Jan 6 2018
Gerontology 613 **Semester**: Spring 2018 **Room**: Gero 125
Health and Aging

Day and times: Tuesday 9-11:50

Class documents are available on Blackboard.

Scheduled Course Exams:
Midterm – March 29th
Final – Tuesday May 8th – 8-10 AM

Instructors: Professor Eileen M. Crimmins 213-740-1707
218D Andrus Gerontology Center crimmin@usc.edu
Office Hours: Tuesday 1-2; or by appointment

Professor Caleb Finch 213-740-1756
325 Andrus Gerontology Center cefinch@usc.edu
Office Hours: Thursday, 10-11; or by appointment

Course Description: This course is a seminar intended for Ph.D. and postdoctoral students with an interest in health issues affecting older persons. The course examines changes in health related to age, changes in health in populations over time, and the key health issues facing older persons. Students will be expected to master issues in the biology and biodemography of aging based on an interdisciplinary bio-psycho-social approach.

Course Objectives: At the end of the course the student will:

1. Be able to knowledgeably describe the major health problems affecting people of different ages and in different cohorts. The student will have detailed knowledge about the causes of a number of major health problems of middle age and older adulthood.

2. Understand how evolutionary forces shape age structures and health characteristics of populations.

3. Have knowledge of the biological, social, behavioral and psychological factors and mechanisms relate to a number of specific health outcomes.

4. Have knowledge of methods and issues faced in doing research on health using both a biological and a psychosocial perspective on health.

Class Format: The class will focus on discussion of the current state of knowledge in areas relevant to health. Class meetings should be participatory. All students should have read the assigned material before the class and be prepared to discuss the material. If in reading papers, you find gaps in your knowledge, you should fill in with textbooks and sources that fill these gaps. Individual students will be assigned to lead the discussion of class readings.

This class fulfills a basic requirement in the Ph.D. curriculum in Gerontology and is intended to provide some students with an opportunity to discuss topics that could be covered on the qualifying exam. Students should use the opportunity of the class to prepare themselves for questions in the areas of health and biology.

Class members should be looking for current research findings and news items with relevant material. Sharing of relevant current material with other class members is an important part of learning. This class should prepare students for thoughtful and critical evaluation of health and longevity.

Assignments and Grading: Members of the class will be expected to prepare a weekly 2 page answer (including references, 11 pt font, ½ inch margins) to a question of the day for 10 class days. Questions are listed before the readings for each week. Use the 2 pages to provide and answer with a clear point of view and end by indicating what research needs to be done to provide a definitive answer.

Students will be responsible for preparing to present important points from the reading material in class. Each student should be prepared to actively participate and to expect to be fully prepared for each class.

There will be two tests. Questions on tests will generally be short answer essay questions similar to those that have been prepared for each week or analytic problems. They will include questions on readings, course lectures, and class discussion.

The 10 papers will be worth 30 points and the class participation will be worth 20 points. Each of the tests will be graded as 25 points.

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs each semester. A letter of verification for approved accommodations must be obtained from Disability Services, and delivered to the instructors as soon as possible. Disability Services is located at STU 301, phone 213-740-0776.

Reading Material: Most of the reading material for this class is available on Blackboard.
We have selected material that is available to you through USC's electronic resources. Many of them can be gotten directly from the source but we have made it easier to find them by putting them on the website. Additional readings on the website are either not copyrighted (e.g. US Government publications) or they were written by one of the instructors.

An additional reference is available in the Bookstore:
Finch, CE (2007): The Biology of Human Longevity (Academic Press)

Class Schedule

Class 1 - January 9 – Overview of Course
Introduction to Biological Theories of Aging and Sociodemographic Models of Aging

Class 2 - January 16 –Mortality in human and Other Populations

Class 3 - January 23–Evolution of Longevity and Life History

Class 4 – January 30 – Healthspan and determinants in Populations

Class 5 - February 6 – Lifecycle Influences on Health: Inflammation, Infection and Longevity

Class 6 - February 13 – Genetics of Longevity

Class 7 - February 20 – Influences of Social Environment, Socioeconomic and Race/Ethnic Differences on Aging (Finch out)

Class 8 – February 27 - Cardiovascular Disease and Aging

Class 9 - March 6 **– Midterm exam**

Spring Break March 13

Class 10 - March 20 - Cognition and Aging

Class 11 - March 27 – Gender Differences in Aging, Sex Hormones and

Class 12 - April 3 – Health Behaviors: Obesity. Exercise and Alcohol and Aging

Class 13 - April 10 – Physical Environments and Aging

Class 14 - April 17 **–** Biomarkers of Stress, Health and Aging.

Class 15 – April 24 – Aging and Longevity in the Future

Final Exam – May 8th - 8-10 AM

Reading Assignments

Class 1 Jan 9 Introduction and Overview of course
The Biology of Aging and Sociodemographic Models of Aging, Crimmins & Finch

Finch CE, Crimmins EM. 2016 Constant molecular aging rates vs. the exponential acceleration of mortality. Proc Natl Acad Sci 113(5):1121-3. PMID: 26792520;

Melov S. 2016. Geroscience approaches to increase healthspan and slow aging. F1000Res. pii: F1000 Faculty Rev-785. PMID: 27158475;

Riera CE, Dillin A. 2015. Tipping the metabolic scales towards increased longevity in mammals. Nat Cell Biol. 17:196-203. PMID: 25720959.

Crimmins and Seeman, 2004. Integrating biology into the study of Health disparities. Pop Devel Rev 30: 89-107.

Uhlenberg, P. 2005. Demography of Aging, 2005, Chapter 5, In Handbook of Population, Eds, D Poston, M Micklin.

Glass T, Goodman S, Hernan M, Samet J 2013. Causal Inference in Public Health. Ann Rev Pub Health 34: 61-75.

Vaupel, James W. 2012. "Biodemography of Human Ageing." *Nature*, 464(25): 536-542.

Class 2 Jan 16, Mortality in Populations (Human & other species), Crimmins & Finch

Question: *How do biological and sociodemographic theories or models explain age patterns of mortality?*

Finch CE, Beltrán-Sánchez H, Crimmins EM. 2014. Uneven futures of human lifespans: reckonings from Gompertz mortality rates, climate change, and air pollution. Gerontology. 60:183-8. PMID: 24401556.

Finch CE, Pike MC. 1996.Maximum life span predictions from the Gompertz mortality Model. J Gerontol A Biol Sci Med Sci. 51:B183-94. PMID:8630694.

Ruby JG, Smith M, Buffenstein R. 2018. Naked mole-rat mortality rates defy Gompertzian laws by not increasing with age. 09-08-2017-SR-eLife-31157R1.

Crimmins E et al. 2011. Divergent Trends in Longevity in High-Income Countries, National Research Council, Washington, D.C.

Crimmins, E. 2015. Lifespan and Healthspan: Past, Present and Promise. The Gerontologist. Nov 10. pii: gnv130. PMID: 26561272.

Class 3 Jan 23, Evolution of longevity and life history, Finch

Question: Why do mice live 3 years and humans 90?

Ricklefs and Finch 1995 AGING: A NATURAL HISTORY, Ch. 7, Evolution of Aging.

Finch 2007, Biology of Human Longevity, Chapter 6.

Austad SN, Finch CE. 2016. Human life history evolution: new perspectives on body and brain growth. In: On Human Nature: Evolution, Diversity, Psychology, Ethics, Politics and Religion, Eds. M Tibayrenc, FJ Ayala, 221-234.

Finch CE. 2010. Evolution of the human lifespan and diseases of aging: Roles of infection, inflammation, and nutrition. Proc Natl Acad Sci USA. 107 (supplement 1) 1718-1724.

Hooper PL, Gurven M, Winking J, Kaplan HS. 2015. Inclusive fitness and differential productivity across the life course determine intergenerational transfers in a small-scale human society. Proc Roy Biol Sci B. 282:20142808.

Rodríguez JA et al 2017 Antagonistic pleiotropy and mutation accumulation influence human senescence and disease. Nat Ecol Evol. 1(3):55.PMID: 28812720.

Class 4 Jan 30, Healthspan in Populations, Crimmins & Finch

Question: *How is it possible to have lengthening life and deteriorating health at the same time?*

Bektas A, Schurman SH, Sen R, Ferrucci L. Aging, inflammation and the environment. Exp Gerontol. 21. pii: S0531-5565(17)30779-9. PMID: 29275161.

Crimmins EM, Levine M. 2015. Current Status of Research on Trends in Morbidity, Healthy Life Expectancy, and the Compression of Morbidity. Handbook of the Biology of Aging, 2016, chapter 18, pp. 495–505.

Kryscio RJ et al 2017. Association of Antioxidant Supplement Use and Dementia in the Prevention of Alzheimer's Disease by Vitamin E and Selenium Trial (PREADViSE). JAMA Neurol. 4(5):567-573.

Gruber J, Halliwell B. 2017. Approaches for extending human healthspan: from antioxidants to healthspan pharmacology. Essays Biochem. 61(3):389-399. PMID: 28698312.

Rana A et al. 2017. Promoting Drp1-mediated mitochondrial fission in midlife prolongs healthy lifespan of Drosophila melanogaster. Nat Commun. 8(1):448. PMID: 28878259.

Class 5 Feb 6, Lifecycle Influences on Health: Inflammation, Infection and longevity Crimmins & Finch

Question*: How could the links between early life and late life health change over time?*

Crimmins EM and Finch CE. 2006. Infection, Inflammation, Height, and longevity. PNAS 103: 498-503.

Belsky DW et al 2017. Impact of early personal-history characteristics on the Pace of Aging: implications for clinical trials of therapies to slow aging and extend healthspan. Aging Cell. 16:644-651

Mazumder B, Almond D, Park K, Crimmins EM, Finch CE (2009) Lingering prenatal effects of the 1918 Influenza Pandemic on cardiovascular disease. J Devel Origins Health Dis 1: 1-9

Brand MP, Peeters PH, van Gils CH, Elias SG. 2017. Pre-adult famine exposure and subsequent colorectal cancer risk in women. Int J Epidemiol. 46(2):612-621. PMID: 27585673.

Power, C, Kuh, D, Morton, S. 2013. From Developmental Origins of Adult Disease to Life Course Research on Adult Disease and Aging: Insights from birth Cohort Studies. Ann Rev Public Health. 34: 7-28.

Montez, J, Hayward, M. 2011. Early Life Conditions and Later Life Mortality. In (Rogers and Crimmins), International Handbook of Adult Mortality. Pp. 187-206.

Class 6 Feb 13, Genetics of Longevity and Health, Finch

Question*: How important are genetic factors in human longevity?*

Finch CE, 2007.The Biology of Human Longevity, Ch 5 Genetics, pp 306-314, 357-369.

Levine ME, Crimmins EM. 2015. A Genetic Network Associated With Stress Resistance, Longevity, and Cancer in Humans. J Gerontol A Biol Sci Med Sci. pii: glv141 PMID: 26355015

Longo VD, Finch CE. 2003 Evolutionary medicine: from dwarf model systems to healthy centenarians? Science 299:1342-6.

Joshi PK, et al 2017. Genome-wide meta-analysis associates HLA-DQA1/DRB1 and LPA and lifestyle factors with human longevity. Nat Commun. 8(1):910. PMID: 29030599;

van Exel E et al 2017 Effect of APOE ε4 allele on survival and fertility in an adverse environment. PLoS One. 12(7):e0179497. PMID: 28683096.

Class 7 Feb 20, Socioeconomic Factors, Race and Health Outcomes, Crimmins

Question: How do race and SES intersect to affect health change with age?

Finch CE, Singer B 2014. Pathways of survival and social structure during human transitions from the Darwinian world. In: Advances in Biodemography: Cross-Species Comparisons of Social Environments and Social Behaviors, and their Effects on Health and Longevity. National Academies Press, pp. 146-167.

Adler, N et al. 1993 Socioeconomic Inequalities in Health, JAMA 269:3140-5.

Crimmins, E., Jung Ki Kim, Teresa E. Seeman. 2009. Poverty and Biological Risk: The Earlier "Aging" of the Poor," J Gerontol: Med Sci 64: 286-92. PMID: 19196637

Hayward, M, Crimmins, E, Miles, T, & Yang, Y. 2000 The significance of socio-economic status in explaining the race gap in chronic health conditions. Am Sociol Rev 65: 910-30.

Seeman, T., S. Merkin, E. Crimmins, B. Koretz, S. Charette, A. Karlamangla. Education, Income and Ethnic Differences in Cumulative Biological Risk Profiles in a National Sample of US Adults: NHANES III (1988-1994). 2008. Social Science Med, 66, 72-87.

Levine ME, Crimmins EM. 2015. Evidence of accelerated aging among African Americans and its implications for mortality. Soc Sci Med. 118:27-32.

Class 8 Feb 27, Cardiovascular Disease and Aging, Crimmins & Finch

Question: What biological. social, and behavioral factors are important risk factors for CVD?

Beltrán-Sánchez H, Finch CE, Crimmins EM. 2015 Twentieth century surge of excess adult male mortality. PNAS. 112:8993-8. PMID: 26150507.

Finch CE. 2010. Inflammation in aging processes: an integrative and ecological perspective. In, Handbook of the Biology of Aging, 7th ed., E Masoro & S Austad, eds, Academic Press: San Diego), pp. 275-296.

Pothineni NVK et al 2017. Infections, atherosclerosis, and coronary heart disease. Eur Heart J. 38:3195-3201.

Kaplan H et al 2017 Coronary atherosclerosis in indigenous South American Tsimane: a cross-sectional cohort study. Lancet. 389(10080):1730-1739. PMID: 28320601.

Lakatta EG. 2015. So! What's aging? Is cardiovascular aging a disease? J Mol Cell Cardiol. 83:1-13.

Paynter, N. et al. 2010. Association Between a literature Based Genetic Risk Score and Cardiovascular Events in Women JAMA ;303(7):631-637

Krantz, D.S., McCeney, M.K. Effects Of Psychological And Social Factors On Organic Disease: A Critical Assessment of Research on Coronary Heart Disease, Annu. Rev. Psychol. 2002. 53:341–69.

Class 9 – Mar 6: Midterm Exam

March 13 – Spring Break

Class 10 - March 20, Cognition and Aging, Crimmins & Finch

Question: The Age 60 Rule: the FAA requires commercial pilots to retire at age 60. Is this justified?

Institute of Medicine. *Cognitive Aging: Progress in Understanding and Opportunities for Action*. Washington, DC: The National Academies Press, 2015. doi:10.17226/21693

Finch CE. 2009. The neurobiology of middle-age has arrived. Neurobiol Aging. 30:515-20;

Cook CJ, Fletcher JM. 2015 Can education rescue genetic liability for cognitive decline? Soc Sci Med 127:159-70.

Crimmins, E. et al. 2011. Assessment of Cognition Using Surveys and Neuropsychological Assessment: The Health and Retirement Study (HRS) and the Aging, Demographic and Memory Study (ADAMS), Journal of Gerontology; Psychological Sciences and Social Sciences. 66: i162-i171.

Griffith HR et al 2013. Lower hippocampal volume predicts decrements in lane control among drivers with amnestic mild cognitive impairment. J Geriatr Psychiatry Neurol.26:259-66.

Kumar DK et al 2016. Amyloid-β peptide protects against microbial infection in mouse and worm models of Alzheimer's disease. Sci Transl Med. 8(340):340ra72. PMID: 27225182;

Ailshire J Crimmins E. 2014. Fine Particulate Matter Air Pollution and Cognitive Function among Older U.S. Adults. Am J Epidemiol. 180(4):359-66. PMID: 24966214.

Class 11 Mar 27, Gender Differences in Aging and Sex Hormones as an Intervention into Aging, Crimmins & Finch

Question: *What are the biological & social underpinnings of gender differences in health and mortality*

Beltrán-Sanchez H, Finch CE, Crimmins EM. 2015. The 20th Century surge of excess adult male mortality. PNAS 112:8993-8998

Espeland MA et al 2015. WHIMS-MRI2 Study Group. Postmenopausal hormone therapy, type 2 diabetes mellitus, and brain volumes. Neurology. 85:1131-8.

Finch CE, Shams S. 2016. Apolipoprotein E and Sex Bias in Cerebrovascular Aging of Men and Mice. Trends Neurosci. 39(9):625-37. PMID: 27546867

Hodis HN et al. 2016. Vascular Effects of Early versus Late Postmenopausal Treatment with Estradiol. N Engl J Med. 374(13):1221-31. PMID:27028912;

Karim R et al. 2011 Hip fracture in postmenopausal women after cessation of hormone therapy: results from a prospective study in a large health management organization. Menopause. 18:1172-7.

Rieker P, Bird C. 2005. Rethinking Gender Differences in Health: Why We Need to Integrate Social and Biological Perspectives. *The Journals of Gerontology: Series B*, V 60, Pp. S40–S47.

Class 12 April 3, Diet, Exercise, Alcohol and Aging, Crimmins & Finch

Question: What behaviors do you recommend for optimizing to live a long and healthy life?

Allison DB, et al 1997 Body mass index and all-cause mortality among people age 70 and over: Longitudinal Study on Aging. Int J Obesity Related Metab Disord 21: 424-31.

de Andrade LP et al 2013. Benefits of multimodal exercise intervention for postural control and frontal cognitive functions in individuals with Alzheimer's disease: a controlled trial. J Am Geriatr Soc. 61:1919-26.

Gaziano JM et al 2000 Light-to-moderate alcohol consumption and mortality in the Physician's Health Study enrollment cohort. J Am College Cardiol 35: 96-105.

Tosti V, Bertozzi B, Fontana L. The Mediterranean diet: metabolic and molecular mechanisms. J Gerontol A Biol Sci Med Sci. 2017 PMID: 29244059.

Wei M et al. 2017 . Fasting-mimicking diet and markers/risk factors for aging, diabetes, cancer, cardiovascular disease. Sci Transl Med. 9(377). PMID: 28202779.

Willett, W, Stampfer, M. 2013. Current Evidence on Healthy Eating. Ann Rev Publ Health 34: 77-95.

Class 13 - April 10, Physical Environment and Aging, Crimmins & Finch

Question: How may climate change impact future health among the aged?

Cacciottolo et al 2017. Particulate air pollutants, APOE alleles and their contributions to cognitive impairment in older women and to amyloidogenesis in experimental models. Transl Psychiatry. 7(1):e1022. PMID: 28140404;

Gatto NM et al. 2013. Components of air pollution and cognitive function in middle-aged and older adults in Los Angeles. Neurotoxicology. 40C:1-7.

Rogowski, J., Freedman, V., Schoeni, R. Neighborhoods and the Health of the Elderly, Research Report: Population Studies Center, University of Michigan.

Künzli N, et al 2010. Ambient air pollution and the progression of atherosclerosis in adults. PLoS One.5:e9096:

Leeson G. 2016. Environment, Health and Aging. Chap 5, Environmental Gerontology in Europe and Latin America, Sánchez-González D., Rodríguez-Rodríguez V. (eds), Springer, pp 93-104

Class 14 April 17, Biomarkers of Stress, Health and Aging, Crimmins & Finch

Question: How good are predictions of life expectancy from biomarkers at these three levels: molecular, cell, and organ function?

Belsky DW et al. 2015. Quantification of biological aging in young adults. PNAS 112:E4104-10

Belsky DW, Moffitt TE, Cohen AA, Corcoran DL, Levine ME, Prinz JA, Schaefer J, Sugden K, Williams B, Poulton R, Caspi A. 2017. Eleven Telomere, Epigenetic Clock, and Biomarker-Composite Quantifications of Biological Aging: Do They Measure the Same Thing? Am J Epidemiol. doi: 10.1093/aje/kwx346.

Levine ME. 2013. Modeling the rate of senescence: can estimated biological age predict mortality more accurately than chronological age? J Gerontol A Biol Sci Med Sci. 2013 Jun;68(6):667-74

McEwen BS, Morrison JH. 2013. The brain on stress: Vulnerability and plasticity of the prefrontal cortex over the life course. Neuron. 79:16-29

Fabbri E et al 2015. Aging and the burden of multimorbidity: associations with inflammatory and anabolic hormonal biomarkers. J Gerontol A Biol Sci Med Sci. 70:63-70.

Steptoe, A, Kivimaki, M. 2013. Stress and Cardiovascular Disease: An Update on Current Knowledge. Ann Rev Pub Health. 34:337-54.

Quach A et al 2017. Epigenetic clock analysis of diet, exercise, education, and lifestyle factors. Aging (Albany NY). 9(2):419-446. PMID: 28198702;

Class 15 April 24, Aging and Longevity in the Future: Finch

Question: What is your personal goal for longevity and why?

Armstrong L, Al-Aama J, Stojkovic M, Lako M. 2014. Concise review: the epigenetic contribution to stem cell ageing: can we rejuvenate our older cells? Stem Cells. 32(9):2291-8.

Corella D, Ordovás JM. 2014. Aging and cardiovascular diseases: the role of gene-diet interactions. Ageing Res Rev. 18:53-73.

Longo VD et al 2015. Interventions to Slow Aging in Humans: Are We Ready? Aging Cell. 14:497-510.

Hayden E 2015. Anti-aging pill pushed as bone fide drug. *Nature* 522**:** 265–266 doi:10.1038/522265a

Miles JM, Rule AD, Borlaug BA. 2014. Use of metformin in diseases of aging. Curr Diab Rep. 14:490. doi: 10.1007/s11892-014-0490-4.

Sutcliffe P et al . 2013 Aspirin in primary prevention of cardiovascular disease and cancer: a systematic review of the balance of evidence from reviews of randomized trials. PLoS One. 8:e81970. PMC3855368.