

Today's Research on Aging

PROGRAM AND POLICY IMPLICATIONS

Issue 1, March 2007

Healthy Aging

In nearly all biological organisms—from yeast to flies to humans—aging is linked to natural declines in physical and mental functions. Social, biological, and other scientists have long been interested in identifying genetic and behavioral factors that could help humans live longer or retain their physical and mental capabilities in old age.

NIA-funded scientists have identified several factors that can improve the chances of staying healthy longer. These factors include eating healthy, exercising, staying in contact with friends and family, and doing things that bring personal happiness. Researchers continue to explore exactly how eating, exercise, and psychosocial factors work to improve health and extend life.

Eat Right and Exercise

Infections are a leading cause of death for people ages 65 and older. As the human body ages, its ability to fight infections and other health problems diminishes. Consequently, the immune system in older adults is significantly less efficient than in younger people. Also, new infectious diseases such as West Nile virus and avian flu place the elderly at greater risk.

The role that regular exercise plays in improving immune function in the older population is being actively studied (Woods 2005). Several studies suggest that in older adults, exercise or a physically active lifestyle can improve the

immune response to influenza vaccinations (Kohut 2002; Keylock 2007). Also, studies of mice show that moderate exercise boosts immune function and reduces mortality caused by influenza infection (Lowder 2005). In humans, researchers continue to clarify the aging effects of interactions between genes, the environment, and behavior.

With respect to diet's influence on longevity, a recent study suggests that nutritional counseling may be a way to reduce the adverse health effects of aging. In 2006, medical researchers reported, for the first time, that limiting calories and eating a healthy diet can prolong life (Meyer et al. 2006). In this study, volunteers eliminated refined carbohydrates and sugary foods with minimal nutrient content (such as soft drinks, sugar, candy, and white bread) and consumed nutrient-dense whole grains and fruits and vegetables. Researchers linked this diet to slower aging by comparing a marker of natural aging—flexibility of the heart's left ventricle—in volunteers on a calorie-restricted diet with a control group. Volunteers following the diet had more flexible ventricles. Meyer and his fellow researchers attributed the success of this diet to the participants' ability to translate knowledge into action. The volunteers were educated professionals who used nutritional software to design a diet that contained at least 100 percent of recommended nutrients while limiting calories. Whether this strategy would work for other individuals, particularly other socioeconomic groups, has yet to be tested. The study's authors warn that restricting calories without ensuring proper nutrition is dangerous because nutrient deficiencies will lead to more rapid aging.

Socioeconomic Status and Health

The relationship between socioeconomic status and health has long been a puzzle to social scientists and health researchers. Poorer people, those with lower-status occupations, or those with less education tend to have poor health. To date, researchers have found that access to health care and health-related behaviors fail to explain this association.

More recently, population-based studies that incorporate biomarkers—physical traits used as indicators of biological

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This review summarizes research related to the objectives of the National Institute on Aging, with emphasis on work conducted at the NIA demography centers. Our objective is to provide decisionmakers in government, business, and nongovernmental organizations with up-to-date scientific evidence relevant to policy debates and program design. These newsletters can be accessed at www.prb.org/TodaysResearch.aspx.

Over time, the percent of older Americans meeting clinical definitions of high-risk for hypertension and obesity-related complications increased.



*significant increases; ‡significant decreases

Source: Eileen M. Crimmins et al., "Changes in Biological Markers of Health: Older Americans in the 1990s," *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 60A, no. 11 (2005): 1409-13.

functions, disease, medical interventions, or exposure to environmental toxicants—have been used to test the association of low socioeconomic status and biological indicators in humans. However, findings from these studies have not been consistent. Some earlier studies have found that biological and disease indicators differ markedly by socioeconomic group (Crimmins et al. 2004; Seeman et al. 2004). However, Dowd and Goldman (2006) found that lower socioeconomic status is not consistently associated with biological markers of poor health status. Similarly, socioeconomic status could not explain recent changes in the proportion of older Americans with high blood pressure and obesity-related complications (Crimmins et al. 2005).

By the end of the 20th century, a greater proportion of older Americans exhibited clinical signs of risk for hypertension (high systolic blood pressure and obesity) and obesity-related complications (high fasting triglycerides and high C-reactive protein) than had exhibited these signs in the late 1980s and early 1990s. However, the proportion at high risk of atherosclerosis as indicated by high LDL cholesterol, high

High-risk cut-off point used for figure

Indicator	Cut-off	Potential health outcomes
Diastolic blood pressure	>90 mmHg	hypertension, stroke
Systolic blood pressure*	>140 mmHg	hypertension, stroke
HDL cholesterol	<40 mg/dl	atherosclerosis
Fasting LDL cholesterol‡	>160 mg/dl	atherosclerosis
Total cholesterol‡	>240 mg/dl	atherosclerosis
Glycated hemoglobin	>6.4%	diabetes-related complications
Body mass index*	>30 kg/m	hypertension, diabetes
Fasting triglycerides*	>200 mg/dl	obesity-related complications
C-reactive protein*	>4.0 mg/l	obesity-related complications
Serum homocysteine‡	>15 µmol/l	atherosclerosis

*significant increases; ‡significant decreases

Source: Eileen M. Crimmins et al., "Changes in Biological Markers of Health: Older Americans in the 1990s," *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences* 60A, no. 11 (2005): 1409-13.

total cholesterol, and high serum homocysteine, declined (see figure). Researchers attributed the decline in risk factors to the increasing use of medications among the elderly (Crimmins et al. 2005).

Some scientists posit that psychosocial stress is the mechanism through which lower social status translates into poor health. Many studies empirically document higher stress in the lives of those with lower socioeconomic status, but only recently have studies tried to measure stress using biomarkers.

Stress and Healthy Aging

In addition to diet and exercise, research has identified connections with family and friends as a factor that contributes to good health among the elderly. But family connections can also cause stress (Almeida 2005; Almeida et al. 2005). Caring for others or arguing with children, for example, can have immediate emotional and physical effects. As they build up over a series of days, months, or years, these daily stressors can produce more serious reactions such as anxiety and depression.

In recent work, Almeida et al. (2005) find that both the *kinds* of daily stress experienced and the way people *interpret* this stress affect the amount of physiological distress and physical symptoms reported. People who experience more disruptive and unpleasant daily stress events report more psychological distress and physical symptoms. In addition, people who perceive that these stressful events put them at financial risk or threaten their self-esteem also report more psychological and physical problems. Less-educated individuals are more likely to experience a greater number of severe daily stresses and more likely to believe that these events place them at financial risk or change how they think of themselves. The difference in the severity and self-appraisal of daily stress events explains some of the observed health differences between more-educated and less-educated individuals. Past research shows the stress of caregiving to be independently correlated with poor blood glucose control, an indicator of diabetes-related complications. Recently, NIA-funded researcher Brummett and colleagues (2005) found that “middle-aged” caregivers living in neighborhoods they believe to be unsafe have even worse glucose control than other caregivers. The study authors could find no control measures, such as education level, to account for this effect, but suspect that caregivers who believe their neighborhood is not safe leave the house less often and, as a result, get their prescriptions less often.

What This Means: Biological Measurement of Health in Surveys

NIA continues to foster research on the mechanisms that contribute most to healthy aging. One of the critical questions that may be addressed by such studies is: What are the contributions of protective genetic traits and what environmental traits are associated with lower levels of disease and disability? Increasingly, such studies require a combination of social science and biological information. As a result, more surveys are incorporating biomarkers. Biomarkers allow better measurement of health and disease, corroboration of self-reported health behaviors, and indicators of exposures to environmental agents. Using biomarkers to identify individual differences in exposure to environmental risk factors, health, or physical activity level can improve understanding of how these factors vary with life histories and their long-term health consequences. Such knowledge may be directly translated into behavioral recommendations that improve health among the elderly.

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The NIA Demography Centers

The National Institute on Aging supports 13 research centers on the demography and economics of aging, based at the University of California at Berkeley, the University of Chicago, Harvard University, the University of Michigan, the National Bureau of Economic Research, the University of North Carolina, the University of Pennsylvania, Pennsylvania State University, Princeton University, RAND Corporation, Stanford University, the University of Southern California/University of California at Los Angeles, and the University of Wisconsin.

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For More Information

Life Extension: Science Fact or Science Fiction (July 2001)
www.niapublications.org/agepages/PDFs/Life_Extension-Science_Fact_or_Science_Fiction.pdf

Major Studies Using Biomarkers
www.usc.edu/dept/gero/CBPH/biomarker/studies.htm

Biodemography and Biomarker Networks
<http://agingcenters.org/networks.html>
www.pop.psu.edu/bio/bio.htm
www.usc.edu/dept/gero/CBPH/biomarker

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