

Intergenerational Clustering of Under-Five Mortality: A Cohort Perspective in Low- and Middle-Income Countries

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ABSTRACT A burgeoning demographic literature documents the exceedingly high rates at which contemporary cohorts of women across the Global South experience the death of their children—even amid historic declines in child mortality. Yet, the patterning of maternal bereavement remains underinvestigated, as does the extent to which it replicates across generations of the same family. To that end, we ask: Are the surviving daughters of bereaved mothers more likely to eventually experience maternal bereavement? How does the intergenerational clustering of maternal bereavement vary across countries and cohorts? To answer these questions, we make use of Demographic and Health Survey Program data from 50 low- and middle-income countries, encompassing data on 1.05 million women and their mothers spanning three decadal birth cohorts. Descriptive results demonstrate that maternal bereavement is increasingly patterned intergenerationally across cohorts, with most women experiencing the same fate as their mothers. Multivariable hazard models further show that, on average, women whose mothers were maternally bereaved have significantly increased odds of losing a child themselves. In most countries, the association is stable across cohorts; however, in select countries, the risk associated with having a bereaved mother is shrinking among more recent birth cohorts.

KEYWORDS Demographic transition • Under-five mortality • Child death • Intergenerational clustering • Mortality mobility

Introduction

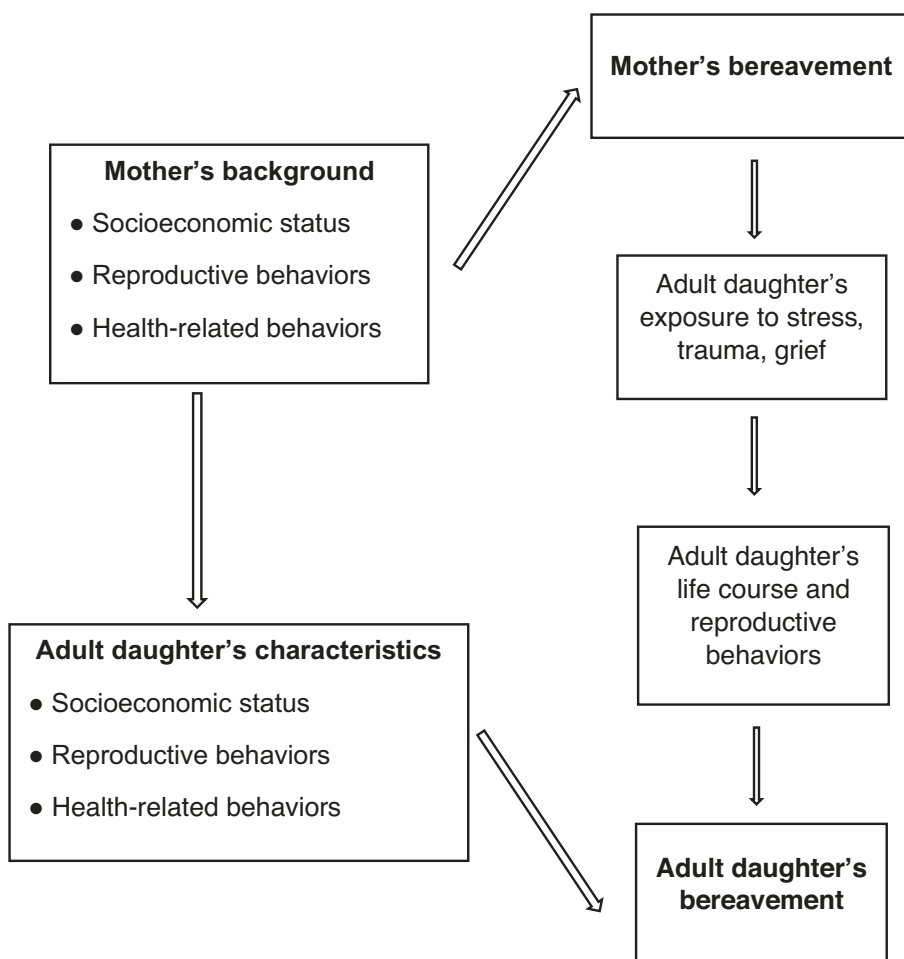
Increasingly, demographic research has emphasized the high burden of child loss experienced by women in contemporary low- and middle-income countries. Even amid precipitous declines in under-five mortality rates, fertility and mortality rates combine to leave a high proportion of women “maternally bereaved”—burdened by the death of one or more of their children (Smith-Greenaway et al. 2021). In many low- and middle-income countries in recent years, upward of one third to one half of mothers are maternally bereaved (Smith-Greenaway et al. 2021).

ELECTRONIC SUPPLEMENTARY MATERIAL The online version of this article (<https://doi.org/10.1215/00703370-11477436>) contains supplementary material.

The burgeoning literature emphasizing the cumulative weight of child loss on contemporary cohorts of mothers offers little insight into inequality in the experience, leaving unclear which women are most likely to endure this reproductive disadvantage. Although demographers have diligently documented the socioeconomic realities that put individual children at risk of premature death, emphasizing the centrality of their mothers' behaviors, resources, and traits (Hanmer et al. 2003), we lack insights into the extent to which their *mothers'* family background is also relevant to children's likelihood of survival. Even as some demographic research describes the "clustering" of repeated child deaths among a subset of women (Bocquier et al. 2021; Das Gupta 1990; Sastry 1997; van Dijk 2019), we know little about whether this clustering extends vertically across kinship networks or, in other words, is patterned intergenerationally. Is the risk of maternal bereavement passed down intergenerationally, such that the same lineages of women are repeatedly burdened, leading to the replication of reproductive inequality in the aggregate? Or are women's fates loosely related to those of their mothers—especially amid widespread mortality and fertility decline?

This study answers these questions by addressing three empirical goals. First, we offer a comprehensive overview of the extent of "mortality mobility" in the bereavement experiences of two generations—women of reproductive age and their mothers—across 50 low- and middle-income countries. Second, we extend these descriptive results to a multivariable framework and investigate the extent to which having a bereaved mother is a unique risk factor for women's hazard of child loss. Third, we assess whether the intergenerational risk associated with a mother's bereavement history is distinct across three birth cohorts of women (1960s, 1970s, and 1980s) who have navigated motherhood amid distinct demographic, social, and infrastructural realities.

Through these analyses, we advance demographic research on maternal bereavement and reveal new aggregate- and individual-level insights into transitioning mortality regimes. In so doing, we deepen current understandings of population health inequality amid demographic transition. More specifically, the study extends the population health inequality literature by analyzing the intergenerational patterning of a rarely studied form of reproductive health disadvantage: maternal bereavement. Having a child die is a disadvantaging experience for women that can act as a major source of stress, trauma, and grief (Stroebe and Schut 2005; Stroebe et al. 2007); accordingly, a child's death can have significant and long-lasting implications for parents' mental and physical health (Finnäs et al. 2018; Levav et al. 2000; Li et al. 2005; Li et al. 2003; Rogers et al. 2008; Rostila et al. 2018; Sanders 1980; Song et al. 2010; Stroebe and Schut 2005; Stroebe et al. 2007), including in contexts where child mortality is pervasive (Dettwyler 2013; Einarsdóttir 2005, 2021). By clarifying the extent to which having a bereaved mother is a risk factor for women's own likelihood of bereavement, the results offer new insights into the intergenerational transmission of health disadvantage in the Global South. Further, the study clarifies whether the intergenerational transmission of maternal bereavement changes across the demographic transition. By studying three birth cohorts of women, the results clarify the potential for demographic transition to disrupt, consolidate, or leave unbothered the replication of population health inequalities.



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Intergenerational Clustering of Maternal Bereavement

Beginning with socioeconomic characteristics, because economic disadvantage is tied to otherwise preventable deaths (Pamuk et al. 2011), a woman's risk of experiencing child loss may mirror that of her mother simply as a result of their similar

positioning in the socioeconomic strata during their reproductive years. Social scientists have long acknowledged that socioeconomic characteristics, such as educational attainment, income, and occupation, are highly influenced by those of one's parents (Carvalho 2012; Mare 2011). Although this literature has focused almost exclusively on high-income populations, even in contexts of dramatic social and economic change, adults' family backgrounds are highly indicative of women's position in the social strata (Carvalho 2012). Thus, given the strong linkages between socioeconomic resources and under-five mortality, this implies that socioeconomic transmission may be a fundamental pathway by which maternal bereavement replicates.

As further depicted in Figure 1, the intergenerational clustering of child death could also be borne out of the replication of life course patterns, reproductive behaviors specifically, across generations of women in the same families. A woman's reproductive outcomes—such as age at first birth, marital context at the time of that birth, relationship stability, spacing of children, and total number of children—correlate highly with those of her mother (Anderton et al. 1987; Axinn and Thornton 1992; Bates et al. 2007; Booth and Kee 2009; Glick et al. 2015; Kahn and Anderson 1992; Kumar et al. 2016; Vidal et al. 2020; Wolfinger 2011). Given that each of these circumstances affects a child's likelihood of survival (DaVanzo et al. 2007, 2008; Pebley and Stupp 1987; Rutstein 2005), the replication of reproductive behaviors is another pathway by which a woman's experience as a parent, including the loss of a child, may come to mirror that of her mother.

Aside from the described passive processes, as shown in Figure 1, a mother's bereavement could more directly affect her adult daughter's reproductive outcomes. A mother's experience of bereavement not only demarcates a family's disadvantage linked to other processes of inequality but also reflects a vital conjuncture—a pivotal life course event that can subsequently influence the well-being of a mother and her children going forward. Exposure to stress-inducing events can manifest in adversities that have intergenerational impacts; hence, a child's premature death could come with long-term consequences for those—and the decedents of those—who experience it. In this way, having a bereaved mother could directly shape a woman's life course trajectory and ultimately elevate her own risk of bereavement when she becomes a mother.

As described, a child's death is a major source of stress, trauma, and grief that has long-lasting implications for parents' health and well-being (Stroebe and Schut 2005; Stroebe et al. 2007). Correspondingly, a child's death is a risk factor for parents' subsequent relationship stability (Weitzman and Smith-Greenaway 2020). These risks have downstream consequences for their surviving children's health and development, status attainment, and social mobility later in life, and thus ultimately their reproductive outcomes (Goldberg 2013a, 2013b; Grant and Pike 2019). Indeed, research has shown that a sibling's death is a powerful correlate of women's fertility preferences and behaviors, as well as health-related behaviors (Broussard and Weitzman 2020; Finnegan 2020; Smith-Greenaway and Lin 2023). Together, this implies that mothers' bereavement could more directly impact their adult daughters' likelihood of bereavement.

Overall, the extant social science literature implies that women whose mothers were bereaved may be more likely to eventually experience the death of their own child. Therefore, the bereavement status of women's mothers may be fundamental to understanding how maternal bereavement is demographically patterned in low- and middle-income countries.

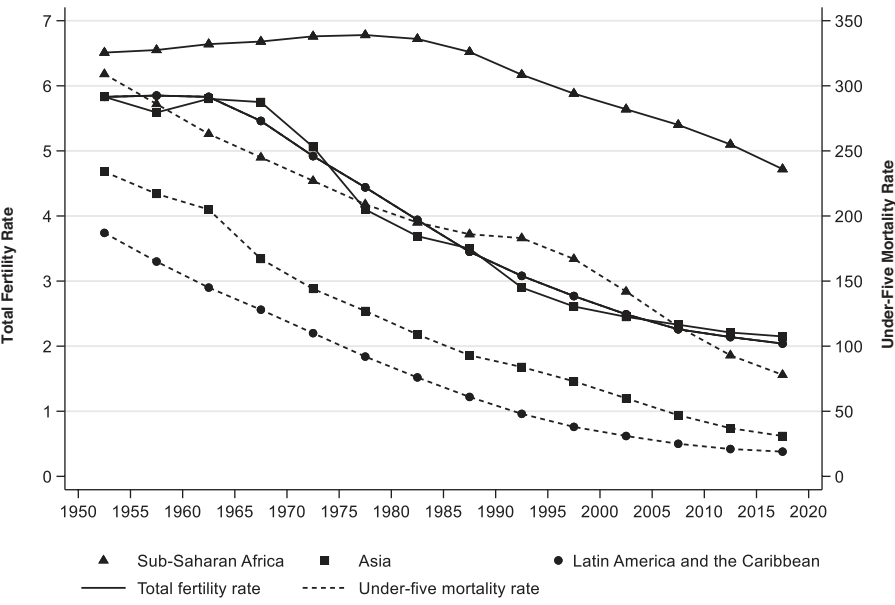


Fig. 2 Mortality and fertility decline in Asia, sub-Saharan Africa, and Latin America and the Caribbean, 1950–2020. *Source:* United Nations Population Division Data from 2021.

Demographic and Social Change: Disruptive of Intergenerational Clustering of Maternal Bereavement?

The numerous mechanisms that could undergird the intergenerational clustering of bereavement experiences between mothers and their adult daughters do not occur in isolation but are tied to the broader mortality and fertility landscape. Therefore, demographic forces could alter the extent of intergenerational replication of maternal bereavement across distinct birth cohorts. In particular, the degree of intergenerational clustering of child loss could change as a country undergoes the transition from high mortality and fertility to low levels of both. Dramatic demographic and social change in low- and middle-income countries could protect women from experiencing the same reproductive adversities that their mothers experienced decades earlier. Mothers’ bereavement histories—histories that unfolded years prior and under what were often radically different social, economic, and health contexts—may simply be of little predictive value to the experiences of their surviving daughters. That is, secular declines in mortality and fertility could produce a generational chasm that renders a mother’s reproductive experience less predictive of her daughter’s reproductive fate.

Mortality decline may especially weaken the intergenerational clustering in child death, diminishing the predictive power of a woman’s mother’s reproductive history for their own risk of child death, resulting in a corresponding rise in the share of women never bereaved—regardless of their mothers’ bereavement. As illustrated in Figure 2, Asia, Latin America and the Caribbean (hereafter referred to as Latin America), and sub-Saharan Africa (hereafter referred to as Africa) have experienced sharp reductions in under-five mortality rates since the 1950s: rates in 2015 were

between one fourth (Africa) and one seventh (Latin America) as high as in 1950. These mortality declines are, in large part, due to expanding infrastructural and service provisions (Headey and Palloni 2019; Joshi and Schultz 2013). Given evidence that mortality decline reduces inequality in the risk of under-five death (Sastry 2004), this diffuse social change could dramatically dampen the salience of women's family history for their own children's survival.

Figure 2 also depicts the sizable fertility declines that have accompanied under-five mortality declines: the total fertility rate has fallen by nearly two children in Africa and by approximately four children in Asia and Latin America. Some theoretical models emphasize that fertility decline weakens intergenerational correlations, effectively equalizing differences between families through the homogenization of family life toward smaller, more comparably resourced families (Beaujouan and Solaz 2019; Lachaud et al. 2017). The decline in fertility thus further suggests the weakening of the intergenerational clustering of child loss among more recent birth cohorts.

Alternatively, demographic and social change could leave unbothered, or even exacerbate, inequality, thus facilitating persistent or growing intergenerational correlations in bereavement. Countering the notion that demographic change can act as a schism between generations—disrupting the long-standing reproduction of the social order—other research has emphasized the potential for demographic change to *accentuate* patterns of inequality (Thornton et al. 1984), thereby consolidating health disadvantage across multiple generations in a family. Because better resourced families are among the first to enjoy lower mortality and to pursue lower fertility (Murphy 1999; Rotering 2017), mortality and fertility decline could work to concentrate disadvantage in particular families. Thus, consistent with the fact that many low- and middle-income countries are some of the world's most unequal societies (Firebaugh 2009), it is possible that any intergenerational association in maternal bereavement becomes more pronounced among more recent birth cohorts of women.

Analytic Approach

Data and Sample

We make use of data from the Demographic and Health Survey (DHS) Program, a long-running, international survey program that has collected mortality data on women aged 15–49 in dozens of low- and middle-income countries. Critical to the current study, the DHS Program collects detailed birth histories from respondents, including information about their deceased children. The DHS Program also includes a sibling history module in many countries, which collects information from respondents about their deceased (and surviving) siblings. The module is intended to track adult mortality conditions in countries that lack civil registration and vital statistics data (Feehan and Borges 2021; Masquelier 2013; Obermeyer et al. 2010); however, in doing so, the module offers a portrait of respondents' mothers' bereavement from the death of one or more of their young children. Together, the DHS sibling and birth history data allow us to investigate any linkages between women's own, and their mothers', experiences of child loss.

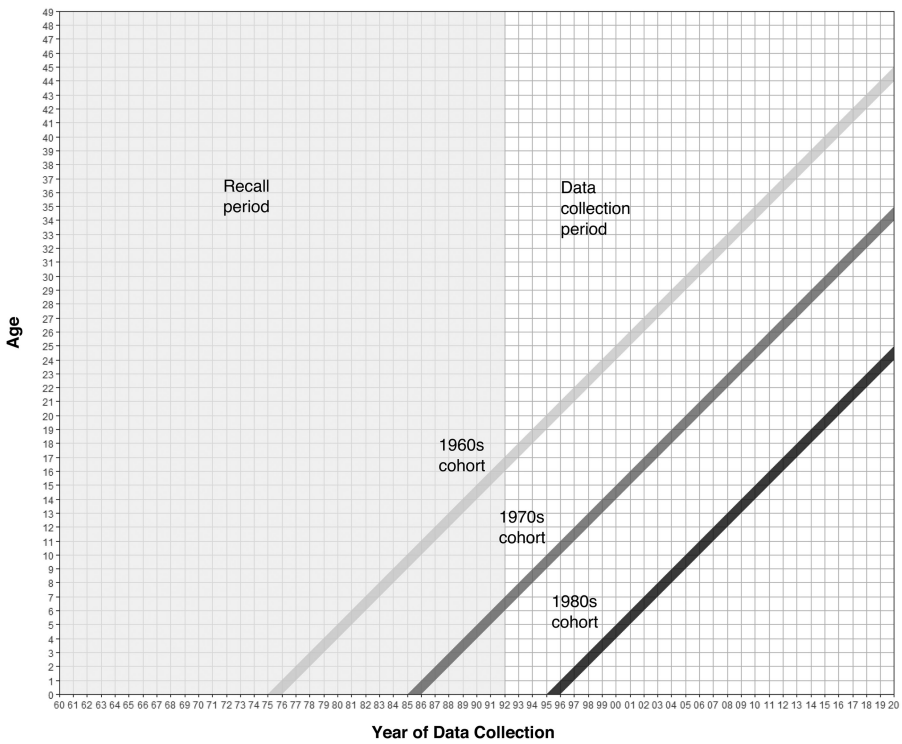


Fig. 3 Duration of data collected on focal DHS Program respondents born in the 1960s, 1970s, and 1980s birth cohorts. The “data collection period” indicates the years for which data were collected among women born in each cohort, and the “recall period” depicts the years/ages for which women retrospectively reported on their lifetime experiences of under-five sibling and offspring deaths. Note that some of the focal women’s mothers were bereaved by the death of a child prior to the focal woman’s own birth and are still included in the analyses (although not depicted here). Sensitivity analyses demonstrate that excluding any bereavement events that happened prior to the focal woman’s birth, and only including those that occurred during their own lifetime, does not meaningfully change the key findings.

An important feature of these data is that they are standardized across all countries and rounds of data collection within each country and thus facilitate a multicountry, multicohort study design. In total, we make use of data from 50 countries in six geopolitical world regions (see Figure S1 in the online supplement). Within these focal countries, we analyze data from 144 surveys, collected between 1992 and 2020, allowing us to track the level and distribution of child loss and how each has (or has not) changed over time.¹ Specifically, we create synthetic cohorts using the repeated, cross-sectional data, categorizing respondents into one of three birth cohorts: 1960s, 1970s, and 1980s.² Figure 3 depicts the time over which the DHS Program interviewed respondents and

¹ We include data from Kenya (2014) and the Dominican Republic (2002); however, the DHS collected sibling death data from only a subset of these respondents (47% and 49% of respondents, respectively), and so we restricted the sample accordingly.

² In the Philippines, Brazil, and the Central African Republic, we focus on women born in the 1960s and 1970s because fewer than 50 respondents were born in the 1980s.

through which these respondents reported on their mothers' bereavement, as well as their own; the figure also illustrates how interview timing relates to respondents' birth cohort. The 1960s cohort completed interviews between 1992 and 2010 (at ages 32–49); the 1970s cohort completed interviews between 1992 and 2020 (at ages 22–49); and the 1980s cohort completed interviews between 1995 and 2020 (at ages 15–40).

To assess the intergenerational clustering of maternal bereavement, we restrict our sample to respondents who have had at least one live birth prior to the time of the survey, and thus were exposed to the risk of losing a child. We further exclude those whose first birth occurred less than one year prior to survey, given the considerable censoring among these cases. Moreover, we include only respondents with at least one sibling and thus were exposed to the risk of having a bereaved mother. In total, we exclude 27% of respondents who had never given birth a year or more before the survey and thus were not at risk of having experienced child death, and exclude less than 3% of women who had no sibling and thus were not at risk of having a bereaved mother.³ Across all countries, 2.5% of eligible respondents are missing data on key covariates included in our multivariable models of the intergenerational clustering of maternal bereavement. Given the small amount of missing data, we use listwise deletion to handle these cases. Our final analytic sample features 1,051,675 women in 50 countries who, together, contribute 11,074,917 person-years of data to our hazard models. Table S1 (in the online supplement) provides a full list of countries, the surveys analyzed, and corresponding sample sizes.

Key Measures

Our key dependent variable is whether the respondent is maternally bereaved—having personally experienced the death of a child before the child reached the age of five (the age by which most childhood deaths occur).⁴ To generate this outcome variable, we make use of information derived from a detailed birth history, including information on the respondent's year of first birth, each offspring's birth year, vital status, and, for deceased children, year of death.

In addition to tabulating the prevalence of the focal respondents ever bereaved by the death of an under-five child, we also model this outcome in a hazard framework. Although we focus on the loss of young children, specifically, many respondents have not completed childbearing or have children under age five and thus are censored. As a result, in all multivariable analyses of the intergenerational clustering of bereavement we account for this censoring. Specifically, we model women's experience of under-five child loss as a time-varying outcome in a hazard framework, with the hazard beginning at the year of a respondent's first birth, with person-years as the unit of analysis. Each person-year that a respondent contributes is coded as 0 if she has a

³ Multivariable model results predicting bereavement are stable to the inclusion of women who are single children (and the coding of them as having nonbereaved mothers).

⁴ Note that in supplementary analyses we relaxed the indicator to model any sibling/offspring death, not only those that occurred before age five. The findings were largely identical, indicating that under-five deaths, which represent most deaths in our data, are driving them.

child but has not yet experienced an under-five-year-old child death and as 1 in the year she first experienced an under-five child death. Even though some women in our data experienced more than one of their children dying, we estimate single-event hazard models, meaning that a respondent no longer contributes observations after she experiences her first under-five child death. For example, a 35-year-old woman who became a mother at age 20 and experienced a child's death at age 30 contributes 11 person-years before exiting ($=1$). Some respondents are never bereaved, having had all their children survive to the time of the survey; these women exit the hazard at their age at the time of the survey. For example, a 35-year-old woman who became a mother at age 20 and never experienced child loss is right-censored and contributes 16 person-years before exiting ($=0$).

Our key independent variable is whether the respondent has a bereaved mother—that is, a mother who experienced the death of a child (before age five). To determine this, we draw on the DHS sibling module, which collects information from respondents about each sibling's birth year, vital status, and, for deceased siblings, year of death. With this information, we generate a binary indicator for whether the respondent's mother was ever bereaved by the death of an under-five-year-old child ($=1$). To ensure that a respondent's mother's bereavement preceded her own child loss, we consider a respondent's mother as bereaved ($=1$) only if the death occurred prior to the year the focal respondent had her first birth and thus happened before the time at which the respondent became at risk of losing a child herself. A mere 4% of respondents' mothers lost an under-five-year-old child after the respondents themselves became mothers. Respondents' sibling histories are remarkably complete: of all respondents who report a sibling death, less than 1% featured incomplete information (i.e., time of death). We excluded these cases.

Data Limitations: Measurement Error and Sample Selection

Before describing our analytical methods, it is important to note limitations of our data. The first major limitation is the retrospective nature of the birth and sibling history data, which makes them prone to error. This limitation is shared by the vast literature that has used these data to study child mortality and to estimate adult mortality; nonetheless, it is essential to keep this in mind when interpreting results. In terms of respondents' experience of child loss, there has long been concern that women underreport deceased children when providing their birth histories (Helleringer et al. 2020). Similarly, women may not disclose all deceased siblings and may forget, misremember, or simply be unaware of the details of a sibling's death. The potential for underreporting suggests that our estimates of both respondents' own experiences of child loss and their mothers' experiences are conservative.

If the same respondents underreport their mothers' bereavement and their own bereavement, this would not, however, affect descriptive or multivariable estimates of the intergenerational clustering of bereavement. Yet, distinct propensities to underreport a death when reporting one's own birth history versus that of one's mother could affect estimates of intergenerational clustering. Specifically, if respondents systematically underreport their mothers' bereavement but not their own—or vice versa—this would lead to more conservative estimates of the true association

between respondents' and their mothers' experiences, as there would appear to be more "mortality mobility" in the data than truly exists. This is conceivable given that the sources of underreporting may be distinct. That is, women are unlikely to misremember or forget having lost a child; thus, any underreporting is likely driven by the desire to not disclose the experience. Conversely, women may underreport their mothers' bereavement because they are simply unaware of it or have forgotten about deaths that they once knew of. Hence, we anticipate that the underreporting is likely to either minimally affect estimates of the intergenerational clustering of bereavement or to result in more conservative results given the potentially distinct sources of underreporting.

The second limitation relates to our use of cross-sectional, retrospective data and our corresponding inability to account for survivor bias. Demographers have long acknowledged the presence of "death clustering" in low-income populations, such that multiple child deaths tend to cluster within a select subset of disadvantaged women (Das Gupta 1990; Sastry 1997). Because of this, the adult daughters of bereaved mothers may be systematically underrepresented in our data given that they too are more likely to have died in childhood. As a result, this would lead to underestimates of the true prevalence of bereaved mothers. Moreover, to the extent that the respondents with bereaved mothers who do survive are positively selected on traits that protect them from reliving their mothers' bereavement, they may be less likely to experience a child death than a sister who did not survive to adulthood, which would further weaken the observed intergenerational linkages in bereavement simply owing to selective survival. This may especially be the case for women in the 1960s and 1970s cohorts, who were born into the harshest mortality conditions and thus may be particularly selected for having survived to reproductive age. In the Discussion section, we return to these limitations.

Methods

We begin by describing the prevalence of respondents who are bereaved, as well as the prevalence who have bereaved mothers, in 50 countries across six world regions, and document how the prevalence of each has (or has not) changed across the three focal birth cohorts. Next, we tabulate the percentage of respondents in the 1960s, 1970s, and 1980s birth cohorts according to their own and their mothers' bereavement. Specifically, we determine the percentage of respondents whose experience mirrors that of their mother—that is, respondents never bereaved (=0) with a never-bereaved mother (=0) and bereaved respondents (=1) with a bereaved mother (=1). We also tabulate the percentage of respondents who have experienced mortality mobility—specifically, those who are bereaved (=1) despite having a never-bereaved mother (=0) and those never bereaved (=0) with a bereaved mother (=1).

Although these tabulations offer a descriptive overview of the extent of mortality mobility versus intergenerational replication in maternal bereavement experiences across the three focal birth cohorts, they do not explicitly examine women's differential risk of bereavement as a function of having a bereaved mother. Thus, we next graph Kaplan–Meier curves to illustrate any disproportionate risk of child loss among women with bereaved mothers (versus those with never-bereaved mothers).

Specifically, we chart respondents' experience of bereavement over their reproductive years as a function of their mothers' history of bereavement and their birth cohort, offering further insights into the intergenerational patterning of these experiences and whether it has changed across cohorts.

Extending the bivariate analyses, we next estimate a series of multilevel discrete-time hazard models analyzing whether having a bereaved mother is associated with respondents' higher odds of child loss. To confirm that patterns are comparable across diverse country contexts, we estimate all models separately by country. In these models, person-years are the unit of analysis, and the hazard of child loss begins at the respondent's time of first birth. This modeling strategy addresses the right-censoring of our dependent variable (child loss) and the hierarchical structure of our data, in which multiple respondents live in the same subnational region. To account for shared, intra-regional conditions, we estimate random-effects logit models for each of the 50 countries, where subnational region is the level-2 unit of analysis.⁵ Model 1 estimates the association between having a bereaved mother and women's odds of child loss. Model 2 includes all controls, including birth cohort. In terms of women's family background, we include women's total number of siblings (at the time of their first birth) and their birth order. We also control for women's own age at the time of their first birth, a time-varying indicator for the number of children they have given birth to as of each year, and their marital status at the time of the interview (never married, currently married, or currently widowed/divorced). To account for socioeconomic disparities, we control for whether women reside in a home with electricity or live in an urban community.⁶ Finally, we estimate a third set of models that include an interaction term between respondents' mothers' bereavement history and their birth cohort to assess whether the implications of mothers' bereavement history are distinct. We use the *margins* postestimation command to calculate the cumulative differences in the predicted conditional probability of child loss by respondents' mothers' bereavement history, separately by birth cohort, and examine if the differences in the probability of child loss by mothers' bereavement status are significantly different for each birth cohort.

Before turning to our results, note that in ancillary analyses we examine whether having a bereaved mother relates to respondents' sociodemographic characteristics in adulthood, thus highlighting the entwinement of women's family history and their social positioning in adulthood. Table S3 (online supplement) shows that respondents' age at first birth, number of children, and current marital status do not vary by their mothers' history of bereavement. Respondents with bereaved mothers do, however,

⁵ In 29 countries, the regional boundaries contracted or expanded between DHS surveys (i.e., larger regions splitting into smaller regions or two regions combining to generate a larger aggregate). In these cases, we maintained the widest aggregate boundaries to synchronize them across time. Note that in supplementary models, we tested for the appropriateness of including a random slope for having a bereaved mother to acknowledge that the coefficient varies systematically across subnational regions within each country. These analyses (available upon request) found evidence of a significant random slope in five countries (Afghanistan, Cambodia, Indonesia, Ethiopia, and Sierra Leone). We appropriately include a random slope in these countries (see Figure 7).

⁶ Notably, the socioeconomic covariates are measured at the time of the survey—offering an ahistorical portrait of women's (and their mothers') socioeconomic background. Even so, they likely approximate women's socioeconomic resources prior to the focal bereavement event, hence our inclusion of them in the multivariable models.

tend to have larger natal families and lower levels of education and are less likely to have electricity in their homes or live in urban areas relative to respondents with never-bereaved mothers. Together, these patterns indicate that having a bereaved mother correlates with other disadvantages in adulthood, making it essential to account for these differences when studying intergenerational linkages in bereavement.

Results

Maternal Bereavement in Low- and Middle-Income Countries

Figure 4 depicts the high percentages of respondents in each country who have been bereaved by a child's death (left panel), as well as women with bereaved mothers (right panel), by country, world region, and respondents' birth cohort. Beginning with the left panel, in several African countries, more than half of women of reproductive age born in the 1960s have lost a child. In other world regions, the prevalence is closer to one third or one fourth of women. In most countries, the prevalence of maternally bereaved women declined precipitously among recent birth cohorts: the percentage of bereaved women born in the 1980s is a mere fraction relative to those bereaved in the 1960s birth cohort—emphasizing that more recent fertility and mortality reductions have combined to significantly reduce the prevalence of child loss. Even so, in a few Latin American and Asian countries, upward of 10–15% of women born in the 1980s cohort have experienced child loss, and as many as 20–30% of women in this same cohort are maternally bereaved in several African countries.

Turning to the right panel of Figure 4, the prevalence of women with bereaved mothers is also high, especially in Latin American (31%), Central African (33%), East African (33%), and West African (30%) countries. By comparison, fewer women have bereaved mothers in South and Southeast Asian (22%) and Southern African (23%) countries. Beyond these regional patterns, there are dramatic between-country differences in respondents' reports of their mothers' bereavement, with country-level prevalence estimates varying from 11% (South Africa) to 44% (Burundi) (see Table S2 in the online supplement for estimates by country). Generally modest reductions are seen in respondents' mothers' bereavement across the three birth cohorts. Only in Latin America, Southern Africa, and West Africa did the prevalence of women with bereaved mothers decline meaningfully between the 1960s and 1980s cohorts.

Intergenerational Clustering of Maternal Bereavement

The high percentage of respondents who have experienced child loss or who have bereaved mothers begs the question of the extent to which these experiences are linked: What percentage of women represented in both panels of Figure 4 have lost a child *and* have a mother who experienced child loss? Further, has the extent of intergenerational replication changed across cohorts?

Figure 5 illustrates the cross-tabulation of respondents' and their mothers' bereavement experiences, by country, region, and cohort. Plots a and d depict the percentage of women who have experienced intergenerational replication: in plot a, both mothers

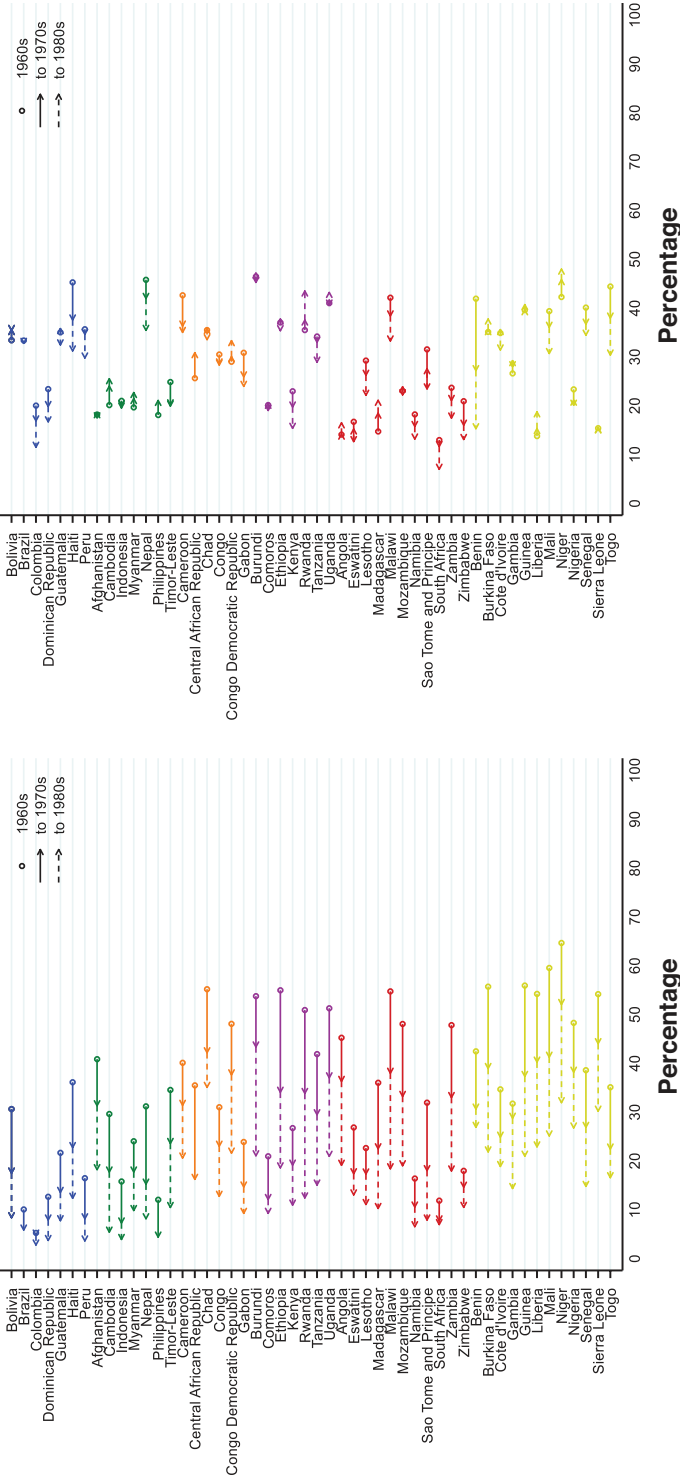


Fig. 4 Percentage of women maternally bereaved (left panel) and percentage of women with a bereaved mother (right panel), by country and cohort. Estimates are based on Demographic and Health Surveys Program data. Colors correspond to world regions: blue = Latin America and the Caribbean; green = West Africa; purple = Southern Africa; red = East Africa; yellow = West Africa.

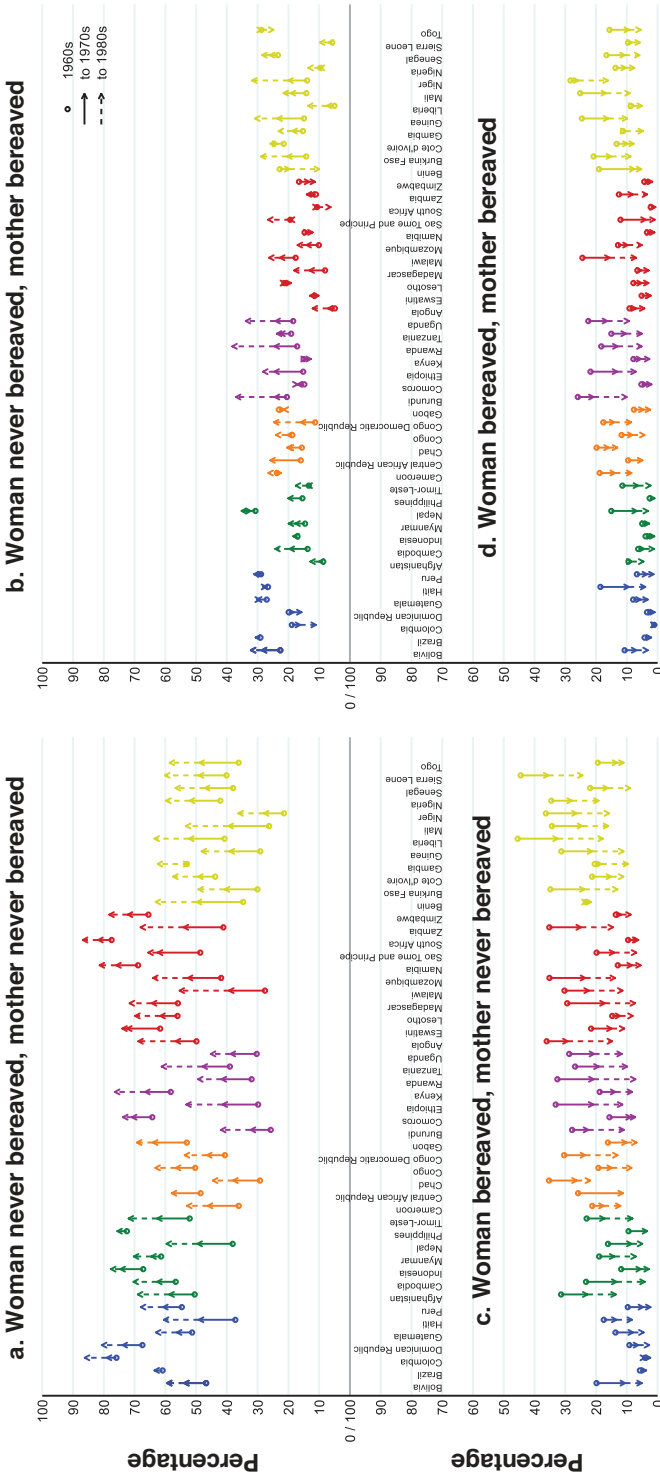


Fig. 5 Distribution of women by their personal experience of bereavement and their mothers' history of maternal bereavement. Estimates are based on Demographic and Health Surveys Program data. Plot a: neither mother nor adult daughter bereaved; plot b: mother bereaved but adult daughter not bereaved; plot c: mother not bereaved but adult daughter bereaved; and plot d: both mother and adult daughter bereaved. Colors correspond to world regions: blue = Latin America and the Caribbean; green = South and Southeast Asia; orange = Central Africa; purple = East Africa; red = Southern Africa; yellow = West Africa.

and daughters are not bereaved, and in plot d, both mothers and daughters are bereaved. Plots b and c depict experiences of mortality mobility. Beginning with plot a, in the 1960s cohort, in most countries, never-bereaved respondents with never-bereaved mothers are a consistently large minority, representing anywhere from 30% to 40% of women. In the 1980s cohort, however, never-bereaved women of never-bereaved mothers are the majority in all countries, aside from a handful of African ones (i.e., Chad, Burundi, Rwanda, Uganda, Burkina Faso, Liberia, and Niger).

Plot d depicts the alternate case of intergenerational replication: bereaved respondents with bereaved mothers. Across all countries, the percentage of bereaved women is declining across each consecutive birth cohort. Even so, in several African countries, upward of 10–15% of respondents born in the 1980s are bereaved and have a bereaved mother. Moreover, considering plots a and d of [Figure 5](#) jointly demonstrates that across the three birth cohorts, most women's bereavement experience increasingly replicates that of their mother, largely because of the rise in never-bereaved women with never-bereaved mothers (as shown in plot a). In only four countries—Burundi, Niger, Rwanda, and Uganda—has the percentage of women replicating their mothers' bereavement outcomes remained consistent across the three birth cohorts.

Plots b and c depict the share of women who have experienced mortality mobility, including upward mobility (i.e., a respondent is never bereaved despite having a bereaved mother) and downward mobility (i.e., a respondent is bereaved despite having a never-bereaved mother). Overall, the results show that the percentage of women experiencing mortality mobility has decreased across cohorts, as an increasingly larger share of respondents replicate their mothers' experience. The mobility that does happen, however, is increasingly upward, meaning that a growing percentage of respondents are never bereaved despite having a bereaved mother. Cases of downward mortality mobility are more prevalent in the 1960s cohort.

Overall, [Figure 5](#) confirms that in most countries, a rising share of women replicate their mother's maternal bereavement history. Even so, a notable percentage of women experience (upward) intergenerational mortality mobility.

Mothers' Bereavement as a Risk Factor for Women's Bereavement

The descriptive portrait of the intergenerational patterning of maternal bereavement raises questions of the extent to which having a bereaved mother is a unique risk factor for a respondent's own odds of bereavement. Thus, shifting from assessing the overall distribution of respondents' and their mothers' bereavement experiences in a descriptive framework, we next examine possible disparities in respondents' cumulative probability of child loss as a function of their mothers' bereavement.

[Figure 6](#) plots Kaplan–Meier curves of respondents' probability of experiencing child loss over their reproductive years by region, disaggregating respondents by birth cohort and their mothers' history of bereavement. [Figure 6](#) illustrates that having a bereaved mother comes with an outsized risk of child loss—a finding that is replicated in all world regions. This implies a strong intergenerational linkage in these experiences, although in some cases the gap in the probability of experiencing child loss between women with and without bereaved mothers appears smaller among more recent birth cohorts. Disparities in the probability of child loss by mothers'

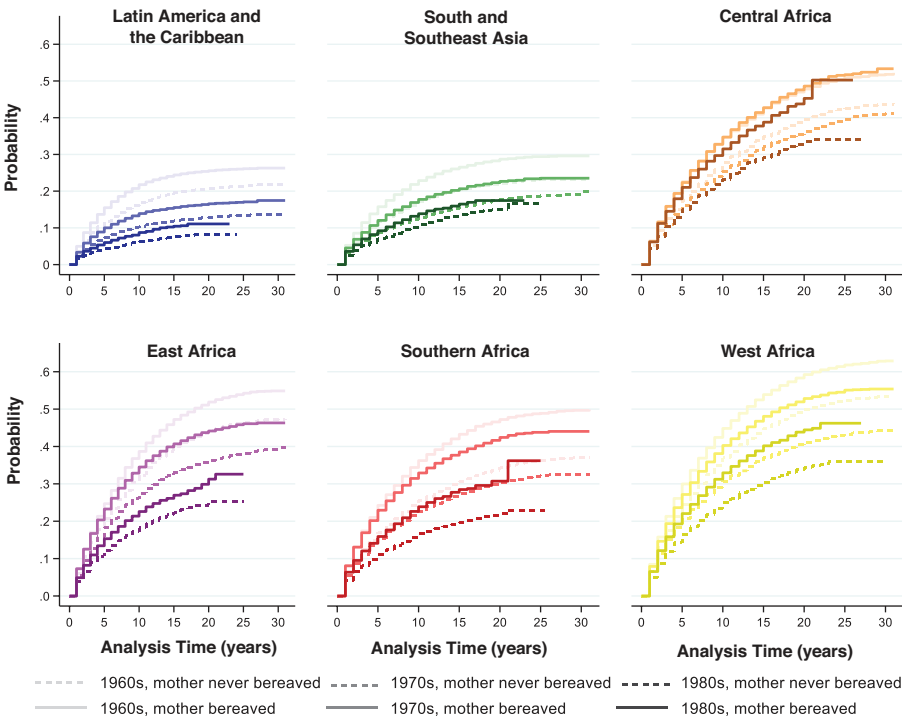


Fig. 6 Women’s cumulative probability of bereavement, by world region and their mothers’ bereavement history. Estimates are based on Demographic and Health Surveys Program data.

history of bereavement, however, remain especially dramatic in the four African regions. In Central Africa, for example, the disparities in the probability of child loss are such that women with bereaved mothers have higher probabilities of child loss than women in earlier birth cohorts: women born in the 1980s with a bereaved mother have comparable—or even higher—probabilities of child loss relative to those without bereaved mothers in earlier cohorts. Only in Latin America and East Africa are cohort advantages consistent for respondents with bereaved mothers.

Given this patterning, we next assess if having a bereaved mother is predictive of women’s odds of bereavement in a multivariable hazard framework.⁷ We begin with the bivariate association. As shown in Model 1 of Table S4 (see online supplement), in 45 of 50 countries, there is a statistically significant association between mothers’ experience of bereavement and respondents’ odds of child loss. In Model 2, this association persists net of the inclusion of controls in 42 of the 50 countries. **Figure 7** graphs the odds ratios from the multilevel hazard models for each of the 50 countries (as shown in Model 2 of Table S4), organized by world region. As depicted, having a bereaved mother is associated with respondents’ significantly higher odds of child loss in all but eight countries (i.e., Colombia, Guatemala, Myanmar, Nepal, the Philippines, Central African Republic, Eswatini, and São Tomé and Príncipe)—even after accounting for covariates.

⁷ Note that Table S4 provides country-specific results for the bivariate association, not including sociodemographic controls.

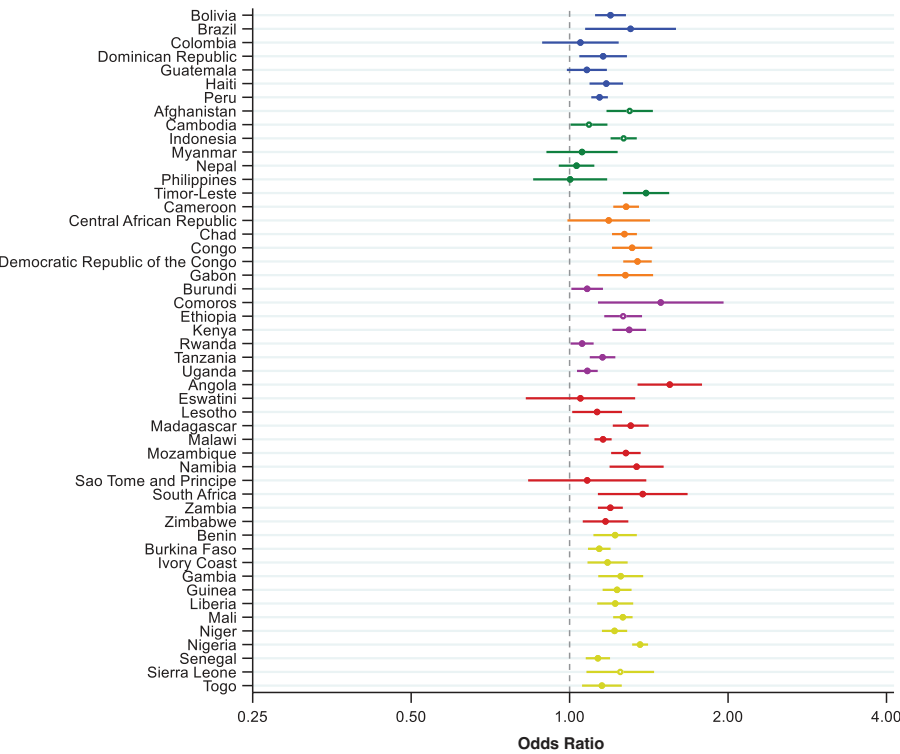


Fig. 7 Discrete time hazard model results of women's odds of bereavement as a function of their mothers' history of bereavement. Estimates are based on Demographic and Health Surveys Program data. Hollow circles denote that the association between mothers' bereavement and women's odds of child loss was modeled with a random slope to acknowledge systematic variation in the association across subnational regions. Colors correspond to world regions: blue = Latin America and the Caribbean; green = South and Southeast Asia; orange = Central Africa; purple = East Africa; red = Southern Africa; yellow = West Africa.

Is the risk associated with having a bereaved mother distinct in magnitude for women born in the 1960s, 1970s, and 1980s cohorts? To answer this question, Model 3 includes an interaction term between mothers' bereavement history and respondents' birth cohort (see Table S4). From these models, we calculate the cumulative differences in the predicted conditional probability of child loss by respondents' mothers' bereavement history, separately by birth cohort (see Table S5 in the online supplement), and report whether the differences in the probabilities of child loss by mothers' bereavement status are significantly different ($p < .05$) for each birth cohort. Figure 8 depicts the results from these analyses. A flat slope indicates that the influence of having a bereaved mother on the predicted probability of child loss is comparable in size across the three birth cohorts. A positive slope indicates that the influence of having a bereaved mother is statistically larger among more recent birth cohorts, whereas a negative slope indicates that it is smaller for more recent birth cohorts. To enhance the readability of the figure, we color country lines only where the differences in the probability of child loss by mothers' bereavement status is significantly different across the birth cohorts (see Table S5 for point estimates for all countries).

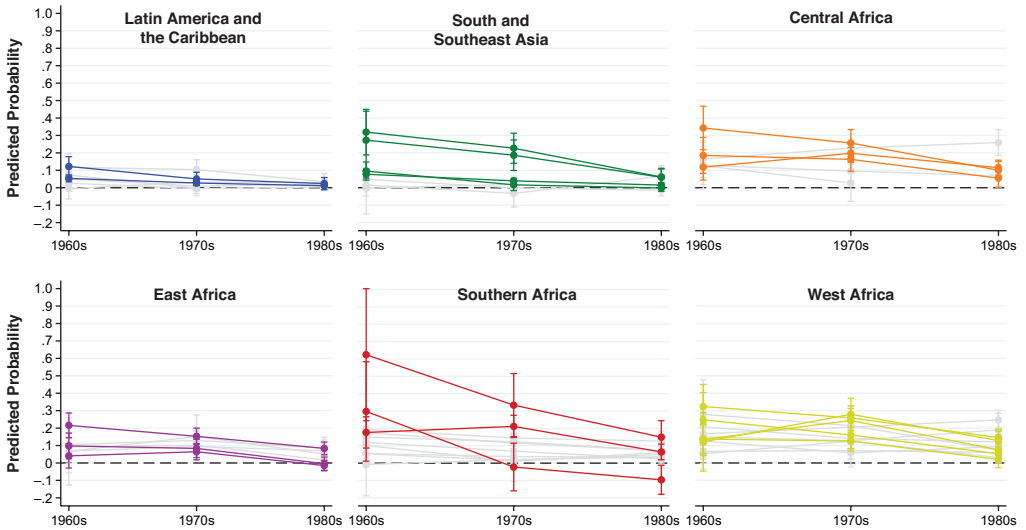


Fig. 8 Differences in the cumulative predicted probability of child loss among respondents with bereaved versus never-bereaved mothers, by country and cohort. Estimates are based on Demographic and Health Surveys Program data. Colored countries are those with significant differences in the probability of offspring death by mothers' bereavement. A negative slope indicates that the difference in the cumulative probability of child loss associated with having a bereaved mother (vs. a never-bereaved mother) is becoming smaller for recent cohorts; a positive slope indicates that the difference is becoming larger for recent cohorts.

Figure 8 shows that in more than half the countries—23 out of the 42 countries where there is a significant association between a woman's probability of child loss and her mother's bereavement history—the size of the association is statistically similar across cohorts. In the remaining countries, however, the size of the association is contracting across more recent birth cohorts, as evident by the negative slopes. That is, in anywhere from two to five countries in each of the six world regions, the respondents' probability of child loss predicted by their mothers' bereavement history has decreased significantly in size for those born in later birth cohorts. In most Latin American and Caribbean countries, the disparity in the probability of child loss between women with and without bereaved mothers is comparable across cohorts. In multiple Asian countries, the influence of a mothers' bereavement is significantly smaller for women born in the 1970s versus the 1960s. In the four regions of Africa, however, the inequality in respondents' probability of child loss by their mothers' bereavement status becomes significantly smaller only for those born in the 1980s relative to the 1970s.

Supplementary Analyses

As outlined in our conceptual framework, the strong intergenerational linkages in maternal bereavement could result from a host of socioeconomic and behavioral pathways that are passively transmitted intergenerationally or could stem from more

direct processes related to the actual experience of having a bereaved mother and deceased sibling. Although we lack data to empirically identify the precise mechanisms underlying the intergenerational clustering that we document, in a series of supplementary analyses, we further explore whether the specific circumstances of mothers' bereavement alter the implications for daughters' risk of child loss, thereby offering further insights into the nature of the associations shown here.

If women's own reaction to their sibling's death is what results in the intergenerational clustering of maternal bereavement, rather than the association being indicative of the passive transmission of a host of socioeconomic, health, and reproductive outcomes, there may be variation in the association between mothers' and daughters' bereavement based on the circumstances of the death. Thus, we first examine potential distinctions in the intergenerational association depending on whether the mothers' bereavement/focal respondents' sibling death occurred before or after the focal respondent was born. Forty-seven percent of respondents with bereaved mothers were alive at the time of a sibling's death. If the risk associated with having a bereaved mother is driven by the impact of having experienced a sibling's death firsthand, it follows that the intergenerational association may be larger if the mother's bereavement occurred during the respondent's own lifetime. However, the results in Table S6 (online supplement) offer little indication that having been alive at the time of a sibling's death versus being born to an already bereaved mother moderates the association with respondents' odds of maternal bereavement.

A related question is whether, among the subsample of respondents who experienced their mothers' bereavement during their lifetime, the proximity of a sibling's death to their own childbearing is relevant to their eventual risk of child loss. Again, however, we find little evidence that the timing of mothers' bereavement is salient to respondents' likelihood of bereavement. In only four countries is the number of years since a mother's (most recent) bereavement associated with women's higher odds of child loss. Conversely, in a single African country, Zambia, we find that the number of years since a mother's (most recent) bereavement corresponds with women's lower odds of child loss. Together, these findings attest to a general stability of the intergenerational correlations in maternal bereavement to various circumstances.

Discussion

Population researchers increasingly recognize bereavement as a demographically salient experience that leaves an indelible mark on the parents who experience it. Building on this literature, this study offers new insights into inequality in maternal bereavement experiences among women in low- and middle-income countries.

Overall, the study demonstrates the incredibly high burden of maternal bereavement across recent cohorts of women of reproductive age and their mothers. Although there are notable between-country differences and general declines in the prevalence of bereavement across cohorts, even among respondents born in the 1980s, in many countries anywhere from 10% to 30% of women of reproductive age have experienced a child's death. Further, who is burdened by child loss is patterned intergenerationally: women's experiences of maternal bereavement tend to replicate those of their mothers. Although we find evidence of intergenerational "mortality mobility,"

the share of women experiencing this is generally declining across more recent birth cohorts and in most regions of the world, owing entirely to reductions in the percentage of women experiencing downward mortality mobility, in which women experience bereavement despite their mothers having not. These decreases in downward mobility fully offset any increases in upward mortality mobility—cases in which women evade child loss despite their mothers' history of it.

The frequency of intergenerational clustering of maternal bereavement is further confirmed in a multivariable framework: having a bereaved mother comes with an outsized risk of women experiencing child loss, emphasizing further the inequality by which women experience bereavement. That is, having a bereaved mother is associated with women's higher odds of child loss in most countries—net of other covariates. Taken together, these results suggest that child loss continues to be concentrated in certain lineages and passed down through generations across the Global South, as has also been observed in select historical European populations (van Dijk and Mandemakers 2018).

The study results are instructive to understanding the intersection of demographic change and social stratification in low- and middle-income countries. We find that in many countries, demographic change is not always disruptive to the intergenerational transmission of reproductive inequalities but instead can leave them unbothered. That is, in about half of countries, the size of the risk of child loss associated with having a bereaved mother is comparable among women born in the 1960s, 1970s, and 1980s birth cohorts. In nearly half of countries, however, the results demonstrate that the influence of mothers' bereavement on women's probability of child loss is smaller for women born in later cohorts, suggesting that demographic change can work to minimize the salience of one's natal family experiences. This implies that as downward mortality and fertility trends continue, the unique salience of a mothers' bereavement as a risk factor for child loss may dwindle further.

Although the results overwhelmingly tell a story of the significant and robust intergenerational clustering of maternal bereavement, there are select country outliers. Five of the eight countries with null multivariable hazard findings have experienced major conflicts marked by exceptionally high mortality rates (i.e., Colombia, Guatemala, Myanmar, Nepal, and Central African Republic). Severe, high-mortality events could have such a devastating effect on a population that they ultimately neutralize inequalities in bereavement burdens therein.

Even so, the size and significance of the descriptive and multivariable results in most countries are especially striking given the study limitations in measurement and sample selection, both of which we suspect would lead to more conservative estimates. As discussed earlier, our data are limited by the retrospective measurement of respondents' and their mothers' experiences of child loss, as well as the selection bias inherent in our data. Regarding the former, there is concern that social desirability bias, a lack of knowledge, and misremembering can lead to underestimates of both respondents' and their mothers' bereavement. As a result, the prevalence estimates of bereavement in both generations are likely conservative. Moreover, if women are prone to underreport their mothers' experiences of child loss more than their own (or vice versa), this would lead to an attenuation of the intergenerational associations shown here. Further, our data select on women who have survived to reproductive age, thereby excluding those who may be especially susceptible to child loss. This would further lead to conservative estimates of the intergenerational correlations.

Even with these limitations, by establishing the intergenerational linkages in maternal bereavement in low- and middle-income countries, the study offers fundamental insights into intergenerational transmission processes and health inequality amid demographic transition more broadly. In doing so, the study raises several questions for future research. Perhaps most immediately, the results beg questions regarding the mechanisms driving the intergenerational clustering of child loss that we document. Although the current project has primarily conceptualized one's mother's loss as an event that happened in the prior generation, a mother's bereavement also signifies a woman's own sibling's death. Beyond the consequences for her parents, it is important to remember that losing a young sibling can also directly affect a woman's own well-being and outlook on the world—their sense of control and predictability, and the degree of uncertainty that occupies their mind and informs their decision-making. Exposure to premature death psychologically imprints people in a way that affects all sorts of behaviors, from their risk taking and thinking about the future (Burke et al. 2010; Pyszczynski et al. 1999) to their fertility desires and preferences (Mathews and Sear 2008) and their overall approach to life (Nettle 2010). Although supplementary analyses attest to the stability of the intergenerational correlations regardless of the circumstances of the mother's bereavement/sibling's death, future efforts to identify the precise pathways linking mothers' and adult daughters' bereavement will advance our understanding of the implications of this early-life experience for women's subsequent life course outcomes.

Beyond more immediate questions of the forces that drive the intergenerational health inequality documented here, our results also open new avenues for research on the experience of child loss specifically by offering a window into the psychosocial circumstances under which maternal bereavement is occurring in Global South countries—at both the population and the individual levels. At the population level, our findings imply that the experience of child loss may be perceived as an increasingly “predictable” maternal experience, given the often large share of women who experience the same reproductive outcome as their mothers. Moreover, in the cases of “mortality mobility,” that is, a difference in the child loss experiences of mothers and their daughters, it is increasingly more common to see women experiencing no child loss despite their mothers' history of bereavement. A high prevalence of women evading the bereavement that burdened their mother may contribute to a greater sense of certainty and predictability in a population's mortality landscape. Of course, the presence of women experiencing child loss “just as their mother did”—or even despite their having no awareness of their mothers' bereavement—could also drive a sense of “demographic stagnation” or even pessimism about mortality conditions. Although we are not aware of large-scale data available to test these ideas, research that studies linkages between the intergenerational clustering of bereavement and other demographic processes, such as fertility, could help to clarify whether the intergenerational patterning of child loss is salient to understanding its demographic consequences.

Our results also pique interest in the psychosocial relevance of women's family history for understanding their own bereavement. In many countries, comparable percentages of women are bereaved with or without reporting their mothers' bereavement. Given that past familial experiences are instructive to women's experiences in adulthood, it is possible that child loss has variable consequences for women when it occurs within or absent the context of having a bereaved mother. Among women who had a bereaved mother, they may be resigned to the notion that they, too, were

destined to experience a child's death. Conversely, bereaved women who lack knowledge of a mother's bereavement may perceive their own child loss to be a particularly unexpected event. Research has theorized that women's vicarious exposures to child death in their community can help to lessen the blow of a loss, leading them to react in a muted way (Scheper-Hughes 1992). This research has not grappled with the potential that women may prioritize their mothers' experiences over those of other age-mates. Efforts to identify how bereaved women without a family history of bereavement make sense of their own loss would be instructive for understanding the importance of women's natal family experiences for navigating and interpreting their own maternal experiences.

This study's results offer a new vantage point for understanding mortality conditions—emphasizing simultaneously the diffuse yet intergenerationally patterned nature by which women of reproductive age experience child death in Global South populations. The intergenerational clustering of maternal bereavement identifies a fundamental inequality in women's reproductive lives that merits further research on both its causes and its consequences. ■

Acknowledgments This research was supported by National Science Foundation (NSF) grant 2116350. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NSF. This research was further made possible with the support of the University of Texas Population Research Center, which is funded by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (P2CHD042849). The content of this study is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. An early version of this paper was presented at the 2023 annual meeting of the Population Association of America; we thank session 17 participants, including discussant Joshua Wilde, for helpful feedback. The authors also thank Kevin J. A. Thomas, Victor Agadjanian, *Demography* Editor in Chief Sara Curran, and two anonymous reviewers for helpful feedback on earlier drafts of the manuscript.

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