Urban-rural inequalities in mortality across age groups: a systematic analysis of survey data in low- and middle-income countries

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Introduction

Ensuring that no one is left behind is a fundamental aspiration of the 2030 Sustainable development goals (United Nations 2015). To achieve this, monitoring of development indicators needs to be disaggregated, especially by sex, age, income, ethnicity, migratory status, disability and geographic location. A large body of research has been devoted to disaggregating indicators of the SDG 3 health targets, and in particular indicators related to under-five mortality and neonatal mortality (Bocquier et al. 2011; de Walque and Filmer 2013; Li et al. 2019; Tabutin and Masquelier 2017). Sub-Saharan Africa (SSA) has been the focus of this research both due to the disproportionate burden of under-five deaths in the region and the low levels of urbanization (McMichael et al. 2004).

Survey estimates suggest that under-five mortality is higher in rural areas than in urban areas in SSA (Bocquier et al. 2011; Fink et al. 2014). This urban advantage can be attributed in part to access to health services, superior infrastructure, and better economic opportunities (Lipton 1977; Sahn and Stifel 2003). Yet, when considering urban-rural differences in mortality in the adult ages, the available evidence is mixed (Günther and Harttgen 2012; Lankoande 2016; Menashe Oren and Stecklov 2018).

Based on estimates derived from reports on the survival of parents, there is evidence of some urban penalty in SSA and excess urban mortality in adulthood is likely to shift to rural areas as countries develop (Menashe Oren and Stecklov 2018). However, this urban penalty could be spurious, because existing adult mortality estimates in SSA are largely based on reports from close relatives, such as children and siblings. Due to lower levels of educational attainment, recall biases in such reports could be larger in rural areas, or there could be misclassification errors introduced by migration between the rural and urban sectors (Lankoande 2016).

The possible coexistence of an urban advantage in child mortality with an urban penalty in adult mortality calls for further investigation examining mortality across age groups. How do the urban-rural disparities change as children grow and as adults age? To our knowledge, the age pattern of the urban/rural difference in mortality has not been documented. In addition, there has been no systematic study of urban-rural disparities in older children aged 5-14 and adolescents. We examine urban-rural inequalities across age groups in low- and middle-income countries. We move beyond SSA to evaluate whether an urban disadvantage disappears as countries develop and urbanise. Since living

standards are higher, and the cause-of-death patterns are different (Roth et al. 2018), we expect rural-urban inequalities may differ in other regions of the world.

Data and methods

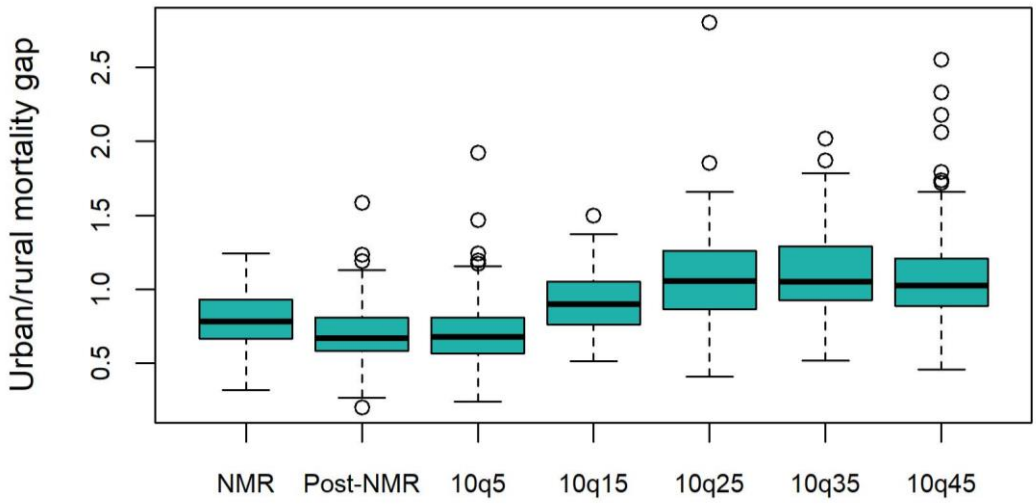
Our analysis is based on 133 Demographic and Health Surveys which collected full birth histories and sibling histories. In full birth histories, women of reproductive age provide an exhaustive list of all their children, with information on their gender, date of birth, and survival status. Current age is recorded for surviving children, while age at death is collected for the deceased. Sibling survival histories have a similar structure, but the information provided refers to all brothers and sisters born to the same mother as the respondent. We use event history analysis to estimate risks of dying in childhood for the 10-year period before data collection for three age segments: neonatal mortality, under-five mortality (excluding the neonatal period), and mortality in middle childhood and early adolescence (between ages 5 and 14). We use sibling survival histories to estimate mortality rates in three age segments: 15-19, 20-34, 35-50. We make no attempt to estimate mortality above age 50, because DHS respondents are aged 15 to 49 and they report on siblings of the same age on average. We examine the urban/rural ratio for each age group over the course of mortality decline (national level mortality) and as countries urbanise.

Results

Aggregated inequalities in mortality between rural and urban sector conceal substantial heterogeneity in mortality by age. Looking at all available estimates covering 52 countries between 1993 and 2016, the rural-urban inequalities in child and adolescent mortality, compared to the rural-urban inequalities in adulthood are especially notable (Figure 1). The urban/rural neo-natal mortality rate (NMR) ratio is lower than one, indicating higher rural mortality. The gap between the sectors is relatively low, and is likely driven by the availability of healthcare services. After survival of the first month of life, the post-NMR and ${}_{10}q_5$ urban/rural ratio remains below one (higher rural mortality), though with an even larger gap in estimates between the rural and urban sector. In countries with higher national mortality, inequalities between rural and urban populations are larger.

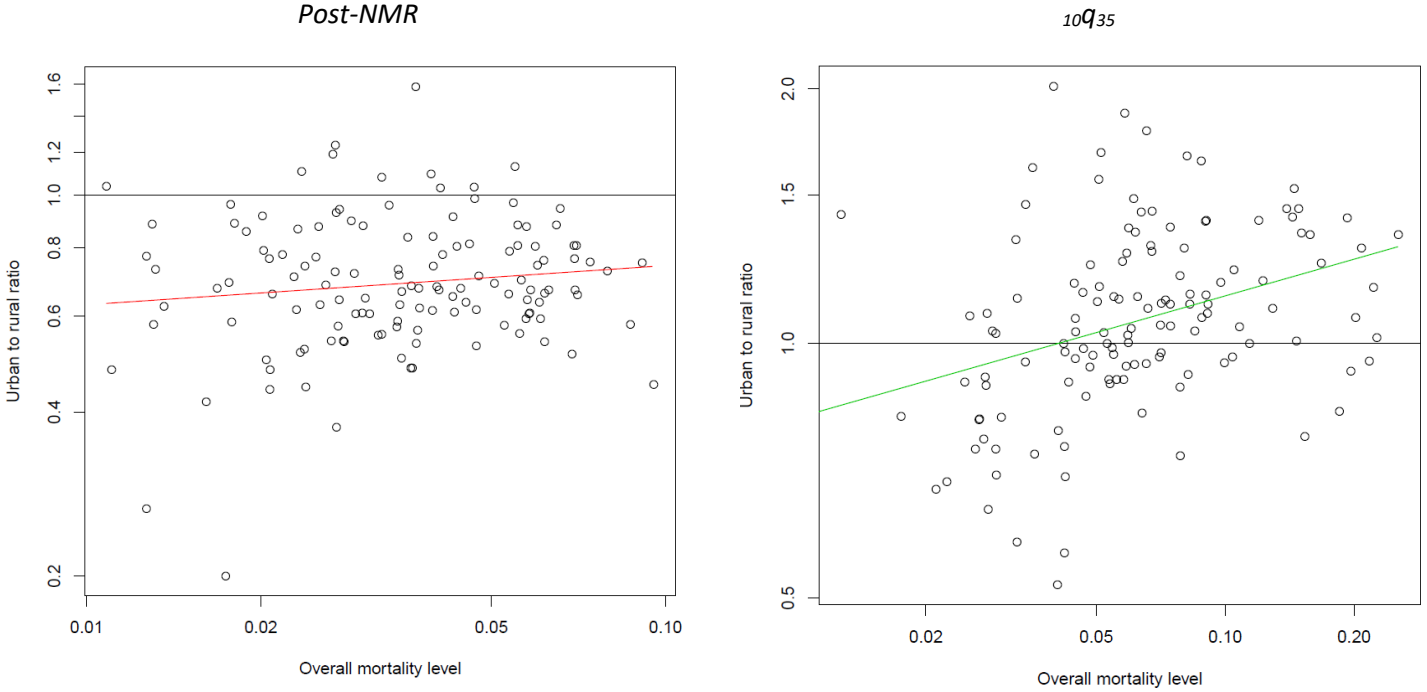
Shifting to older ages, 15-24 year olds have lower rural-urban inequalities, with the majority of countries maintaining higher rural mortality. The rural-urban inequalities in adults aged 25-34 are small to negligible in most countries, with higher mortality countries having slightly larger gaps, though overall the median urban/rural ratio indicates higher urban mortality. The picture is similar among 35-44 year olds. Finally, in the oldest age group we examine, 45-54 year olds, urban mortality is also often higher.

Figure 1: Urban-rural mortality inequalities (ratio) over the life course: NMR, Post-NMR, 5-14, 15-19, 20-34, 35-50



We also test to see whether rural-urban inequalities shift as mortality declines, using two age groups for example here (Figure 2). When national survival is high, the urban to rural ratio of post-NMR is below equity- indicating higher rural mortality – and does not significantly differ to when national survival is low. In contrast, as mortality amongst 35-44 year olds declines, an urban penalty in mortality is replaced by an urban advantage. Indeed, over the life course we see a shift from higher rural mortality to higher urban mortality.

Figure 2: Relationship between declining national mortality and urban/rural mortality ratio



This analysis will be extended through linear regression to model the urban/rural mortality ratio by age group, including major covariates such as the percentage urban, HIV prevalence, overall mortality and regional dummies. We will also estimate urban/rural ratios at the individual level, to control for education of the mother and wealth index and compare the unadjusted and adjusted rate ratios. Finally, we will perform a sensitivity analysis, restricting the sample to women who have never migrated, to check to what extent our results are sensitive to biases introduced by migration.

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