Health transitions in sub-Saharan Africa: overview of mortality trends in children under 5 years old (1950–2000)

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Objective To reconstruct and analyse mortality trends in children younger than 5 years in sub-Saharan Africa between 1950 and 2000.

Methods We selected 66 Demographic and Health Surveys and World Fertility Surveys from 32 African countries for analysis. Death rates were calculated by yearly periods for each survey. When several surveys were available for the same country, overlapping years were combined. Country-specific time series were analysed to identify periods of monotonic trends, whether declining, steady or increasing. We tested changes in trends using a linear logistic model.

Findings A quarter of the countries studied had monotonic declining mortality trends: i.e. a smooth health transition. Another quarter had long-term declines with some minor rises over short periods of time. Eight countries had periods of major increases in mortality due to political or economic crises, and in seven countries mortality stopped declining for several years. In eight other countries mortality has risen in recent years as a result of paediatric AIDS. Reconstructed levels and trends were compared with other estimates made by international organizations, usually based on indirect methods.

Conclusion Overall, major progress in child survival was achieved in sub-Saharan Africa during the second half of the twentieth century. However, transition has occurred more slowly than expected, with an average decline of 1.8% per year. Additionally, transition was chaotic in many countries. The main causes of mortality increase were political instability, serious economic downturns, and emerging diseases.

Bulletin of the World Health Organization 2006;84:470-478.

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Introduction

The health transition, defined as a steady decline in mortality, has been one of the most important features of demographic changes in the twentieth century, and has had many economic and social consequences.[1–5] In sub-Saharan Africa, the health transition began somewhat later than in other countries. Although much change has occurred there since 1930, most African countries still have high levels of infant and child mortality compared with other regions, with much variation between countries.

To judge the health transition in Africa fairly, it seems most appropriate to consider trends in mortality rather than simply looking at current mortality. In countries where the health transition started later, a relatively high death rate after a period a steady decline in mortality could still indicate a favourable health transition, as is the case in some west African countries. By contrast, a situation of increasing mortality, but with a relatively low current mortality could hide a negative change, as is the case in some countries in southern Africa.

Documentation of mortality trends will allow a better understanding of the status of the health transition in Africa, and help to identify gaps where further action is needed. The monitoring of mortality trends is particularly important in children younger than 5 years old, a group that is the main target of public health policies and the most common indicator of mortality levels in developing countries.

Comprehensive vital registration data remain the best source for assessing mortality trends, but these data are not currently available in most African countries. To assess mortality trends, analysts rely on data from demographic sample surveys, or other sources such as mortality data collected in censuses.[6–10] A synthesis of indirect mortality estimates in Africa was conducted at the World Bank for the period before 1985,[11–12] and showed a steady decline in mortality in almost all countries investigated. This study was repeated and extended to other countries, and included new estimates for African countries.[13–14] However, these syntheses suffer from the lack of precision associated with the use of indirect methods to estimate trends, and especially trend reversals. Ahmad et al. have completed analysis using direct and indirect estimates, and reconstructing trends by 5-year periods from 1955–59 to 1995–99.[15] This compendium made better use of all available data, in particular direct estimates provided by Demographic and Health Surveys (DHS). However, although the use of 5-year time periods provided reasonable estimates of mortality levels and major trends, it often obscured the specific time periods when changes in mortality trends occurred. Being able to establish the precise date of reversals in mortality trends is important if the cause of these changes is to be identified.

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Ref. No. **05-029231**

(*Submitted: 15 December 2005 – Final revised version received: 20 February 2006 – Accepted: 22 February 2006*)

In this study we aimed to provide new estimates of trends in mortality in children younger than 5 years in African countries with data from demographic sample surveys. The rationale of this analysis is to identify periods of monotonic change, and precise times at which trend changes occur. Here, we present a synthesis of our work; more details at country level are provided in a companion working paper.[16]

Methods

To reconstruct mortality trends, we used data from demographic sample surveys with maternity histories. These data provide dates of birth, and when applicable, age at death, for large samples of live births, which allowed us to compute age-specific death rates for periods many years before the survey. A total of 56 DHS and 10 World Fertility Surveys (WFS) were selected, covering 32 sub-Saharan Africa countries. In addition, a Multiple Indicator Cluster Survey (MICS) was included to cover Angola, which had no DHS or WFS survey. This MICS survey was based on a simplified methodology: only birth histories of the last three pregnancies were included, which shortens the retrospective period for estimating mortality trends. The sample included about 70% of all countries and 80% of the total population of continental sub-Saharan Africa and Madagascar.

Country mortality estimates

In the first step, we calculated death rates by computing person-years at risk and date of death. When several surveys were available for the same country, deaths and person-years were simply added for each age and period, with the respective weights of each survey. Two age groups were considered: infanthood (<12 months) and early childhood (12–59 months). Life table calculations provided the final estimate of the under-five mortality ratio, q(5), which expresses the probability of dying before the fifth birthday, as is done in DHS surveys.

Search for monotonic periods and inflexion points

In the second step, we searched for monotonic periods of mortality change (i.e. periods of either declining, constant or increasing mortality) and inflexion points (the times at which a change in slope occurred). In a smooth health transition, the rate at which death rates decline (the slope) tends to be constant over long periods of time, with decreases of 4% to 5% per year considered favourable indicators. The search for inflexion points was first done graphically, and then tested statistically. Once monotonic periods were identified, a linear-logistic model (Logit) was applied, the slope was estimated (the b coefficient of the regression line), and a test was performed to verify whether the change in slopes from one period to the next was significant. We discarded non-significant changes in slopes caused by erratic values, and made final estimates for all significant monotonic periods. Monotonic trends also allowed us to identify short periods with excess mortality by testing the difference between observed and expected value. The Logit model could be written as:

$$\text{Logit}[q(5)] = a + b \times \text{year}$$

Where a = intercept and b = slope.

HIV seroprevalence and expected impact of paediatric AIDS

Paediatric acquired immunodeficiency syndrome (AIDS) has become a leading cause of death in many African countries in recent years. The number of AIDS-related deaths is adding to that of other causes of infant and child mortality, and by itself could reverse mortality trends in countries with high human immunodeficiency syndrome (HIV) prevalence. Paediatric AIDS comes almost entirely from the vertical transmission of the HIV virus from mother to child either during pregnancy, at the time of delivery, or through breastfeeding.[17]

We calculated the net effect of paediatric AIDS on mortality in under-5-year-olds assuming probabilities of vertical transmission, and probabilities of death in children infected with HIV. First, the dynamics of HIV seroprevalence in pregnant women was reconstructed for the 1980–2000 period. Trends in HIV prevalence were estimated from data provided by the AIDS database of the US Bureau of Census, International Programs. For many countries, HIV seroprevalence estimates were available for only a few years between 1980 and year 2000. Only one country — South Africa — had a complete series of data for all years between 1990 and 2000. In other countries, only a few data points were available. Trends in seroprevalence were fitted with a hyperbolic function of the Logit of the proportions of seropositive women, a model that we tested successfully on the South African data, and also applied to other countries. In one case where an increase in seroprevalence was halted and even reversed (Uganda), two curves were fitted, one ascending and the other descending. Although based on an ad hoc model, we found that this fitting procedure was suitable for all countries with a sufficient amount of data to test.

Once the dynamics of the HIV epidemic in pregnant women had been reconstructed, we calculated HIV prevalence at birth assuming a vertical transmission rate of 25%. To calculate paediatric AIDS mortality, we used a life table framework and the assumption that 30% of infected children died of HIV/AIDS each year between age 0 and 5 years. These parameters correspond roughly to the mean of several studies conducted in sub-Saharan Africa, and are consistent with a pooled analysis of African data.[18-19] For mortality, our estimates match the pooled estimates (52% versus 51% mortality, respectively, within 2 years), although some studies find somewhat lower mortality, so we might have overestimated AIDS mortality in some countries.

To calculate mortality trends without AIDS, it was assumed that causes of death were additive. Our calculations led to a final estimate of 16 per 1000 for Africa as a whole by 2000, which is consistent with the 13 per 1000 estimate published by other authors.[18-19]

Results

The list of surveys used for our analyses is shown in Table 1, and results of the Logit adjustment (intercept and slope) are shown in Table 2, web version only, available from: http://www.who.int/bulletin. Where there were available data, we started the reconstruction of trends from 1950; reconstruction began later for countries with incomplete data. Estimates stop in the year of the last survey, which ranged between 1987 and 2000.

We calculated average estimates for sub-Saharan Africa by weighting the country estimates by the number of

births in 2000. Results show a steady, and relatively slow, decrease in mortality since 1950, by about 1.8% per year. The decline would have been more rapid in recent years had it not been for the emergence of HIV/AIDS (Fig. 1). The calculations of the African average have some minor biases since the list of included countries is not exactly the same from year to year, especially for the first 10 and the last 10 years. However, if we had included only countries with full information, the bias in mortality calculations would have been even larger and the number of years covered much smaller.

Typological profiles of health transitions in Africa

The reconstructed trends allowed basic typological profiling of national health transitions in sub-Saharan Africa (Fig. 2).

Steady mortality decline

Only a few countries had a smooth health transition (Fig. 2a), i.e. a steady mortality decline in under-5-year-olds during the period covered by the surveys: Botswana (up to 1988), Comoro Islands, Ethiopia, Guinea, Liberia (up to 1986), Malawi, Mali and Togo. These countries had high levels of mortality in 1950, and exhibited no reversals in mortality trends and no minor accidents. The case of Liberia is unusual because no data are available after 1986. This country went through an ordeal of savage civil war in the 1990s, a period during which a rise in mortality might be expected. Similarly, data from Botswana stop in 1988, and it is likely that mortality rose in the 1990s because of HIV/AIDS, since this was the case in neighbouring countries. For Ethiopia, only one survey is available (for 2000), and evidence of trends during the troubled period of the 1970s is very limited. In any case, results of our analysis indicate that only a small number of African countries have had a smooth health transition.

Short periods of excess mortality

Some countries with a steady decline in mortality experienced several years of excess mortality, which although they were statistically significant did not substantially affect overall trends (Fig. 2b). In Burkina Faso mortality increased

Table 1. **Countries and surveys used**

Country	Surveys			
Angola	MICS, 1996			
Benin	WFS, 1982	DHS, 1996	DHS, 2001	
Botswana	DHS, 1988			
Burkina Faso	DHS, 1993	DHS, 1999		
Burundi	DHS, 1987			
Cameroon	WFS, 1978	DHS, 1991	DHS, 1998	
Central African Republic	DHS, 1994			
Chad	DHS, 1997			
Comoros	DHS, 1996			
Côte d'Ivoire	WFS, 1980	DHS, 1994	DHS, 1999	
Ethiopia	DHS, 2000			
Gabon	DHS, 2001			
Ghana	WFS, 1980	DHS, 1993	DHS, 1999	
Guinea	DHS, 1999			
Kenya	WFS, 1978	DHS, 1993	DHS, 1999	
Lesotho	WFS, 1977			
Liberia	DHS, 1996			
Madagascar	DHS, 1992	DHS, 1997		
Malawi	DHS, 1992	DHS, 2000		
Mali	DHS, 1987	DHS, 1995	DHS, 2001	
Mozambique	DHS, 1997			
Namibia	DHS, 1992	DHS, 2000		
Niger	DHS, 1992	DHS, 1998		
Nigeria	WFS, 1982	DHS, 1990	DHS, 1999	
Rwanda	WFS, 1983	DHS, 1992	DHS, 2000	
Senegal	WFS, 1978	DHS, 1986	DHS, 1993	DHS, 1997
South Africa	DHS, 1998			
Sudan	WFS, 1979	DHS, 1989		
United Republic of Tanzania	DHS, 1991	DHS, 1996		
Togo	DHS, 1988	DHS, 1998		
Uganda	DHS, 1988	DHS, 1995		
Zambia	DHS, 1992	DHS, 1996	DHS, 2001	
Zimbabwe	DHS, 1988	DHS, 1993	DHS, 1999	

Fig. 1. **Trends in mortality in under-5-year-olds in sub-Saharan Africa**

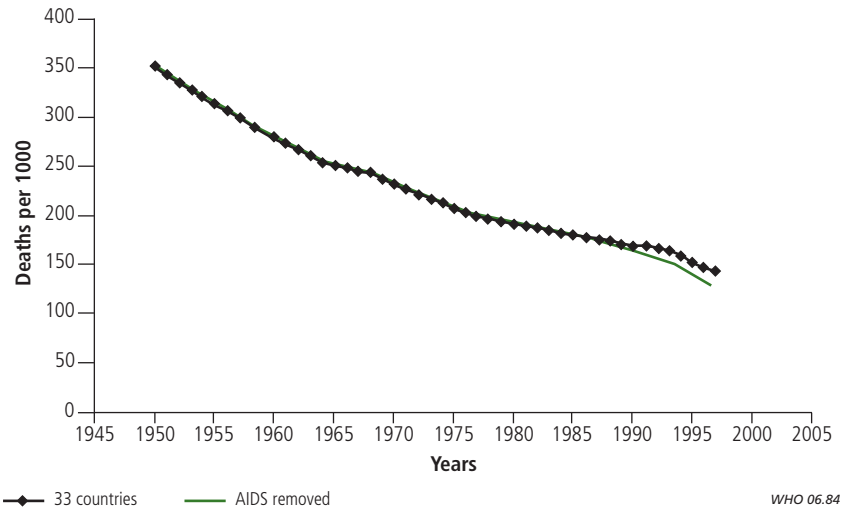


Table 2. **Parameters of the Logit model of mortality trends**

Country	Period	Intercept (a)	Standard. error (a)	Slope (b)	Standard. error (b)
Angola	1950-1978	45.3259		-0.023630	
	1978-1986	202.9928	46.6330	-0.103337	0.027049
	1986-1993	-209.2781	53.6053	0.104262	0.023425
	1993-1996	305.9722	84.6695	-0.154194	0.042453
Benin	1953-1979	63.7668	6.1531	-0.032854	0.003121
	1979-1989	16.6132	11.7597	-0.009039	0.005927
	1989-2001	69.8652	11.2053	-0.035826	0.005620
Botswana	1958-1988	96.9113	11.0420	-0.050285	0.005585
Burkina	1960-1998	55.6811	3.1476	-0.028655	0.001586
Burundi	1952-1965	82.2914	84.3710	-0.042585	0.042997
	1965-1976	-20.7076	25.4705	0.009882	0.012917
	1976-1987	159.0747	18.7730	-0.081013	0.009475
Cameroon	1950-1988	60.4401	2.7935	-0.031344	0.001417
	1988-1998	-60.8683	19.1523	0.029622	0.009614
Central African	1960-1977	74.9251	22.9890	-0.038746	0.011659
Republic	1977-1989	10.0977	16.1443	-0.005903	0.008137
	1989-1994	134.3495	43.1968	-0.068306	0.021693
Chad	1962-1997	45.4859	4.2122	-0.023539	0.002121
Comoros	1963-1996	68.3968	8.7203	-0.035373	0.004395
Côte d'Ivoire	1950-1983	95.6415	3.9351	-0.049116	0.001995
	1983-1998	-10.1896	10.0142	0.004261	0.005034
Ethiopia	1966-1993	30.6826	4.4745	-0.016062	0.002254
	1993-2000	143.0263	19.2678	-0.072426	0.009653
Gabon	1966-1986	97.4507	18.4758	-0.050226	0.009333
	1986-2000	0.3258	16.2530	-0.001323	0.008154
Ghana	1950-1960	125.9092	35.8066	-0.065015	0.018300
	1960-1978	28.1465	6.8509	-0.015119	0.003475
	1978-1984	-76.5461	23.4724	0.037796	0.011849
	1984-1998	72.5919	10.9525	-0.037432	0.005507
Guinea	1966-1977	15.8779	33.3200	-0.008420	0.016883
	1977-1997	74.8426	5.7790	-0.038241	0.002905
Kenya	1950-1984	82.9833	2.7661	-0.042999	0.001403
	1984-1998	-58.4556	9.6152	0.028262	0.004833
Lesotho	1945-1960	118.4702	30.7148	-0.061209	0.015707
	1960-1965	-172.3776	64.4078	0.087115	0.032812
	1965-1977	37.1583	16.2347	-0.019577	0.008235
Liberia	1952-1986	61.3465	4.9672	-0.031561	0.002514
Madagascar	1960-1972	53.1141	32.4219	-0.027710	0.016468
	1972-1986	-40.9950	9.2951	0.019963	0.004693
	1986-1997	72.2333	11.6408	-0.037072	0.005848
Malawi	1960-1982	73.8657	7.8535	-0.037777	0.003974
	1982-1991	27.7750	11.1152	-0.014533	0.005594
	1991-2000	95.8878	11.5898	-0.048739	0.005809
Mali	1960-2000	59.1818	1.7555	-0.030263	0.000884
Mozambique	1950-1975	52.1231		-0.026938	
	1975-1981	141.6061	14.6532	-0.072267	0.007421
	1981-1991	-117.1165	14.8391	0.058341	0.007472
	1991-1997	223.1035	22.5213	-0.112580	0.011301
Namibia	1960-1972	89.1635	53.1447	-0.046334	0.026995
	1972-1980	-33.4002	37.8945	0.015799	0.019170
	1980-1996	90.7401	12.4285	-0.046879	0.006254
	1996-2000	-159.6888	97.4667	0.078554	0.048779

(Table 2, cont.)

Country	Period	Intercept (a)	Standard. error (a)	Slope (b)	Standard. error (b)
Niger	1958-1972	76.7544	25.5523	-0.039305	0.012982
	1972-1992	2.7955	4.8057	-0.001755	0.002422
	1992-1998	281.2102	35.4455	-0.141480	0.017774
Nigeria	1950-1964	83.2608	20.6711	-0.043073	0.010545
	1964-1968	-87.8874	46.9344	0.044066	0.023870
	1968-1978	95.9610	10.4193	-0.049348	0.005279
	1978-1988	-15.4913	9.1827	0.007040	0.004632
	1988-1998	92.6495	13.1926	-0.047380	0.006623
Rwanda	1950-1965	74.9067	26.7263	-0.038740	0.013627
	1965-1977	-34.1623	11.6308	0.016754	0.005896
	1977-1990	121.3574	7.4204	-0.061929	0.003742
	1990-2000				
Senegal	1950-1960	105.7542	26.2883	-0.054454	0.013438
	1960-1970	-17.7548	15.0902	0.008609	0.007675
	1970-1997	90.2819	2.9711	-0.046248	0.001499
South Africa	1967-1993	123.2200	8.5986	-0.063354	0.004338
	1993-1998	-197.7726	76.0769	0.097722	0.038127
Sudan	1950-1974	31.7663	8.6125	-0.017004	0.004377
	1974-1984	-3.5596	14.0428	0.000915	0.007097
	1984-1990	168.5043	38.0094	-0.085788	0.019135
United Republic of Tanzania	1957-1974	56.3372	19.1940	-0.029230	0.009752
	1974-1979	131.6954	21.4779	-0.067412	0.010871
	1979-1985	-55.3085	21.0828	0.027097	0.010636
	1985-1995	58.3647	10.9623	-0.030193	0.005510
	1995-1999	-74.9323	58.3066	0.036621	0.029207
Togo	1957-1998	50.7447	3.5613	-0.026378	0.001795
Uganda	1955-1970	89.2642	23.7988	-0.046117	0.012106
	1970-1982	-53.0599	11.2342	0.026115	0.005681
	1982-2000	42.3717	5.2020	-0.022102	0.002614
Zambia	1958-1975	98.6304	15.1647	-0.050818	0.007696
	1975-1993	-36.2376	4.9845	0.017476	0.002510
	1993-2001	56.5967	16.3753	-0.029120	0.008203
Zimbabwe	1956-1976	64.4661	15.4116	-0.033759	0.007821
	1976-1980	-87.6387	56.6859	0.043256	0.028655
	1980-1987	185.4862	26.6235	-0.094724	0.013424
	1987-1999	-104.3378	16.4523	0.051132	0.008258

during drought in 1973–74 and again in 1994–95 in rural areas, but not in urban areas. In Chad, mortality increased significantly in 1980–81, at the height of the civil war. In Ghana, under-five mortality increased between 1979 and 1983 during a severe political crisis in the country that was later resolved with the return of Jerry Rawlings. In Lesotho, mortality increased significantly between 1962 and 1965. In Namibia, mortality temporarily rose during the struggle for independence (1977–82), to return to a trend of declining mortality until the arrival of HIV/AIDS in the 1990s. Likewise, mortality increased in Zimbabwe during the struggle for independence (1978–82) in that country. In Nigeria, mortality increased around the time of the Biafra war (1964–1968); between 1978 and 1988, another rise occurred in rural areas, but rates were stagnant in urban areas during the same period. In the United Republic of Tanzania, mortality increased during the period between 1979 and 1985, particularly in urban areas. In Togo, mortality rose in rural areas in 1993–94. However, for all the countries mentioned in this section the changes seem to have been transitory, since they did not have any substantial effect on long-term mortality trends.

Changing trends in under-five mortality: political and economic crises

Several countries went through prolonged periods of mortality increase as a result of a political crisis, an economic downturn or civil war (Fig. 2c). In Angola, the limited data available showed that under-five mortality declined during the late colonial period and the years following independence (1975–79), then increased during the civil war (1980–89), to decline again later when the situation became more stable (1993–96). A similar pattern was noted in Mozambique, a country that

went through political change, and was also deeply affected by civil war in the 1980s. In Madagascar, mortality increased during the Malagasy revolution period (1975–86), when per capita GDP underwent a rapid decline. In Uganda, mortality increased markedly during the Idi Amin Dada years (1971–79) and the few years of political uncertainty following his departure (1980–83), until a stable situation returned with the arrival of Yoweri Museveni in 1986. In Rwanda, as in Burundi, mortality increased for about a decade after independence (1965–76). In Rwanda, however, a period of steady decline in mortality ended in 1991 following the attacks of the Tutsi refugees, peaked in 1994 during the period of genocide, and rose again in 1997–98. As a result, no trend is visible during the very troubled period of the 1990s in Rwanda. In Zambia, mortality increased between 1975 and 1992, especially in urban areas. This rise was a consequence of the major drop in international prices for the country's main export commodity, copper, in 1975. A serious economic crisis followed, inducing several political changes culminating with liberalization of the economy in 1992. This large increase in mortality occurred even after discounting the effect of HIV/AIDS.

Stagnation during 1980–2000

We noted periods of stagnation in under-five mortality in the 1980s and 1990s (Fig. 2d) for several countries. In Benin, mortality stopped declining between 1979 and 1989 in urban and rural areas despite favourable economic indicators. In the Central African Republic, mortality stagnated between 1977 and 1989, a difficult period following the installation and fall of Jean-Bédel Bokassa. In Gabon, mortality stagnated after 1985, even after the effect of AIDS had been discounted. In Niger, mortality plateaued in rural areas between 1972 and 1992. In Northern Sudan, mortality remained steady between 1974 and 1984, and even increased slightly in rural areas.

Epidemiological crisis (malaria)

Only one country showed evidence of a reversal in mortality trends due to a disease other than HIV/AIDS. In Senegal, mortality in under-5-year-olds increased between 1960 and 1970, an increase closely associated with a rise in malaria morbidity and mortality that followed the failed attempt to eradicate malaria from 1955 to 1959 (Fig. 2e). Malaria mortality seems to have increased again in the 1990s according to local studies,[20] although there was no discernable effect on all-cause mortality.

Mortality increases caused by HIV/AIDS

Paediatric AIDS has had a strong effect on death rates in several countries, sometimes causing or exacerbating mortality increases, and in other cases slowing the rate of mortality decline. The effect is especially evident in southern African countries (Botswana, Namibia, South Africa, Zimbabwe, Zambia), in some eastern African countries (Kenya, Uganda, United Republic of Tanzania), and in western African (Cameroon, Côte d'Ivoire) (Fig. 2f). In Namibia, United Republic of Tanzania and Zimbabwe, the increase in under-five mortality in recent years seems to be entirely attributable to HIV/AIDS, whereas in other countries (Cameroon, Côte d'Ivoire Kenya, South Africa), paediatric AIDS contributed to only part of the increase. In Uganda and Zambia, mortality has declined in recent years, despite a large effect of HIV/AIDS. Our findings show that the net effect of HIV/AIDS in African countries is complex and dependent on a matrix of factors.

Reversal in health transition after discounting HIV/AIDS

In several countries, under-five mortality remained steady or increased after discounting the effect HIV/AIDS. In South Africa, even after subtracting the effects of paediatric AIDS, under-five mortality stopped declining after 1993. In Cameroon, under-five mortality after discounting HIV/AIDS was estimated at 145 per 1000 in 1998, whereas a lower rate (101 per 1000) was expected from previous trends. In Côte d'Ivoire, under-five mortality was still decreasing from 1983 to 1998 after discounting the effect of HIV/AIDS, but was declining more slowly than it was before 1983. In Kenya, under-five mortality increased after 1985, even after the effect of HIV/AIDS was discounted, and data from the 2003 DHS survey shows that the rate seems to be still increasing.

Divergent changes in urban and rural areas

In most countries, mortality change did not differ greatly between urban and rural areas. However, several cases of divergent changes were documented. In Burundi, rural mortality declined between 1976 and 1986, whereas it increased in urban areas. In the Central African Republic, mortality increased in rural areas between 1976 and 1990, but declined in urban areas during the same period. In Malawi, urban mortality increased substantially after 1984, but remained unchanged in rural areas. In Mozambique, urban and rural areas experienced different trends during the civil war, which had the greatest effect in the countryside. In Niger, mortality remained unchanged between 1972 and 1992 in rural areas, but continued to decline in urban areas. More details on urban/rural differences in Africa are given elsewhere.[21]

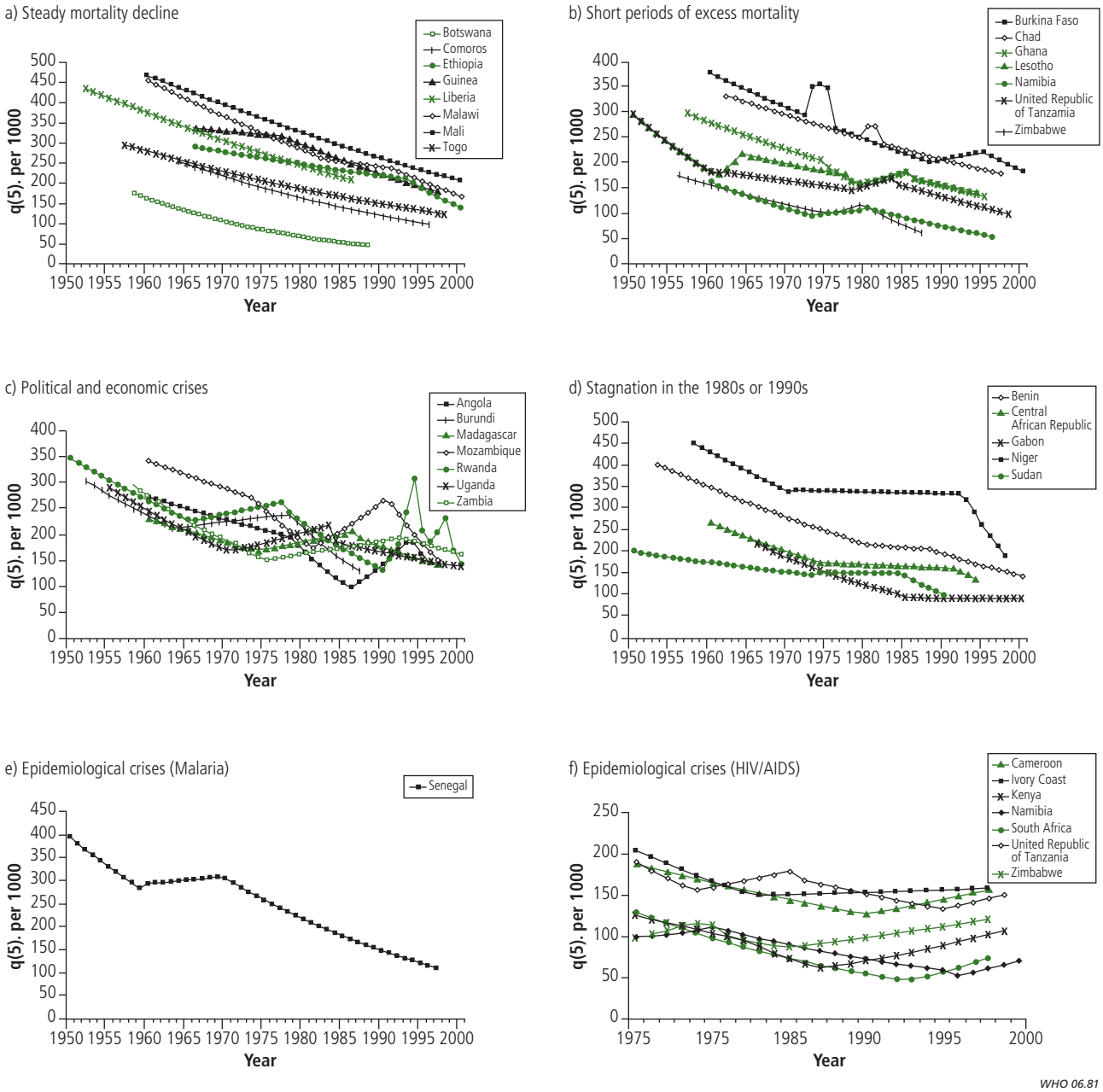
Recent trends

With data from the new round of DHS surveys becoming available, we were able to check the consistency of previous trends. In Burkina Faso, the downward trend has resumed after the 1994–95 crisis. In Cameroon, the rise in mortality since 1990 stopped around 1996, and a rapid mortality decline has resumed. In Kenya mortality continued to rise at least until 2001. In Ghana, mortality remained steady from 1995 to 2002. In Nigeria, data from the 2003 survey were found to be incompatible with previous estimates, which makes any inference difficult. The last three surveys conducted in Nigeria suggest that mortality remained steady since 1985, but mortality levels vary by a ratio of 1 to 2 from survey to survey. In the United Republic of Tanzania, indirect estimates from the 2004 survey suggest a rise in mortality since 1995, probably due to HIV/AIDS.

Discussion

Despite their limitations, data from demographic sample surveys were sufficient to allow us to reconstruct the main trends in under-five mortality. We were also able to identify some erratic changes, as well as mortality increases due to HIV/AIDS and other causes such as political or economic crises. Results

Fig. 2. **Reconstructed mortality trends, by type**



from this reconstruction indicate that the health transition in Africa has been sustained between 1950 and 2000, with under-five mortality declining by about 1.8% a year. This decline for the whole continent has been affected by many situational factors, with minor or major mortality increases, and especially by the effect of AIDS.

Explanation of these changes, both positive and negative, requires a renewed look at mortality determinants. On one hand, major changes have occurred in the field of public health, including the increased number of physicians per capita, improved vaccination coverage, and widespread use of modern medicines, as well as urbanization and modern education, all of which have contributed to reductions in mortality. On the other hand, political crises, civil wars, poor state management, and, to a lesser extent, economic crises, have contributed to mortality increases. HIV/AIDS emerged in Africa in the mid 1980s to complicate the health situation, and now accounts for many increases in mortality seen since this time. Fluctuations in the prevalence and severity of malaria may also have played a role in mortality, although this contribution seems small compared to the other factors. Recent mortality increases after discounting the effect of HIV/AIDS require further research. In particular, increases in poverty in large cities might explain mortality increases in places such as Cameroon, Côte d'Ivoire and Kenya.

This attempt to reconstruct under-five mortality trends has several advantages over earlier estimates. Compared with indirect estimations, which often are out of date and lack precision, the direct estimates seem to provide more robust trends and inflexion points. Compared with earlier WHO estimates, which are based on a mixture of direct and indirect estimates, reconstructed trends are more consistent and often reveal patterns that had been smoothed by the five-year estimates. Furthermore, discounting the effects of HIV/AIDS allows for better identification of the proportion of mortality trends attributable to emerging diseases, and the proportion due to other causes.

The complexity of demographic dynamics is apparent when examining country data. There is much variation between countries' health transitions in sub-Saharan Africa, and are the results of the interference of several factors, the most important of which seem to be political stability, state management, and emerging diseases. The diversity of situations among the countries should be taken into account to better understand the various patterns of under-five mortality trends seen in sub-Saharan Africa during the second part of the twentieth century. ■

Acknowledgements
We thank the Centre d'Etudes et de Recherches sur le Développement International (CERDI), Clermont-Ferrand for administrative support.

Funding: This research was sponsored by the Wellcome Trust, Health Consequences of Population Change Programme (grant number: 062885/Z/00/Z).

Competing interests: none declared.

Résumé

Transitions sanitaires en Afrique sub-saharienne : présentation succincte des tendances de la mortalité chez les enfants de moins de 5 ans (1950-2000)

Objectif Reconstituer et analyser les tendances de la mortalité chez les enfants de moins de cinq ans en Afrique sub-saharienne sur la période 1950-2000.

Méthodes 66 enquêtes démographiques et de santé, ainsi que des enquêtes mondiales sur la fertilité provenant de 32 pays africains, ont été sélectionnées pour analyse. Les taux de mortalité ont été calculés par période d'un an pour chacune des études. Dans les cas où l'on disposait de plusieurs études pour un même pays, les chiffres relatifs aux années de recouvrement ont été combinés. Des séries chronologiques spécifiques à chaque pays ont été également analysées en vue d'identifier les périodes correspondant à une tendance uniforme : déclin, stabilité ou augmentation. Les changements de tendance ont été étudiés à l'aide d'un modèle logistique linéaire.

Résultats Pour un quart des pays étudiés, on a observé un déclin régulier, c'est-à-dire une transition sanitaire progressive. Un autre quart des pays ont enregistré des baisses à long terme, ponctuées par quelques hausses mineures sur de courtes périodes. Huit pays ont connu des augmentations importantes de la mortalité, imputables à des crises politiques ou économiques et dans sept autre, la mortalité a cessé de baisser pendant plusieurs années. Dans huit autres pays encore, la mortalité a augmenté au cours des dernières années en raison des cas pédiatriques de SIDA. Les valeurs et les tendances reconstituées ont été comparées à d'autres estimations établies par des organisations internationales, reposant dans la plupart des cas sur des méthodes indirectes.

Conclusion Globalement, de grand progrès ont été obtenus dans la survie des enfants d'Afrique subsaharienne pendant la deuxième moitié du vingtième siècle. Néanmoins, la transition s'est opérée plus lentement qu'on ne l'attendait, avec une baisse moyenne de la mortalité de 1,8 % par an. En outre, cette transition a été chaotique dans plusieurs pays. Les augmentations de la mortalité étaient imputables principalement à des phases d'instabilité ou de forte récession économique, ou encore à des maladies émergentes.

Resumen

Transiciones sanitarias en el África subsahariana: panorama de las tendencias de la mortalidad en los menores de 5 años (1950–2000)

Objetivo Reconstruir y analizar las tendencias de la mortalidad en los niños menores de 5 años en el África subsahariana entre 1950 y 2000.

Métodos Seleccionamos para el análisis un total de 66 encuestas de demografía y salud y encuestas mundiales de fecundidad de 32 países africanos. Las tasas de mortalidad se calcularon por periodos anuales para cada encuesta. Cuando había varias encuestas para un mismo país, se combinaban los años superpuestos. Las series cronológicas de cada país fueron analizadas para identificar los periodos con tendencias monotónicas, ya fueran decrecientes, constantes o crecientes. Se utilizó un modelo de regresión lineal para analizar los cambios de tendencia.

Resultados Una cuarta parte de los países estudiados presentaban tendencias de disminución monotónica de la mortalidad, lo que significa una transición sanitaria suave. Otra cuarta parte presentaba disminuciones a largo plazo con algunos aumentos de menor importancia durante periodos breves. Ocho países presentaban periodos de aumentos importantes de la mortalidad como consecuencia de crisis políticas o económicas, y en siete países la mortalidad dejó de disminuir durante varios años. En otros ocho países la mortalidad ha aumentado en los últimos años de resultas del SIDA pediátrico. Los niveles y tendencias reconstruidos se compararon con otras estimaciones realizadas por organizaciones internacionales, basadas generalmente en métodos indirectos.

Conclusión En términos generales, durante la segunda mitad del siglo XX se lograron avances muy importantes en materia de supervivencia infantil en el África subsahariana. Sin embargo, la transición ha sido más lenta de lo esperado, con una disminución media del 1,8% anual. Además, la transición ha sido caótica en muchos países. Las causas principales de aumento de la mortalidad fueron la inestabilidad política, graves crisis económicas y las enfermedades emergentes.

ملخص

التحولات الصحية في البلدان الواقعة جنوب الصحراء الأفريقية: نبذة عن اتجاهات وفيات الأطفال دون سن الخامسة، (1950-2000)

الهدف: بناء رتسم لاتجاهات وفيات الأطفال دون سن الخامسة في البلدان الواقعة جنوب الصحراء الأفريقية في الفترة (1950-2000).

الطريقة: اخترنا 66 دراسة من دراسات المسح الصحي ودراسات المسح العالمي للخصوبة، شملت 32 بلداً أفريقياً، وتناولناها بالتحليل، وحسبنا معلات الوفيات لكل سنة في كل دراسة مسح، وجمعنا السنوات المتراكبة عند توافر دراسات مسح متعددة حول بلد ما، وأجرينا تحليلات حول السلاسل الزمنية الخاصة بكل بلد على حدة للتعرف على الفترات الزمنية التي تتبع فيها الاتجاهات نظماً رتيباً، سواء كان ذلك النظم متناقصاً أو ثابت الوتيرة أو متزايداً، وأجرينا اختبارات لتفحص التغيرات التي طرأت على الاتجاهات مستخدين نموذجاً لوجيتسياً خطياً.

الموجودات: لقد كانت الاتجاهات متناقصة ورتيبة الوتيرة في ربع البلدان، وهذا ما يدل على وجود تحول صحي سلس، فيما كانت الاتجاهات في ربع آخر من البلدان تتسم بتناقصات طويلة الأمد مع ارتفاعات ضئيلة حدثت في فترات زمنية قصيرة، وكان لدى ثمانية بلدان ازديادات كبيرة في الوفيات بسبب أزمات سياسية أو اقتصادية، فيما توقفت التناقصات في الوفيات في سبعة بلدان منها لسنوات عديدة، وفي ثمانية بلدان أخرى ازدادت معدلات الوفيات نتيجة الإيدز عند الاطفال. وأجرينا مقارنات بين المستويات والاتجاهات التي حصلنا عليها مع التقديرات الاخرى التي أجرتها المنظمات الدولية باستخدام طرق غير مباشرة.

الاستنتاج: لقد أحرزت البلدان الواقعة جنوب الصحراء الأفريقية تقدماً كبيراً في مجال وفيات الأطفال خلال النصف الثاني من القرن العشرين، إلا أن التحول قد حدث ببطء زاد عما كان متوقعاً له، وكان متوسط النقص 1.5% كل سنة، ولم يكن التحول منتظماً في الكثير من البلدان، وكان أهم أسباب زيادة الوفيات القلاقل السياسية وحالات الركود الاقتصادي الخانقة والامراض المستجدة.

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