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**Health Status and Health Policy
in Sub-Saharan Africa:
A Long-Term Perspective**

Giovanni Andrea Cornia and
Germano Mwabu

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Health Status and Health Policy in Sub-Saharan Africa: A Long-Term Perspective

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CONTENTS

LIST OF TABLES AND FIGURES	v
ACKNOWLEDGEMENTS	vi
ABSTRACT	vii
I INTRODUCTION	1
II TRENDS IN HEALTH STATUS IN AFRICA	2
2.1 Long-term changes in infant and under-five mortality rates: a sustained 1960-80 improvement, followed by a long stagnation	2
2.2 Testing for structural break in the long-term mortality trends and longevity	10
III CONVENTIONAL MORTALITY MODELS: APPLICABILITY TO SUB-SAHARAN AFRICA	12
3.1 Mortality models focusing on famine, conflicts, and displacements	12
3.2 Epidemics and pandemics models	13
3.3 Recession and growth models	14
3.4 Models emphasizing changes in access to health care	15
3.5 Health behaviour models	16
3.6 Unemployment-stigma models	17
3.7 Marginalization and psycho-social stress models	17
3.8 Summing up: elements for a relevant model for interpreting health changes in Sub-Saharan Africa	18
IV AN ECLECTIC MORTALITY MODEL FOR SUB-SAHARAN AFRICA	19
4.1 Specification issues	19
4.2 Famines, war and displacement	20
4.3 The AIDS pandemic	22
4.4 The health impact of economic stagnation	23
4.5 Changes in access to health services and population coverage	25
V FURTHER ESTIMATION RESULTS AND DISCUSSION	27
5.1 Results	27
5.2 Discussion	32

VI	WHAT TO DO? POLICIES FOR BETTER HEALTH IN SUB-SAHARAN AFRICA	35
6.1	An improved economic and political environment	36
6.2	Anti-poverty measures	36
6.3	Raising efficiency by reducing costs	36
6.4	Improving the targeting and decentralization of health expenditure	37
6.5	Increasing the flow of resources to basic social services	37
6.6	Move towards a multiplicity of service providers	40
	BIBLIOGRAPHICAL REFERENCES	40

LIST OF TABLES AND FIGURES

Table 1	Average yearly rate of decline in under-five mortality and infant mortality for Sub-Saharan Africa, 1960-95	4
Table 2	The regression of health status on time trend controlling for regional-specific factors, 1960-95	5
Table 3	Tests for structural breaks in time trends of the health status indicators	11
Table 4	Number of war casualties in Sub-Saharan Africa, 1992-94	21
Table 5	Refugees and internally displaced people (IDPS) in 1995	22
Table 6	Correlation matrix among contemporaneous variables in log form, 1960-95	29
Table 7	Regression of infant, under-five and maternal mortality rates on various socioeconomic factors	30
Table 8	Regression of infant, under-five and maternal mortality rates on various socioeconomic factors (alternative specification)	31
Table 9	Regression of infant, under-five and maternal mortality rates on ethnic conflicts controlling for other covariates	32
Figure 1	Trends in infant and under-five mortality in Africa, 1960-95	6
Figure 2	Trends in maternal mortality in Africa, 1960-95	8
Figure 3	Trends in life expectancy in Africa, 1960-95	9
Figure 4	Trends in per capita income in Africa, 1960-95	24
Figure 5	Female literacy rates in Africa, 1960-95	25
Figure 6	Trends in immunization coverage in Africa, 1960-95, by type	26
Figure 7	Immunization coverage in Africa, 1960-95, by region	27
Figure 8	Summary of the percentage health impact of a 10 % improvement in selected policy interventions	34

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ABSTRACT

This paper discusses the main changes in infant, child and maternal mortality which have occurred over 1960-1995 in Sub-Saharan Africa and analyses the main factors responsible for the observed shifts in these health trends. To do so, the paper surveys the major mortality models discussed in the literature and appraises their applicability to the Sub-Saharan African situation. Pooled cross section and time series data from 40 African countries, each with a population of over one million people, are then used to estimate explanatory models of infant, under-five and maternal mortality, and of female life expectancy at birth.

After controlling for the effects of the time trend, we find that the main determinants of child health status in Africa are real average per capita household income, female literacy rate, nutritional status, safe water supply, immunization coverage and broad accessibility to health services. The health effects of all these factors are statistically significant, though their importance varies according to the population group considered. For instance, income per capita does not appear to be – as often argued – the most important determinant of the health status. Similarly, and somewhat in contradiction with the received theory, female literacy appears to have an impact on infant and child mortality comparable to that of income per capita and access to health care. As expected, immunization has a greater impact on child and maternal mortality than on infant mortality. Calorie supply has a particularly strong impact on under-five mortality but not on infant mortality. Also, maternal mortality falls significantly with the availability of safe water and with increases in vaccinations against neonatal tetanus.

The paper also provides evidence that over the period 1960-95 the trend in health status of the African child and female population was not stable, and that an adverse break in trend occurred over the period 1980-95. Specifically, there was a significant upward shift in all mortality trends analysed over this period, while the trend for female life expectancy shifted downward. We interpret this finding as the effect of unfavourable changes (falling incomes per capita, declining health coverage and spread of conflicts and new diseases) which affected most of Africa in the 1980s and early 1990s. Further, we find that there was a change in the structural relationship between per capita income and health status indicators during the period 1980-95. Over that period, a given increase in per capita income was associated with a greater decline in infant, child and maternal mortality than

in the previous two decades. We interpret this result as a manifestation of better use of resources in spite of or, rather, because of the increased economic hardships of that period.

Our findings reveal the complexity of the evolution of health status in African countries since Independence. The average health outcome for the entire study period (1960-95) is the result of the *shifts* and *breaks* in the mortality trend over that time span. It is important therefore to understand the factors responsible for such shifts and breaks in order to effectively use public policy to influence the future course of health status in Africa. Previous economic investigations of mortality trends (see e.g., Musgrove 1987; Anand and Chen 1996) have associated a fall in mortality during periods of economic crisis with the delayed effects of past investments in health care infrastructure. While this might be true also for Africa, it appears that a more efficient use of public health resources (for instance for child immunization) can lead to a fall in mortality even during a recession. Finally, by providing empirical evidence on the relative importance of different policy interventions such as general health service coverage, immunization, provision of water supply, female education and poverty alleviation, the paper can help national and international policy-makers in the selection of the most efficient mix of policy interventions.

Apart from providing a framework for analysing the linkages between the evolution of health status and public policy, the paper takes a broader view on mortality determinants. We consider, for instance, the effects of ethnic conflicts on mortality. As one would expect, mortality in Africa is positively correlated with ethnic conflicts; we have however been unable to find statistical significance for the association. The finding is nonetheless important from a policy perspective.

The paper ends by providing tentative suggestions on how policy making can help improve health status in Sub-Saharan Africa in the years ahead. The main focus here is on health sector policies, particularly expenditure and pricing policies. The paper argues that these measures should enhance the access to publicly-guaranteed basic health services furnished to all the population by a multiplicity of providers regulated by public authorities. In addition, the paper emphasizes the importance of acting on factors outside the health sector: as conflict prevention and anti-poverty programmes have been found to influence mortality in an important way, policy makers in health ministries need to consider them in formulating overall health care strategies.

I INTRODUCTION

Over the past two decades, growing evidence has emerged on growth and distributive effects of health care, nutrition and fresh water supply, and on the rationality of investing in human resources to promote development in low-income economies, and in sub-Saharan Africa in particular. By now, it is well demonstrated that appropriate health and nutritional interventions have a large impact on the productivity of low income workers. More important, it is now clear that the provision of simple health care at an early age sharply reduces child and overall mortality and overall health outlays over the life cycle. Despite this mounting evidence, over the last two decades, investment in human development in most Sub-Saharan African countries has been modest or has declined. The first half of the 1980s has been characterized by an acute recession followed by a decade of stagnation, spreading civil unrest and ethnic conflicts giving rise to a sharp increase in the number of refugees and internally displaced people living in extremely difficult situations, and the diffusion of AIDS and other non-curable viral diseases such as ebola.

The 1980s also witnessed considerable changes concerning the financing and provision of public health services. The advent of structural adjustment entailed in most cases a reduction in public spending. With sharp falls in tax revenues, it was argued, African governments could no longer afford to provide health care free of charge. Governments were thus to encourage the private sector and make households bear a greater share of the cost of publicly provided social services. At the same time, the 1980s witnessed substantial efforts to expand selective health interventions (such as child immunization and oral rehydration therapy) which – despite their modest cost – can have a potentially large life saving effect.

In a situation dominated by a severe fiscal crisis, little thought was given to protecting the provision of basic health care for all; neither was sufficient attention paid to the rationalization and better use of existing resources, or to the mobilization of additional revenue through traditional and/or presumptive taxation (Taube and Tadesse 1996). During this period, public policy abandoned the key public finance principles concerning 'market failures' (typical of cases where externalities, natural monopolies, merit goods and asymmetric information dominate) which had inspired the public provision of health services until then. While – no doubt –

'government failures' were such as to demand a redefinition of health care provision, this was certainly not the general case.

The relative health impact of these different trends – falling household incomes per capita and public health and education expenditures, increasing recourse to user fees and private provision, greater targeting on low-cost, introduction of high-efficiency health interventions, erosion of female literacy, increasing ethnic instability and spread of new diseases – has not been assessed so far in a model attempting to account simultaneously for all these factors.

While there is a general recognition of the large potential impact of each of the sets of factors mentioned above, precise changes in health status for most of Sub-Saharan Africa are poorly documented; the establishment of precise causal linkages between these factors and changes in health status remains controversial; interpretation of the relative importance of the conditioning factors is not clearly established; and the policy approaches proposed to improve the present situation vary considerably.

The paper is organized into five sections following this introduction. In section II, we present and discuss trends in health status in Sub-Saharan Africa over the period 1960-95. Section III critically reviews the literature on mortality models followed by an exposition in section IV of an eclectic model of mortality suitable for Sub-Saharan Africa. In section V, we present and discuss analytical results obtained from the estimation of the model via a generalized least squares technique for panel data. These results concern effects of socio-economic and public health variables on mortality and life expectancy at birth; the effects of the time trend are discussed early in section II. Finally, we conclude in section VI with tentative recommendations for better health in Africa.

II TRENDS IN HEALTH STATUS IN AFRICA

2.1 Long-term changes in infant and under-five mortality rates: a sustained 1960-80 improvement, followed by a long stagnation

At independence, most Sub-Saharan countries inherited weak and dualistic health care structures – being almost perfect mirror images of the domestic economies, with the traditional and modern sectors coexisting side by side.

Modern health services were understaffed, distorted and located mainly in urban areas; in consequence, the bulk of the population, which resided in rural areas relied on traditional medicine to meet basic health needs. Apart from some vertical disease eradication programmes, broad-based public health efforts were insignificant. Curative care was equally underdeveloped. Except for four or five countries, the average number of people per doctor varied between 12,000 and 100,000 (Burkina Faso), compared to a South Asian average of 6,000 (World Bank 1989). As a result, mortality rates – which were particularly pronounced among the under-fives – were comparatively higher than those of countries with similar levels of income per capita, and were mainly caused by communicable and water borne diseases such as respiratory infections, diarrhoea, tuberculosis and measles.

By any standard, between the early 1960s and the early 1980s, most Sub-Saharan countries realized substantial advances in extending health care coverage. Large scale campaigns were implemented to reduce the incidence of infectious diseases and training for health workers was upgraded in many countries. In contrast, progress in expanding access to potable water in rural areas was more limited, and by 1980 only 33 per cent of the population was covered. Vertical campaigns against infectious diseases were probably the main cause for the fall in IMR (infant mortality rate) and U5MR (under-five mortality rate) in Africa over the period 1960-1980 (Table 1 and Figures 1-3). With an average linear decline of 2.9 points per thousand per year, progress in reducing infant mortality rate was faster than that achieved in South Asia (2.2 points a year), but slower than that realized in East Asia and China and the Arab countries (3.8 and 3.4 points a year), despite the lower initial rates of these two regions (Cornia 1990).

These average region-wide improvements in mortality rates conceal important variations in both levels and rates of improvements over time across the main subregions of Sub-Saharan Africa (Tables 1 and 2 and Figures 1 and 2). For instance, infant, under-five and maternal mortality rates have consistently remained the lowest in Southern Africa (South Africa, Botswana, Zimbabwe, Zambia, Angola, etc.). This region has also maintained the highest life expectancy at birth in Africa (Figure 3). In contrast, all the three mortality rates have remained the highest in West Africa (Nigeria, Sierra-Leone, Liberia, Ghana, Mali, Burkina Faso,

Senegal, Gambia etc.), and this region has also the lowest female life expectancy (Figure 3).

TABLE 1
AVERAGE YEARLY RATE OF DECLINE IN UNDER-FIVE MORTALITY AND INFANT MORTALITY FOR SUB-SAHARAN AFRICA, 1960-95

	Average yearly decline in U5MR				Average yearly decline in IMR			
	1960-70	1970-80	1980-90	1990-95	1960-70	1970-80	1980-90	1990-95
Angola	-4.4	-4.0	3.6	-1.0	-2.9	-2.4	1.8	-0.6
Benin	-5.8	-7.6	-2.6	-1.6	-3.6	-4.4	-1.5	-0.8
Botswana	-3.1	-4.5	-3.2	-2.0	-1.9	-2.9	-2.2	-1.2
Burkina Faso	-4.3	-2.9	-5.2	-6.0	-2.1	-2.7	-3.0	-3.8
Burundi	-2.7	-3.5	-1.3	-0.8	-1.6	-1.9	-0.7	-0.6
Cameroon	-5.0	-4.1	-4.8	-3.8	-2.9	-2.2	-2.6	-2.6
Central African Rep.	-10.5	-5.8	-1.2	-0.6	-5.2	-2.6	-0.5	-1.6
Chad	-7.3	-4.6	-3.8	-3.2	-4.6	-2.7	-2.0	-1.6
Congo	-6.0	-3.5	-1.5	-0.4	-4.3	-1.2	-0.5	-0.4
Cote d'Ivoire	-6.0	-7.0	-2.0	0.0	-3.5	-5.0	-1.8	-0.4
Eritrea	-2.4	-1.0	-4.4	-4.2	-1.6	-0.5	-2.7	-2.6
Ethiopia	-2.4	-1.0	-4.4	-4.2	-1.6	-0.5	-2.7	-2.6
Gabon	-5.5	-3.8	-3.0	-3.2	-3.1	-2.3	-1.8	-2.0
Gambia	-5.3	-7.2	-11.0	-6.0	-2.7	-3.3	-5.8	-3.0
Ghana	-2.6	-3.2	-2.0	-1.0	-1.4	-2.0	-1.2	-0.8
Guinea	-2.8	-3.3	-3.8	-3.8	-2.1	-2.0	-2.2	-2.4
Guinea-Bissau	-2.0	-2.6	-4.4	-3.8	-1.4	-1.6	-2.4	-2.4
Kenya	-4.5	-4.5	-2.2	0.0	-2.3	-2.5	-1.0	-0.2
Lesotho	-1.3	-2.2	-2.0	-1.6	-1.2	-1.0	-1.3	-1.0
Liberia	-2.5	-2.8	-1.6	-0.6	-1.6	-1.9	-1.0	-0.6
Madagascar	-7.9	-6.9	-5.2	0.0	-3.5	-4.4	-4.0	0.0
Malawi	-2.2	-5.3	-6.0	-2.2	-1.2	-2.4	-2.4	-1.6
Mali	-10.0	-10.0	-5.0	-5.0	-6.0	-5.2	-2.3	-2.6
Mauritania	-2.9	-4.3	-3.6	-3.6	-2.4	-2.4	-2.1	-2.0
Mauritius	-0.2	-4.0	-1.6	-0.6	-0.1	-2.7	-1.2	-0.6
Mozambique	0.1	-0.1	-3.0	-6.0	0.0	0.0	-1.3	-2.8
Namibia	-5.1	-4.1	-3.0	-1.2	-2.5	-2.0	-1.9	-0.8
Niger	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	-0.4	-0.4	-0.5	0.0	-0.2	-0.3	-0.3	0.0
Rwanda	1.9	1.2	-7.2	-2.2	1.0	0.6	-4.6	-1.0
Senegal	-2.1	-6.1	-7.1	-3.4	-1.0	-3.5	-3.8	-1.6
Sierra Leone	-4.0	-4.4	-1.7	0.0	-2.1	-2.5	-0.9	0.0
Somalia	-2.6	-2.2	-3.1	-0.8	-1.6	-1.3	-1.9	-0.4
South Africa	-1.8	-1.7	-1.8	-1.2	-0.9	-1.2	-1.3	-0.8
Tanzania	-2.6	-4.3	-2.0	0.0	-1.4	-2.3	-1.0	0.0
Togo	-4.9	-4.0	-3.2	-3.0	-2.7	-2.2	-1.8	-1.6
Uganda	-3.9	-0.5	-1.5	-4.0	-2.3	-0.2	-0.8	-2.0
Zaire	-5.7	-3.5	-0.3	0.0	-2.8	-1.7	-0.2	0.0
Zambia	-4.0	-2.0	3.7	1.2	-2.7	-1.7	1.9	0.8
Zimbabwe	-2.7	-2.9	-4.5	-1.2	-1.2	-1.6	-2.8	-0.6
Sub-Saharan average	-3.7	-3.6	-2.9	-2	-2.1	-2.1	-1.7	-1.2

Source: UNICEF Database (personal communication from Gareth-Jones).

The above observations are confirmed by the regression results presented in Tables 2 and 3. The results come from estimation of an *eclectic* model of health status determination that is particularly applicable to Sub-Saharan Africa during the period 1960-95. The model, the estimation methodology and data are described in section IV. The analytical results in Tables 2 focus on the effects of the time trend on health status indicators (infant/under-five mortality, maternal mortality and female life expectancy) accounting also for regional specific effects. Table 3 on page 11 shows the structural changes in these indicators over the period analysed.

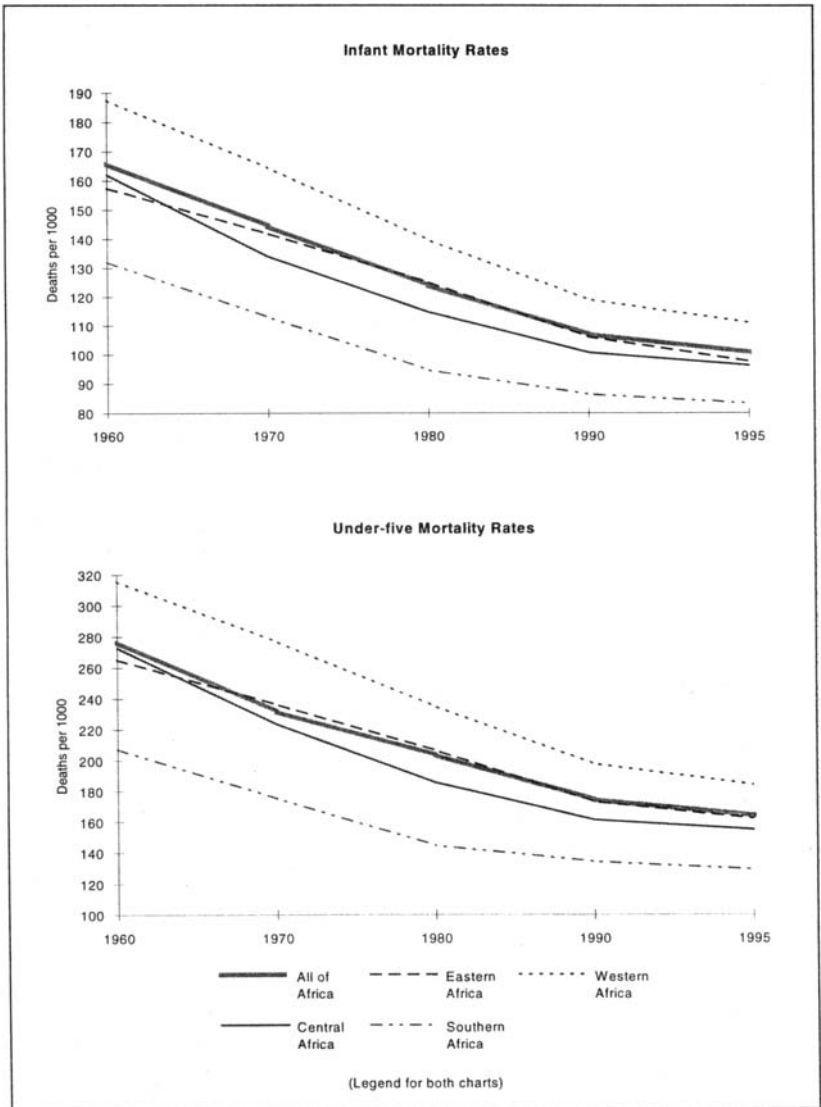
TABLE 2
THE REGRESSION OF HEALTH STATUS ON TIME TREND CONTROLLING FOR
REGIONAL-SPECIFIC FACTORS, 1960-95

<i>Explanatory Variables</i>	<i>Health Status Indicators</i>			
	Log of infant mortality	Log of under-five mortality	Log of maternal mortality	Log of female life expectancy
Constant term	5.257 (65.76)	5.793 (62.04)	5.092 (11.45)	3.661 (129.72)
Log of the time trend	-.346 (20.16)	-.372 (19.15)	.972 (3.07)	.141 (19.32)
Eastern Africa Dummy	-.184 (1.46)	-.218 (1.48)	-.349 (1.37)	.082 (1.86)
Central Africa Dummy	-.155 (1.09)	-.178 (1.07)	-.072 (.26)	.061 (1.23)
Southern Africa Dummy	-.382 (2.69)	-.487 (2.94)	-.883 (2.83)	.141 (2.84)
Overall R-Squared	.357	.347	.215	.403
Sample size	200	200	86	200

Notes: West Africa is excluded to avoid linear dependence. Absolute T-values are in parentheses below the coefficients. The estimation procedure used is the Generalized Least Squares with Random Effects.

The improvement in African health over the period 1960-95 (Table 1) is confirmed by the values and significance of the coefficients in Table 2 which underscore the negative association between the time trend over 1960-95 and infant and under-five mortality, as well as the positive trend in female life expectancy. These data also stress, however, the positive correlation between the time trend and maternal mortality (both relationships are illustrated graphically in Figures 1 through 3).

FIGURE 1
TRENDS IN INFANT AND UNDER-FIVE MORTALITY IN AFRICA, 1960-95



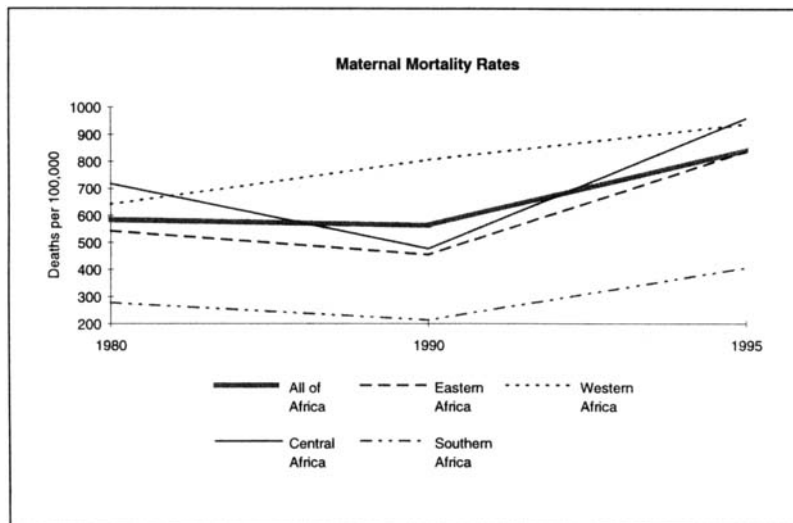
Moreover, in line with the regional variations in health status already noted, the estimation results in Table 2, show that the regional dummy

variables (which alter the subregion specific intercept) for infant, under-five and maternal mortality rates have the highest negative values for Southern Africa in relation to Western Africa (the comparison subregion that we have omitted from the regression to avoid the well known dummy variable trap). It can be seen from the results that life expectancy is consistently higher in Southern Africa as indicated by the higher positive value and statistically significant coefficient of the Southern Africa dummy.

The rapid descent in the mortality rates of most age groups recorded over 1960-80 was followed by a major slow down over the 1980-95 period (Figure 1). During this time span, the average yearly rate of decline in infant and under-five mortality rates for many countries fell below one point a year (Table 1), a rate that was substantially lower than the rate recorded over the previous two decades, and which was much smaller than that normally observed in developing countries with infant and under-five death rates of around 100 and 180 per thousand. The slow-down was particularly acute during the first half of the 1990s, a period during which in many Sub-Saharan countries infant mortality rate stopped declining (Zaire, Sierra Leone, Niger, Nigeria, Madagascar and Tanzania) or marked an increase (Angola and Zambia). The slow-down in the improvement of African health over the period 1980-1995 is also clearly borne out in Figures 1 through 3. While the rate of the decline in infant and child mortality flattened around this period, maternal mortality actually rose in Central and Eastern Africa.

With few exceptions, during the last fifteen years, the health situation has become increasingly complicated by the re-emergence of diseases which were thought to have been eradicated (smallpox), the spread of old ones (cholera and yellow fever) to new areas, the development of drug-resistant varieties (pneumonia, malaria and gonorrhoea) and the spread of new health risks such as AIDS. The uniqueness of the recent African health crisis is underscored by the much more favourable health developments which have occurred in developing regions facing similar economic and political difficulties. For instance, in the 1980s, most of Latin America experienced a significant decline in incomes and health expenditure per capita. In addition, it presented a lower incidence of infectious and respiratory diseases (which can be prevented at relatively low cost) than Africa and a higher incidence of costly-to-treat diseases such as cancer and

FIGURE 2
TRENDS IN MATERNAL MORTALITY IN AFRICA, 1960-95

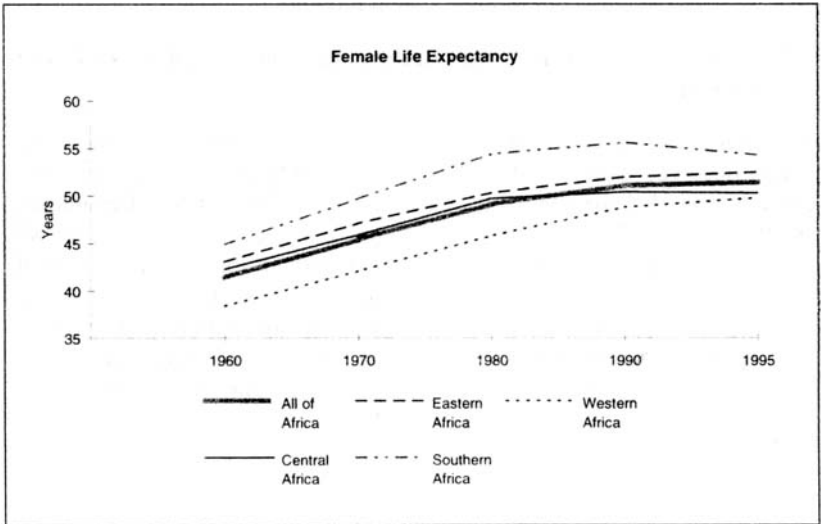


heart ailments (UNICEF 1994). Yet, the main indicators of maternal and child health continued to improve during this period. Possible explanations for the divergence between the Latin American and African health trends would centre around the initial fragility and poor coverage of the health care systems in Africa (in part due to the greater share of the rural population there); the faster expansion of cost effective child-survival interventions in Latin America; the lesser political instability; and the more limited effect of AIDS in this region. Furthermore, in the 1980s, Latin America's strong network of non-governmental organizations was able to replace, if only in part, a weakened public health sector, a fact less evident in Sub-Saharan Africa (*ibid*).

Information about the socio-economic profile of the African population groups affected by the stagnation in health status over the last 15 years is extremely scant. Hereafter we note the very limited material available to us. Past studies on Africa and elsewhere have documented the negative relation between child and maternal mortality risk and level of maternal education, controlling for income and other relevant variables (Caldwell 1979). The recent stagnation or increase in mortality (Figure 2) is therefore

likely to have affected more than proportionately the infants and the children of the poor and the less educated strata of the population. Some direct evidence confirms this hypothesis (Gertler and van der Gaag 1990), especially in rural areas – which, in addition, have been disproportionately affected by the cutbacks in the public provision of health services observed over the 1980s and early 1990s – and among the people living in incomplete families. In much of Sub-Saharan Africa, as in most other parts of the world (Becker 1991), marriage is an important social event requiring considerable expenditures for the ceremony, gifts to the parents of the groom or the bride, to the extended family members etc. The abrupt impoverishment in the 1980s of many families in Sub-Saharan Africa must have contributed to the postponement in marriages and possibly to an increase in incomplete families – with adverse effects on child health and hence longevity (Figure 3).

FIGURE 3
TRENDS IN LIFE EXPECTANCY IN AFRICA, 1960-95



It is also likely that migrant and refugee populations have suffered a greater proportional decline in health status than other populations, at least since the mid 1980s. Past analyses confirm that migrants face greater mortality risks than people who remain in their community. The last ten years have witnessed in Sub-Saharan Africa a sharp increase in the number of distress migrants, international refugees, internally displaced people,

people repatriating to the country of ethnic origin and asylum seekers (see Sections III and IV). For most of these groups, distress migration or displacement have entailed considerable hardship, a difficult redefinition of survival strategies, and – as the result of all this – impoverishment, hunger, greater stress and heightened susceptibility to infection and disease. In an increasing number of countries of Sub-Saharan Africa, mortality has been pushed upwards (though no one knows by exactly how much) by the spread of war and civil unrest.

While the slow-down and stagnation in health status due to 'traditional causes of death' seem to have affected 'the traditional vulnerable groups' (children, delivering mothers, the elderly, people in remote rural areas, the poor, etc.), there is scattered evidence that the mortality due to the 'new causes of death' (such as AIDS and ethnic or political conflicts) have affected also the better educated, the urban middle class in the reproductive age group, males in the combat age, children born to parents affected by HIV, and people with considerable spatial mobility.

2.2 Testing for structural break in the long-term mortality trends and longevity

Hereafter we test formally whether the infant and the under-five mortality trends observed over the 1960-1980 period could predict accurately the changes recorded over the subsequent 15 years. To test this hypothesis, and to estimate the causal models in Section 5, we use data from 40 African countries with a population of over one million people. For all of them we compiled data on infant and under-five mortality rates, maternal mortality, female life expectancy, per capita income, female literacy rates, and other relevant variables such as immunization coverage and health service access indicators. The time series are for the years 1960, 1970, 1980, 1990 and 1995. All data come from UNICEF (1995 and 1997), UNDP (1995 and 1997), World Bank (1983, 1993 and 1997) and IMF (1990).

The aim of the test presented below is to ascertain whether negative events (of whatever nature, but particularly the economic recessions and shocks such as ethnic conflicts) have caused a break-in-trends during the 1980s and 1990s. The information as to whether or not there was a structural break in mortality and longevity over 1980-1995 is crucial for credible predictions of future health status and for the identification of the causes of the premature slow-down in mortality rates.

The test of the break in the time trend is carried out by including in a long term causal model of infant, child and maternal mortality, and in that of female life expectancy, dummy variables for the years 1980-95. A positive and statistically significant value for the dummy variable in the first three cases – and a negative one for the fourth – would signal a clear deterioration in the rate of health improvement over the recent period. The model thus includes as explanatory variables income per capita, female literacy, the time trend (which captures information on all other past causal variables) and the 1980-95 dummy variable. The estimation is carried out in a log-log form using the estimation technique of the generalized least squares (with random effects) for panel data (Greene 1993).

TABLE 3
TESTS FOR STRUCTURAL BREAKS IN TIME TRENDS OF THE HEALTH STATUS INDICATORS

Variables	Health Status Indicators			
	Log of infant mortality	Log of under-five mortality	Log of maternal mortality	Log of female life expectancy
Constant term	6.029 (30.52)	6.721 (30.00)	6.906 (10.89)	3.609 (30.37)
Log of the time trend	-.401 (6.39)	-.424 (6.29)	1.387 (4.33)	.015 (.35)
Log of per capita income	-.117 (2.99)	-.144 (3.01)	-.256 (2.83)	.005 (.24)
Log of adult female literacy rate	-.058 (2.37)	-.069 (2.61)	-.315 (2.45)	.065 (5.72)
Period dummy (= 1 for the period 1980-95 and zero for 1960-70s)	.514 (1.97)	.579 (1.94)		-.203 (2.00)
Log of per capita income times the period dummy	-.079 (1.76)	-.088 (1.72)		.037 (2.02)
Chi-square test-statistic	231.1 [p-value=.000]	216.5 [p-value=.000]	31.6 p-value=.000]	246.3 p-value=.000]
Sample size	133	133	81	133

Source: Authors calculations

Note: Absolute T-values in parentheses under the coefficients.

The results of the test (Table 3) show that the coefficients of the 1980-95 dummy across all specifications are positive and significant at about the 5 per cent level. The results lead us to reject the hypothesis of a *stable*

mortality trend over the period 1960-95, and to accept the hypothesis that there was an upward shift in all mortality curves during the period 1980-95. Correspondingly, there was a downward shift in female life expectancy, as is evident from the negative sign of the coefficient for the 1980-95 dummy. The chief suspects for these unfavourable shifts are the adoption of inappropriate domestic policies or wrong implementation of correct ones (especially in the field of health expenditure and financing), emergence of new diseases such as AIDS, and intensification of ethnic conflicts due to frailty of domestic economies.

The regression results in Table 3 show also that there were changes in the slopes of these indicators. The coefficient on the interaction term (the 1980-95 time dummy multiplied by income per capita) is negative for the infant and child mortality equations and – consistent with this – it is positive for the life expectation equation. This finding indicates that for a given increase in per capita income over the period 1980-95, the decline in child mortality was greater than the decline brought about by the same increase in income during the 1960s and 1970s. That is, the available family resources were being used more efficiently during the period 1980-95 than in the period spanning the preceding two decades. These results provide important lessons for the design of health policies in Africa over the next several decades.

III CONVENTIONAL MORTALITY MODELS: APPLICABILITY TO SUB-SAHARAN AFRICA

In this section, we discuss first the main mortality models in the literature and their applicability to the Sub-Saharan case. We would like to emphasize that we focus on *long term theories of mortality*, as well as on *theories of short term mortality crises*.

3.1 Mortality models focusing on famine, conflicts, and displacements

Large and sudden increases in mortality – or major deviations from its trend – have often been caused by wars, famines, major epidemics, and large scale civil unrest. For example, three million people were wiped off during the Great Bengal Famine of 1943-47, while considerable mortality rises were observed in the 1980s in the Wollo province, other famine-stricken parts of Ethiopia (Sen 1981), and in the Sudan. During the

Bangladesh war of 1971 and severe famine of 1974-5, death rates in Matlab Thana increased 35 per cent. The increase was particularly pronounced for infants and children, and was mainly caused by a surge in deaths due to nutrition-related and infectious diseases (Murray and Chen 1993). On occasion of the collapse of food production and forced peasant migrations following the collectivization of the land in Russia and Ukraine in 1930-33, the crude death rate rose by 49 and 260 per cent respectively. Similarly, during the Dutch Famine of 1944-45, life expectancy at birth dropped by 8 years for men, and by 4.6 for women. Mortality due to hunger was most common among the very young and the very old (Lumey and Van Poppel 1994).

Over the last decade, Sub-Saharan Africa has also witnessed a sharp increase in wars, domestic conflicts and ethnic struggles, all factors that have led to an increase in deaths due to violent causes, starvation and infectious diseases (see Nafziger 1996; and Tables 4-5). However, while in typical famine-war models the sudden peaking of death rates was consistently followed by its return to pre-crisis levels in just 1-2 years, it is unclear whether this has been the case in Sub-Saharan Africa – where severe food shortages have recurred, conflicts have become endemic, and social problems due to displacement of refugees and distress migration have taken a long time to resolve.

Thus, short-term mortality models focusing on famines and wars, offer interesting insights for the interpretation of the mortality changes intervened in Sub-Saharan Africa during the last 15 years. In a few cases, the recent increases in mortality in Africa refer to contextual situations (large social dislocations), categories of population groups affected (the old, the very young and the biologically vulnerable) similar to those mentioned in the famine literature; and as noted in this literature, the rise in death rates has been commonly caused by starvation, undernutrition, exhaustion, endemic diseases and epidemics. It is unclear, however, if the pattern of quick 'large increase/large decrease' in mortality rates can be observed in Sub-Saharan Africa, where many of these phenomena have often become endemic.

3.2 Epidemics and pandemics models

In this class of mortality models (such as those used to explain the impact of the plague in middle-age Europe), very large mortality increase occurring in just a few years (depending on the mechanisms of diffusion of

the contagion) are followed, a few decades later, by a gradual and endogenous recovery in the population level and structure. Only in a few cases – as on occasion of the black plague in Central Europe during the fifteenth century – did such epidemics lead to a lasting and significant decline in population size.

Except for a few acute, but circumscribed, viral infections that impose quickly their deadly toll on the populations, during the last fifteen years or so, Sub-Saharan Africa seems to have avoided major epidemics (typhus, cholera, smallpox, etc.) which tend to cause large peaks in mortality rates. However, since the mid 1980s (and possibly before), the African countries have been affected by the gradual spread of the Acquired Immuno Deficiency Syndrome (AIDS), a deadly pandemic. While other new infectious diseases (hepatitis C and D, ebola and other haemorrhage fevers) have emerged, their mortality impact seems, so far, to be modest. Because of the long period of incubation and slow speed of contagion, AIDS has likely produced an important but gradual upward effect on mortality rates. In a sense AIDS is taking the characteristics of pandemics – rather than an epidemics – which is *ceteris paribus* likely to produce a clear but gradual and permanent uplift of the mortality curve.

3.3 Recession and growth models

This class of models explains short- and medium-term changes in health status on the basis of economic growth or recession and adjustment policies. Studies in this class of models utilize ideas derived from the Mosley-Chen model (1984), a model that synthesizes demographic, epidemiological and economic variables into a coherent framework, and which reflects the epidemiological and mortality patterns prevailing in low income countries. This model is thus particularly appropriate for the conditions prevailing in Sub-Saharan Africa. In the model, health status is proxied by infant/child mortality (a key element of the overall mortality in poor nations), and the main *immediate* causes of death are infectious, parasitic, nutritional and environment-related diseases. The main *underlying* determinants of mortality are maternal factors (including maternal education and health), food intake, environmental conditions (pollution, but also values), and personal behaviour, and household disease control measures.

Many of the mortality determinants in this model are *slow-moving stock variables* (female education, physical infrastructure, environmental

conditions), though most analyses focus on *fast changing flow variables* (household incomes, public health expenditure and price of health care). For instance, Cornia et al (1987) analyse the linkages between adjustment policies and child health through changes in food prices and subsidies, family incomes, availability of health services, changes in the relative prices of the goods consumed by the poor, and time use and literacy rates of mothers. This family of models underscores that health status can be influenced by economic factors and not only by changes in health sector variables; that *stock effects* can shelter people's health even in the presence of sudden and large economic changes; and that there are strong non-linearities and threshold effects in the relationship between economic growth or decline and health status of the population (Benefo and Schultz 1996; Mwabu 1996; Pritchett and Summers 1996). With their emphasize on economic factors – which have shown adverse variations over the last 15 years – these models are relevant to the analysis of long term mortality changes in Sub-Saharan Africa.

3.4 Models emphasizing changes in access to health care

Even in periods of severe recession and fiscal crisis, the mortality impact of falling incomes and health expenditures and rising stress can be strongly mitigated by the adoption of new health technologies, as shown by the introduction of antibiotics in the USA in the early 1930s, or the diffusion of vaccination and other basic health measures in the 1980s in many developing countries. Access to health care can be also influenced by health sector policy reforms which have been adopted widely in Sub-Saharan Africa during the last 15 years, though with uncertain effects. These reforms have pivoted around measures aiming at increasing the efficiency of health expenditure (as, for example, through the introduction of the essential drugs programme), the introduction of user fees, the decentralization of services provision and the reliance on non-governmental organizations for health service delivery. Many of these reforms however remain controversial, as to their effects on health care quality and access (Mwabu et al. 1995).

Many argue that community organizations (which are well established in several parts of Sub-Saharan Africa) can effectively replace eroding state bureaucracies in the provision of basic health services. This does not always occur, however (Robinson and White 1997). While in Latin America in the 1980s the non-governmental organizations were able to replace, if in part, a weakened public health sector, in the Eastern European

countries in transition, the frailty of civil society and a tradition of dependency on the state resulted in a worsening of health status when the public health system contracted (Cornia 1996).

Another important factor affecting access to health care is the type of political regime in power. Recent social and economic reforms have stressed good governance, usually defined in terms of democratic regimes and multiparty politics (World Bank 1995 and 1997). Yet, it has often been argued that widespread access to health care and broadly shared health gains can be achieved in countries with different regimes. However, in the African context, a simple analysis suggests otherwise. For instance, despite its considerably slender natural resource base, democratic Tanzania did much better than military-ruled and oil-rich Nigeria in improving the health of the population over the period 1960-1995. In 1960, under-five mortality rates in Nigeria and Tanzania were 204 and 249 respectively; by 1995, these rates were 191 and 160 for Nigeria and Tanzania respectively (UNICEF 1995).

3.5 Health behaviour models

Models in this class emphasise the role of health knowledge and practices and personal behaviour in health improvements. In the Sub-Saharan context, these models emphasize empowering parents, particularly mothers in their functions as health agents at the household level. They stress, for instance, the desirable behaviours to be adopted (e.g., washing hands, before preparing food, and observing other aspects of personal hygiene); knowledge about home-based oral rehydration therapy to treat children affected by diarrhoea (the second cause of death among African infants); and – in the case of sexually transmitted diseases – responsible behaviour and safer sex. In this approach, promotion of health information and changes in personal hygiene are more important long-term determinants of health status than income, food intake and health expenditure. One could reasonably assume, however, that the availability of health information in Sub-Saharan Africa is strongly correlated with that of outreach health services and female literacy.

Smoking, drinking, lack of physical activity and unbalanced diet (or, in short, 'lifestyles') are also often mentioned as a main cause of ill-health and high mortality in studies falling under this category. For instance, smoking and excessive alcohol consumption are the underlying factors in premature deaths due to various types of cancers and cardiovascular problems.

However, the relevance of this last set of considerations to Sub-Saharan Africa appears to be limited. These health behaviour models focus on causes of death and population groups different from those seen in Sub-Saharan Africa. They refer to consumption patterns (e.g., of fats, cigarettes, alcohol, etc.) which are found primarily in parts of urban areas. If anything, dietary intake in Africa has probably been negatively affected by the belt-tightening imposed on most households by the stagnation-recession of the last 15 years; the decline in food consumption has aggravated nutritional problems due to insufficient – rather than inappropriate – calorie and protein intake for a sizeable share of the population.

3.6 Unemployment-stigma models

Mortality studies in industrialized economies do not emphasize as much the causal variables in the models discussed so far but rather stress the effects of rising unemployment and of changes in social roles of people. Loss of employment is not analysed so much in terms of its income effect, but in terms of the loss of the intrinsic value of work, the termination of the social role associated with having a job, and the social stigma associated with joblessness. Most of these analyses conclude that people with an unemployment experience, particularly the long-term unemployed, suffer far worse mental conditions and mortality rates than the employed. While, during the last decade and a half, underemployment has risen everywhere in Sub-Saharan Africa, the relevance of stigma models appears limited in a continent where a large part of the population is made up of small farmers, and where urban underemployment has traditionally been high and unstigmatizing. The mortality pattern among adult males due for example to cardiovascular and mental problems (typically associated with the factors just mentioned) is not frequently observed in Africa.

3.7 Marginalization and psycho-social stress models

Stress is being increasingly recognized as a key factor in sudden deaths, i.e., deaths due to heart problems, psychosis, violence, ulcers and so on (Cornia 1996). Mental and physical stress may arise when individuals are forced to face new and unexpected situations for which coping behaviours are unknown, and for which traditional survival strategies are no longer effective. The health effects of such adverse situations are likely to be particularly severe when they are unanticipated, and thus have to be faced without preparedness. Among the unsettling situations emerging recently on a grand scale, particularly in countries in transition, are unemployment,

distress migration, civil conflicts, personal insecurity, sudden changes in social hierarchies, and unstable family circumstances. The immediate causes of death associated with stress are cardiovascular, psychosomatic illnesses and stress-induced irrational behaviour leading to accidents, homicide and suicide.

Undoubtedly, many of the drastic social changes just mentioned cropped up in Sub-Saharan Africa in the 1980s, together with a severe recession and harsh economic reforms. The health effects of these adverse social changes were likely compounded by the massive increase in conflicts and ethnic unrest of the same period, and by the weakening – or outright collapse – of health care systems and of national institutions responsible for law-and-order. While it is likely that a considerable number of violent deaths have been caused by the greater number of conflicts themselves, the extent to which increased stress has contributed to greater mortality in Africa remains unclear.

3.8 Summing up: elements for a relevant model for interpreting health changes in Sub-Saharan Africa

The above review allows us to exclude, a priori, a number of potential explanations of the recent stagnation in health conditions in Sub-Saharan Africa. For instance, 'lifestyles' and 'unemployment-stigma' models offer only limited insights to the health situation in Sub-Saharan Africa, as they refer to different contextual situations (reflecting different income levels and social organizations), affect different population groups (the middle aged and the elderly), and reflect different immediate and underlying causal patterns. Also, the 'psycho-social stress' models are only partially applicable to the African case, though there are scattered indications of higher risks of mental problems and stress-related deaths due to suicide and other violent causes in populations facing unexpected crisis situations (involuntary displacement, surging insecurity, acute food scarcity and so on).

An ex-ante interpretation of the changes in health status in Sub-Saharan Africa is thus probably best carried out on the basis of the long term mortality frameworks (such as the 'recession', 'access to health care' and 'pandemics' models), which emphasize variables such as income per capita, population coverage of basic health services, maternal education (proxied by female literacy) and incidence of deadly viral diseases. The short term mortality models, such as the 'famine and war models', which emphasize

the impacts of quasi-exogenous factors, are also possibly relevant in explaining a few recent peaks in mortality in Sub-Saharan Africa. We combine the key elements from these approaches to construct an eclectic model of health status determination and estimate its parameters using panel data from 40 Sub-Saharan countries. We use the estimation results and a synthesis of the various strands of the literature we have reviewed to recommend policies for improving health status in Africa.

IV AN ECLECTIC MORTALITY MODEL FOR SUB-SAHARAN AFRICA

4.1 Specification issues

The literature reviewed above and other literatures (see e.g., Musgrove 1987; Pritchett and Summers 1996); Fogel 1997; Schultz 1997) suggest the following eclectic model of child mortality for a low-income region which has been subject to shocks of the kind experienced in Sub-Saharan Africa during the last 15 years:

$$\text{IMR/U5MR/MMR} = f(\text{PCY, PHC, LIT, SHOCKS, RETI, U})$$

where

- IMR/U5MR/MMR = Infant, under-five and maternal mortality rate;
- PCY = Per capita household income;
- PHC = Population health coverage indicators;
- LIT = literacy rate, especially for females;
- SHOCKS = Exogenous shocks such as famines, wars, epidemics;
- RETI = Region- or time-specific factors;
- U = Disturbance term.

The above equation attempts to capture both the short- and the long-term effects on mortality – the effects of famine for example, are short-lived, while those for the literacy rates are long-lasting. Four aspects of the model specified above need to be noted. First, since mortality measurement is at the national level, the model is aggregate in nature (see Benefo and Schultz 1996 for the microeconomic foundations of such a model). Second, infant and under-five mortality rates are assumed to be random events, uncorrelated with the fertility behaviour of parents (Schultz 1976 and 1997; see Eckstein, Schultz and Wolpin (1985) for an alternative

specification assumption). Third, as Pritchett and Summers (1996) note, infant and under-five mortality rates are better measures of health status than the life expectancy because they are less prone to measurement errors and are exogenous to income (children are not part of the labour force), a fact that mitigates the endogeneity problem in the estimation of long term mortality model. We have nonetheless also estimated an equation for female life expectancy for comparison purposes. The fourth and final issue is that the error term, U , has a component that is country-specific and that could vary or remain constant over time.

The above model was estimated with panel data for the period 1960-95 (see Section 2.2) for data sources and estimation technique). Before turning to model estimation, we comment in detail on the key explanatory variables.

4.2 Famines, war and displacement

Major food shortages, often reaching famine proportions, have been frequently recorded in Sub-Saharan Africa since 1970, particularly over the 1983-85 period and in the early 1990s. At the same time, the ability of national governments and the international community to avert the worse impact of famines has improved substantially, though in some cases this has resulted in increased dependence from abroad.

The most devastating famines in Africa are those that have affected the Horn of Africa over 1982-85 and again in the early 1990s. Important famines were also recorded in the Sudan and Southern Eastern Africa in 1990-92. Deaths to famines and hunger are not necessarily the result of climate changes or entitlement failures, but are now increasingly being aggravated by civil unrest which prevents the delivery of humanitarian aid. Hunger has thus been particularly severe in war zones, such as Rwanda, Southern Sudan and Somalia. This explains why improvements in predicting famines have not resulted in parallel improvements in their prevention (Davies 1993).

Since the mid 1980s, the number of full-fledged wars in Sub-Saharan Africa has steadily escalated. According to Wallensteen and Sollenberg (1995 and 1996), by 1994 there were no less than 13 full-fledged wars in the region. The number however declined to 9 in 1995. The main conflicts affected Angola, Ethiopia (Eritrea and Tigray), Liberia, Mozambique, Rwanda, Somalia, South Africa, Sudan, and Uganda, to which one should

add Burundi, Sierra Leone and former Zaire. If a less restrictive definition is adopted, the number of internal or external armed conflicts underway during this period rises by about a third. Most of these conflicts are increasingly due to internal problems (struggle for power, secession, or autonomy) and only few have been fought between states or have witnessed external interventions. Military conflicts increasingly involve non-state actors, such as armed clans and ethnic movements. This exposes civilian populations to greater suffering as battles are fought in their midst. As a result, conflicts have become more of a social and public health problem than an instrument of state politics. However, the measurement of the mortality impact of civil wars is an extremely difficult task. Whatever the problems involved in their measurement, the numbers are considerable (Table 4).

TABLE 4
NUMBER OF WAR CASUALTIES IN SUB-SAHARAN AFRICA, 1992-94

	Number	The worst year
Rwanda	200-500,000	1994
Angola	100,000	1994
Burundi	100,000	1993
Mozambique	100,000	1992
Liberia	20-50,000	1993
Sudan	6,000	1993
South Africa	3-4,500	1993

Source: IFRCS (1994:111, Table 16)

The deteriorating health status of the Sub-Saharan African population has also been due to an increase in the number of external and internal displacements which leave growing scores of refugees without adequate access to food, fresh water and health care – and which deprives them of their coping strategies. Since the late 1970s, the number of external and internal refugees has increased constantly (Väyrynen 1996). In 1995, there were 5.2 million refugees in Sub-Saharan Africa as a whole, with the biggest group being in Zaire (1.3 million), followed by Tanzania (0.7 million), and Guinea (0.6 million) (World Refugee Survey 1996:4-5). The number of internally displaced people was even greater (Table 5).

TABLE 5
REFUGEES AND INTERNALLY DISPLACED PEOPLE (IDPS) IN 1995

	Refugees	IDPs	Total	Share
Sudan	448,000	1,700,000	2,148,000	7.6
Rwanda	1,545,000	500,000	2,045,000	25.7
Angola	313,000	1,500,000	1,813,000	16.4
Liberia	725,000	1,000,000	1,725,000	56.7
Sierra Leone	363,000	1,000,000	1,363,000	30.2
Somalia	480,000	300,000	780,000	8.4
Ethiopia	500,000	111,000	611,000	1.1
Mozambique	97,000	500,000	597,000	3.7
Eritrea	325,000	200,000	525,000	14.9
South Africa	10,000	500,000	510,000	1.2
Burundi	290,000	216,000	506,000	7.9

Sources: World Refugee Survey 1996 (Tables 3 and 4). These data have been supplemented by information from IFRCS (1994: Tables 12 and 14) and UNHCR (1996). The population figures for 1995 have been obtained from WHO (1996, Table A1), cited in Väyrynen (1996).

4.3 The AIDS pandemic

The precise mortality impact of the human immunodeficiency virus (HIV), the virus that causes Acquired Immunodeficiency Syndrome (AIDS) is difficult to ascertain. AIDS killed 0.7 million people in 1993 and the death toll is expected to rise to 1.8 million by the end of the decade (Ainsworth and Over 1994). Some 60 per cent of the 24 million HIV infected people live in Sub-Saharan Africa, and an even higher share of the total deaths is estimated to have occurred there (other estimates give comparable but somewhat lower figures; *ibid.*). While the disease has been shown to be always fatal, its mortality impact over time depends on the lag between HIV infection and development of AIDS. While in the industrialized countries such lag is estimated at about ten years, preliminary evidence would suggest it is somewhat shorter (five to seven years) in Sub-Saharan Africa, because of the lower nutritional standards of the populations affected and the lack of drugs to delay the onset of AIDS. Already now, baseline mortality rates for the population groups affected have doubled or tripled (*ibid.*).

Unprotected sex between high-income males and low-income single females is the most common vehicle of contagion. HIV then spreads

subsequently to spouses, and through pregnancy, to the new born children. For the moment, HIV and AIDS seem to affect the Sub-Saharan population in a highly differentiated manner. Its incidence is generally higher among the following social groups: in males than females of reproductive age, in urban than rural populations; in the better-off and better educated, and in special population groups (prostitutes and people with high spatial mobility), in the reproductive-age population rather than among children and the elderly (the phenomenon has however already spread to the child population). The incidence is also generally higher in Eastern than Western Africa. Around 1993, urban HIV prevalence rates among adults in Eastern Africa ranged from 12 per cent in Tanzania and 35 per cent in Rwanda. In West Africa it ranged between 1 per cent in Cameroon and a maximum of 15 per cent in Cote d'Ivoire. Rural prevalence rates were estimated at 20-30 per cent of urban rates, with the exception of Zambia (where mortality rates, including for under-fives, rose drastically in the 1990s), Zimbabwe, Tanzania and Central African Republic – which all exhibit rural rates equal to two thirds of urban rates.

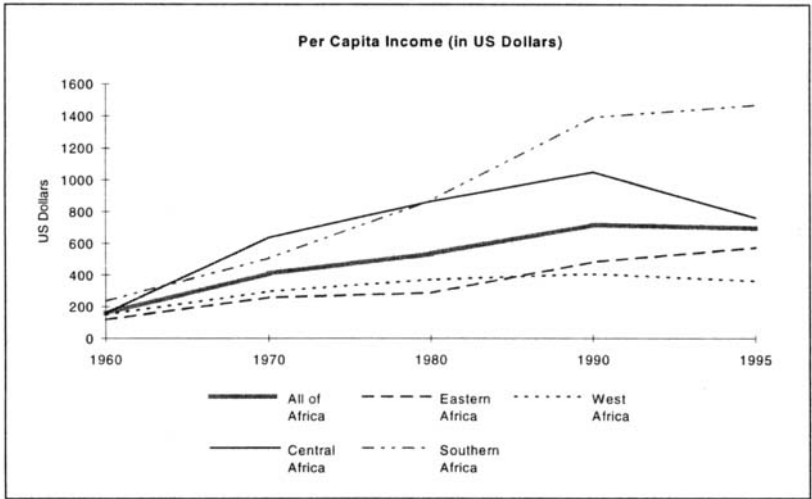
HIV prevalence is highest among the urban well-educated classes. WHO-sponsored surveys for the late 1980s show a positive association between male schooling and number of sexual partners in Central Africa Republic, Cote d'Ivoire, Kenya and Togo. In Rwanda, the rate of infection among women attending pre-natal clinics was found to be related to the level of education and income of their partners. Seroprevalence among women was twice as large among those who had partners with 8 or more years of education as compared with those whose partners had four or less years of education. Infection rates correlated also with the level of income and (even more pronouncedly) with the sector of employment. While 9 per cent of the women with a partner working as a farmer were infected, the proportion rose to 38 per cent among those with their husband/partner working in the civil service (Allen *et al.* 1991, cited in Ainsworth and Over 1994). Similar results were found in studies conducted in Uganda, Zaire and Zambia.

4.4 The health impact of economic stagnation

Over 1980-95, Sub-Saharan Africa has successively experienced a strong recession (1981-4), followed by a moderate recovery, and a long period of weak growth (about 1.5 per cent a year over 1986-95). If population growth is factored in, incomes per capita become – in most cases – slightly to moderately negative, although acceptable growth rates of GDP were achieved in a number of countries, including Mauritius, Ghana,

Burkina Faso, Botswana, and Uganda. On average the fall in per capita GDP was more pronounced in Western and Central Africa (Figure 4).

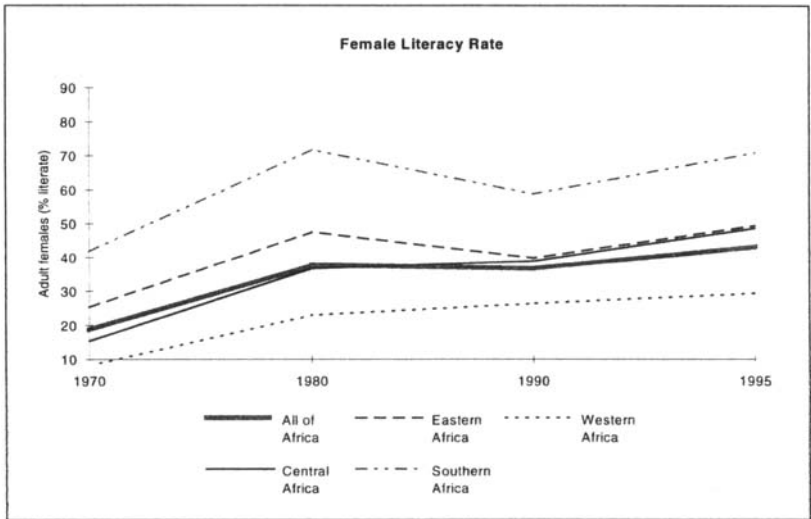
FIGURE 4
TRENDS IN PER CAPITA INCOME IN AFRICA, 1960-95



With few exceptions, poverty and underemployment have escalated in Sub-Saharan Africa, at times sharply. The limited information available about changes in the distribution of income seems to suggest that the rural-urban income gap has shrank, while inequality surged within both such sectors. Though information about poverty rates and food consumption is scarce, it is plausible to surmise that low income urban dwellers, members of incomplete families and landless farmers have experienced a fall in food intake which has rendered them less resistant to disease. While for the population above, say, the 30th percentile of the distribution of income, a cumulative drop in incomes can be weathered by rationalizing consumption and by adopting other survival mechanisms, these options are not necessarily available to the poorest groups which may already be well below a minimum subsistence threshold. *Ceteris paribus*, it might thus be expected that the income fall observed during these years has provoked an increase in mortality due to an escalation in the incidence of the 'diseases of poverty'. The negative trend in income per capita and in public expenditure on education and adult literacy have also affected female

literacy rates (Figure 5). In Southern and Eastern Africa, female literacy rates dropped in the 1980s and recovered only mildly in the 1990s.

FIGURE 5
FEMALE LITERACY RATES IN AFRICA, 1960-95



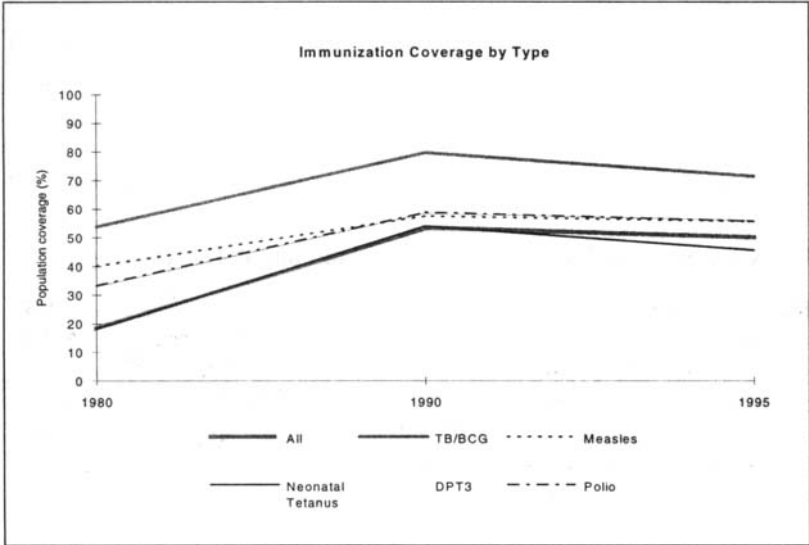
4.5 Changes in access to health services and population coverage

The last fifteen years have witnessed a number of health policy dilemmas in many Sub-Saharan countries. In response to the fiscal crisis affecting the region in the early 1980s, most governments introduced a series of measures with the intention of achieving one or more of the following objectives: increasing the overall efficiency of the health care system; increasing the volume or the quality of the services rendered; and increasing monetary contributions from service users.

The specific measures implemented to achieve these objectives could be listed in the following order: reallocation of expenditure among different levels of the health care system; introduction of new high-cost and high-efficiency basic health technologies; large cuts in public health expenditure; introduction of user fees and other community-based financing mechanisms; and privatization of government hospitals or parts of these facilities. The focus of previous analyses in this area in Africa has

been on the effect of the above measures on service provision, quality and utilization (see e.g., Mwabu *et al.* 1995; Reddy and Vandemoortele 1996; Appleton 1997). Only a few studies have looked at the impact of these measures on health status (Mwabu 1996). The effects of these measures on health outcomes however are unclear because of the delayed favourable effects of previous policies or because of the offsetting effects of events in other sectors of the economy, or because of the effect of the sharp increase in immunization rates in the 1980s (Figure 6). Vaccination coverage against all immunizable diseases rose from 20 to about 50 per cent between 1980 and 1990 for Sub-Saharan Africa as a whole, and concerned all immunizable diseases (Figure 6). However, in the 1990s the increase in vaccination rates levelled off and was reversed in Central Africa (Figure 7).

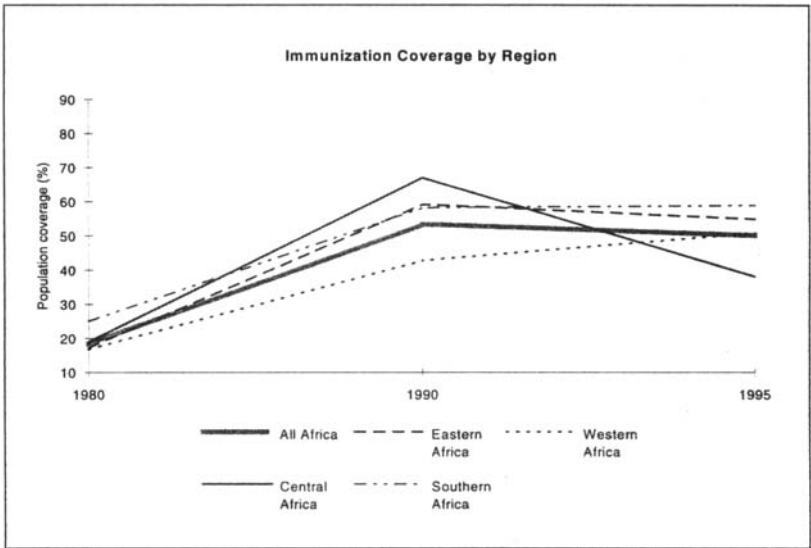
FIGURE 6
TRENDS IN IMMUNIZATION COVERAGE IN AFRICA, 1960-95, BY TYPE



It should be noted, finally, that the negative changes in health status observed in some Sub-Saharan African countries may not have only been due to the shortage of public and private resources, or by negative environmental changes. Indeed, even in the presence of adequate resources, the collapse of the state and political repression – which have

often lead to the breakdown of public order, graft, concentration of privileges for the few and marginalization of many, and erosion of social cohesion – generally lead to worse health outcome than otherwise achievable under conditions of good or even adequate governance. The depth of the health crises in Nigeria and the former Zaire, for instance, cannot be comprehended fully without considering the misuse and misallocation of public resources in these collapsed states.

FIGURE 7
 IMMUNIZATION COVERAGE IN AFRICA, 1960-95, BY REGION



V FURTHER ESTIMATION RESULTS AND DISCUSSION

5.1 Results

In this section we provide results of various estimations of the eclectic model illustrated in Section IV, in addition to those already reported and discussed in Section II. As a prelude, we start by presenting a correlation matrix of the variables for which adequate information could be collected. The correlations were calculated with variables expressed in logarithmic

form, so as to capture any non-linearities in the models considered (Table 6). The correlation matrix indicates that all coefficients have the expected signs and are – with some exceptions – sufficiently large.

We now turn to regressions of infant, under-five and maternal mortality rates on the set of explanatory variables included in the correlation matrix for the period 1980-95 as it was not possible to reconstruct the entire dataset for the years 1960 and 1970. To avoid multicollinearity, we use two similar specifications in which all variables are expressed in logarithmic form. The first specification (the results of which are presented in Table 7) includes as an explanatory variable the share of the population with access to health services, while the second specification (the results of which are reported in Table 8) omits this variable but includes the per capita calorie supply. All other variables appear in both estimations. The estimations have been carried out using the generalized least squares procedure for panel data.

The regression results can be considered satisfactory and confirm a number of relationships which are well established in the literature (see e.g., Schultz 1976 and Lee and Schultz 1982). All variables have the expected signs and, with one exception (access to health services in the first specification) are significant at, at least, the 5 per cent level. Consistent with a priori expectations, the factors which appear to have the strongest impact on mortality vary considerably across the three population groups considered, thus lending some credibility to our results. In the case of infant mortality, income per capita, female literacy and access to health services have a broadly comparable impact, while immunization coverage and access to safe water have a considerably smaller, though positive, impact. In contrast, the under-five mortality rates appear much more sensitive to calorie supply and immunization coverage, while maternal mortality seems to be most sensitive to the availability of fresh water and immunization against neonatal tetanus.

Finally, we attempt to capture the health impact of civil and ethnic conflicts. While it is clear that the 'silent emergencies' due to poor health care, low maternal education and insufficient income and food intake have a continuous pernicious effect on child and maternal mortality, this paper has argued that the spread of civil conflict and ethnic strife has had an additional effect on the health status of the African population over the last ten years.

TABLE 6
CORRELATION MATRIX AMONG CONTEMPORANEOUS VARIABLES IN LOG FORM, 1960-95

Variables in levels	Mortality rate			% of pop. having access to:						
	Infants per 1000	Under-5 per 1000	Maternal mortality per 100,000	Female life expect.	Per capita income	Female literacy rate	Immunization coverage	Daily per capita calorie supply	Health services	Drinking water
Mortality rate:										
Infants per 1000	1.000									
Under-5 per 1000	0.989	1.000								
100,000	0.343	0.329	1.000							
Female life expectancy	-0.695	-0.724	-0.192	1.000						
Per capital income	-0.455	-0.462	-0.382	0.509	1.000					
Female literacy rate	-0.608	-0.626	-0.366	0.646	0.428	1.000				
Immunization coverage	-0.599	-0.633	-0.502	0.541	0.432	0.514	1.000			
Daily per capita calorie supply	-0.484	-0.493	-0.258	0.658	0.564	0.454	0.412	1.000		
Percentage of population having access to:										
Health services	-0.498	-0.511	-0.417	0.315	0.532	0.581	0.542	0.415	1.000	
Drinking water	-0.497	-0.472	-0.457	0.401	0.634	0.374	0.306	0.649	0.584	1.000
Means (in levels)	128.37	211.54	643.24	47.66	515.00	34.13	42.27	92.78	55.41	42.81
Standard deviation	44.08	79.84	474.12	7.29	766.91	22.31	26.19	10.63	23.91	21.26
Number of observations	200	200	86	200	181	138	98	73	90	126

TABLE 7
REGRESSION OF INFANT, UNDER-FIVE AND MATERNAL MORTALITY RATES ON
VARIOUS SOCIOECONOMIC FACTORS

<i>Explanatory variables</i>	<i>Estimated equations</i>		
	Log of infant mortality	Log of under-five mortality	Log of maternal mortality
Constant term	6.670 (17.25)	7.380 (16.84)	7.550 (6.78)
Log of per capita income	-.130 (2.72)	-.159 (2.95)	
Log of adult female literacy rate	-.126 (1.99)	-.127 (1.82)	
Log of proportion of population with access to health services	-.115 (1.61)	-.075 (1.05)	-.165 (.81)
Log of proportion with access to safe water	-.066 (.99)	-.116 (1.49)	-.648 (2.93)
Log of proportion immunized (all vaccinations)	-.038 (1.99)	-.042 (2.06)	
Log of proportion immunized against neonatal tetanus			-.307 (2.54)
Log of time trend			2.124 (3.87)
Overall R-Squared	.502	.500	.508
Chi-Square Statistic	38.0 [p-value=.000]	37.3 [p-value=.000]	34.3 [p-value=.000]
Sample size	72	72	44

Source: authors calculations. Note: Absolute T-values in parentheses under the coefficients.

The models estimated in Table 9 have thus been modified by introducing a dummy variable for ethnic conflicts and by eliminating variables such as immunization coverage, access to safe water and health care and calories supply, the inclusion of which would have entailed large losses of degrees of freedom because of a consequent deletion of observations due to missing data. The results reported may also be biased by the unavoidable arbitrariness entailed by the assigning to the dummy variable of the values of 1 (ethnic strife or war) or 0 (peace) during the entire period considered. This problem is compounded by the fact that for all other variables the data refer only to the years 1980, 1990 and 1995 while conflicts have often intervened in between and for shorter duration. Despite these and other measurement problems, the results in Table 9 indicate that countries beset

by civil wars and ethnic struggles seem to have experienced higher mortality rates than countries without internal conflicts. Even though the coefficients of the ethnic conflict are low and statistically non-significant, these findings nonetheless point to the need for further work in this area, and emphasize the importance of internal peace and conflict prevention as key policies for the overall improvement of mortality over time.

TABLE 8
REGRESSION OF INFANT, UNDER-FIVE AND MATERNAL MORTALITY RATES ON
VARIOUS SOCIOECONOMIC FACTORS (ALTERNATIVE SPECIFICATION)

<i>Explanatory variables</i>	<i>Estimated equations</i>		
	Log of infant mortality	Log of under-five mortality	Log of maternal mortality
Constant term	6.058 (21.25)	10.378 (6.91)	6.749 (4.69)
Log of per capita income	-.123 (2.65)	-.178 (3.10)	
Log of adult female literacy rate	-.147 (2.65)	-.207 (5.25)	
Log of daily per capita calorie supply (as a % of requirement)		-.767 (2.14)	
Log of proportion with access to safe water			-.649 (3.22)
Log of proportion immunized (all vaccinations)	-.052 (3.18)		
Log of proportion immunized against neonatal tetanus			-.307 (2.54)
Log of time trend			2.177 (4.69)
Overall R-Squared	.472	.537	.489
Chi-Square statistic	35.4 [p-value=.000]	84.6 [p-value=.000]	34.0 [p-value=.000]
Sample size	133	66	51

Source: authors calculations. Note: Absolute T-values in parentheses under the coefficients.

TABLE 9
REGRESSION OF INFANT, UNDER-FIVE AND MATERNAL MORTALITY RATES
ON ETHNIC CONFLICTS CONTROLLING FOR OTHER COVARIATES

<i>Estimated equations</i>			
<i>Explanatory variables</i>	Log of infant mortality	Log of under- five mortality	Log of female life expectancy
Constant term	6.356 (21.65)	7.074 (20.63)	3.430 (41.04)
Log of time trend	-.368 (6.65)	-.384 (6.54)	.026 (.83)
Log of per capita income	-.191 (3.98)	-.226 (3.46)	.038 (2.52)
Log of female literacy rate	-.027 (1.11)	-.033 (1.28)	.066 (5.75)
Ethnic conflict (=1 in case of ethnic strife and zero otherwise)	.007 (.06)	.006 (.08)	-.025 (.69)
Chi-square statistic	167 [p-value=.000]	179 [p-value=.000]	111 [p-value=.000]
Sample size	133	133	133

Source: authors calculations Note: Absolute T-values in parentheses under the coefficients.

5.2 Discussion

The empirical findings presented above show large effects of policy and non-policy factors on mortality and health status in Africa. The non-policy variables include time and unobservable regional-specific factors. The policy variables include real per capita income, immunization, access to health care, safe water supplies, female education and calorie intake. These variables can be modified by public policy to improve health status. The paper also provides weak evidence of the mortality impact of political strife and ethnic conflicts.

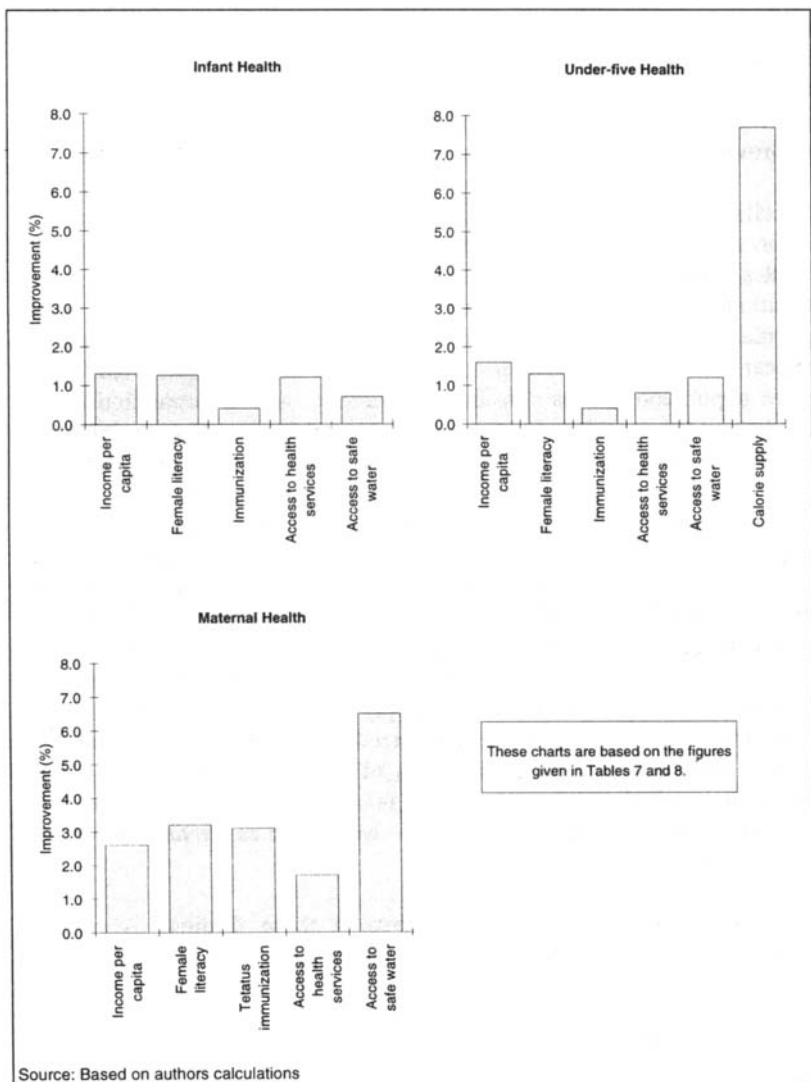
The time variable has the commonly observed negative effect on child mortality; however, its effect on maternal mortality is surprisingly and unplausibly positive, suggesting that some important factor has been omitted in our analysis. In our analysis, time generally represents progress in medical and public health technology, a phenomenon which is favourable to health. It also captures the temporal pattern of allocation of resources in the health sector and within households, a pattern that might be favourable or unfavourable to health (see Schultz 1984 and 1993).

The overall results of the analysis summarized in Figure 8 provide evidence that public policy is an important determinant of the health status of the population. They also offer a tentative guidance to the policy maker about the optimal mix of various public policies in the health and non-health sector. That is, public policy can be used in a deliberate and systematic manner to reduce child and maternal mortality rates and thus improve the health of the population.

Specifically, we find that, after controlling for the time trend, the main determinants of child and maternal health are the six variables included in Tables 7 and 8. Their relative importance is not always the one commonly mentioned in the literature, and varies considerably according to the population group examined. For instance, income per capita does not appear to be the most important determinant of the health status of the three population groups considered. Similarly, and in contradiction with the received theory, female literacy appears to have an effect on infant and under-five mortality broadly equal to that of income per capita and health care. As expected, immunization has a greater impact on under-five and maternal mortality than on infant mortality. Calorie supplies has a strong impact on under-five mortality but was not found to be significant (and was thus dropped) in the infant mortality equation, possibly because of the high prevalence of breastfeeding until one year of age in most of Africa. In addition, maternal mortality declines sharply with the availability of safe water and with increases in vaccinations against neonatal tetanus. The decline in maternal mortality as the supply of safe water improves suggests a positive correlation between generalized access to safe water and other factors that contribute to the lowering of maternal deaths such as better nutrition, sanitation at maternity clinics and mother restraint from excessive workload during pregnancy – work such as fetching water from long distances.

From a policy standpoint, the novelty of these findings is not that improvements in the factors listed above enhance health; its significance is in showing the relative health benefits from such improvements – information that is important in allocating scarce resources among competing health care, education and anti-poverty programmes.

FIGURE 8
SUMMARY OF THE PERCENTAGE HEALTH IMPACT OF A 10 % IMPROVEMENT IN SELECTED POLICY INTERVENTIONS



VI WHAT TO DO? POLICIES FOR BETTER HEALTH IN SUB-SAHARAN AFRICA

The prior discussion has shown that some of the causes of the slow-down in health improvement in most of Sub-Saharan Africa, as in other countries, originate from outside of the health sector, e.g., the economic decline, complex humanitarian emergencies, famines and to a certain extent AIDS. Thus, without a shift to a new model of economic development, to a more stable political conditions, and to less tense ethnic and social relations, it will be difficult to improve permanently, substantially and rapidly the health status in many Africa countries.

Yet, much can be achieved even within the health sector itself, particularly if existing resources are utilized more efficiently, and if additional funds are mobilized for this sector. In all cases, including those of famine and conflict prevention as well as the control of the spread of AIDS, success of public interventions depends on a more efficient, decentralized and flexible government. Neither the traditional state, nor the 'downsized'-liberal state would be able to put through the measures discussed hereafter. In several cases, the government's role should shift from direct provision to that of a funder-regulator-provider, making more room for community, non-governmental and private providers. With the clear mortality impact of health coverage, fresh water supply, vaccination coverage and female education, it is necessary therefore to stop the 'retreat' of the state underway in most of Sub-Saharan Africa for several years and to promote its thorough reform.

In this section, we provide only a brief mention of the global measures (be they economic or political) necessary to improve health status. Nor do we discuss in any detail policies to mitigate the worst forms of poverty so as to allow a truly universal access to health care. For these we make reference to the relevant literature. In contrast, we discuss somewhat more in detail desirable changes concerning the level, targeting, composition and funding of health expenditure. All in all, we think that six sets of measures discussed hereafter are required to provide an answer to the continuing health crisis of Sub-Saharan Africa.

6.1 An improved economic and political environment

Strong macroeconomic performance and a stable political environment are prerequisites for an effective health service delivery system. Sound economic growth provides the basic resources to improve health, while a predictable political institutions provide the structure for designing and implementing sustainable social policies. Thus, effective macroeconomic management and good governance are important elements of a framework for improving health status in Sub-Saharan Africa. While growth per se is important for health, we would like to underscore that the growth with the most beneficial impact is that which is of broad-based nature and which entails, *inter alia*, widespread access to production assets (land and credit in particular), adequate pricing policies for the goods produced by the poor, sustained investment in human development and promotion of labour intensive exports.

6.2 Anti-poverty measures

Poverty is a major problem in Sub-Saharan Africa; in many countries poverty rates are as high as 50-60 percent. Policies for improving health status should thus include strategies dealing with this problem. Targeting expenditure on a broad range of social services to particular groups, using for example, a regional characteristic such as area of residence of the poor, is one strategy for improving health status through poverty reduction. Other measures which have been shown to be successful in poverty alleviation include micro-credit schemes for small producers, public works programmes (in urban areas), training programmes focusing on new skills and the development of collective infrastructure which enhances the functioning of markets in rural areas.

6.3 Raising efficiency by reducing costs

In some cases, health status can be improved by reducing the unit costs of health services, and thus, other things being equal, achieving greater coverage with a given set of resources. The introduction of product standards and better 'production techniques' more in line with local factor endowments, as in the case of the substitution of imported materials with local ones in the construction of clinics and other health facilities can substantially lower units costs and facilitate the expansion of health service coverage. Savings are often possible too in the area of wages and current inputs. For instance, large savings are possible in the procurement, management, distribution and prescription of pharmaceuticals. And there is

a need for more carefully articulated manpower policies, with recognition of the cost implications of alternative skill mixes. In this regard, there is scope for the application of nominal fees as a tool to guide demand for simple health care services away from hospitals. However, great care should be exercised both in the design and implementation of such fees as they can result in unwarranted reduction in health service utilization.

6.4 Improving the targeting and decentralization of health expenditure

The evidence provided by the regression analysis about the strong impact of access to basic health services, water supply and vaccination coverage suggests that substantial improvements can be achieved by a better allocation and management of public expenditure. While resources are needed at all levels, the overall impact of health expenditure would rise if a greater share of resources were allocated to training for village health workers, adequate supervision, mobilization of communities and the strengthening of family planning services in the first tier of the primary health-care pyramid. Most of all, the introduction of key programmes such as child immunization, oral rehydration therapy, promotion of breast feeding, essential drugs and so on, needs to receive priority in low income Sub-Saharan countries. Correcting existing misallocations, however, is not simple, as labour and – particularly – capital are only partially mobile; such a strategy and has greater chances to succeed in periods of expanding budgets.

Greater decentralization is also likely to improve the targeting of services and overall efficiency. Poor communications and transport systems, population dispersion and the fact that the supervision of personnel, resource distribution and operations is easier at lower levels of administration are all arguments in favour of such decentralization. Nonetheless, where it means loss of control over the implementation of national policies (as in manpower training, drug procurement and so forth), or where a large increase in the financial burden is placed on households and communities, decentralization is potentially damaging.

6.5 Increasing the flow of resources to basic social services

Despite the considerable scope for protecting the delivery of high-impact health services during crisis periods, there are limits to what can be achieved through the measures discussed above, particularly when health

expenditure is already low. Indeed in most Sub-Saharan countries, greater access to health care will require that the flow of resources to the health sectors must both be increased substantially. The options available to achieve this include the following:

- *Increasing the share of efficient social services in government expenditure.* Top priority should be given to a restructuring of government expenditures involving the shifting of resources towards health, rural water supply and maternal education, and away from defence, production subsidies and interest payments on the foreign debt.

- *Increasing the revenue of the central or local government.* Between the late 1970s and the middle-late 1980s the average tax to GDP ratio in Sub-Saharan Africa fell from 18 per cent to 16-17 per cent. Recently there are signs of recovery, but these are limited to only a few countries. This fall in tax effort resulted from the neglect of revenue collection in the 'first generation' stabilization programmes, where fiscal deficit reduction was achieved mainly by cutting expenditure. As they took effect rapidly, expenditure cuts probably led to excessive drops in public expenditure on 'quasi-public goods' and might have had a regressive impact. It is now widely recognized that a more active tax policy is needed. Such a policy should aim at improving revenue generation, enhancing the efficiency of the tax system, and permitting a modest rise in 'efficient' public expenditures.

A non-distortionary and equitable increase in the tax ratio of 1-2 points of GDP appears technically feasible in a good number of African countries, and would by itself make it possible to add to the flow of resources to health care, even assuming no growth and no shift in priorities towards the health sector. In some countries (including Burkina Faso, Kenya, Malawi and Zimbabwe), efforts along these lines were initiated since the mid 1980s. Resource allocation to health could be augmented more readily if the new revenue generated, or at least part of it, were directly earmarked to specific health activities, or if these taxes were raised directly by district and provincial authorities.

- *Mobilizing additional resources from household and communities.* In sub-Saharan Africa, households have long been bearing a substantial share of the national expenditure on health care, water supply and so on by contributing resources (in kind, cash and time) for the construction of

facilities, covering direct and indirect costs (transportation, fees, drugs etc.) associated with attendance to clinics and making payments to private providers. Despite these already considerable contributions, user charges have often been introduced in recent years to alleviate the budgetary crisis.

While the small but significant contribution of user charges to health budgets should be acknowledged, their negative impact needs also to be emphasized: first, the introduction of substantial fees leads to a contraction in the demand for health services. Second, it discourages the utilization of preventive services for which potential patients may not see an immediate relevance. Third, it may adversely affect a household's ability to meet other basic needs, such as the purchase of food. In addition, there is little evidence that the revenue from user charges is actually reinvested to improve the quality or expand the coverage of local services. Moreover, user charges usually generate a relatively small proportion of the total operating cost of health care sector, with net yields at around 5 per cent or less. While user charges are not well suited to disease control programmes, basic curative services and communal water supply, the same cannot be said of 'high-income' services.

While direct user fees (levied on patients at the moment of their treatment) are problematic, there are other ways to mobilize resources from communities, such as prepayment schemes, health insurance, lotteries, mutual funds and the sale of produce from community fields. These schemes have two attractive features: they shift the moment of payment, so that individuals are not burdened with significant expenditures at the time of illness, and they spread the burden of costs over a larger group.

- *Increasing the volume of international aid.* Since the early 1980s, there has been a considerable increase in the share of official development assistance (ODA) allocated to Sub-Saharan Africa (its share rose from 19.4 per cent in 1975-76 to 34.2 per cent in 1988-89). However, the share assigned to human development dropped, while debt-service obligations compressed indirectly all discretionary expenditures. In addition, the trend in the 1990s has been towards an absolute decline in aid flows. The simplest and the most cost-effective way to effect new aid transfers would be through debt relief. Improvement in the quality of aid, including greater participation in the financing of recurrent costs and more focus on primary health care and rural water supply are also required.

6.6 Move towards a multiplicity of service providers

Much of the market-oriented literature tends to be overly optimistic about the scope for expanding private services in order to replace those provided by the government. First, private sector services in Africa are typically concentrated in urban areas and cater to upper-income groups. Non-governmental providers (especially missions) are often located in rural areas, and often provide valuable services, but are seldom able to furnish extensive coverage and may duplicate government services. Second, private providers often receive state subsidies and typically offer higher salaries and better working conditions. This draws manpower away from the public sector, thus causing – especially in countries with limited numbers of health workers – a costly and inequitable 'human capital flight' from the public sector. Third, the view that private health institutions in Sub-Saharan Africa are more efficient tends to be based largely on analyses in developed countries.

Yet, a multiplicity of providers is desirable, and probably unavoidable; there are several reasons why such an approach should be fostered. While this approach is not without limitations, it allows the harnessing of social service motivations of NGOs as well as the self-interest motivations of private agents. To be sure, the growing pressure for pluralism in social service provision requires that governments be able to provide central co-ordination and regulation through a well designed incentive structures. Indeed, the proper functioning of a health care system based on a multiplicity of providers depends on the existence of a strong state able to regulate, co-ordinate and ensure that basic health services of acceptable quality are delivered to all citizens of a nation.

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