**Kin-Age-Cohort analysis**

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*13 Feb 2020*

**Cumulative child death**

We propose an extension to the Goodman-Keyfitz-Pullum kinship equations (GKP equations) (Keyfitz 1985), to estimate the cumulative number of offspring deaths experienced by a woman surviving to age *a*, standing before us:

where for infant deaths, for child deaths and 00 for all-age offspring deaths. We restrict the female reproductive age to , so that for all cases.

**Proportion of bereaved mothers per 1,000 mothers**

In order to determine the prevalence of bereaved mothers in a population, we start by considering the age-specific probability that an average woman will experience the death of a child:

where is the hazard rate of experiencing the death of a child younger than *k* (Wachter 2014). We create a life table (Preston, Heuveline, and Guillot 2001) a unit radix where is the probability of losing a child. We define as the fraction of women in a cohort who ever experienced the death of a child younger than *k*. Next, we account for the mortality of women with the help of the fraction of women that survived up to *a* after the start of reproductive age in each birth cohort. We approximated this using country-specific period life tables from the UN WPP. The proportion of women (per 1,000 mothers) who have ever lost one or more children younger than *k* is:

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We estimate an equivalent measure for mothers by rescaling our estimates using a similar life table approach. We consider fertility as a “hazard rate” to approximate the number of women that “survive” having children (i.e. remain childless) after experiencing a set of age-specific fertility rates. The fraction of women who have ever been mothers is approximated as 1 minus the fraction of childless women. We can now define, for a given cohort, the proportion of mothers (per 1,000 mothers) who have ever lost one or more children younger than *k*:

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We generate period estimates of the prevalence of bereaved mothers, comparable to the empirical DHS estimates, using different combinations of cohort and age for Eq. X.

**References**

Keyfitz, N. (1985). *Applied Mathematical Demography*. New York: Springer. http://public.eblib.com/choice/publicfullrecord.aspx?p=3084208.

Preston, S.H., Heuveline, P., and Guillot, M. (2001). *Demography: Measuring and Modeling Population Processes*. Malden, MA: Blackwell Publishers.

Wachter, K.W. (2014). *Essential Demographic Methods*. Cambridge, Mass.: Harvard Univ. Press.