from 1875 to the end of the century has tended to be seen as a contrasting and less dynamic period, during which Gladstonian budgetary control and Treasury retrenchment stifled the initiatives of those medical men and their sympathizers in government, who were the progressive advocates of the public health movement.⁶³ Thus, on the assumption that it was the three middle decades of the nineteenth century when most progress was occurring in the field of public health, the lack of any obvious chronological fit between public health advances and the general fall in mortality from infectious and sanitary diseases, which did not occur until the last third of the century, has perhaps discouraged historians from assigning any particular significance to the expansion of preventive public health measures as the major influence on mortality patterns.

However, an entirely different chronology emerges if we shift the focus of attention away from the central government departments and the nationally famous figures who led the public health crusade, and instead look to the provinces and the municipalities. Although a comprehensive coverage of the history of municipal sanitation in every growing town and city throughout Britain is quite beyond us as yet, there are clear signs that this will prove a very profitable line of enquiry. Anthony Wohl's *Endangered Lives* (1983) has certainly presented enough evidence in an accessible form to show that despite the slowing down in *central* government activity and the relative quiescence of sanitarians in and around Westminster and Whitehall, it was in fact the last 30 years of the nineteenth century when most of the significant improvements and works of construction and concrete applications of preventive health measures went forward and were actually occurring on the ground throughout the provincial cities and towns of Britain.

⁶¹ R. J. Lambert, 'Central and Local Relations in Mid-Victorian England: The Local Government Act Office 1858-71', *Victorian Studies*, vi (1962-3), 121-49.

⁶² R. M. Macleod designated 1860-75 as encompassing 'the heroic age' of State Medicine. R. M. Macleod, 'The Anatomy of State Medicine: Concept and Application' in F. N. L. Poynter (ed.), *Medicine and Science in the 1860s* (London, 1968), pp. 226-7.

⁶³ This view was first put forward by Simon himself, in his influential *English Sanitary Institutions, Reviewed in Their Course of Development, and in Some of their Political and Social Relations* (London, 1890). Until very recently, there has continued to be a broad consensus of agreement on this, founded on such major studies as S. E. Finer, *The Life and Times of Sir Edwin Chadwick* (London, 1952); Lambert, *Sir John Simon*; R. M. Macleod, *Treasury Control and Social Administration* (London, 1968); also R. M. Macleod, 'The Frustration of State Medicine', *Medical History*, xi (1967), 15-40.

With the rise in the 1860s of a genuine ethos of local civic pride in their municipalities, the long-standing strategy of the GRO had added effect. This was the deliberate fostering of an atmosphere of rivalry and competition between local authorities by publishing comparative information on local death-rates as regularly as possible and with graphic comparisons in terms of numbers of lives needlessly lost in the 'Black Spots', relative to the more salubrious 'Healthy Districts'. The optimal health conditions were thereby insidiously established by this clever propaganda manoeuvre as an objective to which all responsible local authorities aspired. Commerce and business was believed to be attracted to those cities with the lowest death-rates, a macabre inversion of today's logic of commercial location which seeks out those authorities with the lowest local fiscal-rates!⁶⁴

The broad-based 1850s backlash against Chadwick's centralizing Poor Law and Health Boards had clearly demonstrated to all in government and administration that formal adherence to the principal of local autonomy was a non-negotiable political necessity. Sanitary progress within these political rules was, nevertheless, perfectly possible once proponents of public health had adjusted their programme appropriately so as to work through and with local authorities, rather than attempting to override them, as Chadwick initially had. However, whilst this adjustment in thinking was occurring, Victorian public health remained hamstrung at the local level by the twin problems of a multiplicity of overlapping authorities and the non-compulsory, merely permissive nature of most of their statutory duties. Steps to improve the urban environment often clashed with the pecuniary interests of factory and workshop owners, landlords, and shopkeepers.⁶⁵ In these circumstances the ambiguity, or positive obstructionism of economizing ratepayers could all too easily prevail over public health arguments for expensive local facilities and services. By the mid-1860s, however, sanitarians were focusing their attentions forcefully on precisely these local political and administrative obstacles blocking their path. Having reluctantly accepted localism in public health, the solution was to compel local government to be effective, as the reforming barrister Edward Jenkins perceived, writing in 1866: 'To a sanitary reformer there is no greater bugbear than a permissive enactment. A system which involves expense to persons interested in that expense is sure, in nine cases out of ten, to be unheeded.'⁶⁶

⁶⁴ From the mid-1850s the GRO produced a list of quarterly returns of the general mortality rates for all the large cities, which was published and discussed in the press; J. M. Eyler, 'Mortality Statistics and Victorian Health Policy: Program and Criticism', *Bulletin of the History of Medicine*, 1 (1976), 342. More generally, on the important role of the GRO in the public health movement, see the forthcoming publication, edited by S. R. S. Szreter, based on papers presented to a symposium held at the Wellcome Institute for the History of Medicine on 27 November 1987: 'The General Register Office in the Nineteenth Century: a Comparative Perspective.'

⁶⁵ E. P. Hennock, *Fit and Proper Persons: Ideal and Reality in Nineteenth Century Urban Government* (London, 1973).

⁶⁶ E. Jenkins, 'The Legal Aspects of Sanitary Reform' in A. P. Stewart and E. Jenkins (eds.) (reprint ed. M. Flinn), *The Medical and Legal Aspects of Sanitary Reform* (Leicester, 1969), p. 93.

The basis for a programme of increasingly effective pursuit of the nation's health within the framework of local government and administration was provided by the three Acts in the 1870s which followed the recommendations of the report of the famous Royal Sanitary Commission of 1869–71. The Commission was itself the Government's response to a public health debate, instigated by those sanitarians, such as Jenkins among many others, who were galvanized by the tantalizing failure of the path-breaking 1866 Sanitary Act: its defective drafting had confounded the novel system of compulsory local sanitary duties subject to central inspectorial supervision which it was intended to establish. It was the 1871 Local Government Act which finally produced a unified department of state to deal with most aspects of local government with a Minister responsible for implementation, the President of the newly created Local Government Board; the 1872 Public Health Act established the corresponding national network of literally hundreds of local sanitary authorities, each with a now obligatory Medical Officer of Health; and it was the great consolidating Public Health Act of 1875 which clearly laid down most of the public health functions and statutory duties of these local authorities and their staff, remaining in force until the subsequent Act of 1936.

Thus, while it is true that a centralized system of 'state medicine' of the sort which had been ambitiously envisaged by H. W. Rumsey was not adopted,⁶⁷ historians of the central departments and national figures have perhaps dwelled too much and somewhat Whiggishly on this aspect of the 'sanitary revival' of these years: the non-emergence of a prototype centralist Ministry of Health. In so doing there has been a failure to give due credit to the political realism of what was actually achieved through the relatively successful harnessing of local and provincial energies and administrative structures to the subsequent promotion of the nation's public health.

With the essential machinery of unambiguous local accountability in place, effective take-up of public health measures began to gather pace. Alongside this was a continual process of modification and diversification in local authorities' powers and duties, as the practical experiences of their officials in attempting to fulfil statutory duties revealed new administrative, technical, and financial obstacles and requirements. For instance, the 1872 Public Health Act obliged local authorities as one of their statutory duties to ensure a pure water supply. In turn, this led to pressure for the 1878 Public Health (Water) Act whereby municipal purchase of private waterworks was made truly financially feasible. Whereas in 1879 only 415 urban local authorities were in charge of their water supplies, by 1905 over two-thirds of the 1,138 urban sanitary authorities then in existence were running the local waterworks, so that the health of the populace was decreasingly left in the hands of the likes of the East London Waterworks Co.⁶⁸ Another example is that of the increasingly close regulation of the quality of the urban food supply, which duly resulted from the attention

⁶⁷ H. W. Rumsey, *Essays on State Medicine* (London, 1856).

⁶⁸ A. S. Wohl, *Endangered Lives. Public Health in Victorian Britain* (London, 1983), p. 111; *Report on Public Health and Social Conditions* (PP 1909, CII), p. 81.

which Medical Officers in the 1860s had begun to pay to adulterated and defective foodstuffs, particularly meat and milk, as a source of disease.⁶⁹ The Adulteration of Foods Acts followed in the 1870s, leading to the appointment of professional inspectors and public analysts by most local authorities in the 1880s; also Weights and Measures Acts in 1878 and 1889 and a final consolidating Sale of Food & Drugs Act 1899. The last third of the century was the classic period in which all the hectic activity of the Public Health political and administrative pioneers finally began to bear fruit and to take concrete effect. Of course, all this was only achieved as a result of innumerable unsung local skirmishes between frequently underpaid health officials, often lacking security of tenure, and their local allies—other sanitary officials, the district registrars of births and deaths, perhaps the town's press and occasionally some members of the local councils themselves—as against the parsimonious representatives of the majority of ratepayers. It is precisely the importance and *necessity* of this slow dogged campaign of a million Minutes, fought out in town-halls and the local forums of debate all over the country over the last quarter of the nineteenth century which has been missing in our previous accounts of the mortality decline.⁷⁰

A. S. Wohl has noted that Sir John Simon himself always regarded the extent of public works loans contracted by local authorities from the central government funds as the true barometer of sanitary progress and real local activity.⁷¹ This was the system whereby local authorities were enabled to borrow long-term loans of cash at lower than market interest rates for provision of sanitary facilities and services. Between 1858 and 1870 only £11 million in such loans were requested, whereas between 1871 and 1897 £84 million was borrowed, £65 million of it by urban authorities.⁷² In addition, in the town-hall building age of the civic gospel of municipal progress symbolized by Joseph Chamberlain's go-ahead Mayorship of Birmingham, 1873–5, there began the deliberate development of municipal trading activities in gas, electricity, and transport in order to generate funds and revenue for municipal social services and facilities independent of the various strings attached both to central government sources of finance and to the local rates. Charles Feinstein's

⁶⁹ Smith, *The People's Health*, pp. 203–15. Burnett, *Plenty and Want*, pp. 99–120.

⁷⁰ Some idea of the kinds of problems faced, and often eventually surmounted, by MOHs, assisted by the LGB and by other local proponents of public health, can be gained from R. K. F. J. Young, 'Sanitary Administration under the L.G.B. 1871–88' (University of Oxford B.Litt. Thesis, 1964). Unfortunately, this is not included in Wohl's otherwise very helpful list of relevant theses, in the bibliography of *Endangered Lives*. Two other highly informative unpublished D.Phil. and Ph.D. theses, too recent for inclusion by Wohl are: Anne Wilkinson (now known as Anne Hardy), 'The Beginnings of Disease Control in London: the Work of the Medical Officers in Three Parishes 1856–1900' (University of Oxford, 1980); Dorothy E. Watkins (now known as Dorothy Porter), 'The English Revolution in Social Medicine', (University of London, 1984). Two other useful unpublished archive surveys are A. B. Cooper, 'Local Reports on Public Health by Government Medical Inspectors 1869–1908' (Loughborough University M.Lib. Studies dissertation, 1981); C. A. Bellamy, 'Central-Local Relations 1871–1919 (LGB)' SSRC End of Grant Report HR7579 (1982).

⁷¹ Wohl, *Endangered Lives*, p. 112.

⁷² *Ibid.*, pp. 113 and 162–3.

figures for gross domestic fixed capital formation show that whereas local authorities were only spending about £5 million per annum on such enterprises in the period 1856–71, this rose to an average of £12–14 million per annum for the period 1874–94, and by the Edwardian period had reached an annual expenditure of about £30 million per annum.⁷³ Furthermore, and despite the expanding revenues of municipal trading, by 1890 subventions from the Imperial exchequer to local authorities represented 6.7 per cent of total national revenue and by 1913 this figure had risen to 11.6 per cent, by which date local government spending represented virtually one-half of total government expenditure.⁷⁴

I would argue, therefore; that there is a sound *prima facie* case to be answered that the decline in mortality, which began to be noticeable in the national aggregate statistics in the 1870s, was due more to the eventual successes of the politically and ideologically negotiated movement for public health than to any other positively identifiable factor. The resulting implementation of preventive measures of municipal sanitation and regulation of the urban environment and food market actually arrived on the ground in the many new cities throughout the country during the last third of the nineteenth century and the first decade of the twentieth.⁷⁵

The all but complete eradication by the end of the century of typhoid, cholera, and smallpox each testify in different ways to the importance and effectiveness of various aspects of the large-scale strategic public health measures which were introduced during this period. Provision of a sufficiently clean local water supply was essential in the cases of both typhoid and cholera. Due to their epidemic nature, elimination of cholera and smallpox additionally required a properly functioning national system of surveillance to identify and snuff out local outbreaks which could otherwise quickly become major incidents. Port sanitary authorities established by the 1872 Public Health Act, alongside the initiative of the GRO in establishing regular communications with foreign authorities so as to gain advance warning of any outbreaks abroad, helped to ensure—in the absence of an entirely secure national water supply—that Britain successfully evaded all three subsequent European visitations of

⁷³ C. H. Feinstein, *National Income, Expenditure and Output of the U.K. 1855–1965* (2 vols., Cambridge, 1972, 1976), Table 39.

⁷⁴ P. J. Waller, *Town, City and Nation. England 1800–1950* (Oxford, 1983), p. 264. Throughout the period 1879–1914 it was always the cost of works for water supply, drainage, and purification which constituted between half and two-thirds of the aggregate capital indebtedness on utilities of all municipalities, despite the not inconsiderable capital costs associated with gas, transport, and electricity utilities, especially in the Edwardian period. See the Table in *ibid.*, p. 307, which shows water accounting for 19 out of 28.5 millions of such indebtedness in 1879–80 rising to 132 out of 224 millions by 1914–15.

⁷⁵ The illustrative estimates recently prepared by Woods (see n. 55) are founded on a much firmer empirical basis for 1861 and for 1911 than for the earlier period. These clearly show that it was the big cities which experienced the greatest falls in mortality across this later period. Woods has therefore concluded that ‘The importance of that set of administrative advances usually labelled the “Sanitary Revolution” appears to be re-emphasized by these estimates of rural and urban life expectations.’ Woods, ‘The Effects of Population Redistribution’, p. 651.

Asiatic cholera in 1873, 1884–6, and 1892–3⁷⁶ Smallpox continued to appear despite its preventability because of the unfortunate involvement of the unpopular Poor Law as the official agency of compulsory vaccination. As a result vaccination was far from universal, especially amongst the Metropolitan poor where a particularly virulent form was in evidence at this time. The final eradication of smallpox, therefore, was in fact further testament to the efficiency of the Metropolitan Medical Officers of Health: their effective operation of the Notification of Infectious Diseases Act of 1889 allied to the provision by the Metropolitan Asylums Board of isolation facilities on hospital ships in the Thames.⁷⁷

By contrast, the apparent rise in the bronchitis group of airborne respiratory diseases may well be evidence that in those areas of the urban and industrial environment where preventive legislation and action was *not* forthcoming, serious consequences followed. Clean air was one obvious omission from the late nineteenth-century sanitary reform arsenal and one need look no further than the appalling urban smogs to explain such anomalously high levels of respiratory disease in the Victorian period. Although there was a Metropolitan Smoke Nuisance Abatement Act as early as 1853 and relevant sections in many other towns' Improvement Acts, these often unenforced clauses applied only to commercial premises. However, it was not factories so much as coal-burning domestic fires which caused the smogs, hence London's were reputedly the worst, rather than those of the northern industrial towns. The Great Fog of 1886 sent the Metropolitan death rate up to almost equal that of the worst years of cholera epidemics, as over 11,000 inhabitants in the capital were recorded as dying of bronchitis alone that year.⁷⁸ Furthermore, in many northern and midland industrial towns an entirely separate and also continuing source of respiratory disease (including TB: see Cronjé's work, noted above) was the unregulated factory atmospheres of textile, pottery, and especially metal-grinding industries, demonstrated in the differential occupational death-rates of those employed in these industries. For instance, male textile workers in the 1890s, a numerically large segment of the factory working class, had a two-and-a-half times higher death-rate from respiratory diseases than agricultural labourers, despite their considerably higher pay and better access to a varied diet—the main factors stressed by McKeown in accounting for secular falls in the incidence of airborne diseases.⁷⁹

It is a well-rehearsed observation that the slower improvement in average expectation of life in the three decades before 1901, by comparison with the

⁷⁶ Smith, *The People's Health*, p. 233.

⁷⁷ Hardy, 'Smallpox in London', pp. 131–8.

⁷⁸ Wohl, *Endangered Lives*, p. 213. For comparison: the final cholera epidemic of 1866 had accounted for 15,000 deaths spread over the whole country. Only the worst cholera outbreak of 1848–9 had accounted for more than 11,000 deaths in the capital (when a total of 62,000 had perished throughout the country as a whole). See Smith, *The People's Health*, pp. 230–1. The last killer fog in London before effective controls were finally introduced was as recently as 1952, when, yet again, over 10,000 perished.

⁷⁹ *Supplement to 55th ARR*, Pt. II (PP 1897, Cmd. 8503), Table on p. xcvi.

three following, was because improvement was confined primarily to the age-groups 2 to 34 for males and 2 to 54 for females. Infant mortality (i.e. age 0 to 1) remained stubbornly high at about 150 per thousand throughout England and Wales in the later nineteenth century. However, almost exactly at the turn of the century the nation's infant mortality rate suddenly plummeted, already reaching 110 per thousand by 1910–12 and then 80 per thousand by 1920–2 despite the intervention of the First World War, and thereafter continuously declining at a somewhat slower rate down to the present minimal level, reaching 18 per thousand in 1970–2.⁸⁰ How, then, does this fit into the general interpretation being presented here? As McKeown himself noted, it was the water- rather than food-borne diseases which had declined first, in the period before 1901: 'It is worth underlining the fact that the rate of decline of mortality before the turn of the century was much greater for the enteric [intestinal] diseases, then spread mainly by water, than for the diarrhoeal diseases spread mainly by food.'⁸¹ This reflects the limits of what was possible through the 'municipal sanitation' movement alone. Although improvement of the urban environment at the strategic level by providing pure water, paved streets, refuse collection, and a proper mains sewage system could eradicate the water-borne diseases which thrived where collective sanitary facilities were defective, such measures could not alter the shortcomings of living conditions and especially food preparation in the overcrowded, working-class domestic environment of the back-to-back. Nor could they educate a populace into more hygienic habits of food preparation for weaning infants, hence McKeown's observation that before the twentieth century there was relatively little decline in food-borne diarrhoeal diseases.

However, several relevant developments affecting the working-class home environment were beginning to take noticeable effect by the first decade of the twentieth century. First, and most importantly, the problems of housing quantity and quality were gradually being alleviated. There was an ever stricter enforcement of minimal standards of design and especially insistence on the provision of basic sanitary and hygiene facilities in the new homes being built or improved during the long boom in house-building 1897–1907.⁸² For instance, whereas in London the Metropolitan Management Act as long ago as 1855 had in theory empowered vestries to compel landlords and builders to connect houses to mains drains (a provision extended to the whole country by the flawed 1866 Sanitary Act), one of the few local studies that has been completed found that in Camberwell such regulations were consistently hood-winked until by-laws in 1889 brought in official on-site inspections before

⁸⁰ On the nation's health during the First World War, see J. M. Winter, *The Great War and the British People* (London, 1985); D. Dwork, *War is Good for Babies and Other Young Children: A History of the Infant Welfare Movement in England, 1898–1918* (London, 1986).

⁸¹ McKeown, *Modern Rise*, p. 61.

⁸² An average of about 130,000 houses per year were built across these years, as against only about 80,000 per annum over the previous 17 years. B. R. Mitchell and P. Deane, *Abstract of British Historical Statistics* (Cambridge, 1962), p. 239.

drains were covered over by builders.⁸³ A further significant step forward in Metropolitan housing standards came 2 years later with the Public Health Act (London), which stipulated that every single new and rebuilt house should have its own 'proper and sufficient water supply'.⁸⁴ Following the 1890 Housing Act, expansion in the provision of municipal housing itself was at last made financially feasible, incorporating minimum crowding and sanitary standards following earlier private philanthropic initiatives (such as the Peabody estates and Rothschild buildings).⁸⁵ Between 1895 and 1907, for instance, the number of occupants municipally housed rose by a factor of 5 in Manchester, to 3,500; by a factor of 7 in Liverpool to 7,500; by a factor of 14 in London to 36,000.⁸⁶ These were admittedly as yet small numbers. However, there are also the ambitious philanthropic and municipal town-planning initiatives to be included, such as Bournville or New Earswick, and Hampstead or Letchworth Garden Cities, respectively. If it is reasonable to assume that the very worst houses and slums tended to be the first to be knocked down and, in effect, replaced by these schemes and by the private building boom, then overall the average quality of the housing stock available, especially in terms of provision of basic utilities for effective domestic hygiene, may have been improving substantially from the 1890s onwards as a net result of all these various factors.⁸⁷ For instance, P. J. Waller cites an inter-war survey of a sample of northern and midland industrial towns, which estimated that between 1894 and 1914, the proportion of homes with a fitted bath multiplied fourfold from 5 per cent to 20 per cent.⁸⁸

Secondly, there was the expansion of local health and maternity services. As I. H. Buchanan's highly effective study of eight mining communities has shown, although actual clinics were rare before the First World War, the health-visiting system, whilst by no means universal, was well established throughout

⁸³ Wilkinson, thesis, pp. 270-1.

⁸⁴ A. Hardy, 'Water and the Search for Public Health in London in the Eighteenth and Nineteenth Centuries', *Medical History*, xxviii (1984), 274.

⁸⁵ The 1875 Artizans' and Labourers' Dwellings Improvement Act (Cross Act) had similarly stimulated the earlier 'five per cent' philanthropic dwelling companies and had also been followed by a short house-building boom, with about 120,000 built per annum 1875-8. Wohl, *Endangered Lives*, p. 320. Mitchell and Deane, *Abstract*, p. 239. J. N. Tarn, *Five Per Cent Philanthropy* (London, 1974); J. White, *Rothschild Buildings* (London, 1980).

⁸⁶ *Report on Public Health and Social Conditions* (PP, 1909, CII), Table on p. 22.

⁸⁷ However, it must be acknowledged that a contraction in the lowest-rent housing stock through slum demolition may not necessarily have had a net beneficial effect in the short term on the welfare of lowest-income sections of the population, given the higher rents which may have been demanded for better quality housing. State enforced rent control of some sort might well be a necessary adjunct. This is what subsequently happened during the First World War. For similar reasons, the growing practice of family limitations among various groups of the working population may not necessarily have helped alleviate overcrowding since there is no reason why smaller families might not simply be pushed into smaller, perhaps subdivided, tenements if left to market forces in the context of a relatively fixed housing stock. See D. Englander, *Landlord and Tenant in Urban Britain 1838-1918* (London, 1983). Also, more generally, M. J. Daunton, *House and Home in the Victorian City* (London, 1983); A. S. Wohl, *The Eternal Slum* (London, 1977).

⁸⁸ Waller, *Town, City and Nation*, p. 303.

much of the country and could have a considerable educational effect.⁸⁹ This activity had a long pre-history in certain towns, such as London, Brighton, Newcastle, and Manchester.⁹⁰ But it was not until the 1890s and 1900s that Lady Health Visitors, alongside midwives, became a more professionalized occupation and began to form an integrated component of a growing network of health services organized by local authorities. By 1909 the official committee reporting on the working of the Midwives Act of 1902, was able to note that a formal division of responsibilities had become a practical norm in many places, with midwives involved for the first 10 days after a birth and health visitors thereafter.⁹¹ Services were co-ordinated in the larger authorities under the direction of the local county or borough Medical Officers of Health, whose coverage of the local community was increasingly comprehensive once adoption of the 1907 Notification of Birth Acts enabled them quickly to locate and follow up all births (this Act became compulsory for all local authorities in 1913).

Another possibly important contemporaneous development, stressed by McKeown himself, was the regulation of the urban milk supply. This was facilitated greatly after the Dairies, Cowsheds and Milkshop Order of the Local Government Board in 1899. However, this development in isolation probably should not be accorded any particular significance. Despite the very considerable attention given to the issue of artificial feeding by the contemporary middle classes, it seems probable that breast-feeding was still the norm for the vast majority of the working-class population, although reliable information is unusually hard to find on this subject.⁹² Furthermore, Dwork has recently pointed out that although purity of the milk supply at source was a necessary step, it was not sufficient in itself, as it was no remedy for the absence of domestic hygiene surrounding the subsequent preparation of infant feeds from

⁸⁹ I. H. Buchanan, 'Infant Mortality in British Coal Mining Communities, 1880-1911' (unpublished Ph.D. thesis, University of London, 1983), pp. 278-84.

⁹⁰ Missionary Biblewomen were in effect the first paid social workers acting as 'Sanitary Missionaries' under the aegis of the Ladies Sanitary Association, founded with Royal patronage in 1857 for 'the diffusion of sanitary knowledge and the promotion of physical education'. W. C. Dowling, 'The Ladies Sanitary Association and the Origins of the Health Visiting Service' (unpublished MA thesis, University of London, 1963), p. 82.

⁹¹ Buchanan, thesis, p. 278.

⁹² Dwork, *War is Good for Babies*, p. 117, cites a rare study, made by the Salford Health Committee in 1905, where only 9.8 per cent of 1,595 infants were found to be bottle-fed. If this low rate was general, then it seems quite plausible to suggest that contemporary middle-class animation over this issue derived primarily from the symbolic importance of breast-feeding at a time when the rigid sex-roles established by Victorian bourgeois culture were under cultural and political threat. However, I do not believe that gender conflicts in the middle classes can supply a satisfactory general interpretation of the history of the infant and maternal health movement at this time. For a balanced and stimulating general study of developments in infant and maternal health services, see Dwork, *War is Good for Babies*, which offers a somewhat different overall interpretation to that of three other well-known recent studies: J. Lewis, *The Politics of Motherhood* (London, 1980); A. Davin, 'Imperialism and Motherhood', *History Workshop Journal*, 5 (1978), 9-65; C. Dyhouse, 'Working Class Mothers and Infant Mortality in England 1895-1914', *Jnl Social History*, xii (1978), 248-67.

that milk.⁹³ A safe milk supply had to be combined with new practices of more hygienic preparation of feeds for infants, before any benefits in terms of lives saved might reasonably be expected to follow. This, then, leads us back to the fundamental importance of the two factors already mentioned: housing and instruction in hygiene. Although breast-feeding would certainly confer some protection in the first months before weaning, the root of the general problem of infants' vulnerability lay in the fundamentally unhygienic conditions and associated practices of the urban working-class home, virtually inevitable in small overcrowded households lacking their own water supply and water-closet.

Until it began to be improved from the 1890s onwards, such an environment was continuously introducing infants to bacterial organisms (in particular some strains of *Escherichia coli*) which, although not harmful to the more developed digestive system of elder children and adults, could produce fatal diarrhoea attacks in infants.⁹⁴ This was a particularly unfortunate problem since it was commonsense practice among working people that food which was safe for adults was safe for infants. It would seem helpful to point out here the significance of making a conceptual distinction between under-nutrition and malnutrition (food-poisoning) as two separable causes of what is normally referred to simply as 'malnutrition', meaning lack of adequate nourishment, without distinguishing the cause. The implication of the distinction in this context is that in order to explain high infant mortality and its subsequent improvement in Britain, it is not enough to consider, as McKeown did, only issues of per capita nutritional intake (the issue of under-nutrition) because a greater intake of food is counterproductive for the preservation of infant life, when that food is inappropriate and crawling with pathogens (the issue of malnutrition, or chronic food-poisoning).

This general interpretation receives further support from one or two local studies which have been reported recently. For instance, Parton has given an account of Huddersfield's famous 'Special Scheme Against Infantile Mortality' established by its energetic mayor, P. Broadbent, through a local Act of Parliament in 1905.⁹⁵ It was to become a model for the future operation of the Notification of Births Act 1907. A combination of volunteer Lady Health Visitors worked in partnership with local government officials under the direction of the Medical Officer of Health, Dr S. G. H. Moore, with payments to parents sanctioned for notification of births within 48 hours (but a projected milk depot was not established nor a day nursery). Huddersfield's infant mortality rate (IMR per thousand) was already much better than many large towns even before these initiatives, standing at 134 per thousand in 1900-2 (Broadbent had been Chairman of the town's Health Committee since 1893:

⁹³ D. Dwork, 'The Milk Option: an Aspect of the History of the Infant Welfare Movement in England 1898-1918', *Medical History*, xxxi (1987), 151-69.

⁹⁴ McKeown, *Modern Rise*, p. 122.

⁹⁵ C. Parton, 'The Infant Welfare Movement in Early Twentieth Century Huddersfield', *Jnl Regional and Local Studies*, iii, Pt. 2 (1983), 69-77.

the IMR had been a little over 150 per thousand until the latter 1890s).⁹⁶ However, apart from the notoriously bad year of 1911 (a nationwide problem due to a severe winter followed by a long hot summer), Huddersfield succeeded in continually improving on this after 1906, recording rates between 95 per thousand and 111 per thousand each year between 1907 and 1915, and thereafter even lower.⁹⁷ In another study, G. M. Nolan has found that in Derby the most important identifiable factors responsible for a drop after 1900 in the infant mortality rate were: the better feeding practices promoted by health visitors and, to a lesser extent, urban improvements.⁹⁸ Other factors addressed, such as changes in levels of earnings, in the birth-rates, or in the quality of the milk supply alone, were found to have less influence. The infant mortality rate fell dramatically from 154 per thousand in 1900–2 to 91 per thousand in 1912–14, although, unlike Huddersfield, there was then no further improvement in infant mortality in Derby until after the First World War.

Thus, whereas the reduction in the mortality of elder children and younger adults throughout the last third of the nineteenth century reflected improvement of the urban environment at the strategic level outside the home, that of infants had to await the more probing and detailed regulations and the expansion of skeletal social services, which had only just begun by the turn of the twentieth century to penetrate into and improve the conditions existing in the infant's 'environment': the working-class domestic household itself.

That this should have been 'the last frontier' for the public health movement will perhaps come as no surprise, when we recall that this is the culture where 'an Englishman's home is his castle'. A strong libertarian respect for domestic privacy was the twin to the ideological position that took it as a matter of patriotic duty to resist despotic 'Bonapartist' centralizing government officials, as Chadwick had found to his cost. It seems probable, then, that part of an explanation for the popularity of the anticontagionist etiology of miasmata, dominant in mid-Victorian England, was its convenient policy implication that it was the public environment of the streets and courts, and not the domestic space, that required regulation and control. However, once contagionism had eventually gained general acceptance during the 1880s and 1890s, as a result of the publicization of the microscopic findings of bacteriological science, the castle's drawbridge was hauled down. But the portcullis might yet remain lowered by the occupants inside. To be truly effective any increased intervention by 'middle-class' agents of local authorities inside the 'working-class' home would have needed a reciprocal positive attitude from the recipients of this attention: active learning on their part in response to the teaching of their social superiors. It seems quite possible that there was indeed some kind of

⁹⁶ *Ibid.*, 70–3.

⁹⁷ All post-1900 IMRs cited here for towns derived from: J. M. Winter, 'The Impact of the First World War on Infant Mortality in Britain', Final Report to SSRC on grant HR 5091 (1979), Table 4.

⁹⁸ G. M. Nolan, 'Infant Mortality as an Indicator of Environmental and Social Change, 1890–1939, with Special Reference to Derby' (unpublished Ph.D. thesis, University of Nottingham, 1982).

sea-change in the relevant aspects of class relations in the wake of the turbulent 1880s; but this must remain only a speculative inference, as there seems to have been little research done as yet on working-class attitudes to the preventive health services or to local authorities in general during this period.⁹⁹

V. Conclusions

As the Professor of Social Medicine at Birmingham University, only the second such department to be established in the country, McKeown was one of the leading members of a post-war generation who rose high and fast into this new discipline, whilst academic enthusiasm for public health waned.¹⁰⁰ For them 'public health' symbolized an obsolete approach to looking after the nation's health, whereby a disparate collection of local government departments were charged with various duties aimed at preventing known pathogens from entering the environment. The institutional and administrative character of public health was formed during the difficult Victorian adolescence of public preventive medicine in Britain, when it had had to come to terms with the awkward political constraints of the prevailing ideology of *laissez-faire* and local autonomy, as discussed above. Social medicine provided an altogether grander vision of positive health enhancement for the populace through deployment of the resources and organization of the State, guided by the requirements and recommendations of modern medical science. McKeown's professional and political battle was primarily directed against those who argued for ever greater diversion of the new National Health Service resources into curative technical medicine—invasive surgery and biochemical 'treatments'—at the expense of preventive, humanist medicine—efforts to understand and modify the health implications of the environment in its widest sense, including lifestyle, behaviour, and diet.¹⁰¹ McKeown's exploration of the historical record was fantastically effective in these professional, political terms, thoroughly puncturing the inflated claims to importance, on the grounds of a supposed long history of life-saving achievements, of the medical 'technocrats'.

However, in the course of this most brilliant attack on the historical claims of his main target, 'scientific medicine', McKeown's detailed historical research work led him to produce an ambitious general interpretation of the causes of mortality decline, which minimalized the role of directed human agency in

⁹⁹ See Smith, *People's Health*, p. 229 for fragmentary evidence on this. For working-class attitudes to education, see J. S. Hurt, *Elementary Schooling and the Working Classes 1860-1918* (London, 1979); there are also some stimulating general insights of relevance in G. Stedman Jones, 'Working Class Culture and Working Class Politics in London, 1870-1900: Notes on the Remaking of a Working Class', in his *Languages of Class* (London, 1983), pp. 179-238.

¹⁰⁰ C. Webster, 'The Origins of Social Medicine in Britain', *Society for Social History of Medicine Bulletin*, xxxviii (1986), 52-5.

¹⁰¹ The most complete statement of this position by McKeown is *The Role of Medicine* (Oxford, 1979). Probably the most important seminal document endorsing this approach has been *A New Perspective on the Health of Canadians* (Ottawa, 1974), by Marc Lalonde, in his capacity as Minister of National Health and Welfare in the Canadian government.

general, not just that which could be identified as the precursor of modern hospital and clinical practice. Ironically, the innocent passenger-seat victim of McKeown's reckless driving was itself the historical ancestor of that kind of preventive and humanist medicine, which McKeown was himself advocating from the 1940s onwards. Perhaps because of his lack of a formal background in the public health tradition itself, McKeown seems to have been particularly opaque to the existence and significance of a long historical record of professional and political struggle to implement a programme of health reforms informed by a similarly environmentalist, humanist, and legislative approach to health and medical services to his own, albeit constrained by a different political and ideological climate.¹⁰² Paradoxically as a result, his account, whilst motivated by the promotion of the best interests of social and preventive forms of medicine in the present, attains the historical aspect of a parricide!

It has been argued here that the historical epidemiological evidence presented by McKeown *et al.* does not in fact offer the conclusive and exclusive support, which it has long been assumed to do, for the contention that rising living standards and associated nutritional improvements have been the predominant source of mortality decline in Victorian and Edwardian Britain. It has been shown that a completely alternative interpretation of the same evidence is much more plausible, even within the same analytical terms of reference set by McKeown. This revisionist interpretation departs from a significant redefinition of the timing and character of the mortality decline itself, to take into account first, our new knowledge, now extended well back into the pre-industrial past, of long-term movements in the average expectation of life and, secondly, the simple point that urban and rural experiences differed, indeed diverged, during the nineteenth century. The revised account indicates a primary role for those public health measures which combated the early nineteenth-century upsurge of diseases directly resulting from the defective and insanitary urban and domestic environments created in the course of industrialization.

If the broad outlines of this reappraisal of the quantitative epidemiological evidence are accepted, then it directly follows that the true motivating 'causes' of the modern mortality decline lie in those agencies which brought about the implementation of these preventive health measures throughout the length and breadth of the country. This, therefore, entails a radically alternative concept of the nature of the causation involved. The 'invisible hand' of rising living standards, conceived as an impersonal and ultimately inevitable by-product of

¹⁰² Thomas McKeown was born in 1912 and came to England from Canada as a postgraduate on a Rhodes Scholarship, completing an Oxford D.Phil. in the Department of Human Anatomy in 1939. He then underwent formal medical training, acquiring an MB in the University of London in 1942. Apparently, he was offered the Chair in the new discipline of Social Medicine at Birmingham in 1944 because he had so impressed the interviewing panel when he unsuccessfully applied for the Chair of Anatomy the previous year (which went to Solly Zuckerman). Hence his academic and medical background was somewhat independent of the British public health tradition, where most of those involved had had extensive practical experience as Medical Officers of Health. I am indebted to Sir George Godber for his recollections of conversations in 1943 with Sir Leonard Parsons, then Dean of the Birmingham Medical School (pers. comm., 23 July 1987).

general economic growth, no longer takes the leading role as historical guarantor of the nation's mortality decline. Indeed, economic growth in itself, even with rising real wages, seems just as likely to harm as to benefit the nation's health, witness the urban experience of the first two-thirds of the last century. It seems, then, that it all depended on how the fruits of that growth were deployed. This, in turn, depended on the cumulative net outcome of a rich history of political, ideological, scientific, and legal conflicts and battles at both national and local levels throughout the period under review.¹⁰³ Fallible, blundering, but purposive human agency is returned to centre stage in this account of the mortality decline.

Furthermore, support for such an interpretation does not derive solely from scrutiny of the nationally aggregated epidemiological evidence. There has been a prevalent tendency among the generation of post-war historians who were McKeown's contemporaries to undervalue the expansion of public health activity at the local level in the latter part of the nineteenth century, giving pride of place in their accounts instead to an earlier 'heroic age' in which the intellectual origins of the grand administrative approach to national health could be discerned. In a sense this can be seen as the direct historiographical effect of the rapid post-war decline in academic enthusiasm for 'public health' due to the competing attractions of 'social medicine'. However, the fourth section of the article has shown that once the focus of attention is shifted away from the central government departments and out to the provinces, then there is already considerable evidence, even from the modest amount of research that has so far been completed by a new generation of historians of public health, to demonstrate the importance of increasingly effective public health activity administered through local government. This was gathering momentum throughout the last half of Victoria's reign and on into the new century *pari passu* with the now-revised chronology of urban-dominated mortality decline. Thus, the proliferating density of local government functions in this period may well have played a much more important and instrumentally effective role in shaping the course of our recent history than has perhaps been previously appreciated, even with respect to such a large-scale phenomenon as the mortality decline.

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—some even implemented measures

¹⁰³ One extremely rich vein of recent work and debate concerns issues in the complex history of biomedical science and its changing theory across this period. The seminal English-language contribution here was E. H. Acknercht's Garrison Lecture of 1948, 'Anticontagionism Between 1821 and 1867', *Bull. of the History of Medicine*, xxii (1948), 562-93; and a major revisionist contribution was M. Pelling, *Cholera, Fever and English Medicine 1825-65* (London, 1978). Luckin, *Pollution and Control*, provides the most recent extended discussion of various relevant aspects of this historiography. The issues involved are too important and complex for a merely superficial treatment, which is all that space would allow here, and so I hope at some point to be able to offer a separate treatment of the significance of these matters with respect to the expansion of public and preventive health measures.

in advance of such parliamentary legislation.¹⁰⁴ 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 the 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.¹⁰⁵ 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 a 'nutritional determinism'.

It has been the principal aim of this article to encourage the exploration of such a new approach, which examines agency not process. In order to re-open the question of causation, it has been necessary to expose to the full the limitations and inadequacies of the established orthodoxy. In view of the sustained nature of the attack mounted here on the conventional wisdom, it should be emphasized that the argument is not that improving nutrition and living standards were entirely unimportant in accounting for the mortality decline, but that the role of a battling public health ideology, politics, and medicine operating of necessity through local government, is more correctly seen as the principal causal agency involved. It is necessary to rescue those who gave their lives to the struggle for the nation's health from 'the enormous condescension of posterity', to borrow a famous historiographical clarion call.

Finally, a comment on the wider context of the subject-matter. As mentioned in the introduction, the McKeown thesis continues to animate debate beyond the bounds of British historiography, amongst economists, demographers, and policy scientists generally. Britain's experience of industrialization continues to be a particularly influential model, not just because it was the first industrial nation but because its history in these respects is considered to be established on an unusually firm and extensive empirical basis. The quantitative data available are particularly rich and of high quality, perfectly exemplified in the detailed epidemiological evidence analysed by McKeown. Much of this was

¹⁰⁴ Another example of this, apart from the Huddersfield scheme mentioned in the text above, would be the famous 'Leicester System' of notification and isolation of infectious diseases pioneered in the mid-nineteenth century by Sir James Simpson. See Hardy, 'Smallpox in London', pp. 122-3. More generally on the varied histories of local governments' politics and administrations in the nineteenth century, see, for example, Hennock, *Fit and Proper Persons*, D. Fraser, *Urban Politics in Victorian England* (Leicester, 1976), and A. Offer, *Property and Politics 1870-1914* (Cambridge, 1981).

¹⁰⁵ The Ph.D. thesis by Buchanan (see n. 89) is an exemplary study of this sort, which any prospective research student would benefit from reading. This involved a comparison of eight communities including two from Scotland. An important novel finding, which could only emerge as a result of the local perspective adopted there, was that at least until 1911-12 the relative incidence of infantile diarrhoea seems to have been strongly influenced not simply by general 'urban insanitation', but more specifically by the relative prevalence and behaviour of house-flies, as a disease vector, and that this, in turn, was determined by the local authority's attitude and policy with respect to the proximity of rubbish tips to residential housing.

generated by all the government-sponsored surveillance and inquiry that was undertaken throughout the nineteenth century by a host of departments and agencies,¹⁰⁶ which is a nice irony since Britain is supposedly a leading and extreme example of successful economic and demographic growth achieved mainly through the operation of free market forces and with a minimum of effective state intervention.¹⁰⁷

Indeed, McKeown's work on Britain continues to provide the only thoroughly researched empirical support for the extreme *laissez-faire* position that health and welfare gains may be generated most effectively merely as a by-product of economic growth and that government policies should, therefore, simply be directed at maximizing economic growth alone (which for the liberal economic purist means minimizing government in general, and all forms of market intervention). If it should emerge, however, that, to the contrary, even in this historical case, per capita national income growth and associated real wage gains were no guarantee of higher life expectancies and that it was, after all, social and medical intervention, albeit unevenly implemented and only weakly centralized, that was the principal source of the nation's health improvements before the First World War, then clearly the authenticity and 'realism' of the case against interventionist social welfare and health policies must suffer some loss of intellectual credibility.

If the British historical case has any direct lessons to offer, it would seem to be that a significant life-saving 'expansion in the health infrastructure' of a country does not necessarily require advanced 'medical technology' nor necessarily require, at least initially, the political act of 'creating a universal free health service'.¹⁰⁸ Of course, the latter must certainly remain an ultimate and highly desirable goal, at least for any society which actively seeks the positive promotion of its citizens' health, not normally a politically contentious aim. It may well also be crucial for achievement of the quickest route to low mortality. However, there may be other *effective*, albeit slower, paths available, especially in circumstances where either economics or politics are against the speedier but more expensive and centralized route, as was the case in Victorian Britain. Here, the history of mortality decline shows that committed local government, or its analogous parochial institutions, can have quite considerable potential and scope as an agency to promote health improvements and general social change, if led by appropriately exhortatory but flexible central direction.

¹⁰⁶ Such as the vast web of over 2,000 paid district registrars who, from July 1837 onwards, relayed quarterly the detailed mortality information collected from their locality to the central office of the R.-G., forming the database discussed in this article.

¹⁰⁷ A recent example, from two relatively well-informed authors: 'Thus, McKeown may be correct in arguing that national public health measures were not very important in the reduction of mortality in England and Wales during the nineteenth century'; S. R. Johansson and C. Mosk, 'Exposure, Resistance and Life Expectancy: Disease and Death during the Economic Development of Japan, 1900-1960', *Pop. Studies*, xli (1987), 218.

¹⁰⁸ Caldwell, 'Routes to Low Mortality', p. 205; and see fuller quotation cited above, at n. 26.