



Child deaths in the past, their consequences in the present, and mortality conditions in sub-Saharan Africa

Kevin J. A. Thomas^{a,1}

Over the past 50 years, various measures of mortality have been used to develop an understanding of the health of populations. Estimates from these measures have been used to study the determinants of mortality, track mortality transitions, and identify contexts where these transitions are anomalous. Sub-Saharan Africa is one such context where such anomalies persist, and in recent years conventional measures of infant and child mortality have provided the main basis for understanding the changing mortality conditions of children. The perspective provided by these measures is, however, one that focuses on the importance of child deaths as exits from a population. While this perspective is important, new estimation approaches are needed to provide more nuanced perspectives on the dynamics of child mortality in the region. Smith-Greenaway and Trinitapoli's (1) maternal cumulative prevalence measures of child mortality offer one such approach. Unlike most conventional mortality estimation measures, they provide a dual perspective that highlights the importance of past mortality events in early childhood and their consequences for mothers in the present.

With the exception of measures of orphanhood (2) and a small selection of other demographic indicators (3, 4), the repertoire of methods providing this dual perspective is limited. However, Smith-Greenaway and Trinitapoli's (1) approach adds to this repertoire in important ways. First, it shifts the focus on the conceptualization of child deaths from one that views them as exits from a population to one that sees them as events with long-term consequences. Second, it highlights the need for analyses of child mortality to give more systematic attention to mothers who experience the death of a child during their reproductive years. In sub-Saharan Africa, where many mothers have multiple children who die in early childhood, this nuanced perspective is important for developing a more comprehensive portrait of population health.

Because these measures are estimated using retrospective data, they also provide us with opportunities for reassessing what we know about recent trends in child mortality.

Declines in infant and child mortality in sub-Saharan Africa are among the most notable public health achievements to occur in recent years (5). Most countries in the region made some progress toward achieving the child mortality targets of the recently concluded Millennium Development Goals. Despite this progress, ~1.2 million newborns still die each year, while about 3.2 million who survive their first year of life die before age 5 y (6). Indeed, children in sub-Saharan Africa are still 15 times more likely to die before age 5 y compared to children in more developed countries (7). There is no question that these estimates are daunting. Yet, few studies have examined the social and economic consequences of the continued high prevalence of child mortality in the region. Even still, we know very little about the psychological burdens left in the wake of these deaths and as a result have lost critical opportunities for designing interventions that would address their consequences.

Maternal cumulative prevalence measures now allow us to better understand the demographic contexts in which child deaths and their consequences are observed. In particular, they provide evidence showing how high prevalence of maternal experiences of child deaths can be under adverse mortality conditions. In some countries, for example, up to 80% of mothers experience the death of a child. In others, close to half of them experience recurrent offspring mortality in their reproductive years (1).

To some extent, the high prevalence of recurrent offspring mortality among some women is not new. Evidence on the clustering of child deaths among mothers is well documented in existing studies (8). However, the estimates provided by Smith-Greenaway and Trinitapoli (1) suggest that the corresponding experiences

^aDepartment of Sociology, The Pennsylvania State University, University Park, PA 16801

Author contributions: K.J.A.T. wrote the paper.

The author declares no competing interest.

Published under the [PNAS license](#).

See companion article on page 4027 in issue 8 of volume 117.

¹Email: kjt11@psu.edu.

First published February 10, 2020.

of many mothers in sub-Saharan Africa are concerning, given the mortality conditions in which they occur. In the 19th century, for example, 60% of mothers experienced the death of an infant under conditions of exceptionally high infant mortality (i.e., 400 infant deaths per 1,000) in Nerder tomea, Sweden (9). Since the 1950s, infant mortality rates in sub-Saharan African countries have been much lower and have remained at or below 250 infant deaths per 1,000 (10). By the end of the 20th century, however, about 60% of mothers in countries such as Liberia, Mali, and Niger were experiencing at least one infant death before the end of their childbearing years (1). In other words, the prevalence of maternal experiences of infant mortality in these African countries is similar to that observed in Nerder tomea in the 19th century. However, underlying infant mortality conditions found in these countries are far more favorable than they were in Nerder tomea about two centuries ago.

Disease environments that increase the risk of child mortality are thus only part of the puzzle that explains the high prevalence of these maternal cumulative experiences in sub-Saharan Africa. Another piece of this puzzle is the continued high level of fertility found in the region. By the turn of the previous century, women in Africa were still having an average of about six children during their lifetime, compared to 4.8 children in 19th-century Nerder tomea. By 2015 very little had changed. In that year, women in Niger and Mali were still having an average of between six and seven children during their childbearing ages. Under these circumstances, it is difficult to ignore the possible connection between maternal experiences of losing a child and the fertility conditions under which they occur. With each live birth, the likelihood that a woman of reproductive age would experience a child's dying increases. Moreover, because the risks of infant and child mortality are higher among higher-parity births (11), it is not surprising that substantial proportions of women are experiencing the death of a child in sub-Saharan Africa. The region is where the world's highest total fertility rates are found, while marriage is close to universal in many of its countries (12).

Beyond their significance for understanding the contexts in which child deaths occurred in the past, maternal cumulative measures also raise important questions about how we respond to the consequences of these deaths in the present. With the exception of a few studies (13), there is limited research examining the welfare of mothers who have had these experiences, and appropriate interventions for improving their circumstances are largely unavailable. While methods for the estimation of orphan status have contributed to the development of policies that address the needs of orphans, the corresponding response to the needs of mothers affected by the death of children has been limited.

Of course, there are notable differences in the characteristics of these two groups of survivors. Orphaned children generally experience the loss of parents at a young age, while most mothers experience the death of children as adults. As children without parents who are alive, orphans further experience several socio-economic disadvantages. However, mothers who experience the loss of children are also disadvantaged in important ways. Apart from the emotional trauma they carry with them for much of their lives (14), they also lose a potential source of much-needed economic support in their older ages. In rural areas, where fertility rates are even higher, the death of children negatively affects the availability of household labor (15) and limits women's ability to meet community obligations.

Mothers whose children die in early childhood must also live with the consequences of these deaths in contexts characterized

by norms that accentuate their vulnerability. Women's access to education, well-paying jobs, and decision-making opportunities is much lower than that of men in many African countries (16). In fact, using information from Smith-Greenway and Trinitapoli (1) and data from the African Development Bank, Table 1 shows a clear negative relationship between levels of maternal offspring mortality (mOM) and gender inequality in Africa. While countries with the highest prevalence of mOM have, on average, lower levels of gender equality, those with the lowest estimates of mOM have higher levels of equality. Theoretically, gender inequalities can have multiple influences on maternal experiences of the death of a child. Accordingly, they have been shown to contribute to higher levels of child mortality (17), but at the same time they can create barriers that limit the ability of mothers to rebound from these experiences.

As a result of their ability to simultaneously capture deaths of children in the past and underscore the consequences of these deaths in the present, maternal cumulative measures of child mortality are uniquely positioned to inform social policy. Few opportunities are as relevant for harnessing this potential as those provided by the United Nations' Sustainable Development Goals (SDGs). For example, the SDG that seeks to ensure healthy lives and promote well-being for all at all ages addresses the need to reduce deaths in early childhood but says nothing about the health of mothers affected by these events. Estimates of the maternal cumulative prevalence of infant mortality and maternal cumulative prevalence of under 5 mortality are thus useful for underlining the fact that child deaths do not occur in a vacuum and can have important consequences for mothers that need to be addressed.

Equally important are the implications of these measures for policies that address the SDG on gender equality. For example, they can be used to highlight the potential contribution of factors such as women's inability to make decisions about their reproductive health to increases in the risk of experiencing the loss of children. More importantly, they can be used to justify interventions that increase women's access to paid work, create laws that protect women's rights within marriage, and develop appropriate policies that improve the contexts in which mothers live after the death of their children.

Table 1. mOM and gender inequality in Africa

mOM (2005–2015)	Gender Equality Index (2015)*
High (600 per thousand and higher)	
Burkina Faso	56.6
Liberia	48.4
Niger	42.2
Rwanda	74.3
Uganda	63.4
(Mean)	(57.0)
Low (400 per thousand or lower)	
Madagascar	65.0
Namibia	73.3
Zimbabwe	69.4
Kenya	63.3
Ghana	62.3
Benin	52.0
(Mean)	(64.2)

*The minimum score estimated by the Gender Equality Index is 0, representing perfect inequality. The maximum is 100, representing perfect equality.



Like any measure of prevalence, maternal cumulative measures of child mortality have their limitations. For example, they do not account for compositional differences in the characteristics of women and their children, nor do they include the outcomes of women who died during childbirth. It is not clear that we can assume that estimating these measures using data on surviving

mothers produces more conservative estimates. This assumption is correct only if deceased mothers have no surviving children or have fewer surviving children than mothers who are alive. More studies are needed to validate this assumption. However, this should not distract us from the significance of maternal cumulative measures for advancing research in public health.

- 1 E. Smith-Greenaway, J. Trinitapoli, Maternal cumulative prevalence measures of child mortality: Perspectives on the mortality burden in sub-Saharan Africa. *Proc. Natl. Acad. Sci. U.S.A.* **117**, 4027–4033 (2020).
- 2 I. M. Timaeus, Estimation of mortality from orphanhood in adulthood. *Demography* **28**, 213–227 (1991).
- 3 G. Alter, M. Dribe, F. Van Poppel, Widowhood, family size, and post-reproductive mortality: A comparative analysis of three populations in nineteenth-century Europe. *Demography* **44**, 785–806 (2007).
- 4 D. Albrez-Gutierrez et al., Women's experience of child death over the life course: A global demographic perspective. SocArXiv:10.31235/osf.io/s69fz (15 November 2019).
- 5 D. You, G. Jones, K. Hill, T. Wardlaw, M. Chopra, Levels and trends in child mortality, 1990–2009. *Lancet* **376**, 931–933 (2010).
- 6 M. V. Kinney et al.; Science in Action: Saving the lives of Africa's Mothers, Newborns, and Children working group, Sub-Saharan Africa's mothers, newborns, and children: Where and why do they die? *PLoS Med.* **7**, e1000294 (2010).
- 7 R. Vakili, Z. Emami Moghadam, G. Khademi, S. Vakili, M. Saeidi, Child mortality at different world regions: A comparison review. *Int. J. Pediatr.* **3**, 809–816 (2015).
- 8 M. D. Gupta, Socio-economic status and clustering of child deaths in rural Punjab. *Population Studies* **51**, 191–202 (1997).
- 9 M. Vandezande, "Born to die: Death clustering and the intergenerational transmission of infant mortality, the Antwerp district, 1846-1905," PhD dissertation, Umea University, Umea, Sweden (2012).
- 10 United Nations' Division of Economic and Social Affairs, *World Population Prospects 2019: Highlights* (United Nations Department for Economic and Social Affairs, New York, 2019).
- 11 E. Sonneveldt, W. DeCormier Plosky, J. Stover, Linking high parity and maternal and child mortality: What is the impact of lower health services coverage among higher order births? *BMC Public Health* **13** (suppl. 3), S7 (2013).
- 12 D. Shapiro, T. Gebreselassie, Marriage in sub-Saharan Africa: Trends, determinants, and consequences. *Popul. Res. Policy Rev.* **33**, 229–255 (2014).
- 13 C. Demmer, Experiences of women who have lost young children to AIDS in KwaZulu-Natal, South Africa: A qualitative study. *J. Int. AIDS Soc.* **13**, 50 (2010).
- 14 H. Laakso, M. Paunonen-Ilmonen, Mothers' grief following the death of a child. *J. Adv. Nurs.* **36**, 69–77 (2001).
- 15 H. S. Kempe Ronald, Child survival, poverty, and labor in Africa. *J. Child. Poverty* **11**, 19–42 (2015).
- 16 African Development Bank Group, "Empowering African women: An agenda for action" (African Development Bank, Abidjan, Côte d'Ivoire, 2016).
- 17 S. J. Scanlan, Gender, development, and HIV/AIDS: Implications for child mortality in less industrialized countries. *Int. J. Comp. Sociol.* **51**, 211–232 (2010).