

CURRICULUM AND COURSE ABSTRACTS

(The abstracts are based on the courses given during the school years 2015-16/2016-17)

Preparatory courses

EDSD 110 Measures and Models of Demography

Instructor: Alyson van Raalte

Course description:

The course is designed for first-year doctoral students in demography who have relatively little previous experience with the subject. It aims to provide EDSD students with an introduction to demographic methods and terminology. It deals with rates and probabilities, the Lexis diagram, the life table, life-time indices of quantum and tempo, period and cohort indices, stable and stationary population, population trends, and basic population projections.

Organization: Instruction is given in the form of six 90-minute lectures in a three-week period.

Examination: There is no examination in this course.

Readings:

Preston, Samuel H, Patrick Heuveline and Michel Guillot. (2001). Demography: Measuring and Modeling Population Processes. Oxford: Blackwell Publishers.

EDSD 120 Basic Mathematic for Demographers

Instructor: Prof. Vladimir Canudas-Romo

Course description:

This course is designed for students who are enrolled in the doctoral program in demography. During six weeks basic mathematics used in demography are reviewed. For most of the students this course is the opportunity to review and practice the mathematics of college level. The principal aim of this course is to bring students entering the doctoral program up to a common standard in mathematics. The course is also intended to prepare students for other courses of the doctoral program, which require that students know the basic mathematics. The main sections covered are: differential and integral calculus, matrices and differential equations. Applications to the study of populations are presented in each class.

Organization:

The course involves a total of 24 lecture hours. Instruction is given in 90 minutes for the first eight lectures, one hour sessions for the rest of the lectures. Perfect attendance is strongly encouraged for those students that have not had mathematics for more than two years. A buddy system with fellow students is recommended and collective assignment will be encouraged.

Prerequisites:

The course is designed for first year doctoral students of demography, no prerequisites are required.

Examination:

Students are expected to hand in assignments each week to reinforce theory and examples of class. Weekly exams and assignments count for the final grade, which is based on the total number of points earned in the course.

General readings:

The course will rely heavily on the book Calculus by Stewart (2003). The book on Matrix Population Models by Caswell (2001) will be used for the matrices part. However, for the demographic applications many other different sources are used which are also recommended to the students (Keyfitz (1968 and 1985) among others).

Stewart, James. 2003. Calculus 5e. Thomson Books/Cole, Belmont CA.

Caswell, Hal. 2001. Matrix Population Models 2e. Sinauer Associates, Sunderland Massachusetts.

Keyfitz, Nathan. 1985. Applied Mathematical Demography. Springer-Verlag: New York.

Keyfitz, Nathan. 1968. Applied Mathematical Demography. Addison-Wesley: Reading Massachusetts.

EDSD 130 Basic Statistics for Demographers

Instructors: Jutta Gampe & Marie Böhnstedt

Course Description:

This course will reiterate basic statistical models and techniques for demographers. The topics covered will be:

- Tools for Exploratory Data Analysis (Tabulation, graphical displays, summary statistics)
- Basic Probability Theory (including random variables, discrete and continuous distributions)
- Statistical models and their estimation (with an emphasis on maximum likelihood)
- Sampling variability, Confidence Intervals and Testing
- Regression (Linear models, including ANOVA, diagnostics)
- Generalized Linear Models: Logistic Regression, Poisson Regression

Organization:

The course involves twelve 90-minute lectures with occasional additional computer labs. The statistical software R is used (freely available, see <http://www.r-project.org>).

Prerequisites:

Even though this course covers many topics of an introductory statistics course, the speed of presentation of the first part is quite high as the emphasis in this course is on modelling data. Hence some background in descriptive statistics (including correlation and regression) is advantageous. Students who do not feel comfortable with mathematical expressions (differentiation, integral, matrix notation) are recommended to also attend the course "Basic Mathematics for Demographers".

Examination:

Students have to hand in solutions to weekly assignments and will have to pass a written exam at the end of the course (120 minutes). The exam and the assignments contribute equally to the final grade.

General Readings:

The course is based on the book:

Agresti, A. and B. Finlay: Statistical Methods for the Social Sciences. Third edition. Prentice-Hall, 1997.

Complementing material is distributed during the course.

EDSD 140 Computer Programming for Demographers

Instructor: Carlo Giovanni Camarda/Tim Riffe

Course Description:

This course introduces the programming language R. It is very well suited for typical demographic analyses which often require more capabilities than other packages can offer. Besides the availability of more built-in statistical procedures than any other widely used statistical package and its outstanding plotting possibilities, R offers an easy way to extend the language by implementing new methods or modifying existing ones. Hence this introductory course for R will be aimed into two directions: On the one hand, the course will show how to perform 'standard' data manipulation and statistical methods known from other programs. On the other hand, a thorough introduction will be given on programming with R. The topics covered in the course are:

- a) Basic concepts of R (calling functions, object-orientation)
- b) Representation of Data (vectors, matrices, dataframes, lists); manipulation of data; referencing elements in data;
- c) Distributions in R
- d) Data Input / Output; reading data (ASCII format as well as binary formats like.sav from SPSS), writing data
- e) Programming with R; flow control (conditional, repetitive execution); writing functions; selected aspects of vectorized computations
- f) Optimization
- g) Graphing Data
- h) Simple statistical modelling

Organization:

There are eight lectures of 90 minutes in the computer lab. The instructor will present concepts and methods using R. The participants will employ those methods immediately on their computers in the lab.

Prerequisites:

Familiarity to work in a computer environment is essential, especially being able to work with a text editor. The presentations will be given using Tinn-R which is free software and can be downloaded from <http://www.sciviews.org/Tinn-R/>. Nevertheless course participants can freely choose their preferred editor (Emacs, UltraEdit, WinEdt,...). This course requires for some parts material covered in the other preparatory courses (e.g. linear regression, probability theory, statistical tests).

Examination:

Students are expected to complete two take home assignments.

General readings:

Some parts of the course will be based on:

W.N. Venables, D.M. Smith and R Development Core Team (2005): An Introduction to R. Available online at: <http://cran.r-project.org/doc/manuals/R-intro.pdf>

In addition, a script is distributed in each lecture which covers all concepts and examples.

Core Course

EDSD 210 Mathematical demography (MATH)

Instructors: James Vaupel & Jim Carey, Vladimir Canudas-Romo, Adam Lenart, Frans Willekens

Learning outcomes:

On a general level the student shall acquire practical knowledge of the important components of formal demography. Specifically students will be able to:
use infinitesimal, differential, integral, and matrix calculus in their future practice;
acquire an overview of usual formalization in demography.

Course content:

The course covers various advanced topics in formal demography:
Mathematical Theory of Population Heterogeneity
Growth and Projection of Populations and Cohorts
Agent-based Modeling and Simulation
Stable Population, Non-stable Populations, Population Momentum

Teaching and assessment:

The course is designed as a series of lectures and seminars. Grading is based on individual performance, via written assignments, oral presentation or group activities.

Readings:

Mathematics of Rescaling Age

Bongaarts and Feeney (1998) On the Quantum and Tempo of Fertility, Population and Development Review.

Lee and Goldstein (2003) Rescaling the Life Cycle: Longevity and Proportionality, Population and Development Review.

Goldstein and Cassidy (2012) How slowing senescence translates into longer life expectancy, Population Studies.

Mathematical Theory of Population Heterogeneity

Vaupel and Yashin (1985) Heterogeneity's Ruses, American Statistician. Box, Vaupel (2010) Biodemography of Human

Aging, Nature. Larsen and Vaupel (1993) Hutterite Fecundability, Demography. Vaupel, Manton and Stallarzi (1979) The

Impact of Heterogeneity, Demography. Vaupel and Zhen Zhang (2010) Attrition in Heterogeneous Cohorts, Demographic

Research. Growth and Projection of Populations and Cohorts

Caswell, H. 2006. Applications of Markov chains in demography. pp. 319-334 in A.N. Langville and W.J. Stewart (editors), MAM2006: Markov Anniversary Meeting. Bosen Books, Raleigh, North Carolina, USA.

Caswell, H. 2009. Stage, age, and individual stochasticity in demography. The Per Brinck Oikos Award Lecture 2008. Oikos 118:1763-1782.

Caswell, H. 2010a. Perturbation analysis of longevity using matrix calculus. Paper presented at the PAA Annual Meeting, April 2010.

Caswell, H. 2010b. Reproductive value, the stable stage distribution, and the sensitivity of the population growth rate to changes in vital rates. Demographic Research 23:531-548. DOI:10.4054/DemRes.2010.23.19

Coale, A.J. 1972. The growth and structure of human populations. Princeton University Press.

Hunter, C.M., H. Caswell, M.C. Runge, E.V. Regehr, S.C. Amstrup, and I. Stirling. 2010. Climate change threatens polar

bear populations: a stochastic demographic analysis. Ecology 91:2883-2898.

Jenouvrier, S., H. Caswell, C. Barbraud, M. Holland, J. Stroeve, and H. Weimerskirch. 2009. Demographic models and IPCC climate projections predict the decline of an emperor penguin population. Proceedings of the National Academy of Sciences 106:1844-1847.

Keyfitz, N. and H. Caswell. 2005. Applied Mathematical Demography, third edition. Springer-Verlag.

EDSD 220 Statistical demography (STATISTICS)

Instructors : Jutta Gampe, G.C. Camarda, Trifon Missov

Learning outcomes:

On a general level the student shall acquire practical knowledge of statistical approaches using various data types. Specifically students will be able to:

individually discuss and calculate the hazard models;

select the appropriate hazard models and apply them to real-world demographic data;

understand the issues relevant in dealing with unobserved heterogeneity;

understand the methods used in the creation and analysis of duration datasets.

Course content:

The course deals with so called event history models. These are statistical techniques to analyse the occurrence of events in time, such as death, marriage, childbirth, entry into retirement etc. We cover the following topics:

Characterizing duration distributions and common parametric families

Observation schemes: censoring and truncation; estimation in parametric models

Nonparametric approaches

Basic hazard regression (proportional hazards), Cox PH model, model diagnostics

Discrete-time hazard regression, piecewise-constant hazard model; aggregate event-data

Non-proportional hazards models

Unobserved heterogeneity

Organization:

Week 1 and 3

Basic terminology & simple parametric models

Observation schemes for survival data & MLE

Piece-wise Constant hazard model Modelling aggregated data

Nonparametric estimation techniques

Hazard Regression models

Parametric proportional hazards model

Cox PH model

Week 3

Discrete-time hazard regression

Alternative regression models Unobserved heterogeneity Competing risks, multi-state models

Teaching and assessment:

The course is designed as a series of lectures and seminars. Grading is based on individual performance, via written assignments, oral presentation as well as group activities.

Readings:

Klein & Moeschberger: Survival Analysis: Techniques for Censored and Truncated Data

Collet: Modelling Survival Data in Medical Research

Kalbfleisch & Prentice: The Statistical Analysis of Failure Time Data

Rodriguez: Lecture Notes on Generalized Linear Models and on Survival Analysis

Plus selected additional reading matter

EDSD 230 Theories of demographic behavior and change (CAUSES)

Instructors: J. Vaupel, B. de Bruijn, C. Mulder, T. Bengtsson

Learning outcomes:

On a general level the student shall acquire a thorough knowledge of the theories and trends behind the causes of various demographic outcomes. Specifically students will be able to:

make use of theories to analyse changes in fertility, nuptiality, mortality and migration

make use of theories to analyse changes in long-term relationships between population development and living conditions

understand the precise mechanisms by which personal attributes, including the stage in the life course, and contextual factors, such as economic conditions and sociocultural system, affect fertility, nuptiality, mortality and migration
understand the mechanisms by which events and conditions during one stage of life affect demographic events and behaviour later in life
prove a disprove a theory using falsifiable hypotheses
present a theoretically based analysis of the complex interplay between population change and economic and social development.

Course content:

The aim of the course is to introduce students to macro-level theories of population change, micro-level theories of demographic behaviour and the micro-macro interactions. At the end of the course, students should comprehend the major theories that explain the level and timing of fertility, family formation and dissolution, the ageing of individuals and society, migration behaviour and migration systems. These theories are situated within the overarching framework of the human life course, embedded in institutional contexts that reflect economic, social, cultural and historical conditions. In addition, students should understand the demographic transition and the demographic response to situational changes such as technological change, economic development, food shortage and economic crisis. Therefore, theories explaining both the influence of population growth on economic, social, and environmental development and vice-versa are discussed. Students should be able to apply these theories to interpret data on levels and differentials in demographic change and the drivers: fertility, mortality and migration, to identify how long-term and short-term economic changes influence population behaviour as well as to understand the complex interrelationships between population and living standards by using information with details at individual and family, and household levels.

The course is divided into four modules:

Theories of fertility and the family (Bart de Bruijn)

- Major trends in fertility and the family

- Natural fertility and proximate determinants of fertility

- Demographic strategies and demographic transitions around the globe

- The impact of values, norms and economics on fertility behaviour

- The impact of gender policies, labour market policies and institutional arrangements (e.g. child care) on fertility behaviour

- Theories of the family and family dynamics (including intergenerational transfers of values, norms and resources)

Theories of mortality and morbidity (James Vaupel)

- Major trends in life expectancy, health expectancy, diseases and causes of death

- The biodemography of aging (including evolutionary-demographic theories and biodemographic diversity of mortality patterns)

- Late life legacy of very early life

- Theories of the epidemiologic transition.

- Compression and expansion of morbidity: impact of lifestyle, environmental, socioeconomic and cultural factors (including institutional factors, such as characteristics of the health care system).

Migration (Clara Mulder)

- Main theoretical approaches of migration and residential mobility, derived from various disciplines: demography, geography, economics, social psychology

- The implications of the theories for empirical research.

Historical demography (Tommy Bengtsson)

- Population and economy. The recent debate and its intellectual sources

- Population and economy. Long term macro evidence.

- The demographic transition theory revised: the mortality decline

- The demographic transition theory revised: the fertility decline

- Short-term economic stress. Macro evidence.

- Population and living standards. From macro to micro

- The demographic transition and population ageing.

Teaching and assessment:

The course is designed as a series of lectures, seminars, workshops and discussions on projects reports. Grading is based on individual performance, via written assignments, oral presentation as well as group activities.

Readings:

Theories of fertility:

Aries Ph. (1980), "Two successive motivations for the declining birth rate in the West", *Population and Development Review*, 6(4): 645-650.

Becker G. S. (1960) "An economic analysis of fertility", in *Demographic and Economic Change in Developed Countries: A Conference at the Universities - National Bureau Committee for Economic Research*, Princeton: Princeton University Press, pp. 209-231.

Bongaarts J. (1978), "A framework for analyzing the proximate determinants of fertility", *Population and Development Review*, 4(1): 105-132.

Bongaarts J., W. Mauldin, and J. Phillips (1990), "The demographic impact of family planning programs", *Studies in Family Planning*, 21(6): 299-310.

Caldwell J. (1976), "Towards a restatement of demographic transition theory", *Population and Development Review*, 2(3/4): 321-366.

Cleland J. and C. Wilson (1987), "Demand theories of the fertility transition: An iconoclastic view", *Population Studies*, 41(1): 5-30.

Coale A. (1978), "T.R. Malthus and the population trends in his day and ours." Ninth *Encyclopedia Britannica* lecture, University of Edinburgh, 1 November 1978.

Hakim 2003 - "A New Approach to Explaining Fertility Patterns: Preference Theory", *Population and Development Review*, Vol. 29, No. 3 (Sep., 2003), pp. 349-374

Henry L. (1961), "Some data on natural fertility", *The Eugenics Review*, 53(1): 81-91.

Jeon.Y. and M.P. Shields (2005), The Easterlin hypothesis in the recent experience of higher-income OECD countries: a data-panel approach. *Journal of Population Economics*, Vol. 18, No. 1, pp. 1-13.

Johnson-Hank Jennifer (2007). "Natural Intentions: Fertility Decline in the African Demographic and Health Surveys." *American Journal of Sociology*, 112: 1008-1043.

Kirk, D. (1996), "Demographic transition theory" *Population Studies*, 50(3): 361-387.

Knodel J. and E. van de Walle, (1967), "Breastfeeding, fertility and infant mortality: an analysis of some early German data", *Population Studies*, 21(2): 109-131.

Leridon H. (2006), "Demographic effects of the introduction of steroid contraception in developed countries", *Human Reproduction Update*, 12(5):603-16.

MacDonald P. (2000), "Gender equity in theories of fertility transition." *Population and Development Review* Vol. 26, No. 3, pp. 427-439.

MacDonald P. (2006), "Low fertility and the state: The efficacy of policy", *Population and Development Review* 32(3) : 485-510.

Mason, K. Oppenheim (1997), "Gender and demographic change: what do we know?" In: Jones, G.W., R.M. Douglas, J.C. Caldwell and R.M D'Souza: *The continuing demographic transition*, Oxford, Clarendon Press, pp. 158-182.

Montgomery, M. and J. Casterline (1996), "Social learning, social influence, and new models of fertility", *Population and Development Review*, 22: 151-175.

Neyer G. (2003), "Family policies and low fertility in Western Europe." MPIDR working paper WP 2003-021.

Preston S. (1978), "Introduction" in: S. H. Preston (ed), *The effect of infant and child mortality on fertility*, New York Academic Press, pp. 1-17.

Pritchett L. (1994), "Desired fertility and the impact of population policies", *Population and Development Review*, 20(1): 1-55.

Randall S, Legrand T (2003). "Reproductive strategies and decisions in Senegal: the role of child mortality", *Population-E*, 58(6): 687-715.

Riley N et J. McCarthy (2003). "The essentials of demography", in *Demography in the Age of the Postmodern*, Chap.3, Cambridge University Press, Cambridge, p.35-60.

Schneider J. and P. Schneider (1984). "Demographic transition in a Sicilian rural town" *Journal of Family History*, 9(3): 245-273.

Surkyn J. and R. Lesthaeghe. (2004), "Value orientation and the second demographic transition in Northern, Western and Southern Europe: An update", *Demographic Research*, Special Collection 3, article 3.

Van De Kaa D. J. (1987) "Europe's second demographic transition", *Population Bulletin* 1.

Van De Kaa D. J. (1996), "Anchored narratives: The story and findings of half a century of research into the determinants of fertility", *Population Studies*, 50(3): 389-432.

Van de Walle F. (1986), "Infant mortality and the demographic transition", in Coale A. and S. Watkins (eds), *The Decline of Fertility in Europe*, Princeton: Princeton University Press: pp. 201-234.

Willis R. (1987). "What have we learned from the economics of fertility?" *American Economic review*.

77(2): 68-81.

Theories of mortality:

Andersen-Ranberg, Schroll and Jeune (2001), *Healthy Centenarians do Not Exist, but Autonomous Centenarians do: A Population-Based Study of Morbidity Among Danish Centenarians*, JAGS.

Christensen, McGue, Petersen, Jeune, and Vaupel (2008), *Exceptional longevity does not result in excessive levels of disability*, PNAS.

Christensen, Doblhammer, Rau, Vaupel (2009), *Ageing populations: the challenges ahead*, *The Lancet*.

Christensen and Vaupel (1996), *Determinants of longevity: genetic, environmental and medical factors*, *Journal of Internal Medicine*.

Meslé and Vallin (2006), *Diverging Trends in Female Old-Age Mortality: The United States and the Netherlands versus*

France and Japan, Population and Development Review.

Murphy, M. (2010), Reexamining the Dominance of Birth Cohort Effects on Mortality, Population and Development Review.

Oeppen and Vaupel (2002). Broken limits to life expectancy. Science.

Oksuzyan, Juel, Vaupel and Christensen (2008), Men: good health and high mortality. Sex differences in health and aging, Aging Clinical and Experimental Research.

Rau, Soroko, Jasilionis, Vaupel (2008), Continued Reductions in Mortality at Advanced Ages, Population and Development Review.

Rostron and Wilmoth (2011), Estimating the Effect of Smoking on Slowdowns in Mortality Declines in Developed Countries, Demography.

Vallin and Meslé (2010), Espérance de vie: peut-on gagner trois mois par an indéfiniment? Population & Sociétés.

Vaupel (2010), Biodemography of human ageing, NATURE.

Vaupel and Yashin (1985) Heterogeneity's Ruses: Some Surprising Effects of Selection on Population Dynamics, The American Statistician, pp.176-185

Vaupel, Manton, Stallarci (1979), The Impact of Heterogeneity in Individual Frailty on the Dynamics of Mortality, Demography.

Historical Demography

Books

Bengtsson, T, Campbell, C, Lee, J Z et al . 2004. Life under Pressure. Mortality and Living Standards in Europe and Asia, 1700-1900. Cambridge, Ma.: MIT Press.

Tsuya, N O, Wang, F, Alter, G, Lee, J Z et al. 2010. Prudence and Pressure. Reproduction and

Human Agency in Europe and Asia, 1700-1900. Cambridge, Ma.: MIT Press. Articles

Bengtsson, T. 1992. "Lessons from the past. The demographic transition revised". AMBIO, vol. 21, no. 1, 24-25.

Bengtsson, T. 1998. "Introduction. The population debate and its intellectual sources", in Nùnez, CE. (ed), Debates and Controversies in Economic History. Madrid: Fundación Ramon Areces, Part A, 69-72.

Bengtsson, T. and Broström, G. 2011. "Famines and mortality crises in 18th to 19th century southern Sweden." Genus, LXVII (No. 2): 119-139.

Bengtsson, T. and Dribe, M. 2007. "Deliberate Control in a Natural Fertility Population: Southern Sweden 1766-1865." Demography, Vol 43-No 4, November: 727-746

Bengtsson, T and Ohlsson, R. 1994. "The demographic transitions revised" in Bengtsson, T (ed.) Population, Economy, and Welfare in Sweden. Berlin: Springer-Verlag. 13-36.

Boserup, E. 1983. "The Impact of Scarcity and Plenty on Development". Journal of Interdisciplinary History, vol. 14, no. 2, 383-407

Easterlin, R. A. 1999. How Beneficent is the Market? A Look at the Modern History of Mortality. European Review of Economic History 3: 257-294.

Galloway, P. R. 1988. "Basic Patterns in Annual Variations in Fertility, Nuptiality, Mortality and Prices in Pre-industrial Europe". Population Studies, vol. 42, no. 2, 275-302.

Hajnal, J. 1965. "European Marriage Patterns in Perspective", in Glass, D.V. and Eversley, D.E.C, (eds), Populations in History. Essays in Historical Demography. London: Edward Arnold.

Laslett, P. 1972. "Mean household size in England since the Sixteenth Century", in Laslett, P and Wall, R. (eds), Household and family in the past. Cambridge: Cambridge University Press.

Lee, R. D. 1981. "Short-term variation: vital rates, prices and weather", Chapter 9 in Wrigley, E. A. and Schofield, R. S. (1981) The Population History of England 1541-1871. A reconstruction. London: Edward Arnold.

Lee, R.D. 1990. "The Demographic Response to Economic Crisis in Historical and Contemporary Populations". Population Bulletin of the United Nations, no. 29, 1-15.

Malthus, T. 1803. An Essay on the Principle of Population, 2nd ed., Winch, D. (ed.). Cambridge: Cambridge UP, 13-29

McKeown, T. R. G. Brown and R. G. Record 1972. An Interpretation of the Modern Rise of Population in Europe. Population Studies 26: 345-382.

Schofield, R. 1985. "English Marriage Patterns Revised", Journal of Family History, Spring. Pp 2-20.

Wrigley, E. A. and Schofield, R. S. 1981. The Population History of England 1541-1871. A reconstruction. Chapters 7, 10 and 11. London: Edward Arnold.

Migration:

Sjaastad, L. A. (1962). The costs and returns of human migration. *Journal of Political Economy*, 70(5, Part 2: Investment in Human Beings), 80-93.

De Jong, G. F., & Fawcett, J. T. (1981). Motivations for migration: An assessment and a value-expectancy research model. In G. F. De Jong & R. W. Gardner (Eds.), *Migration decision making. Multidisciplinary approaches to microlevel studies in developed and developing countries* (pp. 13-58). New York: Pergamon Press.

Mulder, C. H., & Hooimeijer, P. (1999). Residential relocations in the life course. In L. J. G. Van Wissen & P. A. Dykstra (Eds.), *Population issues: An interdisciplinary focus* (pp. 159-186). New York: Plenum.

Cooke, T. J. (2008). Migration in a family way. *Population, Space and Place*, 14(4), 255-265.

Mulder, C. H., & Cooke, T. J. (2009). Family ties and residential locations. *Population, Space and Place*, 15(4), 299-304.

EDSD 240 Population data and summary measures (DATA)

Instructors: M. Barbieri, A. Esteve, M. Luy, M. Pechholdova, A. Bailey/Monika Mynarska

Learning outcomes:

On a general level the student shall acquire practical knowledge of the use and calculation of

summary measures using various data sources. Specifically students will be able to:
individually discuss and calculate basic summary measures
link fertility and mortality laws to population dynamics
use multistate life tables, compare standardization methods
understand the methods used in working with incomplete data
work on building and using consistent time series
use heterogeneous information in a consistent way
understand and discuss qualitative approach in demography

Course content:

The course is divided into five modules:

Basic Summary Measures (Magali Barbieri)

The most often used basic summary measures are described, as well as their strengths and shortcomings. The implicit hypotheses behind the calculations are made explicit. The following concepts and tools are presented and discussed: crude rates, age-specific rates, summary indices based on rates of the 1st kind or the 2nd kind, net and gross probabilities, population change during one year and reproduction from one generation to the next, life table indexes, multiple-decrement life table, multistate life tables, methods of standardization, heterogeneity of populations, period and cohort summary indexes, compositional and tempo effects in period measures.

Working with Incomplete or Inaccurate Data (Marc Luy)

In many countries fully developed administrative systems are lacking and thus accuracy of reporting and classification of demographic events cannot be assumed. During the last 50 years indirect estimation techniques have been developed to overcome such limitations and to provide adequate measures of demographic processes in situations in which direct measures were too inaccurate to be informative. The methods can be divided into two broad groups. One group uses consistency checks between different measures of the same underlying phenomenon to explore likely accuracy, and then applies simple models of data errors to arrive at plausible corrections ("semi-direct methods"). The second group uses robust indicators of an underlying phenomenon, even though the indicator may be affected by other factors ("indirect methods"). Over the course of three sessions, for both semi-direct and indirect methods, one example for estimating adult mortality is presented in detail.

Causes of death: collection, classification, analysis (Markéta Pechholdová)

This module begins with a history of the collection and classification of causes of death, and then moves on to discuss the current systems in use today. Problems related to choice of the cause of death, axes of classification, problems of comparability in time and space are discussed. The topics are illustrated through discussion of various real-world situations.

Data collection and sources of demographic data (Albert Esteve)

This module deals with sources of demographic data such as censuses and registers, illustrating the importance of administrative records in secondary analysis. The module then moves on to demographic and social surveys, from questionnaire construction, through data reliability issues, and on to analysis. The module concludes with a discussion of data comparability and the harmonization of various data sources.

Qualitative Methods (Ajay Bailey/Mynarska)

This module addresses both theoretical and practical aspects of the qualitative approach. It covers following topics: Limits of quantitative data, Qualitative concepts, Methods of qualitative data collection, Analysis of qualitative data, Integration of qualitative and quantitative research.

Teaching and assessment:

The course is designed as a series of lectures and seminars. Grading is based on individual performance, via written assignments, oral presentation as well as group activities.

Readings:

Keyfitz Nathan, Caswell Hai, 2005, *Applied Mathematica! Demography*. Third edition. Springer, 555 p.

Preston Samuel, Heuveline Patrick, Guillot Michel, 2001, *Demography. Measuring and Modelling Population Processes*. Blackwell, 291 p.

Population & Societies. A four pages monthly journal available at www.ined.fr

Caselli (Graziella), Vallin (Jacques) et Wunsch (Guillaume) (éd.), 2006. *Demography analysis and synthesis. A treatise in demography*. Amsterdam, Boston, Elsevier/Academic Press, 4 volumes, xxiv + xii + 655, xx+465, xxii + 657, xxiv + 977 p.

Basic Summary Measures

Brouard N., 1980, "Espérance de vie active, reprise d'activité féminine : un modèle", *Revue économique*, 31 (6) : 1259-1287.

Caselli Graziella, Vallin Jacques, Wunsch Guillaume, *Demography: Analysis and Synthesis. A Treatise in Population*

Studies. Elsevier, Academic Press. Especially Ch. 8: Rates, Frequencies, and Probabilities. Ch. 9: Competing Risks, Independence, and Continuity, G. Wunsch

Preston Samuel H., and Hai don g Wang, 2007. Intrinsic Growth Rates and Net Re production Rates in the Presence of Migration. *Population and Development Review*, 33(4): 357-666

Ortega José Antonio, and Luis Alberto del Rey, 2006, Birth Replacement Ratios in Europe: 1960-2000. EAPS European Population Conference, Liverpool 2006.

<http://epc2006.Princeton.edu/download.aspx?submissionId=60203>. See also PAA 2007.

Hoem, Jan M., and Michaela Kreyenfeld, 2006, "Anticipatory analysis and its alternatives in life-course research. Part 1: Education and first childbearing. Part 2: Marriage and first birth". *Demographic Research*, Vol. 15; articles 16: 461 - 484 and 17: 485 - 498.

Toulemon Laurent, 2006, "Fertility Among Immigrant Women and Men in France: A New Approach for New Data", Population Association of American 2006 Annual Meeting, Los Angeles, California, March 30-April 1, 2006. Session 102: New Ways of Looking at Fertility Measurement Challenges, 19 pages.

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EDSD 250 Modelling, simulation and forecasting (MODELLING)

Instructors: M. Sanchez Romero, T. Fent, D. Ediev, G. Abel

Learning outcomes:

On a general level the student shall acquire practical knowledge of the modelling, simulation and forecasting of various populations. Specifically students will be able to:

- analyse the dynamics of age-structured and of interacting populations
- critically discuss the fundamentals of the demographic dividend literature
- project future populations using the cohort component approach
- learn how to obtain jump off data for projections and define scenarios in terms of aggregate indicators and apply demographic models in order to obtain age-specific rates
- apply household projection methods
- individually simulate multi-state populations
- discuss the fundamentals of microsimulation models

Course content:

The course is divided into three modules:

Modelling and Simulation

This module is divided in two parts. First, students get acquainted with the matrix notation, and learn about modelling and simulation of nonlinear-interacting populations. They have to program population projections and the dynamics of interacting populations, such as susceptible-infectious-recovered populations, using R and learn about the stable population model through numerical simulations. The second part focuses on learning the main theories and concepts about how population dynamics impact on economic growth.

Population Forecasting

This is a “hands-on” module in which the students carry out a forecast of a chosen country, region, or sub-population using functions create in R. In the process the students learn to acquire jumpoff data for the population of interest, and develop justifiable future assumptions to match their own research questions. They learn how to use these models in the framework of cohort component population projections and visualise the results using dynamic population pyramids.

Based on population projection and using extension of the headship rates method, students should be able to implement household projection for the chosen population.

Microsimulation

This module is designed as a series of lectures with special emphasize on “real life” examples and practical simulation exercises. Students acquire a basic knowledge of microsimulation and its various aspects including statistical modelling and modelling options, advantages and disadvantages compared to other approaches, model types, existing microsimulation applications, and the technical implementation of microsimulation models. The course uses the demographic teaching model RiskPaths which is implemented in the microsimulation programming language Modgen. Students explore RiskPaths from three perspectives: the underlying statistical models, the use of the microsimulation model, and the programming of the model.

Teaching and assessment:

The course is designed as a series of lectures and seminars. Grading is based on individual performance, via written assignments, oral presentation as well as group activities.

Readings:

Modelling and Simulation

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EDSD 260 Consequences of demographic change (CONSEQUENCES)

Instructors: P. Bocquier, G. Caselli, G. De Santis, K. Scott, C. Tomassini, D. Vignoli

Learning outcomes:

On a general level the student shall acquire advanced knowledge of the economic and social consequences of demographic processes. Specifically students will be able to:

- individually discuss various aspects of population change as its impacts for growth and development prospects in both developed and developing countries;
- discuss various aspects of population ageing and explain its effects for intergenerational transfers, labour market, health and care arrangements, and pension systems;
- discuss how varying cohort sizes may affect individual welfare;
- demonstrate an understanding of how families and living arrangements evolve over the past century;
- understand relations between family change, labour market developments, gender roles and welfare regime;
- discuss the impacts of migration on population dynamics, demographic structures and economic performance of both receiving and sending countries.

Course content:

The course on Consequences of Demographic Change discusses multifaceted impacts of demographic change on the society, the economy and social institutions. The main themes to be covered during the course and the time allocation across themes are:

Ageing:

consequences for labour market, social security (including social support) and health care, as well as for family networks – six class hours,

Families:

impact of demographic change on family structure, family life (work, care) and relationships between family members (includes gender issues, companionship, marriage concept, etc.) – eight class hours,

Migration and integration:

contribution to population change; the diversity that comes with migration, incorporating innovation potential and (perceived) threat to social cohesion ('unity in diversity') – eight class hours,

Population and development:

relations between demographic change, economic growth and development in developed countries and developing countries (labour market, investments, productivity, sustainable public finance) –14 class hours. That theme is divided into two modules to discuss population and development issues for developed and developing countries separately:

- Module I on developed countries - six class hours,
- Module II on developing countries – eight class hours.

Each theme should be covered in a historical perspective and an international comparative perspective. Students should receive both a general knowledge about main consequences of demographic change, making a distinction between developed and developing countries, and more detailed insights in policy responses in Europe, in particular policy reform across the EU.

Teaching and assessment:

The course is designed as a series of lectures and seminars. Students should write two term papers to receive a grade: one on a topic of their choice related to one of the three themes: Ageing, Families and Migration and Integration, and one on a topic of Population and Development. A final grade might include also evaluation of individual performance during the course.

Readings:

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- Soons, J.P.M., Kalmijn, M., 2009, Is Marriage More Than Cohabitation? Well-Being Differences in 30 European Countries, *Journal of Marriage and Family* 71: 1141 – 1157
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- Matysiak A., Vignoli D., 2008, Fertility and women's employment: a meta-analysis, *European Journal of Population* 24:363–384
- Adserà, A., 2004, Changing fertility rates in developed countries: The impact of labor market institutions. *Journal of Population Economics* 17: 17-43.
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3.1.3 Research seminar

The research seminar (EDSD 300) runs together with the core courses for a period of 8.5 months (see Figure 1). It consists of a **Thesis course** and a **colloquium series** (2 hours /week).

Thesis course

Instructors: Alessandra De Rose & Cristina Giudici

Learning outcomes:

Students will be able to:

- identify a relevant research question
- frame the research aims and goals of an independent doctoral study
- prepare a well-structured thesis proposal
- present a written report, in accordance with academic standards
- discuss a research report on the basis of academic standards
- prepare a scientific poster

- write a well-structured scientific paper, chose an appropriate journal to submit the paper to, make revisions to the paper according the peer reviews

Course content:

The student has to define a research issue, carry out research, write and present a dissertation (thesis proposal or research paper) independently, although with support from a supervisor. At an early stage a supervisor will be allotted to the student on the basis of her/his area of interest. Well before the actual period of the thesis work a series of preparatory seminars will be held, where the students present ideas and plans for the research. It is the task of the supervisor to support the development from idea to plan, and thereafter to stimulate and criticize the student's work.

Teaching and assessment:

Teaching takes place primarily through individual supervision and discussions in the student group at seminars, at different phases of the project, led by the course leaders. Throughout the writing process the student can consult her/his supervisor for advice, feedback and criticism. The final grade will consist of assessment of the final presentation of the student's work (30% of the final grade) and of assessment of the thesis proposal/ research paper (70% of the final grade). The final presentation and the written work (a 25-30 page paper) will be assessed by a Committee formed by both the course leaders and two other scholars. The final grade will take into account both the individual work and the level of participation to lectures and to the other students' paper discussion.

About three/quarters of the sessions of the Thesis course are dedicated to presentations by the students of their final EDSD work, that can be a research paper or a dissertation chapter related to their PhD project. The students present their work four times, the first time at the end of December or beginning of January: they prepare a one or two pages project that is circulated to their mentors (both the local one and the mentor in the institution which fund the student). The second time between February and April, they present the topic and the content of their research project in groups of 4 to 5. The public are the other students, who also play an active role as discussant, and the local mentors. The draft of the final work is presented in May and June to a more general public, including Department's scholars and researchers. Finally, they defend their Master thesis by the end of July.

All the EDSD students receive advice from their mentors. The sponsoring institution designates - usually among its staff - a senior researcher who will be in charge of supervising the research project of the student. In addition to that, the Dean of the school designates a "local" mentor for all the students. Mentors and students are matched according to their research interests. The mentors should help the student elaborating his/her EDSD thesis and PhD project and finding fellowship to continue their PhD once EDSD is finished. The "local" mentor should also facilitate the integration of the student in the hosting institution and help mainly with the EDSD final work. The Thesis course also emphasizes the practical, ethical and organizational aspects of research. Students learn "professional skills": how to make a research presentation, how to make a map, how to use census micro-data, etc.

Colloquium series (Elena Ambrosetti&Viviana Egidi)

Students are expected to attend a series of lectures given by invited researchers. These lectures are designed to provide students with an overview of research and methods in the field of demography. The lecturers come from demography and related disciplines thereby providing students with a multidisciplinary perspective. At the MPIDR these lectures were opened to all the members of the institute as well as to other people. At Sapienza the audience is also open to the Department staff and to the rest of the academic community.

In addition, since the Thesis Course involves the Dean and one of the Vice Dean, and the Colloquium Series the other Vice Dean, this course provides an opportunity to maintain a permanent contact with the students.