# Video 3: Introduction to demographic microsimulation

## Day 3: Online genealogies and demographic microsimulation

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# Agenda

1. Introduction to the SOCSIM microsimulator
2. Pros and cons of simulations
3. Accessing SOCSIM

# Reading for videos 3-4

Verdery, A.M., Smith-Greenaway, E., Margolis, R., and 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):17695–17701. doi: https://doi.org/10.1073/pnas.2007476117.

# Demographic microsimulation

- Model individual-level demographic behaviour using set of rules
- Manufacture individual-level data
- Simple inputs
- Different alternatives:
  - SOCSIM
  - CAMSIM
  - R/python
  - Agent-based modelling: more tomorrow!

# Demographic microsimulations with SOCSIM

- A stochastic microsimulation platform, 1970s at UC Berkeley
- Starts with initial population
- Each simulated individual experiences specific rates every month (e.g., mortality, fertility, marriage)
- Keeps track of kinship ties to create a full genealogy
- **UC Berkeley SOCSIM User Manual**[1]

[1] Mason, C. (2016). SOCSIM Oversimplified. UC Berkeley. https://lab.demog.berkeley.edu/socsim/CurrentDocs/socsimOversimplified.pdf

# SOCSIM

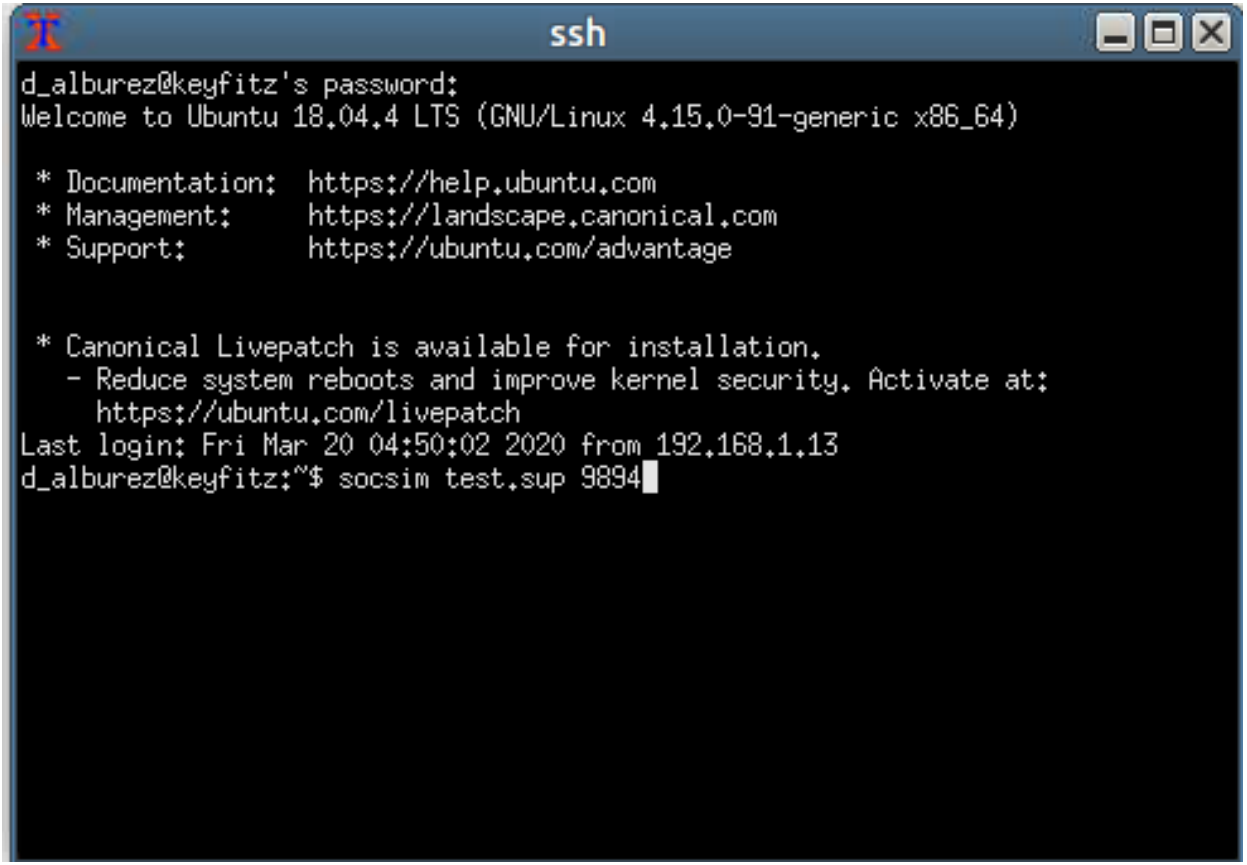


Figure 1: SOCSIM interface in UC Berkeley Unix server

# Input data for SOCSIM microsimulation

1. User-provided
   - 1.1 Initial population
   - 1.2 Age-specific fertility rates
   - 1.3 Age-specific mortality rates
2. Optional or default parameters available
   - 2.1 Marriage transition rates
   - 2.2 Model for marriage market
   - 2.3 Other transition rates
   - 2.4 Other parameters (inheritance of fertility, etc.)

# Output of a SOCSIM microsimulation[2]

```
library(knitr)

read.csv("../../Assignment/Data/sweden_socsim.csv",
         nrows = 6) %>%
  kable()
```

| profileid | gender | father | mother | birth_year | death_year |
|---|---|---|---|---|---|
| 42201 | male | 18853 | 20610 | 1750 | 1750 |
| 42202 | female | 0 | 12456 | 1750 | 1829 |
| 42203 | female | 18213 | 20889 | 1750 | 1750 |
| 42204 | male | 11381 | 12555 | 1750 | 1750 |
| 42205 | female | 0 | 20044 | 1750 | 1819 |
| 42206 | female | 0 | 19985 | 1750 | 1765 |

[2] Zagheni, E. 2017. The Demographic Foundations of the Lived Experience of Kin Death. Working paper.

# Pioneering work using demographic microsimulation

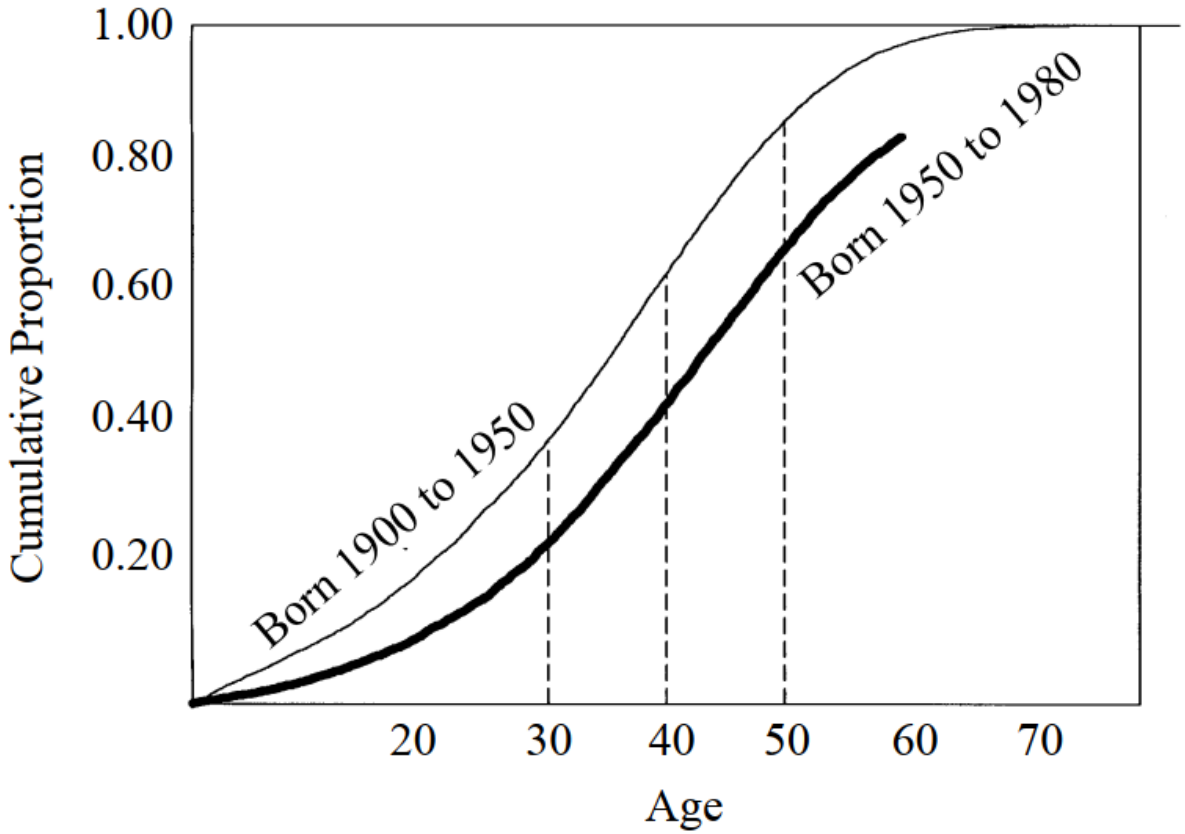


Figure 2: Age at first parent's death, US whites born 1900-1980[3]

[3]Wachter, K.W. (1997). Kinship resources for the elderly. Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences 352(1363):1811–1817.

# Pros and cons of SOCSIM microsimulation

**Strengths**

- Keep track of kinship ties
- Full genealogies
- Low data requirements
- Flexible and adaptable states

**Limitations**

- Not real populations
- Correlated input rates
- Computing power

# When to use demographic microsimulations?

- Use real data whenever possible
- Complex inter-generational processes
- Trace ancestry or relatedness
- Improve the interval validity of simulations
  - Calibration
  - Comparing simulations to ground-truth
  - Methodological triangulation

# How to access SOCSIM?

- Unix version UC Berkeley Demography Lab: https://lab.demog.berkeley.edu/socsim/
- **New** Windows version at the Max Planck Institute for Demographic Research

# Coming up in the next video...

1. Studying demography and kinship with microsimulations
2. Work in progress: Demographic Drivers of the Demand of Care-Time