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Urban–Rural Mortality Differentials: An Unresolved Debate

ROBERT WOODS

THE PRESUMPTION TODAY is that life chances will not show a distinctive pattern of differentiation between urban and rural places or, if there are differentials, that they will favor the urban population, which has superior access to the most modern health care facilities. But in medieval and early modern Europe it is apparent that there were strong urban–rural differences; that towns were the high-mortality, unhealthy places bedeviled by epidemics while the risks of dying prematurely were relatively less in the countryside. Indeed, it is usually argued that without a constant flow of rural migrants, towns would not have been able to survive, that urban growth and urbanization would have been impossible. Outside Europe it has proved even more difficult to describe the extent of urban–rural mortality differentials, but there is some suggestion that in East Asia the mortality experience of cities might have been less destructive than in Europe. These uncertainties have helped to fuel a continuing debate—one that has focused on description, measurement, and interpretation, none of which is as yet secure.

Since the pioneering work of Henri Pirenne (1926) and Roger Mols (1954, 1955, 1956) it has become the convention to regard Western cities as politically, economically, and demographically distinct, quite separate from the countryside and from other non-Western urban places. Cities governed themselves; they had walls for defense, to allow taxes to be collected, and to symbolize separate identities; they offered markets for merchants, production centers for craftsmen, administrative headquarters for princes and bishops; they were places of conspicuous consumption for the wealthy; but they also had highly distinctive demographic regimes. Their principal demographic characteristic was excessive mortality, far higher than in the surrounding rural areas. There was, in other words, an obvious urban–rural mortality differential that was exacerbated by frequent and severe demographic crises, especially epidemics of such diseases as bubonic plague. Late medieval and early modern European cities could be centers of wealth and power, but they were also dangerous to live in. Cities were graveyards, demographic sinks, and there was a clear penalty in terms of life chances to being or becoming a resident. The evidence for this view seemed overwhelming. The burial registers for fifteenth-century Italian cities showed many years with catastrophic mortality (Del Panta 1980). Bills of Mortality, developed as a public health early-warning system, also reinforced the argument for London in the seventeenth and eighteenth centuries.

Allan Sharlin's 1978 article, "Natural decrease in early modern cities," marked a point of departure for research on the demography of such cities. Instead of stressing the impact of epidemic crises, it shifted attention to the rural-to-urban migrants. Without a constant supply of migrants from the countryside, cities would not be able to survive, let alone grow, and urbanization would be impossible. Migrants filled the gaps left by the premature deaths of urban residents. By this means, any surplus rural population could easily be drawn off and made efficient economic use of in the towns. Sharlin also pointed out, however, that the survival chances of "temporary migrants" and nonmigrant "permanent residents" might differ in the urban environment; that the latter could show natural increase (an excess of births over deaths) while the former displayed natural decrease at a level sufficient to cancel out any gains contributed by the permanent residents. Sharlin's reconsideration has proved both a welcome challenge and a source of frustration to other researchers. For example, Galley (1998: 12) has observed that although the shift of emphasis from crises to the experiences of migrants—their attraction to cities, marriage, fertility, and risk of death—has helped to make analysis of the urban regime far more sophisticated, the data required to distinguish between the experiences of the various subgroups involved far exceed the capacity of even the best parish registers. Sharlin's intervention has also encouraged renewed discussion of the extent to which cities should be seen as "generative" or "parasitic" (Hozelitz 1957). Urban centers could be engines of national economic growth by being not only points of innovation and consumption, but also devourers of rural surplus labor thanks to their excess mortality (Wrigley 1987, 1990).

Other demographers and historians, such as Kingsley Davis (1973; Davis and Golden 1954) and Jan de Vries (1984, 1990), have followed the lead of Adna Ferrin Weber (1899) by concentrating on the causes of urban growth, especially those of urbanization. In this case the true extent of urban–rural mortality differentials needs to be established so that the balance between natural growth and population increase by net migration can be identified, and the point at which any particular urban center acquired the capacity for natural increase can be defined (see Keyfitz 1980; Keyfitz and Philipov 1981).

Where does the debate on the historical demography of cities stand now? First, there seems to be an appreciation that although Sharlin's intervention has raised some pertinent questions—certainly it has redirected attention from crises to migrants and has spurred the integration of work on economic, social, and demographic structures—it will never be possible to monitor the demographic experiences of highly mobile sections of the population in the past (Woods 1989). Second, recent research on mortality patterns has emphasized the importance of certain key age groups and causes of death. For example, early-age mortality and the childhood infectious diseases can have a disproportionate impact on the overall level of mortality (life expectancy at birth, for example) while being highly sensitive to environmental differences, especially the quality of drinking water and population density (Preston and Haines 1991; Bideau et al. 1997). There are obvious implications for urban–rural mortality differentials. Third, historians and demographers have become more sensitive to culture. They now appreciate that values, beliefs, and feelings are likely to have had a bearing on cultural practices and the ways in which these were recorded. Infant mortality may not mean the same thing in Japan, China, France, and England despite the fact the indicative rates are calculated in the same way. Comparative research on urban–rural differentials faces a particular challenge, therefore. Fourth, contributions by urban geographers and planners have enhanced our understanding of urban systems in general. For historians this involves the need to return to old questions about the distinctive, defining characteristics of urban places (size, density, function, autonomy, and the like). The clarification of such characteristics will encourage the quest for an urban–rural mortality continuum while contributing to the challenging possibility that not all places that were in some sense urban were necessarily graveyards in the past.

This article focuses on the second, third, and fourth of these issues. It considers the different ways in which mortality levels may be indexed, especially the relative merits of considering general mortality or individual age components; the cross-cultural comparability of some of these standard measures; and one way in which a mortality continuum might be identified using log-normal distributions as a guide.

How to measure and compare?

The European experience may be thrown into sharper contrast by comparison with East Asia. For Japan and perhaps also China, the case has been made that cities should not be seen as dangerous, distinctly unhealthy places. Susan B. Hanley (1997: 104–128) and Alan Macfarlane (1997), for example, have argued that the state of sanitation in late Tokugawa cities was superior to European standards of the time, that preparation of a predominantly vegetarian diet helped the situation, that expected standards of personal hygiene were high, that the concentration of urban centers between mountains and the sea facilitated the supply of fresh water, and that night soil was especially highly prized as an agricultural resource. In these circumstances one would not expect to find sharp urban–rural mortality differentials, at least not ones generated by the water- and food-borne diseases (diarrhea, cholera, typhoid, dysentery, and the like). Hanley's arguments help to raise some pertinent questions about the effects of cultural practices and the nature of demographic evidence. What would we need to know in order to demonstrate the validity of her case?

The obvious place to begin is with the scrutiny of available demographic estimates for levels of mortality in urban and rural places. Tables 1, 2, and 3 offer a starting point. They show mortality rates for infants (q_0 in parts per thousand) and early childhood ($_4q_1$ in parts per thousand) together with life expectancy at birth (e_0), at ages 1 (e_1), 5 (e_5), and 15 (e_{15}), and the partial life expectancy between ages 15 and 35 (e_{15-35}, the key age group for reproduction) all in years. The tables focus on East Asia, France, and England, respectively.

Table 1 presents estimates from a variety of Chinese and Japanese sources. Urban areas are underrepresented, especially for Japan, although one might argue that the outcast village of Minami Oji could be used to represent urban conditions, and there are some limited data for Nara (not shown) assembled by Hayami (2001: 136–137). This is not the most critical problem, however. Gender biases in the reporting of births, difficulties in the recording of age, and the practices of infanticide, child abandonment, sale, and adoption make the estimation of early-age mortality rates exceptionally troublesome.[1] Natural and unnatural deaths are confused; and base, at-risk populations normally provided by live births are systematically underenumerated. Table 1 is a veritable demographic minefield (Campbell 2001). It remains uncertain whether in the past East Asia exhibited a clear urban–rural mortality gradient favoring the countryside, although Hayami (2001) is now inclined to think that adult mortality may have been higher in urban than rural Japan, and Jannetta (2001) has pointed to the tardy development of smallpox vaccination. Hanley's case is thus not proven.

The French example, represented by Table 2, encourages further consideration of time-honored assumptions about the form of the urban–rural mortality differential in Europe. Figure 1 performs the elementary exercise of plotting time series for vital events or their proxies (baptisms and burials). It shows the example of Paris in the eighteenth century and reflects most of the problems faced by urban historical demographers: poor continuity, uncertain reliability, extreme fluctuations in births and especially deaths, and unknown denominators (Chaunu 1978: 517; Roche 1981: 30). France was about 12.5 percent urban and Paris contained perhaps 2.2 percent of the national population at that time. However, the level of mortality is particularly difficult to estimate for Paris as it is for most French localities, whether urban or rural, because of the absence (in urban areas) or

TABLE 1 Urban and rural mortality measures, examples from China and Japan

	q_0	$_4q_1$	e_0	e_1	e_5	e_{15}	e_{15-35}
Chinese clans, males (1)							
Urban	182	107	34.4	41.0	41.7	33.8	14.4
Rural	206	120	35.5	43.6	45.4	37.8	14.1
Peking elite, 1701–50 (2)							
Males	104	281					
Females	144	271					
Peking, 1929–33 (3)							
Males	173	174	40.9	48.3	54.1	48.9	17.1
Females	170	180	36.1	42.4	47.1	42.1	11.4
Rural China, 1929–31 (4)							
Males	162	230	34.9	40.3	47.6	43.9	13.4
Females	155	232	34.8	39.7	47.0	42.8	11.5
Nakahara, 1717–1830 (5)							
Both sexes	170	126	43.2	48.2	51.0	44.9	13.7
Males				46.1	49.7		
Females				50.8	52.6		
Mino villages, 1751–1869 (6)							
Males	205	139	37.2	45.6	48.7	42.5	14.2
Females	175	134	40.1	47.5	50.5	43.4	12.7
Minami Oji, 1830–69 (7)							
Males		164	30.6	37.1	40.1	34.9	11.1
Females		189	31.6	38.4	42.9	38.6	11.6

NOTE: q_0 (probability of dying between ages 0 and 1, infant mortality rate) and $_4q_1$ (probability of dying between ages 1 and 5, early childhood mortality rate) are both in parts per 1000; e_0 (life expectancy at birth), e_1 (life expectancy at age 1), e_5 (life expectancy at age 5), e_{15} (life expectancy at age 15), and e_{15-35} (partial life expectancy between ages 15 and 35) are all expressed in years.

SOURCES: (1) Lower Yangtze clans, various birth cohorts from the fifteenth to the nineteenth century, from Liu Ts'ui-Jung (1990); "Demographic aspects of urbanization in the lower Yangzi region of China, *c.* 1500–1900," in Ad van der Woude, Jan de Vries, and Akira Hayami (eds.), *Urbanization in History* (Oxford: Clarendon Press), pp. 328–351, Table 19.8. (2) Qing imperial lineages in Peking, 1701–50, from James Lee, Wang Feng, and Cameron Campbell (1994), "Infant and child mortality among the Qing nobility: Implications for two types of positive check," *Population Studies* 48: 395–411, Table 2. Note that equivalent figures are given for 1751–1820 and 1821–40. (3) Peking, First Demonstration Health Station, 1929–33, from Cameron Campbell (1997), "Public health efforts in China before 1949 and their effects on mortality," *Social Science History* 21: 179–218, Table 2. (4) Rural Chinese families, 1929–31, from Harry E. Seifert (1935), "Life tables for Chinese farmers," *Milbank Memorial Fund Quarterly* 13: 223–236, Table 6. (5) Nakahara (near Ogaki, Nobi Plain, Japan), 1717–1830, from Thomas C. Smith (1977), *Nakahara, Family Farming and Population in a Japanese Village, 1717–1830* (Stanford: Stanford University Press), Tables 4.1, 4.2, 4.5, 4.6, low-mortality estimates throughout. (6) Three villages, Mino Province, central Japan, 1751–1869, from Osamu Saito (1997), "Infant mortality in pre-industrial Japan: Levels and trends," in Alain Bideau, Bertrand Desjardins, and Héctor Pérez Brignoli (eds.), *Infant and Child Mortality in the Past* (Oxford: Clarendon Press), pp. 135–153, Table 8.4. The high (based on Model West) and low (Model North) estimates for infant mortality have been averaged. (7) Minami Oji (Izumi City, Japan), 1830–69, from Dana Morris and Thomas C. Smith (1985), "Fertility and mortality in an outcast village in Japan, 1750–1869," in Susan B. Hanley and Arthur P. Wolf (eds.), *Family and Population in East Asian History* (Stanford: Stanford University Press), pp. 229–246, Table 10.6.

presence (in rural areas) of those infants put out to wet nurse—*les nourrissons*. The series in Table 2 and the pattern suggested by Figure 1 must both have been distorted by this problem of early-age migration, especially when one realizes that these nurslings faced far higher risks of mortality than infants who remained at home and were breastfed by their mothers. Flandrin (1976:

TABLE 2 Urban and rural mortality measures, examples from France

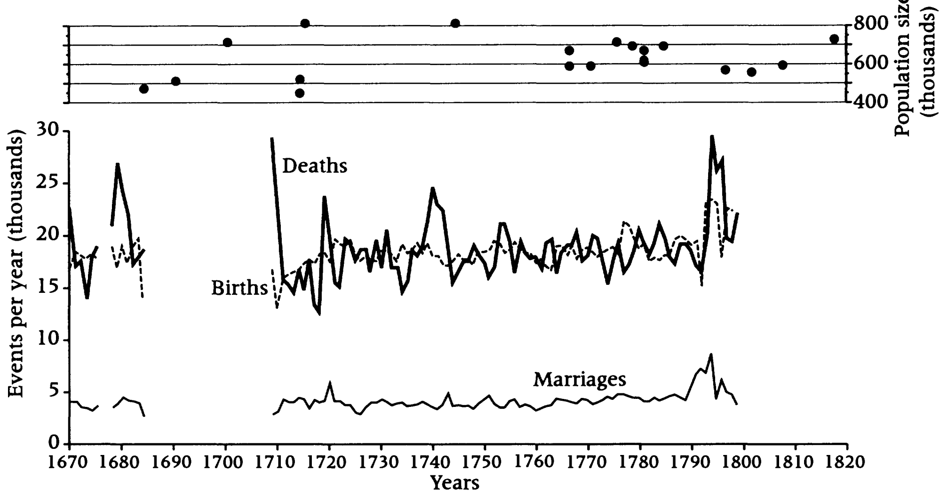
	q_0	$_4q_1$	e_0	e_1	e_5	e_{15}	e_{15-35}
Rural areas (1)							
1690–1719	350	261					
1720–49	328	277					
1750–79	261	223					
France, 1740–89 (2)							
Males	281	262	31.1	40.1	43.9	36.6	12.5
Females	241	263	32.5	41.3	44.2	38.5	11.9
Small town, Meulan (3)							
1668–1739	244	312					
1740–89	226	269					
1790–1839	155	192					
3 villages, 1700–99 (4)	212	180					
17 parishes, 1774–94 (5)	177	201					
France, 1840s (6)	149	130	42.3		51.4		
Seine (Paris)	191	221	31.1		43.5		
Rhône (Lyon)	195	175	34.0		45.5		
Bouche-du-Rhône (Marseilles)	173	230	32.9		45.8		

NOTE: See note to Table 1.
SOURCES: (1) From Jacques Houdaille (1984), "La mortalité des enfants dans la France rurale de 1690 à 1779," *Population* 39: 77–106, Table 5. (2) Based on Jacques Dupâquier (1979), *La Population Française aux XVIIe et XVIIIe Siècles* (Paris: Presses Universitaires de France), pp. 99–100. (3) Meulan, north west of Paris, from Marcel Lachiver (1969), *La Population de Meulan du XVII^e au XIX^e Siècle (vers 1600–1870)* (Paris: SEVPEN), pp. 199 and 203. (4) Three villages in the Ile-de-France, 1700–99, from Jean Ganiage (1963), *Trois Villages d'Ile-de-France au XVIIIe Siècle. Étude Démographique*, INED, Travaux et Documents, Cahier No. 40 (Paris: Presses Universitaires de France), p. 106. (5) Seventeen parishes on the southern outskirts of Paris, 1774–94, excluding *nourrissons*, from Paul Galliano (1966), "La mortalité infantile (indigènes et nourrissons) dans la banlieue sud de Paris à la fin du XVIIIe siècle (1774–1794)," *Annales de Démographie Historique*, pp. 139–177, Table 3. (6) Three urban *départements* of France in the 1840s, from Samuel H. Preston and Etienne van de Walle (1978), "Urban French mortality in the nineteenth century," *Population Studies* 32: 275–297, Tables 1 and 5. Two *départements* (Orne and Sarthe) had e_0s greater than 50 in the 1840s; estimates for the female population only.

196), for example, has argued that "the practice of putting babies out to nurse doubled infant mortality among urban families. It is this that explains both the excessive mortality of children in the towns and the excessive fertility of urban couples not practising contraception." Van de Walle and Preston (1974: 103) have shown that even in the 1890s at least a third of Paris-born infants were placed with wet nurses.

Generally speaking, in England babies were not put out to wet nurse; they were cared for at home by their mothers or, among the aristocracy, by their nurses (Fildes 1986). Compared with rates for France, English infant mortality rates are remarkably low, especially in the healthy rural parishes of the southwest (Hartland in Table 3). In the urban areas of London, York, Liverpool, and Manchester, by contrast, infant and early childhood mortal-

FIGURE 1 Births, deaths, marriages, and population estimates: Paris, 1670–1799



SOURCE: Redrawn from Chaunu (1978: 517).

ity was substantially higher—even to the point where it seems early childhood mortality was higher than infant mortality, as it appears to have been in parts of urban France. What is also interesting about Table 3 (as well as Tables 1 and 2) is the consistent level of adult mortality, with the partial life expectancy between 15 and 35 falling in the range 11 to 14 years. This emphasizes, once again, the importance of mortality in early ages in determining overall urban–rural mortality differentials.

It might be thought that, apart from the problems associated with child care, the evidence in Tables 2 and 3 could be directly compared, but there is at least one associated matter that needs to be confronted. Before the nineteenth century, parish registers offer virtually the only source for demographic reconstruction whether via the aggregative analysis illustrated by Figure 1 or by the particular form of nominal record linkage known as family reconstitution. The estimation of early-age mortality is highly sensitive to the numbers included in the population at risk: live births derived from registered baptisms. In largely Catholic France it was believed essential to have infants baptized immediately after birth, by a priest at the font if possible, but at home by the midwife if necessary. By assuming that the fetus was still alive, a baptism might also be performed before parturition (Gélis et al. 1978; Laget 1982). Such practices would tend to maximize the number baptized (the denominator) by including some stillborn among the live births. In Protestant England the approach to baptism was more relaxed: one, two, or three weeks could elapse before a church christening. In these circumstances some live-born infants might die before baptism and the stillborn are less likely to be included. English infant mortality would tend to be underestimated (especially

TABLE 3 Urban and rural mortality measures, examples from England

	q_0	$_4q_1$	e_0	e_1	e_5	e_{15}	$e_{15\text{–}35}$
Hartland (1)							
1675–1749	94	77					
1838–44	80	84					
Gainsborough (1)							
1675–1749	270	185					
1838–44	141	90					
England (2)							
1675–1749	193	112	36.1	42.0	45.7	40.2	13.1
London (3)							
1580–1650	228	190	28	39	42	35	12
1650–1799	293	265	27	36	41	36	12
York, 1641–1700 (4)	266	226					
England and Wales, 1840s (5)	146	131	41	47	50	44	13
Surrey	122	98	45	50	52	45	14
London	163	184	37	43	48	41	14
Manchester	268	296	26	34	43	38	13
Liverpool	253	301	26	33	43	37	13

NOTE: See note to Table 1.
SOURCES: (1) Hartland (Devon) and Gainsborough (Lincolnshire) capture the range of mortality experience among the 26 reconstitution parishes, from E. A. Wrigley, R. S. Davies, J. E. Oeppen, and R. S. Schofield (1997), *English Population History from Family Reconstitution, 1580–1837* (Cambridge: Cambridge University Press), Table 6.16. (2) England, 1675–1749, has been derived from Wrigley et al. (1997), Tables 6.14, 6.19, and 6.21, while England (and Wales), 1838–44, is from the Second English Life Table calculated by William Farr. (3) London parishes 1580–1650, based on mean of four parishes from Roger Finlay (1981), *The Demography of London, 1580–1650* (Cambridge: Cambridge University Press), Tables 5.15 and 5.16; London Quakers, 1650–1799, based on John Landers (1993), *Death and the Metropolis: Studies in the Demographic History of London, 1670–1830* (Cambridge: Cambridge University Press), Tables 4.3 and 4.10. (4) York estimates from Chris Galley (1998), *The Demography of Early Modern Towns: York in the Sixteenth and Seventeenth Centuries* (Liverpool: Liverpool University Press), Table 4.9. (5) England and Wales, Surrey (nonmetropolitan), London, and Liverpool are from the *Fifth Annual Report of the Registrar General* for 1841, while Manchester is from the *Seventh Annual Report* for 1843 and 1844.

in the larger rural parishes) while French rates might be overblown (Woods 2003a). The development of civil systems for the direct registration of vital events during the nineteenth century should have removed most of these difficulties—apart, that is, from the wet nursing problem in France and the underregistration of births in urban England (Wrigley et al. 1997; Woods 2000).

Ideally it ought be possible to reduce the data in Tables 1 through 3 to a 3 x 2 matrix—three regions x two environments—but this task is far from straightforward. Perhaps the best that can be said is that during the early nineteenth century life chances were about 1.5 times better in rural than in urban places in western Europe, and 1.2 times better in Japan. However, we can also focus on certain points of difference or similarity. First, although the urban–rural differential is clear in France and England in the nineteenth century, when the death registration systems were more secure, this clarity also applies to England in earlier periods. In France the situation is less clearcut. Second, adult mortality (when it can be calculated) appears less sensitive to environmental differences than mortality at earlier ages. Mortality in childhood (ages 0–14 years) was particularly sensitive to the differences between urban and rural environments; but it was also susceptible to infanticide or deliberate neglect, differences in infant feeding practices, attitudes toward baptism (and thus its registration), and conventions concerning the stillborn. Were it not for the distortions these problems are capable of creating, the childhood mortality rate would appear to be the most appropriate device for measuring differences between the experiences of urban and rural places.

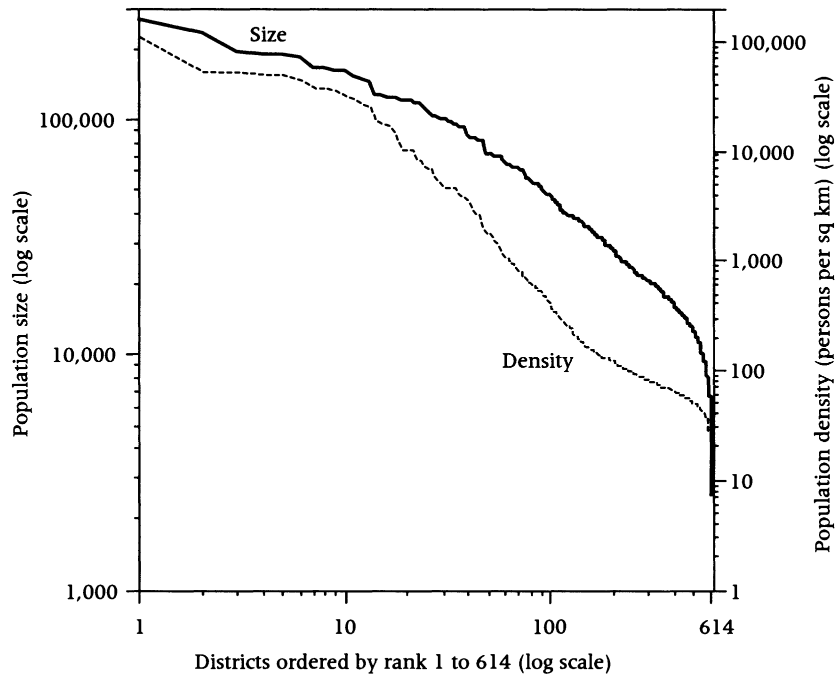
Mortality and the rank-size rule

Although comparison of the material in Tables 1, 2, and 3 has helped to clarify certain issues, as well as highlighting a number of additional problems, it is not able to help us with the following questions. Was there an urban–rural mortality continuum in the past? Was the level of mortality directly associated with the population size or population density of places?

By substituting the notion of a continuum for that of a simple urban versus rural dichotomy, it may be possible to advance the debate and to add some new sophistication to the analysis of mortality patterns. The use of log-normal distribution, as represented by the so called rank-size rule, will help us to identify the mortality continuum and to consider the way in which mortality in different age groups was distributed among places with different population sizes or densities.

It must be reiterated, however, that before the development of population censuses and vital registration in the nineteenth century it is not possible to be certain about the population sizes, densities, and mortality levels in all statistical units into which a country might be divided; rather, such certainty was reserved for only a few well-documented cases. Even in Britain, not until the Victorian era can we begin to distinguish between different age groups in systematic rather than selective terms, and to start identifying the effects of particular causes of death in the entire range of urban, rural, and intermediate districts. Thanks largely to the efforts of William Farr, the Statistical Superintendent at the General Register Office in London, Victorian England and Wales offers an exceptional wealth of data on mortality and its characteristics and causes.[2] For example, using the framework provided by the network of local registration districts in combination with the notion of a rank-size rule, we may examine the pattern of mortality variation between urban and rural districts in terms of their population size and density.

FIGURE 2 Rank size and rank density distributions, England and Wales, 1851–60

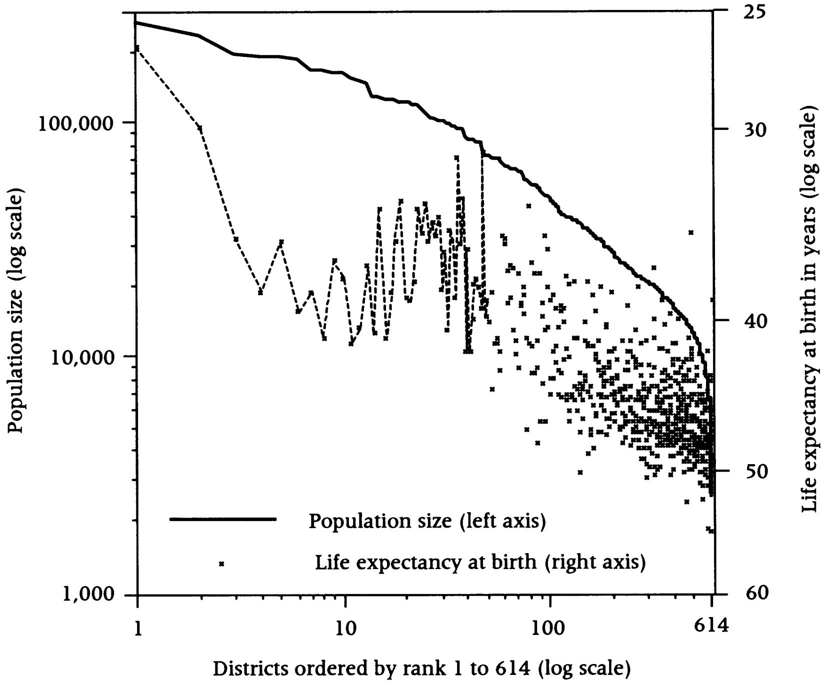


The rank-size rule has often proved useful as a descriptive device, and it will be used here to establish a standard against which the actual pattern of mortality may be judged (Haggett et al. 1977). It has been defined as follows:

$$\log P_n = \log P_1 - b(\log n) \tag{1}$$

where 1 and n denote first and nth rank order in terms of the population sizes of places (P), and $-b$ is a constant expressing the negative slope of the log-normal relationship between the population sizes of places and their rank orders.[3] In those circumstances where b is 1, the population of the nth-ranked place would be that of the first-ranked place (P_1) divided by n (the second would be half the first, the third would be a third of the first, and so on). During the 1960s the rank-size rule was especially popular among geographers and urban planners as a tool for describing and classifying urban systems. Brian J. L. Berry, in particular, pioneered its use in the study of economic development (Berry 1961, 1971). The initial hypothesis was that a region's urban system would become more functionally integrated, and thus closer to a rank size and less like a primate distribution (in which the largest city is far larger than twice the size of the second-largest), as economic development progressed; but the available evidence led to the

FIGURE 3 Rank size and rank life expectancy at birth in years, England and Wales, 1851–60

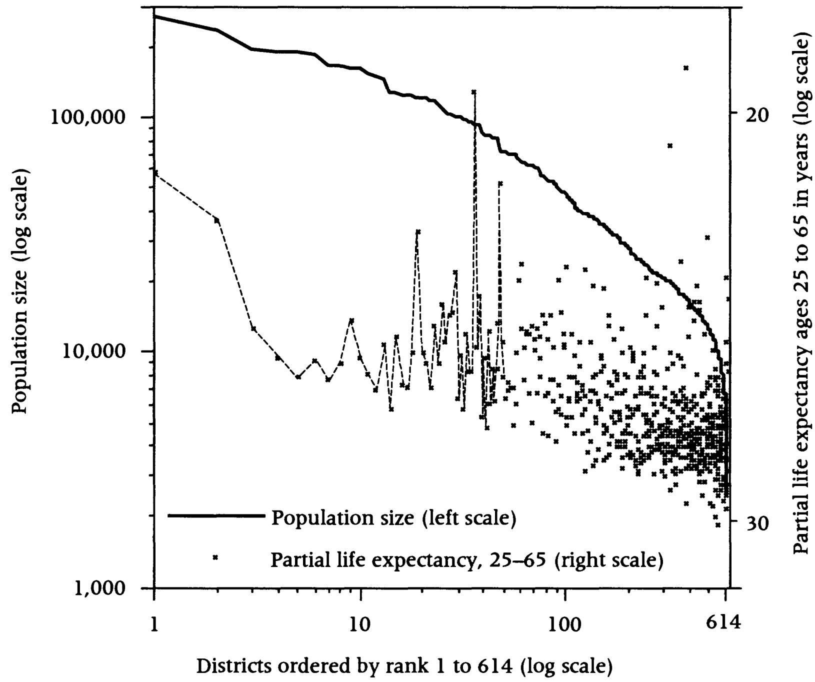


counter conclusion that "different city size distributions are in no way related to the relative economic development of countries" (Berry 1961: 585). More recently de Vries (1984) has used the log-normal distribution as a simple descriptive device to argue that European urbanization should be seen in terms of two distinct modes: the city-creation mode and the urban-concentration mode. In the former b is rather shallow and P_1 increases only slowly, while in the latter b becomes steeper and P_1 and thus the entire urban system expands rapidly.

Figure 2 illustrates the basic distributions among the 614 districts into which England and Wales can be divided in the 1850s, taking first their population size and then their population density. Not surprisingly the districts do not conform to the rank-size rule; they are after all data-collection and recording units and not devices for charting the geography of built-up areas. Nonetheless, the ranking and log transformation of Figure 2 do produce some semblance of order: there is a regular progression in the population size of districts, although the simple linear quality of equation (1) is not replicated.

Figure 3 takes the population size distribution from Figure 2 as a guide to rank districts and focuses on life expectancy at birth in years (e_0), again

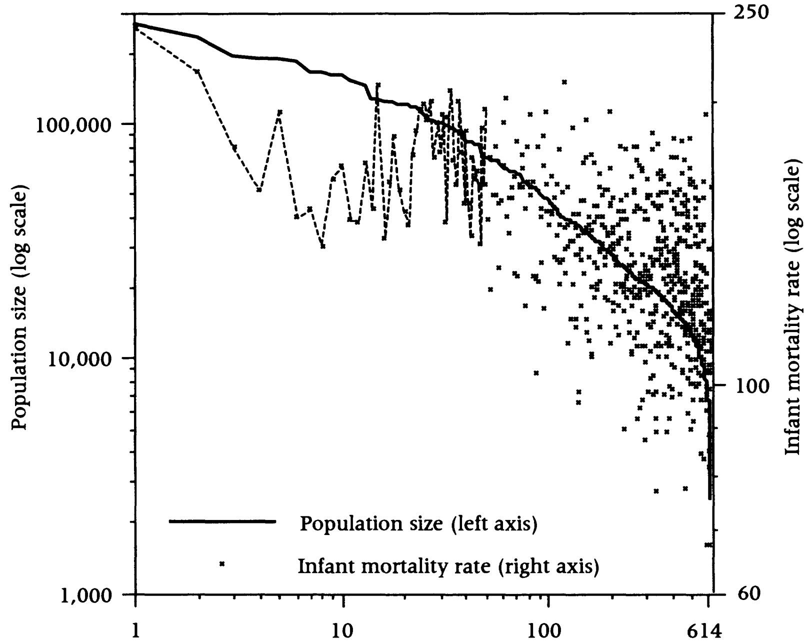
FIGURE 4 Rank size and rank partial life expectancy 25 to 65, England and Wales, 1851–60



for the 1850s. Observations for the 50 most populous districts are emphasized. Overall mortality does not decline in a manner that is neatly ordered by population size of district. If it did, then the mortality distribution would match the rank population size distribution. The smaller districts tend to have lower mortality, with life expectancy at birth between 45 and 50 years even in the middle of the nineteenth century (rural Surrey in Table 3). But at the other end of the distribution life expectancy may be at or even below 30 years (Liverpool and Manchester in Table 3). For the intermediate ranks there is a good deal of disorder, with no regular progression by size. In broad terms Figure 3 appears to indicate that while mortality was directly related to population size among districts, no decisive distinction could be made between the mortality level for urban and rural places. There were many distorting factors.

Whereas Figure 3 combines the effects of age groups, Figure 4 begins the process of disaggregation. It uses the partial life expectancy in years between ages 25 and 65 (e_{25-65}), which is a fairly refined measure of adult mortality, but avoids the effects of deaths in old age. With no adult mortality, e_{25-65} would be 40 years. In the 1850s most districts of England and Wales

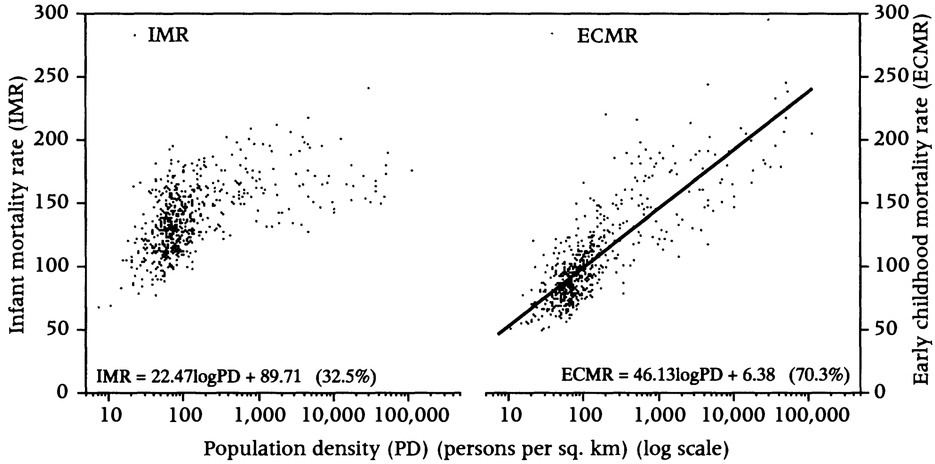
FIGURE 5 Rank size and rank infant mortality, England and Wales, 1851–60



had an e_{25-65} of 25 to 30 years, that is from 63 to 75 percent of the maximum, and this would include a substantial number of urban districts. A handful of districts—Liverpool and Manchester included—experienced excess adult mortality at about 55 percent of the maximum, but they were the exception. Adult mortality was not the principal cause of the general mortality effects seen in Figure 3; they are far more closely influenced by the consequences of mortality at early ages. Figure 5 uses the same framework to illustrate the influence of the infant mortality rate (q_0, in parts per thousand). Here the distribution sits astride the rank-size guideline, and there is in some ways a more orderly urban–rural continuum; but among the smaller districts there was still considerable scope for variation, confirming that not all rural districts experienced low levels of infant mortality of less than 100. Infant, and doubtless childhood mortality in general, were rather more sensitive to environmental conditions than adult mortality.

Figure 6 is a final illustration of how this size-density effect influenced the urban–rural mortality gradient. It shows, in simple terms, the associations between the infant mortality rate (IMR) and the early childhood mortality rate (ECMR) and population density among the 614 districts of En-

FIGURE 6 The effects of population density (PD) on the infant mortality rate (IMR) and early childhood mortality rate (ECMR), England and Wales, 1851–60



gland and Wales in 1851–60. While there is clearly a positive and significant link between infant mortality and population density, the association is less strong and certainly less clearcut than that between early childhood mortality and population density. There should be few surprises here. The infant mortality rate combines a number of diverse elements: especially the after effects of delivery and the possibility that birth did not occur at full-term, factors that affect the neonatal mortality rate (deaths at 0–30 days); and the influence of breastfeeding and the start of exposure to the common childhood diseases, factors that affect postneonatal mortality (deaths at 1–12 months). The early childhood mortality rate responds mainly to the infectious diseases of childhood, especially measles, scarlet fever, whooping cough, diphtheria, and smallpox. Figure 6 also suggests that, in many areas of relatively low population density and substantially rural characteristics, infant mortality was higher than might have been expected. These anomalies are certainly worthy of closer investigation.[4]

The data presented in Figures 2 through 6 also complicate matters for those seeking to assess the demographic consequences of urbanization during the early stages of industrialization. They make it more difficult to capture long-run trends in the standard of living without considering the additional risks to health and of dying early that became synonymous with the urban environment. Real wages and the quality of life did not run together, thanks to urbanization, in those countries where the industrial revolution began before the twentieth century (Szreter and Mooney 1998; Szreter and Hardy 2000; Woods 2000: 360–380; Woods 2003b). In developing regions today, there is also a continuing debate on the extent of poverty in cities and the ways in which urban poverty may affect well-being and access to health care, especially among children (Brockerhoff and Brennan 1998; Harpham and Molyneux 2001). But Africa has experienced excess rural mortality and this may also have been true of early-twentieth-century China (Table 1). In the well-documented case of Kenya during the 1980s, for example, early-age mortality hardly improved in most rural areas but did improve in urban locations, thereby exacerbating already substantial rural–urban differentials; during the 1990s, meanwhile, conditions improved in rural Kenya (especially in highland areas with no endemic malaria) and deteriorated in most urban districts, reversing the earlier trend (Gould 1998).

There are some other interesting questions. What would Figure 6 look like for earlier centuries and other places? Presumably the increase in population density in the new urban places encouraged increases in early childhood mortality, rather than infant mortality, in eighteenth-century Europe. Was measles endemic in Chinese and Japanese cities, and if so what was its impact on early childhood mortality? And what was the role of pulmonary tuberculosis in maintaining urban–rural mortality differentials?

Conclusion

The economic and epidemiological conditions of urban compared to rural places continue to have a bearing on the risk of death. The historical analysis of such differentials offers several pointers to the way in which the debate might be advanced. First, the focus of attention clearly needs to be mortality in childhood, which appears to be highly sensitive to differences in population density. It is important as well to distinguish between deaths in infancy and early childhood and to realize that an excess of the latter may be found especially in urban centers and at times before the medical control of childhood infectious diseases became possible.

Second, although it is convenient to categorize environments as either urban or rural, in reality there was in the past, at least in Europe, a mortality continuum. Certainly the average life chances, measured by life expectancy at birth, were as much as 1.5 times better in the countryside than in the larger towns, but this does not mean that the former was invariably healthier. What changed the situation in Europe during the eighteenth and nineteenth centuries was rapid urbanization: the redistribution of people from the relatively good to the bad locations in terms of health environments.

Third, in using demographic indexes to facilitate cross-cultural comparison, historians always run the risk of oversimplification. Even near neighbors such as Catholic France and Protestant England, while sharing an apparently common system of ecclesiastical registration, displayed very different attitudes toward both infant feeding and the need for an infant to be baptized quickly. The resulting conventions undoubtedly affected parish register entries and thereby the results of family reconstitution studies. The comparison of East Asia and West Europe is far more troublesome, however. In early modern Japan it seems most likely that urban centers did experience some excess mortality, although differentials were less than in Europe even while levels of urbanization were comparable. In China, where the distinctions between town and countryside were even more blurred in both administrative and statistical terms, the pattern of mortality is far from obvious.

The long debate on urban–rural mortality differentials has not been brought to a successful conclusion, but the signs of greater cultural awareness and analytical sophistication are encouraging. In particular, it is critical that the crude depiction of an urban graveyard effect be replaced by a far more contingent account that is sensitive to the diversity of health environments that may be associated with the clustering of populations in high-density areas.

Notes

1 Wolf (2001: 153), for example, assumes that ${}_5q_0$ (the childhood mortality rate) for late Qing China was 0.333 (1 in 3 babies born alive did not reach their fifth birthday), but the evidence summarized in Table 1 indicates that early-age mortality was rather variable (see Lee and Wang 1999; Lee, Campbell, and Wang 2002). There must also be a continuing suspicion that these estimates are too low. More generally, Naquin (2000; see also Skinner 1977; Mote 1995) has illustrated the various source problems that limit work on the urban history of China; and, in similar fashion, Benedict (1996) has shown the problems faced in research on Chinese historical epidemiology created by the absence of continuous statistical and demographic data.

2 Woods and Shelton (1997) and Woods (2000) provide detailed guides to the mortality statistics available for Victorian England and Wales. Although these data are not without limitations, they provide a means of observing variations and changes in the level of mortality, its age pattern, and the principal causes of death, disaggregated by at least 600 geographical units (many of which can be classified as either overwhelmingly urban or predominantly rural in terms of population density or economic function) spread over six decades (1851–60 to 1901–10).

3 Bak (1997: 27) and Wolfram (2002: 1014) have recently reminded us that George Kingsley Zipf's rank-size rule is simply one of many examples of "power laws" to be found in nature.

4 Dobson (1997) has examined some of these environmental differences in rural England during the early modern period. Apart from the towns, the low-lying estuarine and coastal marsh areas were especially prone to high levels of infant mortality.

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