Sociology 256 – DEMOGRAPHY

SIMULATION METHODS IN SOCIAL DEMOGRAPHY
(last updated April 27, 2006)

Syllabus – Spring 2006

Instructors.  Robert Mare and Elizabeth Bruch

Time and Place.  Mondays, 2:00 - 4:50, Public Policy 2319.

Class Website:  http://www.sscnet.ucla.edu/06S/soc256-1/

Prerequisites.  Sociology 210c and 213a or their equivalents.

Description.  The seminar will focus on the use of simulation in demographic analysis.  This will include both simulating from estimated statistical models and also agent based modeling (which uses artificial data to answer theoretical questions).  We will discuss how simulation can be used to display, interpret, and extend statistical results and to represent behavioral processes.  We will work with applications to residential mobility and segregation, marriage markets, socioeconomic mobility, education, peer effects, and possibly other topics.

Background.  Much of demography is concerned with the relationship between the characteristics and behaviors of individuals and the aggregate properties of populations.  Our own research shares this concern and this course covers methods that we have found useful in our work.  These methods include simulation from statistical models and simulation with artificial data in agent based models.  Unfortunately, much statistical analysis stops with the calculation and presentation of coefficients and measures of fit, and gives little attention to the implications of estimated models for individual and aggregate behavior.  To answer many substantive questions of interest, we often should extend our statistical results with simulation of predictions under alternative counterfactual conditions or the invention and implementation of decompositions.  This is especially valuable when we want to explain several outcomes at once.

In addition, in many demographic problems, we face one of two related dilemmas.  On the one hand, we may have so much data that we don't know which statistical models to run.  We face innumerable model specification decisions, and yet not know which decisions are truly consequential.  This is particularly an issue when we seek to understand both individual level behavior and the aggregate properties of populations.  On the other hand, often our ideas about human behavior are much richer than available data.  In both instances, simulation can help.  In the first instance, we can experiment with simulated data to see what difference our assumptions about individual behavior make for aggregate outcomes.  In the second instance, individual-level data, combined with alternative behavioral assumptions and aggregate data, may be used to simulate aggregate outcomes that can be compared to observed data.  Agent based modeling is a
powerful tool for this work.

These methods are particularly useful when macrolevel phenomena may dynamically emerge from individual social behavior. Examples include: (1) the residential mobility behavior of individuals and the residential segregation of cities; (2) individual preferences about marriage and patterns of assortative mating; (3) marriage, fertility, and childrearing behavior and the intergenerational reproduction of inequality; and (4) peer or neighborhood effects on such behaviors as academic performance, delinquency, or fertility.

**Format.** The course will be a series of weekly 3-hour sessions that include lectures, demonstrations, and student presentations.

**Requirements.** Regular class attendance, occasional computation assignments and oral presentation of results, and a written proposal and progress report on a piece of research that makes use of some of the methods discussed in class.

**Software.** We assume that all students are experienced users of Stata. We will also introduce Netlogo, a programming environment for simulation. Netlogo enables beginners to use and invent models relatively quickly, without learning more sophisticated programming tools. Other software may be introduced depending on student interests. Netlogo is available: [http://ccl.northwestern.edu/netlogo/](http://ccl.northwestern.edu/netlogo/). Students should download version 3.0.2 to their personal computer from that website. Online and downloadable versions of the user manual are available at that sight as well.

**Readings.** Most readings are downloadable from public online sources or the class webpage. These readings are available at:

- the class website (W): [http://www.sscnet.ucla.edu/06S/soc256-1/](http://www.sscnet.ucla.edu/06S/soc256-1/)

In addition, we assign readings from *Demography: Measuring and Modelling Population Processes* by Samuel H. Preston, Patrick Heuveline, and Michel Guillot (Blackwell Publishers, Malden MA, 2001). This has been a required text in Sociology 213a. We assume that most of these readings will serve as review and that students already own this book. This is denoted "DMMPP" on the syllabus.
SCHEDULE AND READINGS
(Subject to Revision)


4/10: Multi-Equation Processes – Effects, Decompositions, Simulations


4/17: Life Tables, Event Histories, Linking Demographic and Statistical Models

DMPP, Ch. 1-3.


DMPP, Ch. 4-6, 12

Mare, Robert D. 1997. “Differential Fertility, Intergenerational Educational Mobility, and Racial Inequality.” Social Science Research 26: 263-91. (S)


5/1: Discrete Choice Models, With and Without Social Interactions


Mare, Robert D., and Elizabeth E. Bruch. 2001. "Spatial Inequality, Neighborhood Mobility, and Residential Segregation." Working Paper CCPR-003-03. California Center for Population Research. (C)


5/8: Introduction to Microsimulation


5/15: Introduction to Agent Based Modeling, Complex Adaptive Systems


Gilbert, Nigel and Klaus Troitzsch. 2005. Simulation for the Social Scientist. Pp. 151-71 in Ch. 7-9 (Pp. 151-71). (Ch. 7 on cellular automata includes an introduction to Netlogo); ch. 8-9 discuss multi-agent models and systems). (W)


5/22: Introduction To Netlogo, Basic Programming Concepts

NetLogo Manual. (W)


5/29: Memorial Day

6/5: Linking Empirical Research and Dynamic (Agent-Based) Modeling
