

Migration, Urbanisation and Child Health in Africa: A Global Perspective

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Abstract:

The paper reviews the complex relationships between migration, urbanisation and health in a global perspective, with special focus on contemporary issues of recent migration trends 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.

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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 first part of this paper reviews some examples of these complex interactions in historical populations. The second part introduces the context of modern public health and economic development, which dramatically changed the nature of the relationships between migration and health. The third part deals with the variety in the types of moves and migration as it relates to potential health effects. The last part focuses on current trends in the relationships between migration, urbanisation and child health in sub-Saharan Africa.

1 - Historical background

Spread of communicable diseases and population movements

A most visible effect of population movements is that migrants may carry communicable diseases with them and propagate these diseases in host populations, from country to country and from region to region. The observation, as well as the fear, that migrants and travellers carry and bring diseases is very old, and isolation and quarantine policies were applied very early in Europe, probably since the 12th century in Venice (Rosen, 1958). The peak of leprosy in the 13th and 14th century was attributed to the “large shifts in population” induced by the Crusades (Rosen, 1958). Plague was often introduced in Europe by merchants travelling on ships coming from the East since the great black plague epidemic of 1346. Similarly cholera was usually introduced by merchant ships in Europe, the United States, and many overseas countries during the 19th century. Large population movements occurring at the end of the first world war, in particular troops travelling overseas, contributed to the rapid spread of the Spanish flu in 1918-1919, from Europe to the United States, Africa and South Asia, causing millions of deaths (Crosby, 1989; Patterson and Pyle, 1983). Similarly, Europeans and Africans moving to the new world in the 16th and 17th century carried with them a variety of viral diseases, in particular

smallpox, measles and yellow fever, and parasitic diseases, in particular malaria, diseases which were new to the host population, the Amerindians. These diseases caused the premature death of probably 90% of them within less than a century, resulting in major changes in settlement patterns of the Americas (McNeill, 1976; Guerra, 1993; Berlinguer, 1993). Quarantine policies, isolation and restriction to population movements remained one of the main tools to fight a number of communicable diseases until the 20th century. The debate on whether quarantine policies and population movements controls are efficient was still vivid in the second part of the 20th century. For instance, cholera epidemics still induced controls of the moves of travellers until the 1970's. The emerging HIV/AIDS epidemic in the 1980's also provoked the screening for HIV and restrictions to migration in countries as diverse as the USA, China, Russia and South Africa, though most of these controls were later lifted for protecting individual human rights (Cherry, 1988). The screening for tuberculosis is still routine for migrant workers in many countries, though with the aim of appropriate treatment to stop the re-emergence of the disease (IOM web site).

Urban-rural migration and STD's

Migrants and travellers also contribute to the spread of certain communicable diseases within national populations, in particular from urban to rural areas (Wilson, 1995). A classic example is provided by the sexually transmitted diseases (STD's), which are transmitted primarily in cities within core groups often involving prostitution and other forms of multiple partnership, and are spread to the rural areas by returning migrant workers, merchants and travellers. Syphilis was spread this way throughout Europe, especially in the 19th century at the time of fast industrialisation and urbanisation. New job opportunities attracted young single men and women from the rural areas, who were particularly susceptible to multiple partnerships, and STD's. The dynamics of the HIV/AIDS epidemic in sub-Saharan Africa bears much similarities with the earlier syphilis epidemic in Europe, and is also closely linked to rapid urbanisation, as shown by Shorter (1992).

Urban health prior to sanitation

Another 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).

Vulnerability of migrants

From the individual perspective, the susceptibility of migrants to a variety of ailments may increase during their moves and in their new environment. For instance, Europeans who moved to tropical countries, especially in Africa, endured severe losses due to malaria, dysentery, and yellow fever. This was also the case for African-Americans who were forced to move back to West Africa, and founded Liberia: they suffered extreme losses in the first years of their arrival, probably because they had lost their immunity to malaria (McDaniel and Preston, 1994).

Another example of high vulnerability during moves is provided by pilgrimages, which are in addition a source of spread of infectious diseases such as plague and cholera, dysentery,

tuberculosis and meningitis. For instance, the Muslim pilgrimage to Mecca has been shown to place pilgrims at risk of various diseases, in particular diarrhoeal diseases (cholera, dysentery), as well as at risk of violent deaths (Memish, 2002; Alzeer et al., 1998).

Forced migration

Forced migration usually have adverse health effects, and numerous examples can be found of high mortality endured by displaced populations, especially at time of civil and international wars, famines, and other causes of forced migration. This was true in the past, in particular after World War I in Europe, and, as it will be seen below, still highly prevalent in sub-Saharan Africa.

Migrants may move to healthier environment

On the opposite side of the equation, positive aspects of migration can be found in the historical literature. In fact, unless they are forced to migrate, migrants will tend to move to better, and often healthier environments, where they can earn higher incomes, and therefore are likely to benefit from their moves. For instance, Europeans who moved to Australia, and New Zealand soon achieved higher levels of life expectancy than populations in their country of origin. Life expectancy in 1881 in New Zealand reached 55.0 years, that is 9.1 years higher than in England and Wales at the same time, and life expectancy in 1911 in Australia reached 59.5 years, that is 8.1 years higher than in England and Wales at the same time (source: Preston, Keyfitz and Schoen, 1972). This is not always the case however, and for instance Chile always had a lower life expectancy than Spain since 1909.

Migrants may bring with them health knowledge and technology

An atypical aspect of migration is that migrants can bring with them health knowledge and technology. Two classic historical examples can be given, related to the fight against smallpox, a disease cause of high mortality in the past. The reverend Cotton Mather, who was living in Boston in the 18th century, learned in 1706 about the variolization technique from an

African slave who had kept the memory from his country of origin, and proposed it at the Boston Academy of Medicine in 1721 to fight an epidemic. Similarly, Lady Mary Montagu, who was living in Constantinople (now Istanbul) learned about smallpox inoculation in Turkey, inoculated her own child in 1715, and brought it back to London in 1721, initiating one of the most successful public health intervention which culminated later with Jenner's vaccination (Grmek, 1996).

Similarly, the transfer of modern Western medical technology to Africa and Asia by missionaries and colonisers since the early 20th century, and sometimes even before, has been at the origin of the sustained mortality decline throughout the developing world. This point will be further developed later.

The overview on historical experiences has many implications for understanding current dynamics of migration and health in sub-Saharan Africa.

2 – The context of modern public health

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, characterising 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. 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. However, this is not always the case, in particular obesity, the other type of malnutrition, tends to be more frequent in cities, especially among the urban poor and among people with low levels of education.

3 - Types of migration and possible health consequences

Discussing the complex relationships between migration and health in contemporary populations requires specifying the types of move involved. Migration is defined as a change of main residence, often taken with a threshold of six months in the new residence. This definition covers a wide variety of situations, which imply different relationships with health. Among the most common situations, one could cite: people who move for family reasons, in particular changes in marital status, often the most frequent reason for moving for young adults; people who move for economic reasons, usually to find a better source of income, better housing, better living environment, and better access to schools, health services and modern commodities; people who are forced to move because of a crisis situation, whether a political disaster (war, revolution, change in political regimen), a natural disaster (drought, flood, etc.), or some economic disaster (famine, loss of job, etc.); people who move for health reasons (their own diseases or environmental health).

In addition to the situation in the place of destination, the moving period in itself involves health hazards. Travelling on roads, railway, sea, river, and air exposes the migrants to a variety of casualties, in particular to car accidents nowadays one of the leading causes of death in developing countries. Refugees also endure high casualties when escaping political or natural disasters, often walking long distances without proper feeding and health care.

With respect to contemporary populations of Southern Africa, the most important moves were the fast urbanisation associated with economic development and modernisation, the circulatory moves of migrant workers to the mines and the industrial complexes, and the refugees escaping numerous civil and international wars. Urbanisation has dramatically changed

the pattern of human settlement in Southern Africa during the 20th century, and in these early years of the 21st century almost half 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 urbanised (43%), and the proportion urban was below 10% in the other Southern African countries (table 1).

The dynamics of urbanisation in Africa over the 1950-2000 period varied strongly by country. Because of the very restrictive system of apartheid and homelands, urbanisation 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 urbanised, such as Gabon (81%), and Congo (63%), reaching higher levels than Northern African countries. African Islands also have high levels of urbanisation, 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 urbanisation: Malawi (25%), Lesotho (28%) and Swaziland (26%), all of them being strong providers of cheap labour to South Africa. The countries where urbanisation 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 (Tunisa) 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 urbanisation, 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 urbanisation, 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.

As other parts of the continent, Southern Africa witnessed major flows of refugees, in particular at the time of the post-colonial civil war in Angola (1975-2002), and Mozambique (1975-1994), at the time of fights for independence in Zimbabwe (1975-1979), and Namibia (1980's), during the decay of Zaire (now Democratic Republic of Congo: 1980-2002), and during the dismantling of apartheid in South Africa.

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.

4 - Migration and child health in Africa

Urbanisation 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 Mumbai, 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 summarises 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 urbanisation: Rwanda (1992), Burundi (1987), Chad (1996), and Lesotho (1977); one highly urbanised 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 (summarised 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 than 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.

Mortality levels were investigated among the urban poor using DHS surveys. A socio-economic score 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 modernisation, 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 underlines the close correlation between modernisation 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 it 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.

Migrant workers in Africa

Beyond urbanisation, major flows of international migrants developed in sub-Saharan Africa during the 1950-2000 period. Two classic examples of moves to large poles of development were analysed by various researchers: Sahelians moving to Côte d'Ivoire, in particular from Burkina-Faso, Mali and Niger, and Southern Africans moving to South Africa, in particular Mozambicans and Malawians. We know little on their mortality, since no comprehensive study covers the subject. However, available information tends to suggest that these workers rather benefited from their moves, since they tended to move to countries where health infrastructure was better and mortality was lower. For instance in Abidjan, Côte d'Ivoire a

study of vital registration data over the 1973-1992 period suggested that mortality among the migrants from Burkina increased less than the mortality of Ivorians born in the city or elsewhere, and in any case remained lower than mortality in the country of origin (Garenne et al. 1995).

Lower under-five mortality does not mean that the health situation is always better for the parents. In particular, foreign migrant workers tend to be discriminated in the host country, and numerous cases of violence were reported in newspapers among the Burkinabe in Côte d'Ivoire and the Shangaans in South Africa.

In addition, migrant workers also suffer from other hazards, in particular from occupational hazards. If now the occupational risks in South African mines are kept to a minimum, this was not the case in the past, and furthermore many miners contracted tuberculosis or silicosis during their stay (Packard, 1989). For instance, Basotho workers were found to often bring tuberculosis back home when returning (Kanno, 1995), and silicosis was still a relatively common cause of death in Agincourt in the 1990's (Kahn et al. 1999).

On the positive side, remittances from labour migration became an important source of income throughout Africa. This increased income, often sent on a regular basis, confers a socio-economic advantage to rural households with links to the city. This new situation can translate into health benefits for those who stayed, despite the spatial division created by the family. Increased income may mean better access to health services in countries where fee for service was set up following the Bamako initiative. We know very little on these indirect effects of migration, but it is quite possible that remittances played a significant role in the goods owned by "wealthier rural household", which appeared associated with lower under-five mortality than "poorer rural households" in our analysis.

Migrant workers to Europe

African migrant workers to Western Europe come primarily from North Africa and from West Africa. Migration of Africans to Europe involves at the same time illegal and legal migration. Little has been published about the health of African migrants after their move to Europe. A study focusing on Moroccans in France sheds some light on the current situation. Moroccans immigrants were found to not only have a lower mortality than their countrymen in

Morocco, but also a lower mortality than the national average in France. This provides a good example of beneficial health effects of migration (Courbage and Khlat, 1996).

Refugees

The situation of refugees is monitored by various international organisations (UN High Commission for Refugees, Red Cross etc.), and a number of surveys provide evidence on the health problems they face during the travel period and in refugee camps. Refugees are particularly exposed to malnutrition, infectious diseases, stress and violence. Among the most common communicable diseases, physicians working in African refugee camps found a high incidence for a variety of gastrointestinal diseases (diarrhoea, dysentery, cholera, typhoid), respiratory infections (pneumonia, tuberculosis), childhood diseases (measles, whooping cough, meningitis), parasitic diseases (malaria, worms) and skin diseases; protein energy malnutrition is a major problem, together with a variety of nutritional deficiencies such as iron, vitamin A, pellagra, and scurvy (Dondero, 1985; Shears and Lusty, 1987). Refugees also suffer from accidents and violence, and children of various forms of child abuse (Coady, 1982). This situation often leads to extremely high levels of mortality in refugee camps such as those in Malawi, Rwanda, Somalia, Sudan, Tanzania and Zaire: death rates of one to 6 per 1000 children per day were common in the first few days after admission, and would lead to the rapid extinction of the population if they continued for many weeks and if proper care and help was not provided (Dowell et al. 1995; Mgabo, 1994; UN High Commission for Refugees, 1992; Moren et al., 1991; Toole and Waldman, 1988; Toole et al. 1988).

On the other hand, former refugees who eventually settled sometimes ended up in a better position than they would have been if they had stayed in their country of origin. For instance, the Shangaans who escaped civil war in Mozambique in the 1980's and settled in the Agincourt study area in South Africa had a lower child mortality (64 per 1000) than their counterparts in Mozambique (201 per 1000), although they still were not as well off as South African children living in the same area (46 per 1000) (de Jongh, 1994; Hargreaves et al. 2002).

Emerging diseases in Africa

Much has been written on the spread of HIV/AIDS in sub-Saharan Africa since the onset of the epidemic in the mid-1970's. Migration and travels have played a large role in the rapid spread of this primarily sexually transmitted disease to first the main urban centres and later to the rural areas. For instance, the Eastern Africa highway linking Mombasa to the lake Victoria area, considered by many as the focal point of the HIV-1 epidemic, was a major route of spreading the disease in that part of the world. Similarly, migrants workers returning from Côte d'Ivoire seemed to have played a major role in the spread of the disease to their countries of origin, Burkina Faso and Mali in particular. Large migration flows in Southern Africa most likely contributed immensely to the spread of HIV in the region, from Zambia to Kwazulu-Natal, and from Namibia to Mozambique. Furthermore, migrants to the mines, industrial complexes, and commercial farms often are single persons who are at risk of multiple partnership and on STD's (Lurie et al. 1997; Lurie, 200; Jochelson et al. 1991).

Another disease for which migration played a similar role of increasing risk and rapid spread is tuberculosis. A very large tuberculosis epidemic raged throughout the 20th century in Southern Africa, with several large waves of high incidence, followed by times of lower transmission in South Africa. The epidemic seemed to have been introduced by European migrants coming to the industrial centres at the turn of the 20th century, even though the disease most likely existed in rural areas before, but with a low incidence. The epidemic developed along the moves of the circulatory migrants, around the mines and in the hostels built for the mine workers, in the low quality housing areas of fast growing cities where they also stayed, and in the rural areas where the migrants were returning (Packard, 1989). The circulatory migration system was not a spontaneous migration scheme, but was carefully organised by the Chamber of the Mines in South Africa, and its counterparts in Zambia. This organised migration had dreadful health consequences for the African population, in particular the workers and their families, but at the same time was, at least in part, at the origin of the development of the modern public health system throughout the country, now the most developed in sub-Saharan Africa.

Cholera is a recent disease in Africa, and exploded after an outbreak in 1971 in Guinea, brought by a migrant student coming by plane from Russia. The rapid spread of the disease in the early years followed primarily the main routes of communication and migration, mainly along

the seashore, and along the large rivers such as Niger. Since then, cholera became endemic in sub-Saharan Africa, and outbreaks throughout the continent caused large number of deaths in rural areas, and reached even quite developed areas such as South Africa in 2001-2002.

Discussion

The aim of this paper was to provide a broad overview on the relationships between migration and health, with special focus on child health in Southern Africa. As it was seen throughout the review, the subject appears especially complex and versatile, and this review 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, urbanisation 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, urbanisation 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 to 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 organisations 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 modernisation), 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 short review 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.

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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.

Survey (country, year)	Wealthier strata		Poorer strata	
	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

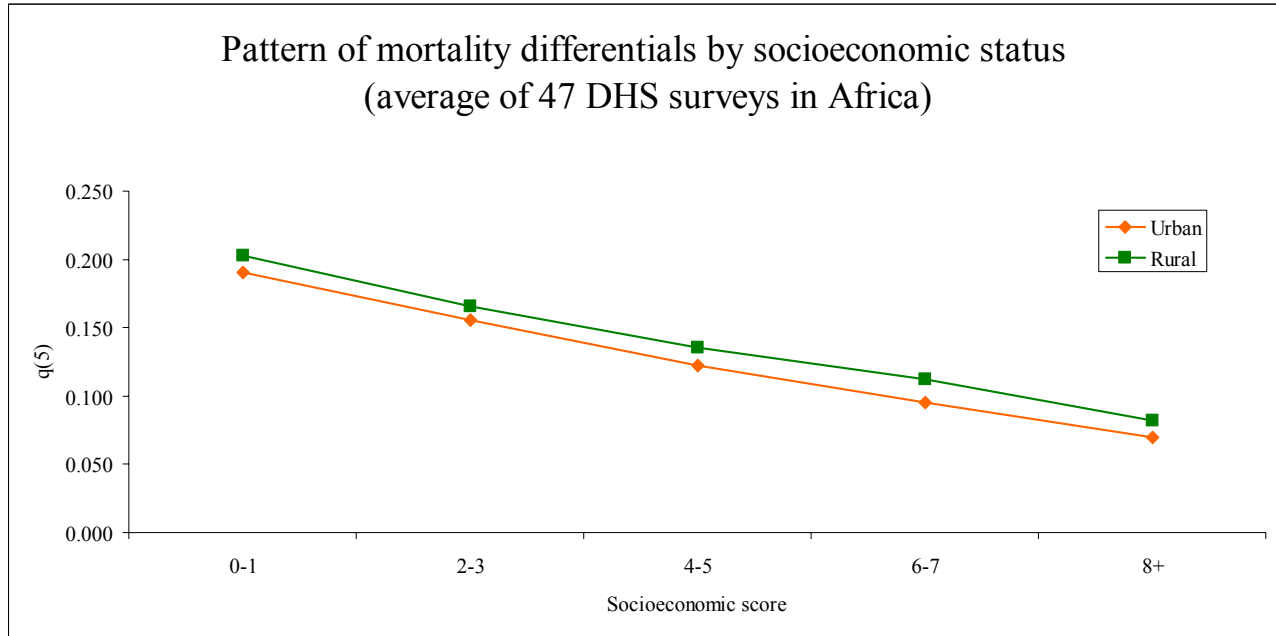


Figure 2

