Inequality of child mortality among ethnic groups in sub-Saharan Africa

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Accounts by journalists of wars in several countries of sub-Saharan Africa in the 1990s have raised concern that ethnic cleavages and overlapping religious and racial affiliations may widen the inequalities in health and survival among ethnic groups throughout the region, particularly among children. Paradoxically, there has been no systematic examination of ethnic inequality in child survival chances across countries in the region. This paper uses survey data collected in the 1990s in 11 countries (Central African Republic, Côte d'Ivoire, Ghana, Kenya, Mali, Namibia, Niger, Rwanda, Senegal, Uganda, and Zambia) to examine whether ethnic inequality in child mortality has been present and spreading in sub-Saharan Africa since the 1980s. The focus was on one or two groups in each country which may have experienced distinct child health and survival chances, compared to the rest of the national population, as a result of their geographical location. The factors examined to explain potential child survival inequalities among ethnic groups included residence in the largest city, household economic conditions, educational attainment and nutritional status of the mothers, use of modern maternal and child health services including immunization, and patterns of fertility and migration. The results show remarkable consistency. In all 11 countries there were significant differentials between ethnic groups in the odds of dying during infancy or before the age of 5 years. Multivariate analysis shows that ethnic child mortality differences are closely linked with economic inequality in many countries, and perhaps with differential use of child health services in countries of the Sahel region. Strong and consistent results in this study support placing the notion of ethnicity at the forefront of theories and analyses of child mortality in Africa which incorporate social, and not purely epidemiological, considerations. Moreover, the typical advantage of relatively small, clearly defined ethnic groups, as compared to the majority in the national population, according to fundamental indicators of wellbeing — child survival, education, housing, and so forth — suggests that many countries in sub-Saharan Africa, despite their widespread poverty, are as marked by social inequality as are countries in other regions in the world.

Keywords: Africa south of the Sahara; health services accessibility; infant mortality; multivariate analysis; social justice; socioeconomic factors.

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Introduction

Accounts by journalists of wars in several countries of sub-Saharan Africa in the 1990s have raised concern that ethnic cleavages and overlapping religious and racial affiliations may widen the inequalities in health and survival among ethnic groups throughout the region, particularly among children (*1, 2*).[a] Paradoxically, there has been no systematic examination of child survival chances in relation to ethnic groups across countries in the region, including the majority of African countries that have experienced relative peace over the past decade or more. This shortcoming is conspicuous insofar as early cross-national analysis of ethnicity and mortality, using data from the 1960s and 1970s, concluded that "ethnicity ... exerts a strong influence on mortality in countries where ethnic groups appear to be sharply differentiated" (*3*). Neglect of mother's ethnicity, in particular, as an influence on child survival, is remarkable in the light of countless studies that have emphasized the central importance of maternal characteristics and behaviour for child health in Africa.

This paper uses survey data from 11 countries to examine whether ethnic differentials in child mortality have been pronounced in many sub-Saharan African countries since the 1980s.[b] While

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[a] Kaplan's article in *Atlantic Monthly* (*1*), which linked the ''rise of tribal domains'' with the ''unchecked spread of disease'' (p. 48), was largely based on his observation of war in Sierra Leone in the early 1990s

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[b] Countless definitions of ethnicity have been employed and the literature on African ethnicity is notoriously contentious with respect to terminology (*4–6*). Confusion is perhaps inevitable because ethnic affiliation may be fluid and overlapping, particularly in Africa's urban setting (*7*), and class interests may override ethnic solidarity as modernization proceeds. In general, however, in most of Africa ''solidarity across ethnic lines is weak'' (*8*). The ethnic groups discussed in this study can be considered to meet the following criteria: speak a single language or dialect; have a single social organization; share a common religion; have a sense of identity, cohesion and history; and have a single set of customs and behavioural rules (as in marriage, clothing, diet, taboos, and so on) (*9*). We used static descriptions of ethnicity, as identified by the survey respondents, and use the terms ethnicity and ethnic affiliation interchangeably.

some African offspring are the result of interethnic marriages, the analysis focuses on the ethnic affiliation of the mother, given women's heavy responsibility for childrearing.[c] Of particular interest is whether one or two ethnic groups selected in each country experienced better child survival chances — compared with the rest of the population in their countries — as a result of their geographical concentration in or close to the country's largest city, or in favourable ecological settings, or in critical centres of economic activity.

Conceptual issues

The few comparative studies of ethnic group mortality in Africa are mostly based on births and deaths in the 1960s and 1970s. These demographic studies generally reveal enormous differentials but provide scant interpretation of these discrepancies. Tabutin & Akoto (*11*), for instance, found that the probability of dying before 2 years of age was twice as high among the Luo as among the Kikuyu in Kenya, and 40% higher among the Hutu than among the Tutsi in Rwanda. In Cameroon, ethnic membership was the strongest predictor of child survival chances. While these findings went unexplained, the authors concluded that "the ethnic variable should always be controlled in a study of mortality" (*11*, p. 54). A more intensive analysis of Cameroon data showed that Hauossa–Foulbe children had higher neonatal mortality than others — presumably because of a high incidence of sexually transmitted disease among their parents — but lower mortality thereafter, perhaps because of some combination of dietary factors and reduced exposure to acute diseases (*12*). Two separate studies showed that the Peul (or Fulani), one of the largest ethnic groups in the Sahel region, had an under-2-year-old mortality that was 10% higher than that of the majority Bambara in central Mali (*13*), but 30% lower mortality than the majority Wolof and Serer in the Sine-Saloum region of Senegal (*14*). Both studies proposed that group differences in child care, notably in nutritional practice, accounted for the variation in mortality. In the mid-1960s the Tonga of the Gwembe District in southern Zambia had 20% higher child mortality ($_5q_0$) than the country's population as a whole (234 compared to 190 deaths per 1000 live births), but experienced a one-third reduction by the early 1990s (down to 156/1000) while the national level remained stable (*15*). Differential mortality decline was attributed, in this case, to an exhaustive set of expanded preventive health care services in Gwembe.[d]

Such imprecise accounting for ethnic child mortality differences no doubt reflects the heterogeneity of sociocultural and ecological settings in Africa. As Hill (*18*, p. 63) observed from surveys in Mali, "the very different life-styles of the different ethnic groups comprising the national population of any Sahelian country are likely to have characteristic patterns of mortality and fertility even though the physical environment may be roughly comparable between the groups." Similarly, Podlewski (*19*) found that mortality rates differed among 30 highly clustered ethnic groups in northern Cameroon as a result of their ecological settings, as well as their degree of assimilation to the dominant Islamic culture. Clearly, the absence of a general model of ethnicity and child mortality to guide the analysis and provide explanations is unfortunate, for as Gaisie (*20*, p. 613) asserts with respect to African cultures, "ethnic frameworks are necessarily the most important determinants of the degree of adaptation to modern conditions including changes in health behaviour."

It seems reasonable to presume, however, that the geographical setting in which an ethnic group is primarily centred strongly influences the health and survival chances of children. Kenya provides a useful illustration. Whereas Somali groups in North-eastern Province and the Luhya of Western Province of Kenya are highly mobile (*21*) — hence exposed to multiple disease environments and potentially to new infectious disease agents — 99% of Kalenjin-speaking people remain sedentary in Rift Valley Province (*22*), where the epidemiological setting is less conducive to the spread of measles and malaria (*16, 23, 24*). Kenya's fertility rate has dropped considerably in recent years (*25*), but Gusii women in the south-west are still expected to bear a child every 2 years until menopause and have much higher completed fertility than the national average (*26*). The Kikuyu clustered in Nairobi and surrounding Kikuyu territory, meanwhile, were the beneficiaries of economic and education entitlements bestowed by British colonialists (*27*), but traditionally they also placed higher cultural value on female education than the Luo (*28*). And although it is presumed that, in more advanced developing countries such as Kenya, all households will rely on modern preventive child health care given motivation and effective access to use it, a study in the largely rural Machakos district showed that some ethnic groups, such as the Akamba, will frequently apply traditional practices to remove 'bewitching spirits' that afflict ill children before they resort to modern medicine (*29*).

Since the countries in our study each contain numerous ethnic groups (for instance, over 50 in Uganda), reliable estimation of child mortality levels and trends for each group is impossible. Instead, we focused on one or two relatively large groups in each country which can be broadly categorized according to geographical criteria, such as the following.

- Close proximity to the largest city, where economic resources typically are most concentrated (e.g. the Yakoma and M'baka in the Central African Republic, the Djerma–Songhai in Niger,

[c] In patrilineal societies, children may be more likely to assume their fathers' ethnic identity. However, data do not exist to examine child health and mortality according to the father's ethnicity in Africa. Child health outcomes have been studied in communities where men's ethnicity is known—for instance, in Bledsoe's work (*10*) among the Mende in Sierra Leone—but these ethnic communities have been studied in isolation.

[d] Similar results, based on World Fertility Survey data, are presented for Kenya (*16*) and for Senegal (*17*).

the Tutsi ethnic group or "caste" in Rwanda, and the Baganda in Uganda).

- Location primarily in a favourable ecological (i.e. epidemiological) or cash-crop environment in the interior of the country (e.g. the Baoulé in Côte d'Ivoire, the Ashanti in Ghana, and the Kalenjin and Kikuyu in Kenya).
- Location in crucial centres of economic production (e.g. the Bemba in Zambia, who are notably occupied as migrant labourers in the north-east copperbelt region of the country).
- Dispersion through most of the country (e.g. the Bambara in Mali and Ovambo in Namibia).
- Concentration in an area of extensive international medical research and child health interventions (e.g. the Serer in the Sine region of Senegal).

Data and methods

Our data for the 11 countries come from Demographic and Health Surveys (DHS) conducted between 1990 and 1995.[e] In each survey, women of reproductive age were asked directly for their ethnic affiliation. Eight of these surveys were nationally representative. For reasons of security, the Kenya DHS did not include the Eastern and Northeastern Provinces, which comprise less than 4% of the national population; the Mali survey omitted the rural areas of Gao and Timbouctou, representing 10% of the population; and the Uganda DHS did not survey the Acholi population in the northernmost Kitgum district, who account for less than 5% of Uganda's population. The Rwanda survey was conducted in 1992 immediately before the crisis, while for the other countries, except Namibia, the period studied — approximately the early 1980s to mid-1990s — was one of relative nonviolence on a national scale. The variables used in the regression analyses of mortality are described in the Annex.[f] Again, ethnic group membership is categorized simply as a dichotomous or trichotomous measure in order to test whether particular groups have enjoyed better child survival chances, but also because dozens of ethnic groups are identified in some surveys.[g]

The analysis was carried out as follows. After a comparison of the household characteristics of selected ethnic groups, logistic regression (considering the effect of ethnic affiliation only) was used to assess whether these groups experienced lower odds of child mortality than did other ethnic groups (that is, the majority of residents in these countries) in the 10 years preceding the surveys. The odds ratios of mortality were compared for three age groups, 0–11 months, 0–23 months, and 0–59 months, to examine whether ethnic inequality in survival persisted throughout early childhood. Comparable data on ethnic affiliation from the World Fertility Survey (WFS) were used along with DHS data to examine the 20-year trends in early child mortality (${}_2q_0$) among ethnic groups in Côte d'Ivoire, Kenya, and Senegal.

Multivariate analysis uses logistic regression, taking into consideration the effects of ethnic affiliation as well as additional variables, to determine whether infant mortality differentials among ethnic group members were related to a combination of differences in household economic conditions, women's status, demographic behaviour, and preventive health care practices, as well as residence in the largest city of the country. The multivariate analysis was based on births in the 5 years preceding the surveys, since health service information was not available for earlier births. We examined mortality during infancy, rather than at other ages, since infant mortality also represents the most universally accepted measure of comparative wellbeing across countries and within national populations (*30*). The full multivariate model can be summarized simply as:

$$\text{Ln}\ (P/1\text{–}P) = \alpha + \beta_E E_{hi}, + \beta_Z Z_{hi},$$

where P is the probability of dying before the age of 12 months for the i th child of household h, Ln(P/1–P) is the logit transformation, α denotes the constant term, E represents a dummy variable for ethnic affiliation, Z denotes all other covariates (that is, sets of economic and other factors), and β represents the associated coefficients. The child's household, h, is identified to adjust for potential intra-household correlation of mortality risks.[h]

Descriptive results

Socioeconomic differentials

Table 1 presents selected characteristics of the ethnic groups in the 11 countries, covering the educational status of women, economic conditions, use of health care, and geographical setting. These variables also typically affect child survival chances in low-income countries. The statistics reveal large differentials in each country according to ethnic affiliation.

Levels of female education vary enormously across African countries, with only about 10% of women having attended school in Niger, compared with over 80% in Kenya, Namibia, and Zambia. In most countries, however, there are large disparities in schooling between ethnic groups, either in absolute

[e] Demographic and Health Surveys (DHS) is an ongoing project sponsored by USAID; surveys have been conducted in over 50 countries since 1985.

[f] The descriptive analysis uses additional individual and household-level variables which are self-explanatory.

[g] For Côte d'Ivoire, we excluded the immigrant population since their representativeness in 1995, of all immigrants at any time during 1985–95, was unknown, and because most other surveys did not identify immigrants. The Ashanti in Ghana are coded as 1 and 2 in variable 131 of the Ghana DHS, and do not represent the Akan-speaking population as a whole. The European population in Namibia consists of Germans, Afrikaaners, and British.

[h] Without adjustment for clustering of mortality risks within households according to uncontrolled and often unobservable characteristics (for instance, genetic traits), standard errors of parameter estimates of effects on mortality tend to be underestimated. The Huber formula in the Stata software package is used to obtain more robust estimates of standard errors.

Table 1. **Characteristics of ethnic groups in 11 countries**[a]

Country and survey year	% of women who attended school	% of husbands with a modern occupation[b]	% of dwellings with electricity	% of completely immunized children[c]	% living in largest city[d]
Central African Republic, 1994–95					
Yakoma	71.3 **	27.3 *	8.5 *	63.3 **	40.9 **
M'baka	67.9 **	35.5 **	13.6 **	37.7	40.0 **
All other	44.5	21.9	4.3	36.4	17.7
Côte d'Ivoire, 1994					
Baoulé	49.5 **	36.3 **	54.2 **	46.3 **	15.1
All other	39.0	27.2	41.6	34.8	15.7
Ghana, 1993					
Ashanti	84.1 **	32.1 *	43.1 **	60.8 **	19.8
All other	60.4	27.2	30.6	49.7	18.6
Kenya, 1993					
Kikuyu	90.5 **	36.3 *	18.4 **	89.2 **	10.8 **
Kalenjin	80.1	21.9 **	5.3 **	72.9	0.6 **
All other	80.7	33.0	11.4	70.7	11.6
Mali, 1995–96					
Bambara	20.6 *	9.9 *	8.5 *	37.8 *	13.3
All other	18.0	11.6	9.7	31.3	12.9
Namibia, 1992					
Ovambo	88.2 **	37.4 *	11.5 **	60.3 **	7.5 *
European	97.2 **	61.2 **	77.2 **	61.4 **	42.8 **
All other	78.4	30.3	23.8	46.9	9.9
Niger, 1992					
Djerma–Songhai	16.8 **	9.2	7.7 **	22.8 **	36.5 **
All other	8.9	8.6	4.4	13.9	15.4
Rwanda, 1992					
Tutsi	80.2 **	15.3 *	8.3 **	84.9 *	25.0 **
Hutu	60.3	9.9	2.4	78.3	9.3
Senegal, 1992–93					
Serer	25.3	32.4	19.7 **	63.4 **	19.7 **
All other	26.9	34.8	31.0	49.0	24.6
Uganda, 1995					
Baganda	95.1 **	41.4 **	26.8 **	62.5 **	23.1 **
All other	64.3	21.0	5.5	49.3	3.9
Zambia, 1992					
Bemba	89.0 **	38.6 **	28.4 **	65.4	9.2 **
All other	81.0	31.6	22.3	64.5	16.0

[a] Statistics are derived from surveys of women aged 15–49. All missing values and ''Don't Know'' responses deleted.

[b] Professional, technical, managerial, clerical, or skilled manual.

[c] Based on children aged 12–35 months. Received BCG, measles, diphtheria–pertussis–tetanus 1–3, and poliovirus 1–3 immunization.

[d] Based on weighted sample in countries where urban areas were over- or under-represented in the sample design.

* $P \leqslant 0.05$.

** $P \leqslant 0.01$.

or relative terms. In the Central African Republic, roughly 70% of Yakoma and M'baka women attended school, compared with 45% of other women. Among women in Ghana and Uganda, 84% of Ashanti and 95% of Baganda received some education, compared with about 60% of others. In Niger, women who belong to the culturally affiliated Djerma and Songhai — despite both being patrilineal societies — are twice as likely to have attended school as are other women in Niger.

Men's occupations and the availability of electricity in dwellings are obvious indicators of the economic status and modernity of households. In most countries, the ethnic groups in our study were favoured according to one, and usually both, of these characteristics. In Côte d'Ivoire, 36% of Baoulé men and 27% of others had occupations that presumably drew higher pay than agriculture, fishing, services, or unskilled labour. Even in Namibia, Ovambo men were more likely to hold modern-sector jobs than other non-Europeans in the country, despite their typical location far from Windhoek. And while relatively few dwellings in East Africa, for instance, have electricity, those of the Kikuyu in Kenya, the Baganda in Uganda, and Bemba-speakers in Zambia were much more likely than others to have it.

Most striking has been the highly disparate use of immunization services between ethnic groups in virtually all countries, despite the formal commitment of all governments to universal primary health care. In the Sahelian states of Mali, Niger, and Senegal, for instance, complete immunization coverage was significantly higher among the Bambara, Djerma–Songhai, and Serer, respectively, than among other groups. During the so-called child survival revolution of governments and international health organizations, since the late 1970s, Yakoma children in the Central African Republic apparently benefited much more than others in the country. In Kenya, the Kalenjin's completely rural concentration did not lead to lower use of immunization, compared with other non-Kikuyu children, who are much more urbanized.

There is mixed evidence that the above-mentioned ethnic inequalities are related to the relative concentration of the groups in the largest cities of these countries, which are known to contain a disproportionate share of each country's material resources relative to the spatial distribution of national populations (*31*). Advantages of the Djerma–Songhai, Tutsi, and Baganda in their countries, and of European descendants in Namibia, may be attributable to these groups' large presence in the biggest cities. However, the Baoulé, Ashanti, Kikuyu, Ovambo, and Bemba experienced several advantages despite similar or smaller concentrations of their populations in the largest cities as compared to the other groups.

Child survival inequality

Table 2 presents the odds ratios (i.e., exponentiated parameter estimates) of mortality at ages 0–11 months, 0–23 months, and 0–59 months, by ethnic group. A ratio of 0.78, for instance, represents a 22% lower chance of dying for a child of a given ethnic group as compared to children of other groups in that country; 1.37 denotes a 37% higher chance.

The results show remarkable consistency. In all 11 countries there were significant differentials between ethnic groups in the odds of dying for at least one age group. In most countries, strong disparities appear at each age group; in a few countries, such as the Sahelian states of Mali and Senegal, they exist only among children under age 1 or 2 years. Children of Ashanti women in Ghana, and of Tutsi women in Rwanda up to 1992, for instance, were about 20% less likely to die than other Ghanaian and Rwandan children. In Uganda, Baganda children experienced more than one-third lower odds of dying before the age of 5 years than children of other ethnic groups. Children of the Baoulé in Côte d'Ivoire and the Djerma–Songhai in Niger — groups that constitute less than one-quarter of their national populations — have about a 35% lower chance of dying before the age of 5 years than other children in their countries. In Namibia, Ovambo children have an advantage of similar magnitude before the age of 2 years. Inequities in Namibia are also evident by race, since European children had 37% lower odds of death under the age of 5 years. Survival differences are particularly striking in Kenya. Kalenjin children have been half as likely to die before the age of 5 years as other non-Kikuyu children, despite their almost exclusively rural residence. Meanwhile, odds of under-five mortality for the more highly urbanized Kikuyu have been 65% lower among infants, and 74% lower among children under 5 years. Zambia is the notable exception in our study (differences in Mali are slight). In Zambia — which experienced a sharp rise in child mortality in the 1980s (*32*) — the Bemba who, as noted above, have been traditionally occupied as migrant labourers in the north-east Copperbelt region, experienced slightly higher odds of child mortality, perhaps as a result of the collapse of the national copper market in the 1980s and widespread perinatal human immunodeficiency virus (HIV) transmission among migrant workers.

The availability of comparable WFS data on ethnicity allows one to examine ethnic child mortality trends over a 20-year span (roughly 1970–90) in Côte d'Ivoire, Kenya, and Senegal.[i] Fig. 1 shows that, in Côte d'Ivoire, the Baoulé have maintained consistently lower child mortality (${}_2q_0$) than other groups over time, even though they are not over-represented in Abidjan, where the child mortality rates are lowest (*33*). In Kenya, the Kikuyu experienced a 69% decline in mortality among birth cohorts that encompassed the 1970s. By the 1980s the child mortality levels among the Kikuyu were on par with those of many industrialized countries (*34*). At the same time, early-age mortality declined more slowly among the Kalenjin than among other non-Kikuyu groups (by 27% and 44%, respectively), but the Kalenjin subsequently enjoyed a decline of 37% between the generations of 1978–82 and 1983–87. While strong cultural homogeneity prevails in Senegal, the Serer nonetheless underwent a more rapid decline in under-two mortality between the 1968–72 and 1988–92 cohorts than did other groups (by 78% and 66%, respectively); a 20% survival disadvantage around 1970 was reversed to a 20% advantage by around 1990. The rapid and sustained decline in Serer child mortality —perhaps unparalleled in Africa — was particularly remarkable in that Serer women were disproportionately concentrated in the rural areas of Senegal (*35*, p. 111).

This consistent pattern of inequality in child mortality across countries, and associated differentials in socioeconomic conditions and immunization coverage, suggests a need to examine whether the factors identified in our framework — geographical setting, demographic behaviour, and so forth — explain the survival differentials in each of these countries.

[i] In Fig. 1, estimates for the two earliest five-year periods (e.g. 1968–72 and 1973–77 in Kenya) are derived from World Fertility Survey (WFS) data, while estimates for the three most recent periods are calculated from Demographic and Health Survey (DHS) data. It was necessary to use WFS data for the earlier periods because of the likelihood of differential underreporting of child deaths among ethnic groups in the more distant past, as recorded in the DHS.

Multivariate results

Table 3 shows the effects of ethnic affiliation and other characteristics on recent infant mortality in each country. To facilitate the presentation of a large amount of information, one ethnic group is examined in each country. The effects on infant mortality shown in Table 3, model 1, are based on children born in the 5 years preceding the surveys — rather than on the 10-year birth cohorts examined in Table 2 — hence they differ from the statistics for infants shown in Table 2. Yet, when converted to odds ratios, the direction and magnitude of ethnic mortality differentials are virtually identical in all countries in Table 1 and Table 2, suggesting that ethnic inequality in mortality levels was entrenched throughout the 1980s and 1990s.

The findings presented in Table 3 suggest that, on balance, the child survival advantages of many ethnic groups in sub-Saharan Africa may derive considerably from favourable economic situations at the household level. Indeed, the three indicators of household economic status estimated in model 2 have pronounced effects on child survival. The presence of either electricity or piped drinking-water in the dwelling reduced significantly the chances of infant death in all 11 countries. Meanwhile, a higher status occupation of the husband or regular partner lowered the mortality chances substantially in nine countries; when estimates were converted to odds ratios (i.e, exponentiated), this reduction from occupational status exceeded 35% in all nine countries, and was over 80% in the Central African Republic. In eight of the nine countries where an ethnic group had highly favourable infant survival, this advantage was reduced significantly upon control for variation at the national level in household economic conditions (Hausman statistic $w > 3.84$) (*36*).[j]

The use of preventive health services by mothers, estimated in model 3, exhibited similar strong effects on infant survival; in all 11 countries, the chance of infant death was lowered significantly by either tetanus toxoid immunization or multiple antenatal care visits to health professionals. In five countries — Kenya, Namibia, Niger, Rwanda and Zambia — both of these practices reduced the odds of mortality by at least 28%. More striking, recent migration — just before, during, or after conception or birth — had a deleterious effect on infant survival chances in all countries except Ghana and Kenya; in the other nine countries, non-migration in the previous 5 years (during which time the child was born) lowered the odds of infant mortality by at least 20%. Heightened odds of infant mortality from migration may occur from the disruptive effects of a move (for instance, premature termination of breastfeeding, temporary isolation from health facilities and additional childrearers, or greater physical demands during pregnancy or early postpartum), or from maladjustment to the new surroundings after migration (for instance, an inability to speak the local dialect or to obtain quickly housing, health services, and income-earning opportunities). Infant mortality chances were much reduced in six countries, most notably Kenya and Senegal, when the mother currently was living in the largest city, and in four

Table 2. **Odds ratios of child mortality by ethnic group, 1982–95[a]**

	Odds ratio for ages		
Country and survey year	**0–11 months**	**0–23 months**	**0–59 months**
Central African Republic, 1994–95			
All other	1.000	1.000	1.000
Yakoma	0.890	0.892	0.742 *
M'baka	0.742 **	0.788 *	0.949
Côte d'Ivoire, 1994			
All other	1.000	1.000	1.000
Baoulé	0.735 ***	0.738 ***	0.658 ***
Ghana, 1993			
All other	1.000	1.000	1.000
Ashanti	0.794 **	0.780 **	0.792 **
Kenya, 1993			
All other	1.000	1.000	1.000
Kalenjin	0.566 ***	0.551 ***	0.507 ***
Kikuyu	0.355 ***	0.327 ***	0.265 ***
Mali, 1995/96			
All other	1.000	1.000	1.000
Bambara	1.104 *	1.079	1.059
Namibia, 1992			
All other	1.000	1.000	1.000
Ovambo	0.805 *	0.660 **	0.765 **
European	0.756	0.837 *	0.631 *
Niger, 1992			
All other	1.000	1.000	1.000
Djerma–Songhai	0.784 ***	0.667 ***	0.644 ***
Rwanda, 1992			
Hutu	1.000	1.000	1.000
Tutsi	0.765 **	0.802 *	0.807 *
Senegal, 1992–93			
All other	1.000	1.000	1.000
Serer	0.766 **	0.789 **	1.049
Uganda, 1995			
All other	1.000	1.000	1.000
Baganda	0.723 ***	0.717 ***	0.635 ***
Zambia, 1992			
All other	1.000	1.000	1.000
Bemba	1.229 **	1.187 **	1.141 *

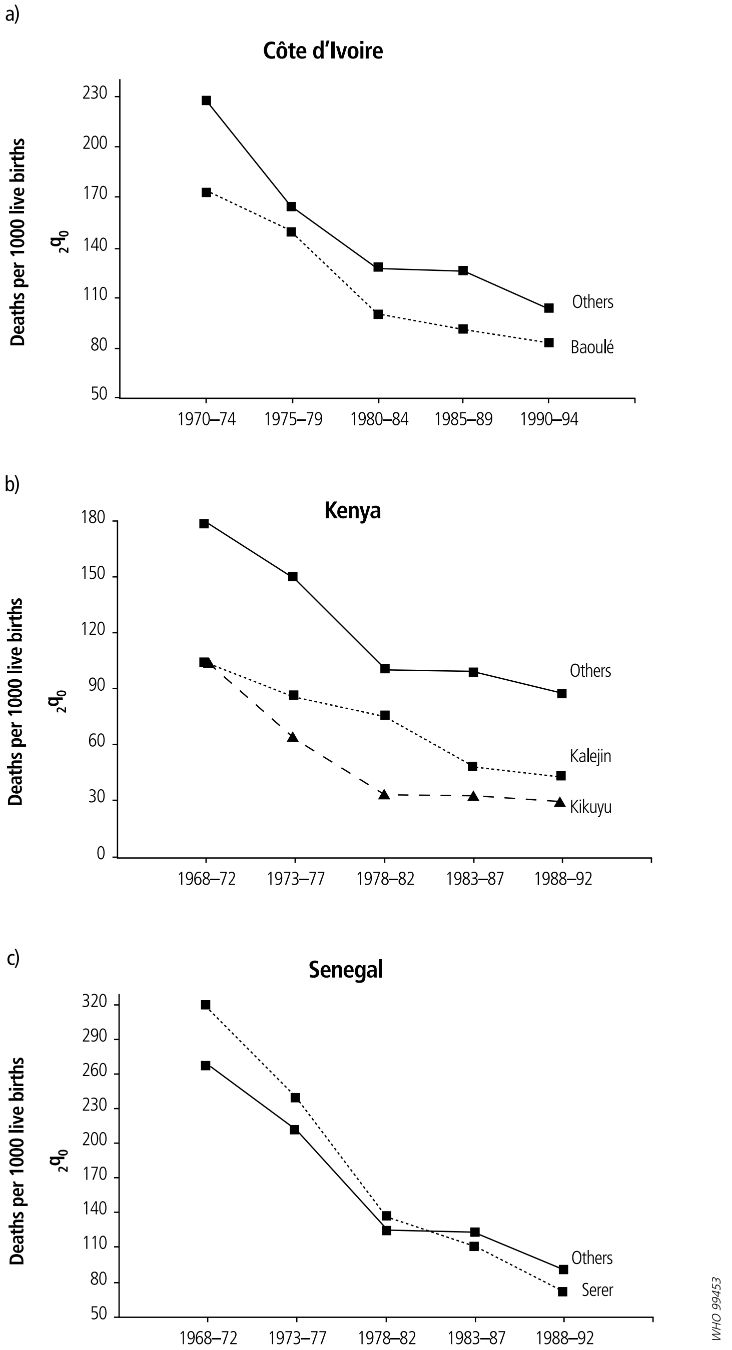
[a] Based on births in the 10 years preceding the surveys.
* $P \leqslant 0.10$.
** $P \leqslant 0.05$.
*** $P \leqslant 0.01$.

[j] The Hausman test (*36*) is used to assess the statistical significance of the *change* in the estimated effect of a variable across models containing fewer or more control variables. This test can be expressed simply as the difference in the ethnicity coefficients between the model with more control variables and benchmark model, divided by the square root of the difference in the variance of the respective ethnicity coefficients (that is, the square of the standard errors of the coefficients), or

$$w = \frac{\hat{\beta}_2 - \hat{\beta}_1}{\sqrt{se^2\hat{\beta}_2 - se^2\hat{\beta}_1}},$$

where β_2 and β_1 represent the parameter estimates for ethnic affiliation in model 2 and model 1, respectively. Since the statistic w is distributed normally with one degree of freedom, to be significant at the 0.05 level, for instance, w must exceed 3.84 (i.e., the square of 1.96).

Fig. 1. **Trends of mortality among under-2-year-olds ($_2q_0$), by ethnic group, in three of the study countries**



countries when the child was not a very high-order birth. In contrast, indicators of a mother's relatively high status — having a schooling at least equal to that of the husband, marriage after 18 years of age, and non-stunting (reflecting in part adequate nutrition through childhood) — showed scant association with infant survival chances. Most important, however, control for the non-economic variables estimated in model 3, in sum, significantly reduced the ethnic infant survival advantage in only two countries — among the Djerma–Songhai in Niger and the Serer in Senegal. As shown in Table 2 and Table 3, the results suggest that the survival advantage of these groups derives largely from greater use and availability of modern preventive health care including immunization, and possibly also from differential migration patterns among the groups.

Table 4 shows the effects of ethnic affiliation on control of all of the variables considered in the preceding models. A significant residual advantage appears for groups in four countries — the M'baka in the Central African Republic, the Kikuyu in Kenya, the Ovambo in Namibia, and the Serer in Senegal; factors not measured adequately by these surveys — such as the epidemiological environment of most groups' members, childrearing practices, and unequal access to a broad range of curative as well as preventive health care services — may contribute to these advantages. More important, with few exceptions, parameter estimates scarcely changed from the partial models of Table 3 to the full model in Table 4. Strong and universal effects of household economic conditions on infant survival, for instance, which generally contribute to ethnic survival advantages, do not appear to result merely from the concentration of economic resources in the largest cities; nor do potent effects of use of health services, which contribute to lower mortality for Sahelian groups, appear to reflect solely an availability of economic resources to use these services.

Conclusion

Based on an analysis of survey data from the 1990s, this study has revealed large disparities in early child survival chances among ethnic groups in a wide range of African countries. Descriptive statistics from households suggest a close correspondence of child mortality differentials with ethnic inequalities in household economic status, education of women, access to and use of health services, and degree of concentration in the largest city. Multivariate analysis shows that ethnic mortality differences are, in fact, closely linked to economic inequality in many countries, and perhaps with differential use of child health services in countries of the Sahel region, but seem to have a less direct relationship with intergroup variation in geographical settings, demographic behaviour, and the cultural status of women. One might therefore modify the broad analytical framework applied in this study to a simple pathway, one that links ethnic affiliation to child survival mainly through economic advantages at the household level, and still explain much of the difference in child mortality levels among ethnic groups at the national level in many countries. In any case, the typical advantage of relatively small, clearly defined ethnic groups, as compared to the majority in the national population, according to fundamental indicators of wellbeing — child survival, education, housing, and so forth — suggests that many countries of sub-Saharan Africa, despite their widespread poverty, are as marked by social inequality as are countries in other regions of the world.

Table 3. **Effects of ethnic affiliation and other characteristics on mortality at ages 0–11 months, 1987–95: three competing models[a]**

Country	Central African Republic	Côte d'Ivoire	Ghana	Kenya	Mali	Namibia	Niger	Rwanda	Senegal	Uganda	Zambia
Ethnic groups	**M'baka**	**Baoulé**	**Ashanti**	**Kikuyu**	**Bambara**	**Ovambo**	**Djerma–Songhai**	**Tutsi**	**Serer**	**Baganda**	**Bemba**
Model 1. Ethnic group	–0.656***	–0.219*	–0.350*	–1.251***	–0.041	–0.340**	–0.357**	–0.282*	–0.349**	–0.393 **	0.097
Constant	–2.203	–2.304	–2.674	–2.623	–1.971	–2.546	–1.899	–2.312	–2.539	–2.245	–2.179
Model χ^2	7.711***	3.178*	3.240*	16.464***	0.301	6.984**	12.841***	2.808*	4.679**	4.288 **	1.010
Model 2. Ethnic group and economic conditions											
Electricity in home	–0.461**	–0.348***	–0.107*	–0.419**	0.033	0.066	–0.503***	–0.251**	–0.694***	0.075	–0.438 ***
Piped water in home	–0.391***	0.042	–0.346*	–0.044	–0.447***	–0.223*	–0.316***	–0.012	–0.245**	–0.402 **	–0.267 ***
High status occupation (men)	–1.691***	–0.443**	–0.801***	–0.683**	–0.649**	–0.870***	–0.712**	–0.423**	–0.172	–0.771***	–0.001
Ethnic group	–0.329**†	–0.110†	–0.168†	–0.863***†	–0.081	–0.215*†	–0.211**†	–0.094†	–0.437***	–0.064†	0.144
Constant	–2.076	–2.186	–2.538	–2.552	–1.883	–2.318	–1.825	–2.376	–2.219	–2.284	–2.021
Model χ^2	52.473***	16.862***	16.564***	53.285***	24.525***	16.634***	41.837***	17.534***	35.257***	17.345 **	21.137 ***
Model 3. Ethnic group and other attributes											
Status of mothers											
Schooling ⩾ husband's	0.028	0.091	0.171	0.116	–0.384***	0.115	0.092	–.216**	–.126	0.097	0.166
Married after age 18 years	0.013	–0.182***	–0.170	–0.239*	0.023	–0.084	–0.173	–.070	–.269	–0.070	0.171
Height ⩽ 145.0 cm.	0.234	0.606*	0.589	0.563*	0.091	–0.132	NA	NA	–.055	0.058	0.183
Demographic behaviour											
Did not migrate <5 years	–0.269**	–0.378***	0.091	–0.005	–0.359***	–0.295**	–0.227**	– 0.529***	–0.375***	–.276****	–0.408 **
Parity <7	–0.076	–0.459***	–0.400**	–0.225*	–0.129*	0.004	–0.116	0.056	–0.036	0.006	0.136
Geographical setting											
Largest city	–0.490***	–0.321*	0.037	–0.718**	–0.488***	0.075	–0.175***	0.104	–0.587***	–0.125	0.133
Health services											
Tetanus immunization	–0.495***	–0.539***	–0.215	–0.447**	–0.741***	–0.323**	–0.338***	–0.399***	–0.304***	–0.087	–0.327 ***
⩾3 Antenatal visits	0.079	–0.088	–0.319*	–0.409**	0.133	–0.384**	–0.440***	–0.394***	–0.234**	–0.238 *	–0.528 ***
Ethnic group	–0.594***	–0.191*	–0.317*	–1.181***	0.092†	–0.317**	0.018†	–0.263*	–0.210*†	–0.309 *	0.087
Constant	–1.795	–2.425	–2.425	–1.742	–1.428	–2.166	–1.662	–1.493	–1.946	–2.251	–1.848
Model χ^2	34.555***	62.274***	23.498***	77.975***	83.602***	29.250***	85.743***	36.403***	37.739***	27.441***	58.642 ***
Number	3846	5570	3025	5019	8236	3120	5566	4485	4557	5794	4939

[a] All missing values and "Don't Know" responses are omitted from the analysis. NA = not available. † Change in Beta coefficients of ethnic affiliation variable is statistically significant at $P \leqslant 0.05$ according to Hausman specification test. Models adjust for potential non-independence of observations resulting from shared characteristics among siblings by use of the Huber formula as computed by Stata software package.

* $P \leqslant 0.10$.

** $P \leqslant 0.05$.

*** $P \leqslant 0.01$ (two–tailed test).

While our descriptive evidence of ethnic inequality across African countries is conclusive, this study is exploratory with respect to understanding the determinants of child mortality among ethnic groups in African societies, insofar as it only highlights national inequalities among selected groups and offers an explanation of the findings based on the limited data at our disposal. Nonetheless, the strong and consistent results presented here strongly support placing the notion of ethnicity at the forefront of theories and analyses of child mortality in Africa, which incorporate social, and not purely epidemiological, considerations. This emphasis might lead to more informed child health policies. For instance, in Niger — where child mortality levels are the highest in the world (*2*) — the mortality rate around 1990 for under-fives was about 242 deaths per 1000 live births among the Djerma, but an astonishing 353 for other children in Niger. In Kenya, which has one of the five lowest child mortality rates in tropical Africa, the non-Kikuyu experience child mortality levels that exceed the average of many African countries.[k] Such disparities within countries

[k] The under-five mortality rate ($_5q_0$) during 1989–93 was 36.1 per 1000 live births for the Kikuyu and 125.1 for the non-Kikuyu in Kenya. In comparison, even West African countries such as Cameroon, Côte d'Ivoire and Senegal had average child mortality rates below 125 per 1000 live births in 1994 (*2*). Factors not included in the statistical analyses probably account in part for much lower child mortality of the Kikuyu than of other Kenyans. While the Kikuyu are not more likely to reside in Nairobi than are non-Kikuyu, many members of this group live in Nairobi Province, in relatively close proximity to the capital and the resources concentrated there. The relatively high altitude of this province is also not conducive to the spread of malaria, a leading cause of death in Kenya.

Table 4. **Effects of ethnic affiliation and other characteristics on mortality at ages 0–11 months, 1987–95[a]**

Country	Central African Republic	Côte d'Ivoire	Ghana	Kenya	Mali	Namibia	Niger	Rwanda	Senegal	Uganda	Zambia
Ethnic groups	**M'baka**	**Baoulé**	**Ashanti**	**Kikuyu**	**Bambara**	**Ovambo**	**Djerma–Songhai**	**Tutsi**	**Serer**	**Baganda**	**Bemba**
Variables											
Electricity in home	–0.401**	–0.265**	–0.151	–0.322*	0.013	0.014	–0.169	–0.337**	–0.477**	0.043	–0.414***
Piped water in home	–0.294**	0.058	–0.425*	0.114	–0.448***	–0.114	–0.049	–0.053	–0.198*	–0.352*	–0.231*
High status occupation (men)	–1.740***	–0.337**	–0.680**	–0.512**	–0.703**	–0.738**	–0.669**	–0.371*	–0.139	–0.616***	0.034
Schooling ⩾ husband's	–0.024	0.094	0.172	0.198	–0.364***	0.170	0.204	–0.224**	–0.047	0.149	0.055
Married after age 18 years	0.002	–0.173*	–0.153	–0.219*	0.042	–0.069	–0.130	–0.062	–0.178	–0.032	0.100
Height ⩽ 145.0 cm.	0.221	0.551*	0.519	0.538*	0.121	0.174	NA	NA	–0.055	0.081	0.137
Didn't migrate < 5 years	–0.295**	–0.291**	0.090	0.001	–0.366***	–0.281**	–0.251*	–0.541***	–0.342**	–0.242**	–0.349*
Parity < 7	–0.113	–0.441***	–0.372*	–0.231*	–0.135*	0.027	–0.118	0.059	–0.042	0.003	0.097
Largest city	–0.169	–0.188	0.105	–0.335*	–0.155	0.092	–0.121	0.317	–0.188	–0.040	0.044
Tetanus immunization	–0.513***	–0.539***	–0.233	–0.437**	–0.692***	–0.323**	–0.308**	–0.399***	–0.263**	–0.097	–0.287***
⩾ 3 antenatal visits	0.033	0.057	–0.339*	–0.411**	0.139	–0.362**	–0.394**	–0.382***	–0.191*	–0.223**	–0.483***
Ethnic group	–0.307**†	–0.097†	–0.154†	–.844***†	0.020	–0.203*†	0.101†	–0.087†	–0.254**	–0.038†	0.112
Constant	–1.629	–1.487	–2.324	–1.741	–1.383	–2.088	–1.642	–1.378	–1.882	–2.179	–1.772
Model χ^2	73.124***	78.886***	35.734***	89.511***	105.079***	36.662***	95.379***	44.563***	47.549***	31.706***	75.131***
Number	3846	5570	3025	5019	8236	3120	5566	4485	4557	5794	4939

[a] All missing values and ''Don't Know'' responses are omitted from the analysis. NA = not available. † Change in Beta coefficients of ethnic affiliation variable is statistically significant at $P \leqslant 0.05$ according to Hausman specification test. Models adjust for potential non–independence of observations resulting from shared characteristics among siblings by use of the Huber formula as computed by Stata software package.

* $P \leqslant 0.10$.

** $P \leqslant 0.05$.

*** $P \leqslant 0.01$ (two–tailed test).

question the validity of targets for national mortality reduction, and of uniform methods to achieve such reduction, as established at the 1990 World Summit for Children. Clearly, child survival efforts in African countries should pay special attention to the disadvantaged ethnic groups and the areas where they are concentrated, and develop strategies for optimal success of these efforts. Our findings, however, suggest that in the absence of policies to reduce economic disparities between ethnic groups, the targeted child health interventions are likely to have a limited impact on the inequalities or disadvantages for chances of survival in many countries. ■

Résumé

Disparité de la mortalité infanto-juvénile chez les groupes ethniques de l'Afrique subsaharienne

D'après les reportages sur la guerre dans plusieurs pays d'Afrique subsaharienne au cours des années 90, il semblerait que les clivages ethniques et l'appartenance religieuse et raciale creusent les inégalités en matière de santé et de survie entre les groupes ethniques de toute la région, surtout chez les enfants. Paradoxalement, on n'a fait aucune étude systématique sur la disparité des chances de survie de l'enfant parmi les ethnies de la région.

Sur la base de données d'enquêtes effectuées dans les années 90 dans 11 pays (Côte d'Ivoire, Ghana, Kenya, Mali, Namibie, Niger, Ouganda, République centrafricaine, Rwanda, Sénégal et Zambie), on cherche à savoir, dans cet article, s'il y a des inégalités entre ethnies en matière de mortalité infanto-juvénile en Afrique subsaharienne depuis les années 80 et si elles se sont étendues. Dans chaque pays, on s'est intéressé à un ou deux groupes qui, de par leur situation géographique, pouvaient se distinguer du reste de la population nationale sur le plan de la santé et des chances de survie de l'enfant. Les facteurs retenus pour expliquer l'inégalité des chances de survie de l'enfant entre les différents groupes ethniques étaient les suivants : lieu de résidence dans la plus grande ville, conditions économiques du ménage, niveau d'instruction et état nutritionnel des mères, accès à des services de santé maternelle et infantile modernes, y compris vaccination, caractéristiques de la fécondité et migration.

Les résultats sont remarquablement homogènes. Dans les 11 pays, les probabilités de décès pendant les premiers mois ou avant l'âge de 5 ans variaient de manière significative d'un groupe ethnique à l'autre. Jusqu'en 1992, le risque de décès chez les enfants de mère Ashanti au Ghana et de mère Tutsi au Rwanda était plus faible de 20 % environ que chez les autres enfants ghanéens et rwandais. Chez les enfants Baoulé en Côte d'Ivoire, Djerma-Songhai au Niger, et Baganda en Ouganda, les probabilités de décès avant l'âge de 5 ans étaient d'un tiers moins élevées que chez les enfants d'autres groupes ethniques du même pays. Les chances de survie étaient particulièrement inégales au Kenya. Les enfants Kalenjin risquaient deux fois moins de décéder avant l'âge de 5 ans que les autres enfants non Kikuyu, bien qu'habitant presque exclusivement en zone rurale. Par ailleurs, les probabilités de décès avant l'âge de 5 ans dans la population très urbanisée des Kikuyu étaient inférieures de 65 % chez les nourrissons et de 74 % chez les enfants de moins de 5 ans. En Zambie, la mortalité infanto-juvénile était nettement supérieure chez les Bemba.

L'analyse multivariée fait apparaître que les différences entre ethnies en matière de mortalité infanto-juvénile sont étroitement liées aux inégalités économiques dans nombre de pays et, peut-être, aux écarts constatés dans l'utilisation des services de santé infantile dans les pays du Sahel. Les disparités économiques à l'origine des différences observées dans la mortalité infanto-juvénile sont peut-être liées à la situation géographique des groupes dans les pays, mais n'ont pas pour cause directe le fait d'habiter dans la plus grande ville du pays. A la fois probants et homogènes, les résultats de cette étude incitent à réserver une place de choix à l'ethnicité dans les théories et analyses de la mortalité infanto-juvénile en Afrique qui tiennent compte de paramètres sociaux, et non purement épidémiologiques. En outre, l'avantage dont jouissent habituellement les groupes ethniques relativement restreints et clairement délimités par rapport à la majorité de la population nationale d'après les critères fondamentaux de bien-être – survie de l'enfant, instruction, logement, etc.– laisse à penser que de nombreux pays d'Afrique subsaharienne, malgré une pauvreté généralisée, sont aussi marqués par les inégalités sociales que les pays d'autres régions du monde.

Resumen

Desigualdades interétnicas en materia de mortalidad infantil en el África subsahariana

Las noticias sobre los conflictos bélicos acaecidos en varios países del África subsahariana durante los años noventa han suscitado preocupación por la posibilidad de que las divisiones étnicas y el solapo de grupos religiosos y raciales den lugar a un aumento de las desigualdades interétnicas en materia de salud y supervivencia en toda la región, sobre todo entre los niños. Paradójicamente, no se ha llevado a cabo ningún estudio sistemático de las desigualdades étnicas en lo tocante a la supervivencia infantil entre los países de la región.

En este artículo se utilizan datos reunidos en los años noventa en 11 países (República Centroafricana, Côte d'Ivoire, Ghana, Kenya, Malí, Namibia, Níger, Rwanda, Senegal, Uganda y Zambia) para determinar si han existido desigualdades étnicas, y en caso afirmativo si se han ampliado, en materia de mortalidad infantil en el África subsahariana desde los años ochenta. En cada país el interés se centró en uno o dos grupos que, como consecuencia de su situación geográfica, hubiesen podido presentar un estado de salud y unas probabilidades de supervivencia distintos del resto de la población nacional. Entre los factores considerados para intentar explicar las posibles desigualdades en supervivencia infantil entre los grupos étnicos cabe citar el dato de si habitan o no en la principal ciudad del país, la situación económica de la unidad familiar, el nivel educativo y el estado nutricional de las madres, el uso de servicios modernos de salud maternoinfantil, en particular de inmunización, y las pautas de fecundidad y migración.

Los resultados muestran una notable coherencia. En los 11 países se observaron diferencias significativas entre los grupos étnicos en lo tocante a la probabilidad de fallecer durante la lactancia o antes de los cinco años. Hasta 1992, los niños de las mujeres ashanti en Ghana y de las tutsi en Rwanda tenían un 20% menos de probabilidades de fallecer que los otros niños ghaneses y rwandeses. Los niños de Baoulé, en Côte d'Ivoire, los djerma-songhai en el Níger y los baganda en Uganda presentaban un riesgo de morir antes de los cinco años inferior en más de un tercio al de los niños de otros grupos étnicos de su país. Las diferencias de supervivencia eran especialmente marcadas en Kenya. Entre los niños kalenjin, el riesgo de fallecer antes de los cinco años equivalía a la mitad del correspondiente a otros niños no kikuyu, pese a que habitan casi exclusivamente en zonas rurales. Al mismo tiempo, el riesgo de los kikuyu, predominantemente urbanos, de morir antes de los cinco años era un 65% más bajo entre los lactantes, y un 74% más bajo entre los niños menores de cinco años. Los lactantes y los niños pequeños bemba presentaban una mortalidad notablemente mayor en Zambia.

El análisis multifactorial muestra que las diferencias de mortalidad infantil entre etnias están estrechamente relacionadas con las desigualdades económicas en muchos países, y quizá también con el diferente uso que los países de la región del Sahel hacen de los servicios de salud infantil. Las disparidades económicas que están en la base de la desigual mortalidad infantil pueden estar relacionadas con el entorno geográfico habitual de los grupos en los países, pero no son un resultado directo de su distinta radicación en la ciudad principal del país. La robustez y la coherencia de los resultados de este estudio justifican que la noción de etnicidad pase al primer plano de los análisis y teorías de la mortalidad infantil en África que incorporan consideraciones sociales, no sólo epidemiológicas. Además, teniendo en cuenta la ventaja que supone haber estudiado grupos étnicos relativamente pequeños y claramente definidos, en comparación con la mayoría de la población nacional, con arreglo a indicadores fundamentales del bienestar — supervivencia infantil, educación, vivienda, etc. —, los resultados llevan a pensar que muchos países del África subsahariana, aun en un contexto de pobreza generalizada, presentan desigualdades sociales en grado similar a países de otras regiones del mundo.

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ANNEX
Description of the variables used in the multivariate analysis

Variable	Categorization
Dependent variable	
Infant mortality	0. Survived to age 12 months 1. Died before age 12 months
Independent variables	
I. *Ethnic group*	1. Other[a] 2. M'baka, Baoulé, Ashanti, Kikuyu, Bambara, Ovambo, Djerma–Songhai, Tutsi, Serer, Baganda, or Bemba (see Table 1 for countries)
II. *Economic status*	
Electricity in dwelling	1. No[a] 2. Yes
Water in dwelling	1. No[a] 2. Yes
High status occupation of husband/partner	1. Other or none[a] 2. Professional, technical, managerial, clerical, or skilled manual
III. *Cultural status of women*	
Educational level $\geqslant$ husband's	1. No[a] 2. Yes
Married after age 18 years	1. No[a] 2. Yes
Height $\leqslant$145.0 cm	1. No[a] 2. Yes
IV. *Demographic behaviour*	
Did not migrate in last 5 years	1. No[a] 2. Yes
Child is parity $\leqslant$6	1. No[a] 2. Yes
V. *Geographical setting*	
Largest city	1. No[a] 2. Yes
VI. *Use of modern maternal/child health care*	
Tetanus immunization	1. No[a] 2. Yes
Number of antenatal visits	1. < 3[a] 2. $\geqslant 3$

[a] Reference category in the analysis.