

# University of Chicago

Syllabus

## Sociology 219/319 Biodemography of Human Mortality and Longevity

Spring 2001  
Wednesday, 3:00-5:50  
Cobb Lecture Hall, 5811-27 S. Ellis Ave. Room 214

Dr. Leonid A. Gavrilov, Ph.D. (concepts and theories in biodemography)  
Dr. Natalia S. Gavrilova, Ph.D. (methods of data analysis in biodemography)  
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**Course Description:** This course is a broad overview of biodemographic ideas, models, methods, and findings regarding human aging, mortality, and longevity. Topics include the construction and analysis of life tables, mortality laws, gender differences in life span, the limits to human longevity, mathematical theories of human aging and mortality, genetics and evolution of human life span, similarities and differences between human and animal mortality patterns. The course is intended to provide students with general understanding of the driving forces behind mortality trends and differences.

**Textbook:** The course largely follows the following book:

Gavrilov L.A., Gavrilova N.S. *The Biology of Life Span: A Quantitative Approach*, NY: Harwood Academic Publisher, 1991, 385p.

[http://catalog.gbhap-us.com/fc3/catalog?/books/TITL\\_PBPUBREC\\_0001583](http://catalog.gbhap-us.com/fc3/catalog?/books/TITL_PBPUBREC_0001583)

<http://www.amazon.com/exec/obidos/ASIN/3718649837/>

Selected chapters will be assigned each week. The text of updated chapters of the book will be disseminated prior to each lecture.

**Additional reading** on biodemography includes:

1. *Biodemographic Perspectives on Human Longevity*. Population, Special Issue. 2001, vol.13-1.

<http://www.ined.fr/englishversion/publications/population/englishselection/>

2. *Sex and Longevity*. J.-M.Robine, T.B.L.Kirkwood, M.Allard (eds). Springer-Verlag, Berlin, 2000.

<http://www.amazon.com/exec/obidos/ASIN/3540677402/>

[http://www.springer.de/cgi-bin/search\\_book.pl?isbn=3-540-67740-2](http://www.springer.de/cgi-bin/search_book.pl?isbn=3-540-67740-2)

3. Wachter K.W., Finch C.E. *Between Zeus and the Salmon. The Biodemography of Longevity*. Washington, D.C.: National Academy Press, 1997.

Available at: <http://www.nap.edu/catalog/5740.html>

**Methods of mortality analysis in demography** are described in the following publications:

1. Preston, S.H., Heuveline P., Guillot M. 2000. *Demography*. Blackwell Publishers.
2. Bogue, D.J., Arriaga E.E., Anderton, D.L. 1993. *Readings in population research methodology*. Vol.2. Chicago: Published for the United Nations Population Fund by Social Development Center. (available at the NORC library, [Reg. HB850.R395]).

Additional recommended reading will be provided before the each lecture. Some of the recommended articles could be found at our website:

<http://www.src.uchicago.edu/~gavr1/>

### **Course Grading:**

The course grade will be based on one mid-term problem set (40%) and one 3-5 page written report (60%) on assigned human mortality/longevity topic.

### **Course Schedule:**

#### **Lecture #1**

Introductory lecture. Why it is necessary to study life span. Short history of the subject.

Present state of the aging and longevity studies.

Methods of life span studies. The life table and its functions. Human lifespan. Cohort versus cross-sectional approach. Demographic life tables. Demographic indicators of mortality.

#### **Lecture #2**

In search of the mortality law. Gompertz law of mortality. Mathematical functions (laws) describing life span distribution.

Regularities of human mortality. Mortality laws proposed for description of human mortality. Biological and social characteristics of human life span. Historical changes of life span in developed countries.

#### **Lecture #3**

Evolution and longevity. Review of existing theories.

Brief review of existing theories of aging. Aging: a self-destruction program or wear and tear?

#### **Lecture #4**

Epidemiological approach to the biology of the human lifespan. Brief review of main factors that influence human lifespan (behavioral, social, environmental, nutritional, physiological, etc.).

Early life events and human mortality in later life. Parental age at reproduction and human longevity. Season-of-birth effects. Other approaches.

Additional reading:

Gavrilov L.A., Gavrilova N.S.

"SEASON° OF° BIRTH° AND° HUMAN° LONGEVITY"

Journal of Anti-Aging Medicine, 1999, 2(4): 365-366.

<http://www.liebertpub.com/jaa/default1.asp>

**Lecture #5**

Statistical methods of the survival analysis. The survival function and its confidence limits. Censoring. Design of the survival experiments.

Comparison of the survival curves. Statistical tests: Log-rank, Gehan-Breslow and Kolmogorov-Smirnov tests. Cox proportional hazard model. Frailty models of mortality.

**Lecture #6**

Causes of death and methods of their analysis. Multiple-decrement and cause-elimination life tables. Analysis of morbidity and disability. Health expectancy and disability-free life expectancy.

Data resources for studying mortality and longevity.

**Lecture #7**

Gender differences in lifespan. Do females live longer than males?

Prospects for human life span extension. Population aging and its causes. Different approaches to forecasting the life expectancy and the expected number of elderly people in the United States.

**Lecture #8**

Interspecies differences in lifespan. Species-specific life span. Is there a species-specific life span limit?

Mortality crossover effect and compensation effect of mortality. Studies of exceptional longevity. Construction of life tables for advanced ages.

**Lecture #9**

Genetics of human longevity. Methods of genetic studies.

Reliability theory and aging studies. Mathematical models of life span.

**Lecture #10**

Experimental studies of lifespan. Genes that increase longevity in lower organisms. Experimental life extension: caloric restriction, hypothermia, antioxidants. Experiments on cell cultures.

Discussion of students' reports. Discussion on the perspectives of human lifespan extension.