Reading Course on Demographic Methods

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Time and place:

- Fridays 10-12am July 17, 24, 31, Aug 7, 14
- Via Zoom

Course website:

https://github.com/MJAlexander/demographic-methods

This contains slides and labs from when I taught this course previously. I'll also provide a second link that contains the draft of a book on demographic methods in R, that I'll aim to add to as we go.

Overview

The aim of this reading course is to give a general introduction to demography and demographic methods for statistics students. The focus of the course will be on:

- introducing some classical readings, theories and concepts in demography
- illustrating how to implement demographic methods in R

We will meet every week (except for first week), to chat about ideas and find typos in my notes.

The list of readings below is too long and I don't expect you to read all the items. Just do whatever you want to and focus on whatever you're interested in. One approach would be to pick a reading in each of the subsections. If you're more interested in playing around with the R code, then that's fine too.

Textbooks

The following are two good introductory textbooks on demographic methods. Given the current circumstances, you may not be able to access hard copies. EDM is available online through the UofT library. Let me know if you are interested in any parts of PHG but cannot get access to a copy.

- Preston, Heuveline and Guillot (2001): 'Demography: Measuring and Modeling Population Processes' (PHG)
- Wachter (2014): 'Essential demographic methods' (EDM)

In addition, I will refer to my work-in-progress book as DMR (Demographic Methods in R)

Reading list

NOTE The later sections are not updated but will be updated by the week before we discuss the topic.

(*) indicates the most important in that particular subsection

Part 1: Introduction

- What is demography and why does it matter?
- Demographic identity
- Demographic rates
- Models without age
- Age, periods, cohorts
- Demographic transition theory
- Population debates

Readings

Background:

- PHG Chapters 1-2
- EDM Chapters 1-2
- (*) DMR Chapters 1-2
- Keyfitz, N. 1975. 'How Do We Know the Facts of Demography?' Population and Development Review. 1(2):267-288.
- (*) Keyfitz, N. 1980. 'Population Appearances and Demographic Reality.' Population and Development Review 6(1):47-64.
- Ryder, NB. 1964. 'Notes on the Concept of a Population.' American Journal of Sociology 69: 447-62.

Demographic transition theory:

- (*) Lee, R. 2003. 'The Demographic Transition: Three Centuries of Fundamental Change.' Journal of Economic Perspectives 17(4):167-190.
- Myrskylä, M., Kohler, H.P. and Billari, F.C., 2009. 'Advances in development reverse fertility declines'. Nature, 460(7256), pp.741-743.
- Lesthaeghe, R., 2014. 'The second demographic transition: A concise overview of its development.' Proceedings of the National Academy of Sciences, 111(51), pp.18112-18115.
- Zaidi, B. and Morgan, S.P., 2017. 'The second demographic transition theory: A review and appraisal. Annual review of sociology, 43, pp.473-492.'

Population debates:

NOTE I don't expect you to read the entirety of the original texts but they are here for completeness. You may be interested in reading other sources on Malthusian v Boserupian ideas, or the Ehrlich/Simon debate. There's lots on the internet. I will say that parts of Malthus are worth a read, if nothing else but for entertainment value.

- **Malthus v Boserup**:
  - Malthus, T. 1798. 'An Essay on the Principle of Population'. Chapters 4-5
  - Boserup, E., 1965 'The conditions of agricultural growth: The economics of agrarin change under population pressure.'
  - Turner, B.L. and Fischer-Kowalski, M., 2010. 'Ester Boserup: An interdisciplinary visionary relevant for sustainability.' Proceedings of the National Academy of Sciences, 107(51), pp.21963-21965.
- **Erlich v Simon**:

- Ehrlich, P.R., Parnell, D.R. and Silbowitz, A., 1971. 'The population bomb'. New York: Ballantine books.
- Simon, J.L., 1981. 'The Ultimate Resource'. Princeton University Press.
- Sabin, P., 2013. 'The bet: Paul Ehrlich, Julian Simon, and our gamble over Earth's future.' Yale University Press.

Part 2: Mortality

- Life tables
- Multi-state life tables, cause-deleted life expectancy
- Mortality models: parametric, non-parametric, relational
- Hazard models
- Oldest-old mortality

Readings

Background:

- PHG Chapters 3,4, 9.1, 11.1
- EDM Chapters 3,7,8
- (*) DMR Chapters 3-4
- Keyfitz, N. 1985. Applied mathematical demography. Second edition. Chapter 2.
- Graunt, J. 1662. 'Natural and Political Observations Mentioned in a Following Index, and Made Upon the Bills of Mortality' in Smith, D and Keyfitz, N. 'Mathematical Demography'. Chapter 2.

Oldest-old mortality, mortality improvement:

- Barbi, E, Lagona, F, Marsili, M, Vaupel, J and Wachter, K. 2018. 'The plateau of human mortality: Demography of longevity pioneers', Science, 360: 1459-1461.
  - Critique: Newman, SJ. 2018. 'Plane inclinations: A critique of hypothesis and model choice in Barbi et al'. PLoS Biol 16(12): e3000048.
  - Ken's response: Wachter, K. 2018. 'Hypothetical errors and plateaus: A response to Newman'. PLoS Biol 16(12): e3000076.
- Oeppen, J, and Vaupel, JW. 2002. 'Broken limits to life expectancy.' Science 296.5570: 1029-1031.

Mortality models:

- (*) Lee, RD, and Carter, LR. 1992. 'Modeling and Forecasting US Mortality.' Journal of the American Statistical Association 87 (419). Taylor & Francis: 659-71.
- Feehan, D. 2018. 'Separating the Signal From the Noise: Evidence for Deceleration in Old-Age Death Rates'. Demography 55(6):2025–2044.
- Alexander, M., Zagheni, E., and Barbieri, M., 'A Flexible Bayesian Model for Estimating Subnational Mortality', Demography, 2017, 54(6): 2025–2041.

Part 3: Fertility

- Basic indicators
- Parity
- Mean age at childbearing
- Fertility models
- Tempo and quantum

Readings:

- PHG Chapters 5, 9.3

- EDM Chapters 4, 6

These are all modeling papers.

- Alkema, L, Raftery, A, Gerland, P and Clark, S 2011. 'Probabilistic Projections of the Total Fertility Rate for All Countries'. Demography. 48(3): 815-839.
- Bongaarts, J and Feeney, G. 1998. 'On the Quantum and Tempo of Fertility'. Population and Development Review, 24(2):271-291.
- Coale, A. and Trussel, J. 1974. 'Model Fertility Tables: Variations in the Age Structure of Childbearing in Human Populations' in Smith, D and Keyfitz, N. 'Mathematical Demography'. Chapter 30.
- Kohler, H and Philipov, D. 2001. 'Variance effects in the Bongaarts-Feeney Formula'. Demography. 38(1): 1-16.

Read either one of these:

- (*) Schmertmann, C and Hauer, M. 2018. 'Bayesian estimation of total fertility from a population's age–sex structure'. Statistical Modelling 19(3): 1-23.
- (*) Hauer, M. E., & Schmertmann, C. P. (2020). Population pyramids yield accurate estimates of total fertility rates. Demography, 1-21.

Part 4: Population projection and stable populations

- Leslie matricies
- Lotka's r
- Reproductive value
- Population momentum
- Generational waves
- Probabilistic projections

Readings:

- PHG Chapters 6,7
- EDM Chapters 5,10
- Keyfitz, N. 1985. Applied mathematical demography. Second edition. Chapter 6.
- Bernadelli, H. 1941. 'Population Waves' in Smith, D and Keyfitz, N. 'Mathematical Demography'. Chapter 23.
- Goodkind, D. 2017. 'The Astonishing Population Averted by China's Birth Restrictions: Estimates, Nightmares and Reprogrammed Ambitions'. 54:1375-1400.
  - Lots of responses, e.g.: Zhao, Z and Zhang, G. 2018. 'Socioeconomic Factors Have Been the Major Driving Force of China's Fertility Changes Since the Mid-1990s'. Demography. 55: 733-742.

Bayesian stuff:

- A relatively new book: Byrant and Zhang, 2018. Bayesian Demographic Estimation and Forecasting. CRC Press.
- Wheldon, Raftery, Clark and Gerland, 2016. 'Bayesian population reconstruction of female populations for less developed and more developed countries'. Popul Studies. 70(1): 21–37.

Part 5: Migration, kinship and the future

- Incorporating migration into Leslie Matrix
- Migration models (parametric, gravity)
- Kinship
- Bayesian demography: data and process models

Readings:

- PHG Chapter 9.4
- EDM Chapter 11
- Raftery, A, Alkema, L and Clark, S. 2014. 'Bayesian Population Projections for the United Nations', Statistical Science. 29(1):58-68.
- Goodman, L, Keyfitz, N and Pullum, T. 1974 'Family Formation and the Frequency of Various Kin Relationships'. Theoretical Population Biology. 5: 1-27.
- Zagheni, E, Weber, I and Gummadi K. 2017. 'Leveraging Facebook's Advertising Platform to Monitor Stocks of Migrants'. Population and Development Review. 43(4): 721-734.