High Under-Five Mortality among Twins in Sub-Saharan Africa: Patterns and Explanations

Christiaan Monden (Oxford) & Jeroen Smits (Nijmegen)

Sub-Saharan Africa not only has the highest rate of twin births in the world [1] but also the world’s highest rate of infant and child mortality [2]. Mortality rates tend to be higher for infants and children from multiple births compared to singletons. Especially in the first months of life, twin status increases mortality risks. This holds true in Sub-Saharan Africa as well. Combined these trends lead to an extremely high infant and child mortality rate among the relatively large group of twins in Sub-Saharan Africa.

Given the size of the group and the level of mortality, it is surprising how little is known about the patterns of mortality among twins in Sub-Saharan Africa. Guo and Grummer-Strawn already noted this in their 1993 seminal study on child mortality among twins in less developed countries. Basic questions concerning the excess twin mortality in Sub-Saharan Africa still remain to be addressed: Are the determinants of infant and child mortality for twins similar to those for the majority group of singletons or can we observe difference in the mortality patterns? And, do these patterns vary between regions with high and low levels of twinning rates and between poorer and richer regions?

Lack of data made it hard to answer these questions. The availability of a large number Demographic and Health Surveys (DHS) with increasingly large samples throughout Sub-Saharan Africa now makes it possible make progress in our understanding of excess infant and child mortality among twins. Gou and Grummer-Strawn were able to analyze data on 1438 twins in 11 Sub-Saharan countries using the first wave of DHS from the late 1980s. To have sufficient power they pooled twins and singletons from Africa (North and Sub-Saharan), Latin America and Asia (two regions with very low twinning rates and, especially in Asia, mostly mono-zygotic twins). They concluded: “Weakened by gestational and other biological complications, twins seem to be more vulnerable to detrimental demographic and household socio-economic influences than singletons.” What constitutes detrimental demographic and socio-economic influences varies between regions and over time, at least in relative terms. The importance of maternal age, single motherhood, maternal education and wealth, for instance, varies considerably. Is this variation similar for twins and singletons? Which factors are particularly
important for twins? The wealth of information in the DHS now allows us to study patterns of infant and child mortality in the region with the highest mortality and the most twins in much more detail than ever before.

Since Guo and Grummer-Straw’s 1993 study only a couple of studies have investigated patterns of infant and child mortality among twins in Sub-Saharan Africa and these studies have only looked at one to three countries at a time.[3-5] These studies, too, have found particular factors to be related to mortality in twins, but we do not know whether this forms a general pattern. These studies included a by now well-established core set of demographic and socio-economic determinants of infant and child mortality. These mostly concern variables at the level of the child/mother and the household, such as maternal age, preceding birth interval, child’s sex, breast-feeding, and maternal education to name just a few important ones. In this study, we will include this set of ‘standard’ factors and explore patterns with mortality for twins and singletons. More importantly, the number of cases now available in pooled DHS samples, allows including district characteristics as well. The role of the level of development of the district (in terms of material wealth and/or educational expansion) and the level of health facilities on under-five excess mortality in twins can now be analyzed.

The current study aims to extend our understanding of the patterns in under-five mortality in African twins in four ways. First, it updates and significantly extends empirical evidence by analyzing the interaction between child’s twin status and the ‘standard’ set of demographic and socio-economic determinants using information from over 60 DHS surveys in 32 Sub-Saharan Africa countries. Second, we add indicators of economic development and health facilities at the sub-national district level. Third, we distinguish between different forms of infant and child mortality: under-five mortality (month 0-59), neonatal mortality (in the first month), postneonatal mortality (month 1-11), and child mortality (month 12-59). And fourth, we examine whether the determinants and their patterns differ by regions with high and low levels of twinning rates.

The general hypothesis that guides our study is that twins are more vulnerable to all detrimental factors. Although we study a broad array of factors, we will pay particular attention to maternal education (at the individual and collective level), maternal age and health facilities, and the extent to which their importance is universal or varies across Sub-Saharan Africa.
Data

The data are derived from the Demographic and Health Surveys (DHS). We use surveys for 32 Sub-Saharan African countries: Benin, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Congo Brazzaville, Congo DR, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Kenya, Liberia, Lesotho, Madagascar, Malawi, Mali, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.

The sample includes about 1.4 million births and over 250,000 deaths [these numbers will increase as new DHS surveys are constantly added to the data base], including over 45,000 children in a twin birth of whom almost 18,000 died before age 5. The crude mortality rate for twins is extremely high, close to 40/100.

We include explanatory variables at the level of the child/mother, mother/household, subnational district level and the national level: maternal age at birth, mother’s partner status, rural residence, household wealth (at the time of the interview), untreated drinking water, breastfeeding, prior birth interval, living siblings, assistance prior to and at delivery, immunization, district level indicators (education, % households with tv, health care facilities), etc. Household wealth is measured by an index constructed on the basis of household assets (such as TVs, cars, phones), the possession of land, and housing characteristics (such as floor material, roofing, toilet facilities, source of drinking water). Using a method developed by Filmer & Pritchett [6], all households within a country are ranked on the basis of the available characteristics and divided into wealth index deciles. As indicator of the level of health care facilities at the district level we use the percentage of children who received a polio vaccination in the last 5 years. GDP per capita at the national level is also taken into account.

Statistical techniques

We employ discrete time event history models in a logistic multilevel regression set up for total under-five mortality and child mortality. These models deal correctly with right-censoring while simultaneously taking the nested structure of the data into account. Technically, we estimate logistic multilevel regression models on child-year records in MlwiN 2.25. The dependent variable indicates, for each year that the child was at risk, whether it died or not. Because different causes of death prevail at different ages and there may be differences in susceptibility by twin status, we separately analyze total under-five mortality (month 0-59) and (depending on
the number of cases) neonatal mortality, postneonatal mortality or infant mortality and child mortality.

Children are observed up to the time of interview, age five, or time of death, whichever comes first. In the case of neonatal and post-neonatal mortality, there is only one year of observation and we use a standard logistic multilevel model. We distinguish three levels: mothers and children – level 1; districts – level 2; and countries – level 3. Random intercepts are modeled at the context levels. Case weights provided by DHS are applied. We also estimate country fixed-effect models as a robustness test.

Results

We will present elaborate descriptive statistics on how the mortality rates for twins and singletons differ across regions/countries. For Sub-Saharan Africa as a whole, we will be able to look at the differences between two time periods: mid/late 1990s vs early/mid 2000s.

The core of the results will be tests of interactions between twin status and each mortality determinant (at the child/mother/household and district level). We will run these tests for Sub-Saharan Africa as a whole and by sub groups of countries according to twinning rate and level of development.

NB: The data set is already prepared and we have it for analyses on maternal height[7], sex-differentials in under-five mortality[8] and twinning rates[1]. Over the next months, we will add the most recent DHS surveys to the database.

REFERENCES