



PII: S1353-8292(98)00009-4

African mortality and the new ‘urban penalty’

W. T. S. Gould

Department of Geography, The University of Liverpool, Liverpool, L69 3BX, Merseyside, UK

This paper reviews trends in rural/urban under-5 mortality differentials in Sub-Saharan Africa in historical perspective, with particular attention to the case of Kenya. The rural/urban mortality gap has narrowed within the last half-century, but while this was largely due to rapidly falling rural infant and childhood mortality over most of the period, in recent years it has been due primarily to a stalling and even upturn in urban under-5 mortality as urban economic and environmental conditions have sharply deteriorated in rapidly growing cities. Policy attention and resources need to be directed to large urban areas to prevent further deterioration of urban mortality and associated health conditions. © 1998 Elsevier Science Ltd. All rights reserved.

Keywords: Africa, Mortality, Rural/urban disparities, Urban environment

Introduction

Differences in health and demographic indices between rural and urban areas are familiar in all societies and over most time periods, though the differences are not always in the same direction or to the same extent, for they depend on the very different sets of conditions affecting mortality, morbidity and health in rural and urban areas. The extent and causation of rural/urban differences and their variation over time broadly reflect the larger processes in the geography of any area, of relative levels of incomes and development and of service provision. The geographies of mortality and morbidity at local and national scales are directly linked to the variable economic, environmental and social context in which a population seeks its livelihood.

This paper seeks to set rural/urban childhood mortality differences in Sub-Saharan Africa (SSA) in historical perspective as part of a larger concern for changing urban mortality conditions in the continent more generally¹. The substantial reductions in mortality experienced almost everywhere in Africa over the second half of the 20th Century have now slowed, and in some cases have even been reversed, but everywhere mortality levels remain considerably above those currently found in the more developed parts of the world. This is a disappointing outcome that

raises important issues primarily for the well-being of the populations of SSA, but also for both population theory and development theory. Is this a temporary blip in the long-term downward trend, or will the expected (i.e. on the basis of classical demographic transition theory) lower levels never be reached? Is Africa fundamentally different from other major world areas in the ways in which mortality responds to changing economic and environmental conditions?

The principal objective of this paper is to review the changing patterns and explanations of rural/urban differentials in under-5 mortality in contemporary SSA generally, exploring the experience of Kenya in particular, and to set these findings in the broader context of growing national planning and policy problems associated with rapid urbanization. The argument of the paper proceeds in three major sections. In the first of these the African experience of the rural/urban mortality gap of the last 100 years is compared with the very different European, and particularly British, mortality experience from 1850, which was characterized by an ‘urban penalty’. This is then followed by a more detailed consideration of urban mortality change in SSA since *ca.* 1950, and the third section focuses on the Kenyan experience, where the available under-5 mortality indices for Nairobi, its capital and largest city, all indicate a potential reversal

of its long-standing advantage over the rest of the country.

The Twentieth Century African experience in historical perspective

The urban penalty in 19th Century England and Wales

Mortality in late 19th Century Europe was categorized by an 'urban penalty'²: mortality was substantially higher in urban areas than in rural areas, and particularly for infants and children. Infant mortality rates (1q0) in England and Wales, as derived from registration sources, were higher in urban areas than in rural areas in all regions. In rural areas they were typically between 100 and 140/1000 between 1850 and 1900. Urban rates were highest in the largest towns, typically between 150 and 200/1000 for towns of over 100,000 (though it was between 130 and 150 for London), and 120–150/1000 for smaller towns of over 10,000 (Williams and Galley, 1995). The pattern was due to different patterns of causes of infant death: high urban infant mortality has been shown to be closely associated with overcrowding and insanitary conditions in industrialized areas compared with rural areas, despite the higher level of medical facilities and personnel and higher average incomes in towns. In Jeffrey Williamson's terms there was substantial underinvestment in social overhead capital in British cities (Williamson, 1990).

Williams and Galley also demonstrated that during the second half of the 19th Century rural mortality fell earlier and further than urban mortality fell. They estimate that rural infant mortality was 23% lower by the end of the century than it was in 1851–60, while the rate for large towns fell 21% during that period, and for London it was only 16%. The growing urban population at that time, with disproportionately high absolute and relative growth in the capital and other large towns, meant that the national aggregate infant mortality remained high, with a widening rural–urban differential up to the turn of the century (Woods and Hinde, 1987). The rural rate was 70% of the large town rate, 1851–60, but 67% in 1891–1900. The 1890s, a period of hot summers, experienced very high summer seasonal mortality, especially in London, and rates rose in many cities (Mooney, 1994). During the first decade of the 20th Century, however, infant mortality was falling rapidly in all types of areas, and continued to fall throughout the century, to the extent that the gross rural/urban gap in infant mortality had effectively disappeared by the 1930s (Winter, 1979), though significant

inter-urban and intra-urban differentials remain into the 1990s.

This 'urban penalty' was well documented in the publications of the Registrar General, and can find echoes in other European countries. The population problem, in these terms, was essentially one of excess urban mortality, and was resolved by tackling the urban problems through the public health movement from the middle of the 19th Century to create more favourable urban conditions in housing, sanitation and water supply, together with better curative health provision and higher incomes, measures which did not seriously begin to be reflected in mortality declines until the 20th Century.

Rural/urban mortality differentials in Sub-Saharan Africa

One ideological presumption of colonialism was that adequate public health and improving curative medicine would be provided by the colonizing power as the primary mechanism for minimizing mortality. This had been so well documented and much discussed in Europe at the time, and was transferred to Africa during the Age of Imperialism, between the 1880s and the early decades of the present century, at the time when colonial cities were being established, whether *de novo* or at or near the sites of pre-existing African settlements. There was an immediate recognition by the colonial authorities of the need for a public health infrastructure of the type that had developed in European cities in the previous 50 years, if only to maintain the health of the European immigrant colonial population, as in Côte d'Ivoire to 1920 (Tirefort, 1981). However, this was to be developed in a continent with a largely rural population where mortality levels were assumed to be everywhere high and certainly much higher than in rural Europe or even than in urban Europe in the 19th Century. There would certainly not be any 'urban penalty', even from the beginning of colonial urban settlement.

Rural mortality rates, however measured, have remained much higher than urban rates throughout the 100 years since then, and the high national aggregates mostly reflect the continuing numerical dominance of the rural population, for until recently SSA was the least urbanized of the continents. Urban mortality has been low because it has been controlled primarily by urban environmental and health care conditions imported from Europe. This was particularly evident in cities established by the colonial authorities, where there was early scope for public health measures, such as the installation of sewerage and water supply systems, and also where the first and best quality of health care was provided, initially to serve the needs and expect-

tations of the colonial immigrant population (Cantrelle, 1967, p. 44). A typical outcome is illustrated by Clyde Mitchell using data from a social survey of 'line-of-rail' towns in Northern Rhodesia (Zambia), 1950–55, concluding that 'urban infant mortality of 67.25 (/1000) is lower than that of 182.00 (/1000) estimated in the 1950 Sample Demographic Survey in Northern Rhodesia' (Mitchell, 1990, p. 236).

However, even in 'traditional cities' — such as Ibadan or Kumasi — mortality rates were consistently lower than in the surrounding countryside. In Sierra Leone in 1971, for example, Freetown, the capital city established at the founding of the colony in the 1820s with relatively limited 'modern' infrastructure, and the surrounding Western Rural area had infant mortality (1q0), under-2 mortality (2q0) and under-5 mortality (5q0) estimates well below the national average, and well below any of the other districts of the country (Kandeh, 1989) (*Table 1*). Even in these relatively favoured urban areas, recourse to traditional medicines and traditional health seeking behaviours have been and remain important, but these have been sufficiently supplemented by some modern sanitation and health care, higher incomes and more education to have had a major impact on mortality. In other 'mixed' cities — such as Dakar and Lagos — a similar pattern has been evident, but here the intra-urban differentials would be expected to be particularly large, reflecting the basic social geography of residential segregation by race and class in such cities (O'Connor, 1983). In Dakar, Senegal, for example, Antoine and Mbodji (1991), following

the classic work of Pierre Cantrelle in the 1960s, identified very large differentials in infant mortality between Dakar and other urban areas and the rural areas of Senegal, within the overall context of mortality decline in all areas, 1960–85. Throughout the period the urban levels were less than half the rural levels.

Clarke (1972), however, argued that the Senegal case is extreme, for, at least in former French West Africa, the urban levels were typically much nearer the national average, but with wide variation — from an infant mortality rate of 48/1000 in Bamako in Mali to 202/1000 in Fort Lamy, now Njemeina, in Chad. Clarke also cites T.E. Smith's conclusions for the 1950s and '60s that:

...the typical infant mortality rate for towns is about 100–150/1000 and about one child in four fails to survive to the age of 5, while in rural areas the ratio is probably one to three (Clarke, 1972, p. 68).

The historical experience of rural/urban differential in colonial Africa was certainly very different from the European experience in the nineteenth century. But what of more recent trends since independence?

Mortality differentials in SSA since *ca.* 1950

A narrowing rural/urban differential?

Mortality decline has been fairly widespread and consistent in Africa since the 1920s, but particularly since 1950. The effects have been evident in

Table 1. Proportion of children dying between birth and certain exact childhood ages^a: Administrative areas of Sierra Leone, 1971

| | < 1 Year | < 2 Years | < 5 Years |
|--------------------|----------|-----------|-----------|
| SIERRA LEONE | 0.2152 | 0.2743 | 0.3582 |
| WESTERN AREA | 0.1556 | 0.1999 | 0.2627 |
| Western Rural | 0.1861 | 0.2384 | 0.3125 |
| Freetown | 0.1516 | 0.1948 | 0.2561 |
| SOUTHERN PROVINCE | 0.2427 | 0.3077 | 0.4000 |
| Sherbro Urban | 0.2208 | 0.2812 | 0.3668 |
| Pujehun District | 0.2721 | 0.3428 | 0.4431 |
| Moyamba District | 0.2415 | 0.3063 | 0.3982 |
| Bonthe District | 0.2130 | 0.2717 | 0.3548 |
| Bo District | 0.2405 | 0.3051 | 0.3967 |
| EASTERN PROVINCE | 0.2194 | 0.2795 | 0.3647 |
| Kono District | 0.2041 | 0.2607 | 0.3409 |
| Kenema District | 0.2406 | 0.3052 | 0.3968 |
| Kailahun District | 0.2179 | 0.2776 | 0.3623 |
| NORTHERN PROVINCE | 0.2123 | 0.2708 | 0.3537 |
| Tonkolili District | 0.2439 | 0.3092 | 0.4018 |
| Port Loko District | 0.1973 | 0.2523 | 0.3302 |
| Koinadugu District | 0.2200 | 0.2802 | 0.3656 |
| Kambia District | 0.2033 | 0.2597 | 0.3397 |
| Bombali District | 0.2053 | 0.2622 | 0.3428 |

Source: Kandeh (1989), p. 22.

^abased on the North Model.

both urban and rural areas, but can be attributed to rather different mixes of the basic causes. In *urban* areas there were public health measures and a curative health care, providing initially and primarily for a rich and politically powerful colonial elite and, after independence, a predominantly national elite. Improved sanitation and a clean water supply bring immediate benefits: according to a 1988 survey in Pikine, a middle/low income suburb of Dakar, mortality was 64% higher in households supplied by a communal well than in those with a tap in the dwelling (Antoine and Mbodji, 1991, p. 30). Furthermore, urban populations have been generally richer, increasingly better educated and many had begun to benefit from superior housing conditions compared with rural populations.

In *rural* areas there were certainly some public health measures and health care services in place before the 1950s, notably to reduce the mortality impact of epidemics of measles or smallpox, and both rural and urban areas were affected by the disease consequences of high temperatures and drought. Probably more important for rural areas, however, was the gradual reduction in the incidence and extent of famine mortality as a result of better distribution infrastructure for food, in Iliffe's terms much less 'conjunctural' poverty than hitherto:

With certain exceptions the great famines which in the past had periodically decimated population ceased in the mid colonial period and were replaced by more subtle problems of nutrition and demography (Iliffe, 1987, p. 143)

National levels of mortality continued to fall in most countries throughout the 1980s, including through a period of adverse economic circumstances:

The real question is why Africa (in the 1980s) has managed to sustain its mortality decline through such a difficult period over the past twenty-five years, during which per capita income has fallen in half the countries of the region (Caldwell, 1991, p. 226).

Caldwell sees this as providing further justification for his broader argument about mortality decline in being less strongly linked to aggregate economic performance than to 'the driving force of social change' (p. 227), including more widespread education, especially for girls, as in Ghana and Ivory Coast, more and better health care, as in Botswana, and generally the continued penetration of the market economy into rural areas.

Into the 1990s, however, there is greater evidence than was available to Caldwell or to the NRC study of the *Demographic impact of econ-*

omic reversals (National Research Council, 1993) for a stalling of national mortality declines. Mortality rates may indeed now be rising as a result of the differential effects of economic crisis and structural adjustment that have caused a widening of the social inequalities in wealth and access to much reduced public services in favour of private provision, and these rises are likely to occur where health services and economic opportunities have been disproportionately available in the past — in urban areas.

Has the rural/urban mortality gap narrowed with the overall trend of mortality decline, 1950–1990? The traditional answer in the literature has been that it has not, and this on the basis of both expected trends, extrapolating for the earlier experience, and empirical evidence. The most influential support for this conclusion came from Pierre Cantrelle's review of the West African experience up to the early 1970s, including his own work in Dakar:

The possibility should not be ruled out that the differential between rural and urban mortality will continue to increase in the years ahead. In some rural areas mortality may well increase, whereas in the towns there appears to be every possibility of decline. In Dakar, for example, infant mortality has dropped from 175/1000 in 1942–45 to 70/1000 at the present time (in the early 1970s) (Cantrelle, 1975, p. 117).

Such a conclusion was explicitly based on an optimistic view of continuing urban improvement to European levels of infrastructure, health and income, rather than of rural improvement. However, improvements in the rural areas were everywhere evident in the 1960s and '70s. Supported by such international agencies as the World Bank, with its dominant 'basic needs' strategy at that time, and by specific health interventions by such agencies as UNICEF and Save the Children, governments devoted considerable attention to promoting health in rural areas with major disease eradication (notably for smallpox) and vaccination campaigns. Rural rates by the 1970s seemed to be falling more rapidly than urban rates, and even in Senegal, where Antoine and Mbodji (1991) have demonstrated a narrowing trend between rural and urban survey evidence that seems to contrast with Cantrelle's conclusions, which had themselves been strongly influenced by his Senegalese experience before the 1970s. In the 1970s urban rates in Senegal were continuing to fall but at a slower rate than before, and more slowly than the rural rates, such that the rural/urban mortality gap was narrowing. The broad narrowing was also confirmed by the NSF country study on Senegal, but its conclusions noted that 'urban and rural areas ex-

perience different rhythms of mortality change' (Pison *et al.*, 1995, p. 156).

These different rural and urban rhythms have also been identified for Zambia since its independence in 1964 (Nsemukila, 1994). Using data from successive censuses (1980 and 1990) and the Zambia Demographic and Health Survey (1992), he showed that national under-5 mortality rate was falling in the 1960s and early 1970s, a time of relative prosperity in the country. It stalled at about 150/1000 between the mid-1970s and mid-1980s, but rose in the late 1980s and early 1990s to a new plateau at about 170/1000. However, the national mean masks rather different trends for rural and urban areas. While there was a fairly consistent fall in rural rates between the mid-1960s and early 1970s, the urban rate was more volatile. Between 1970 and 1973 the rural/urban gap was at its narrowest, at between about 20 and 30/1000. Urban under-5 mortality continued to fall (though only slightly) over the next few years at a time when the rural rate was rising rapidly, thus substantially widening the rural/urban gap. There was some narrowing of the gap to 1980, but in the early 1980s rural rates rose and urban rates fell. In 1983 and 1984 rural rates of more than 200/1000 were almost double the urban rates. By the late 1980s, however, rural rates had remained stable at that high rate, but urban rates had sharply deteriorated to over 150/1000, again narrowing the rural/urban gap.

The recent trends in urban mortality in Africa have not proved to be those optimistically expected by Cantrelle. The substantial economic downturn since the 1980s seems to have had a disproportionate effect on urban areas. With rapid population growth and in-migration of an increasing number — if not proportion — of job seekers, with or without their families, urban infrastructure has not been able to cope with the additional population, and sanitation services have generally deteriorated; so too with health services in an era of structural adjustment and 'cost recovery'. The proportion of the urban population who are poor, however measured, has risen everywhere, with major implications for disease conditions and health care (Satterthwaite, 1995).

Rural/urban under-5 mortality differentials in Kenya

For most of the last 50 years there has been continuous mortality decline in Kenya. This trend has been well recorded in official census and survey reports, most recently by the published reports of the 1989 Census including a volume on 'Mortality' (Kenya Government, 1996), and by a stream of more specific analyses (e.g. Anker

and Knowles, 1980; Van Vianen and Van Ginniken, 1984), and most authoritatively by Brass and Jolly (1993) in their NSF volume on Kenya. While there are some problems with the available data, notably the under-recording (largely due to recall error) of early childhood deaths, there is a well recognized and fairly consistent downward trend in all measures of child mortality. Brass and Jolly identified two major periods: the first, derived largely from the analysis of census sources for the period 1954–73, displayed a largely linear downward trend; the second, 1973–84, derived from data from a range of national sample surveys, showed that:

Between 1973 and 1984, child mortality fell by 27% to approximately 110 deaths to children under 5 years of age per 1000 births. Although mortality had decreased significantly in the 20 years before, this period was notable in that the rate of mortality decline accelerated markedly (p. 1).

They were also able to explore aspects of the geography of the decline:

The declines were shared almost equally between rural and urban areas, although significant differentials that existed in the 1970s still remain...Central Province showed the greatest improvements in mortality among all provinces since the 1950s, with a reduction of about 70%. Coast Province did rather poorly in the same period, with a decrease of only 19%. The four remaining provinces, other than Nairobi, experienced closer to the national average of 54% (p. 1/2).

Particularly relevant to the argument of this paper are their data and findings on Nairobi:

Nairobi also appears to do rather badly in improvement from an exceptionally good level in 1954, but the changing composition of the city population must be borne in mind (p. 38).

Table 2 summarizes some of these data. The 1954 estimate for 5q0 gave Nairobi a rate well below even that of Central Province. By 1973 the Nairobi rate was still well below the national rate, but *above* the Central Province aggregate, and, according to the 1969 Census Report, above all districts of that province (Nyeri was nearest at 214/1000). Nairobi was also well below the rate for Mombasa (228/1000), the only other separately identifiable urban area in that census report (Kenya Government, n.d.). The 1979 census estimates placed Nairobi under-5 mortality rate above the rate for four of the five districts of Central Province (Kenya Government, 1982, p. 95). Comparison with Mombasa in 1979 still gave estimates for Nairobi that are well below the 5q0 for Mombasa, itself still well below the rates for surrounding districts in Coast Province.

Table 2. Estimates of trends in probability of dying by age 5 (5q0) for rural and urban populations, and Nairobi and Central Provinces, Kenya, 1954–84

| | 1954 | 1973 | 1984 | | 1973/54 | Ratios 1984/73 | |
|---------|-------------|-------------|-------------|-------------|---------|----------------|------------|
| | | | adjusted | unadjusted | | adjusted | unadjusted |
| Rural | — | 0.152 (102) | 0.092 (101) | 0.110 (101) | — | 61 | 72 |
| Urban | — | 0.120 (81) | 0.090 (99) | 0.108 (99) | — | 75 | 90 |
| Nairobi | 0.133 (69) | 0.103 (69) | 0.083 (91) | 0.103 (95) | 77 | 84 | 100 |
| Central | 0.192 (80) | 0.090 (60) | 0.049 (54) | 0.059 (54) | 47 | 54 | 66 |
| Kenya | 0.239 (100) | 0.149 (100) | 0.091 (100) | 0.109 (100) | 62 | 61 | 73 |

Kenya = 100.

Source: from Brass and Jolly (1993), Tables 3.5 and 3.6.

By 1984, however, Nairobi's unadjusted and adjusted under-5 mortality estimates were near the national levels, in stark contrast to the significant improvement evident for Central Province. Between 1973 and 1984 rural rates for Kenya as a whole improved more than overall urban rates, and by 1984 these were very similar, to the extent that the rural/urban mortality gap had almost disappeared. Central Province had further improved, even in comparison with the substantial improvement in the national rural figure. However, the unadjusted Nairobi data suggest no improvement in this period, though with some improvement with the adjusted data, but less than the national urban average. The 5q0 1979 census estimate for Nairobi was 104/1000 and 137/1000 for Mombasa. The 1989 Census recorded an unadjusted national estimate of 113/1000, marginally higher than mid-1980s estimates, but with some improvements for Nairobi and Mombasa (to 75/1000 and 123/1000, respectively), though by then Nairobi had rates above all five districts of Central Province, and also above those for Embu, Machakos and Meru districts in Eastern Province, and in four of the districts of Rift Valley Province. Clearly, the position of Nairobi had deteriorated from being the district of the country with lowest mortality in the 1950s — and probably also in the decades before that — to nearer the national average by the late 1980s, above the level in all surrounding rural districts.

Evidence from the 1993 KDHS

However, Brass and Jolly did not have access to the 1993 DHS at the time of their work, and the evidence now available in that source seems to have altered the picture somewhat. In contrast to the more optimistic conclusions of the 1989 Census for the 1980s as a whole, there was in the 1989 KDHS general evidence of a slowing down in the rate of mortality decline, as derived from comparison of three year retrospective mortality estimates, and even some slight evidence (though within a margin of sampling error) of a recent stalling of the mortality decline, for there was a slight upturn in national 1q0 from 58/1000 for

1979–83 to 60 for 1984–88. Nothing much was made of these estimates in the published report, which still adopted an optimistic tone though recognizing the general slow down:

While the KDHS rates indicate a decline in mortality, it is important to note that the decline is small...When the KDHS rates are compared to data from previous sources they imply a substantial decline in infant and childhood mortality (Kenya Government, 1989, p. 57).

The data of the 1993 KDHS, however, identified a rather different picture. There were reported upturns between 1983–87 and 1988–93 in post-neonatal (1–12 months) mortality, though not in infant mortality overall or in early childhood (1–4 years) mortality. At one level these changes are attributed to technical aspects of the data collection:

Given the relatively high level of sampling error associated with mortality rates, this pattern should not be interpreted as indicating any real change in mortality over the periods examined (Kenya Government, 1994, p. 84). At another level, however, there is concern over the stagnation in child mortality:

It would appear that child survival in Kenya has shown little or no improvement in recent years (p. 84), and, while the report did not seek to investigate systematically causes of the observed trend, it identified economic recession and AIDS as possible causes (p. 85).

Direct comparison of the most recent trends from the KDHS reports of 1989 and 1993 is not always possible, largely because of the different time-periods of recall and analysis used, but further evidence on the trends is possible using 10-yearly mortality estimates by province (Table 3). There is quite clearly a wide range in experience of rates of change of both infant (1q0) and childhood (4q1) mortality. Nyanza, already with among highest values, and Rift Valley, with well below average rates, experience rising rates in both indices; Coast and Western, both well above average, experience falling rates in both in-

Table 3. Infant and child mortality 1979–89 and 1983–93 by location and region: Kenya

| | IMR (1q0) | | CMR (4q1) | | Under-5 (5q0) | |
|-------------|-------------|-------------|------------|--------------|---------------|-------------|
| | 1979–89 | 1983–93 | 1979–89 | 1989–93 | 1979–89 | 1983–93 |
| Rural | 58.9 (101) | 64.9 (104) | 34.3 (100) | 31.3 (96) | 91.2 (100) | 95.6 (103) |
| Urban | 56.8 (97) | 45.5 (73) | 34.2 (99) | 32.8 (100) | 89.0 (98) | 75.4 (81) |
| Nairobi | 46.3 (79) | (44.4) (71) | 35.7 (104) | (39.5) (121) | 80.4 (88) | (82.1) (88) |
| Central | 37.4 (64) | 30.9 (49) | 10.0 (29) | 10.7 (33) | 47.0 (52) | 41.3 (44) |
| Coast | 107.3 (183) | 68.3 (109) | 54.5 (159) | 43.4 (133) | 156.0 (172) | 108.7 (117) |
| Eastern | 43.1 (73) | 47.4 (76) | 22.2 (65) | 19.4 (59) | 64.3 (71) | 65.9 (71) |
| Nyanza | 94.2 (160) | 127.9 (205) | 60.0 (175) | 67.5 (206) | 148.5 (163) | 186.8 (200) |
| Rift Valley | 34.6 (59) | 44.8 (72) | 19.6 (57) | 16.7 (56) | 50.9(56) | 60.7 (65) |
| Western | 74.6 (127) | 63.5 (102) | 62.9 (183) | 62.9 (192) | 132.8 (146) | 109.6 (118) |
| KENYA | 58.6 (100) | 62.5 (100) | 34.3 (100) | 32.7 (100) | 90.9 (100) | 93.2 (100) |

() = based on less than 500 children exposed.

Kenya = 100.

Sources: from KDSH 1989 (Kenya Government, 1989), Table 6.2: KDSH 1993 (Kenya Government, 1994), Table 7.2.

dices. Furthermore, the extent of change is very high, especially since there is an overlap of 7 years, 1983–89, in the period used to calculate both estimates. It is likely, therefore, that a large proportion of the regional variation can indeed be attributed to large sampling errors, such that meaningful interpretation for the medium term trend must remain rather speculative.

Where there are larger numbers, as with rural and urban aggregations, there can be greater reliability on the data. *Table 3* would suggest that while the rural and urban trends are roughly similar for child mortality (4q1), with a slight decline between the two overlapping data recall periods, the rural and urban experience of infant mortality are very different. Rural infant mortality has risen by over 10%, but urban infant mortality has fallen by almost 20%. While it is the case that the rural figures are more robust, given the much larger sample size (6423 rural households and 1527 urban households in 1993), there is a strong implication of a substantial widening of the rural/urban gap in infant mortality, with a national upward drift. This is in contrast to Brass and Jolly's evidence of a narrowing gap for the 1970s and 1980s. The rural and urban rates of child mortality for 1983–93 are very similar for both dates, with only a slight fall between them. Overall, the widening of the rural/urban gap seems due almost entirely to changes in infant mortality.

The position of Nairobi is seen to be rather different from that of the 'urban' areas taken as a whole, despite the fact that Nairobi Province is itself entirely urban. The 1989 infant mortality estimate placed Nairobi well below the national urban and rural estimates, but for 1993 the Nairobi and urban estimates were roughly similar, and well below the rural figure. This is consistent with the apparent widening of the rural/urban gap in 1q0 noted above, but suggesting that most of the urban improvement for the infant rate is in other urban areas out of

Nairobi. For child mortality (4q1), by contrast, the 1989 estimates for rural, urban and Nairobi were roughly similar, as Brass and Jolly had shown for 1984, but the gap had substantially widened by 1993. Nairobi again behaved differently from other 'urban' areas, with a 4q1 at 20% above the other two estimates.

Thus within this overall summary picture of a stalling in the decline of mortality we can identify changing geographical patterns. For infant mortality, Nairobi rates, traditionally well below national and other urban rates, have hardly moved, in comparison to sharp improvements for the other urban areas, 1989–93. For child mortality, Nairobi rates seem to have moved sharply adversely, in contrast to the relatively stable levels, though marginally falling, for the national rural and urban aggregates. Nairobi seems to have behaved differently to what might have been expected. Its aggregate under-5 mortality has risen to near the national average, above the levels of surrounding rural districts, and above that of the urban population for Kenya as a whole. Why should this have happened?

It is certainly the case that the size of the Nairobi sample in the KDHS 1993 creates a serious problem. The mortality estimates are based on data from the birth histories of only 367 women (the next smallest provincial group was 945, and estimates for all other provinces were based on over 1000 women), and therefore a relatively small number of deaths. Furthermore, the sampling problems are not only those of size, but are also associated with its structure. The KDHS, as with all national Demographic and Health Surveys of the last decade, is based on a cluster sample structure, and the choice of a small number of clusters to be representative of Nairobi clearly raises the margin for sampling error where, as would be expected in a city, mortality rates can vary markedly between clusters. Clearly these problems suggest that the KDHS evidence is not sufficient

in itself to substantiate the case for arguing that, in terms of recent experience, Nairobi is different from the rest of urban Kenya.

However, that evidence is wholly consistent with a range of evidence for Nairobi from other sources on economic, environmental and health deterioration. Nairobi, with a population estimated to be over 1.7 million in 1994, is by far the largest city in Kenya, with over 40% of the national urban population. Its annual rate of growth between 1979 and 1989 was estimated to be at 4.5%, rather less than in the 1970s, but from a much larger base (Lamba, 1994a). Nairobi remains the principal focus of the national migration system, as it has been since the city was founded, attracting migrants with jobs but also with a wider range and better quality services than are available in most rural areas (Gould, 1990). However, a growing proportion of urban growth is through natural change, even though Nairobi's fertility rates are considerably lower than elsewhere in Kenya. While some of this natural and migrational growth has been in new suburbs, well provided with housing, services and infrastructure, much of it has been in poor quality and overcrowded housing in poorly serviced areas such as in classic areas of unregulated settlements. In 1992 it was estimated that 363,000 people were in the seven most densely populated neighborhoods, with a mean density of over 43,000 per sq.km. (Lamba, 1994a, p. 6).

This recent population growth has been at a time of serious economic stagnation, if not reversal, associated with successive implementation of 'structural adjustment' measures, that have successively reduced private incomes and public revenues. In all provinces of Kenya there has been increasing poverty (Mukui, 1994), and Nairobi is certainly no exception, with all the classic symptoms of a widening gap between rich and poor within the city. Unemployment remains high, and there is increasing reliance on the largely irregular and generally small incomes that can be earned in the informal sector, disproportionately by women. Public services deteriorate as government revenues fall or are increasingly diverted from the social sectors. Supply of public service provision has been reduced, and even where a service is available, its quality may have deteriorated — there are fewer books in the schools and fewer drugs in the clinics.

The decline in range and quality of services is exacerbated by the fall in per capita demand, due to lower incomes and higher costs, to 'cost recovery' and imposition of user fees for health and education services, lowering levels of nutrition, raising levels of housing overcrowding, and reducing levels of health and use of health care facilities in both rural and urban areas (Mbuga *et al.*, 1995). The 1993 KDHS, for example, recorded

for Nairobi a lower level of fever among children than was recorded by the KDHS 1989 (37% of children aged less than 5 years with a fever in the two weeks prior to the survey, compared with 45% in 1989, not in itself a particularly surprising difference given seasonality and weather factors in fever), but while 70% of those with a fever consulted a medical facility in 1989, this had fallen to 58% for 1993. The national average fell rather less — from 55% to 47% in this same period. The quality of health service provided by Nairobi City Council, responsible for primary health care in the city, has certainly sharply deteriorated (Schwarz, 1992).

One much discussed aspect of health affecting Nairobi more than the rest of the country concerns AIDS. While detailed figures are not available on the geography of HIV+ and AIDS in Kenya, it is widely assumed that seropositivity rates are much higher in Nairobi than even in other urban areas, and will certainly have some effect on mortality, including in under-5 mortality through infantile AIDS. The precise impact of infantile AIDS on childhood mortality is a matter of some dispute, in Kenya as elsewhere. Brass and Jolly (1993) concluded that there was little evidence in their data (i.e. up to 1989) for it having an effect on infant and child mortality, but rates will have risen since then, and the *Migration* report of the 1989 Census acknowledges this possibility (Kenya Government, 1996, p. 63). Bongaarts (1996, Table 3, p. 34) has recently concluded that even areas of high seropositivity and AIDS prevalence, the effect of infantile AIDS on mortality is likely to remain well below 1% of all births. Nicoll *et al.* (1994), by contrast, have argued that towns with high seropositivity rates, such as Nairobi, may experience an increase of one-third in childhood mortality. Since seropositivity rates for Nairobi are not known with any accuracy, it is almost impossible to begin to estimate with any level of confidence the effect of AIDS on its under-5 mortality, except to surmise it is likely to raise urban rates more than rural rates.

There is now reasonably well-documented evidence for substantial environmental deterioration in Nairobi in recent years. The Nairobi City Convention held in 1993 concluded that over the previous decade the city had gone from the 'Green city in the sun' to a level of decay that is unacceptable:

Many Nairobians do not have access to basic health facilities, and consequently die from common diseases which could otherwise be treated. The quality of health services in public hospitals and health centres has steadily fallen, and drug supplies are low (Kouga, 1993, p. 62).

In addition, the Mazingira Institute has shown how population growth has outstripped service facilities such that a broad range of environmental conditions — waste disposal, water supply, sanitation, air pollution — are all adversely affecting health and mortality conditions for the city as a whole, though evidently much more seriously in some areas of the city than in others. It argues that:

...the city has never made a serious or systematic attempt to provide adequate water supply, sanitation, drainage, health care and other services in poverty areas (Lamba, 1994b, p. 194).

This evidence from a range of sources is strongly consistent. It points to economic stress and environmental deterioration as both cause and effect of the rising mortality in Nairobi, with a growing proportion of its population in impoverished and underprovided neighborhoods. Furthermore, the pattern of a changing mortality differential between Nairobi and the rest of the country, both rural and urban, complements the statistical evidence, however unconvincing it may be itself, of the KDHS on the relative decline in the demographic condition of the capital city.

These findings raise important questions for population analysts in Kenya. If urban mortality rises will there be an effect on raising urban fertility, already low, in a country where there seems to be a strong association between fertility and infant mortality rates (Gould, 1995)? Where the overall narrowing of the rural/urban gap in health and mortality continues, what will be the effect on rural/urban migration, and indeed might there be a reverse flow, as Potts (1995) has argued for Zimbabwe in similar conditions of economic difficulties and 'structural adjustment'? They also raise important questions for the political economy of Kenya, and wider questions of relative urban and rural priorities in development expenditures. A political economy associated with an urban bias that exacerbated rural/urban inequalities, so long associated with neo-colonial and neo-liberal Kenya, no longer applies, but a new urban bias may need to be reasserted if development policies are to be targeted to reach the urban poor. The technical means for improving urban conditions and services are immediately available; what is lacking are the resources and the political will — nationally and internationally — to mobilize resources that could be available to meet the need.

Conclusion

There does seem in recent years to have been a broad but by no means regular or universal trend towards a narrowing of the rural/urban mortality gap in Sub-Saharan Africa, but its causes are

now different from those of earlier decades. In the earlier period of narrowing in the 1950s and 1960s both rural and urban rates were falling, but the rural rates were falling much more rapidly than the urban as rural incomes rose, food supply was more assured and more comprehensive health services spread to rural areas. In recent years, however, the narrowing of the gap is more problematic, and has been much more erratic and much less immediately evident from available data sources. It seems to have more to do with deteriorating urban conditions for the majority of the urban population than with improvements in rural conditions, such that urban mortality rates may indeed be rising, and especially in the largest cities, such as Nairobi, even though rural rates may continue to fall, though much more slowly than in previous decades.

In the largest cities, rapid and consistent urban growth has continued over several decades, despite dismal economic performance and a lack of formal sector jobs. The growing population has been channelled economically into low income opportunities, especially into the informal sector, and geographically into poorly serviced, insanitary and overcrowded settlements. Urban sanitary conditions have not been able to cope with rapid growth; health services have faltered; there is high disease incidence, especially in the most rapidly growing but poorest and already most overcrowded areas. Public health measures appear to decline, and new diseases have appeared, notably AIDS, disproportionately prevalent in capital cities and other large urban areas.

A further narrowing of the rural/urban mortality gap is to be expected, even if the national aggregate levels continue to stall or even go into reverse. However, widening intra-urban differentials, as yet largely unexplored (among exceptions are Stephens *et al.*, 1994; Harpham, 1996), are also to be expected as the rich take refuge in private provision for preventive health and sanitation, and the poor are obliged to live in conditions that may give rise to mortality levels that rise above those of rural areas. Without urgent and substantial commitment to urban improvement — in the public domain and in the domestic domain (Cairncross *et al.*, 1996), and by international donors and agencies as well as by national governments — there really might then be a serious threat of an 'urban penalty' emerging in Africa within the next decade, and particularly for the rapidly growing mass of the urban poor. Harpham (1996) suggests that such a commitment may be emerging in Gambia, but is not yet evident in Kenya or most other African countries, despite the recent urgings of the 1996 edition of UNFPA's *The state of the*

world's population, with its particular attention on growing urban populations, even though the debate over the relative disadvantage of the rural and urban poor, so much in evidence in June 1996 at Habitat II in Istanbul, remains unresolved (Webb, 1996). Even if African countries were to find their own Edwin Chadwicks or William Duncans to create a political climate for legislation for urban public health improvement and ensure the technical means to implement any measures, the scale of the problem in large cities, and even smaller ones, is such that the lack of governmental or municipal resources — in the absence of major commitment by the international community — would be likely to militate against significant alleviation of the severely depressed urban condition.

Notes

¹This study arises from an Overseas Development Administration (ODA) financed research project on *Rising childhood mortality in urban Africa: policy implications of alternative explanations* in the 'Population and Environment Research Programme' (PERP) managed by the Development Planning and Policy Centre, University of Bradford. However the ODA can accept no responsibility for any information provided or views expressed. I am grateful to Sarah Davidson, Chris Galley, Geoffrey Nsemukila and Bob Woods for comments on a previous draft.

²The term, 'the urban penalty', seems to have been coined by Kearns (1988) to suggest that migrants from rural to urban areas in the early 19th Century England and Wales, at a period of very rapid urbanization, will experience worse mortality which will offset the opportunity to earn higher wages.

References

- Anker, R. and Knowles, J. C. (1980) An empirical analysis of mortality differentials in Kenya at the macro and micro levels. *Economic Development and Cultural Change* **29**, 165–185.
- Antoine, P. and Mbodji, F. G. (1991) La mortalité des enfants au Sénégal. *African Population Studies* **5**, 18–35.
- Bongaarts, J. (1996) Global trends in AIDS mortality. *Population and Development Review* **22**, 21–45.
- Brass, W. and Jolly, C. L. (1993) *Population Dynamics of Kenya*. National Academy Press for National Research Council, Washington DC.
- Cairncross, S., Blumenthal, U., Kolsky, P., Moraes, L. and Tayeh, A. (1996) The urban and domestic domains in the transmission of disease. *Tropical Medicine and International Health* **1**, 27–34.
- Caldwell, J. C. (1991) The soft underbelly of development: demographic transition in conditions of limited economic change. In *The World Bank, Proceedings of the Annual Conference on Development Economics*, Washington, DC, pp. 207–253.
- Cantrelle, P. (1967) *Afrique noire, Madagascar, Comores. Démographie comparée: 6. Mortalité*. INSEE/INED, Paris.
- Cantrelle, P. (1975) Mortality: levels, types and trends. In *Population Growth and Socio-Economic Change in West Africa*, ed. J. C. Caldwell, pp. 98–118. Columbia University Press for The Population Council, New York.
- Clarke, J. I. (1972) Demographic growth of cities in Black Africa and Madagascar: the mechanism of growth and general characteristics of demographic structures. In *La Croissance Urbaine en Afrique Noire et à Madagascar*, ed. P. Venetier, pp. 65–72. CNRS, Tome 1, Paris.
- Gould, W. T. S. (1990) Migration and basic needs in Africa. In *The Role of Migration in African Development: Issues and Policies for the 1990s*, ed. Union for African Population Studies, pp. 142–155. UAPS, Dakar.
- Gould, W. T. S. (1995) Ideology and data analysis in African population policies: the case of Kenya. *Applied Geography* **15**, 203–218.
- Harpham, T. (1996) Urban health in the Gambia: a review. *Health and Place* **2**, 45–49.
- Iliffe, J. (1987) *The African Poor: A History*. CUP, Cambridge.
- Kandeh, B. S. (1989) Spatial variations in infant and child mortality levels in Sierra Leone. *African Population Studies* **2**, 18–38.
- Kearns, G. (1988) The urban penalty and the population history of England. In *Society, Health and Population During the Demographic Transition*, ed. A. Brandstrom and L.-G. Tedebbrand, pp. 213–236. Alqvist and Wikesell, Stockholm.
- Kenya Government (1982) *1979 Population Census. Volume II, Analytical Report*. Central Bureau of Statistics, Ministry of Finance and Planning, Nairobi.
- Kenya Government (1989) *Demographic and Health Survey, 1989*. National Council for Population and Development, Ministry of Home Affairs and National Heritage, Institute for Resource Development/Macro Surveys, Nairobi.
- Kenya Government (1994) *Demographic and Health Survey, 1993*. National Council for Population and Development, Central Bureau of Statistics, Office of the Vice-President and Ministry of Planning and National Development, Macro International, Nairobi.
- Kenya Government (1996) *Kenya Population Census 1989. Analytical Report, Volume 5: Mortality*. Central Bureau of Statistics, Office of the Vice-President, Ministry of Planning and Economic Development, Nairobi.
- Kenya Government (n.d.) *1969 Population Census. Volume IV. Analytical Report*. Central Bureau of Statistics, Ministry of Finance and Planning, Nairobi.
- Kouga, J. (1993) Actions towards a better Nairobi. Report of Recommendations of the Nairobi city convention: 'The Nairobi we want', July 27th–29th, 1993. Nairobi City Council, Nairobi.
- Lamba, D. (1994a) *Nairobi's Environment. A Review of Conditions and Issues*. Mazingira Institute, Nairobi.
- Lamba, D. (1994b) The forgotten half; environmental health in Nairobi's poverty areas. *Environment and Urbanization* **6**, 164–172.
- Mbuga, J. K., Bloom, G. H. and Segall, M. M. (1995) Impact of user charges on vulnerable groups: the case of Kibwezi in rural Kenya. *Social Science and Medicine* **41**, 829–835.
- Mitchell, J. C. (1990) Social factors in child mortality in a sample of urban women. In *Demography from Scanty Evidence. Central Africa in the Colonial Era*, ed. B. Fetter, pp. 235–244. Lynne Rienner, Boulder Co. and London.
- Mooney, G. (1994) Did London pass the 'sanitary test'? Seasonal infant mortality in London, 1870–1914. *Journal of Historical Geography* **20**, 158–174.
- Mukui, J. T. (1994) *Kenya: Poverty Profiles, 1982–92*. Nairobi: Consultant's Report prepared for the Office of the Vice President and Ministry of Planning and National Development.
- National Research Council (1993) *Demographic Effects of Economic Reversals*. National Academy Press, Washington, DC.
- Nicoll, A., Timaeus, I., Kigadye, R.-M., Walraven, G. S. and Kilewo, J. (1994) The impact of HIV-1 infection on child health in sub-Saharan Africa — a demographic and epidemiological analysis. *AIDS* **8**, 995–1005.

- Nsemukila, G. (1994) *Maternal and childhood mortality in Zambia. Determinants and trends, 1965–1992*. Lusaka, Zambia: UNICEF Monograph No. 1.
- O'Connor, A. M. (1983) *The African City*. Hutchinson, London.
- Pison, G., Hill, K. H., Cohen, B. and Foote, K. (ed.) (1995) *Population Dynamics of Senegal*. National Academy Press for National Research Council, Washington DC.
- Potts, D. (1995) Shall we go home? Increasing urban poverty in African cities and migration processes. *Geographical Journal* **161**, 245–264.
- Satterthwaite, D. (1995) The underestimation of urban poverty and of its health consequences. *Third World Planning Review* **17**, iii–xii.
- Schwarz, R. A. (ed.) (1992) *Final Report of the Kenya Health Rehabilitation Project, 1992*. Development Solutions for Africa, Ltd., Nairobi.
- Stephens, C., Timaeus, I., Akerman, M., Alve, S., Maia, P. B., Campanario, P., Doe, B., Lush, L., Tetteh, D. and Harpham, T. (1994) *Collaborative Studies in Accra, Ghana, and Sao Paulo, Brazil, and Analysis of Urban Data of Four Demographic and Health Surveys*. London School of Hygiene and Tropical Medicine, London.
- Tirefort, A. (1981) Essai de démographie coloniale. La population coloniale de Côte d'Ivoire'. In *African Historical Demography*. Proceedings of a Seminar held in the Centre of African Studies, University of Edinburgh, pp. 721–756.
- United Nations Population Fund (1996) *The State of the World's Population 1996*. UNFPA, New York.
- Van Vianen, H. A. W. and Van Ginniken, J. K. (1984) Analysis of demographic data collected in a rural area of Kenya. *Journal of Biosocial Science* **16**(4), 463–473.
- Webb, J. (1996) Should we learn to love the urban monster? *New Scientist* 13, 10.
- Williams, N. and Galley, C. (1995) Urban-rural differentials in infant mortality in Victorian England. *Population Studies* **49**, 401–420.
- Williamson, J. G. (1990) *Coping with City Growth during the British Industrial Revolution*. CUP, Cambridge.
- Winter, J. M. (1979) Infant mortality, maternal mortality and public health in Britain in the 1930s. *Journal of European Economic History* **8**, 439–486.
- Woods, R. and Hinde, P. R. A. (1987) Mortality in Victorian England. *Journal of Interdisciplinary History* **18**, 27–54.