List of references on health expectancy
Monthly update n°2
15/11/2006 to 15/12/2006

New references with keywords and abstracts

- 2006 -

Healthy ageing, a keystone for a sustainable Europe: EU health policy in the context of Demographic change. Luxembourg: DG SANCO; 2006. CB16/55

HEALTH EXPECTANCY
AGING
TRENDS
HEALTH POLICY
EUROPE

This report gives an overview of current demographic trends including life expectancy and healthy life expectancy. It sets out policies that are being developed to support a continued increase of healthy life expectancy.

Bronnum-Hansen, H., Davidsen, M. **Social differences in the burden of long-standing illness in Denmark**. *Sozial-Und Praventivmedizin* 2006;51(4):221-231. CB16/59

HEALTH EXPECTANCY
LIFE EXPECTANCY
LONG-STANDING ILLNESS
SOCIAL INEQUALITY
DENMARK
1990s

Objectives: To estimate the impact of diseases on social differences in life expectancy and expected lifetime with illness among Danes in 1995-99.
Methods: Expected lifetime with and without long-standing illness were calculated for groups with low, medium and high educational levels. Estimates based on observed rates of mortality and prevalence of illness were compared with those based on rates from which a specific disease had been eliminated.
Results: Partial life expectancy (age 30-75) would increase by almost 1.5 years if cancer were eliminated. Expected lifetime without long-standing illness would increase by approximately 1 year. Elimination of cardiovascular diseases would increase partial life expectancy, mainly among men with a low educational level. If diseases of the musculoskeletal system were eliminated the benefit would be greatest for persons with a low educational level.
Conclusions: The gain in life expectancy to be expected by eliminating certain diseases decreased with educational level. Elimination of cancer would extend lifetime both with and without illness for all educational levels.

Congdon, P. **A model for geographical variation in health and total life expectancy**. *Demographic Research* 2006;14:157-178. CB16/62

HEALTH EXPECTANCY
LIFE EXPECTANCY
GEOGRAPHIC COMPARISON
MATHEMATICAL MODEL
ORIGINAL CALCULATION
UNITED KINGDOM
2001

This paper develops a joint approach to life and health expectancy based on 2001 UK Census data for limiting long term illness and general health status, and on registered death occurrences in 2001. The model takes account of the interdependence of different outcomes (e. g. ill health and mortality) as well as spatial correlation in their patterns. A particular focus is on the proportionality assumption or 'multiplicative model' whereby separate age and area effects multiply to produce age-area mortality rates. Alternative non-proportional models are developed and shown to be more parsimonious as well as more appropriate to actual area-age interdependence. The application involves mortality and health status in the 33 London Boroughs.

Dubois, M. F., Hebert, R. **Cognitive-impairment-free life expectancy for Canadian seniors**. *Dementia and Geriatric Cognitive Disorders* 2006;22(4):327-333. CB16/63

DEMENTIA-FREE LIFE EXPECTANCY
DEMENTIA
COGNITIVE FUNCTION
ORIGINAL CALCULATION
CANADA

Background/Aims: While cognitive impairment (CI) and dementia are among the most common morbid conditions in later life, life expectancies free from CI or dementia have been the object of much less investigation than life expectancy based on measures of physical functioning.
Methods: We estimated sex-specific CI-free life expectancy in Canada for people aged 65 and older using data from a nationwide, multicenter Canadian study on the epidemiology of dementia.
Results: The absolute number of years with CI remains virtually constant with increasing age. Whatever the current age, senior men can expect to live 2.5-3 years of their remaining life with some form of CI and about 1.5 years of those with dementia. For women, these figures rise to 3-4 years with CI, of which 2-2.5 years are spent with dementia.
Conclusion: Surviving to an older age does not result in a longer average absolute period of CI. This period is associated with a significant reduction in quality of life, the use of home and institutional services, as well as psychological and physical distress for formal and informal caregivers. Results are compared to findings reported in other countries.

Eurostat. ***Healthy life years expectancy. Disability-free life expectancy-DFLE***. Luxembourg: Eurostat; 2006. CB16/82

HEALTH EXPECTANCY

CALCULATION METHOD
SULLIVAN METHOD

Sullivan method and the data requirement for the calculation of healthy life years expectancy are described.

Kurimori, S., Fukuda, Y., Nakamura, K., Watanabe, M., Takano, T. **Calculation of prefectural disability-adjusted life expectancy (DALE) using long-term care prevalence and its socioeconomic correlates in Japan**. *Health Policy* 2006;76(3):346-358. CB16/64

HEALTH EXPECTANCY
DISABILITY-ADJUSTED LIFE EXPECTANCY (DALE)
LONG-TERM CARE
GEOGRAPHIC COMPARISON
SOCIAL INEQUALITY
JAPAN

Objectives: The objectives of this study were: (1) to determine the disability weight, "utility", for calculation of disability-adjusted life expectancy (DALE) using the prevalence of long-term care; (2) to calculate prefectural DALE; and (3) to clarify the relation between DALE and area socioeconomic conditions in Japan.
Methods: Disability utility by care level (support and levels I-V) of long-term care insurance was determined by a survey of 236 professionals with four standard utility measures: EuroQol-5D, time trade-off, standard gamble, and visual analogue scale. DALE at age 65 (DALE65) and age-adjusted weighted disability prevalence (AIDP) of 47 prefectures were calculated using the determined utilities, prevalence of long-term care, and life tables. The relationships of DALE and WDP to mortality from major causes and socioeconomic indicators were examined by correlation analysis.
Results: The determined utilities were: support, 0.78; level I, 0.68; level II, 0.64; level III, 0.44; level IV, 0.34; and level V, 0.21. The prefectural DALE65 ranged from 17.11 to 15.29 years for men and from 20.21 to 18.42 years for women. Strong correlations were found between DALE65 and mortality for both sexes. Male DALE65 was correlated with no socioeconomic indicators, while female DALE65 was correlated with some indicators. WDP was positively associated with indicators representing socioeconomic disadvantage, such as unemployment rate and percentage of elderly single households.
Conclusions: The socioeconomic correlates of DALE and WDP suggested that favorable socioeconomic policies, in addition to a decrease in mortality from major causes, will contribute to significant extension of the independence period in the elderly. The method proposed here encourages the practical use of health expectancy in health policy, especially at local and regional levels.

Manton, K. G., Gu, X. L., Lamb, V. L. **Long-term trends in life expectancy and active life expectancy in the United States**. *Population and Development Review* 2006;32(1):81-106. CB16/68
HEALTH EXPECTANCY
ACTIVE LIFE EXPECTANCY (ALE)
ORIGINAL CALCULATION
SULLIVAN METHOD
CHRONOLOGICAL SERIES
TIME SERIES
FORECASTING
1935 ; 1965 ; 1982 ; 1999 ; 2015 ; 2022 ; 2080

Changes in life expectancy and in active life expectancy may have effects on the fiscal integrity of both the Social Security and Medicare programs. Analysis of the fiscal stability of these programs shows that the most serious problem may be the growth of Medicare expenditures projected to surpass, in about 2024, Social Security costs. This is aggravated by the associated rapid growth of the Medicaid program. To understand how the growth of Medicare, Medicaid, and Social Security might be correlated we present estimates of changes in life expectancy and active life expectancy from 1935 to 1999 and then project those values to 2080. How the correlation of life expectancy and active life expectancy changes over time, and by age, may provide insights into how increased health care expenditures, if effective in changing health in the elderly, could modify the age structure of the labor force and the availability of human capital.

Mathers, C. D., Iburg, K. M., Begg, S. **Adjusting for dependent comorbidity in the calculation of healthy life expectancy**. *Population Health Metrics* 2006;4(4) CB16/69

HEALTH EXPECTANCY
HEALTH-ADJUSTED LIFE EXPECTANCY (HALE)
MORBIDITY
WORLDWIDE

Background: Healthy life expectancy - sometimes called health-adjusted life expectancy (HALE) - is a form of health expectancy indicator that extends measures of life expectancy to account for the distribution of health states in the population. The World Health Organization has estimated healthy life expectancy for 192 WHO Member States using information from health interview surveys and from the Global Burden of Disease Study. The latter estimates loss of health by cause, age and sex for populations. Summation of prevalent years lived with disability (PYLD) across all causes would result in overestimation of the severity of the population average health state because of comorbidity between conditions. Earlier HALE calculations made adjustments for independent comorbidity in adding PYLD across causes. This paper presents a method for adjusting for dependent comorbidity using available empirical data.
Methods: Data from five large national health surveys were analysed by age and sex to estimate 'dependent comorbidity' factors for pairs of conditions. These factors were defined as the ratio of the prevalence of people with both conditions to the product of the two total prevalences for each of the conditions. The resulting dependent comorbidity factors were used for all Member States to adjust for dependent comorbidity in summation of PYLD across all causes and in the calculation of HALE. A sensitivity analysis was also carried out for order effects in the proposed calculation method.
Results: There was surprising consistency in the dependent comorbidity factors across the five surveys. The improved estimation of dependent comorbidity resulted in reductions in total PYLD per capita ranging from a few per cent in younger adult ages to around 8% in the oldest age group (80 years and over) in developed countries and up to 15% in the oldest age group in the least developed countries. The effect of the dependent comorbidity adjustment on estimated healthy life expectancies is small for some regions (high income countries, Eastern Europe, Western Pacific) and ranges from an increase of 0.5 to 1.5 years for countries in Latin America, South East Asia and Sub-Saharan Africa.
Conclusion: The available evidence suggests that dependent comorbidity is important, and that adjustment for it makes a significant difference to resulting HALE estimates for some regions of the world. Given the data limitations, we recommend a normative adjustment based on the available evidence, and applied consistently across all countries.

Matthews, F. E., Miller, L. L., Brayne, C., Jagger, C. **Regional differences in multidimensional aspects**

of health: findings from the MRC cognitive function and ageing study. *BMC Public Health* 2006;6(90) CB16/70

HEALTH EXPECTANCY
IMPAIRMENT-FREE LIFE EXPECTANCY
ACTIVE LIFE EXPECTANCY (ALE)
HEALTHY LIFE EXPECTANCY
ORIGINAL CALCULATION
SULLIVAN METHOD
GEOGRAPHIC COMPARISON
UNITED KINGDOM
1990s

Background: Differences in mortality and health experience across regions are well recognised and UK government policy aims to address this inequality. Methods combining life expectancy and health have concentrated on specific areas, such as self-perceived health and dementia. Few have looked within country or across different areas of health. Self-perceived health, self-perceived functional impairment and cognitive impairment are linked closely to survival, as well as quality of life. This paper aims to describe regional differences in healthy life expectancy using a variety of states of health and wellbeing within the MRC Cognitive Function and Ageing Study (MRC CFAS).
Methods: MRC CFAS is a population based study of health in 13,009 individuals aged 65 years and above in five centres using identical study methodology. The interviews included self-perceived health and measures of functional and cognitive impairment. Sullivan's method was used to combine prevalence rates for cognitive and functional impairment and life expectancy to produce expectation of life in various health states.
Results: The prevalence of both cognitive and functional impairment increases with age and was higher in women than men, with marked centre variation in functional impairment (Newcastle and Gwynedd highest impairment). Newcastle had the shortest life expectancy of all the sites, Cambridgeshire and Oxford the longest. Centre differences in self-perceived health tended to mimic differences in life expectancy but this did not hold for cognitive or functional impairment.
Conclusion: Self-perceived health does not show marked variation with age or sex, but does across centre even after adjustment for impairment burden. There is considerable centre variation in self-reported functional impairment but not cognitive impairment. Only variation in self-perceived health relates to the ranking of life expectancy. These data confirm that quite considerable differences in life experience exist across regions of the UK beyond basic life expectancy.

Matthews, R. J., Jagger, C., Hancock, R. M. **Does socio-econornic advantage lead to a longer, healthier old age?** *Social Science and Medicine* 2006;62(10):2489-2499. CB16/71

HEALTH EXPECTANCY
HEALTHY LIFE EXPECTANCY
ELDERLY
SOCIAL INEQUALITY
ORIGINAL CALCULATION
MULTI-STATE LIFE TABLE (Imach)
UNITED KINGDOM

The effect of socio-economic disadvantage on mortality is well documented and differences exist even at older ages. However, whether this translates into differences in the quality of life lived at older ages is less well studied, and in particular in the proportion of remaining life spent without ill health (healthy life

expectancy), a key UK Government target. Although there have been studies exploring socio-economic differences in disability-free life expectancy (DFLE) worldwide, these have tended to focus on a single measure of socio-economic advantage, for example, education, race, social class or income, with the majority based on cross-sectional data from younger populations. In this prospective study we examine differences in DFLE and total life expectancy (TLE) at older ages using a range of measures of socio-economic advantage. We use a longitudinal study of 1480 participants aged 75 years or over in 1988 registered with a UK primary care practice, who were followed up until 2003 with measurements at up to seven time points. Disability was defined as difficulty with any one of five activities of daily living. The largest differences in DFLE for both men and women were found for housing tenure. Women aged 75 years living in owned or mortgaged property could expect to live 1 year extra without disability compared with those living in rented accommodation, while for men the difference was almost 1.5 years. The effect of socio-economic advantage on disability-free and total life expectancies appeared to be larger for men than women. In women, socio-economic advantage had more effect on DFLE than total life expectancy for all indicators considered, thus the socio-economically advantaged experienced a compression of disability.

Nasu, I., Saito, Y. **[Active life expectancy for elderly Japanese by chewing ability]**. *Japanese Journal of Public Health* 2006;53(6):411-423. [In Japanese] CB16/86

HEALTH EXPECTANCY
ORIGINAL CALCULATION
MULTI-STATE LIFE TABLE (Imach)
ELDERLY
JAPAN
1999-2003

OBJECTIVE: Panel interview surveys of nationally representative elderly people aged 65 years or above in Japan were conducted three times at 2-year intervals since 1999 (Nihon University Japanese Longitudinal Study of Aging) to estimate health expectancy for males and females separately according to their chewing ability.
METHOD: Multistate life table methods were applied to estimate health expectancy. Three health states, namely, active, inactive and dead, were defined according to the ability to perform specified daily activities. Living respondents were considered to be in an "inactive state" if they responded "very difficult" or "unable" for performance of at least one ADL or IADL. Otherwise they were considered to be in an "active state". 4,323 sampled persons who responded to the baseline survey were included in the study. Based on estimated transition probabilities over the survey period between active and inactive states, and active and inactive states to death, both population- and status-based multistate life tables were constructed according to chewing ability. Those who could chew relatively hard foods at the baseline survey were classified as Group A and those who could chew only relatively soft foods were classified as Group B.
RESULTS: The population-based multistate life tables indicated that at age 65, total life expectancy was 19.3/23.2 (males/females) years for Group A and 16.7/21.1 years for Group B. Active life expectancy was 16.8/18.6 years and 13.6/16.3 years, and inactive life expectancy was 2.4/4.6 years and 3.1/4.8 years for Groups A and B respectively. A statistically significant difference was observed between the two groups only in terms of active life expectancy. From status-based multistate life tables, similar patterns were observed for those whose status at the baseline was "active".
CONCLUSION: These results suggest that maintenance or recovery of sufficient chewing ability for elderly people is related to a longer total life expectancy and even more strongly related to a longer active life expectancy.

Unger, R. **Trends in active life expectancy in Germany between 1984 and 2003 - A cohort analysis with different health indicators**. *Journal of Public Health* 2006;14(3):155-163. CB16/89

HEALTH EXPECTANCY
ACTIVE LIFE EXPECTANCY (ALE)
ORIGINAL CALCULATION
MULTI-STATE LIFE TABLE
GERMANY
1984-2003

Aim: This article examines trends in active life expectancy and their dependency on indicators of health using data from the German Socio-Economic Panel (GSOEP).
Subjects and methods: A multistate life-table modelling approach is used to estimate active life years. First, mortality risks and the rates of entering and leaving the health statuses are estimated by applying multivariate hazard models. In a second step, increment-decrement life tables are constructed by applying age-specific transition rates for three different cohorts. Two measures of limitations in the activities of daily life (ADL) and two measures of health satisfaction are used. The study uses a cohort approach instead of the more commonly used method of cross-sectional investigation.
Results: Results show that trends in active life expectancy depend markedly on the indicator chosen. Substantial improvements can be observed for younger cohorts with regard to severe health states. These improvements are a result of the decline in the transition from the independent to the dependent state, whereas no advances in recovery from the dependent state could be found. In contrast, if moderate health limitations in ADLs are investigated, the improvements are less substantial, and moderate health dissatisfaction is not accompanied by any change for younger cohorts.
Conclusions: These findings suggest that, rather than examining trends in the prevalence of each health status, further research should focus on the changing path in and out of differing health status.

van Baal, P. H. M., Hoeymans, N., Hoogenveen, R. T., de Wit, G. A., Westert, G. P. **Disability weights for comorbidity and their influence on health-adjusted life expectancy**. *Population Health Metrics* 2006;4(1) CB16/90

HEALTH-ADJUSTED LIFE EXPECTANCY (HALE)
MORBIDITY
DISABILITY
CALCULATION METHOD

Background: Comorbidity complicates estimations of health-adjusted life expectancy (HALE) using disease prevalences and disability weights from Burden of Disease studies. Usually, the exact amount of comorbidity is unknown and no disability weights are defined for comorbidity.
Methods: Using data of the Dutch national burden of disease study, the effects of different methods to adjust for comorbidity on HALE calculations are estimated. The default multiplicative adjustment method to define disability weights for comorbidity is compared to HALE estimates without adjustment for comorbidity and to HALE estimates in which the amount of disability in patients with multiple diseases is solely determined by the disease that leads to most disability (the maximum adjustment method). To estimate the amount of comorbidity, independence between diseases is assumed.
Results: Compared to the multiplicative adjustment method, the maximum adjustment method lowers HALE estimates by 1.2 years for males and 1.9 years for females. Compared to no adjustment, a multiplicative adjustment lowers HALE estimates by 1.0 years for males and 1.4 years for females.

Conclusion: The differences in HALE caused by the different adjustment methods demonstrate that adjusting for comorbidity in HALE calculations is an important topic that needs more attention. More empirical research is needed to develop a more general theory as to how comorbidity influences disability. copyright 2006 van Baal et al; licensee BioMed Central Ltd.

Van Oyen, H., Bossuyt, N., Deboosere, P., Gadeyne, S., Abatih, E., Demarest, S. **Erratum: 'Differential inequity in health expectancy by region in Belgium'**. *Sozial- und Präventivmedizin* 2006;51(1):67. CB16/91

Erratum to article 16/07

Veerman, J. L., Barendregt, J. J., Mackenbach, J. P., Brug, J. **Using epidemiological models to estimate the health effects of diet behaviour change: the example of tailored fruit and vegetable promotion**. *Public Health Nutrition* 2006;9(4):415-420. CB16/92

HEALTHY LIFE EXPECTANCY
MATHEMATICAL MODEL

Objective: To explore the use of epidemiological modelling for the estimation of health effects of behaviour change interventions, using the example of computer-tailored nutrition education aimed at fruit and vegetable consumption in The Netherlands.
Design: The effects of the intervention on changes in consumption were obtained from an earlier evaluation study. The effect on health outcomes was estimated using an epidemiological multi-state life table model. input data for the model consisted of relative risk estimates for cardiovascular disease and cancers, data on disease occurrence and mortality, and survey data on the consumption of fruits and vegetables.
Results: if the computer-tailored nutrition education reached the entire adult population and the effects were sustained, it could result in a mortality decrease of 0.4 to 0.7% and save 72 to 115 life-years per 100000 persons aged 25 years or older. Healthy life expectancy is estimated to increase by 32.7 days for men and 25.3 days for women. The true effect is likely to lie between this theoretical maximum and zero effect, depending mostly on durability of behaviour change and reach of the intervention.
Conclusion: Epidemiological models can be used to estimate the health impact of health promotion interventions.

Wait, S., Harding, E. ***The state of aging and health in Europe***. London: International Longevity Centre-UK; 2006. CB16/81

HEALTH EXPECTANCY
ELDERLY
EUROPE

The report is an accessible summary of the key health data, indicators and trends amongst older people in the new EU-25. It points out the relevance of disability-free life expectancy to assess the differences in levels of quality of life among elderly in Europe.

Wood, R., Sutton, J. R., Clark, D., McKeon, A., Bain, M. **Measuring inequalities in health: the case for healthy life expectancy**. *Journal of Epidemiology and Community Health* 2006;60:1089-1092. CB16/93
HEALTH EXPECTANCY

PERCEIVED HEALTH
LONG-STANDING ILLNESS
HEALTH INEQUALITY
ORIGINAL CALCULATION
SCOTLAND
2001

Objective: To evaluate healthy life expectancy (HLE) as a measure of health inequalities by comparing geographical and area-based deprivation-related inequalities in healthy and total life expectancy (TLE).
Design: Life table analysis based on ecological cross-sectional data.
Setting and population: Council area quarters and postcode sector-based deprivation fifths in Scotland.
Main outcome measures: Expectation of life in good self-assessed general health, or free from limiting long-term illness, and TLE, for females and males at birth.
Results: Women in Scotland have a life expectation of 70.3 years in good health, 61.6 years free from limiting long-term illness, and a TLE of 78.9 years. Comparable figures for men are 66.3, 58.6 and 73.5 years. TLE and HLE decrease with increasing area deprivation. Differences are substantially wider for HLE. A 4.7-year difference is seen in TLE between women living in the most and least deprived fifth of areas. The difference in HLE is 10.7 years in good health and 11.6 years free from limiting long-term illness. The degree of deprivation-related inequality in HLE is 2.5 times wider for women and 1.8 times wider for men than in TLE.
Conclusions: Differences in TLE underestimate health inequalities substantially. By including morbidity and mortality, HLE reflects the excess burden of ill health experienced by disadvantaged populations better. Inequalities in length of life and health status during life should be taken into account while monitoring inequalities in population health.

- 2005 -

Albala, C., Lebrão, M. L., León Díaz, E. M., Ham-Chande, R., Hennis, A., Palloni, A., Peláez, M., Pratts, O. **Encuesta Salud, Bienestar y Envejecimiento (SABE): metodología de la encuesta y perfil de la población estudiada / The Health, Well-Being, and Aging ("SABE") survey: methodology applied and profile of the study population**. *Revista Panamericana de Salud Pública / Pan American Journal of Public Health* 2005;17(5/6):307-322. [In Portuguese] CB16/84

HEALTH SURVEYS
LATIN AMERICA
THE CARRIBBEAN
ELDERLY
AGING

This document outlines the methodology of the Salud, Bienestar y Envejecimiento (Health, Well-Being, and Aging) survey (known as the "SABE survey"), and it also summarizes the challenges that the rapid aging of the population in Latin America and the Caribbean imposes on society in general and especially on health services. The populations of the countries of Latin America and the Caribbean are aging at a rate that has not been seen in the developed world. The evaluation of health problems and disability among older adults in those countries indicates that those persons are aging with more functional limitations and worse health than is true for their counterparts in developed nations. In addition, family networks in Latin America and the Caribbean are changing rapidly and have less capacity to make up for the lack of protections provided by social institutions. The multicenter SABE study was developed with the objective of evaluating the state of health of older adults in seven cities of Latin America and the Caribbean: Bridgetown, Barbados; Buenos Aires, Argentina; Havana, Cuba; Mexico City, Mexico; Montevideo, Uruguay; Santiago, Chile; and São Paulo, Brazil. The SABE survey has established the

starting point for systematic research on aging in urban areas of Latin America and the Caribbean. Comparative studies of these characteristics and with this comparative nature should be extended to other countries, areas, and regions of the world in order to expand the knowledge available on older adults.

Beekman, J. A. **"A framework for long-term actuarial projections of health care costs: the importance of population aging and other factors", Howard J. Bolnick, October 2004**. *North American Actuarial Journal* 2005;9(3):150-151. [Discussion of paper already published] CB16/76

ACTIVE LIFE EXPECTANCY (ALE)
FORECASTING

This paper discusses the paper by Bolnik (cf CB16/77)

Breakwell, C., Bajekal, M. **Review of sources and methods to monitor healthy life expectancy**. *Health Statistics Quarterly* 2005;26(Summer):17-22. CB16/80

HEALTH EXPECTANCY
HEALTH SURVEYS
UNITED KINGDOM

This article presents the rationale for proposed changes in the methods used to calculate Healthy Life Expectancy (HLE). HLE is currently calculated for Great Britain and England based on data from the General Household Survey (GHS). The proposed revisions have been prompted by three sets of changes reflecting improvements to sources and methods:
● Changes in GHS methodology and survey coverage which affect estimates of the rates of ill-health in the noninstitutional population.
● Availability of data from the 2001 Census to update estimates of the ill-health rates and the size of the institutional population.
● Inclusion of data from the Continuous Household Survey of Northern Ireland (CHS-NI) to produce a HLE estimate for the UK.

Bronnum-Hansen, H., Iburg, K. M., Andersen, O., Lissau, I., Saelan, H., Rasmussen, N. K. **Sociale Forskelle i kobenhavnernes forventede levetid med godt helbred [Social differences in expected lifetime spent in good health in Copenhagen, Denmark]**. *Ugeskrift for Læger* 2005;167(2):166-168. CB16/72

HEALTH EXPECTANCY
PERCEIVED HEALTH
LONG-STANDING ILLNESS
ORIGINAL CALCULATION
SULLIVAN METHOD
EDUCATION
COPENHAGEN
DENMARK
2000

Introduction: The concept of health expectancy is based on the average person's lifetime in various health states. The purpose of this study was to compare life expectancy and expected lifetime in various states of health among inhabitants of Copenhagen in groups of high, medium and low educational levels.

Materials and methods: Data from the Copenhagen Health Profile 2000 and life tables for various educational groups in Copenhagen were combined using Sullivan's method.
Results: Life expectancy was 7.4 years longer for 30-year-old men with a high educational level than for those with a low level. At age 30, the percentage of expected lifetime in self-rated good health was 56.8%, 67.4% and 72.6% for men with a low, medium and high educational level, respectively. Among 30-year-old women, the difference in life expectancy between low and high educational levels was 4.8 years, and the proportion of expected lifetime in self-rated good health was 55.1% at the low and 72.0% at the high educational level. The expected lifetime without a long-lasting illness increased with educational level but less distinctly for women than for men, whereas the years expected to be spent with a long-lasting illness differed only slightly with the level of education.
Discussion: The educational attainment of Copenhageners is clearly related to their life expectancies and even more to the time they can expect to live in good health.

Burgio, A., Marano, C., Folino-Gallo, P. **Geographic variations and gender differences in Life Expectancy and Disability Free Life Expectancy in the Italian regions: a challenge to health systems**. *European Journal of Public Health* 2005;15(Supplement 1):43-44. [Abstract] CB16/60

HEALTH EXPECTANCY
DISABILITY-FREE LIFE EXPECTANCY
ACTIVITIES OF DAILY LIVING (ADL)
ORIGINAL CALCULATION
SULLIVAN METHOD
GEOGRAPHIC COMPARISON
ITALY

Disability-free life expectancy is calculated for each Italian region according to Sulllivan's method.

Cai, L., Lubitz, J. **Racial/ethnic differences in active life expectancy and lifetime nursing home expenditure**. *Gerontologist* 2005;45(Special Issue II):101-101. [Abstract] CB16/61

HEALTH EXPECTANCY
ACTIVE LIFE EXPECTANCY (ALE)
ACTIVITIES OF DAILY LIVING (ADL)
ELDERLY
INSTRUMENTAL ACTIVITIES OF DAILY LIVING (IADL)
LONG-TERM CARE
ORIGINAL CALCULATION
MULTI-STATE LIFE TABLE
RACIAL COMPARISON
USA
1992-2002

The authors examine differences in ALE and nursing home expenditures at age 65 among three racial/ethnic groups: white non-Hispanics, black non-Hispanics and Hispanics using the 1992-2002 Medicare Current Beneficiary Survey and a newly developed semi-Markov process model to estimate rates of transition between functional states. This model differs from the traditional multi-state life table model by taking into account the duration effect. Functional disability is defined based on difficulty or inability to perform Instrumental Activities of Daily Living (IADL) and Activities of Daily Living (ADL). Three mutually exclusive categories are used: no disability, moderate disability (1+ IADL

limitations or 1-2 ADL limitations) and severe disability (3+ ADL limitations). The results indicate that older Hispanics live longer than whites or blacks and spend more time in both active health and disability. Hispanics incur much less nursing home expenditures than the other two groups, both cumulatively from age 65 until death and in the last few years of life, suggesting a higher dependence on informal and community care. These findings reveal the differential needs, and timing, of long-term care services among major racial/ethnic groups of elderly.

Camargos, M. C. S., Perpetuo, I. H. O., Machado, C. J. **Life expectancy with functional disability in elderly persons in Sao Paulo, Brazil**. *Revista Panamericana de Salud Pública / Pan American Journal of Public Health* 2005;17(5/6):379-386. [In Portuguese] CB16/83

HEALTH EXPECTANCY
DISABILITY-FREE LIFE EXPECTANCY
INDEPENDENT LIFE EXPECTANCY
ACTIVITIES OF DAILY LIVING (ADL)
ORIGINAL CALCULATION
SULLIVAN METHOD
ELDERLY
BRAZIL
2000

OBJECTIVE: For persons 60 years of age or older living in the city of São Paulo, Brazil, in the year 2000 to estimate four characteristics: (1) life expectancy free of functional disability, (2) life expectancy with functional disability, (3) life expectancy with functional disability but without dependence, and (4) life expectancy with functional disability and dependence.
METHODS: The estimates of the four characteristics were calculated by means of a life table constructed based on the method proposed by Sullivan. The basic data used for the calculations were the elderly population estimated for the city of São Paulo as of mid-2000, obtained from the demographic censuses of 1991 and 2000, and deaths in the elderly population, obtained from the State Data Analysis System Foundation (Fundação Sistema Estadual de Análise de Dados, or SEADE) of the state of São Paulo. The prevalences of functional disability and of functional dependence were calculated based on data concerning activities of daily living collected in the city of São Paulo as part of a project called Health, Well-being, and Aging in Latin America and the Caribbean (the "SABE project"). The activities of daily living considered were: dressing, eating, bathing, using the bathroom, lying down on the bed and getting up from it, and walking across a room. Functional disability was defined as difficulty in performing one or more of the activities of daily living. Dependence was defined as the need for help in performing at least one of the activities of daily living.
RESULTS: In 2000, 60-year-old men from the city of São Paulo could expect to live, on average, 17.6 years, of which 14.6 years (83%) would be free of functional disability. Women of the same age could expect to live 22.2 years, of which 16.4 years (74%) would be free of functional disability. Men would have a functional disability and be dependent on others for 1.6 years (9%), while the comparable period for women would be 2.5 years (11%).
CONCLUSIONS: Despite their longer life expectancy, the women faced more years with functional disability. The number of years with functional disability and dependence was also higher for the women. Public policies should take into account the differing needs of elderly women and of elderly men as well as other specific characteristics of this older population.

Fukuda, Y., Nakamura, K., Takano, T. **Municipal health expectancy in Japan: decreased healthy longevity of older people in socioeconomically disadvantaged areas**. *BMC Public Health* 2005;5:65.

CB16/65

HEALTH EXPECTANCY
ORIGINAL CALCULATION
SOCIAL INEQUALITY
GEOGRAPHIC COMPARISON
JAPAN
2000-2002

Background: Little is known about small-area variation in healthy longevity of older people and its socioeconomic correlates. This study aimed to estimate health expectancy at 65 years (HE65) at the municipal level in Japan, and to examine its relation to area socio-demographic conditions.
Methods: HE65 of municipalities (N = 3361) across Japan was estimated by a linear regression formula with life expectancy at 65 years and the prevalence of those certificated as needing nursing care. The relation between HE65 and area socio-demographic indicators was examined using correlation coefficients.
Results:The estimated HE65 (years) ranged from 13.13 to 17.39 for men and from 14.84 to 20.53 for women. HE65 was significantly positively correlated with the proportion of elderly and per capita income, and negatively correlated with the percentage of households of a single elderly person, divorce rate, and unemployment rate. These relations were stronger in large municipalities (with a population of more than 100,000) than in small and medium-size municipalities.
Conclusion: A decrease in healthy longevity of older people was associated with a higher percentage of households of a single elderly person and divorce rate, and lower socioeconomic conditions. This study suggests that older people in urban areas are susceptible to socio-demographic factors, and a social support network for older people living in socioeconomically disadvantaged conditions should be encouraged.

Jiang, Y., Hesser, J. E. **Healthy life expectancy in Rhode Island**. *Medicine and Health Rhode Island* 2005;88(8):282-283. CB16/85

HEALTHY LIFE EXPECTANCY
PERCEIVED HEALTH
ORIGINAL CALCULATION
SULLIVAN METHOD
RHODE ISLAND
1993-2004

Healthy life expectancy is calculated for Rhode Islanders using data on perceived health from the Behavioral Risk Factor Surveillance System.

Laditka, J. N., Laditka, S. B., Olatosi, B., Elder, K. T. ***Disability burdens among older Americans associated with gender and race/ethnicity in rural and urban areas***. Columbia, SC: South Carolina Rural Health Research Center; 2005. CB16/73

HEALTH EXPECTANCY
ACTIVITIES OF DAILY LIVING (ADL)
ELDERLY
ORIGINAL CALCULATION
EDUCATION
RACIAL COMPARISON

USA

The authors developed estimates of healthy, disabled, and total life expectancy for rural and urban populations, by gender, education and race/ethnicity. Data are from the 1982, 1984, 1989, 1994, and 1999 National Long Term Care Survey, a representative sample of Americans age 65 and over who were disabled in one or more activity of daily living (ADL) at baseline.

Laditka, S., Laditka, J., Olatosi, B., Elder, K. **Healthy life expectancy among impaired older Americans, by race/ethnicity in rural and urban areas**. *Gerontologist* 2005;45(Special Issue II):88-88. [Abstract] CB16/66

HEALTH EXPECTANCY
ORIGINAL CALCULATION
RACIAL COMPARISON
USA

Little is known about differences between rural and urban residents in life expectancy, or the percentage of life without substantial disability (healthy life expectancy). We developed estimates of healthy, disabled, and total life expectancy for rural and urban populations, by gender and race/ethnicity. Data are from the 1982, 1984, 1989, 1994, and 1999 National Long Term Care Survey, a representative sample of Americans age 65 and over who were disabled in one or more activity of daily living (ADL) at baseline. A Markov chain was used to estimate monthly functional status transition probabilities. We estimated a multinomial logistic regression model in which the dependent variable represents three states: unimpaired, having no ADL limitations; impaired, 1+ ADL limitations; and dead. Next, microsimulation was used to produce full distributions of total, healthy, and disabled life expectancy, and to calculate summary indices. Among whites, rural women live 6% longer lives than urban women. Rural men live 7% longer lives than urban men. The percentage of life with impairment is approximately equal for rural and urban residents. In absolute terms, rural men live 3 more months with impairment than urban men; rural women live 4 more months with impairment than urban women. Life expectancy for blacks was less than for whites; however, the rural-urban comparisons for blacks were similar to those for whites. Aggregating costs of addressing impairment across the nation for even a few additional months in the average individual's life suggests large national costs of rural residents' greater disabled life expectancy.

Lynch, S., Brown, J. **Active life expectancy (ALE) differences by region of birth and region of current residence**. *The Gerontologist* 2005;45(Special Issue II):269-269. [Abstract] CB16/67

HEALTH EXPECTANCY
ACTIVE LIFE EXPECTANCY (ALE)
ORIGINAL CALCULATION
GEOGRAPHIC COMPARISON
USA

Researchers often incorporate "region" as a covariate in health research, but the reason is often unclear. Region may be included simply because health is known to vary across region in cross-section. Much of this variation may be attributable to cultural differences across regions, but many cultural factors (e.g., diet) may be meaningful only at the individual level; thus, macro-level differences in regional culture may matter only insofar as the regional culture is incorporated by the individual (e.g., via socialization). This process occurs primarily at young ages, and thus region of birth may be more important to individual health than the region of current residence. On the other hand, at the population level, regional differences

in health that are based on individual-level data on current residence may understate true underlying regional differences because geographic mobility is ignored: Persons who share a current region are a heterogeneous mix of individuals who were born in (and remain) a region and immigrants to the region. Using a Bayesian approach to estimating ALE, the authors examine (1) whether ALE differences between individuals are affected more by respondents' regions of birth or regions of current residence, and (2) whether "region's" influence is understated when only current region of residence is included. Results indicate that region's influence is considerably understated when only current region is included, but at the same time that region of birth is more important in affecting ALE than current region. The implications for understanding-and interpreting-"region's" effect on health are discussed.

Minicuci, N., Noale, M., ILSA group. **Influence of level of education on disability free life expectancy by sex: the ILSA study**. *Experimental Gerontology* 2005;40:997-1003. CB16/57

HEALTH EXPECTANCY
DISABILITY-FREE LIFE EXPECTANCY
AGED
ORIGINAL CALCULATION
MULTI-STATE LIFE TABLE (Imach)
ACTIVITIES OF DAILY LIVING (ADL)
INSTRUMENTAL ACTIVITIES OF DAILY LIVING (IADL)
EDUCATION
ITALY
1992-1996

PURPOSE: To assess the effect of education on Disability Free Life Expectancy among older Italians, using a hierarchical model as indicator of disability, with estimates based on the multistate life table method and IMaCh software.
METHODS: Data were obtained from the Italian Longitudinal Study on Aging which considered a random sample of 5632 individuals.
RESULTS: Total life expectancy ranged from 16.5 years for men aged 65 years to 6 years for men aged 80. The age range for women was 19.6 and 8.4 years, respectively. For both sexes, increasing age was associated with a lower probability of recovery from a mild state of disability, with a greater probability of worsening for all individuals presenting an independent state at baseline, and with a greater probability of dying except for women from a mild state of disability. A medium/high educational level was associated with a greater probability of recovery only in men with a mild state of disability at baseline, and with a lower probability of worsening in both sexes, except for men with a mild state of disability at baseline.
DISCUSSION: The positive effects of high education are well established in most research work and, being a modifiable factor, strategies focused on increasing level of education and, hence strengthening access to information and use of health services would produce significant benefits.

Nusselder, W. J., Looman, C. W. N., Mackenbach, J. P., Huisman, M., Van Oyen, H., Deboosere, P., Gadeyne, S., Kunst, A. E. **The Contribution of Specific Diseases to Educational Disparities in Disability-Free Life Expectancy**. *American Journal of Public Health* 2005;95(11):2035-2041. CB16/56

HEALTH EXPECTANCY
DISABILITY-FREE LIFE EXPECTANCY
DISABILITY
MORBIDITY

HEALTH INEQUALITY
EDUCATION
BELGIUM
1997

Objectives. We examined the contribution that specific diseases, as causes of both death and disability, make to educational disparities in disability-free life expectancy (DFLE).
Methods. We used disability data from the Belgian Health Interview Survey (1997) and mortality data from the National Mortality Follow-Up Study (1991–1996) to assess education-related disparities in DFLE and to partition these differences into additive contributions of specific diseases.
Results. The DFLE advantage of higher-educated compared with lower-educated persons was 8.0 years for men and 5.9 years for women. Arthritis (men, 1.3 years; women, 2.2 years), back complaints (men, 2.1 years), heart disease/stroke (men, 1.5 years; women, 1.6 years), asthma/chronic obstructive pulmonary disease (COPD) (men, 1.2 years; women, 1.5 years), and "other diseases" (men, 2.4 years) contributed the most to this difference.
Conclusions. Disabling diseases, such as arthritis, back complaints, and asthma/COPD, contribute substantially to differences in DFLE by education. Public health policy aiming to reduce existing disparities in the DFLE and to improve population health should not only focus on fatal diseases but also on these nonfatal diseases.

Pérès, K., Jagger, C., Lièvre, A., Barberger-Gateau, P. **Disability-free life expectancy of older french people: gender and education differentials from the PAQUID cohort**. *European Journal of Ageing* 2005;2(3):225-233. CB16/58

HEALTH EXPECTANCY
DISABILITY-FREE LIFE EXPECTANCY
ORIGINAL CALCULATION
MULTI-STATE LIFE TABLE (Imach)
DISABILITY
EDUCATION
AGED
FRANCE
1990s

In countries with low mortality rates, the quality of the years of life is more important to consider than total life expectancy (TLE). Disability-free life expectancy (DFLE) is one of the most relevant indicators of health and the quality of life. This paper aims to estimate TLE and DFLE with four levels of severity of disability and to explore gender and educational differences in older French people. In this cohort study, four levels of disability severity were distinguished, disability being evaluated for mobility, instrumental and basic activities of daily living. For each level, TLE and DFLE were calculated using multi-state models from transition probabilities. From the population of two areas of South West France 3,777 subjects were randomly selected from the electoral rolls. At the baseline, they were aged 65 years and over, living in the community and were interviewed 6 times over the 10-year follow-up. At age 65, women lived longer than men (4.5 extra years), but shorter fully independent lives (−2.2 years). They also lived longer in each of the three degrees of disability (+4.2 years with moderate or severe disability). The higher educated lived longer (1.3 extra years at age 65), with the additional years free of disability. Regardless of age, gender and education, there appeared to be a 1-year incompressible time spent with severe disability. To conclude, these are the first health expectancies based on the longitudinal data for France. Whilst most of the studies were based on cross-sectional data, this paper gives a more realistic indicator of the health and socio-economic inequalities in France in the 1990 s.

Shapiro, J., Bebbington, A. C. **Health dynamics and disability**. *PSSRU Bulletin* 2005(15):26. [Research Report] CB16/74

HEALTH EXPECTANCY
DISABILITY-FREE LIFE EXPECTANCY
EUROPEAN UNION
1994-2001

One page research report on PSSRU's contribution to AHEAD project (see complete report CB16/37)

- 2004 -

Abatih, E. ***Socio-economic differences in disability free life expectancy in Belgium***. Brussels: Scientific Institute of Public Health; 2004. CB16/88

HEALTH EXPECTANCY
CALCULATION
SOCIAL INEQUALITY
GEOGRAPHIC COMPARISON
SULLIVAN METHOD
BELGIUM

Objectives: The purpose of the project was to compare the health status of the population of the Flemish and the Walloon regions of Belgium using the Disability Free Life Expectancy (DFLE) indicator.
Methods: Sullivan's method was used to calculate the DFLE by combining prevalences of disabilities from the 1997 health interview survey and probabilities of death from the national mortality database (1991-1996). The inequalities in DFLE were determined by using two regression based life table methods: the survey logistic regression method and the bootstrap weighted least squares regression method. The variances of the DFLE were estimated using Sullivan's method, the delta method and the bootstrap method. These variances were used to construct 95% confidence intervals and to conduct tests of significance of differences in DFLE between sub-populations in the two regions.
Results: Looking at the DFLE for all men and women in both the Flemish and Walloon regions, significant differences existed only at age 25 years. According to the results from the survey logistic regression and the bootstrap methods, a clear socio-economic gradient in DFLE was found for Flemish and Walloon men and women: thus the higher the educational level, the longer the DFLE. The survey logistic regression method took full account of the sampling design of the health interview survey and thus gave unbiased estimates for the regression parameters. The survey logistic regression indicated that the differences in DFLE between the top and the bottom of the social hierarchy were all statistically highly significant for both Flemish and Walloon men and women. No statistically significant differences in socio-economic gradient were found between Flemish and Walloon men and women. Flemish men and women at the lowest position of the social hierarchy turned out to have similar DFLE compared to their Walloon counterparts. Statistically significant differences in DFLE were found between Flemish and Walloon women for all ages at the highest position of the social hierarchy whereas significant differences existed for men only up to and including age 35 years.
Conclusions: A clear socio-economic gradient in DFLE was found in both regions-the higher the educational level, the longer the DFLE. There were no significant differences in socioeconomic gradient between the Flemish and Walloon regions. The differences in DFLE between Flemish and Walloon men and women were non-significant for those at the lowest position of the social hierarchy. At the highest position of the social hierarchy, significant differences in DFLE were observed between Flemish and

Walloon men (up to age 35 years) and women (for all ages). Not only differences in socio-economic status but especially life style (smoking, physical activity, nutritional habits… etc) may be potential factors causing the described differences.

Bajekal, M., Harries, T., Breman, R., Woodfield, K. ***Review of disability estimates and definitions***. London: National Center for Social Research; 2004. Report No: 128. CB16/53

DISABILITY
UNITED KINGDOM

This report reviews existing survey estimates of disability for Great Britain. It explores the definitions of disability used and the methodological validity of the disability questions. The report identifies the reasons why disability estimates vary from survey to survey and recommends appropriate estimates for use in a range of circumstances. The study was carried out by a research team of quantitative and qualitative researchers from the National Centre for Social Research between May and July 2003.

Bolnick, J. A. **A framework for long-term actuarial projections of health care costs: the importance of population aging and other factors** *North American Actuarial Journal* 2004;8(4):1-29. CB16/77

HEALTH-ADJUSTED LIFE EXPECTANCY (HALE)
DISABILITY-FREE LIFE EXPECTANCY
REVES
HEALTH CARE SYSTEM

Ever-expanding life expectancy is increasing the size of elderly populations with profound social and economic consequences for developed nations, including future cost of their health care systems. Most existing long-term health care cost projections are driven mainly by changing demographics (aging populations). This simplified approach fails to recognize the many variables, and complicated interactions among them, affecting the future of health, health care, and health care costs. This study presents a framework incorporating key health care cost drivers. Using the framework, the study then introduces three plausible futures for health care along with broad, nonmodeled estimates of their costs that point to a very wide range of potential future costs. By taking the next step and building actuarial models based on the framework presented in this study, actuaries and health economists can create a powerful tool for health policymakers and health officials to better understand the long-term consequences of decisions taken during their stewardship of health care systems.

Gazinska, M., Mojsiewicz, M. **Modelowanie Czasu Trwania Życia Bez Niepelnosprawnosci/Modeling the disability-free life expectancy [In Polish]**. *Studia Demograficzne* 2004;1(145):75-91. CB16/54

HEALTH EXPECTANCY
DISABILITY-FREE LIFE EXPECTANCY
MATHEMATICAL MODEL
COX MODEL

The life expectancy depends greatly on health - morbidity, disability and invalidity. A rise of life expectancy and increased morbidity make problems of the disabled people even more important; in many countries disability becomes more common. This paper presents methods of modeling the life expectancy without disability.The sample survey of disable persons was used to estimate the disability-free life table

and to verify Gompertz, Weilbull, exponential and linear-expotential disability hazard functions. None of these functions was accepted to describe the disability hazard for the total surveyed population.The hypothesis that a probability of becoming disabled depends on age, sex, education, type of disability certificate, causes of disability, necessary support and subjective restraints from taking up a job was verified by the use of the semiparametric Cox model of proportional hazards. It was concluded that only age influence significantly the disability hazard. For people in the working age results of the disability-free life tables as well as Gompertz, Weilbull, exponential and linear-exponential disability hazard functions, estimated separately for the considered age groups, provided acceptable results except for the age 45-54. About 10 years before reaching the retirement age the disability hazard rate increased markedly and according to the estimated Cox model depends strongly on restraints in taking up jobs and needed care as well as on sex. Therefore disability hazard functions should be specified by sex.

Li, N. **Estimating national disability risk**. *Theoretical Population Biology* 2004;65(4):389-400. CB16/96

ACTIVE LIFE EXPECTANCY (ALE)
DISABILITY
CALCULATION METHOD

A method to rebuild the active and disabled life expectancy (ALE and DLE) on the basis of 'current' death and disability risks, and to measure disability risk. is provided. This method uses national-level data, and is based on two main assumptions. The first is the Gompertz assumption that death rate rises with age exponentially, and the second is the Cox assumption that death rates of active status are proportional to those of disabled status across age. Applying this method to the US data, the author finds that the disability risk has increased between 1970 and 1990 for both men and women aged 40 and older. Situations in which above assumptions could be removed are also discussed.

- 2003 -

Abatih, E. ***Estimation of variance of health expectancy by relative educational level in Belgium*** [Master of science in applied statistics]. Diepanbeek: Limsburgs Universitair Centrum; 2003. CB16/87

HEALTH EXPECTANCY
SOCIAL INEQUALITY
EDUCATION
BELGIUM

This report is a continuation of the report on calculation of health expectancy by educational level, from the Unit of Epidemiology in the Institute of Public Health (IPH) in Belgium. After estimating the health expectancy by relative educational level, using a regression based method; the task that remained was to provide confidence intervals for this estimate. An attempt to do so using weighted least squares formulae for variances only resulted in highly inflated confidence intervals. This warranted the use of alternative methods of estimating variances such as bootstrap simulations, which will be implemented in this study. The estimated variances will then be used to compare this measure amongst the various educational levels and to further use this measure for international comparisons. Determining the size of the differences in HE between the various educational levels will then be possible and may serve as a criterion for evaluating policy measures aimed at reducing these differences in health. Intervention strategies may thus be aimed at monitoring those factors affecting the relationship between educational level and health. Examples of such factors include lifestyle (smoking behaviour, diet, etc), use of health and social amenities. The report presents a comprehensive discussion of the bootstrap method for estimating the

variance of health expectancy by relative educational level based on the regression method. Morbidity data were obtained from the Belgian health interview survey conducted in 1997 and mortality data were obtained from the five-year follow-up of the 1991 census data (linked to the national register).

- 2000 -

Fries, J. F. **Compression of morbidity in the elderly**. *Vaccine* 2000;18(16):1584-1589. CB16/95

AGING
MORBIDITY COMPRESSION
DISABILITY
FRAILTY

The Compression of morbidity paradigm envisions reduction in cumulative lifetime morbidity through primary prevention by postponing the age of onset of morbidity to a greater amount than life expectancy is increased, largely by reducing the lifestyle health risks which cause morbidity and disability. Recent data document slowly improving age-specificc health status for seniors, indicate that postponement of the onset of disability by at least 10 years is feasible, and prove effectiveness of some lifestyle interventions by randomized controlled trials. Human aging is increasingly represented by frailty, with declining reserve function of many organ systems, including the immune system. Enhancement of immune function in this setting raises medical, ethical, and social issues which are sometimes in conflict.