**Digital Demography (Population Data and Science)**

**Course programme**

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# Introduction

## Course description

Rapid increases in computational power and the explosion of Internet, social media and mobile phone use have radically changed our lives, the way we interact with each other and our behavior, including demographic choices and constraints. The digitalization of our lives has also led to the so-called “data revolution” that is transforming social sciences. In this course, we will study how traditional methods used in social sciences can help us make sense of new data sources, and how these new data sources may require new approaches.

## Goals

We will discuss a number of substantive topics related to the emergence of (big) data-driven discovery in social sciences, with emphasis on population processes. By the end of the course, students will be familiar with relevant literature at the intersection of demographic research and computational social science. The main goals of the course are

1. to introduce students to recent substantive advances in the field of Digital and Computational Demography
2. to develop critical thinking about modern demographic analysis and (big) data-driven discovery
3. to learn some of the methods, approaches and tools of data science in the context of population research

## Organisation and examination

This course consist of four lectures, one assignment, and some take-away exercises. There are **required** and **optional** readings each week (all of them can be downloaded using this link). Only the former are obligatory but students will benefit from reading the latter before the class as well. There is no exam but an assignment which needs to be the end of the week (see section Assignment).

# Final assignment

**“Bias in online genealogies”**

The aim of this assignment is to acquire hands-on experience using digital data. You will use a sample of the Familinx database, which contains data from [www.geni.com](http://www.geni.com). A sample of the data, pertaining to profiles from Finland, can be downloaded using this LINK. A codebook is available in the website of the dataset: <https://familinx.org/data.html>.

In the sample dataset, each record in the genealogical data provided is a unique record. I have added two fields to identify family members: “father” and “mother”, which indicate the id of the respective relative for each row-person. The data looks something like this:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **profileid** | **father** | **mother** | **birth\_year** | **death\_year** | **…** |
| 12589845 | 21489 | 3218 | 1912 |  |  |
| 12648785 | 585202 |  | 1658 | 1701 |  |
| 12698523 | 5545459 | 321681 | 1754 | 1755 |  |

This assignment consists of three exercises:

**Exercise 1**

How has lifespan developed historically in Finland, according to the online genealogies?

* Compute the lifespan average by birth cohort and sex. You can define “birth cohort” as you wish, but it is probably more efficient to consider grouped years (e.g. people born between 1800 and 1850).
* Include a short description of your findings (max 200 words) and one figure that summarises them.

**Exercise 2**

What is the difference between lifespan and life expectancy? The two readings from Thursday seem to conflate both terms at points.

* Write a short paragraph (max 150 words) describing the connection between lifespan and life expectancy for a given birth cohort.
* Is it possible to evaluate this empirically using data from online genealogies? Write a short paragraph (max 250 words) indicating how you would do it
* For extra points, compute the cohort life expectancy for any given birth cohort using the genealogies

**Exercise 3**

What are potential sources of bias in the online genealogies? How can we evaluate these biases?

* Write a short paragraph (max 250 words) describing three potential sources in bias in online genealogies.
* Focus on one of the three biases identified below and prove its existence empirically
* Write a short paragraph with a potential solution to overcome this bias (max 200 words).

You must submit a written report outlining the results of the exercises described above. Assignments are due Friday April 3 at midnight (CET). Please send your assignment via email to [alburezgutierrez@demogr.mpg.de](mailto:alburezgutierrez@demogr.mpg.de) with the subject line “EDSD assignment”. Please make sure to include:

* A written report (Word document of pdf file). Call this file “[your\_surname]\_report.docx”
* The R scripts used to produce the empirical results presented in the written result. Clearly identify to which figure or calculation each part of the script refers. Call this file “[your\_surname]\_scripts.R”

# Lecture plan

## Monday March 30 2020, 11:30-13.00 - “Introduction to digital demography”

**Required readings**

Cesare, N., Lee, H., McCormick, T., Spiro, E., and Zagheni, E. (2018). Promises and pitfalls of using digital traces for demographic research. *Demography* 55(5):1979–1999. doi:[10.1007/s13524-018-0715-2](https://doi.org/10.1007/s13524-018-0715-2).

Alburez-Gutierrez, D., Zagheni, E., Aref, S., Gil-Clavel, S., Grow, A., and Negraia, D.V. (2019). *Demography in the Digital Era: New Data Sources for Population Research*. SocArXiv. doi:[10.31235/osf.io/24jp7](https://doi.org/10.31235/osf.io/24jp7).

**Optional readings**

Salganik, M. (n.d.). *Bit by Bit: Social Research in the Digital Age*. Princeton, NJ: Princeton University Press. <https://www.bitbybitbook.com/en/1st-ed/preface/>.

Zuboff, S. (2015). Big other: Surveillance capitalism and the prospects of an information civilization. *Journal of Information Technology* 30(1):75–89. doi:[10.1057/jit.2015.5](https://doi.org/10.1057/jit.2015.5).

## Tuesday March 31 2020, 11:30-13.00 - “Digital trace data”

**Required readings**

Alexander, M., Zagheni, E., and Polimis, K. (n.d.). The impact of Hurricane Maria on out-migration from Puerto Rico: Evidence from Facebook data. . doi:[10.31235/osf.io/39s6c](https://doi.org/10.31235/osf.io/39s6c).

Fatehkia, M., Kashyap, R., and Weber, I. (2018). Using Facebook ad data to track the global digital gender gap. *World Development* 107:189–209. doi:[10.1016/j.worlddev.2018.03.007](https://doi.org/10.1016/j.worlddev.2018.03.007).

**Optional readings**

Sofia Gil’s tutorial on using the Facebook Marketing API: <https://github.com/SofiaG1l/Using_Facebook_API>

Rampazzo, F., Zagheni, E., Weber, I., Testa, M.R., and Billari, F. (2018). Mater certa est, pater numquam: What can Facebook Advertising Data Tell Us about Male Fertility Rates? *arXiv:1804.04632 [cs]*. <http://arxiv.org/abs/1804.04632>.

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. doi:[10.1111/padr.12102](https://doi.org/10.1111/padr.12102).

## Wednesday April 1 2020, 11:30-13.00 - “Computational approaches”

**Required readings**

Verdery, A.M. and Margolis, R. (2017). Projections of white and black older adults without living kin in the United States, 2015 to 2060. *Proceedings of the National Academy of Sciences* 114(42):11109–11114. doi:[10.1073/pnas.1710341114](https://doi.org/10.1073/pnas.1710341114).

Zagheni, E. (2011). The Impact of the HIV/AIDS Epidemic on Kinship Resources for Orphans in Zimbabwe. *Population and Development Review* 37(4):761–783. doi:[10.1111/j.1728-4457.2011.00456.x](https://doi.org/10.1111/j.1728-4457.2011.00456.x).

**Optional readings**

Grow, A. and Van Bavel, J. (eds.) (2017). *Agent-Based Modelling in Population Studies: Concepts, Methods, and Applications*. Cham: Springer. The Springer Series on Demographic Methods and Population Analysis; volume 41.

Grow, A. and Van Bavel, J. (2020). The Gender Cliff in the Relative Contribution to the Household Income: Insights from Modelling Marriage Markets in 27 European Countries. *European Journal of Population*. doi:[10.1007/s10680-019-09547-8](https://doi.org/10.1007/s10680-019-09547-8).

Margolis, R. and Verdery, A.M. (2019). A Cohort Perspective on the Demography of Grandparenthood: Past, Present, and Future Changes in Race and Sex Disparities in the United States. *Demography* 56(4):1495–1518. doi:[10.1007/s13524-019-00795-1](https://doi.org/10.1007/s13524-019-00795-1).

**Homework**

1. Download the sample online genealogy from LINK and load it onto R
2. Create graphs showing the distribution of years of births and years of death of the population

## Thursday April 2 2020, 15:00-17.00 - “Crowd-sourced online data”

**Required readings**

Kaplanis, J., Gordon, A., Shor, T., Weissbrod, O., Geiger, D., Wahl, M., Gershovits, M., Markus, B., Sheikh, M., Gymrek, M., Bhatia, G., MacArthur, D.G., Price, A.L., and Erlich, Y. (2018). Quantitative analysis of population-scale family trees with millions of relatives. *Science* 360(6385):171–175. doi:[10.1126/science.aam9309](https://doi.org/10.1126/science.aam9309).

Fire, M. and Elovici, Y. (2013). Data Mining of Online Genealogy Datasets for Revealing Lifespan Patterns in Human Population. *arXiv:1311.4276 [cs, q-bio, stat]*. <http://arxiv.org/abs/1311.4276>.

**Optional readings**

Malmi, E., Gionis, A., and Solin, A. (2018). Computationally Inferred Genealogical Networks Uncover Long-Term Trends in Assortative Mating. *arXiv:1802.06055 [physics, q-bio]*. <http://arxiv.org/abs/1802.06055>.

Antoun, C., Zhang, C., Conrad, F.G., and Schober, M.F. (2016). Comparisons of online recruitment strategies for convenience samples: Craigslist, Google AdWords, Facebook, and Amazon Mechanical Turk. *Field Methods* 28(3):231–246.

## Friday April 3 2020, Assignment (no class)

See assignment description in pages 1-2.