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/

Prerequsites. 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/ . 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/
Annual Review of Sociology **(A)**
http://arjournals.annualreviews.org/loi/soc
CCPR Working Paper Series **(C)**: http://www.ccpr.ucla.edu/asp/papers_authors.asp
Demography (from 2000) **(D)**: http://muse.jhu.edu/journals/dem/
JSTOR **(J)**: http://www.jstor.org/
Social Science Research (from 1993) **(S)**: http://www.elsevier.com/locate/issn/0049-089X (click on "Full Text Online" on the right hand side of the page)

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)

4/3: Introduction, Overview, Decompositions and Standardizations in Linear and Nonlinear Models, Elementary Concepts of Prediction and Simulation.

Caswell, Hal, and A. Meredith John. 1992. "From the Individual to the Population in Demographic Models." Pp. 36-61 in D. L. DeAngelis and L. J. Gross (eds.) *Individual-Based Models and Approaches in Ecology*. London: Chapman and Hall. **(W)**

Kitagawa, Evelyn M. 1964. "Standardized Comparisons in Population Research." *Demography* 1: 296-315. **(J)**

Mare, Robert D. 1981. "Change and Stability in Educational Stratification." *American Sociological Review* 46:72-87. **(J)**

Barsky, Robert, John Bound, Kerwin Kofi Charles, and Joseph P. Lupton. 2002. "Accounting for the Black-White Wealth Gap: A Nonparametric Approach." *Journal of the American Statistical Association* 97: 663-73. **(W)**

Phillips, Julie A., and Megan M. Sweeney. 2005. "Can Differential Exposure to Risk Factors Explain Racial Differences in Marital Disruption?" Working Paper CCPR-035-05. California Center for Population Research. **(C)**

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

Breen, Richard, and Jan O. Jonsson. 2000. "Analyzing Educational Careers: A Multinomial Transition Model." *American Sociological Review* 65:754-772. **(J)**

Gamoran, Adam and Robert D. Mare. 1989. "Secondary School Tracking and Educational Inequality: Compensation, Reinforcement, or Neutrality?" *American Journal of Sociology* 94:1146-1183. **(J)**

Manski, Charles F., and David A. Wise. 1983. *College Choice in America*. Cambridge, MA.: Harvard University Press. (Ch. 2, 4, 8) **(W)**

Mare, Robert D., and Vida Maralani. (forthcoming). "The Intergenerational Effects of Changes in Women's Educational Attainments." *American Sociological Review*. **(W)**

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

DMPP, Ch. 1-3.

Allison, Paul. 2004. "Event History Analysis." Pp. 369-85 in M. Hardy and A. Bryman (eds.) *Handbook of Data Analysis*. London: Sage. **(W)**

Finnas, Fjalar, and Jan M. Hoem. 1980. "Starting Age and Subsequent Birth Intervals in Cohabitational Unions in Current Danish Cohorts, 1975." *Demography* 17:275-95. **(J)**

J. Vaupel and A. Yashin. 1985. "Heterogeneity's Ruses: Some Surprising Effects of Selection on Population Dynamics." *American Statistician* 39:176-85. **(J)**

Heckman, James J., V. Joseph Hotz, and James R. Walker. 1985. "New Evidence on the Timing and Spacing of Births." *American Economic Review* 75: 179-84. **(J)**

Keyfitz, Nathan. 1973. "Individual Mobility in a Stationary Population." *Population Studies* 27:335-52. **(J)**

4/24: Population Growth Processes (Without Interaction); Leslie Matrix, Markov Models, Multistate Processes.

DMPP, Ch. 4-6, 12

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

Mare, Robert D. 1998. "Assortative Mating, Intergenerational Mobility, and Educational Inequality." Working Paper CCPR-004-00. California Center for Population Research. **(C)**

Quillian, Lincoln. 1999. "Migration Patterns and the Growth of High Poverty Neighborhoods, 1970-1990." *American Journal of Sociology*. 105: 1-37. **(J)**

Preston, Samuel H., and Cameron Campbell. 1993 "Differential Fertility and the Distribution of Traits: The Case of IQ." *American Journal of Sociology* 78: 997-1019. **(J)**

Nobles, Jenna. 2006. "The Contribution of Migration to Children's Family Context" Unpublished paper. **(W)**

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

McFadden, Daniel. 2001. "Economic Choices." *American Economic Review* 91: 351-78. (Nobel Lecture). **(J)**

Louviere, Jordan J., David A. Hensher, and Joffre D. Swait. 2000. *Stated Choice Methods: Analysis and Application*. Ch. 3, "Choosing a Choice Model." **(W)**

Hoffman, Saul D., and Greg J. Duncan. 1988. "Multinomial and Conditional Logit Discrete-Choice Models in Demography." *Demography* 25: 415-427. **(J)**

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)**

Moffitt, Robert A. 2001. "Policy Interventions, Low-Level Equilibria, and Social Interactions." Pp. 45-82 in Steven N. Durlauf and H. Peyton Young (eds.) *Social Dynamics*. Cambridge MA: MIT Press. **(W)**

Durlauf, Steven N. 2001. "A Framework for the Study of Individual Behavior and Social Interactions." *Sociological Methodology 2001*. (Vol. 31): 47-87. **(J)**

Bowles, Samuel, Lin Tao, Christopher Winship, Aimée Dechter, and Steven N. Durlauf. 2001. Comment and Rejoinder on "A Framework for the Study of Individual Behavior and Social Interactions." *Sociological Methodology 2001* (Vol. 31): 89-128. **(J)**

Kohler, Hans-Peter, Jere R. Behrman, and Susan C. Watkins. 2001. "The Density of Social Networks and Fertility Decisions: Evidence from South Nyanza District, Kenya." *Demography* 38: 43-58. **(J)**

5/8: Introduction to Microsimulation

Van Imhoff, Evert, and Wendy Post. 1998. "Microsimulation Methods for Population Projection." *Population: An English Selection* 10: 97-138. **(J)**

Wachter, Kenneth W., John E. Knodel, and Mark Vanlandingham. 2002. "Aids and the Elderly of Thailand: Projecting Familial Impacts." *Demography* 39: 25-41. **(J)**

Ronald Lee. 2006. “Sociality, Selection and Survival: Simulated Evolution of Mortality with Intergenerational Transfers And Food Sharing.” Unpublished manuscript. **(W)**

Wachter, Kenneth. 1987. “Microsimulation of the Household Cycle.” Pp. 215-27 in J. Bongaarts, T. Burch, and K.W. Wachter (eds.) *Family Demography*. Oxford: Clarendon Press. **(W)**

Ruggles, Steven. 1993. "Confessions of a Microsimulator: Problems in Modeling the Demography of Kinship." *Historical Methods* 26: 161-169. **(W)**

Moffit, Robert A., and Michael S. Rendall. 1995. "Cohort Trends in the Lifetime Distribution of Family Healdship in the United States, 1968-1985." *Demography* 32: 407-424. **(J)**

Panis, Constantijn. 2004. "Microsimulations in the Presence of Unobserved Heterogeneity." Unpublished paper. **(W)**

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

Macy, Michael W. and Robert Willer. 2002. "From Factors to Actors: Computational Sociology and Agent-based Modeling." *Annual Review of Sociology* 28:143-66. **(A)**

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)**

Schelling, Thomas. 1971. "Dynamic Models of Segregation." *Journal of Mathematical Sociology* 1:143-86. **(W)**

Schelling, Thomas. 1977. "Thermostats, Lemons, and other Families of Models." Pp. 81-133 in *Micromotives and Macrobehavior* New York: Norton and Company.

5/22: **Introduction To Netlogo, Basic Programming Concepts**

NetLogo Manual. **(W)**

Bruch, Elizabeth and Robert Mare. (forthcoming). "Neighborhood Choice and Neighborhood Change." *American Journal of Sociology*. Working Paper CCPR-013-05. California Center for Population Research. **(C)**

Benenson, Izhak. 2004. "Agent-Based Modeling: From Individual Residential Choice to Urban Residential Dynamics." Pp. 67-94 in M. Goodchild and D. Janelle (eds.), *Spatially Integrated Social Science*. New York: Oxford University Press. **(W)**

Todd, Peter M., Francesco Billari, and Jorge Simao. 2005. "Aggregate Age-at-Marriage Patterns from Individual Mate-Search Heuristics." *Demography* 42:559-573. **(D)**

5/29: Memorial Day

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

Waddell, Paul. 2006. "Reconciling Household Residential Location Choices and Neighborhood Dynamics." Unpublished manuscript. **(W)**

Bruch, Elizabeth. 2006. "Dynamic Models of Ethnic and Economic Segregation." Unpublished manuscript. **(W)**

Durlauf, Steven. 2005. “Complexity and Empirical Economics.” *The Economic Journal* 115:F225-243. Oxford: Royal Economic Society. **(W)**