Draft, do not quote without author's permission

Urbanization, Poverty and Child Mortality in sub-Saharan Africa:

(Draft paper)

By

Michel Garenne (1)

(1) Directeur de Recherche, IRD, Paris, France

Revised:

September 15, 2003

Address for correspondence:

M. Michel Garenne, ISD, 15 rue de l'école de médecine, 75480 Paris cedex 06, France.

Email: mgarenne@bhdc.jussieu.fr

Abstract

The paper reviews the complex relationships between urbanization and child survival in sub-Saharan Africa. According to available data, and primarily Demographic and Health Surveys data, child mortality appears always higher or equal in rural areas than in urban areas throughout the continent. However the relationship between urban and rural under-five mortality is not always stable, and cases of changing trends were documented, usually with convergence of urban and rural mortality, either by rising mortality in urban areas, or by faster decline in rural areas. The case of the urban poor is also investigated using an innovative approach comparing wealthier and poorer households in urban and rural areas. Cases where the urban poor have a higher under-five mortality than rural areas, or higher than expected compared to other countries are investigated. Possible reasons for divergent patterns are explored, in particular patterns of migration and health policies. Special attention is devoted to the role of emerging and re-emerging diseases, in particular to HIV/AIDS, as well as emerging urban poverty. Findings are discussed in light of historical experience, and the role of modern public health in developing countries.

Key Words: Migration, Urbanization, Poverty, Under-five mortality, Emerging diseases, HIV/AIDS, Tuberculosis, Cholera, Health policies, sub-Saharan Africa, Southern Africa.

Introduction

Migration and health keep complex relationships and interactions, which operate both ways, from migration to health and from health to migration, and can be either positive or negative, from beneficial to deleterious effects on health, and from push to pull factors on migration. The most important component of migration in Africa since 1950 has been urbanization. The paper focuses on current trends in the relationships between urbanization, poverty and under-five mortality in sub-Saharan Africa.

Background on the health transition and urbanization

An aspect of the relationship between migration and communicable diseases is the peculiarities of urban health prior to modern water supply and sanitation. Much evidence is available indicating that cities were places of high disease transmission and high mortality until the public health revolution (Rosen, 1958). Estimates of urban life expectancy in these situations always rank low, often below 30 years, and it has been argued that cities could only survive by the constant influx of migrants, otherwise the negative natural population growth would have led to their rapid disappearance. This has been documented for cities in the Roman Empire (Rosen, 1958; Trenerry, 1926), in India in the late 19th century (Dyson, 1997), as well as in England prior to the 20th century (Woods et al. 1988). For instance, in England and Wales, in the late 19th century (1889-1891), infant mortality was 2.2 times higher in urban areas than in rural areas. Similarly in the United States, infant and child mortality at the turn of the 20th century was higher in urban than in rural areas (Preston, 1985; Poulain et Tabutin, 1980; Elman and Myers, 1999). We will see below that these relationships were inverted with the implementation of sanitation, modern public health and economic development. Some exception to this rule have been noted however, and for instance in France urban mortality seems to have been lower than rural mortality in the 18th century, possibly because of widespread poverty in the country side at that time (Houdaille, 1980).

The health transition, which started around 1860 with the hygienist movement in Western Europe and was exported thereafter through out the world, has dramatically changed the relationships between migration and health. The steady mortality decline, especially among young children, characterizing the health transition is due to a variety of factors, most important being clean water supply and sanitation, improved nutrition, preventive and curative medicine, in particular antibiotics and vaccines. Cleaning the water supply and

implementing modern sanitation not only eradicated dreadful diseases such as cholera, typhoid and dysentery, but also seemed to have had a long term cohort effect on mortality. In their classic study of three French cities in the later part of the 19th century, van de Walle and Preston (1978) showed that a strong mortality reduction soon followed the implementation of sanitation in the cities, and that children who benefited from it when they were young also benefited throughout their lives. Since water and sanitation programs have been implemented in cities, urban mortality became lower than rural mortality, changing the historical balance between the two areas, and exceptions to this rule are few in the world (see below).

Similarly, urban dwellers now enjoy better health services, in quantity and quality than rural settlers, and usually have higher levels of education and higher income on the average (Hewett and Montgomery, 2001). In most countries, developed and developing, urban dwellers tend to have a better nutrition, in total quantity and quality of the diet, and a better nutritional status.

Background on urbanization in Africa

Urbanization has dramatically changed the pattern of human settlement in Africa during the 20th century, and in these early years of the 21st century more than a third of the population is living in cities and towns, whereas only a tiny fraction of the population was living in an urban environment a century ago. By 1950, only South Africa was partly urbanized (43%), and the proportion urban was below 10% in the other Southern African countries (table 1).

The dynamics of urbanization in Africa over the 1950-2000 period varied strongly by country. Because of the very restrictive system of apartheid and homelands, urbanization hardly increased in South Africa (50.4% in 2000), whereas in nearby Botswana urban population increased from 0.3% in 1950 to 50.3% in year 2000, reaching the same level as South Africa. Some sub-Saharan African countries are now highly urbanized, such as Gabon (81%), and Congo (63%), reaching higher levels than Northern African countries. African Islands also have high levels of urbanization, in particular Reunion, Seychelles, Cape Verde and Saint Helena. On the other end of the spectrum, some countries remain highly rural, for instance Central African countries like Rwanda, Burundi and Uganda, Eastern African countries such as Ethiopia and Eritrea, and West African Sahelian countries such as Niger and Burkina Faso. In Southern Africa, a few countries remain with low levels of urbanization: Malawi (25%), Lesotho (28%) and Swaziland (26%), all of them being strong providers of

cheap labor to South Africa. The countries where urbanization was the most rapid were primarily countries where economic development took place, acting as a pull factor, in particular oil exporting countries (Gabon, Libya, Cameroon, Algeria, Nigeria), mine countries (Botswana, Zambia), and countries relying on small industries (Tunisia) or agro-business (Côte d'Ivoire). In other cases push factors were more important, such as drought in Mauritania, or the civil war in Mozambique. In the islands, pull and push factors were also at work, such as economic development in Reunion or drought, as in Cape Verde. Africa shows therefore a variety of types of urbanization, which may imply different relationships with health.

The massive movement of workers towards South African and Zambian mines during the 20th century, and to a lesser extent to other countries as well (Botswana, Namibia), involved millions of persons, and were at first often forced migrations (Mijere and Chilivumba, 1994; Ohadike, 1972; Chirwa, 1997; Milazi, 1995). These dynamics are coming to an end, with the closing of Zambian mines, and the reduction in employment in the South African mines.

In the early phase of urbanization, usually the number of males moving to the city looking for industrial jobs exceed that of females, which creates an strong imbalance in sexes in the population. This was the case, for instance, in Abidjan, Côte d'Ivoire, where the ratio of male to females among the young adults was higher than 2 in the 1950's. Similar observations were made in South Africa in the first part of the 20th century. However, later population movements tend to re-establish the balance between the sexes in the population, and over the past decade often more female migrants than male migrants moved to the city, in search for a variety of opportunities, including informal jobs, as shown in the same two countries.

Recently, new patterns of migration have emerged in South Africa, with emphasis on people living the so-called Bantustan rural areas (homelands) for nearby towns where they find all modern commodities they need, often without much chances of formal employment opportunity. In this case again, there were more female migrants (Collinson et al. 2001).

Migration of persons infected with HIV/AIDS back to the rural areas have also been documented, in countries as diverse as Burkina-Faso, Uganda, and South Africa.

These different types of migration are likely to have divergent effects on health, since some are induced by pull factors (attraction for a better life), and others by push factors (escaping a difficult situation), and others directly linked to health factors.

Urbanization and child mortality in Africa

Overall in the world since 1950, urban areas are almost universally associated with lower child mortality than rural areas (Cleland et al., 1992). In developing countries, a review of DHS surveys reveals only a few exceptions, such as Haiti (1995), the Philippines (1993), and other studies point to a similar pattern in Porto-Allegre, Brazil and Mumbay, India. In these cases, mortality was exceptionally high in the urban slums of the capital city, such as "*Cité Soleil*" of Port au Prince, and the slums of metro-Manilla (Bicego et al, 1991; Ebrahim, 1983; Rohde, 1983; Guimaraes and Fischmann, 1985; Basta, 1977; Pryer and Crook, 1988).

In African demographic surveys (WFS and DHS), differentials between urban and rural mortality are published in final reports and refer to the 10 year period prior to the survey. Table 2 summarizes these findings for all DHS and WFS surveys available. Data were provided by the Measure web site for the DHS surveys, and recomputed from original data for the WFS surveys. In the surveys investigated, under-five mortality was always equal or lower in urban areas than in rural areas. Countries where the difference between urban and rural was not significant were quite different from each other: four countries with low urbanization: Rwanda (1992), Burundi (1987), Chad (1996), and Lesotho (1977); one highly urbanized country: Gabon (2000); and two countries from Southern Africa: Botswana (1988), and Namibia (1992). In addition, in two other countries the difference was not significant in one survey, but was significant in other surveys taken in the same country: in Uganda (1988), and in Tanzania (1992). In the other surveys investigated (n= 58), mortality was on the average 39% higher in rural areas. In some cases the difference between urban and rural was much larger, such as Senegal where the relative risk of rural to urban under-five mortality was consistently high: 2.03 in 1978, 1.82 in 1986, 1.81 in 1993, 1.85 in 1997.

Successive WFS and DHS surveys were conducted in a number of countries, which allowed testing the stability of the relationship between urban and rural mortality (table 2). Significant changes over time were visible in a number of cases. In Burkina-Faso, mortality tended to decline in urban areas, and to increase in rural areas between the two surveys, (1993 and 1998), increasing the gap by 26% ($P< 0.001$). In Côte d'Ivoire, mortality increased more in rural areas than in urban areas between the two surveys, (1994 and 1998), increasing the gap by 14% ($P< 0.001$). In Ghana, urban mortality declined faster than rural mortality between the 1988 and 1993 surveys, increasing the gap by 34% ($P< 0.001$). In Malawi, urban mortality declined faster than rural mortality between the 1992 and 2000 surveys, increasing the gap by 20% ($P< 0.001$). Niger experienced the same changing relationship, with an

increasing gap by 11% (P< 0.001). In Tanzania, urban mortality declined, whereas rural mortality stagnated between the two surveys (1992 and 1996), increasing the gap by 18% (P< 0.003). In Togo, urban mortality declined faster than in rural areas, increasing the gap by 21% (P< 0.009). In only one country, Rwanda, the gap between urban and rural areas was reduced by 20% between the 1983 and 1992 survey, because of a faster decline of mortality in rural areas (P< 0.002). Here again, the relationship between mortality in urban and rural areas appears as complex, and shaped by a variety of factors which remain to be explored.

The trends in urban and rural mortality were further investigated by reconstructing yearly mortality estimates in all countries for which WFS and DHS surveys were available. The systematic analysis of mortality trend provided a better grip on real trends than the 10-year retrospective average period done in DHS reports, and in particular proper period estimates of the changing relationships. Results confirmed that in general trends in urban and rural mortality tended to be similar in the long term (summarized in table 3). Kenya, for instance, provides a typical example of a country where urban and rural mortality evolved parallel to each other, with declining trends from 1950 to 1984 and increasing trends in both areas from 1985 to 1998. However, a variety of situations of divergent urban and rural areas were found in the available data. In a number of countries, mortality decline was faster in rural areas, reducing the absolute gap between urban and rural: Burkina-Faso (1970-1998), Rwanda (1977-1992), Senegal (1972-1996), Togo (1970-1997), Uganda (1986-1995). In Benin, mortality stagnated in urban areas after 1980, and continued to decline in rural areas, reducing the gap in the most recent period (1992-1996). In four countries the gap was reduced primarily because of rising mortality in urban areas: Burundi (1973-1987), Malawi (1985-1994), Zambia (1985-1996), and Zimbabwe (1987-1999). In only a few cases the absolute gap between urban and rural areas increased, that of Niger 1970-1992, because of a faster decline in urban areas, although the trend was reversed in the most recent period (1992-1997), and that of Mozambique during the civil war (1977-1994), though the trend was also reversed thereafter (1994-1997). This investigation of trends in absolute gap between urban and rural areas produced a different picture than the relative comparison of average values in the 10-year retrospective period, and seemed to better reflect the recent changes.

The reasons why urban mortality is consistently lower or equal than rural mortality in Africa are two fold: first, modern health services are far more developed in cities and towns, and consistently access and use of health services is found to be better in urban areas in DHS surveys; second, income and socio-economic status, in particular the mother's level of

education, are consistently higher in urban areas, and found universally to be a major predictor of child survival (Cleland and van Ginneken, 1988).

A study has investigated the under-five mortality of children of mothers living previously in rural areas after they moved to urban areas (Antoine and Diouf, 1988). The study was conducted in Pikine, a newly modern area built north of Dakar, the capital city of Senegal. Pikine includes at the same time wealthy areas of a modern African city and poorer areas, including shacks and some informal settlements, although usually with access to clean water. The study showed that children born to rural mothers tended to have a rural mortality when they stayed in rural areas and an urban mortality after they moved to urban areas, showing that the environment, in particular the modern health environment, was far more important than the socio-economic characteristics of the mother. However, the magnitude of differences between urban and rural areas in Senegal is higher than elsewhere, and these findings might not apply to other countries.

Slum areas and the urban poor

Slum areas in cities of the third world are often associated with poor health outcomes and specific health problems (Harpham and Stephens, 1991; Harpham et al., 1988; Gilbert and Gugler, 1992). Large demographic surveys do not focus on the urban poor and the slum areas, and usually do not provide information on this important aspect of urban public health. However, DHS surveys contain socio-economic information which allows computing mortality differentials within cities. In their comparison of four countries (Ghana, Egypt, Brazil and Thailand), Timaeus and Lush (1995) found moderate to large differentials associated with a variety of socio-economic status and environmental variables. In a comparative study of 15 DHS surveys, Brockerhoff (1993) also found differential mortality associated with socio-economic status, and found higher under-five mortality among the urban poor compared to rural areas in Kenya (1979-1988), in Uganda (1979-1988), and in Tunisia (1978-1987), but not in the other seven African countries investigated. He also found mixed effects of the mother's migrant status on child survival, from positive effects in Mali, Senegal and Togo to negative effects in Ghana, Kenya, and Uganda.

A recent study conducted in year 2000 in the slums of Nairobi, Kenya revealed not only the high levels of under-five mortality but also the rising trends in mortality (APHRC, 2002). Nairobi's slums account for about a quarter of the total population of the city, estimated around 2 million. The study was conducted as a DHS survey, using a similar

questionnaire, and permitted the same type of investigation. The survey revealed that under-five mortality (151 per 1000 live births) was 35% higher in the slums than in rural areas of Kenya, and 2.5 higher that the average of the city; in addition vaccination coverage was found to be 25% lower, and incidence of common childhood diseases two to three times higher than in rural areas. There were differences between the slums themselves, and very high values of 254 and 195 per 1000 live births were found in two slum areas in the sample. Furthermore, under-five mortality tended to increase steadily in the slums, by 44% since the late 1980's, and much faster than in the rural areas of the country. This increase in mortality seems partly due to the well documented increase in poverty in the country as a whole, and in cities in particular, and to the HIV/AIDS epidemic raging in Kenya.

Poverty and child mortality

Mortality levels were investigated among the urban poor using DHS surveys. A wealth index was developed, based on housing characteristics and modern goods available in the households, which ranged from 0 to 14. This score allows to compute either quintile of wealth to estimate relative poverty, or to perform directly comparisons between countries using absolute values. The score is closely linked to modernization, and its average value by country was positively correlated with estimates of GDP-PPP per capita (r= 0.49). This procedure is quite similar to what Timaeus and Lush (1995) and Brockerhoff (1993) had done earlier on other data sets, although we used only housing characteristics and goods owned, and no other socio-economic variable such as education in order to be closer to income and poverty. Results showed a marked gradient of under-five mortality by socio-economic status measured by the score. Taking the average of the 47 surveys considered, under-five mortality decreased from 0.202 in the lowest group (score 0-1), 0.163 (score 2-3), 0.128 (score 4-5), 0.098 (score 6-7), and 0.071 (score 8+), a ratio of 2.8 to 1 from lowest to highest. The gradient was clearly dominated by socio-economic status, and differences between urban and rural areas were smaller when controlling for the socio-economic score (figure 1).

The scoring system allowed one to compare the mortality of wealthier (score 4+) and poorer groups (score 0-3) by area of residence. The overall pattern, all 47 surveys combined was smooth, and under-five mortality increased from 0.105 among the wealthier urban strata, to 0.129 among the wealthier rural strata, to 0.167 among the poorer urban strata, and 0.191 among the poorer rural strata (table 4, figure 2). This average pattern was quite expected in a sense, since it underline the close correlation between modernization and health. Moreover, it

permitted to reveal the differences between countries, in particular the inversions in the gradient associated with the urban poor. The urban poor had a significantly higher mortality than the rural poor in only one survey: Kenya (1989). In addition, the urban poor under-five mortality was not significantly different from the rural poor (whereas is was expected to be) in a number of countries as diverse as Kenya, Ethiopia, Sudan, Uganda, Tanzania, Zambia, Zimbabwe, Malawi, Botswana, Namibia, Rwanda, Burundi, Cameroon, Chad, Ghana, Liberia, and Nigeria. The urban poor under-five mortality was significantly lower than the rural poor primarily in West francophone Africa (Benin, Burkina-Faso, Central African Republic, Côte d'Ivoire, Guinea, Mali, Niger, Senegal and Togo), as well as in some South-Eastern countries (Comoros, Madagascar, Mozambique). Some countries where several surveys were taken had a more complex pattern, and in particular urban poor under-five mortality was significantly lower in Cameroon (1998), in Ghana (1993), in Nigeria (1990), and in Zimbabwe (1988), contrary to other surveys taken in the same countries. This brief survey reveals that the pattern of differentials among the poorer strata is by no means simple and uniform, and that each country deserves an appropriate analysis. A similar observation was made earlier by Brockerhoff (1993) on a much smaller sample of African countries.

Discussion

The aim of this paper was to provide a broad overview on the relationships between urbanization, poverty and child health in Africa. As seen throughout the review, the subject appears especially complex and versatile, and this study does not have the ambition to be by no means complete. What came out clearly from this first investigation was that the variety of situations in Africa was quite similar to the variety of situations found throughout the world, and that only detailed analysis of the many specific cases would bring more light to the matter.

Furthermore, it should be reminded that the health transition appears more complex and diverse in Africa compared to other continents, primarily due to the difficult evolutions of the political and economic situations since the independence movements, as well as recent trends in emerging diseases, in particular HIV/AIDS. Many instances of rising under-five mortality have been documented, either as a consequence of economic and political crisis, or as a consequence of emerging diseases (Garenne, 1997).

Health policies, social policies, and housing programs were not identical in the various African countries since independence, and choices made by governments could have not only an impact on the speed of the mortality decline, but also on differences between urban and rural areas. For instance, when most of the health infrastructure and personnel lie in urban areas (such as Senegal), the gap between urban and rural mortality is larger, and the potential benefits for migrants to towns and cities are larger. On the contrary, when a colonial tradition of neglecting urban slums had continued after independence (such as in Kenya), situations of excess urban mortality among the poor may persist and even getting worse. The history of these health and social policies remains to be written, and their links with child mortality, and adult mortality as well, remain to be explored.

Much remains to be studied about recent African migration, since we have only vague accounts on the magnitude of migration flows over the past 50 years, and know even less about the motivation for moving for most of the migrants. Similarly, urbanization remains understudied in Africa. As Brockerhoff showed, size and types of cities and towns might have close relationships with health issues, not counting the health infrastructure and environment of each location. Detailed analysis of these contrasted situations would be most valuable.

More than other places in the world, Africa suffered recently from a series of attacks of emerging diseases, the most visible of them being HIV/AIDS, tuberculosis and cholera. To this short list one could add resistant strains of malaria, and probably a series of sexually transmitted diseases, including hepatitis B and Herpes. HIV/AIDS, tuberculosis and malaria are probably the most important diseases in this list accounting for a rise in under-five mortality. It is striking to note that in most places where mortality increased since 1990, HIV prevalence is also very high and rising (Kenya, Zambia, Zimbabwe, South Africa etc.). These countries are also countries where the urban poor seem often to be in a relative disadvantaged situation compared to other strata. Whether the mortality increase among the urban poor noticed in some countries is due to HIV/AIDS or to poor health and social policies remains to be investigated country by country.

Geographical patterns of mortality decline or increase or of differences between urban and rural areas may shed some light on the ultimate determinants of health in Africa (Allison and Harpham, 2002). In particular, it is striking to note that many countries with excess mortality among the urban poor lie in Eastern and Southern Africa: this could be either associated with a pattern of social policies in these former British colonies, or simply an effect of the HIV/AIDS epidemic, which rages in this part of the continent more than elsewhere.

The study of the relationships between migration, urbanization and health may have theoretical implications to better understand the determinants of child health. For instance, comparing the survival of children of the same mothers, with the same socio-economic, in different environments may reveal the role of the environment. However, it should be noted that in many cases the social and economic situation of the migrant mother as measured by demographic surveys is closely associated with the move itself. Not only the mother moves to an urban environment, but also she gains in socio-economic status, in income, in quality of housing, in hygiene, in access to health services, in health information, and sometimes may even improve her level of education by going back to regular school or to professional school. The development process often appears as a whole change in the economic and social situation, and trying the estimate the effect of each factor might become illusory, when the global social change is the important phenomenon explaining the health situation.

Better documenting the needs of migrants may help reshape current health and social policies in a number of countries. Even though international organizations and aid agencies help developing countries to formulate and implement health and social policies, they sometimes lack the basic information to target the groups most in need. The situations of rising mortality and of the high mortality of the urban poor in a number of countries call for a special attention on the determinants of poor health and deteriorating situations, which require special policies and actions.

The focus of this review was on child health, primarily because it is better documented than other aspects of health. In particular, the wealth of data provided by the Demographic and Health Surveys is unique, and has no comparison for other age groups. However, it should be remembered that many other health issues and other age groups are at stake in modern Africa: young adults, the middle aged, and the elderly also suffer from various ailments: the same communicable diseases (HIV/AIDS, tuberculosis, cholera, malaria), nutritional disorders (obesity is a public health problem in South Africa), non-communicable diseases associated with modern life style (hypertension and diabetes in particular), mental disorders (in particular stress associated with rapid modernization), and a variety of forms of violence (car accidents, household accidents, homicide and suicide). Most of these new health problems probably affect disproportionately the newly settled urban poor.

This study opens many doors for further research on migration and health: the effect of public policies on trends in both migration and health and their interactions; the differential effects of emerging diseases in particular HIV/AIDS by social strata; the emerging urban poverty and its health and environmental consequences; the detailed study of causes of death

and morbidity among migrants and among settled persons; the consequences of premature young adult mortality on household structures, family links, and migration. Promoting these studies seems to imply to conduct both in-depth case studies, local and national, as well as international comparisons. Implications of improving this scientific knowledge for population and health policies are numerous, as could be seen for the complex political issues surrounding the HIV/AIDS epidemic.

Acknowledgement

The author is grateful to Mr. Mark Collinson, from the Agincourt field site, and to Dr. Enéas Gakusi, who commented on an earlier version of this manuscript and suggested key references.

References

Allison M, Harpham T. (2002). Southern African perspectives on the geography of health. *Health and Place*; 8:223-225.

Alzeer A, Mashlah A, Fakim N, Al-Sugair N, Al-Hedaithy M, Al-Majed S, Jamjoom G. (1998). Tuberculosis is the commonest cause of pneumonia requiring hospitalization during Hajj (pilgrimage to Makkah). *Journal of Infection*; 36(3):303-306.

Antoine P, Diouf PD. (1988). Urbanisation, scolarisation et mortalité des enfants. *Annales de L' IFORD*; 12(1):9-24.

APHRC. (2002). Population and health dynamics in Nairobi's informal settlements. Nairobi, African Population and Health Research Centre. (256 p.)

Basta SS. (1977). Malnutrition and health in low-income urban areas of the Third world. *Ecology of Food and Nutrition*; 6:113-124.

Berlinguer G. (1993). The interchange of disease and health between the Old and New worlds. *International Journal of Health Services*; 23(4):703-715.

Bicego G; Chahnazarian A; Hill K; Cayemittes M. (1991). Trends, age patterns and differentials in childhood mortality in Haiti (1960-1987). *Population Studies*; 45(2):235-252.

Bollini P. (1993). Health for immigrants and refugees in the 1990's. *Innovation*; 6(1):101-110.

Brockerhoff M. (1990). Rural-to-urban migration and child survival in Senegal. *Demography*; 27(4):601-616.

Brockerhoff M. (1993). Child survival in big cities: are the poor disadvantaged? New York, Population Council, Research Division Working Papers No 58. (53 p).

Charbit Y; Robin N. (1994). Migrations africaines. *Revue Européenne des Migrations Internationales*; 10(3) [Poitiers, France, Université de Poitiers, 214 p].

Cherry L. (1988). South Africa use deportation in the battle against AIDS. *Nature*; 332(6163):386.

Cleland J, Bicego G, Fegan G. (1992). Socioeconomic inequalities in childhood mortality: the 1970's to the 1980's. *Health Transition Review*; 2(1):1-18.

Cleland J, van Ginneken J. (1988). Maternal education and child survival in developing countries: the search for pathways of influence. *Social Science and Medicine*; 27(12):1357-1368.

Chirwa WC. (1997). “No TEBA...forget TEBA": the plight of Malawian ex-migrant workers to South Africa, 1988-1994. *International Migration Review*; 31(3):628-54.

Coady DE. (1982). Medical and psychosocial problems of refugees overseas. In: NCIH – *New Developments in Tropical Medicine*. Washington, National Council for International Health.

Collinson M, Garenne M, Tollman S, Kahn K, Mokoena O. (2001). Moving to Mkhuhlu: emerging patterns of migration in the new South Africa. Paper presented at the fourth African Census Analysis Project Workshop, Dakar, Senegal, January 2001. To be published in the conference proceedings (forthcoming).

Collinson M, Tollman SM, Garenne M, Kahn K. (2001). Temporary female migration and labour force participation in rural South Africa. Princeton University, Center for Migration and Development, Working Paper.

Cookson S, Waldman R, Gushulak B, MacPherson D, Burkle F, Paquet C, Kliever E, Walker P. (1998). Immigrant and refugee health. *Emerging Infectious Diseases*; 4:427-428.

Courbage Y; Khlat M. (1996). Mortality and causes of death of Moroccans in France, 1979-91. *Population: An English Selection*; 8:59-94.

Crosby AW. (1989). *America' s forgotten pandemic : the influenza of 1918* Cambridge University Press.

De Jongh M. (1994). Mozambican refugee resettlement: survival strategies of involuntary migrants in South Africa. *Journal of Refugee Studies*; 7(2-3):220-238.

Dolan CG, Tollman SM, Nkuna VG, Gear JS. (1997). The links between legal status and environmental health: a case study of Mozambican refugees and their hosts in the Mpumalanga (eastern Transvaal) lowveld, South Africa. *Health and Human Rights*; 2(2):63-84.

Dondero TJ. (1985). Nutrition and health needs in drought-stricken Africa. *Public Health Reports*; 100(6):634-638.

Dowell SF, Toko A, Sita C, Piarroux R, Duerr A, Woodruff BA. (1995). Health and nutrition in centers for unaccompanied refugee children. Experience from the 1994 Rwandan refugee crisis. *JAMA*; 273(22):1802-1806.

Dyson T. (1997). Infant and child mortality in the Indian subcontinent, 1881-1947. In: *Infant and child mortality in the past*, edited by Alain Bideau, Bertrand Desjardins, Hector Perez Brignoli. Oxford, England, Oxford University Press: 109-134.

Ebrahim GJ. (1983). Primary care and the urban poor. *Journal of Tropical Pediatrics*; 29(1):2-3.

Egunjobi L. (1991). Tackling Africa's slums. *World Health*;():14-15.

Elman C, Myers GC. (1999). Geographic morbidity differentials in the late nineteenth-century United States. *Demography*; 36(4):429-443.

Englund H. (1998). Death, trauma and ritual: Mozambican refugees in Malawi. *Social Science and Medicine*; 46(9):1165-74.

Garenne M, Madison M, Tarantola D, Zanou B, Aka J, Dogoré R. (1995). Conséquences démographiques du sida en Abidjan : 1986-1992. *Etudes du CEPED n° 10*, 1995. Paris, CEPED.

Gilbert A, Gugler J. (1992). Cities, poverty and development. Oxford, Oxford University Press.

Girdler-Brown B. (1998). Eastern and Southern Africa. *International Migration*; 36(4):513-551.

Grmek, MD. (1996). Les premières étapes de la vaccination: mythe et histoire. In: AM Moulin editor: *L'aventure de la vaccination*. Paris, Fayard.

Guimaraes de Lima JJ, Fishman A. (1985). Inequalities in the 1980 infant mortality among shanty town residents in the municipality of Porto Allegre, Rio Grande do Sul of Brazil. *PAHO Bulletin*; 19:235-251.

Hargreaves J, Collinson M, Kahn K, Tollman S, Clark S. (2002). Socio-economic status and child mortality in Agincourt, a rural sub-district of South Africa. Report to INDEPTH.

Harpham T, Stephens C. (1991). Urban health in developing countries: from the shadows into the spotlight. *Tropical Diseases Bulletin*; 88(8):1-35.

Harpham T, Lusty T, Vaughan P. (1988). *In the shadow of the city: community health and the urban poor*. Oxford, Oxford University Press.

Hawley AH. (1964). World urbanization: trends and prospects. In: Freedman R, editor. *Population: the vital revolution.* Garden City, New York, Doubleday: 70-83.

Hewett PC, Montgomery MR. (2001). Poverty and public services in developing countries. Population Council, Research Division, Paper No 154.

Houdaille J. (1980). La mortalité des enfants en Europe avant le XIXe siecle. In: Boulanger PM, Tabutin D. La mortalité des enfants dans le monde et dans l' histoire. Liège, Belgium, Ordina Editions: 85-118.

Jokelson K, Mothibeli M, Leger JP. (1991). Human Immunodeficiency virus and migrant labour in South Africa. *International Journal of Health Services*; 21(1):157-173.

Kanno NB. (1985). Lesotho: a case study of migration and health delivery. In: Lindsay B. editor, *African migration and national development*. University Park, PA, Pennsylvania State University.

Kahn K, Tollman SM, Garenne M; Gear JS. 1999. Who dies from what? Determining cause of death in South Africa's rural Northeast. *Tropical Medicine and International Health*, (June 1999); 4(6):433-441.

Lurie M, Harrison A, Wilkinson D, Abdool Karim S. (1997). Circular migration and sexual networking in rural Kwazulu Natal: implications for the spread of HIV and other sexually transmitted diseases. *Health Transition Review*; 7 Suppl 3:17-27.

Lurie M. (2000). Migration and health in Southern Africa: a review. *South African Journal of Science*; 96:343-347.

McDaniel A; Preston SH. Patterns of mortality by age and cause of death among nineteenth-century immigrants to Liberia. *Population Studies*. 1994 Mar;48(1):99-115.

McNeill, WH. (1976). *Plagues and peoples*. New York, Anchor Books.

Mears R. (1997). Rural-urban migration or urbanization in South Africa. *South African Journal of Economics*. Dec;65(4):595-614.

Memish ZA. (2002). Meningococcal disease and travel. *Clinical Infectious Diseases*; 34(1):84-90.

Mgabo MC. (1994). Some correlates of child mortality in the refugee populated regions in Tanzania. (1994). *Journal of Biosocial Science*; 26(4):451-467.

Mijere NJ; Chilivumbo A Rural-urban migration and urbanization in Zambia during the colonial and postcolonial. In: *Population growth and environmental degradation in southern Africa*, edited by Ezekiel Kalipeni periods. Boulder, Colorado, Lynne Rienner Publishers:147-77.

Milazi D. (1995). Emigration dynamics in southern Africa. *International Migration*; 33(3-4):521-56.

Moren A, Bitar D, Navarre I, Gastellu Etchegorry M, Brodel A, Lungu G, Hakewill P. (1991). *Disasters;* 15(4):363-372.

Ohadike PO. (1972). Migrants in the copper mines of Zambia, 1940-66. In: Ominde, S.H. and Ejiogu, C.N., eds. *Population growth and economic development in Africa*. London, Heinemann: 252-261.

Packard, RM. (1989). White plague, black labor: tuberculosis and the political economy of health and disease in South Africa. Berkeley, University of California Press.

Patterson KD, Pyle GE. (1983). The diffusion of influenza in sub-Saharan Africa. *Social Science and Medicine*, 17 (): 1302-

Pick W, Cooper D. (1997). Urbanisation and women's health in South Africa. *African Journal of Reproductive Health*; 1(1):45-55.

Pryer JN, Crook N. (1988). Cities of hunger: urban malnutrition in developing countries. Oxford: Oxfam.

Poulain M; Tabutin D. (1980). La mortalité aux jeunes âges en Europe et en Amérique du Nord du XIXe à nos jours. In: Boulanger PM, Tabutin D. *La mortalité des enfants dans le monde et dans l' histoire*Liège, Belgium, Ordina Editions: 119-157.

Preston SH, van de Walle E. (1978). Urban French Mortality in the Nineteenth Century. *Population Studies*. Vol. 32 (2): 275-297.

Preston SH. (1985). Resources, knowledge, and child mortality: a comparison of the US in the Late Nineteenth Century and Developing Countries Today," *IUSSP International Population Conference. Florence. June 5-12, 1985 (Proceedings*). Vol 4, pp. 373-388.

Preston SH, Keyfitz N, Schoen R. (1972). Causes of death: life tables for national populations. New York, Seminar Press.

Rohde J. (1983). Why the other half dies: the science and politics of child mortality in the Third world. *Assignment Children*; 61/62:35-37.

Seaman J. (1992). Famine mortality in Ethiopia and Sudan. In*: Mortality and society in Sub-Saharan Africa,* edited by Etienne van de Walle, Gilles Pison, and Mpembele Sala-Diakanda. Oxford, England, Clarendon Press: 349-366.

Shears P, Lusty T. (1987). Communicable disease epidemiology following migration: studies from the African famine. *International Migration Review*; 21(3):783-795.

Sheik-Mohamed A; Velema JP. Where health care has no access: the nomadic populations of sub-Saharan Africa. *Tropical Medicine & International Health*. 1999 Oct;4(10):695-707.

Shorter E. (1992). What can two historical examples of sexually-transmitted diseases teach us about AIDS? In: Sexual behaviour and networking: anthropological and socio-cultural studies on the transmission of HIV. Edited by Tim Dyson. 49-64. Liege, Belgium, Editions Derouaux-Ordina.

Siem H. (1997). Migration and health – the international perspective.*Praxis*; 86:788-793.

Siem H, Bollinini P. (1992). Migration and health in the 1990's. *International Migration*; 30:209-214.

Swerdlow DL; Malenga G; Begkoyian G; Nyangulu D; Toole M; Waldman RJ; Puhr DN; Tauxe RV. (1997). Epidemic cholera among refugees in Malawi, Africa: treatment and transmission. *Epidemiology and Infection*; 118(3):207-14.

Timaeus IM, Lush L. (1995). Intra-urban differentials in child health. *Health Transition Review*; 5(2):163-190.

Toole MJ, Waldman RJ. (1988). An analysis of mortality trends among refugee populations in Somalia, Sudan and Thailand. *WHO Bulletin*; 66(2):237-247.

Toole MJ, Nieburg P, Walman RJ. (1988). The association between inadequate rations, undernutrition prevalence and mortality in refugee camps: case studies of refugee population in Eastern Thailand, 1979-1980 and Eastern Sudan, 1984-1985. *Journal of Tropical Pediatrics*; 34(5):218-224.

Trenerry CF. (1926). Tables of annuity values which were sanctioned by the Roman law for the purposes of the *Lex Facidia*. In *The Origin and early history of insurance*. London, King & Son. [Reprinted in D. Smith and N. Keyfitz editors, *Mathematical Demography: selected papers*. Berlin, Springer Verlag, 1977].

UN-HCR. Mortality among newly arrived Mozambican refugees – Zimbabwe and Malawi, 1992. (1993). MMWR; 42(24):468-469, 475-477.

Unterhalter B. (1982). Inequalities in health and disease: the case of mortality rates for the city of Johannesburg, South Africa, 1910-1979. *International Journal of Health Services*; 12(4):617-636.

Vaugham M. (1988). Measuring crisis in maternal and child health: an historical perspective. In: Wright M, Stein Z, Scandlyn J, editors: *Women's health and apartheid: the health of women and children and the future of progressive primary health care in Southern Africa*. New York, Columbia University Press.

Warnasuriya N. (1998). Middle East migration and health. *Sri Lanka Journal of Population Studies*; 1(1):57-63.

Wilson ME. (1995). Travel and the emergence of infectious diseases. *Emerging Infectious Diseases*; 1(2):39-46.

Woods RI, Watterson PA, Woodward JH. (1988). Mortality decline in England and Wales, 1861-1921. *Population Studies*, 42 () : 343-366

Yach D. (1994). Health status and its determinants in South Africa. *Africa Health*; (Spec No):5-8.

Young H; Jaspars S. (1995). Nutrition, disease and death in times of famine. *Disasters*; 19(2):94-109.

Web sites :

Measure-DHS : www.measuredhs.com

International Organisation of Migration (IOM): www.iom.com

Refugees International: www.refugeesinternational.org

Table 1: Trends in urbanisation in Africa (source: United Nations, Population Division)

Country	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000
Algeria	22.3	26.1	30.4	37.6	39.5	40.3	43.5	48.0	51.4	54.3	60.3
Angola	7.6	8.9	10.4	12.5	15.0	17.8	20.9	24.2	27.6	31.0	34.2
Benin	4.9	6.8	9.3	12.5	16.7	21.9	27.3	30.8	34.5	38.4	42.3
Botswana	0.3	0.9	1.9	3.8	8.2	12.8	18.4	28.6	42.3	47.2	50.3
Burkina Faso	3.8	4.2	4.7	5.2	5.7	6.3	8.5	11.4	13.6	15.0	18.5
Burundi	2.0	2.1	2.2	2.3	2.4	3.2	4.3	5.2	6.3	7.5	9.0
Cameroon	9.8	11.7	13.9	16.4	20.3	26.9	31.4	35.7	40.3	44.7	48.9
Cape Verde	8.2	11.2	16.3	17.9	19.5	21.6	23.5	33.0	44.2	54.2	62.3
Central African Republic	16.0	19.1	22.7	26.7	30.2	33.7	35.1	36.3	37.5	39.1	41.2
Chad	3.8	5.1	6.8	9.0	11.8	15.6	18.8	19.9	21.0	22.2	23.8
Comoros	3.5	5.7	9.8	16.3	19.3	21.3	23.2	25.4	27.9	30.4	33.1
Congo	30.9	31.4	31.9	32.3	32.9	35.0	42.0	49.3	55.7	61.2	62.5
Côte d' Ivoire	13.2	16.0	19.3	23.1	27.4	32.1	34.7	37.5	39.9	41.7	46.4
Djibouti	41.9	45.6	48.8	54.4	61.9	69.0	74.2	78.2	81.0	82.9	83.3
Egypt	31.9	34.8	37.9	40.7	42.2	43.5	43.8	43.9	43.6	43.1	45.2
Equatorial Guinea	16.0	20.3	25.4	26.4	26.7	27.1	27.2	29.8	35.8	42.3	48.1
Eritrea	5.9	7.1	8.7	10.4	11.7	12.7	13.8	14.8	15.8	17.1	18.7
Ethiopia	4.6	5.4	6.4	7.6	8.6	9.5	10.5	11.6	12.7	14.0	17.6
Gabon	11.3	14.1	17.5	23.4	31.2	40.0	49.6	59.2	68.1	75.9	81.4
Gambia	10.5	11.5	12.5	13.6	15.1	17.0	19.7	22.3	24.9	27.6	32.5
Ghana	14.5	18.5	23.2	26.1	29.0	30.1	31.2	32.3	33.5	34.8	38.4
Guinea	5.5	8.4	9.9	11.7	13.8	16.3	19.1	21.6	23.4	25.4	32.8
Guinea-Bissau	10.1	11.7	13.6	14.4	15.1	15.9	17.3	20.4	23.8	27.6	23.7
Kenya	5.6	6.4	7.4	8.6	10.3	12.9	16.1	19.8	24.0	28.5	33.1
Lesotho	1.0	1.9	3.4	6.3	8.6	10.8	13.4	16.5	20.1	24.0	28.0
Liberia	13.0	15.6	18.7	22.1	26.0	30.3	35.0	39.3	42.0	42.0	44.9
Libya	18.6	20.6	22.8	27.4	45.3	60.9	69.3	76.7	81.8	85.3	87.6
Madagascar	7.8	9.1	10.6	12.4	14.1	16.3	18.5	20.9	23.6	26.4	29.6
Malawi	3.5	3.9	4.4	4.9	6.0	7.7	9.1	10.3	11.6	13.1	24.9
Mali	8.5	9.7	11.1	12.6	14.3	16.2	18.5	21.0	23.8	26.9	30.0
Mauritania	2.3	3.7	5.8	9.0	13.7	20.3	27.7	36.0	44.0	50.9	57.7
Mauritius	28.8	30.9	33.2	37.1	42.0	43.4	42.3	41.3	40.5	40.5	41.3
Morocco	26.2	27.7	29.2	31.9	34.6	37.8	41.3	44.8	48.4	52.0	56.1
Mozambique	2.5	3.1	3.8	4.7	5.8	8.7	13.1	16.7	21.1	26.2	40.2
Namibia	9.4	12.0	15.0	16.7	18.6	20.6	22.8	24.7	26.6	28.6	30.9
Niger	4.8	5.3	5.8	6.8	8.5	10.6	12.6	14.3	16.1	18.2	20.6
Nigeria	10.1	12.1	14.4	17.0	20.0	23.4	26.9	30.7	35.0	39.6	44.0
Reunion	23.4	27.8	32.8	38.2	43.6	49.1	54.6	59.5	63.9	67.8	70.9
Rwanda	1.8	2.1	2.4	2.8	3.2	4.0	4.7	5.0	5.3	5.7	6.2
Saint Helena	20.0	20.0	20.0	20.0	20.0	20.0	20.0	40.0	50.0	66.7	66.7
Sao Tome and Principe	13.3	14.5	15.6	19.1	23.3	27.2	30.9	34.6	39.1	42.9	46.7
Senegal	30.5	31.2	31.9	32.7	33.4	34.2	35.7	37.5	40.0	43.8	47.4
Seychelles	26.5	26.3	26.2	25.5	26.4	33.3	41.3	47.0	53.6	59.2	63.8
Sierra Leone	6.7	8.6	11.0	14.0	17.5	21.4	24.0	26.9	30.0	33.3	36.6
Somalia	12.7	14.9	17.3	19.5	20.4	21.3	22.2	23.2	24.2	25.6	27.5
South Africa	43.1	44.9	46.6	47.2	47.8	48.0	48.1	48.3	48.8	52.6	50.4
Sudan	6.3	8.1	10.3	13.0	16.4	18.9	20.0	22.4	26.6	31.4	36.1
Swaziland	1.5	2.4	4.0	6.5	9.8	13.9	17.9	21.9	23.8	25.0	26.4
Togo	7.2	8.5	9.8	11.4	13.1	16.3	22.9	26.5	28.5	30.8	33.3

Tunisia	31.2	32.9	36.0	39.5	44.5	49.9	51.5	53.8	57.9	61.9	65.5
Uganda	3.1	4.0	5.1	6.5	8.0	8.3	8.8	9.9	11.2	12.5	14.2
Tanzania	3.8	4.2	4.7	5.3	6.7	10.1	14.8	17.6	21.7	26.9	32.9
Western Sahara	69.2	61.9	55.9	49.1	43.4	55.4	69.3	80.0	87.6	93.0	95.2
Congo Democat Rep (Zaire)	19.1	20.7	22.3	26.1	30.3	29.5	28.7	27.9	27.9	28.7	30.3
Zambia	8.9	12.5	17.2	23.3	30.2	34.8	39.8	39.7	39.4	39.2	39.6
Zimbabwe	10.6	11.6	12.6	14.4	16.9	19.6	22.3	25.2	28.4	31.8	35.3

Table 2: Urban / rural differentials in under-five mortality in Africa (source: WFS and DHS surveys)

Survey (country, year)	Urban	Rural	RR	P-value	Significant
Benin 1982	182.0	242.7	1.33	0.000	*
Benin 1996	150.0	199.5	1.33	0.000	*
Botswana 1988	55.3	55.2	1.00	0.987	
Burkina Faso 1992/93	148.4	214.4	1.44	0.000	*
Burkina Faso 1998/99	129.1	234.7	1.82	0.000	*
Burundi 1987	163.7	184.2	1.13	0.180	
Cameroon 1978	145.2	206.2	1.42	0.000	*
Cameroon 1991	120.3	158.6	1.32	0.000	*
Cameroon 1998	110.7	160.1	1.45	0.000	*
CAR 1994/95	128.6	178.4	1.39	0.000	*
Comoros 1996	80.7	122.6	1.52	0.001	*
Côte d' Ivoire 1980	167.2	210.8	1.26	0.000	*
Cote d' Ivoire 1994	120.2	165.2	1.37	0.000	*
Cote d' Ivoire 1998/99	125.2	196.8	1.57	0.000	*
Eritrea 1995	128.9	159.9	1.24	0.000	*
Ethiopia 2000	148.6	192.5	1.30	0.000	*
Gabon 2000	88.4	99.9	1.13	0.120	
Ghana 1979	113.1	141.1	1.25	0.001	*
Ghana 1988	131.0	162.5	1.24	0.003	*
Ghana 1993	89.9	149.2	1.66	0.000	*
Ghana 1998	76.8	122.0	1.59	0.000	*
Guinea 1999	148.7	210.6	1.42	0.000	*
Kenya 1978	125.5	155.8	1.24	0.004	*
Kenya 1989	88.5	91.6	1.04	0.638	
Kenya 1993	75.4	95.6	1.27	0.022	*
Kenya 1998	88.3	108.6	1.23	0.023	*
Lesotho 1977	201.1	188.8	0.94	0.596	
Liberia 1986	217.8	239.7	1.10	0.037	*
Madagascar 1992	142.1	183.4	1.29	0.000	*
Madagascar 1997	127.1	173.8	1.37	0.000	*
Malawi 1992	205.4	244.1	1.19	0.002	*
Malawi 2000	147.9	210.4	1.42	0.000	*
Mali 1987	199.6	302.8	1.52	0.000	*
Mali 1995/1996	190.3	272.6	1.43	0.000	*
Mozambique 1997	150.4	236.9	1.58	0.000	*
Namibia 1992	86.3	94.7	1.10	0.284	
Niger 1992	210.3	346.9	1.65	0.000	*
Niger 1998	178.1	327.4	1.84	0.000	*
Nigeria 1982	128.5	167.0	1.30	0.000	*
Nigeria 1990	130.1	208.0	1.60	0.000	*
Nigeria 1999	107.8	142.8	1.32	0.000	*
Rwanda 1983	174.4	227.9	1.31	0.000	*
Rwanda 1992	155.3	163.0	1.05	0.500	
Rwanda 2000	141.3	216.2	1.53	0.000	*
Senegal 1978	169.1	343.1	2.03	0.000	*
Senegal 1986	137.2	250.3	1.82	0.000	*
Senegal 1992/93	102.0	184.4	1.81	0.000	*
Senegal 1997	89.5	165.4	1.85	0.000	*
South Africa 1998	43.2	71.2	1.65	0.000	*
Sudan 1979	125.8	158.9	1.26	0.000	*
Sudan 1990	117.0	144.0	1.23	0.000	*
Tanzania 1992	144.1	152.0	1.05	0.377	
Tanzania 1996	120.3	150.0	1.25	0.000	*
Chad 1996/97	190.1	204.2	1.07	0.075	
Togo 1988	131.7	169.6	1.29	0.002	*

Togo 1998	101.3	157.4	1.55	0.000 *
Uganda 1988	164.3	189.4	1.15	0.121
Uganda 1995	133.5	159.1	1.19	0.021 *
Uganda 2000/01	100.5	163.8	1.63	0.000 *
Zambia 1992	151.2	201.4	1.33	0.000 *
Zambia 1996	173.3	204.5	1.18	0.000 *
Zimbabwe 1988	53.2	96.1	1.81	0.000 *
Zimbabwe 1994	63.0	80.3	1.27	0.021 *
Zimbabwe 1999	69.0	99.7	1.44	0.001 *

Table 3: Changes in the relationship between urban and rural mortality in Africa (source: WFS and DHS surveys)

Country	Change	Observation
Angola	No change	Despite rising mortality 1985-1995
Benin	Converge	Mortality decline in rural areas, stagnation in urban areas since 1980
Botswana	No change	No gap between urban and rural
Burkina Faso	Converge	Mortality decline somewhat faster in rural areas
Burundi	Converge	Mortality decline in rural areas, increase in urban areas 1967-1986
Cameroon	No change	Despite rising mortality in the 1990' s
Central African R	No change	Slow mortality decline
Comoros	Converge	Faster mortality decline in rural areas
Côte d' Ivoire	No change	No mortality decline since the mid 1980' s
Ethiopia	No change	Somewhat increasing gap in the 1980' s, narrowed after 1992
Ghana	No change	Despite rising mortality 1979-1983
Guinea	No change	Regular mortality decline
Kenya	No change	Despite rising mortality since 1985
Lesotho	No change	Small difference between urban and rural, no decline 1960-1977
Liberia	No change	Regular mortality decline
Madagascar	No change	Despite rising mortality 1973-1987
Malawi	Converge	Mortality increase in urban areas, steady level in rural areas since 1983
Mali	No change	Regular mortality decline
Mozambique	No change	Increasing gap during the civil war (1979-1994), narrowed later
Namibia	No change	Despite rising mortality 1975-1985; only small difference U/R
Niger	Diverge	Increasing gap in 1970-1992; but narrowed later
Nigeria	No change	Despite steady mortality levels 1975-1990
Rwanda	Converge	Mortality decline faster in rural areas from 1978 to 1992
Senegal	Converge	Mortality decline faster in rural areas from 1972 to 1996; large gap
Sudan	No change	Increasing gap in 1974-1986, but narrowed later
Tanzania	No change	Narrowing gap in 1978-1992, increased later
Chad	No change	Regular mortality decline, small difference U/R
Togo	Converge	Mortality decline faster in rural areas from 1966 to 1998
Uganda	Converge	Despite mortality increase 1971-1986
Zambia	Converge	Faster mortality increase in urban areas 1975-1992
Zimbabwe	Converge	Faster mortality increase in urban areas 1985-1999

Table 4: Under-five mortality differentials according to socio-economic status and area of residence, Africa DHS surveys.

	Wealthier strata		Poorer strata	
Survey (country, year)	Urban	Rural	Urban	Rural
Burkina Faso 1992/93	0.139	0.164	0.163	0.222
Burkina Faso 1998/99	0.128	0.190	0.131	0.237
Benin 1996	0.143	0.176	0.162	0.209
Botswana 1988	0.042	0.055	0.066	0.055
Burundi 1987	0.109	0.076	0.234	0.187
CAR 1994/95	0.088	0.139	0.150	0.183
Cote d' Ivoire 1994	0.108	0.135	0.152	0.175
Cameroon 1991	0.093	0.097	0.165	0.168
Cameroon 1998	0.098	0.096	0.135	0.170
Ethiopia 2000	0.099	0.082	0.191	0.191
Ghana 1988	0.127	0.157	0.160	0.166
Ghana 1993	0.068	0.119	0.116	0.155
Ghana 1998	0.049	0.091	0.121	0.124
Guinea 1999	0.129	0.124	0.160	0.211
Kenya 1989	0.060	0.051	0.121	0.094
Kenya 1993	0.062	0.065	0.128	0.103
Kenya 1998	0.075	0.065	0.124	0.117
Comoros 1996	0.059	0.091	0.088	0.124
Liberia 1986	0.192	0.173	0.240	0.250
Madagascar 1992	0.096	0.034	0.165	0.187
Madagascar 1997	0.072	0.103	0.148	0.177
Mali 1987	0.157	0.325	0.229	0.303
Mali 1995/1996	0.147	0.217	0.224	0.278
Malawi 1992	0.161	0.159	0.256	0.253
Mozambique 1997	0.131	0.236	0.160	0.239
Nigeria 1990	0.123	0.167	0.170	0.220
Nigeria 1999	0.103	0.122	0.142	0.154
Niger 1992	0.143	0.269	0.252	0.351
Niger 1998	0.123	0.243	0.204	0.325
Namibia 1992	0.081	0.081	0.099	0.098
Rwanda 1992	0.082	0.079	0.184	0.166
Sudan 1990	0.094	0.105	0.146	0.152
Senegal 1986	0.122	0.176	0.196	0.261
Senegal 1992/93	0.079	0.116	0.141	0.192
Senegal 1997	0.077	0.126	0.119	0.172
Chad 1996/97	0.147	0.051	0.199	0.204
Togo 1988	0.126	0.147	0.169	0.176
Togo 1998	0.090	0.128	0.112	0.157
Tanzania 1992	0.115	0.097	0.167	0.152
Tanzania 1996	0.081	0.117	0.145	0.153
Uganda 1988	0.147	0.142	0.203	0.196
Uganda 1995	0.103	0.131	0.155	0.162
Zambia 1992	0.120	0.142	0.192	0.209
Zambia 1996	0.139	0.198	0.223	0.208
Zimbabwe 1988	0.061	0.078	0.035	0.097
Zimbabwe 1994	0.056	0.088	0.096	0.079
Zimbabwe 1999	0.068	0.093	0.081	0.100
All countries	0.105	0.129	0.167	0.191

Figure 1

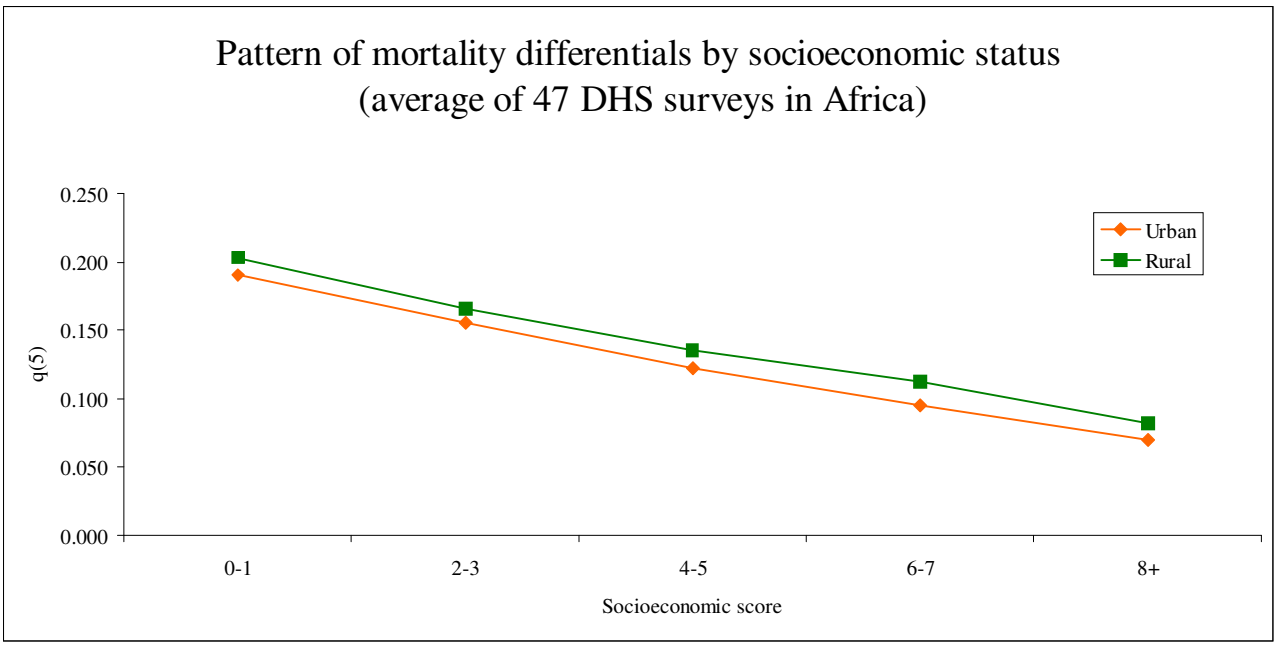
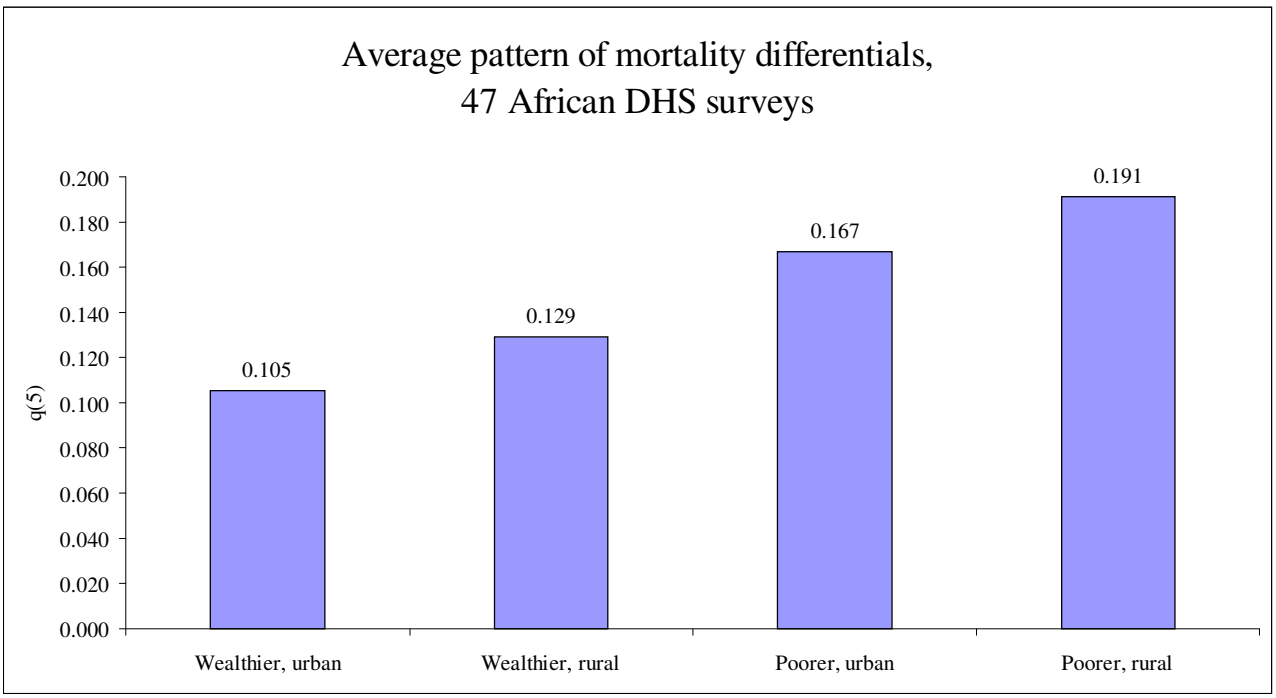

Pattern of mortality differentials by socioeconomic status
(average of 47 DHS surveys in Africa)
0.250
0.200
0.150
0.100
0.050
0.000
q(5)
0-1
2-3
4-5
6-7
8+
Socioeconomic score
Urban
Rural

Figure 2


Average pattern of mortality differentials,
47 African DHS surveys
q(5)
0.200
0.180
0.160
0.140
0.120
0.100
0.080
0.060
0.040
0.020
0.000
0.105
0.129
0.167
0.191
Wealthier, urban
Wealthier, rural
Poorer, urban
Poorer, rural