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# Famine in China, 1958–61

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For many years, very little reliable information was available about the population of the People's Republic of China. Inferences and speculations about population trends were based on press reports, eyewitness accounts, and occasional snippets of official information apparently based on a population registration system. This unsatisfactory situation has changed completely in the last four years, reflecting both a general switch to much greater openness on the part of the Chinese authorities and the successful execution of the 1982 population census. A flood of demographic data has poured out of China, including single-year age distributions from the 1953 and 1964 censuses, results from a 10 percent sample of households from the 1982 census, fertility rates for the period 1940–82 from a one-in-a-thousand sample fertility survey carried out in late 1982, and registration figures for year-end population and for birth and death rates from 1950 to 1982. These data provide a basis not only for assessing current demographic trends in China, but also for constructing demographic estimates for the entire period back to the establishment of the People's Republic.

Not surprisingly, the sudden availability of extensive data concerning the world's most populous country has generated great interest in the demographic community, and several reviews of China's demographic history have appeared recently.<sup>1</sup> All these reviews stress the consistency of the information from the diverse sources. This consistency is indeed remarkable for a country of China's level of social and economic development, but it is not perfect; the sources agree closely but not exactly. Information from the population registers is the most difficult to fit into the general picture; the figures on population size and on birth and death rates for 1950–82 given in the 1983 *Statistical Yearbook* not only fail to match closely comparable indicators from other sources but also appear to be internally inconsistent. Population size from 1956

to 1959 increases more rapidly than implied by the reported rate of natural increase (only possible with substantial net immigration), while from 1960 to 1964 population growth is below the rate implied by the natural increase rate (only possible with net emigration). Similar inconsistencies continue into the 1970s. Thus, although general demographic trends over the last 30 years can now be established beyond any reasonable doubt, the exact course of short-term deviations from these trends remains ambiguous.

Particular interest attaches to the period from 1958 to 1963. Population totals were missing from published figures until very recently, and the apparent discrepancies among sources were greatest for this period. Much more important, it is also increasingly clear that during this period China suffered a demographic crisis of enormous proportions. The apparent magnitude of this crisis was first reported in papers by Ansley Coale and John Aird.<sup>2</sup> Coale's early estimates were that the number of excess deaths during 1958–61 might be on the order of 16.5 million. Aird, like Coale, was careful to note the many qualifications that had to be made about inconsistencies in the data and the need for further information (much of which has now become available), but he observed that the available data pointed to a loss in population of at least 23 million. Quoted by A. K. Sen in an article in the *New York Review of Books* and in a published lecture in India, the estimates aroused immediate controversy.<sup>3</sup> The evidence that has become available since these articles were written, however, confirms that these estimates are of the right order of magnitude.

This paper first presents demographic evidence that during the period 1958–62 about 30 million premature deaths occurred in China: deaths that occurred earlier than they would have on the basis of mortality trends for more normal years. At about the same time fertility dropped very significantly. The number of births during 1958–62 fell short by about 33 million of the number that would have been expected. Data on food availability demonstrate that the major cause of the demographic crisis was famine. Indeed, measured by the absolute magnitude of its demographic impact—about 30 million excess deaths and about 33 million lost or postponed births—the 1958–61 Chinese famine was the largest in human history. The data on food availability also suggest that, in contrast to many other famines, a root cause of this one was a dramatic decline in grain output, which continued for several years and which in 1960–61 involved a drop in grain output of more than 25 percent. We review both the causes of this drop and the apparent policy responses to it. We then attempt to answer the question of how the largest famine in human history could occur in modern times and go almost unrecognized outside China. Finally, we consider some of the implications of this experience for broader issues of Chinese and world development.

### **Demographic crisis in China, 1958–62**

All available indicators confirm that a major demographic catastrophe occurred in the late 1950s and early 1960s in China. Registration data show the birth

rate falling by nearly 50 percent, the death rate more than doubling, and the population growth rate changing from over 2 percent per annum to minus 1.5 percent per annum from the mid-1950s to 1960; the 1982 fertility survey shows the total fertility rate falling from around 6.0 in the mid-1950s to well below 4.0 in 1961; the 1964 and 1982 age distributions show sharply smaller numbers in age groups born between mid-1958 and mid-1962 than in those born between mid-1955 and mid-1958. Table 1 shows these indicators for 1955–64, a sufficiently long period to permit comparisons of demographic rates in the crisis years with those characterizing the pre- and postcrisis “normal” years.

The reconstructions of both Coale and Banister accept the occurrence of this demographic crisis. Coale estimates that roughly 27 million excess deaths took place between 1958 and 1963. His estimates of fertility during the period are based on the results of the 1982 fertility survey, after minor adjustments, whereas his estimates of death rates for single calendar years are based on registered deaths adjusted for underregistration, which is assumed to be declining steadily during this period. His estimate of excess deaths is obtained by subtracting from estimated deaths for 1958–63 the number of deaths that would have occurred had adjusted deaths increased linearly from 1957 to 1964. This procedure fails to take account of the fact that actual deaths would have fallen during the period as a result of the pronounced fertility decline. Banister's estimates of fertility are taken directly from the 1982 fertility survey, whereas the year-by-year mortality estimates appear to be obtained by intercensal projection. Neither study focuses on the period in which we are interested here, however. We have, therefore, reexamined the data to try to describe more accurately the timing and magnitude of the demographic crisis of 1958–62.

**TABLE 1** Indicators of China's demographic crisis, 1958–62: selected indicators characterizing the crisis years and the years immediately preceding and following the crisis

Year	Year-end population (millions)	Birth rate	Death rate	Total fertility rate	Survivors of birth cohorts <sup>a</sup> (millions)			
					According to 1964 census		According to 1982 census	
					Males	Females	Males	Females
1955	614.7	32.6	12.3	6.26	10.78	9.86	10.21	9.50
1956	628.3	31.9	11.4	5.85	9.84	8.97	9.26	8.69
1957	646.5	34.0	10.8	6.41	10.41	9.44	9.82	9.10
1958	659.9	29.2	12.0	5.68	10.77	9.77	10.16	9.32
1959	672.1	24.8	14.6	4.30	7.81	7.18	7.42	6.90
1960	662.1	20.9	25.4	4.02	7.50	6.91	7.50	6.98
1961	658.6	18.0	14.2	3.29	6.00	5.61	5.74	5.37
1962	672.9	37.0	10.0	6.02	8.08	7.60	8.43	7.91
1963	691.7	43.4	10.0	7.50	15.62	14.84	14.58	13.73
1964	705.0	39.1	11.5	6.18	14.61	14.08	13.12	12.40

<sup>a</sup> Male census age distributions are adjusted to smooth sex ratios at “military” ages by single years of age. Census dates are mid-year, so numbers represent survivors of births from mid-year of preceding year to mid-year of year shown.

SOURCES: Columns 1–3, *Statistical Yearbook of China, 1983*; column 4, 1982 fertility survey; columns 5–6, census of 1964; columns 7–8, census of 1982.

Although the indicators shown in Table 1 are unanimous in indicating that a crisis occurred, they are not directly comparable as they stand. The last four columns (taken from census age-distribution data) indicate survivors of midyear to midyear ("fiscal year") birth cohorts, whereas the birth and death rates and the total fertility rate refer to calendar years. The census data reflect the joint effects of both fertility (births in a one-year period) and mortality (survivorship to the census enumeration). Total fertility rates are not comparable with birth rates, since the latter are affected by the population age distribution, though the measures do vary closely together over short time periods. A comparison of the different indicators for the period of interest is obviously crucial, however, to an evaluation of the underlying demographic rates. Accordingly, we have converted the available indicators into comparable measures for "fiscal years." The available data provide more scope for examining the consistency of measures of fertility and of implied child mortality than of adult mortality since there are no independent indicators of the timing of adult deaths beyond the registered crude death rates; intercensal population loss indicates the total number of adult deaths, but not their timing. We thus concentrate on fertility and child mortality, and derive trends in adult deaths from registered deaths by year.

We have made minor adjustments to the data to allow for the apparent absence of the military population in census age distributions, and for the fact that respondents providing retrospective data in the fertility survey appear to have used Chinese years for reporting dates of birth of their children. Such date reporting, compared with conventional dating, overestimates the number of births in the 13 lunar months of a Chinese leap year and underestimates the number in other years. The adjustments are described in the Appendix, as are the methods used to calculate fertility and mortality year-by-year for the period between the 1953 and 1964 censuses. The Appendix also presents a year-by-year analysis of the apparent completeness of birth registration, as implied by the fertility survey and the age distributions of the 1964 and 1982 censuses.

From this year-by-year analysis, we draw the following conclusions about fertility:

- 1 Birth registration was approximately 80 percent complete from 1954–55 to 1960–61; completeness then improved to over 90 percent in 1962–63 and 1963–64.
- 2 Fertility was quite high in the early and mid-1950s, with total fertility between 6.0 and 6.5 and the crude birth rate in the low 40s. Fertility then fell in 1958–59 by nearly 20 percent, fell again slightly in 1959–60, fell again by about 25 percent in 1960–61, recovered somewhat in 1961–62, then rose very sharply to a peak in 1962–63, with total fertility over 7.0 and the birth rate close to 50 per thousand, before declining slightly in 1963–64.

The Appendix also describes a step-wise series of reverse-survival calculations, which, with some further adjustments, have been used to derive

estimates of infant and child mortality. The survivorship probabilities are consistent with a steady decline in infant and child mortality from 1953 to 1964, interrupted by two sharp mortality surges, for 1958–60 and again for 1961–62, with infant mortality rates for these fiscal years climbing above 200 per thousand live births. The mortality estimates are used to calculate total deaths under age 10 in each fiscal year.

Estimates are then made of deaths of the population aged 10 years and over. A problem is that the sequence of registered deaths at all ages does not vary closely with the sequence of calculated deaths under age 10. The period with peak numbers of registered deaths, 1959–61, is a period with relatively few estimated deaths under age 10, giving rise to low ratios of calculated child deaths to total registered deaths, whereas the years of high estimated deaths under 10, 1958–59 and 1961–62, have only moderately higher total registered deaths, giving rise to high ratios of child to total registered deaths.

There are three possible explanations for the lack of consistency between the sequences of registered deaths and estimated child deaths. The first is that the sequence of deaths under age 10 is wrong. Accepting this explanation would mean dismissing the consistency between the 1964 age distribution, the 1982 fertility survey results, and registered births by year. Also, few births occurred in the period 1959–61, so even a doubling of infant deaths would have had little effect on total deaths; thus the large numbers of registered deaths are unlikely to reflect child deaths in the main, and thus provide little information about such deaths. This point is reinforced by the sequence of ratios of registered deaths to adjusted births; these ratios are fairly constant through the mid-1950s, rise to a peak for 1959–61, and then fall to low levels for 1962–64. Clearly, registered deaths are not closely related to registered births. Thus it is possible that the sequence of child deaths is wrong, but the sequence of registered deaths does not prove this.

The second explanation is that the completeness of death registration varied sharply by year; thus, registered deaths do not reflect the trend in actual deaths at all closely. This explanation does not seem plausible, since the completeness of birth registration apparently remained approximately constant, at least until 1962, and a coverage change in deaths would be expected to be associated with a similar change for births. The third explanation is that the surge in registered deaths in the period 1959–61 resulted from very high adult mortality in the two years, not reflected in child deaths. This explanation would require that the underlying cause of the high adult mortality did not have a marked effect on child mortality. Although this explanation is not apparently very plausible either, it is possible that severe famine accompanied by strict food rationing or some other method of food allocation that gave preference to young adults and children could produce such a differential.

The Appendix shows that the demographic evidence tends to favor the third explanation. The evidence suggests that, on average over the period, mortality above age 40 was substantially higher between 1953 and 1964 than it had been prior to 1953, the excess being particularly severe for males. The sharp drop in survivorship ratios for the population aged 35 and over in 1953

would be consistent with a famine combined with a system of food allocation that gave priority to those under age 40 during 1959–61.

Thus the annual numbers of registered deaths are not necessarily inconsistent with the estimated numbers of deaths under age 10, since the huge numbers of deaths registered for the period 1959–61 probably reflect very largely deaths over age 40. Child deaths may have increased in 1958–59 before rationing measures were put into effect, and then may have fallen to more normal levels in 1960–61 as a result of targeted rationing and then increased again in 1961–62 as rationing was relaxed. The obvious alternative hypothesis—that child mortality was actually very high in 1959–61, but that births were severely underregistered because of the high infant mortality, and that births for the period recorded by the 1982 fertility survey were badly underreported for a similar reason—fails to explain why survivorship ratios to 1964 are actually higher for the births reported for 1959–61 than for the births reported for 1958–59 or for 1961–62; if infant deaths lead to omissions between 1959 and 1961, then they would be expected also to lead to omissions in 1958–59 and 1961–62.

Thus, although the basic data are at first sight inconsistent and minor inconsistencies remain unexplained, a reasonably plausible account of demographic trends between 1953 and 1964 can be based on them. The implications of the account arrived at here are summarized in Table 2. Starting with the 1953 population, the projected births from Table A–4, total estimated deaths from Table A–5, and the sequence of child mortality levels from Table A–3, the population, birth rate, death rate, and infant mortality rate are obtained for each year; total fertility is also obtained by adjusting the rates obtained from the 1982 fertility survey for the years 1954–55, 1959–60, and 1962–63, but accepting the rates for other years.

**TABLE 2 A reconstruction of demographic changes in China: selected indicators, fiscal years 1953–54 to 1964–65**

Fiscal year	Population (beginning of fiscal year) (millions)	Births (millions)	Deaths (millions)	Birth rate	Death rate	Infant mortality rate	Total fertility rate	Growth rate (percent)
1953–54	582.6	26.08	13.99	44.3	23.8	186	6.39	2.05
1954–55	594.7	27.31	13.69	45.4	22.8	177	6.62	2.26
1955–56	608.3	24.82	12.86	40.4	20.9	167	5.96	1.95
1956–57	620.3	25.54	12.10	40.7	19.3	156	6.08	2.14
1957–58	633.7	25.80	12.24	40.3	19.1	144	6.07	2.12
1958–59	647.3	22.11	15.87	34.0	24.4	236	5.17	0.96
1959–60	653.5	18.88	21.37	28.9	32.8	205	4.38	–0.39
1960–61	651.0	14.72	19.17	22.7	29.5	132	3.39	–0.68
1961–62	646.6	20.88	13.79	32.1	21.2	236	4.71	1.09
1962–63	653.7	33.81	10.07	50.8	15.1	88	7.55	3.57
1963–64	677.4	30.71	11.73	44.7	17.1	96	6.82	2.76
1964–65	696.4							

The reconstructed estimates given in Table 2 and other estimates in the Appendix show clear evidence of a demographic crisis from mid-1958 to mid-1962. Fertility fell some 15 percent while infant mortality rose by 60 percent in the first year; in the second year, 1959–60, fertility fell by a further 15 percent, infant mortality fell somewhat, but adult deaths, particularly of males over age 40, increased enormously; in the third year, 1960–61, fertility declined yet again, by over 20 percent, infant mortality fell to precrisis levels, and adult deaths remained extremely high; in the fourth year, fertility rose to about 75 percent of the precrisis level, infant mortality rose sharply, but adult deaths fell to near normal. In the year following the crisis, 1962–63, fertility increased spectacularly, the infant mortality rate fell to below precrisis levels, and adult mortality returned to normal. Interpolating between pre- and postcrisis mortality levels, we calculate that the number of excess deaths during the crisis amounts to about 17.3 million deaths over age 10 and 12.2 million deaths under age 10, giving a total of almost 30 million excess deaths. The assumptions underlying these calculations, and their results, are shown in Table 3. The concept of excess deaths is not an unambiguous one. Our calculations estimate the number of premature deaths, or deaths that occurred during the crisis earlier than they would otherwise have occurred. We assume that the number of births

**TABLE 3** Estimated actual deaths and estimated deaths that would have occurred in the absence of raised mortality rates during the crisis period, at ages under 10 and 10 and over, by fiscal year: China, fiscal years 1958–59 to 1961–62

Fiscal year	Deaths in absence of crisis <sup>a</sup> ('000)			Estimated actual deaths ('000)			Estimated excess deaths ('000)		
	Under age 10	Age 10 and over	Total	Under age 10	Age 10 and over	Total	Under age 10	Age 10 and over	Total
1958–59	4,423	6,966	11,389	8,691	7,182	15,873	4,268	216	4,484
1959–60	3,570	6,886	10,456	6,491	14,877	21,368	2,921	7,991	10,912
1960–61	2,710	6,807	9,517	3,263	15,903	19,166	553	9,096	9,649
1961–62	2,638	6,727	9,365	7,062	6,727	13,789	4,424	0	4,424
Total	13,341	27,386	40,727	25,507	44,689	70,196	12,166	17,303	29,469

<sup>a</sup> Deaths in the absence of the crisis were calculated as follows: Births in the crisis years were assumed to be as estimated in Table 2. Deaths under age 10 were estimated by applying mortality levels interpolated between the values for 1957–58 and 1962–63 in Table A–3 to the population aged under 10 in mid-1958 and the fiscal year births. The mortality levels used (by sex) were:

Fiscal year	East mortality level	
	Males	Females
1958–59	15.6	13.9
1959–60	16.2	14.8
1960–61	16.8	15.7
1961–62	17.4	16.6

Deaths at ages 10 and over were obtained by interpolating between the deaths 10+ in 1957–58 and those in 1961–62, by which time adult mortality had apparently returned to normal.

each year was the same for both crisis and no-crisis calculations; if we had assumed steady fertility in the no-crisis case, excess deaths under age 10 would have been lower, but the difference would represent deaths of persons in the no-crisis case who were never actually born. Above age 10, we estimate no-crisis deaths by interpolating between numbers of annual deaths for fiscal years before and after the crisis. The result underestimates slightly the number of deaths that would actually have occurred in the absence of the crisis, since the crisis reduced the elderly population and thus the number of postcrisis deaths over age 10, but the difference is the premature, rather than excess, deaths that occurred during the period.

Only fragmentary information is available concerning regional differentials in the severity of the crisis. Birth and death rates for Shanghai County show little effect of the crisis, with a minimum birth rate in 1962 and a maximum death rate for 1963 only slightly above the general trend.<sup>4</sup> In other places such as Anhui, the death rate appears to have been extremely high.<sup>5</sup> The 1982 fertility survey shows little difference in fertility trends between women living in urban and rural areas in 1982; for both groups, the lowest fertility is in 1961, at a level about 50 percent of the average for the mid-1950s. The three provinces for which single-year age distributions from the 1982 census are presently available, Henan, Hebei, and Zhejiang, show substantially different net effects of the crisis. For Hebei, the population aged 20–23 in 1982—survivors of births of 1959–62—is 68 percent of the population aged 24–27—survivors of births of 1955–58; for Zhejiang, the comparable figure is 76 percent, whereas for Henan, it is 63 percent. Clearly the effects of the crisis differed in extent and timing across China, although a proper analysis of regional differentials must await the publication of 1982 age distributions for all provinces.

### **Famine: the proximate cause of the demographic crisis**

China has been living in the shadow of famine for centuries. North China has been frequently afflicted by catastrophic drought. In 1876–79, such a drought led to a famine that is estimated to have caused between 9.5 and 13 million deaths—the worst famine in human history, until that of 1958–61.<sup>6</sup> Flooding has also been a serious problem in north China, where millions of people have been periodically affected by breaks in the dikes of the Yellow River and by flooding of the Huai and Hai rivers. In central China, the Yangtze has been the cause of massive flooding every few decades. The climate of south China is somewhat less variable, and droughts and floods have been less frequent and less severe, but famine conditions have been by no means absent.<sup>7</sup> Although the food shortages that resulted from such natural catastrophes were hard to eliminate, human intervention could reduce the effects of famine. In 1920–21 a drought and famine occurred in the same area of north China that had been devastated in 1876–79. However, rail transport and international relief efforts

provided grain and reduced the number of famine deaths to “only” 500,000 persons.<sup>8</sup> Nevertheless, the frequency and intensity of famines in China led it to be thought of in the West as a “land of famine.”<sup>9</sup>

Recent work on famine, especially by A. K. Sen, has stressed that it is not necessary for food availability to fall for famine to occur.<sup>10</sup> As Sen points out, some of the worst famines have occurred without a significant drop in the availability of food per head. What is important is that affected individuals cease to have the ability to obtain food—they no longer have what Sen terms an “entitlement” to it—which may reflect a change either in their own circumstances or in the terms on which food was previously available, or both. Nevertheless, it is to crop failure that one must look first for an explanation of the occurrence of famine; very often the groups most affected are normally dependent on agriculture for their incomes, either as small farmers or as hired laborers.

As with demographic data, the quality and quantity of available Chinese agricultural data have improved greatly in recent years. It has now become possible to construct time series of yearly production, trade, and food availability estimates. Table 4 provides such estimates on an annual basis from 1950 to 1966. An obvious problem in interpreting these data is that, like demographic data, agricultural data have been periodically subject to disruption of statistical operations and pressures to falsify in order to report success. This was a chronic problem during the Great Leap Forward—in 1958 and the years immediately thereafter. Unfortunately, in agricultural statistics, there are no periodic retrospective checks on the likely accuracy of past estimates such as

**TABLE 4** Grain production and trade: China, 1950–66 (million tons per year)

Year	Total grain production	Total grain imports	Total grain exports	Net grain trade	Domestic grain supply
1950	132.1	.1	1.2	–1.2	130.9
1951	143.7	.0	2.0	–2.0	141.7
1952	163.9	.0	1.5	–1.5	162.4
1953	166.8	.0	1.8	–1.8	165.0
1954	169.5	.0	1.7	–1.7	167.8
1955	183.9	.2	2.2	–2.1	181.9
1956	192.7	.2	2.7	–2.5	190.2
1957	195.0	.2	2.1	–1.9	193.1
1958	200.0	.2	2.9	–2.7	197.3
1959	170.0	.0	4.2	–4.2	165.8
1960	143.5	.1	2.7	–2.7	140.9
1961	147.5	5.8	1.4	+4.5	152.0
1962	160.0	4.9	1.0	+3.9	163.9
1963	170.0	6.0	1.5	+4.5	174.5
1964	187.5	6.6	1.8	+4.8	192.3
1965	194.5	6.4	2.4	+4.0	198.5
1966	214.0	6.4	2.9	+3.6	217.6

SOURCE: State Statistical Bureau, *Statistical Yearbook of China, 1983* (Hong Kong: Economic Information and Agency, 1983), pp. 158, 422, and 438.

are provided by population censuses. Recent Chinese data attempt to eliminate the false reporting of the era of the Great Leap Forward, by using in part data more recently gathered in surveys asking for multiyear recall. But at best, this must be a poor substitute for a system of adequate contemporary reporting.<sup>11</sup>

In spite of the many qualifications that must be made about the quality of the data, especially for the period 1958–62, the general trends unmistakably demonstrate that the major cause of the demographic crisis described in the preceding section was a massive food shortage. Prerevolutionary levels of production were regained by 1952–53 and agricultural output increased by 4.6 percent per year during 1952–57. In 1959 food production (as measured by grain output) declined sharply and the following two years were even worse. Only by the mid-1960s had total grain output recovered to its level at the start of the Great Leap.

Data on food production can be used to estimate the levels and sources of net energy, protein, and fat available in the average Chinese diet, by constructing food balance sheets that allow for such factors as grain used for animal feed, for agricultural seed, and for food lost in processing and distribution. Such estimates are presented in Table 5 for 1953–64. The per capita availability of nutrients increased dramatically during China's recovery from the revolution and throughout the implementation of the First Five-Year Plan (1953–57). By the mid-1950s the daily per capita availability of food energy exceeded 2100 calories, about equal to average food energy requirements. Although averaging somewhat below the 2130–2280 calories of average daily food energy availability estimated for the 1930s by a number of authors, food supply in the 1950s was probably more evenly distributed than in the 1930s.<sup>12</sup> Beginning in 1959 the food situation deteriorated precipitously. The estimated

**TABLE 5 Annual per capita grain supply and average daily nutrient availability, 1953–64**

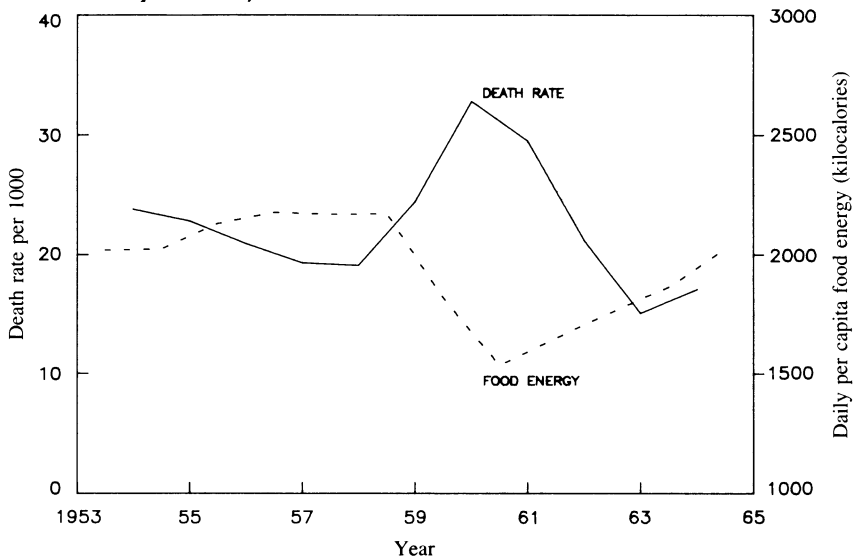
Year	Per capita grain supply (kg/yr)	Daily food energy (Kcal)	Daily food protein (gm)	Daily food fat (gm)
1953	283.2	2018.1	53.3	25.2
1954	280.5	2024.2	53.5	25.9
1955	298.9	2130.5	55.8	26.3
1956	306.6	2175.6	56.3	26.0
1957	304.7	2167.0	58.5	25.4
1958	304.9	2169.6	57.4	27.1
1959	253.8	1820.2	48.8	22.9
1960	216.4	1534.8	41.7	16.6
1961	235.0	1650.5	45.1	17.1
1962	250.7	1761.2	47.9	17.6
1963	257.5	1863.7	48.4	19.8
1964	276.1	2026.1	52.3	22.6

SOURCES: Alan Piazza, "Trends in food and nutrient availability in China, 1950–81," World Bank Staff Working Paper No. 607 (Washington, D.C.: World Bank, 1983), p. 9 (adjusted to the population totals in Table 2 of this paper); and Table 4.

daily per capita availability of food energy during 1960–62 fell below any estimates for other countries in recent years. In 1980, only Chad (1768 calories), Ethiopia (1735), Uganda (1760), Afghanistan (1775), and Upper Volta (1791) had estimated food energy availability figures below 1800 calories per day.<sup>13</sup> In comparison the 1960 estimate for China is only about 1500.

Figure 1 plots the availability of food in terms of per capita energy availability over time, and shows the close inverse relationship that has existed between this series and the estimated death rate. Again, the estimates can be considered only approximate, but they do highlight both the extraordinary magnitude of the crisis of 1958–61 and the significant improvement that has taken place in both indicators after 1961.

**FIGURE 1** Death rate and total per capita food energy availability: China, 1953–65



It must be stressed that these figures are national averages. A fuller analysis of the 1958–61 famine would require an investigation of the entitlements of different groups of the population to a share of the aggregate food supply. These differential abilities to obtain food would, in turn, determine the relative suffering of various subgroups from the famine. Regional disparities are likely to be particularly important in this regard, since in the absence of alternative food distribution mechanisms, it is likely that the places suffering from a drop in food output are also those in which incomes and, in most distribution systems, entitlements also fall, tending to localize the famine. Unfortunately it is not possible to obtain data on food availability at the provincial level for the famine years.

It is clear, however, that local experience must have varied greatly. For example, we noted above that demographic data from Shanghai show little evidence of the famine. In contrast, there were clearly other places where the effect of the famine was devastating.<sup>14</sup> Most accounts of the current food situation imply that the situation in the famine years was worse in rural areas. Extensive interviews with refugees by Miriam London and Ivan D. London, which confirmed the existence of “widespread hunger ranging from acute food shortage to . . . real black famine,” led them to conclude that the situation was far worse in the countryside than in the cities, particularly the major cities, and worse and more prolonged in the north than in the south.<sup>15</sup> The reported occurrence of considerable resistance to interprovincial grain shipments is not surprising. It was probably inevitable that any mechanism for redistributing food from relatively well-supplied localities to areas of food shortage would encounter severe difficulties in circumstances of widespread food shortages, since there was no certainty that the place with the temporary surplus would be able to obtain food should its own harvest fail next year. For example, Li Jingquan, party leader in Sichuan, was later accused of having falsified statistical reports to show a reduced capacity to supply grain to other provinces.<sup>16</sup>

Although there are contemporary accounts of food-sharing at the brigade or commune level, and information on national policy actions, there is little available information regarding policy measures at the provincial level. To what extent a more effective redistribution of food between provinces might have alleviated the famine and reduced mortality is difficult to assess without more information on the location of the greatest harvest failures and the highest levels of mortality, and on the activities of local officials.

### **Factors contributing to the famine**

A. K. Sen makes the point that even when famine is accompanied by reduction in the amount of available food per head, this may tell us little about the mechanism that actually precipitated starvation, and may not explain why some groups starved and others did not. In the case of the Chinese famine, both natural forces and government policy contributed to the famine. A distinction should be made between the government policies that contributed to the decline in food availability and the policies that aggravated its consequences.

#### **Agricultural policy**

In spite of the long history of famine in China, the Communist government that achieved power in 1949 seemed unworried by fears of food shortages. Mao Zedong took an explicitly orthodox Marxist view of Malthus as a Western bourgeois economist whose concerns about food supplies had been refuted in liberated China and the Soviet Union. It was generally believed that increased production and redistributive measures would ensure an adequate supply of food.<sup>17</sup> Although concern about population growth became much greater after the 1953 census, the impressive performance of agriculture in the period up to 1957 must have reinforced this confidence.

The early years of the People's Republic saw a far-reaching agrarian reform, followed by the development of progressively more collectivized forms of cooperation. Initially, households were organized into mutual aid teams (typically of eight to ten households), which by 1955 incorporated some 60 percent of agricultural households. In 1955–56 virtually the whole agricultural sector was reorganized into simple or advanced agricultural producer cooperatives (with 20–25, and 150–200 member families, respectively). The Great Leap of 1958 saw advanced cooperatives merged to form People's Communes (with an average membership of 5,000 households).

Local cadres were ill equipped, however, to handle the complicated administrative tasks associated with an organization the size of the People's Communes. Farmers' private incentives were considerably weakened. The expanded coverage of the workpoint system to include more individuals meant personal income was less directly related to individual work output. Another production disincentive was the discouragement of private plots and the closing of local markets that distributed goods so produced. The communes were encouraged to provide a range of services to their members, such as communal kitchens to provide free meals, and to engage in such nonagricultural activities as the production of steel in backyard furnaces. Even though the data show a record food crop in 1958, other reports suggest that the heavy emphasis on such nonagricultural activities led to the neglect of the harvest. In 1959, Defense Minister Peng Dehuai, whose criticisms of the Great Leap led to his dismissal, wrote that the drive to produce steel led to a severe shortage of labor to gather the harvest, which "not only affected the livelihood of the people, who were left with nothing to eat the first half of 1959, but also affected the light industry production using agricultural products as raw material." Peng also observed that the additional work carried out on the backyard furnaces created an obligation on the state to pay additional workpoints, unmatched by additional production, which was a "great shock to the market."<sup>18</sup>

There is little doubt that the sudden implementation of the commune system directly contributed to the onset of the food problems in 1958. It is also apparent that much of the subsequent crisis might have been avoided through a more appropriate response to the initial indications of food shortage. Part of the problem was that indications of the famine came much too slowly. In 1958, statisticians had come under attack for their "dogmatism."<sup>19</sup> Subsequently they dared not try to prevent the wild exaggerations of the growth in output that took place. But, as MacFarquhar points out, the undermining of the statistical system went a good deal further than that.<sup>20</sup> Early in 1958 Mao issued a document entitled "Sixty articles on work methods," evidently intended as an intraparty document for discussion and ratification, which prescribed many but not all of the features of the Great Leap. It called for a new dual system of target-setting. At central government, provincial, and county levels there were to be two sets of production plans—a publicized minimum and a larger expected one. The latter became the publicized minimum for the level below. So each level set increasingly higher targets for the level below.

There was a strong incentive for cadres at each level to report fulfillment and overfulfillment of the targets prescribed. This in turn led the higher levels to set still more ambitious targets. The exaggerations of output were often wild. The 1958 grain harvest was a very good one: it is currently estimated to have been 200 million tons, which exceeded all previous levels and was not approached again until the mid-1960s. But some officials had originally proposed that output was as high as 500 million tons; eventually a figure of 375 million was announced. Contemporary foodgrain production figures and recent revised estimates are shown in Table 6. Chinese figures and their derivatives consistently indicated production levels higher than those presently accepted. Procurement difficulties in the face of such a large harvest suggested that peasants must be concealing output. For example, in the spring of 1959, Minister of Finance Li Xiannian complained of a new tendency developing in a number of places to conceal their full harvest output so that communes could retain more for their own use.<sup>21</sup>

The deception with respect to 1958 production figures was apparently so complete that in 1959 a policy of intensive cultivation and *reduced* hectareage was adopted with the slogan "A Small Amount of Seeds, But High Production and a Large Crop."<sup>22</sup> As shown in Table 7, the area sown to grain declined by 12 percent between 1957 and 1959.

An indication that there was no clear view from the top of what was going on in rural areas is the fact that as late as the spring of 1961, Deng Xiaoping directed several high-ranking Party members to investigate rural

**TABLE 6 Contemporary estimates and 1980 official figures of foodgrain production in China: 1957–63 (million metric tons)**

Source	1957	1958	1959	1960	1961	1962	1963
Official figures (pre-1980)	185	250	270 <sup>b</sup>	150	162	174	183
US Agr. Attaché, Hong Kong <sup>a</sup>	185	193	168	159	166	180	178
Econ. Research Service, USDA <sup>a</sup>	185	200	165	150	162	174	183
Official figures (1980)	195	200	170	144	148	160	170

<sup>a</sup> The Agricultural Attaché's estimates are given in *Current Scene*, published by the US Consulate in Hong Kong. The Economic Research Service's estimates are published in the Foreign Agricultural Economic Reports of the US Department of Agriculture.

<sup>b</sup> Official figure was later revised downward. Hong Kong observers estimated production levels at 180–220 million tons.

SOURCES: Official figures (pre-1980): The Economist Intelligence Unit, *Three-Monthly Economic Review of China, Hong Kong and North Korea*, No. 27 (September 1959); No. 29 (March 1960); No. 32 (November 1960).

Thomas B. Wiens, "Agricultural statistics in the People's Republic of China," in Alexander Eckstein (ed.), *Quantitative Measures of China's Economic Output* (Ann Arbor: The University of Michigan Press, 1980), p. 80.

US Agricultural Attaché and Economic Research Service: Robert F. Dernberger, "Quantitative measures and the analyses of China's contemporary economic evolution: Problems and prospects," in Eckstein (ed.), p. 20.

Official figures (1980): State Statistical Bureau, *1980 Chinese Agricultural Yearbook*, p. 34; cited in Piazza (see source to Table 5).

TABLE 7 Sown area and yield: China, 1950–66

Year	Sown area (million ha.)			Yield (kg/ha)		
	Total grain <sup>a</sup>	Rice	Wheat	Total grain <sup>a</sup>	Rice	Wheat
1950	114	26	23	1155	2108	638
1951	118	27	23	1223	2250	750
1952	124	28	25	1320	2415	735
1953	127	28	26	1320	2520	713
1954	129	29	27	1313	2468	863
1955	130	29	27	1418	2678	863
1956	136	33	27	1410	2475	908
1957	134	32	28	1463	2693	855
1958	128	32	26	1568	2535	878
1959	116	29	24	1463	2393	938
1960	122	30	27	1170	2018	810
1961	121	26	26	1215	2040	555
1962	122	27	24	1313	2340	690
1963	121	28	24	1410	2663	780
1964	122	30	25	1538	2805	818
1965	120	30	25	1628	2940	1020
1966	121	31	24	1770	3128	1058

<sup>a</sup> Grain includes rice, wheat, corn, sorghum, millet, tubers (at one-fifth wet weight), soybeans, and other minor grains and pulses.

SOURCE: *1980 Chinese Agricultural Yearbook* (Beijing: Agricultural Publishing House, 1981), pp. 34–35.

conditions.<sup>23</sup> Even at that time, Mao, among others, was still skeptical as to the extent and severity of China's agricultural crisis.<sup>24</sup>

The apparent rise in infant mortality in 1958–59 would not seem to reflect aggregate food production in 1958, although it should be noted that exaggerated reporting led to excessive government procurement, causing some communities to be extremely short of food.<sup>25</sup> Chen Yun wrote, "Because we procured too much and left too little to the peasants [in the final analysis] the peasants did not like to work and . . . we did not collect anything."<sup>26</sup> Reported surpluses also encouraged wasteful consumption. Some communes practiced free supply. But it is also likely that the generally chaotic situation of 1958–59, with the formation of the People's Communes, the widespread switch to communal eating facilities, the diversion of effort to backyard steel production, and the obviously frenetic pace of individual economic activity, exemplified by shock brigades that worked literally day and night to bring in the neglected harvest, could well have led to deteriorating infant care.

Eventually, the poor performance and labor inefficiencies of the 1958 harvest began to be recognized, however; and in August 1959 the production figure was revised downward to 250 million tons. Both cities and rural districts were urged to "conserve" foodgrains through the "economic consumption" of grain. This plea, first voiced in May 1959, was to continue throughout the lean years. A policy reversal occurred in June 1959, with exhortations to cultivate all available land ("A Large Amount of Seeds and a Large Crop").

Simultaneously, urban dwellers in 37 major cities were urged to grow their own grain and vegetables on suburban land tracts.<sup>27</sup> Unfortunately, the 5 percent increase in area sown to grains in 1960 was more than offset by a disastrous 20 percent decline in grain yields (see Table 6). In both 1960 and 1961, yields and cultivated areas were below the corresponding 1957 levels.<sup>28</sup>

In 1960, agriculture was affirmed as the foundation of China's economy, an explicit shift of emphasis from the priorities of the Great Leap, which had stressed the simultaneous growth of industry and agriculture. A variety of measures were then taken to correct production and distribution problems in agriculture. Communes were reduced in size to more manageable units. The production team, typically with some 30–40 families, became the basic production and accounting unit. An increased emphasis was placed on personal incentives, with a return to the principle of “to each according to his work,” or more income for more work. Producer prices were increased (principally in 1961).<sup>29</sup> Opportunities for cultivating private plots were increased and rural trade fairs were reopened. Commune services, such as communal kitchens and nurseries, were cut down or abolished.

### Urbanization policy

In addition to government policies that contributed to decreased grain production, other policies aggravated the consequences of production shortfalls. These included direct and indirect encouragement of urban growth, and the insulation of urban Chinese from the agrarian crisis through grain rationing systems and the maintenance of state-controlled stockpiles. The period from 1949 to 1956 had seen extensive migration into urban areas, with urban population growing from an estimated 58 million in 1949 to 99 million in 1957.<sup>30</sup> Attempts to restrict migration were fairly unsuccessful before 1956, but in that year and the following a drive to put “urban superfluous workers” back to work in agriculture sent millions returning to their native villages. The heavy emphasis on industrialization that characterized the Great Leap, however, led to a new wave of migration, and by 1960 the urban population was reported to have reached 130 million. At this point China's economy was in complete disarray, and many industrial enterprises could no longer operate. The problem of procuring enough food for the urban population was also of great concern to the government, as the writings of Chen Yun at the time illustrate,<sup>31</sup> although the urban food situation appears never to have been as grim as in many rural areas since state stockpiles could be used to supplement current supplies. The state had stocks of 18.2 million tons of processed grain in June 1957. By June 1961, reserves were down to 7.4 million tons, according to Chen Yun's estimates at the time, of which only 5.0 million represented a carryover from previous harvests.<sup>32</sup> The carryover represented less than 40 kilograms per urban resident—or less than two months' average ration.<sup>33</sup> An estimated 20 million workers were sent back to their villages, 10 million by spring 1961.<sup>34</sup>

### International trade policy

Domestically supplied food was virtually the only food source until major grain imports began in 1961. That the highly exaggerated reports of 1958 agricultural output affected agricultural planning is most clearly indicated by the unfortunate increase in net grain exports during the first two years of the food crisis—in 1959 and 1960. As shown in Table 4, net grain exports in 1959 were more than 50 percent greater than the net exports of 1958. These large net grain exports continued throughout 1960, when net exports approximated 3 million metric tons. It was not until the very substantial increase in grain imports and the reduction in exports in 1961, resulting in net grain imports of over 4 million tons, that the domestic food crisis began to influence China's international grain trade. There is no way of determining the cost in human suffering of this two-year delay in resorting to international grain markets to reduce domestic food shortages. Net grain exports during 1959–60 totaled almost 7 million tons, however, representing enough food energy (22 trillion kilocalories) to feed 16 million people a diet of 2000 calories per day for nearly two years.

### Natural disasters

The frequency of Chinese reports on natural calamities and exhortations to combat such forces increased during the years of the agricultural crisis. Chinese authorities claimed severe crop damage to more than half the cultivated area in 1960. A reported 60 million hectares were affected; severely affected were 20–27 million hectares, leaving some areas completely cropless. Since the crop damage in 1960 followed on the heels of damage in 1959 to 40 million hectares, the effect was a cumulative worsening.<sup>35</sup> All of China except Xizang and Xinjiang Provinces was said to have suffered some form of drought, flood, typhoon, plant disease, or insect pest. It has been suggested that a change in policy in 1957 to give higher priority to irrigation over flood control in north China, and consequent errors in the irrigation and water conservation program, may have contributed significantly to the massive flooding.<sup>36</sup>

According to Chinese reports droughts caused the loss of 25 percent of the crop in Hubei and 54 percent in Shaanxi in 1959. In the same year, drought in central and northwest China affected the late rice crop (which usually provides the bulk of the harvest). Floods inundated 810,000 hectares in Guangdong in June 1959, and 58,000 hectares in Fujian in September. The following year, drought exacted severe tolls on crop production throughout China. Hardest hit were Hebei, Shandong, Shanxi, and Henan Provinces, where droughts lasted 6–7 months and reduced crops by 60 percent. Other areas also affected included Shanxi, Inner Mongolia, Gansu, Sichuan, Yunnan, Guizhou, Guangdong, Guangxi, and Fujian. In 1960, more typhoons struck China than had occurred in any of the previous 50 years. Eleven typhoons hit Guangdong, Fujian, Jiangxi, and Shandong between June and October 1960. Natural disasters continued into 1961 with drought affecting the north—Henan, Hebei, Shanxi,

Shandong, and Anhui. Further south, floods again visited Fujian, Guangdong, Sichuan, Guangxi, and Hunan.<sup>37</sup>

Many foreign observers felt that these reports of weather-related crop failures were designed to cover up political factors that had led to poor agricultural performance. They also suspected that local officials tended to exaggerate such reports to obtain more state assistance or tax relief. Clearly, the weather contributed to the appalling drop in output, but it is impossible to assess to what extent. Liu Shaoqi, who succeeded Mao as head of state in April 1959, was later accused of having charged that the crisis was 70 percent manmade and only 30 percent the result of natural calamities.<sup>38</sup> In view of the nearly complete breakdown of the agricultural reporting system of the time, Liu's judgment must be considered arbitrary. Indeed, once the system of reliable information had broken down, it must have been impossible for anybody, even at the pinnacle of government, to have had a clear idea of what was going on, or of the exact cause of contemporary problems.

### **What was known about the famine outside China?**

When first hearing of the magnitude of the 1958–61 Chinese famine, many outside observers, including the present authors, reacted with disbelief. Such an attitude probably stems from two factors. The first is the well-justified respect for the subsequent accomplishments of the Chinese government in raising levels of health and nutrition. Second, it is remarkable that in an era of instant worldwide communications and the regular monitoring of political and economic events in foreign countries, a human tragedy of such enormous scale could occur anywhere, no matter how closed the society, without its existence becoming widely known. Could it really have happened?

Contemporary press coverage noted agricultural production difficulties and declining consumption, yet the toll in human lives resulting from China's food crisis was never appreciated. The early agricultural achievements of the Communist era and especially the false reports of the 1958 harvest in fact impressed many people. For example, one of the most eminent authorities on the world food situation, Lord Boyd Orr, a former head of the Food and Agriculture Organization, said that the evidence indicated a 50–100 percent increase in food production over the 1955–58 period (in contrast to official claims of a 114 percent increase). He remarked that “modern farming methods had increased Chinese yields to levels comparable with those of Britain and had ended the traditional Chinese famine cycle.” “China,” he said, “has one quarter of the world's population, but seems capable of feeding it well.”<sup>39</sup>

Ironically, Lord Boyd Orr's remarks were made in May 1959, at just about the same time as Western newspapers were noting that food scarcities were reported in Canton, Peking, and other Chinese cities.<sup>40</sup> An acknowledgment of grain shortages in “areas amounting to less than 5 percent of the expanse of the country” was made by Zhou Enlai at a Party conference in

Lushan in August of that year.<sup>41</sup> Zhou blamed both planning failures and poor management of the harvest, as well as natural calamities in the spring. The difficulties highlighted by Zhou became the subject of outside speculation.

China's growing political isolation, however, made it difficult for anybody outside the country to make an objective assessment of the situation. China's relations with the Soviet Union progressively deteriorated, leading to the withdrawal of Soviet technical and economic assistance in July 1960. This added to the country's economic difficulties, although grain exports to the Soviet Union in partial repayment for earlier aid reportedly continued.<sup>42</sup> Refugee reports and claims by anticommunist sources described conditions of famine but were regarded as either unrepresentative or politically biased. Chinese authorities were loathe to admit production declines. Despite reports of severe weather—floods and heavy rains in the south and northeast, and droughts and pests in central and northwest China—record harvests were proclaimed. Although outside observers discounted reports of record harvests, they also observed continued grain exports and no food imports to suggest the scope of the food crisis. Nevertheless, some observers commented that “there is much evidence to suggest serious food shortages.” In the latter half of 1960, there were indications that the agricultural situation was “a great deal more serious than officially admitted [as] indicated by the tone of anxiety underlying the reports of victories in the fights against the forces of nature and the current campaign for increasing agricultural production.”<sup>43</sup>

By early 1961, the existence of severe famine was widely accepted outside China.<sup>44</sup> Offers of famine relief came from the International Red Cross. In February, the Secretary General of the League of Red Cross Societies reported that the People's Republic had rejected offers of Red Cross famine aid.<sup>45</sup> Possibilities of food aid were discussed in the US Congress and the White House. In late January and February 1961, President Kennedy rejected suggestions that the United States offer to help alleviate food shortages. He “was not anxious to offer food if it is regarded merely as a propaganda effort.” He noted that China recently had exported quantities of foodstuffs and said that in view of the Chinese “belligerent attitude,” there was “no indication . . . that they would respond favorably” to US aid.<sup>46</sup> In February Foreign Minister Chen Yi declared that the food crisis in China could only be solved domestically. He rejected offers of outside assistance, telling Japanese visitors to Peking that China would never “stoop to beg for food from the US.”<sup>47</sup>

The wider recognition outside China of the grave nature of the problem did not, however, mean that anything resembling a consensus emerged on its degree of seriousness. A paper by Joseph Alsop in *The China Quarterly* of July–September 1962 stated that “The most reliable data obtainable in Hong Kong this spring, derived from great numbers of refugee interrogations and collected and analysed with extreme care, showed an average food intake for mainland China of 1300 to 1600 calories per person per day, according to the individual's labor category. These figures are squarely based on the best first-hand evidence that exists; and they are therefore unchallengeable except by

those experts who think they know more about the Chinese diet than the people who have recently been eating it.”<sup>48</sup> But the set of invited comments in the next issue showed that such conclusions could and would be challenged.<sup>49</sup> Were it not for the recent decision by the Chinese to make available a good deal more information covering the famine period, and to publish the contemporary writings of Peng Dehuai and Chen Yun, it is likely that the controversy would have remained where it stood in 1962.

### Some implications

Tension between ideological and pragmatic approaches to policy is not, of course, peculiar to China; indeed, the policies of most countries probably veer from one side to the other from time to time. But in China the swings have been extremely sharp and plainly disruptive to her long-run development efforts. By 1962, pragmatism had been restored to policy. Not only were agrarian policies modified; family planning was reemphasized, and statistical work was reorganized, strengthened, and explicitly removed from control by party cadres or other government departments. But in spite of the bitter lessons of experience, “politics again took command” in the Cultural Revolution, and many important lessons seemed to have been forgotten. Before long, statistical work was again attacked on ideological grounds, the link between effort and reward in agricultural production was substantially reduced, and, for several years, family planning efforts were reduced.

Since the late 1970s, of course, pragmatism has been strongly emphasized, and it is possible that the release of information about the famine years is seen as a way to guard against a return to the errors of the past. One of the main lessons is that a system in which at least some important decisions are made on a centralized basis—which means any modern economy—requires an information system that can provide an objective assessment of what is going on. China is vast; conditions are very varied; government departments are highly compartmentalized; only a very few people can have access to the overall picture, and if they lack objective information there is no way that anybody can know what is going on. The Chinese have drawn their own correct conclusions about the need to insulate the statistical system from interference by those with responsibility for implementing policy.

A statistical system, though essential, is, however, inevitably slow, at least in a country with few computers and little experience with sample surveys. A British prime minister of the 1950s complained that obtaining economic statistics to make policy was like “looking up trains in last year’s Bradshaw” (a railway timetable). A. K. Sen has argued that an open democratic society with a free press and opposition parties plays an important role in alerting the public to what is happening and forcing a change in policy.<sup>50</sup> It may also play a role in alerting the government where normal reporting systems cannot be relied on to be objective.

In 1977 the per capita output of food was little higher than it had been 20 years earlier. Improvements since then, and especially reforms that have given new weight to individual incentives and to price increases, have led to a dramatic increase in output, and might appear to have lifted China well above any fear of future famine. Nevertheless it is likely that the difficulties of feeding the growing Chinese population with the relatively slender amount of agricultural land available and the constant threat of serious droughts and floods continue to be of concern to the Chinese leadership. Acute difficulties with food supplies were evidently experienced in Sichuan in 1976, a fact that Deng Xiaoping, who is from that province, and Prime Minister Zhao Ziyang, who was based there from December 1975 to early 1980, are unlikely to forget. Grain remains rationed and in the late 1970s showed considerable variation from year to year both in quantities and in the grains of which the rations were composed.<sup>51</sup> In December 1978, the Central Committee of the Communist Party of China reviewed the agricultural situation and observed that "between 1957 and 1977 [the Chinese] population grew by 300 million [and] the amount of cultivated land decreased by more than 100 million *mu* [6.7 million hectares] due to capital construction. Therefore, although per-unit yield and grain production had grown by 1977, the average grain ration for each person was still less than in 1957, and more than 100 million persons in the rural areas suffered from lack of grain."<sup>52</sup> In early 1981, it was admitted that 130 million people in at least nine provinces faced "varying degrees of food shortages," with 21 million "seriously affected."<sup>53</sup> The government requested disaster relief for the first time, and after surveying the provinces of Hubei and Hebei, a UN Disaster Relief Organisation team reported that China needed \$700 million in food and other aid.<sup>54</sup>

Policies continue to stress the need for local self-sufficiency in food grains. Nevertheless effective policies for redistributing food to places of acute shortage must have played a considerable role in the success of the Chinese in reducing mortality, especially among young children. The desire to restrict the rate of urbanization, and especially the growth of large cities, may, however, still partly reflect anxiety about the difficulties of ensuring them food in times of crisis. The policy to restrict parents to only one child until population growth has been brought to a halt probably reflects concern over the difficulties of feeding a larger population as much as anything else.

What are the lessons for the rest of the world? Developing countries face two sorts of food problems. The first stems from the inability of agriculture in very poor countries to provide adequate diets for a great many people, even with 70–80 percent of their populations engaged in agriculture. In these circumstances, even if food aid could alleviate existing widespread malnutrition, this could scarcely be done regularly on a large scale without depressing the incomes of the very poor farmers who depend on selling grain. Such a situation results from very low productivity in agriculture, and the priority for foreign assistance must be to increase this productivity, not to try to offset it. Although China has not fully escaped from this situation, she appears to be poised to

do so, and to be about to attain a position where supplying the population with adequate basic foodstuffs will require a much smaller proportion of the country's resources than it has in the past.

A different sort of problem occurs where a series of bad years in a poor country with a weak international trading situation leaves it with a significant food deficit and potential famine. Nothing is gained, in terms of incentives to future production, by withholding international food assistance in such a situation, and there ought to be no stigma attached to requesting such assistance. But where the problem reflects past mistakes of policy, and the major possible donor appears to be an implacable political adversary, one can understand, if not excuse, reluctance to seek external assistance.

The Chinese famine of 1958–61 was an extreme case. Grain production in the world's largest country dropped by 15 percent in one year and then to about 25 percent below its previous level for two further consecutive years. Any such situation would challenge the best organized system of internal food redistribution, as well as the most ambitious of international relief programs. But prior domestic policy errors apart, the tragedy of the Chinese famine of 1958–61 is that internal food redistribution was obviously limited and major international relief was never even attempted. Earlier unwise policies became compounded by ignorance and by the warp of international politics. Internally, the destruction of systems of objective reporting hid the facts from policy-makers. Externally, the political isolation of China turned the requesting and granting of assistance into much more politically charged actions than they need have been, and in consequence they never occurred. It would not be inaccurate to say that 30 million people died prematurely as a result of errors of internal policy and flawed international relations.

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## **Appendix**

### **The derivation of estimates needed to ascertain the magnitude of the demographic crisis of 1958–62 in China**

Some minor data adjustments were made before carrying out the consistency checks and estimation procedures described below. The reported age distributions from all three censuses (1953, 1964, 1982) show clear deficits of young adult males. The most likely explanation of these deficits is that the army was not fully included in the reported age distributions, although other explanations such as clandestine male migration cannot be ruled out. The evidence for 1953 and 1964 that these deficits are statistical distortions rather than

true patterns is that in both cases marked deviations from otherwise fairly regular sex ratios by age for young adults are not repeated for the same cohorts at the next (1964 or 1982) census. The recurrence of the pattern in 1982 is also assumed to be the result of statistical distortion, though of course there is no subsequent enumeration to support this assumption. The three age distributions were adjusted (at ages 16–30 for 1953, 17–25 for 1964, and 18–22 for 1982) by calculating the number of males from the recorded number of females

using sex ratios by single years of age obtained by interpolating across the deficit age range. This adjustment resulted in a slight inflation of the total census population for 1964, but merely a redistribution within the recorded total for 1953 and 1982.

The second adjustment corrects for apparent misreporting due to a feature of the Chinese calendar. In carrying out an analysis similar to that described here, comparing registered births with births calculated using fertility rates from the 1982 fertility survey, Coale (cited in note 1, p. 27) observed that the estimates of registration completeness thus obtained were uniformly low for Chinese leap years, which consist of 13 lunar months as opposed to the 12 lunar months of the non-leap years. For the period 1954–80, the completeness estimates for leap years all fall below a three-year moving average of the annual estimates, the average deviation being –4.6 percent. Coale's convincing explanation of this phenomenon is that births were reported, at least in part, to the fertility survey in terms of the Chinese rather than the Western calendar, thus increasing fertility rates for leap years and reducing rates for all other years. If all births were reported in this way, births in leap years would be exaggerated by 5 percent, while births in other years would be reduced by 3 percent. Since the average deviation is close to this maximum 5 percent, we have assumed that all births in the fertility survey were reported by the Chinese calendar, although Coale adopts a more conservative assumption that only two-thirds of births were thus reported. Age-specific and total fertility rates were thus adjusted prior to interpolating to fiscal years, leap year rates being divided by 1.05, and rates for other years by 0.97.

Comparisons of the alternative sources of demographic information are made as follows. First, the annual numbers of births and deaths registered in each calendar year are estimated from the reported crude birth and death rates and the geometric mean of the beginning- and end-year populations, on the assumption that this is the inverse of the procedure used to calculate the reported annual birth and death rates. Numbers of births and deaths for fiscal (midyear to midyear) years are then estimated by interpolation, fitting a fourth-order polynomial to cumulated births and deaths for four

consecutive calendar years centered on the fiscal year of interest. Total fertility rates for fiscal years are obtained by applying the same interpolation procedure to the total fertility rates for calendar years reported by the 1982 fertility survey. The 1953 census age distribution of females aged 4 and over in 1953 is then projected forward by single calendar years to 1964, using smoothed intercensal survival probabilities varying by fiscal year to approximate actual mortality trends suggested by the registered crude death rate. International migration was assumed to be negligible. Fiscal-year births were then calculated from the age-specific and total fertility rates for fiscal years from the 1982 survey applied to the projected midyear female populations. The number of registered births can then be compared with the number of projected births estimated from the census projection and the 1982 fertility survey for each fiscal year, and the apparent completeness of registration can be calculated. The births for each fiscal year from these two sources can then be compared with the numbers of survivors of those births recorded by the 1964 and 1982 census enumerations; the most convenient form of comparison is apparent survivorship ratios, which can be computed by sex by applying an assumed sex ratio at birth of 106 males per 100 females to the births.

Table A–1 shows, for fiscal years 1953–54 to 1963–64, the number of registered births and the number of births based on census projection and fertility survey, and indicates the implied completeness of birth registration, and the implied survivorship probabilities by sex, to 1964 and 1982, of fiscal year birth cohorts estimated from census projection and fertility survey. The estimates of birth registration completeness fall for the first two years shown in the table; settle around 80 percent for 1955–56 to 1960–61 (with the exception of a high value for 1959–60); and then rise abruptly for the last three years, a rise that continues (though not shown in the table) to nearly 95 percent in the mid-1960s. The survivorship probabilities to both 1964 and 1982 are remarkably consistent by sex, although the sex differential changes from a male advantage for births prior to 1960, through approximate equality for 1960 to 1963, to a female advantage for 1963–64; the sex differentials are more

**TABLE A-1** Estimated number of births based on registration and obtained from 1953 census projection and 1982 fertility survey; implied completeness of birth registration and implied survivorship of birth cohorts to 1964 and 1982 censuses: China, fiscal years 1953-54 to 1963-64

Fiscal year	Births (thousands)			Survivorship rates of fiscal year birth cohorts <sup>a</sup>			
	Registration	Census projection and fertility survey <sup>a</sup>	Implied registration completeness	According to the 1964 census		According to the 1982 census	
				Males	Females	Males	Females
1953-54	22,269	26,081	.854	.750	.733	.717	.713
1954-55	21,303	25,645	.831	.817	.792	.773	.763
1955-56	19,545	24,824	.787	.770	.744	.725	.721
1956-57	20,908	25,537	.819	.792	.762	.748	.734
1957-58	20,646	25,800	.800	.811	.780	.765	.744
1958-59	17,793	22,113	.805	.686	.669	.652	.642
1959-60	15,198	17,542	.866	.831	.811	*	.819
1960-61	11,957	14,716	.813	.793	.786	*	.751
1961-62	17,819	20,875	.854	.752	.750	*	.781
1962-63	28,060	30,898	.908	.983	.989	*	.915
1963-64	28,780	30,705	.937	.925	.944	*	.832
Total	224,278	264,736	.847	n.a.	n.a.	n.a.	n.a.

\*Male survivorship to 1982 not given, since male population was adjusted on basis of female population for ages 18-22.

<sup>a</sup> For explanation of calculations, see text.

marked for survival rates to 1964 than to 1982. The survivorship ratios are also reasonably consistent by cohort and by end point (1964 or 1982); the general pattern is of a gradual increase in survival with year of birth, consistent both with gradually falling infant and child mortality and with the successively shorter lengths of life to which the survival rates refer, but there are several notable deviations from the general pattern. Births in 1954-55 have higher than expected survival to both 1964 and 1982; births in 1958-59 have much lower than expected survival to both 1964 and 1982; births in 1959-60 have somewhat higher than expected survival, especially to 1982; births in 1961-62 have lower than expected survival to 1964, though their survival to 1982 is not clearly out of line; and births in 1962-63 have higher than expected survival, which is particularly marked to 1964.

Table A-1 compares measures based on four supposedly independent sources,\* and the

variations observed provide powerful support for this independence. However, the nature of the sources provides some basis for drawing conclusions about the causes of the variations for each birth cohort. We discuss these variations below, by fiscal year of birth.

— 1953-54 Completeness of birth registration is high, but all the survivorship probabilities are reasonable. Since the two censuses and the fertility survey are consistent, birth registration is probably abnormal, a conclusion strengthened by the observation that the official birth and death rates through 1953 are rounded and may not be based on actual registrations. We therefore accept the fertility survey births and their survival probabilities.

— 1954-55 Completeness of birth registration is rather high, but all the survival probabilities are rather high. Birth registration completeness might come out high as a result of a continuation of the birth rate rounding proposed for 1953-54, but there is no obvious reason why the mortality risks for this cohort should have been lower than those of adjacent cohorts, or why the population aged 9 in 1964 and 27 in 1982

\* The 1953 census age distribution is also used in the calculations, but only in the calculations of fiscal year births from the fertility survey age-specific fertility rates.

should both have been overreported. We therefore conclude that the fertility survey rates for 1954–55 are some 7 percent too low, a conclusion that would reduce birth registration completeness to around 77 percent and cohort survivorship rates by 7 percent.

- 1955–56 to 1958 All the measures are approximately consistent, so the fertility survey rates and survivorship probabilities are accepted.
- 1958–59 Completeness of birth registration is about normal, but the survivorship probabilities are all low. Since it is unlikely that the population aged 5 in 1964 and 23 in 1982 was consistently underenumerated, the measures are accepted as consistent but as indicating sharply heavier child mortality for this than for earlier birth cohorts.
- 1959–60 Completeness of birth registration is high, and the survivorship probabilities are rather high to 1964, and high to 1982. The female population aged 22 in 1982 may be overreported, since age 22 is an officially advocated lower age limit for female marriage, but there is no reason to suppose that the population aged 4 in 1964 was overreported. We therefore conclude that registration completeness was about the norm of 80 percent, implying survivorship to 1964 somewhat lower than normal, and that the fertility survey rates for this year are some 6 percent too low.
- 1960–61 All the measures are approximately consistent, so the fertility survey rates and survivorship probabilities are accepted.
- 1961–62 Birth registration completeness is rather high, suggesting too few births from the fertility survey, but the survivorship probabilities to 1964 are low, suggesting too many births; survival to 1982 is not so low, but the number of females aged 20 in 1982 may be inflated owing to the influence of age at marriage laws or guidelines. On balance, we accept the fertility survey results and the probabilities of survivorship to 1964, and conclude that birth registration completeness started to rise during this fiscal year.
- 1962–63 Birth registration completeness is high, survivorship to 1964 impossibly

high, and survivorship to 1982 for females also implausibly high. A tempting conjecture would be that one-year-olds were overreported in 1964, by an upward age shift from age 0, a common error in developing country age distributions. However, female survivorship from 1964 to 1982, age 1 to age 19, is a not implausible 0.925, so any error in 1964 was followed by an error of similar magnitude at a quite different age in 1982. A more likely explanation seems to be that the fertility survey rates for 1962–63 are too low, possibly as a result of the fiscal-year interpolation procedure used here. However, even a registration completeness of 80 percent, the lowest that can reasonably be assumed, would reduce survivorship probabilities only to around 0.87 to 1964, implying an infant mortality rate of only about 110 per thousand live births. There are thus probably errors in several of the sources: the interpolated fertility survey rates too low, the 1964 population aged 1 too large, the 1982 female population aged 19 possibly too small (some 19-year-olds having been reported as age 20); all we can conclude is that birth registration was more complete, that fertility was higher than the interpolated rates, and that infant mortality was much lower than its average level over the preceding decade.

- 1963–64 Although birth registration completeness is high, so is survivorship to 1964; survivorship to 1982 is somewhat low. It is hard to evaluate these measures effectively, because of the importance of the age pattern of early child mortality, but it is not evident that any one is inconsistent with the others. We therefore accept the general level of fertility indicated in the 1982 survey and the level of child mortality as shown in Table A-1.

From this year-by-year analysis, we draw the conclusions about fertility noted in the first section of this paper. A detailed account of the reconstructed estimates is given in the text and in Table 2.

Turning to child mortality, we have survivorship ratios for adjusted births by sex and fiscal years to the 1964 census. These survivorship ratios reflect the cumulative effects of mortality experience over different time and

age spans as each cohort ages from birth to census enumeration. Obviously they cannot be taken as measures of mortality level in the fiscal year of birth, even though the survival rates will normally be most influenced by the high mortality experienced in the first year of life. However, by a stepwise procedure we can obtain estimates of period mortality levels from these survivorship probabilities. The survivorship probability for male (or female) births in 1963–64 represents only the mortality level of that fiscal year, and approximates the life table function  ${}_1L_0/\ell_{(0)}$ . For each sex, we can find the implied mortality level in a model life table family, and assume that the same mortality level applied to all the birth cohorts as they passed through the year. Using ratios  ${}_1L_n/{}_1L_{n-1}$  for the implied model life table level, we can reverse-survive each 1964 single-year cohort to mid-1963. We can then repeat the process for male (or female) births in 1962–63, calculating the survivorship ratio to mid-1963, finding the model mortality level of the corresponding  ${}_1L_0/\ell_{(0)}$ , assuming that this level applies to all older cohorts, and projecting backward to mid-1962. Theoretically, we can continue this procedure backward year by year to 1953, finding model mortality levels for each year that are consistent with the observed cohort survivorship probabilities, the child

mortality pattern of the model, and the assumption of a single period mortality level applying to all cohorts passing through the year.

Using the Coale–Demeny model life tables, it turns out to be impossible to apply this method across all cohorts. The fluctuations in survivorship probabilities are too sharp from cohort to cohort to be able to assume period levels applying to all cohorts without obtaining negative mortality for at least one period, even using the ‘East’ mortality pattern, which has the highest infant mortality relative to child mortality, and can therefore represent wider fluctuations than any of the other three families. However, by adjusting the survivorship probabilities to 1964 in Table A–1 for the ages 1, 4, and 9 in accordance with the above discussion of birth registration and enumeration completeness, by using the East family of model life tables, and by smoothing somewhat the extreme fluctuations in survivorship probabilities for cohorts aged 2, 5, 6, and 7 (for males) or 8 (for females) in 1964, it is possible to obtain a reasonable sequence of child mortality levels and infant mortality rates by sex for fiscal years from mid-1953 to mid-1964. The levels and infant mortality rates obtained by period, and the implied cohort survivorship probabilities, are shown in Table A–2. The fluctuations not accounted for may reflect co-

**TABLE A–2 Cohort survivorship rates to 1964 and corresponding mortality levels and infant mortality rates, by sex: China, fiscal years 1953–54 to 1963–64**

Fiscal year	Males				Females			
	Cohort survivorship rates				Cohort survivorship rates			
	Observed (birth to 1964)	Model	East mortality level	Infant mortality rate	Observed (birth to 1964)	Model	East mortality level	Infant mortality rate
1953–54	.750	.750	12.5	185	.733	.733	11.1	178
1954–55	[.760]*	.760	13.0	176	[.738]*	.738	10.6	187
1955–56	.770	.770	13.2	172	.744	.755	[11.5]**	171
1956–57	.792	.773	[14.2]**	155	.762	.762	12.3	158
1957–58	.811	.756	[15.0]**	141	.780	.742	[14.0]**	132
1958–59	.686	.724	[10.0]**	235	.669	.709	[8.0]**	237
1959–60	[.772]*	.772	11.9	195	[.753]*	.753	9.1	215
1960–61	.793	.793	15.9	126	.786	.786	13.6	138
1961–62	.752	.795	[10.0]**	235	.750	.803	[8.0]**	237
1962–63	[.892]*	.892	18.0	93	[.910]*	.910	17.5	83
1963–64	.925	.923	17.0	108	.944	.944	17.5	83

\* Adjusted observations.

\*\* Levels smoothed to avoid assumption of impossible or implausible levels in prior years.

hort effects, whereby particular birth cohorts that experienced high initial mortality continued to experience mortality rates above period averages, presumably because they were weakened by their early adverse conditions, thus leading to overestimates of mortality in their year of birth, and thus necessarily to an underestimate of mortality in the preceding year.

Although the results in Table A-2 are not entirely satisfactory, presumably reflecting the sensitivity of the methods to reporting errors, even with rather good data, we can draw some conclusions. The survivorship probabilities are consistent with a steady decline in infant and child mortality from 1953 to 1964, interrupted by two sharp mortality surges, for 1958-59 and again for 1961-62, with infant mortality rates climbing well above 200 per thousand live births. Using the East model, the lower female than male survivorship probabilities from the early and mid-1950s imply similar levels of infant mortality by sex (it is a feature of the East model that child mortality rates favor males whereas infant mortality rates favor females, so similar infant mortality rates imply lower female survivorship because of the heavier female child mortality rates). It is therefore not necessary to introduce assumptions about female infanticide to explain the lower female survivorship to 1964, though of course we cannot determine age at death with any certainty. Table A-3 gives a somewhat more plausible sequence of mortality levels by year, smoothing the initial estimates and taking into account survivorship to 1982 as well as to 1964. The infant mortality rates shown in Table 2 of the text correspond to the mortality levels shown in Table A-3.

Having arrived at period estimates of mortality levels in infancy and childhood, we can now turn to adult deaths, taken arbitrarily to mean deaths at ages 10 and over. Total registered deaths can be estimated for each calendar year from the 1983 *Statistical Yearbook*, and fiscal-year totals can be obtained by interpolation in the same way as was done for births; results are shown in Table A-4. Deaths under age 10 are estimated by projecting forward from the 1953 age distribution and adjusted births from 1953 to 1964, using the period child mortality levels from Table A-3. The sequence of registered deaths at all ages does not vary closely with the sequence of

**TABLE A-3 Smoothed East mortality levels under age 10 by sex: China, fiscal years 1953-54 to 1963-64**

Fiscal year	Males	Females
1953-54	12.5	10.6
1954-55	13.0	11.1
1955-56	13.6	11.6
1956-57	14.2	12.3
1957-58	15.0	13.0
1958-59	10.0	8.0
1959-60	11.9	9.1
1960-61	15.9	13.6
1961-62	10.0	8.0
1962-63	18.0	17.5
1963-64	17.0	17.5

deaths under age 10. The number of deaths under age 10, approximating the true numbers, as a percent of total registered deaths, assumed to suffer from underregistration, varies around 80 percent prior to 1958-59, rises to 104 percent in 1958-59, falls to below 50 percent in 1959-60 and 1960-61, rises to 94 percent in 1961-62, and then falls to around 50 percent in 1962-63 and 1963-64. The period with peak numbers of registered deaths, 1959-61, is a period with relatively few estimated deaths under age 10, giving rise to the low ratios of child to total registered deaths, whereas the years of high estimated deaths under 10, 1958-59 and 1961-62, have only moderately higher total registered deaths, giving rise to the high ratios of child to total registered deaths.

If we accept the sequence of deaths under age 10 in Table A-4, it is clear that the registration of deaths under age 10 was substantially less complete than the registration of deaths at age 10 and over. The increase in child deaths of 3.5 million from 1957-58 to 1958-59 is associated with an increase in registered deaths of only 1.2 million, while the decline in child deaths of 3.9 million from 1961-62 to 1962-63 is associated with a decline in registered deaths of only 1.0 million. Taken together, these two observations suggest that the registration of child deaths was only about 30 percent complete. We can estimate total intercensal deaths as the 1953 population plus intercensal births minus the 1964 population, giving 156,875 thousand. Deaths at age 10 or

**TABLE A-4 Total registered deaths, estimated deaths under age 10, and comparison of registered deaths to registered births: China, fiscal years 1953-54 to 1963-64**

Fiscal year	Estimated deaths		Ratio: estimated deaths under age 10 to total registered deaths	Births from projection and survey ('000)	Ratio: registered deaths to births
	Registered deaths ('000)	Deaths under age 10 ('000)			
1953-54	7,926	6,610	0.83	26,081	0.30
1954-55	7,680	6,609	0.86	27,312*	0.28
1955-56	7,275	6,088	0.84	24,824	0.29
1956-57	6,899	5,633	0.82	25,537	0.27
1957-58	7,230	5,193	0.72	25,800	0.28
1958-59	8,389	8,691	1.04	22,113	0.38
1959-60	13,924	6,491	0.47	18,882*	0.74
1960-61	13,782	3,263	0.24	14,716	0.94
1961-62	7,534	7,062	0.94	20,875	0.36
1962-63	6,494	3,197	0.49	33,813*	0.19
1963-64	7,514	3,825	0.51	30,705	0.24
Total	94,647	62,662	0.66	270,658	0.35

\* Adjusted on the basis of interpolated survivorship ratios.

over can be estimated by subtracting deaths under 10, giving 94,213 thousand. If 30 percent of deaths under 10 were registered, then 78,848 thousand deaths at 10 or over were registered, implying a completeness of registration of 80.5 percent. Marked differentials in registration completeness between child and adult deaths are commonly observed in developing countries, so such a difference for China is not implausible. That the completeness of registration for adult deaths is roughly

the same as that for births is not necessarily implausible either, since births rapidly followed by death may be much less likely to be registered than births that survive to a year or more. Table A-5 shows the numbers of deaths by year under age 10, 10 and over, and total, assuming that the registration completeness of deaths under 10 was 30 percent, while that for deaths over 10 was 80.5 percent. The sequence of deaths 10 or over by year looks quite reasonable, except perhaps for the increase in

**TABLE A-5 Estimated deaths (thousands) under age 10 years and age 10 and over: China, fiscal years 1953-54 to 1963-64**

Fiscal year	Under age 10	Age 10 or older	Total
1953-54	6,610	7,382	13,992
1954-55	6,609	7,077	13,686
1955-56	6,088	6,768	12,856
1956-57	5,633	6,470	11,103
1957-58	5,193	7,045	12,238
1958-59	8,691	7,182	15,873
1959-60	6,491	14,877	21,368
1960-61	3,263	15,903	19,166
1961-62	7,062	6,727	13,789
1962-63	3,197	6,875	10,072
1963-64	3,825	7,908	11,733
Total	62,662	94,213	156,875

**TABLE A-6** Intercensal age- and sex-specific survival ratios, 1953-64, implied East mortality levels, and growth rates by age group and sex: China, 1953 to 1964

Age group (1953)	Males			Females		
	Intercensal survival ratio	East mortality level	Growth rate (percent)	Intercensal survival ratio	East mortality level	Growth rate (percent)
10-14	.924	5.7	3.83	.959	12.7	4.58
15-19	.940	11.9	1.30	.949	12.8	1.61
20-24	.929	11.3	0.66	.933	11.8	0.57
25-29	.921	11.4	1.42	.925	11.8	1.13
30-34	.893	10.0	2.07	.883	8.0	1.47
35-39	.818	5.6	1.13	.852	6.1	0.91
40-44	.754	3.9	0.90	.830	6.2	1.02
45-49	.687	3.1	0.48	.802	7.8	0.55
50-54	.584	1.7	0.47	.728	8.0	0.83
55-59	.448	<1.0	0.16	.601	7.3	1.27
60-64	.323	<1.0	0.00	.458	7.2	0.96
65-69	—	—	-0.64	—	—	0.11
70-74	—	—	-1.02	—	—	-0.37
75-79	—	—	-0.08	—	—	0.51
80+	—	—	-0.54	—	—	-0.22

1963-64, a year in which death registration completeness may have increased, as it apparently did for birth registration.

The sequence of registered deaths is the only available source of information about the timing of adult mortality between 1953 and 1964, but census survivorship ratios from 1953 to 1964 by age group provide an indication of the age pattern of intercensal mortality. Survivorship ratios by sex for five-year age groups of the population aged 10 and over in 1953 are shown in Table A-6 with corresponding East mortality levels. In terms of mortality levels, the survivorship ratios plunge for initial age groups over 35 in 1953; for males, the levels continue to drop as age increases, whereas for females they stabilize around level 7. It seems unlikely that the mortality patterns implied by the 1953-64 survivorship ratios were standard features of Chinese mortality, since the age-specific growth rates, as shown in Table A-6, fall sharply for males from about age 45 to negative values above age 65, and fall sharply for females above age 65 to close to zero; if

mortality had been falling prior to and during the period, the age-specific growth rates would be expected to increase with age above age 40. A further indication that the 1953-64 experience was not typical of China prior to 1953 is the changes in the age distribution of the population above age 40 from 1930 (taken from the Chinese Farmers Survey, admittedly not necessarily representative of all China) through 1953 to 1964. The age distributions, shown in Table A-7, show increasing proportions above age 60 from 1930 to 1953, consistent with declining mortality, but falling proportions for the same age groups from 1953 to 1964. The information suggests that, on average over the period, mortality above age 40 was substantially higher between 1953 and 1964 than it had been prior to 1953, especially among males. The sharp drop in survivorship ratios at age 35 (in 1953) would be consistent with a famine combined with a rationing scheme giving priority to those under age 40 during 1959-61.

**TABLE A-7** Distribution of the population aged 40 years and older by age group, by sex (percent), according to the Chinese farmers survey of 1930 and according to the national censuses of China, 1953 and 1964

Age group	Males			Females		
	1930	1953	1964	1930	1953	1964
40-44	24.39	22.65	24.14	20.92	20.48	21.12
45-49	23.47	20.20	20.57	22.57	18.97	18.59
50-54	17.06	17.12	17.40	15.88	16.06	16.22
55-59	14.63	14.32	14.07	15.55	13.69	14.51
60-64	9.68	11.02	10.64	10.17	11.44	11.72
65-69	5.68	7.43	6.69	7.02	8.59	8.01
70-74	2.90	4.55	3.93	4.02	6.07	5.37
75-79	{ 2.20	1.88	1.80	{ 3.87	3.00	2.92
80+		0.82	0.74		1.70	1.53
40 and older (total)	100.00	100.00	100.00	100.00	100.00	100.00

## Notes

1 Judith Banister, "An analysis of recent data on the population of China," *Population and Development Review* 10, no. 2 (June 1984): 241-271; William Brass, "Mortality in China over the past fifty years: Indirect estimates from the 1982 Census," paper presented at the International Seminar on China's 1982 Population Census, Beijing, March 1984; Ansley J. Coale, *Rapid Population Change in China, 1952-1982*, Report no. 27, Committee on Population and Demography (Washington, D.C.: National Academy Press, 1984).

2 Ansley J. Coale, "Population trends, population policy, and population studies in China," *Population and Development Review* 7, no. 1 (March 1981): 267-297; and John S. Aird, "Population studies and population policy in China," *Population and Development Review* 8, no. 2 (June 1982): 85-97.

3 See A. K. Sen, "How is India doing?" *The New York Review of Books* 29, no. 20 (16 December 1982): 41-45; A.K. Sen, "Food battles," Coromandel Lecture, delivered in New Delhi on December 13, 1982; Letters to the Editor of *Economic and Political Weekly* (India) on "Famine and 'extra deaths'" written by K. N. Raj, 18, no. 1 and 2 (1-9 January 1983) and 18, no. 8 (19 February 1983); and by A. K. Sen, 18, no. 6 (5 February 1983) and 18, no. 9 (26 February 1983); and Letters

to the Editor, " 'How is India doing?': An exchange," *New York Review of Books* (3 March 1983): 39-41.

4 Gu Xing-Yuan and Chen Mai-Ling, "Vital statistics," in "Health services in Shanghai County," *American Journal of Public Health* 72, Supplement (September 1982).

5 See Thomas P. Bernstein, "Stalinism, famine, and Chinese peasants: Grain procurements during the Great Leap Forward," *Theory and Society* 13 (May 1984): 339-377. "In 1961, Mao Zedong singled out three provinces, Shandong, Henan, and Gansu, where the situation was 'grave,' evidently meaning both the food crisis and political disturbances. Much evidence exists to show that Anhui was a province in which famine was particularly serious. A western scholar was able some time ago to see an internally held table of provincial population data, which shows a mortality rate for that province of 68 per 1,000 in 1960" (p. 344).

6 For an account of this famine, see Paul Richard Bohr, *Famine in China and the Missionary: Timothy Richard as Relief Administrator and Advocate of National Reform, 1876-1884* (Cambridge: Harvard East Asian Research Center, 1972).

7 See Ben Stavis, "Ending famines in China," in Rolando V. Garcia and Jose C.

Escudero, *Drought and Man: The 1972 Case History*, Vol. 2: *The Constant Catastrophe: Malnutrition, Famines and Drought* (Oxford: Pergamon Press, 1982), pp. 112–119.

8 See Lillian M. Li, "Introduction: Food, famine and the Chinese state," *Journal of Asian Studies* 41, no. 4 (August 1982): 688.

9 See Walter Mallory, *China: Land of Famine* (New York: American Geographical Society, 1926). Other major famines, recorded in China, include: a series of famines in the first half of the nineteenth century (1810–49), claiming more than 45 million lives; the 1876–79 drought and famine in north China, mentioned above; a drought and famine in 1892–94, resulting in one million deaths; the 1928–31 famine, leaving 3 million dead; and a 1936 drought and famine in west China, claiming 5 million lives. See Jay Robert Nash, *Darkest Hours* (New York: Wallaby Pocket Books, 1977), pp. 727–735.

10 A. K. Sen, *Poverty and Famines* (Oxford: Oxford University Press, 1981).

11 The primary reference for production data on total grains, rice, and wheat is the 1980 *Chinese Agricultural Yearbook* (Beijing: Agricultural Publishing House, 1981). *Ten Great Years* (Beijing: Foreign Language Press, 1960) supplies some additional production data for the 1950s. Currently available agricultural production data are reviewed by Bruce Stone, "The use of agricultural statistics," in Randolph Barker and Radha Sinha (eds.), *The Chinese Agricultural Economy* (Boulder, Colorado: Westview Press, 1982), pp. 205–245. Agricultural trade data for the period 1950–81 are available in the *FAO Trade Yearbook* (Rome, FAO), and summarized in US Department of Agriculture, *Agricultural Trade of the PRC, 1935–69* (Washington, D.C.: Economic Research Service, 1972), pp. 26–39.

12 Vaclav Smil, "China's food: Availability, requirements, composition, prospects," *Food Policy* 6 (May 1981): 70, presents estimates of calorie availability for a number of periods.

13 World Bank, *World Development Report 1983* (New York: Oxford University Press, 1983), p. 194.

14 See Thomas P. Bernstein, "Starving to death in China," *The New York Review of Books* (16 June 1983): 36–38.

15 Miriam London and Ivan D. London, "The other China: Hunger: Part I: The three red flags of death," *Worldview* (19 May 1976): 5.

16 Stavits, cited in note 7, p. 152.

17 There are numerous expressions of such beliefs in the Chinese press. See for example, Tao Chu, "Refutation of the theory of limited increase in food production (1 August 1958), in US Joint Publication Research Service (JPRS) No. 7837 (March 1961); Liu Jui-lung, "Food for 600 million," *China Reconstructs* 4, no. 11 (November 1955), in US Consulate General, Hong Kong, *Extracts from China Mainland Magazines*, No. 13 (7 November 1955); "We have victoriously attained self-sufficiency in food grains," translated from *Hopei JP* (11 November 1959), in US Consulate General, Hong Kong, *Survey of China Mainland Press*, No. 2166 (30 December 1959).

18 See "Peng Dehuai notes on Lushan Plenum," Beijing *Jindai Shi Yanjiu* [Study of Modern History], in JPRS No. 77668 (25 March 1981).

19 Sun Yefang, "Consolidate statistics work, reform the statistics system," Beijing *Jingji Guanli*, translated in US Foreign Broadcast Information Service, *Daily Report: People's Republic of China* (26 March 1981): L4–L9.

20 Roderick MacFarquhar, *The Origins of the Cultural Revolution*, Volume 2: *The Great Leap Forward* (New York: Columbia University Press, 1983), pp. 31–32.

21 Economist Intelligence Unit, *Three-Monthly Economic Report on China, Hong Kong and North Korea*, No. 25 (February 1959): 5.

22 See JPRS, No. 5414 (1 September 1960), "Agricultural problems in Communist China," translation of article "Chugoku Nogyo No Sho Mondai," *Ajia Kenkyu* No. 226, Tokyo (19 July 1960).

23 Nicholas Lardy and Kenneth Lieberthal (eds.), "Chen Yun's strategy for China's development: A non-Maoist alternative," *Chinese Economic Studies* (Spring/Summer 1982): xxx.

24 Lardy and Lieberthal (eds.), cited in note 23, pp. xxvii–xxix. Mao actively opposed

the import of cereals throughout the early to mid-1960s.

25 See Bernstein, cited in note 5, for several examples.

26 Lardy and Lieberthal (eds.), cited in note 23, pp. xxviii–xxix. Chen Yun, one of the most important of China's economic policymakers after 1949, held a number of senior party and administrative positions. His strong belief in the importance of price incentives and balanced growth led him to criticize some of the attempts to achieve very high rates of investment and many aspects of the Great Leap, and he seems to have played no policy role from mid-1959 until early 1961, possibly for political, possibly for health reasons. But in May 1961, he was arguing strongly that it was essential for large numbers of urban residents to return to the countryside, since the need to procure food for them in the towns was a disincentive to agricultural production and was leading to the use of scarce foreign exchange on grain.

27 Radio broadcast, 30 June 1959, reported in *Facts on File Yearbook 1959* (New York: Facts on File, Inc., 1960), p. 219.

28 Poor yields were due in part to the poor quality of cultivated land. Chen Yun reported in 1962 that the cultivated area had been reduced by 6.7 million hectares between 1958 and 1961. Much of the land taken out of production was high-yielding, whereas newly cultivated land in the outlying areas had low yields. See Chen Yun in Lardy and Lieberthal (eds.), cited in note 23, p. 187.

29 Prices of farm and sideline products increased 22.0 percent between 1960 and 1961 (as measured by changes in the general purchasing price index of farm and sideline products). During the same period, general retail prices increased 16.2 percent. This contrasts with the preceding two years: farm prices increased 1.8 percent in 1959, and 3.5 percent in 1960. See State Statistical Bureau, *Statistical Yearbook of China 1981* (Hong Kong, 1982).

30 Leo A. Orleans, "China's urban population: Concepts, conglomerations, and concerns," US Congress, Joint Economic Committee, *China Under the Four Modernizations, Part 1* (Washington, D.C.: US Government Printing Office, 1982), pp. 286–288.

31 See Lardy and Lieberthal (eds.), cited in note 23, esp. pp. 144–150.

32 Lardy and Lieberthal (eds.), cited in note 23, p. 147.

33 Lardy and Lieberthal (eds.), cited in note 23, p. xxx.

34 MacFarquhar, cited in note 20, p. 330.

35 See *Hsinhua News Agency* reports of 29 December 1960, reprinted in JPRS No. 8909 (21 September 1961): 7.

36 See K. N. Raj, *Economic and Political Weekly* (19 February 1983): 249–258.

37 See Economist Intelligence Unit, *Three-Monthly Economic Review of China, Hong Kong, and North Korea*, No. 28, December 1959, and No. 32, November 1960; *Hsinhua News Agency*, 29 December 1960 reports in JPRS No. 8909, 21 September 1961; and *Union Research Service*, May 1961.

38 Cited in Stavis (see note 7 above), p. 124.

39 Statements of 13 May 1959, cited in *Facts on File Yearbook 1959* (New York: Facts on File, Inc., 1960), p. 162.

40 *New York Times*, 16 May 1959, reported in *Facts on File Yearbook 1959*, p. 162.

41 Zhou Enlai, "Report on the economy," delivered 26 August 1959 to the Standing Committee of the National People's Congress; reported in New China News Agency, 29 August 1959, and translated in Harold Hinton (ed.), *The People's Republic of China 1949–1972*, Vol. 2: *The Great Leap Forward and Its Aftermath* (Wilmington, Delaware: Scholarly Resources, Inc., 1980), p. 766.

42 Internal propaganda seems to have stressed this point. Although data on agricultural trade are not available, it is likely that the bulk of China's exports consisted of grains. In 1959, the largest value of exports from China to the Soviet Union was recorded. Exports increased from \$670 million in 1955 to a peak of \$1,118 million in 1959. Subsequently, exports steadily declined from \$819 million in 1960, to \$536 million in 1961, to \$222 million in 1965. An import bill of \$1,120 was recorded for 1955; annual imports from Russia remained in excess of \$600 million until 1961, when they plunged to \$292 million.

### China: trade with the Soviet Union (\$ million)

Year	Exports	Imports	Net trade
1955	\$ 670	\$1,120	\$ - 450
1956	762	762	0
1957	747	618	129
1958	899	640	259
1959	1,118	979	139
1960	819	845	- 26
1961	536	292	244
1962	491	211	280
1963	407	194	213
1964	312	134	178
1965	222	186	36

SOURCE: 1981 *Chinese Statistical Yearbook* (Hong Kong: Chinese Overseas Press, 1981), p. 363.

43 Economist Intelligence Unit, *Three-Monthly Economic Review of China, Hong Kong, and North Korea*, No. 29, March 1960, p. 3 and No. 32, November 1960, pp. 2-3.

44 But see W. K., "Communist China's agricultural calamities," *The China Quarterly*, No. 6 (April-June 1961): 69: "The situation has been far from satisfactory since the harvest of 1960. Taking all available information into account, and allowing for such non-food uses as seed, waste, feed and industrial requirements, a food balance may be constructed which eliminates the impossible and reveals the probable. It suggests a national average consumption in 1960-61 of 1,850-1,900 calories per head per day. It may be more. Behind this average there are hidden, side by side with ample food for the privileged, certain cases of malnutrition in deficit areas, particularly during the last months of the consumption year. These conditions have given currency to the erroneous view that the whole of China is suffering from conditions of starvation. There is no evidence to support such a contention." In contrast, the 6 January 1961 issue of *Time* acknowledged the existence of food shortages but did not attribute them to natural disasters.

It reported, "All Western observers believe that the food shortage was not caused by droughts and floods. They point to meteorological reports from Japan which show that the climate in Communist China last year was not at all abnormal and think that the natural disaster story was completely fabricated and exaggerated." However, other Western media did not deny the severity of natural disasters in 1960. A *New York Times* editorial of 30 December 1960 indicated "there is no doubt that the Chinese mainland suffered serious natural disasters in 1960, but it is probable that the damage was doubled by the bungling administration of the Peking Government."

45 *Facts on File Yearbook 1961*, p. 202.

46 *Facts on File Yearbook 1961*, p. 43.

47 *Facts on File Yearbook 1961*, p. 202.

48 Joseph Alsop, "On China's descending spiral," *The China Quarterly*, No. 11 (July-September 1962): 24.

49 *The China Quarterly*, No. 12 (October-December 1962) on Alsop, cited in note 48. Not all commentators agreed on the existence of a food crisis. Many took exception to Alsop's reliance on refugee reports based primarily on one province, which may not be indicative of nationwide trends.

50 A. K. Sen, letter to the *Economic and Political Weekly* (India) 18 (5 February 1983): 167-168.

51 Smil, cited in note 12, p. 72.

52 "Decisions of the Central Committee of the Communist Party of China on some questions concerning the acceleration of agricultural development (draft)," *Issues and Studies: A Journal of Chinese Studies and International Affairs* 15, no. 7 (July 1979): 105-106.

53 Li, cited in note 8, p. 688.

54 *New York Times*, 25 April 1981; cited in Li (see note 8 above), p. 688.