The Demography of Kinship (1)

Introduction to Kinship Demography

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European Doctoral School of Demography 2023-24
21 May 2024

MAX PLANCK INSTITUTE FOR DEMOGRAPHIC RESEARCH
MAX-PLANCK-INSTITUT FÜR DEMOGRAFISCHE FORSCHUNG

EUROPEAN DOCTORAL SCHOOL OF DEMOGRAPHY

Consider a baby born in Spain in 1950...

1. How old were her grandparents when she was born, on average?
2. How many living children did she have on her 70th birthday?
3. How many grandchildren?

Agenda

1. Course setup and evaluation

2. Introduction to kinship demography

3. Example: The lived experience of kin loss, or looking at mortality through a kinship lens

Course setup and evaluation

Course overview

1. Tue - "Introduction to kinship demography"
2. Wed - "The formal demography of kinship"
3. Thu - "Extensions of the kinship model"
4. Fri - Office hours

Course website:
https://amandamartinsal.github.io/EDSD_kinship/

Schedule

- Lectures
  1. Tuesday, 09:30-11:00
  2. Wednesday, 9:00-10:30
  3. Thursday, 9:00-10:30
- Lab sessions:
  1. Tuesday, 11:15-12:30
  2. Wednesday, 10:45-12:00
  3. Thursday, 10:45-12:00 and 13:30-16:30 (Assignment)

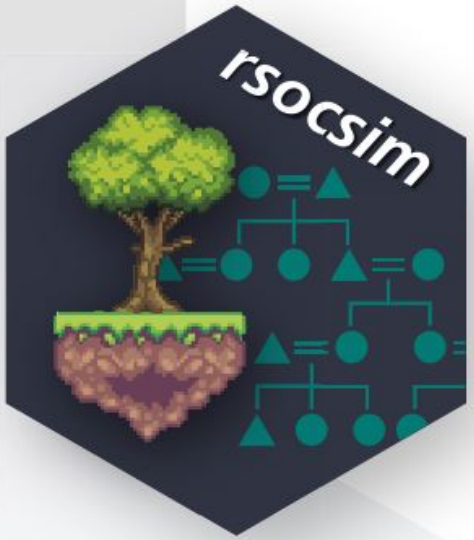
Lab session

The R package 'DemoKin' provides an accessible interface for computing expected kinship structures from demographic rates under a range of scenarios and assumptions using models from formal demography.

FOR MORE INFORMATION, SEE:

Williams, I.; Alburez-Gutierrez, D.; Song, X.; and H. Caswell. (2021) DemoKin: An R package to implement demographic matrix kinship models.

github.com/IvanWilli/DemoKin



The R package rsocsim introduces a platform-independent implementation of the SOCSIM microsimulation software used to produce synthetic populations with plausible kinship structures using demographic rates as input.

FOR MORE INFORMATION, SEE:

Theile, T.; Alburez-Gutierrez, D.; Snyder, M.; Calderón-Bernal L. P.; and E. Zagheni.(2022). rsocsim: An R package to run demographic microsimulations using SOCSIM. kinship models.

github.com/MPIDR/rsocsim

Final assignment

Goal

- Hands-on experience with kinship models
- Reflect on model specifications, assumptions, and outcomes

Exercises

- Model kinship dynamics using ‘DemoKin‘ package
- Benchmark models of kinship

See full instructions in syllabus!

Introduction to kinship demography

Why do we need a course on kinship demography?

Kinship demography, in recent years:

1. theoretical, methodological, and substantive developments
2. opportunity to advance discipline as a whole
3. low visibility of kinship demography

Great societal interest[1]

The Economist

[1] 'The age of the grandparent has arrived.' (Jan 2023). The Economist. https://www.economist.com/international/2023/01/12/the-age-of-the-grandparent-has-arrived

Definitions (1)[2]

Kinship

Social relationships that bind individuals together through culturally shared definitions of relatedness on biological, legal, or normative grounds, ultimately constituting family systems.

Family

More narrow group of kin given special privilege which, among other things, organize the provision of support, socialization, and social placement of its members.

[2] Alburez-Gutierrez, D., Barban, N., Caswell, H., Kolk, M., Margolis, R., Smith-Greenaway, E., Song, X., Verdery, A., & Zagheni, E. (2022). Kinship, Demography, and Inequality: Review and Key Areas for Future Development. *SocArXiv*. https://doi.org/10.31235/osf.io/fk7x9

The role of kinship in human societies

1. Socialisation, protection, and sustenance
2. Inter-generational solidarity: exchanges and bequests
3. Social structure and identity
4. Early-life conditions $\rightarrow$ later-life outcomes

Definitions (2)[3]

Kinship demography

The study of family networks, their structures and dynamics from a demographic perspective and using demographic methods.

[3] Alburez-Gutierrez, D., Barban, N., Caswell, H., Kolk, M., Margolis, R., Smith-Greenaway, E., Song, X., Verdery, A., & Zagheni, E. (2022). Kinship, Demography, and Inequality: Review and Key Areas for Future Development. *SocArXiv*. https://doi.org/10.31235/osf.io/fk7x9

Kinship as a demographic human universal

1. All humans are born
2. All humans die
3. All humans are embedded in kinship structures[4]
4. No particular family configuration is universal or stable

[4] Caswell, H. (2019). The formal demography of kinship: A matrix formulation. *Demographic Research*, *41*, 679–712

The *Strong Ergodic Principle*[6]

"A closed population with unchanging mortality and fertility rates has an **implicit age structure**."

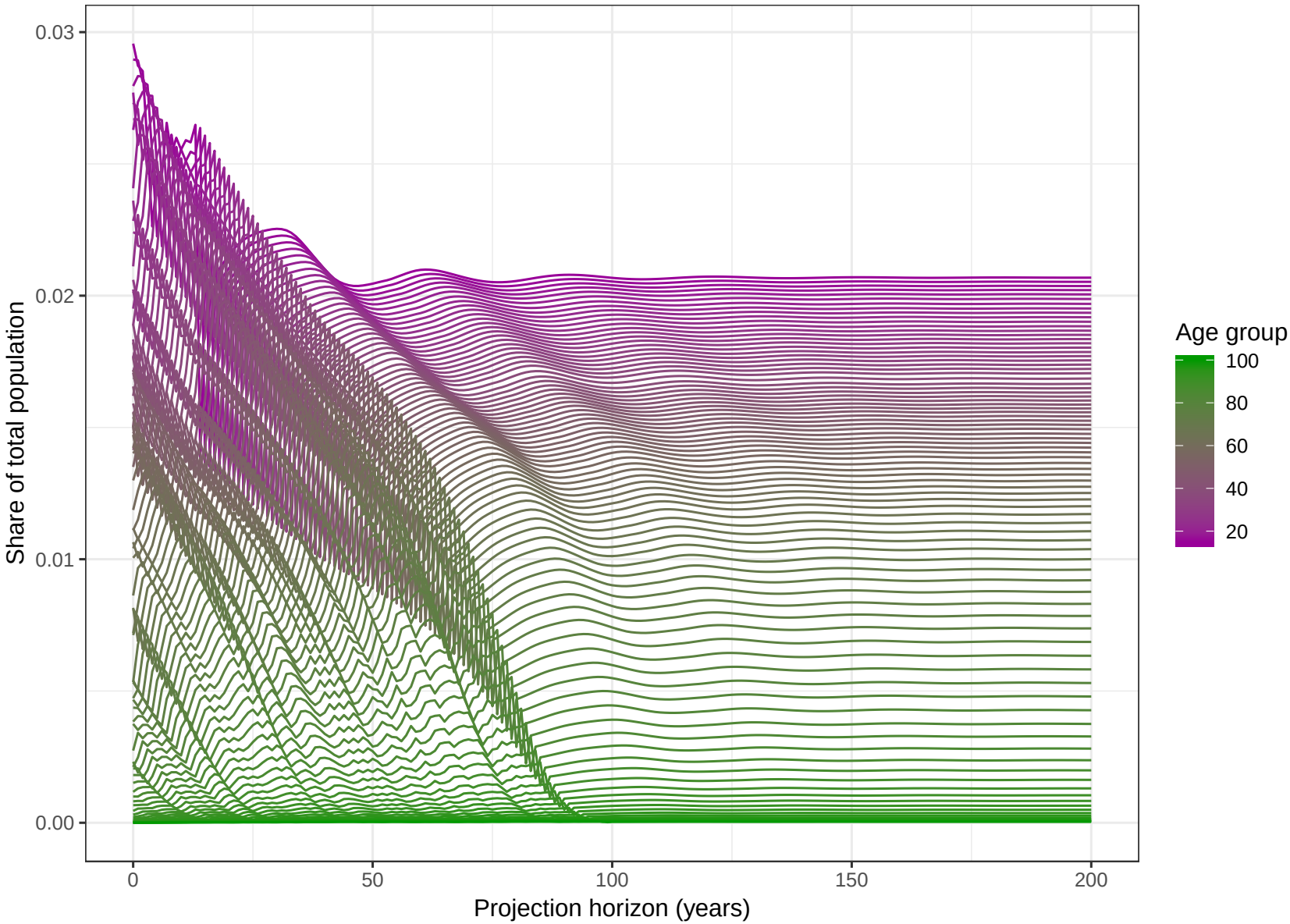
The proportion of the population aged x to $x + n$ in a stable population is[5]:

$$\frac{{}_nK_x}{{}_\infty K_0} = b\frac{{}_nL_x}{l_0}e^{-rx} \tag{1}$$

[5] Wachter, K. W. (2014). *Essential demographic methods* [OCLC: 931410976]. Harvard Univ. Press

[6] Sharpe, F., & Lotka, A. (1911). A problem in age-distribution. *The London, Edinburgh, and Dublin Philosophical Magazine and Journal of Science*, *21*(124), 435–438. https://doi.org/10.1080/14786440408637050

Implied age structures using Leslie matrices



The demographic foundations of kin structure

THEORETICAL POPULATION BIOLOGY 5, 1–27 (1974)

Family Formation and the Frequency of Various Kinship Relationships

LEO A. GOODMAN

The University of Chicago

NATHAN KEYFITZ AND THOMAS W. PULLUM

Harvard University

Received January 19, 1970

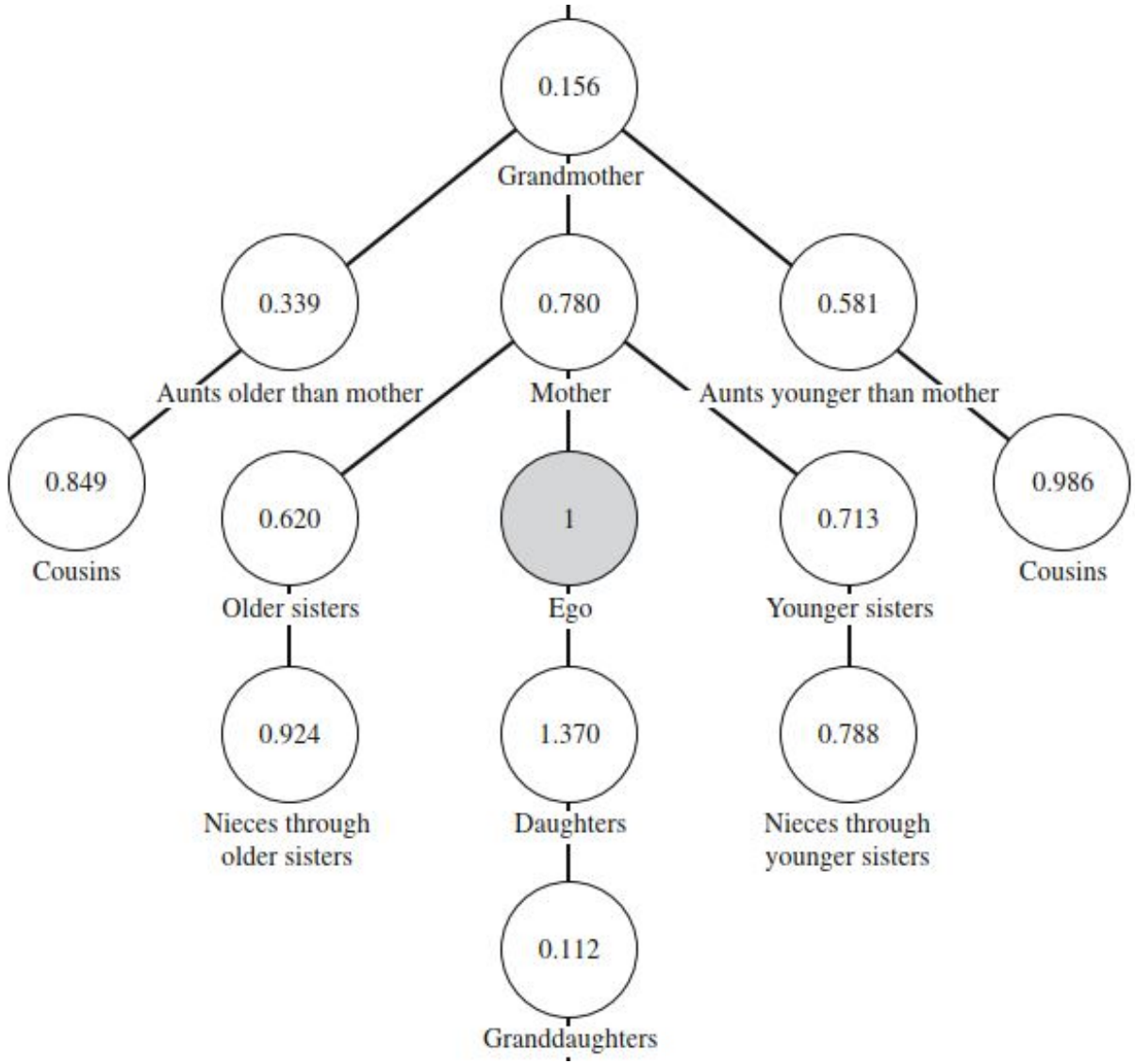
A set of age-specific rates of birth and death implies expected numbers of kin. An individual girl or woman chosen at random out of a population whose birth and death rates are specified can be expected to have a certain number of older sisters, younger sisters, nieces, cousins; expressions for these values are provided for both total kin and kin who are still living. Included also are the

Implied kinship structures

"A fixed set of age-specific rates implies the probability that a girl aged *a* has a living mother and great-grandmother, as well as her expected number of daughters, sisters, aunts, nieces, and cousins."[7]

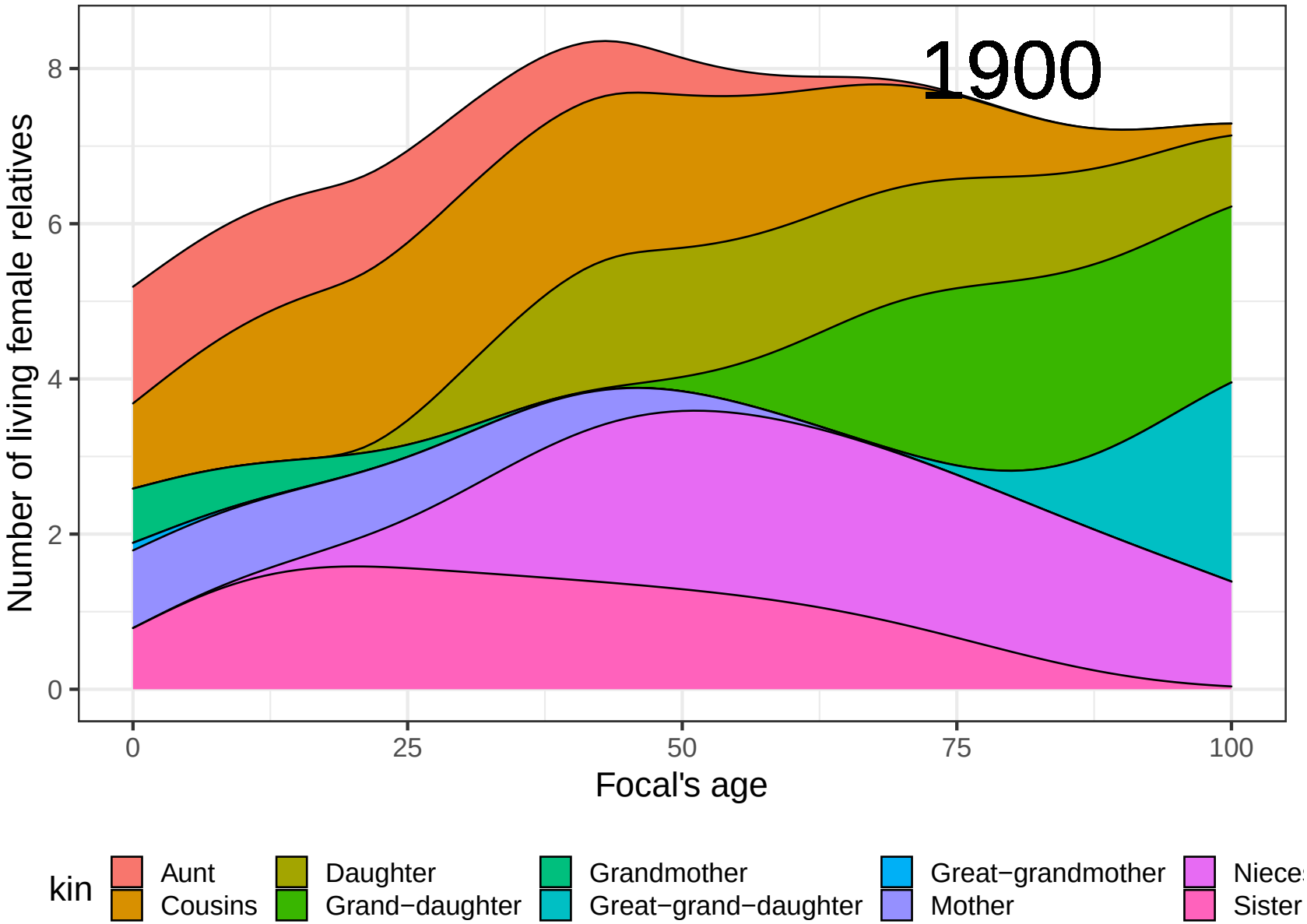
[7] Keyfitz, N. (1985). *Applied mathematical demography*. Springer

Expected number of relatives (USA 1965, F, 45 yo)[8]



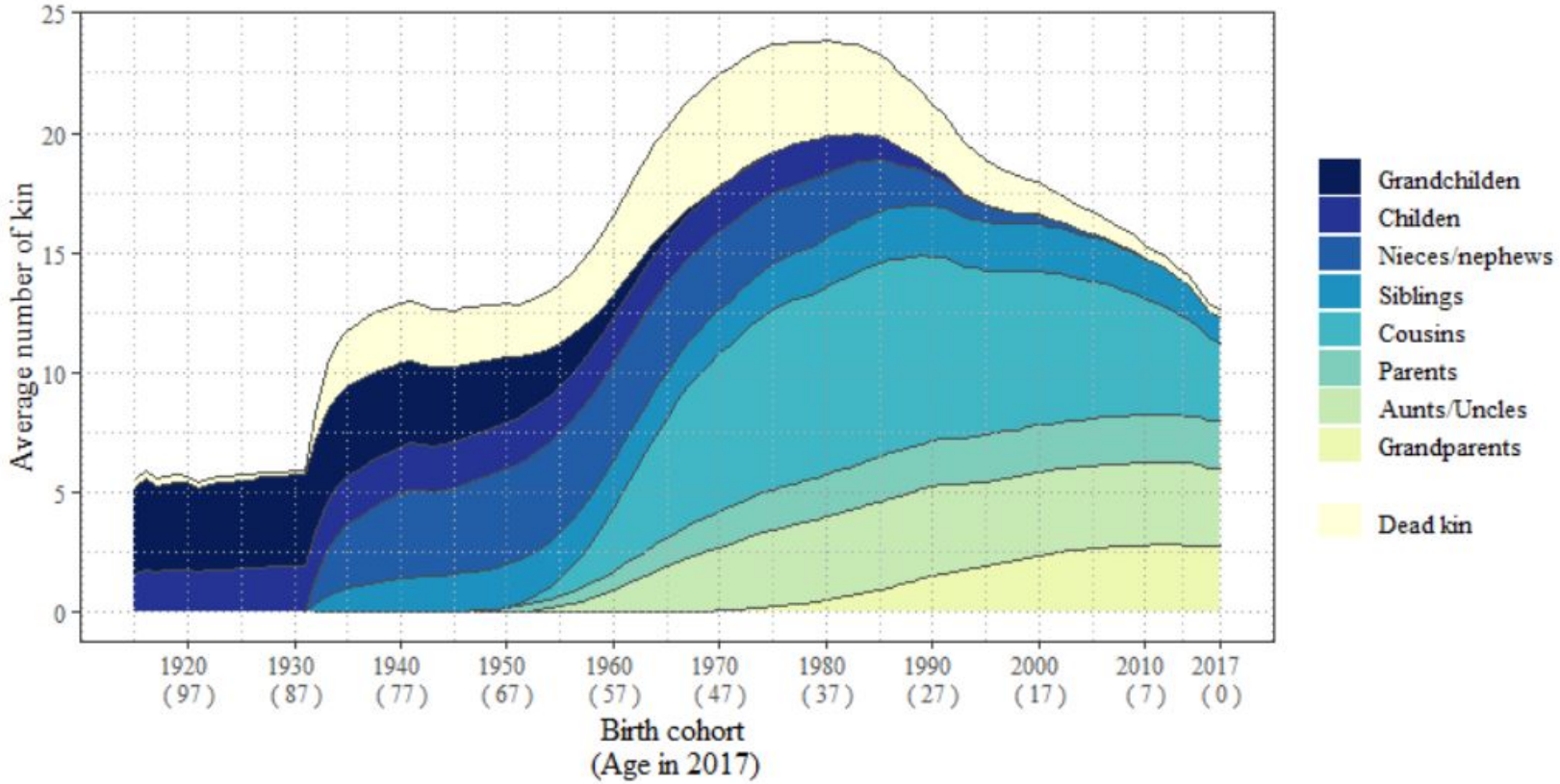
[8] Keyfitz, N. (1985). *Applied mathematical demography*. Springer

Expected kin count for a Swedish woman[9]



[9]Time-invariant conditions; http://alburez.me/DemoKin_example/

Observed kin count from Swedish registers[10]



[10] Kolk, M., Andersson, L., Pettersson, E., & Drefahl, S. (2021). The Swedish Kinship Universe – A demographic account of the number of children, parents, siblings, grandchildren, grandparents, aunts/uncles, nieces/nephews, and cousins using national population registers. *Stockholm Research Reports in Demography, 28*. https://doi.org/10.17045/sthlmuni.17704988.v1

Summary

- Kinship matters for individuals and for societies
- Kinship is a demographic universal
- Implicit kinship structures in populations

DemoKin: matrix kinship models in R[11]

- Time-(in)variant models
- One/two-sex models
- Multistate models
- Kin loss by cause of death
- More in the lab session...

[11] **williams˙demokin˙2023**

Discuss

1. What is ‘kinship demography’ and how is it different from ‘family demography?’

Break

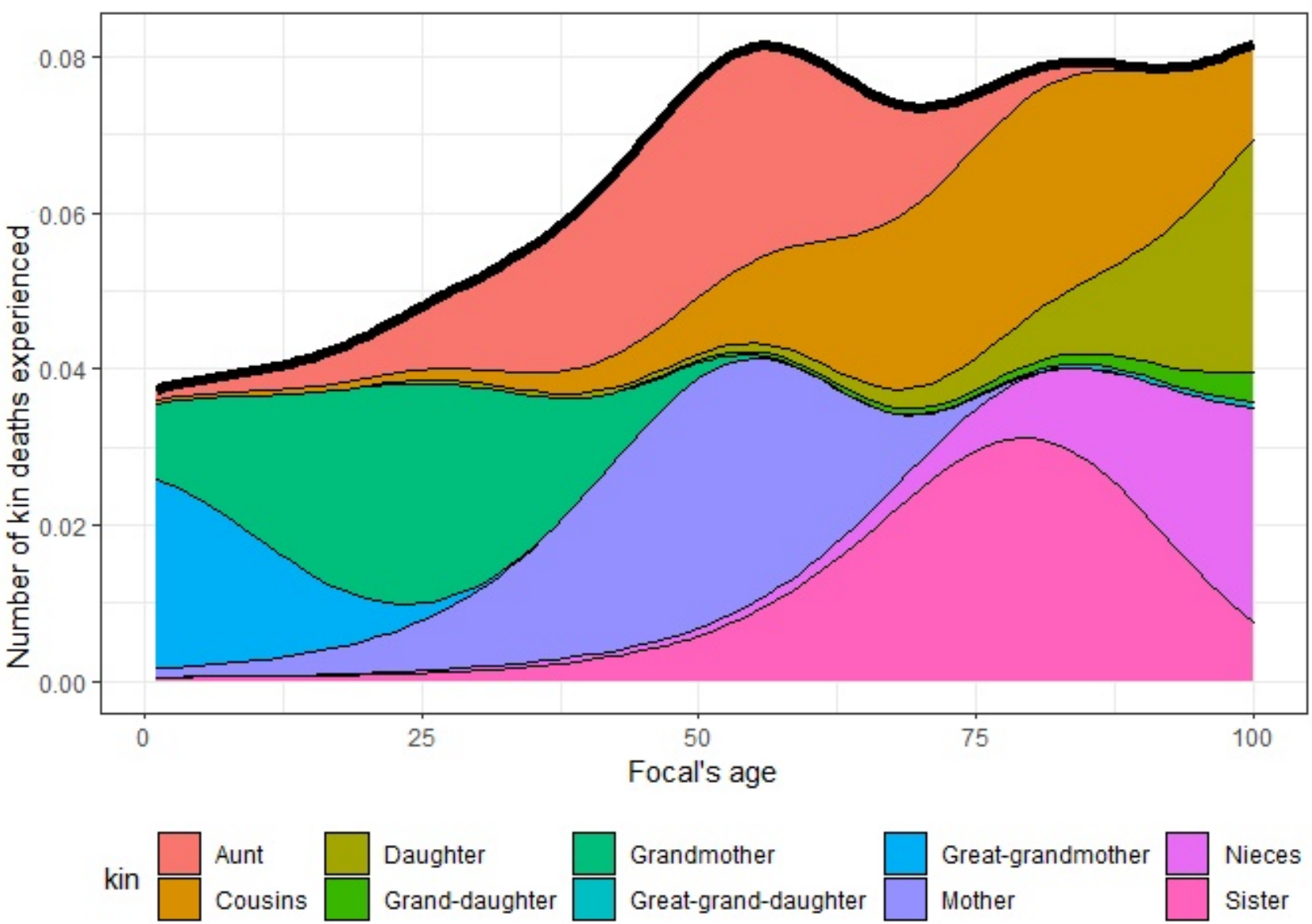
Example: The lived experience of kin loss, or looking at mortality through a kinship lens

Death and loss

"People living through [the Covid-19 pandemic] do not experience the world by weekly rates; they perceive mortality risk through the experiences of their own social network."[12]

[12] Trinitapoli, J. (2021). Demography Beyond the Foot. In L. MacKellar & R. Friedman (Eds.), *Covid-19 and the Global Demographic Research Agenda* (pp. 68–72). Population Council

Deaths experienced at each age (Sweden 1950, F)[13]



[13] http://alburez.me/DemoKin_example/

Mortality $\Rightarrow$ kin loss

DEMOGRAPHY

ISSUES FEATURED ADVANCE PUBLICATION FOR AUTHORS ALERTS ABOUT

RESEARCH ARTICLE | OCTOBER 01 2021

Women's Experience of Child Death Over the Life Course: A Global Demographic Perspective

Diego Alburez-Gutierrez; Martin Kolk; Emilio Zagheni

Demography (2021) 58 (5): 1715–1735.

https://doi.org/10.1215/00703370-9420770

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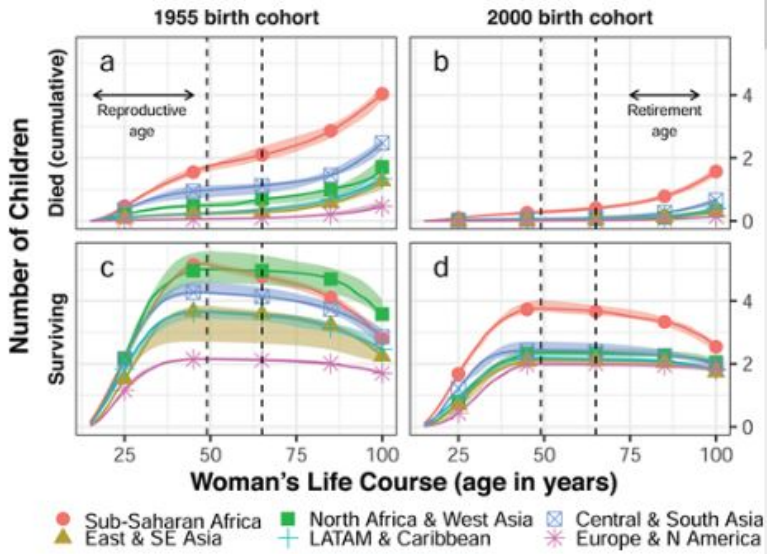
Abstract

The death of a child affects the well-being of parents and families worldwide, but little is known about the scale of this phenomenon. Using a novel methodology from formal demography applied to data from the 2019 Revision of the United Nations World Population Prospects, we provide the first global overview of parental bereavement, its magnitude, prevalence, and distribution over age for the 1950–2000

Data & Figures Contents Supplements References Related

Fig. 1



VIEW LARGE

Mean frequency of child death (top) and child survival (bottom)

Experience of child loss[14]

Research question

How can we characterise the experience of offspring loss from the vantage point of mothers?

1. Methods: formal methods from kinship demography
2. Data: 2019 UN World Population Prospects estimates (1950-2020) and projections (2020-2100) for 201 countries

[14] Alburez-Gutierrez, D., Kolk, M., & Zagheni, E. (2021). Women's Experience of Child Death Over the Life Course: A Global Demographic Perspective. *Demography*, *58*(5), 1715–1735

Demographic foundations of lived experience of kin loss

Child Death $CD_{(a,c)}$ is the cumulative number of child deaths experienced by a woman in cohort c, conditional on her survival to age a:

$$\textit{Children born}_{(a,c)} = \textit{Children surviving}_{(a,c)} + \textit{Children died}_{(a,c)}$$

Demographic foundations of lived experience of kin loss

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$$Children\ died_{(a,c)} = Children\ born_{(a,c)} - Children\ surviving_{(a,c)}$$

Demographic foundations of lived experience of kin loss

Child Death $CD_{(a,c)}$ is the cumulative number of child deaths experienced by a woman in cohort c, conditional on her survival to age a[15]:

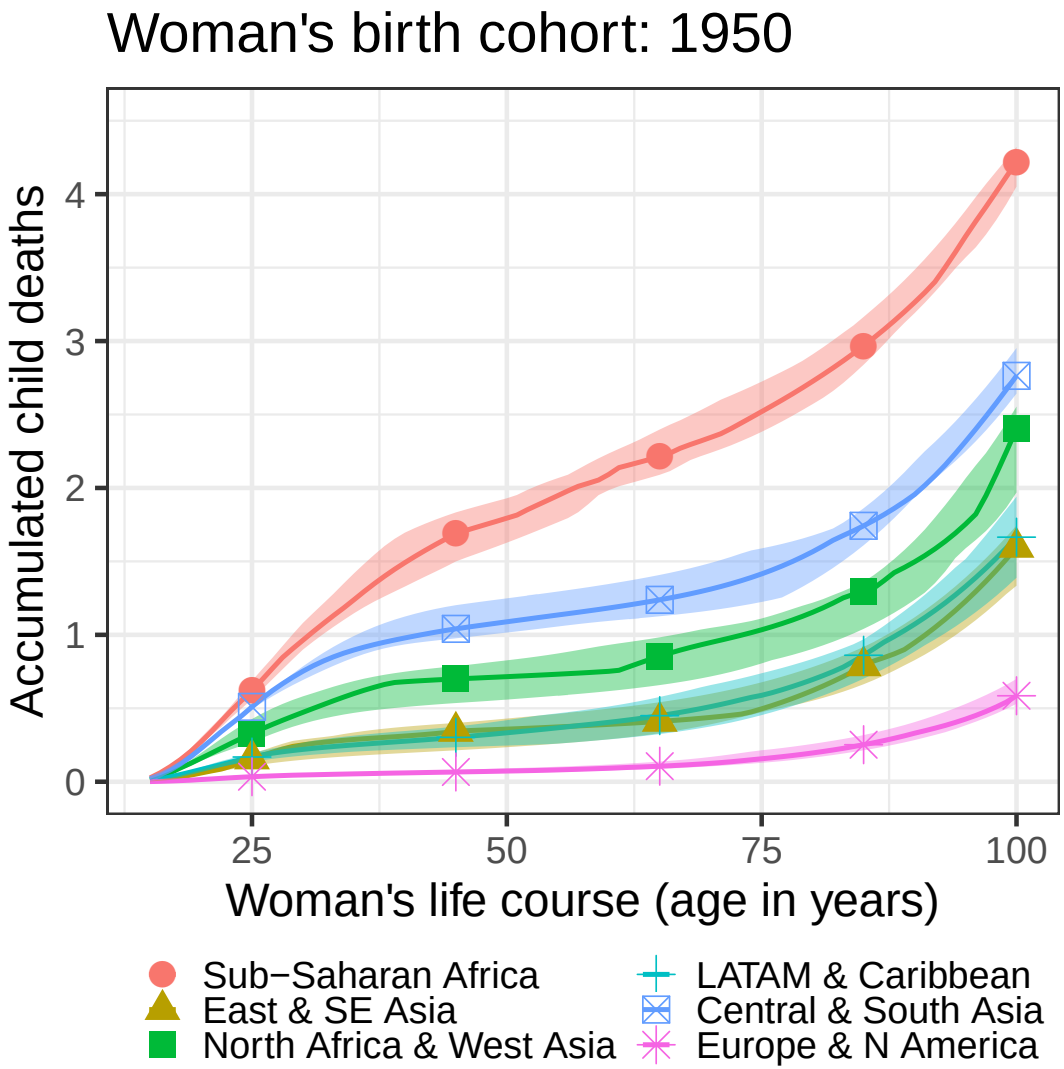
$$\underbrace{CD_{(a,c)}}_{\text{Children died}} = \underbrace{\sum_{x=15}^{x=a} {}_1F_{(x,c)}}_{\text{Children born}} - \underbrace{\sum_{x=15}^{x=a} {}_1F_{(x,c)} l_{(a-x,c+x)}}_{\text{Children surviving}}$$

where

- ${}_1F_{(x,c)}$ are age-specific fertility rates for mothers
- $l_{(a-x,c+x)}$ are age-specific mortality probabilities for mother's children

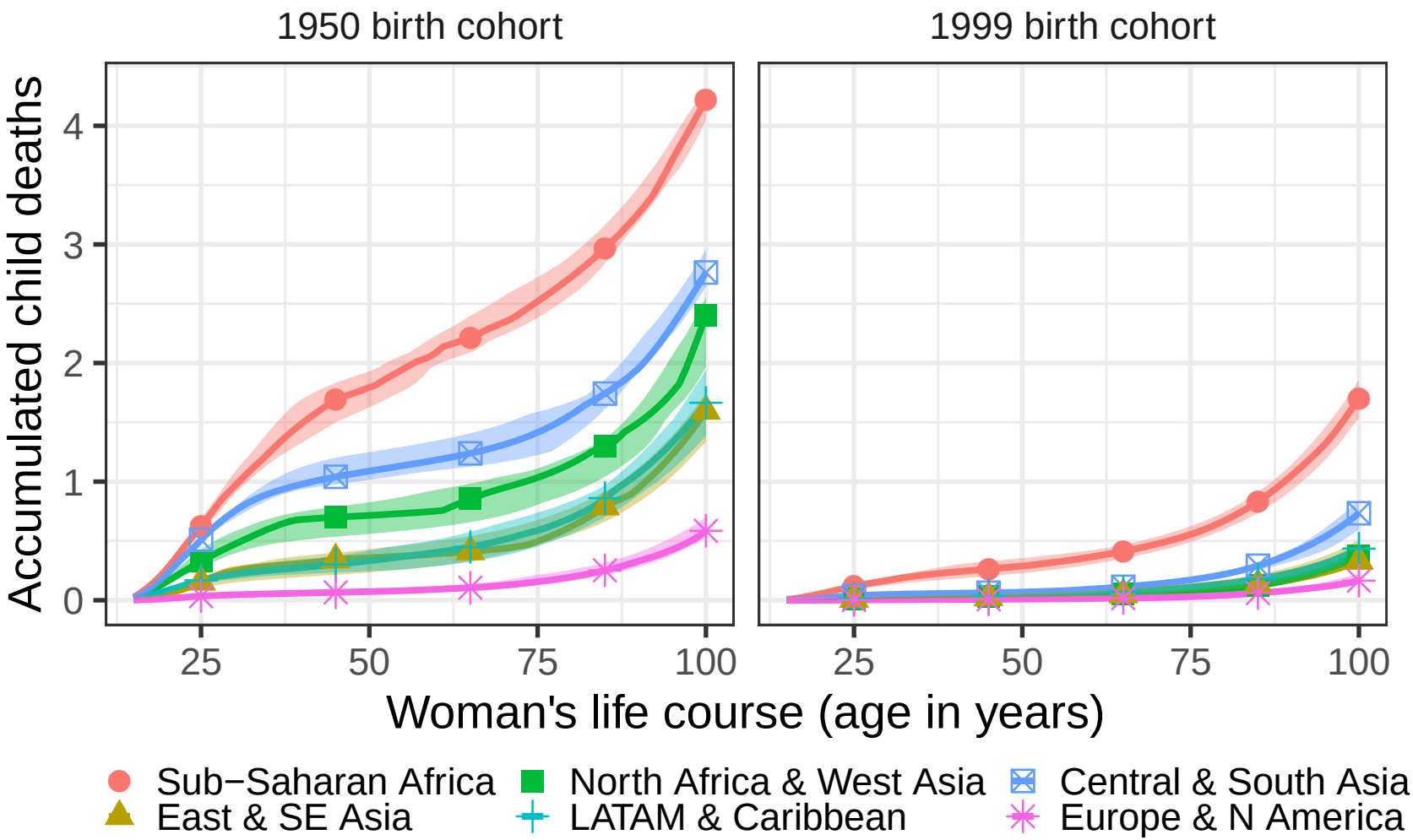
[15] Goodman, L. A. (1974). Family Formation and the Frequency of Various Kinship Relationships. *Theoretical Population Biology*, 27

Offspring loss over the life course[16]



[16] Alburez-Gutierrez, D., Kolk, M., & Zagheni, E. (2021). Women's Experience of Child Death Over the Life Course: A Global Demographic Perspective. *Demography*, *58*(5), 1715–1735

Offspring loss over the life course[17]



[17] Alburez-Gutierrez, D., Kolk, M., & Zagheni, E. (2021). Women's Experience of Child Death Over the Life Course: A Global Demographic Perspective. *Demography*, *58*(5), 1715–1735

Kin loss $\Rightarrow$ bereavement

BMJ Global Health

Global burden of maternal bereavement: indicators of the cumulative prevalence of child loss

Emily Smith-Greenaway,[1] Diego Alburez-Gutierrez,[2] Jenny Trinitapoli,[3] Emilio Zagheni[2]

To cite: Smith-Greenaway E, Alburez-Gutierrez D, Trinitapoli J, *et al*. Global burden of maternal bereavement: indicators of the cumulative prevalence of child loss. *BMJ Global Health* 2021;**6**:e004837. doi:10.1136/bmjgh-2020-004837

Handling editor Sanni Yaya

► Additional material is published online only. To view, please visit the journal online (http://dx.doi.org/10.1136/

ABSTRACT

Background We provide country-level estimates of the cumulative prevalence of mothers bereaved by a child's death in 170 countries and territories.

Methods We generate indicators of the cumulative prevalence of mothers who have had an infant, under-five-year-old or any-age child ever die by using publicly available survey data in 89 countries and an indirect approach that combines formal kinship models and life-table methods in an additional 81 countries. We label these measures the maternal cumulative prevalence of infant mortality (mIM), under-five mortality (mU5M) and offspring mortality (mOM) and generate prevalence estimates for

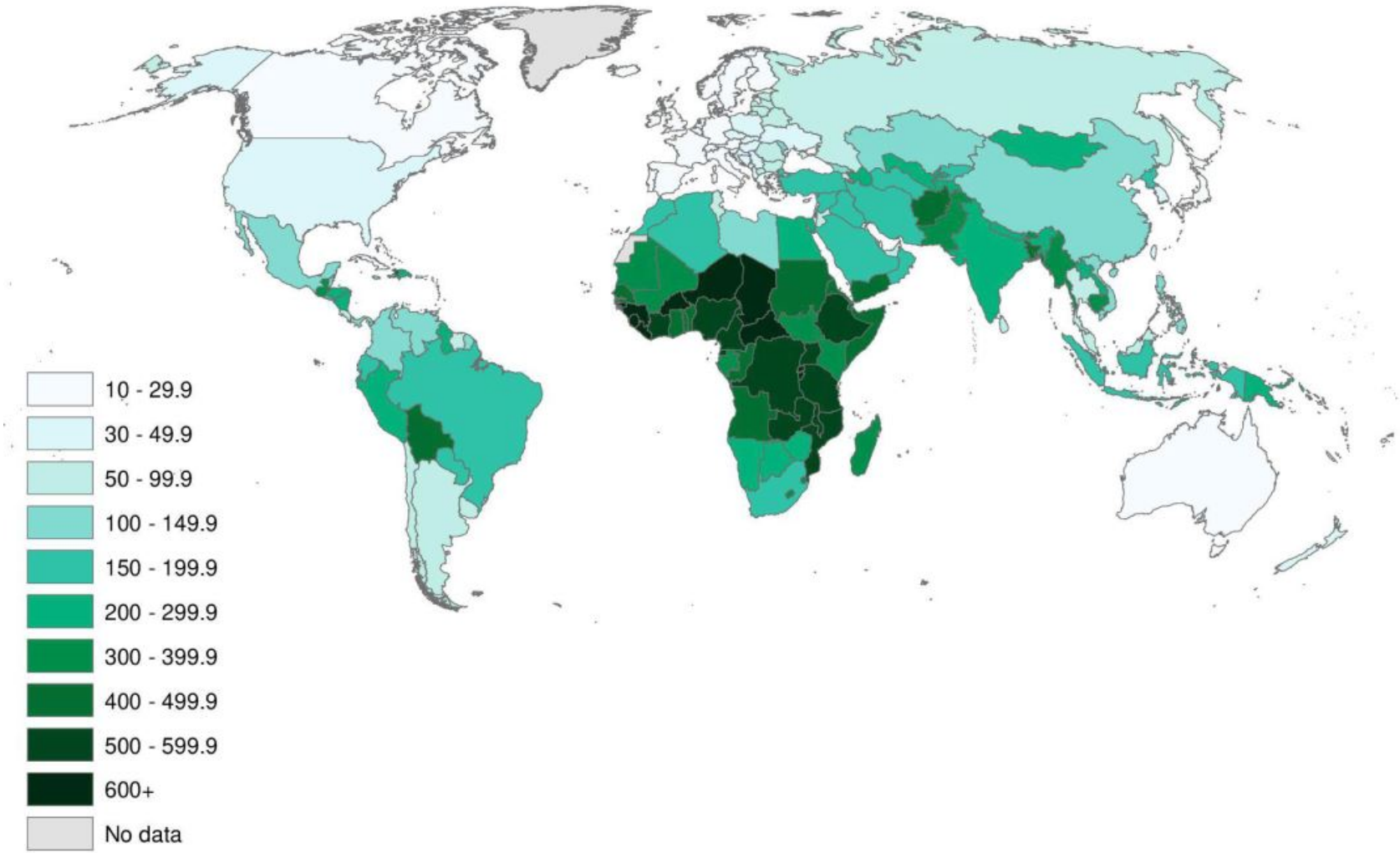
Key questions

What is already known?

- In sub-Saharan African countries, maternal indicators of the child mortality burden show that—even as infant and child mortality rates decline—having experienced a child's death remains a common maternal experience.
- Child death is known to adversely affect mothers' lives, yet we lack a systematic, global analysis of the maternal prevalence of child loss.

What are the new findings?

How many mothers (‰) have ever lost a child?[18]



[18] Smith-Greenaway, E., Alburez-Gutierrez, D., Trinitapoli, J., & Zagheni, E. (2021). Global burden of maternal bereavement: Indicators of the cumulative prevalence of child loss. *BMJ Global Health*, *6*(4), e004837.

PNAS BRIEF REPORT | DEMOGRAPHY OPEN ACCESS

Estimates from 31 countries show the significant impact of COVID-19 excess mortality on the incidence of family bereavement

Mallika Snyder[a,1], Diego Alburez-Gutierrez[b], Iván Williams[c], and Emilio Zagheni[b]

Edited by Douglas Massey, Princeton University, Princeton, NJ; received February 17, 2022; accepted April 19, 2022

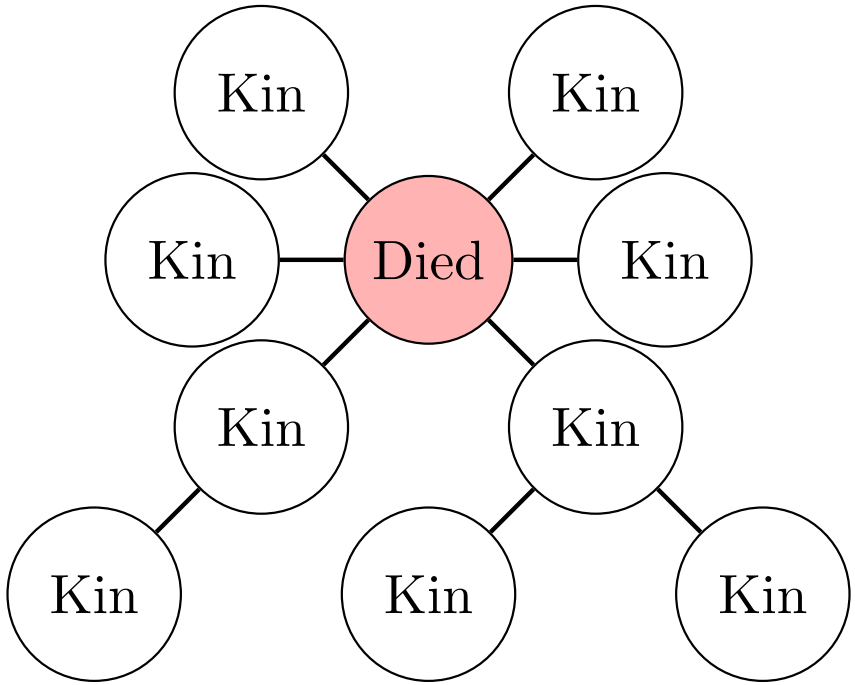
Excess mortality associated with the COVID-19 pandemic has led many to experience the loss of family members, with significant negative outcomes. We quantify the extent to which these population-wide rates of kin loss represent a departure from levels expected in the absence of COVID-19 excess mortality and consider which demographic groups are most likely to be affected. Results for biological kin in 31 countries indicate dramatic increases in excess kin loss associated with excess mortality and follow a generational pattern consistent with COVID-19 mortality risk by age. During periods of high excess mortality, the number of younger individuals losing a grandparent increased by up to 845 per 100,000, or 1.2 times expected levels (for individuals aged 30 to 44 y in the United Kingdom in April 2020), while the number of older individuals losing a sibling increased by up to 511 per 100,000 or 1.15 times (for individuals aged 65 y and over in Poland in November 2020). Our monthly multicountry estimates of excess kin loss complement existing point estimates of the number of individuals bereaved by COVID-19 mortality [Verdery et al., *Proc. Natl. Acad. Sci. U.S.A.* 117, 17695–17701 (2020); Kidman et al., *JAMA Pediatr.* 175, 745–746 (2021); Hillis et al., *Lancet* 398, 391–402 (2021)] and highlight the role of heterogeneous excess mortality in shaping country experiences.

Demographic change and the lived experience of kin loss

1. Excess mortality from Covid-19
2. Some deaths would not have happened in the absence of the pandemic
3. Some people would not have lost a relative (i.e., 'bereaved')

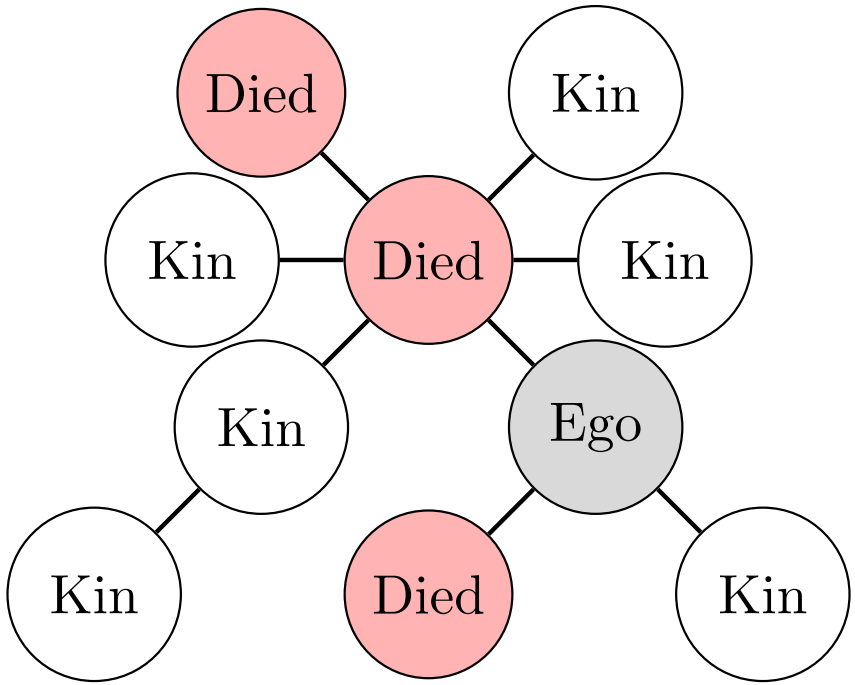
The 'bereavement multiplier' approach

"...every death from COVID-19 will leave approximately nine bereaved."[19]



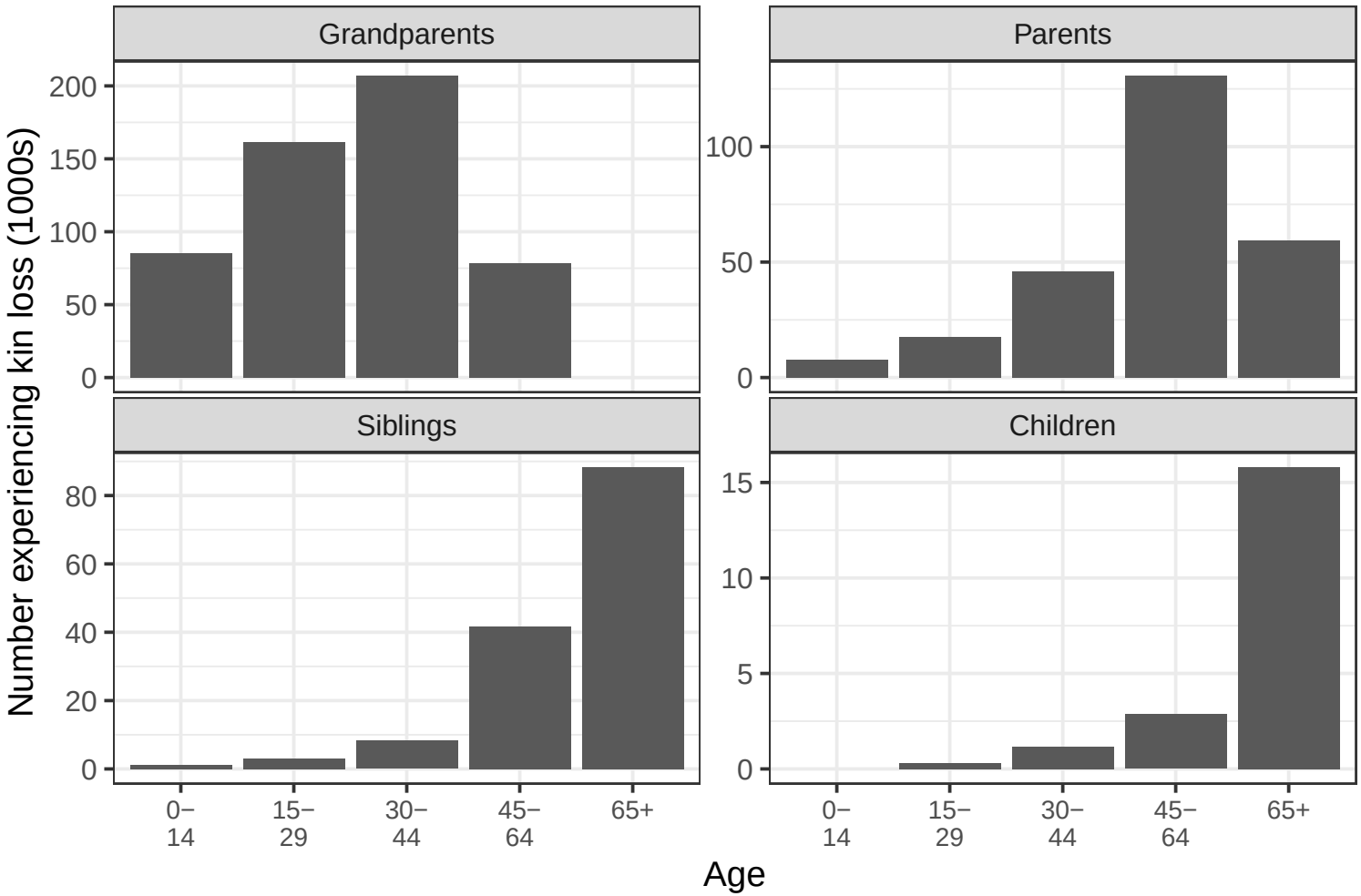
[19] Verdery, A. M., Smith-Greenaway, E., Margolis, R., & Daw, J. (2020). Tracking the reach of COVID-19 kin loss with a bereavement multiplier applied to the United States. *Proceedings of the National Academy of Sciences*, *117*(30), 17695. https://doi.org/10.1073/pnas.2007476117

‘Excess bereavement’: the survivor’s perspective[20]



[20] Snyder, M., Alburez-Gutierrez, D., Williams, I., & Zagheni, E. (2022). Estimates from 31 countries show the significant impact of COVID-19 excess mortality on the incidence of family bereavement. *Proceedings of the National Academy of Sciences*, *119*(26), e2202686119. https://doi.org/10.1073/pnas.2202686119

How many people in the UK lost a relative to Covid-19?[21]



[21] Snyder, M., Alburez-Gutierrez, D., Williams, I., & Zagheni, E. (2022). Estimates from 31 countries show the significant impact of COVID-19 excess mortality on the incidence of family bereavement. *Proceedings of the National Academy of Sciences*, *119*(26), e2202686119. https://doi.org/10.1073/pnas.2202686119

Mortality from a kinship perspective

1. Mortality $\Rightarrow$ kin loss $\Rightarrow$ breavement $\Rightarrow$ memory
2. Mortality crises 'accelerate' the experience of bereavement
3. Implications for individuals and populations

$$\text{Kin Loss} \approx \text{Mortality} \times \text{Kinship Structure}$$

Discuss

1. How could you apply a ‘kinship lens’ to study other demographic processes?
2. Think of 2-3 concrete examples