Adult Mortality and the Wealth Gradient in Low- and Middle-Income Countries

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Background

The gap in life expectancy between the richest and poorest percentiles in high-income countries is at least a decade (1,2). Socioeconomic inequalities in mortality, defined as the differences in mortality rates between those of high socioeconomic status (SES) and those of low SES, are costly, and are a major source of social inequality that can disrupt domestic and international stability (3,4). Knowing who dies is a fundamental building block of public health sciences. Data on deaths disaggregated by basic characteristics, such as age, sex, and SES are necessary in the development of targeted policies and programs that improve population health and decrease inequalities within a country. As set forward in the Sustainable Development Goal (SDG) target 10.3 (5), reducing inequalities within populations is a key global priority. Despite the fact that 80% of the world's adult population live in low- and middle-income countries (LMICs), we have little knowledge of inequalities on adult mortality in these countries (6).

Socioeconomic inequalities in mortality in LMICs represent one of the world's most severe public health challenges. Inequalities are seen in under-five mortality (7), maternal mortality (8), and mortality for diseases such as malaria (9) and stroke (10). Beyond moral considerations, mortality inequalities lead to the development of suboptimal aging and labor force policies. They persist across generations and can disrupt domestic and international stability (3,4). Increasing economic and mortality inequalities have been linked to a recent rise of international migration and authoritarianism, suggesting mortality inequalities in LMICs are likely to have global ripple effects (3). Measuring adult mortality inequalities in LMICs is, therefore, crucial for identifying vulnerable populations.

Although there is much literature on inequalities in health and childhood mortality in LMICs, we know little about the socioeconomic inequalities in adult mortality. The main reasons for this gap are a lack of high-quality data, a lack of data that link mortality and SES, and few methodologies that can be applied under such constraints. In this paper, we overcome these challenges by applying kinship methods to publicly available data. The aim of this study is to estimate age-specific adult mortality rates by SES in LMICs.

Data and Methods

Data

We analyzed sibling mortality from Demographic and Health Surveys (DHS) and parent mortality from national censuses, accessed via the Integrated Public Use Microdata Series (IPUMS) International. The criteria for inclusion of DHS datasets were: 1) the survey was conducted in or after 2000; 2) the maternal mortality module was completed, which contains questions about sibling survival; and 3) wealth index of the survey participant was recorded. The criteria for inclusion of IPUMS census datasets were: 1) the census included information on maternal and/or paternal mortality; and 2) the census included relevant variables for construction of a wealth index.

Siblings (from DHS) and parents (from IPUMS) were included where survival status was reported. Siblings were between the ages of 15 and 49 during the specified study periods, or died between the ages of 15 and 49 during the specified study periods. In DHS data, wealth index is a five-level composite measure of a household's living standard and is calculated using principal component analysis with a range of variables.

Census respondents in IPUMS data were between the ages of 15 and 60. IPUMS does not calculate a wealth index, but many censuses include variables that can be used to construct a wealth index. In these preliminary analyses of 2016 South African census data, we constructed a five-level wealth index by applying principal component analysis to variables such as certain household assets, materials used for housing construction, types of water access, and sanitation facilities. This is the same methodology applied by DHS (11,12). Wealth quintiles were assumed to be the same as those of the survey participant (DHS) or census respondent (IPUMS).

Methods

We used DHS data to estimate adult mortality by wealth index using data on siblings aged 15-49 years. For this, we estimated mortality rates by calculating the number of deaths divided by the number of person years of exposure (13). In these analyses, we calculated mortality rates in the following ways: 1) age-standardized mortality rates by geographic region according to the UN Statistical Division (15); and 2) age-specific mortality rates by country income classification according to the World Bank (16). All analyses were stratified by wealth quintile and sex.

We used IPUMS data to estimate adult mortality using mortality data on parents. To do this, we calculated the proportion of parents alive by census-respondent age group, and used the Brass orphanhood method to estimate adult mortality rates per 1,000 for mothers and fathers (14). In these preliminary analyses, we used data from the 2016 census for South Africa to calculate age-specific mortality rates for mothers and fathers ages 45-84. We combined these results with results of age-specific mortality from the 2016 South African DHS survey to create a more complete picture of age-specific adult mortality by wealth quintile and sex in South Africa. All analyses were done in R.

Results

We calculated mortality rates for adults aged 15-49 in 47 countries using 98 DHS datasets for the years 2000 to 2024. We also calculated mortality rates by wealth quintile and sex for adults aged 15-84 for South Africa by combining analyses from 2016 DHS and IPUMS data.

Our results on age standardized mortality rates by geographic region indicate that Southern Africa had the highest adult mortality, and the widest inequalities, especially among women when comparing the richest (quintile 5) and poorest (quintile 1) groups. There were also statistically significant mortality gaps between the richest and poorest quintiles in Middle Africa, Western Africa, Southern Asia, East Asia & Pacific, Latin America and the Caribbean, and among women in Northern Africa. These results are illustrated in Figure 1.

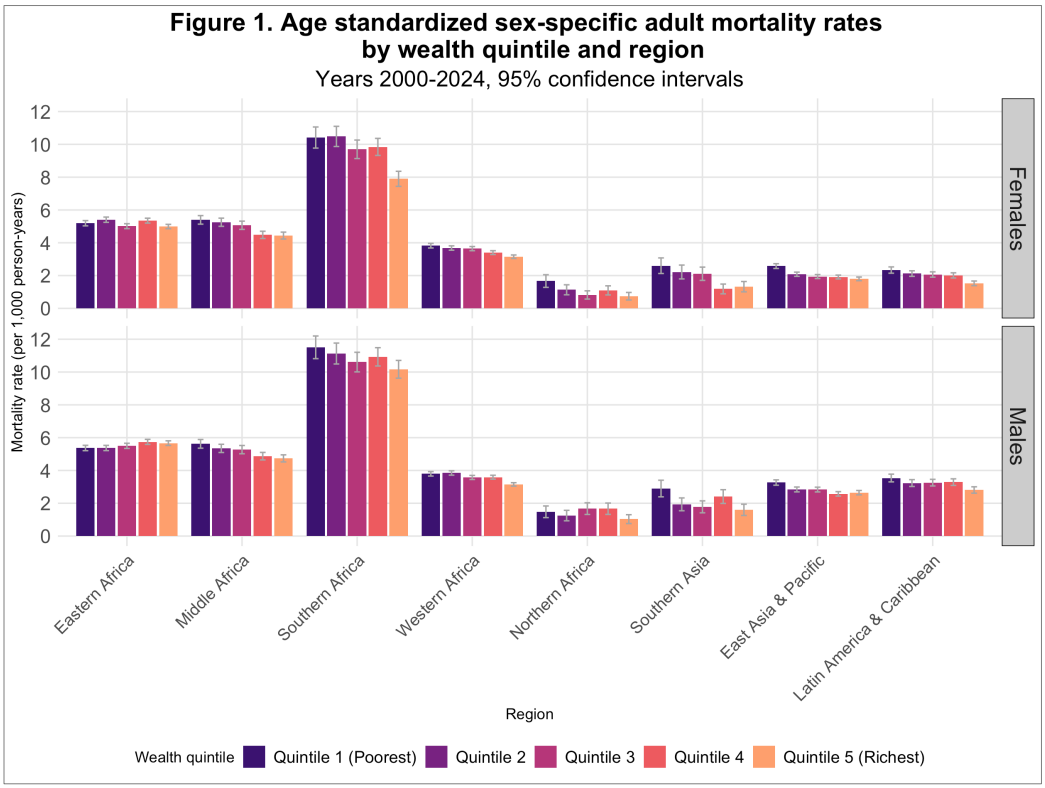
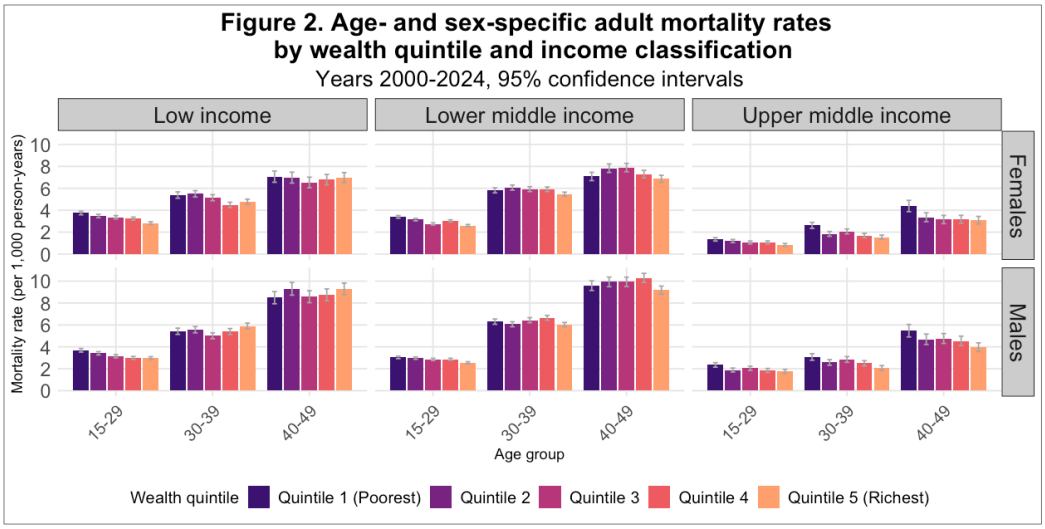


Figure 2 presents adult mortality by wealth quintile, age group, and by World Bank country income classification for all DHS surveys from 2000 onwards. Overall, the upper-middle-income countries had lower adult mortality in all age groups when compared to low- and low-middle-income countries. When comparing the richest and poorest quintiles, the richest group had significantly lower mortality at ages 15-29 in all country income groups, and in all age groups in upper-middle-income countries. This suggests that although there is lower mortality in these age groups in upper-middle-income countries, there could be greater inequalities between the richest and poorest groups.

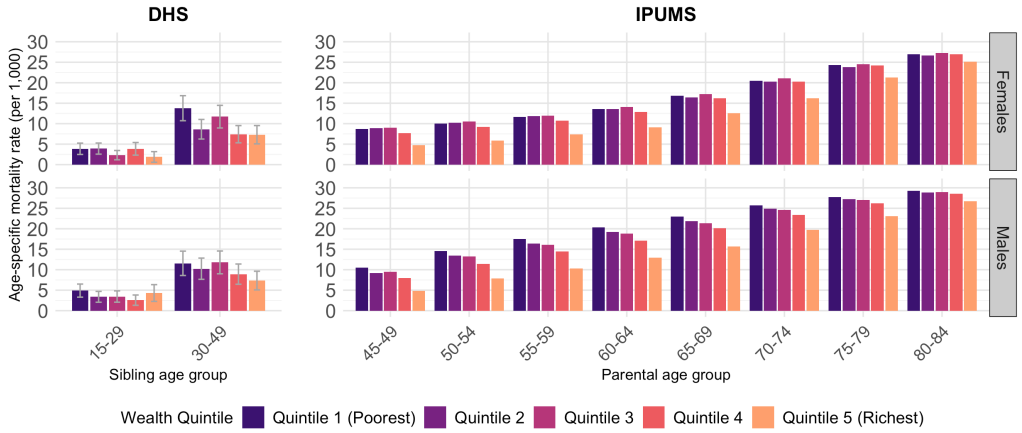


In Figure 3 we present the combined results of adult mortality across datasets to give a more complete picture of adult mortality. In this Figure we show age- and sex-specific mortality for ages

15-84 in South Africa for data collected in 2016. Overall, the richest group consistently has lower mortality than all other wealth groups, although this difference is smaller in the 80-84 age group. At younger ages, the only statistically significant difference in mortality rates is seen in females aged 30-49, where the poorest group (quintile 1) has significantly higher mortality than the two richest groups (quintiles 4 and 5).

Figure 3. Age- and sex-specific adult mortality rates by wealth quintile

South Africa 2016

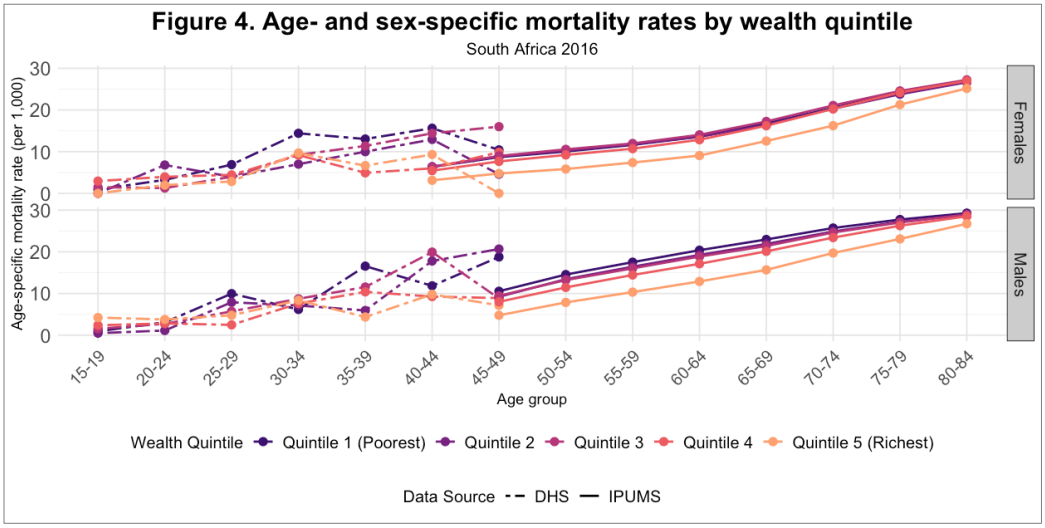


Next Steps

Figure 4 depicts the same results from Figure 3, and illustrates preliminary analyses for the next phase of the project. We plan to develop a wealth index for all countries in IPUMS that have maternal and/or paternal mortality data from 2000 onwards. We plan to combine these analyses with equivalent DHS survey data to present a more complete picture of adult mortality in LMICs. Because individual DHS surveys have small numbers when stratified by wealth quintile and sex, as illustrated by the unstable results in Figure 4, we plan to analyze data by region and country income classification, as well as any other relevant categorization. We also plan to calculate changes in mortality rates over time.

Figure 4. Age- and sex-specific mortality rates by wealth quintile

South Africa 2016



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