Towards a demographic analysis of kinship bereavement

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1 Background

The loss of kin is a universal life event (Shear, 2012) because kinship is universal (Caswell, 2019) and mortality is the only unavoidable demographic process. The more than 60 million annual deaths worldwide (United Nations, Department of Economic and Social Affairs, Population Division, 2022) each leave behind an average of nine bereaved relatives in the United States (Verdery et al., 2020). Each of those relatives experiences bereavement at specific ages and kinship distances, within networks that evolve over time. Given a fixed fertility–mortality regime, this generates a characteristic life-course pattern of bereavement at the population level.

From a public-health perspective, knowing these patterns helps plan interventions for an event associated with excess short- and long-term mortality (Prior et al., 2018; Colin Murray and Holly G., 2009). Recent protocols for bereavement risk assessment identify vulnerable groups requiring mental-health support (Aoun et al., 2015). The early stage of grief is associated with poor self-reported health, mental distress, and increased service use (Thimm et al., 2020), and closeness of the kin relation strongly predicts grief intensity (Lobb et al., 2010).

Throughout this study, *bereavement* refers to the state of having lost someone close; *grief* to the psychobiological response; and *mourning* to the set of processes that moderate

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and integrate grief (Shear, 2012). We define kin strictly as blood relatives. Using recent advances in kinship demography (Caswell, 2019), we explore demographic dimensions of bereavement to compare populations over time and space, showing how changes in fertility and mortality reshape the average bereavement experience by age.

2 Methodology

2.1 Kinship demography framework

The analysis relies on the expected distribution of living and deceased relatives by Focal's age, sex, and kin type, derived from two-sex, time-invariant kinship models (Caswell and Song, 2021). These estimates resemble period-type measures such as life expectancy, but applied to kin networks. They assume independent survival between Focal and her relatives. For each age, we compute the expected number of living kin and the expected number of deaths among them.

2.2 Measuring demographic bereavement

We propose four indicators describing the demographic structure of bereavement:

- **Unexpected proportion of kin deaths (U)** – share of losses considered premature.
- **Overlapping generational sequence (O)** – proportion of bereavement that occurs out of the expected generational order.
- **Expected loss of shared kin-time (S)** – expected number of years lived while bereaved of a specific kin type.
- **Mean life proportion since loss (M)** – proportion of life already lived in bereavement.

These indicators describe both retrospective and prospective aspects of bereavement: how much loss has been experienced, how much remains likely, and how it distributes across the life course. For example, a 60-year-old woman may have outlived both parents, spending one-third of her life since those losses, while still expecting limited additional losses of descendants.

2.3 Expected loss of shared years

The measure $S(x)$ estimates how much shared lifetime is lost due to relatives' deaths, combining past, present, and future components. In intuitive terms, it sums the time already lived in bereavement with the expected future time affected by deaths among living or yet-to-be-born relatives. The result can exceed individual life expectancy because it counts *kin-years* rather than personal years—reflecting the total exposure to bereavement within the kin network.

2.4 Mean time since loss

The indicator $M(x)$ expresses the mean portion of Focal's life already spent since experiencing kin loss. It is retrospective and conditional on survival to age x, illustrating how long individuals have lived as bereaved. While informative for common losses (e.g., parents), it may be unstable for rare kin deaths.

2.5 Unexpected deaths

"Unexpected" deaths are defined epidemiologically as those occurring from external or premature causes, often linked to greater risk of prolonged grief disorder (Aoun et al., 2015; Pitman et al., 2016). At population level, these correspond to deaths below a mortality-specific threshold age or due to violent or sudden causes (Mazzuco et al., 2021; Caswell et al., 2023). The indicator $U(x)$ gives the proportion of accumulated kin deaths that fall in this category.

2.6 Overlapping generational experience

Bereavement follows a generational order: grandparents, then parents, then peers, then descendants. When this order is disrupted, grief tends to be more traumatic, as in the loss of a child (Alburez-Gutierrez et al., 2021; Youngblut and Brooten, 2018). The overlapping indicator $O(x)$ measures the share of bereavement that occurs simultaneously or inversely between two kin types (e.g., parents and grandparents). Higher values imply greater disruption of generational order.

3 A first application: Argentina 2015

Under 2015 conditions, an Argentinian woman is expected to experience about 27 kin deaths throughout her lifetime, one-third before age 60 and two-thirds after 80. Bereavement composition evolves by age. At birth, she has two living parents and expects roughly 21 kin-years of shared time with them. By age 30, this decreases to 16; by age 60, to less than three. At that point, she has on average 0.6 living parents and has already spent about 30% of her life in bereavement for a parent. Roughly 3% of those losses are classified as unexpected.

Intergenerational overlap remains moderate: by age 60, about 19% of the combined bereavement experience for parents and grandparents occurred simultaneously. For children, only about 1.3% of deaths by age 60 are unexpected. At birth, she also expects to live around 35 kin-years without her grandparents—a demographic manifestation of generational distance.

These indicators reveal how fertility and mortality jointly determine the life-course structure of bereavement. Comparing Argentina and Guatemala in 1950 and 2015 highlights that fertility decline reduces exposure to descendant loss, while mortality decline delays parental loss, concentrating bereavement later in life and increasing the total time lived with dead kin. This demographic shift transforms not only family structures but also the age pattern of grief exposure across populations.

4 Discussion and implications

This framework introduces bereavement as a measurable demographic experience, analogous to fertility or mortality, but expressed in shared time and kin counts. It allows comparative study of populations' "bereavement regimes" and how these evolve through demographic transition. The indicators capture both structural and experiential aspects of loss—when it occurs, how long it lasts, and whether it follows generational order—thus bridging demographic and psychological perspectives.

Potential applications include quantifying the population at risk of complicated grief, projecting future bereavement burdens under different mortality scenarios, or integrating bereavement exposure into health and social-policy models. As mortality improvements continue to postpone death, individuals will increasingly accumulate longer periods of bereavement later in life—turning loss into an expanding, quantifiable component of human longevity.

5 Future work

We will provide fully operationalization demographic definitions of the measures introduced in this paper. We will discuss applications for time-variant and two-sex kinship models, in addition to the steady-state definitions included in this extended abstract. The final article will apply these measures to data from real-world populations to exemplify the different dimensions of bereavement. We expect that our work will provide a much-needed demographic foundation for the study of bereavement that goes beyond the existing framework proposed by Caswell et al. (2023).

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