

THE HEALTH AND RETIREMENT STUDY

AGING IN THE 21ST CENTURY

CHALLENGES AND OPPORTUNITIES FOR AMERICANS



HRS | HEALTH AND
RETIREMENT
STUDY

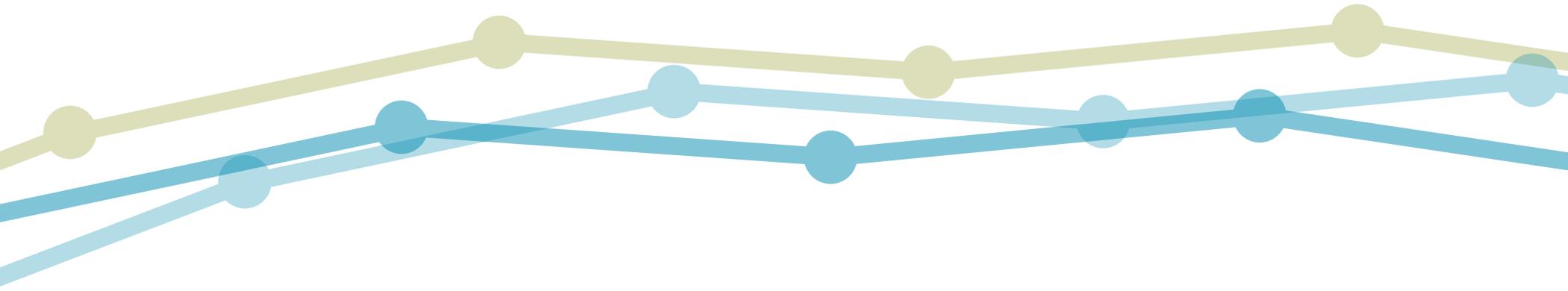
SURVEY RESEARCH CENTER | INSTITUTE FOR SOCIAL RESEARCH
UNIVERSITY OF MICHIGAN



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FOREWORD

An aging population is a sign of success — success at increasing life expectancy and managing family size. It is also a challenge. The rapid growth of the older population means that the number of retirees will grow relative to the number of workers even though people are working longer. It means that the burden of Alzheimer’s disease and related dementias will grow even if the recent trends toward lower rates of the disease continue. The demographic pressures of an aging population are being felt everywhere in the world. In the US, the timing of aging is driven by the Baby Boom generation which is now entering retirement in record numbers and will in twenty years similarly require record increases in nursing care. The need for high quality and reliable data on our aging population is more critical than ever.

The Health and Retirement Study (HRS) was designed more than a quarter century ago to provide data for research on aging as an individual experience as well as a population phenomenon. The study’s combination of longitudinal data on health, retirement, disability, resources, and family support offers unprecedented opportunities to analyze and gain insight into our aging selves. Elucidating the complex interplay of health and retirement, of biology and individual choice, is at the heart of HRS objectives. Broad multi-disciplinary measurement is essential to that mission. Because life changes, and we with it, a study of aging needs to be able to track change by longitudinal measurement.

This book aims to illustrate how the multi-disciplinary and longitudinal data collected

by the HRS address those needs. Reflecting this, the themes of the chapters are analytical and integrative rather than descriptive as was an earlier volume of HRS findings titled *Growing Older in America*. The other key feature of the HRS is the public sharing of data which enables vastly greater scientific discovery than would be possible with a narrow team of investigators. While this volume reviews a large swath of the research output using HRS research, it is only a fraction of what the scientific community has produced.

We gratefully acknowledge financial support and scientific cooperation from the National Institute on Aging (NIA U010009740) and additional co-funding and scientific input from the Social Security Administration. Two individuals loom large in the inception of the HRS. Richard Suzman was the Director of the Office of Behavioral and Social Research (BSR) at the NIA until his untimely death in 2015. Together with HRS’ first Director, F. Thomas Juster, he provided vision and leadership to create and build the study we have today.

Many individuals and institutions contribute to the ongoing planning, design, development and administration of the study, especially a highly distinguished multidisciplinary team of co-investigators at the University of Michigan and other institutions nationwide: Charles C. Brown, Eileen M. Crimmins, Jessica D. Faul, Michael D. Hurd, Sharon L. R. Kardina, Kenneth M. Langa, Helen G. Levy, John J. McArdle, Kathleen McGarry, Olivia S. Mitchell, Mary Beth Ofstedal, Jacqui Smith, Robert B. Wallace, and Robert J. Willis.

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Finally, and most importantly, we thank the over 30,000 Americans who have shared their lives with us to make our vision of a broadly nationally representative multidisciplinary longitudinal study a reality. Our gratitude to them knows no bounds.

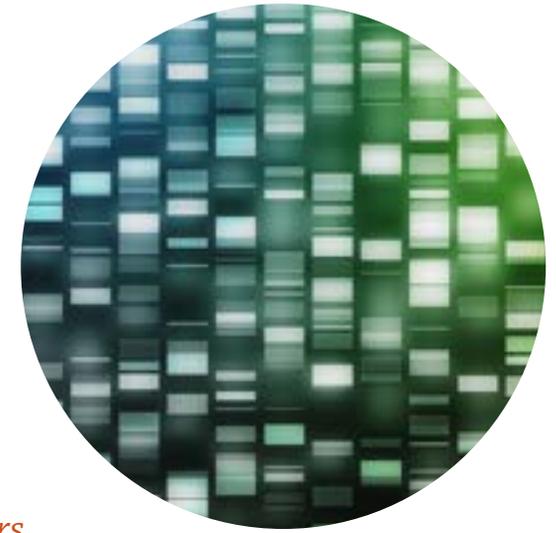
David Weir
Director
Health and Retirement Study

INTRODUCTION



INTRODUCTION

Our nation's leading resource for data on aging in America — the Health and Retirement Study (HRS), a panel study of people over age 50 in the United States — is now in its 25th year. As the Baby Boom generation retires at the astounding rate of 10,000 people per day, this public asset is more important than ever. By 2030, when the last of the Boomers turns 65, the population aged 65 and older will have increased to 20 percent from 15 percent in 2015. This dramatic change in our population means that there will be more retirees drawing benefits and fewer workers to help pay for programs like Social Security and Medicare. The HRS was created to help address these challenges by providing information about the lives of retired people and people approaching retirement ages.



Published in 2006, the first [HRS data book](#) sought to introduce the world to the HRS by describing the study's innovative design and content and providing some early findings within the main content areas of health, work and retirement, income and wealth, and family connections. In the decade since, the HRS has built on its foundation of innovation, pioneering in new directions and increasing the data's value and relevance. The world is noticing. There are now more than 24,000 registered users of the data — including scientists, policy analysts, media, and others — from more than 20 countries. Every day, news outlets report on significant new findings from the HRS.

With over 3,000 publications reporting on HRS data, this book aims to synthesize some of the research these remarkable data have yielded. In reviewing select HRS research over the past 10 years, our goals for this publication are:

- To emphasize several integrative themes of HRS research output
- To demonstrate the critical need for longitudinal data to study changes that come with age and changes in policies as well as the national economic outlook that can affect people's lives
- To illustrate why it is necessary to include assessments of economic conditions, health, and other aspects of life in one survey in order to gain a complete understanding of human aging

The HRS is supported by the National Institute on Aging (part of the National Institutes of Health) and the Social Security Administration in order to meet the nation's need for reliable data on the health and well-being of people as they age. Launched in 1992 at the University of Michigan's Institute for Social Research, the HRS was the first nationally representative longitudinal study of older people that included detailed economic and health information in the same survey. Since then, the HRS has grown to become the largest and — with its expansion into biomarkers, genetics, and psychosocial content — the most comprehensive panel study of Americans over age 50. The HRS provides a growing body of multidisciplinary data on aging.

This book looks at some of the most significant trends and changes related to aging over the past two decades, providing information and insights that can only be found with the rich data resources of the HRS. Each of the five chapters is organized around a major theme (see [Figure A-1](#)). This introduction presents an overview of the HRS study design and content, the relevance of HRS findings, and directions for the future.

The HRS is a large and complex study, but the basic design is a survey that:

- Is nationally representative of the population over age 50
- Follows individuals and their spouses or partners from the time of their entry into the survey until death
- Introduces a new 6-year birth cohort of participants every 6 years

This book looks at some of the most significant trends and changes related to aging over the past two decades.

This brief overview describes the survey content, including external data sources to which HRS data are linked, and the longitudinal cohort design. More detail of the study design is provided in [Sonnegg et al. \(2014\)](#).

FIGURE A-1 Themes of the book

Chapter 1 considers the trend toward longer working lives, addressing factors that influence decisions about how long to work and when to retire. We review HRS research that helps us understand how healthy we are as a nation and what influences our health in terms of work capacity at older ages. What are the consequences of retirement for health and well-being?

Chapter 2 takes up the question of the aging brain. A major contribution of the HRS is to provide accurate population estimates of cognitive health, including the incidence and prevalence of Alzheimer's disease and dementia. Studies that use HRS data can also yield important insights about the causes and consequences—including the costs—of dementia. What puts us at risk for cognitive decline and what keeps us sharp at older ages?

Chapter 3 explores retirement preparation. As the retirement landscape continues to change, workers are increasingly responsible for making sure they have adequate financial resources in retirement. Financial planners suggest, on average, that we need about 80% of the income while working in order to maintain our living standard in retirement. Is this realistic? Are there other ways to determine retirement resource adequacy? We review HRS research on the many personal as well as institutional factors that influence our ability to save and our decisions about saving for retirement and spending during retirement.

Chapter 4 reviews cross-national comparative research that reveals relatively worse health in the US as compared to other developed countries, despite much higher levels of spending on health care. A deeper understanding of health disparities within the US may help us understand the cross-national gap. Particularly at middle age, health disparities are very large both by race and by socioeconomic status. Health disadvantages appear to start in childhood and reach into adulthood, influencing health well into older age. Where we live also has a powerful influence on health.

Chapter 5 discusses the impact of the Great Recession of 2007 to 2009, looking at changes in wealth as well as changes in work and work expectations over the period of the stock market crash, the recession, and recovery.

What does HRS Measure?

The HRS has many components. The heart of the study is the core interview that takes place every two years. The core interview takes about two hours to complete and constitutes the bulk of the data the HRS collects.

The first core interview, or baseline, is conducted face-to-face in participants' homes. Follow-up core interviews are conducted either by phone or face-to-face.

There are currently twelve waves of core data available from 1992 to 2014 with about 18–23,000 participants in any given wave. The core interview collects information on a range of factors related to well-being among older adults:

Income and Wealth

Detailed characterizations of household income and wealth over time are hallmarks of the HRS. Personal information like this can be difficult to obtain, but innovative data collection methods used in the HRS have overcome many traditional survey obstacles and continue to yield in-depth and reliable measures.

Health and Use of Health Services

The HRS takes a multidimensional approach to health — studying the course of chronic diseases and the evolution of functional capacities.



A signature feature of the HRS is the direct assessment of cognitive abilities and how they change with age. Information on health insurance and medical care are important for understanding health and the connections among health, employment, and economic resources.

Employment

For many people, retirement is anything but a simple one-step transition from full-time work to no work at all. The HRS tracks all the different ways people retire and “un-retire” and can relate these choices to their health, type of work, pension and health insurance coverage, and family situation. These data are invaluable in understanding the potential effects of new policies to encourage people to work longer.

Family Connections

Family background shapes health and economic outcomes throughout life. Family members provide economic and emotional support and often provide physical care for each other. Understanding these connections and how they change with age has been a central concern behind the design of HRS from its beginning.

Creating a Biosocial Survey

Disparities in health by race, education, and socioeconomic circumstances have been a policy concern for generations, with little insight into the biological mechanisms. Only recently have

large population-representative surveys begun to integrate biological measurement to create biosocial surveys that enable such discovery (Hauser and Weir 2010). In 2006, the HRS introduced a new in-person interview, known as the enhanced face-to-face interview (EFTF), that expanded to include the collection of a wide range of measures of physical function, dried blood spots for clinical biomarkers, and salivary DNA. Integrating biology in this way puts the HRS at the forefront of biosocial surveys of aging.

Since 2006, blood-based biomarkers measured include cholesterol, glycosylated hemoglobin (HbA1c), an indicator of blood sugar control over the past two to three months; C-reactive protein (CRP), a general marker of systemic inflammation, and cystatin C, an indicator of kidney functioning. Beginning in 2014, a measure of immune functioning and inflammation, IL-6, is also assayed. Physical measures include grip strength, timed walk, lung function, balance, height and weight, waist circumference, and blood pressure.

These biomarkers have been chosen in the HRS to reflect important age-related changes in cardiovascular and metabolic functioning, levels of inflammation, and organ reserve or frailty. Biomarkers such as blood pressure, cholesterol level, and glycosylated hemoglobin may indicate preclinical problems which are unknown to survey participants, especially those without regular preventive health care. Markers of inflammation such as CRP and markers related to frailty such as lung function, grip strength and cystatin C, are predictors of a number of major health outcomes including mortality.

In 2009, funding from the American Recovery and Reinvestment Act created the opportunity for the HRS to make its case for creating a genetic resource for research. Awarded multi-year RC2 and RC4 awards (National Institutes of Health Director's Opportunity Award), the HRS has genotyped nearly 20,000 participants using state-of-the-art technology. With over 180 approved studies in the National Institutes of Health database of genotypes and phenotypes (dbGaP), and participation in dozens of consortia projects, the HRS is now among the most influential genetic cohorts, and by far the most impactful social science survey in the study of human genetics.

Psychosocial and Lifestyle Factors

Compared to the first 30 years of life, scientists know relatively little about how we change and grow in later life. Many people can now expect to live a long life, and to understand more about what influences vitality, well-being, and life quality during these added years, the HRS also measures psychosocial functioning. As part of the EFTF interview, participants are given a self-administered questionnaire that asks about participants' well-being, various sources of stress, social relationships, personality and beliefs, and experiences at work (Figure A-2).

FIGURE A-2 HRS psychosocial content: 2010 and beyond

Well-being	Lifestyle	Social Relationships
Life satisfaction	Activities in life	Spouse/child/kin/friends
Domain satisfaction	Neighborhood evaluation	Positive support
Depression	Religiosity	Negative support
Positive/negative affect	Discrimination	Closeness
Hedonic well-being	Lifetime traumas	Loneliness
Purpose in life	Early life experiences	Early parental relationships
Personal growth	Stressful life events	Friend contact
Financial strain	Ongoing stress	Child contact
Personality	Work	Self-related Beliefs
Extraversion	Work stress	Personal mastery
Neuroticism	Work discrimination	Perceived constraints
Openness	Work satisfaction	Hopelessness
Agreeableness	Capacity to work	Subjective age
Conscientiousness	Effort-reward balance	Perceptions of aging
Cynical hostility	Work support	Subjective social status
Anxiety	Work/family priorities	Optimism
Anger	Work/life balance	Pessimism



FIGURE A-3 HRS supplemental off-year surveys

Consumption and Activities Mail Survey (CAMS) biennial from 2001-2015+

CAMS is administered by mail to a random subsample of about 4,000 HRS core respondents; the survey collects extensive information about individuals' time use and household patterns of spending

Aging, Demographics and Memory Study 2001, 2002, 2006, 2008

ADAMS is an in-home neuropsychological assessment designed to provide a diagnostic determination of dementia or cognitive impairment without dementia; the study aims to estimate the prevalence of dementia as well as risk factors and outcomes

Prescription Drug Study 2005, 2007, 2009

The Prescription Drug Study (called the Health and Well-Being Study in 2009) is designed to track changes in prescription drug use and coverage as Medicare Part D – the federal prescription drug benefit – was implemented; administered by mail to 3,500- 5,000 HRS respondents; the 2009 wave added new content on experienced well-being

Internet Surveys 2003, 2006-2007, 2009, 2011, 2013

Web-based surveys developed in conjunction with the RAND Corporation; covered topics include internet use/ social media, health literacy, childhood health, cognition, well-being, residence history, income, assets, expectations, consumption, retirement preferences, prescription drug use, health behavior, annuities, and sibling transfers

HRS Mail Survey 1999

First mail survey designed to evaluate the impact on response rate of questionnaire length and impact of participation in the mail survey on core response rates; topics include health and health care use, psychosocial and attitudinal factors, housing and employment, spending preferences

Human Capital Mail Survey 2001

Surveyed a random subsample of about 4,000 HRS 2000 respondents by mail about parental economic investments in education, children's educational attainment, and the costs associated with attending college

Diabetes Study 2003

Conducted by mail with a subsample of about 2,000 HRS respondents who reported having diabetes in the 2000 or 2002 core interview; the focus was diabetes care, self-management, and health care utilization

Disability Vignette Survey 2007

Interviewed about 4,000 HRS respondents about their own health and disabilities; then told respondents vignettes that provide descriptions of people in different states of health and asked respondents to rate the level of disability of the hypothetical person

Health Care Mail Survey 2011

Conducted by mail with a subsample of about 7,000 HRS respondents on topics in health care, including access, utilization, policy, and veterans' health services

Health Care and Nutrition Survey 2013

Conducted by mail with a subsample of over 8,000 HRS respondents on topics in health care access and satisfaction, food security, food expenditures, and nutritional intake including vitamins and other supplements

Veterans Mail Survey 2013

Conducted by mail with a subsample of over 1,800 HRS respondents who had ever served in the active military. Contains questions about health care of veterans and their experiences in the military

Life History Mail Survey 2015

Contains questions about residential history from birth to age 50 and about educational history and experiences of HRS participants

Supplemental Off-year Studies

Even with all that is covered in the core and EFTF interviews, there are still more topics of pressing interest in aging. To keep the core interview from growing longer, HRS also conducts supplemental surveys with subsamples of 3,000 to 7,000 participants from the core sample. These supplemental studies are conducted in the years between core interview waves. Because the samples are drawn from the full HRS sample, data from these supplemental studies can be linked to the core data. The supplemental studies collect a range of information in a variety of modes. For example, the Aging, Demographics, and Memory Study, or ADAMS, is an in-home clinical interview designed to provide diagnostic information on Alzheimer’s disease and other dementia subtypes. Other supplemental studies are mail surveys, such as the Consumption and Activities Mail Survey (CAMS), which is an ongoing biennial survey that tracks changes in spending and activities throughout retirement. The HRS has also conducted web-based internet surveys on many different topics, such as health, cognition, well-being, economics (income, assets, expectations, and consumption), and retirement. The supplemental off-year studies are summarized in Figure A-3.

Administrative Linkages

HRS data are also linked at the individual level to sources of administrative information. Linkage to administrative records of the Social Security Administration (SSA) has been a top priority and signal success of the HRS. SSA records provide earnings histories, benefit histories, and application histories for disability and supplemental

security income of HRS participants, all of which are widely used by researchers to study the impact of policy changes.

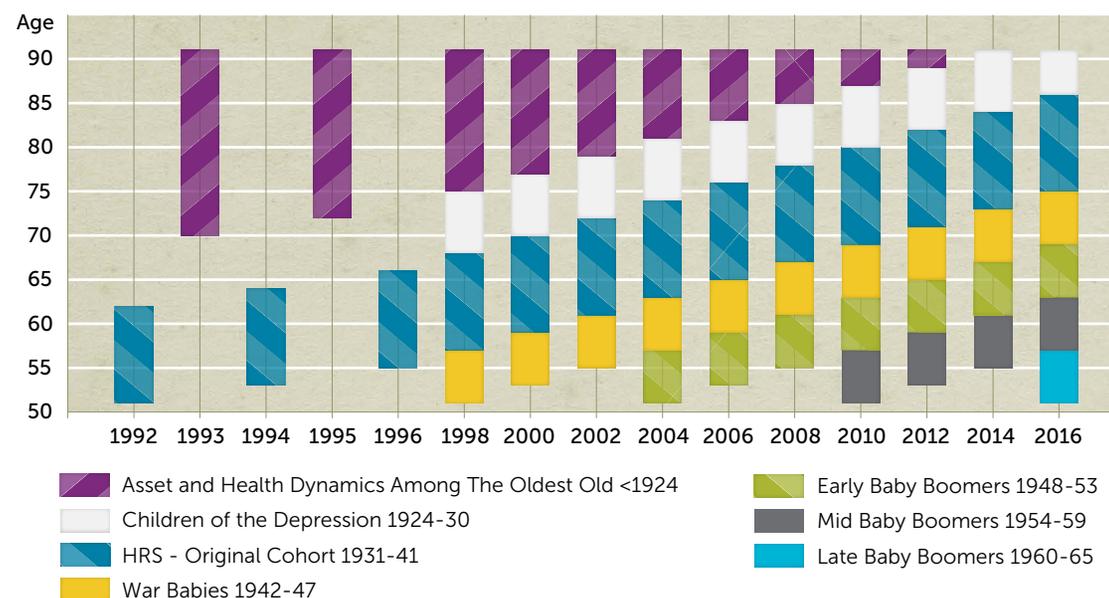
Other linkages at the individual level provide an important complement to the health information available in the HRS. One of the main goals of the HRS is to understand the relationship between medical history and financial status and how use of health care may change as people age. For all respondents who are eligible for Medicare, the HRS endeavors to obtain information about diagnoses and costs of treatment from Medicare records maintained by the Centers for Medicare and Medicaid Services. Similarly, for HRS participants who served in the military and obtained health care through the Department of Veterans Affairs (VA), the HRS attempts to obtain medical

records from the VA. For tracking mortality, the HRS links to the National Death Index.

At the employer level, information on employer-provided pension plans is obtained for businesses where respondents are or have been employed. The HRS is the only large-scale survey to attempt direct matching of respondents to employer-provided pension plan information. This is of particular value for understanding the retirement incentives of these plans and measuring the wealth they imply.

All of these sources of linked data not only provide validation of self-reported information but also additional information not collected in the survey.

FIGURE A-4 Longitudinal cohort design of the HRS



Longitudinal Cohort Design

The HRS sample has been built up over time. **Figure A-4** depicts the longitudinal cohort sample design. The initial 1992 HRS cohort consisted of persons born 1931 to 1941, who were then aged 51 to 61. Members of this first HRS cohort, now in their 70s and 80s, have been interviewed every two years since 1992. A second study was added in 1993, the Asset and Health Dynamics Among the Oldest Old, or AHEAD, which captured those born before 1924, who were 70 and older at the time. Then in 1998, the HRS and AHEAD cohorts were merged, and two new cohorts were enrolled to bridge the study age gaps for Americans over age 50. These birth cohorts are the Children of the Depression Era, or CODA, for those born 1924 to 1930, and the War Babies, for those born 1942 to 1947.

Without refreshment, the HRS sample would age quickly and become irrelevant to pre-retirement ages. So HRS now employs a steady state design, replenishing the sample every six years with younger cohorts. In 2004, the HRS added the Early Baby Boomers (EBB), born 1948 to 1953, and in 2010 added the Mid Baby Boomers (MBB), born 1954 to 1959. The Late Baby Boomers (LBB), born 1960 to 1965, were added in 2016. For all cohorts, both members of a couple are included in the sample.

To constrain costs, study recruitment was reduced in the steady state by nearly half from the levels of the original HRS cohort. This meant that lower numbers of minority households in the more recent cohorts became a concern. The HRS

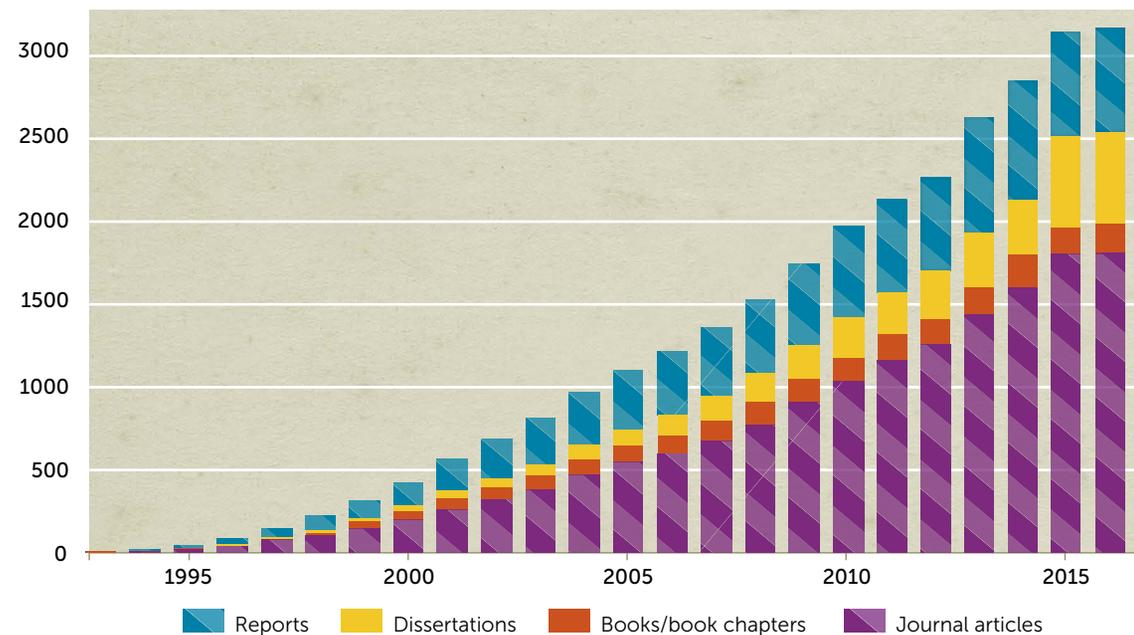
is an important resource for understanding causes of racial disparities in wealth and health, so maintaining the sample of minority participants is a priority. To address this need, a new initiative launched in the 2010 wave of data collection greatly expanded the minority sample in the EBB and MBB cohorts.

Going Global

The success of the HRS idea — a publicly available, multidisciplinary, longitudinal study of the older population — has led to the proliferation of sister studies. The HRS is now the model for a growing network of harmonized longitudinal aging studies around the world — including England, Ireland, 20 European Union countries,

Israel, Mexico, China, Japan, South Korea, India, Brazil, Northern Ireland, Scotland, and South Africa. The global network greatly enhances the value of each of its members, including the HRS itself, through sharing of ideas and methods. The international studies have attracted researchers from a variety of disciplines and all parts of the globe. The availability of comparably measured data in other countries with different policy structures, social environments, and histories provides opportunities for comparative research to shed light on causal relationships that even longitudinal analysis in a single country cannot accomplish. The growth of these studies expands the network of researchers using the HRS data and contributing innovative measurement ideas.

FIGURE A-5 HRS scientific productivity



Expanding Access and Use of the Data

The first mission of the HRS is to collect high value data on aging. The second mission is to share it with the public. The HRS places a premium on early and open access to data while implementing state-of-the-art data security measures to protect confidentiality. There are three levels of data security. The vast majority of the data are public data available to all registered users. Sensitive health data, like biomarkers and information on prescription drugs, require an extra step in registration. Most of the information from administrative linkages is restricted data and requires submission of a separate licensing agreement, which ensures confidentiality but limits accessibility. For those who do not meet the requirements of the licensing agreement, the HRS has always maintained a secure data enclave on site at the Institute for Social Research. To increase accessibility to these data, which are especially valuable for policy analysis, the HRS has now created a virtual desktop infrastructure, which allows users to work with some of the restricted data through fully secure remote desktop connection to the enclave.

Another major asset that widens access to a broader array of potential users is the RAND versions of HRS data. Researchers at the RAND Corporation have created a user-friendly version of much of the HRS public data. Derived variables covering a broad, though not complete, range of measures have been constructed and named consistently across waves. While the RAND contribution is a good starting place for new

users, even seasoned users continue to make use of derived variables, such as total household income and wealth, which are very time-consuming to create. Other contributions include user-friendly versions of CAMS as well as income and wealth imputations (which help fill in missing information). RAND has also created a family data file that contains a cleaned, processed, and streamlined collection of variables related to the respondent's family including a subset of available characteristics of all participant and spouse children, children-in-law, and grandchildren.

For those interested in conducting comparative research using the HRS sister studies, the Gateway to Global Aging Data (G2G) is another useful resource created and maintained by researchers at the University of Southern California. The G2G site (g2aging.org) offers a digital library of survey questions, a search engine for finding comparable questions across surveys, and identically defined variables for cross-country analysis.

Impact

The HRS exists to support research on aging and every metric suggests it continues to grow in its impact. Annual website visits have climbed from 91,063 to 286,815 between 2006 and 2015. Annual data product downloads increased from 18,805 to 46,638 over that period. User registrations per year have gone from 1,248 to 2,565, and the total number of registered users now stands at 24,798. Annual peer-reviewed journal publications broke 100 for the first time in 2009 and were at 190 in 2015. The total now stands at over 1,800, and publications of all



kinds (including working papers) are nearing 3,500. A public resource like the HRS is especially valuable in the training of new researchers. The HRS has been used in 442 doctoral dissertations. Many of those new scholars would not have done research in aging without the availability of the HRS. [Figure A-5](#) shows the growth in the number of HRS publications.

The HRS exists to support research on aging and every metric suggests it continues to grow in its impact.

A Scientific Foundation for Policy

Good policy at the population level goes hand in hand with better science for understanding aging at the individual level. Having been created in large measure to prepare for the aging of the Baby Boomers, the HRS is now following these cohorts into retirement, to support the analysis of policy options and to gauge the impact of policy changes on all the older population. Scientists are using the data to document needs, to model behavior relevant to policy, and to follow the impact of policies after their introduction. HRS data are widely used by government agencies — the Congressional Budget Office, the Treasury Department, the Government Accountability Office, and the Social Security Administration — to evaluate policy proposals.

Social Security and Medicare

The Baby Boom delayed population aging in the US by a full generation relative to what it would have been in the absence of that period of high fertility and relative to virtually all other countries at similar levels of development. As the Boomers approach older ages, we face an unusually rapid pace of population aging that will quickly catch us up. We have already seen much of the adjustment in the private sector's retirement policies — the abandonment of defined benefit pension plans in favor of defined contribution plans, and the erosion of retiree health plans both pre- and post-Medicare eligibility. State and local public-sector pensions are now under similar stress. Perhaps the clearest evidence of the Baby Boom's beneficence is the positive balances in the

Social Security and Medicare trust funds built up during their working years. Those balances will erode and eventually force some adjustment. The HRS is an invaluable source for understanding how different policy adjustments would affect different segments of the population, and what the behavioral responses might be.

Scientists are using the data to document needs, to model behavior relevant to policy, and to follow the impact of policies after their introduction.

Similarly, the future of the Medicare program is now intimately tied to the progress of broad-based health care reform. This creates great opportunities for the HRS to be relevant to evaluating changes, particularly in the Medicare program (Ayanian et al. 2011). For example, one line of research has studied health care utilization of HRS participants before and after age 65 (the age of Medicare eligibility) showing clear increases in utilization after Medicare becomes available for those who were previously uninsured (McWilliams et al. 2009).

The Role of Families

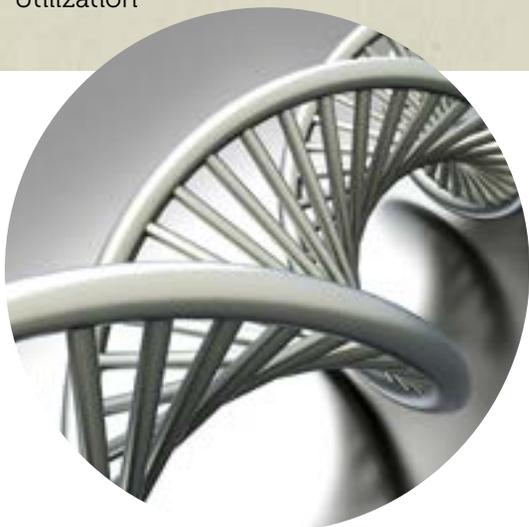
The cohort design of the HRS is extremely valuable for analyzing family behavior. The family experiences of the Baby Boom cohorts differ in important ways from the older cohorts that preceded them. Families are changing dramatically with the incidence of divorce, childlessness, and women's labor force participation increasing along with increases in step-families and cohabitation.

At the same time, the numbers of siblings and children available to individuals are decreasing. These changes will likely lead to significant changes in the availability of family members to provide support in various dimensions as well as in the strength of the bonds between them. The steady state design of the HRS provides researchers with the information needed to assess how these demographic changes affect family relationships, interactions and transactions over time and across cohorts.

With its detailed family and caregiving data, the HRS is also uniquely positioned to analyze the effects of important developments in public policy regarding long-term care where families, private insurance, and public insurance are substitutes for one another.

FIGURE A-6 Selected contextual measures, by domain

SES/Demographic Structure	Physical Hazards
Socioeconomic disadvantage	Air pollution
Racial/ethnic composition	Monitor-based
Age structure	Predicted surfaces
Residential stability	Amenities
Psychosocial Stressors	Retail stores
Disorder and decay	Food environment
Traffic	Recreation facilities
Health Care	Public libraries
Quality/effective care	Land Use/Built Environment
End of life/post-acute care	Street connectivity
Hospital & physician capacity	Land use mix
Utilization	Parks



The Future

As the aging of the population unfolds and the retirement of the Baby Boomers continues, the HRS will continue to innovate and grow to meet the need for data on these trends. In the coming years, by observing the dynamics of retirement and health and people's social and economic well-being following retirement, the HRS will be a powerful research tool for tracking and understanding important societal changes and potential policy responses. This last section outlines some of the new directions the HRS is taking.

New Linkages

Where older people live may be very important for creating opportunities to lead healthy, active, independent and engaged lives. The HRS Contextual Data Resource (HRS-CDR) links data on the socioenvironmental context to HRS respondents and includes measures representing six domains (see Figure A-6). Measures are available across multiple years of the survey period and at different levels of geography. The HRS-CDR will be available to users through the virtual desktop infrastructure in 2017.

Similarly, a linkage to the Census Bureau Business Register is underway. These data will also facilitate the availability of contextual data on the physical, social, and health care environments of the geographic regions where HRS participants reside. Finally, given the high policy priority of understanding more about the health of those with low income, HRS is now building a linkage to the Medicaid Analytic eXtract (MAX).

Obtaining Whole Blood

In 2016, the HRS began collecting samples of venous blood, which will greatly enhance the existing set of biomarkers by adding biomarkers related to immune system functioning, new information about age-related changes at the molecular and cellular levels, and epigenetic markers.

Frontiers in Genetic Discovery

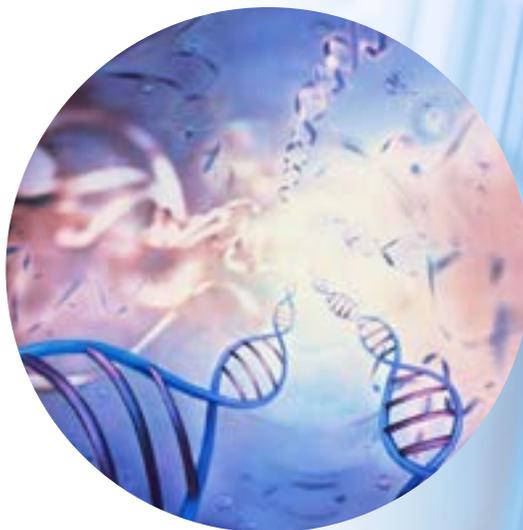
The HRS will continue to build its data resource for conducting genome-wide association studies (GWAS), which investigate both common and rare genetic variations in a population to see whether certain variants are linked to better health and

functioning and longer lifespans. The genetic association discoveries in the HRS to come will likely shape the future of how we measure certain traits (Singer 2011). The capacity of the longitudinal HRS to adapt its measurement of traits (like personality or physical functioning) in future waves makes it uniquely valuable to the study of genetic contributions to human behavior.

The GWAS technology will foster studies of survivorship, longevity, and genetic determinants of aging along with studies of complex disease traits, physiological measures and functions, biomarkers and physical performance, as well as behavioral phenotypes. Exploration of “gene by environment” interactions in a variety of health, social, and behavioral domains will be possible. The longitudinal nature of the HRS greatly enhances both the power to detect genetic effects and provides an important, under-studied opportunity to examine the genetic influence on the age-dependent changes in key health indicators over time. The ultimate goal is to uncover genetic variations in a population that can be used as biomarkers of healthy aging and longevity.

Tackling Alzheimer’s

No disease of aging is more feared, or more burdensome, than dementia. With the aging of our population, it looms ever larger. Congress and the National Institutes of Health have begun to act on the need for more research on this condition, with a significant increase in funding for the NIA. The HRS has been studying cognition for over twenty years and is responding to the national effort by launching its Healthy Cognitive Aging Project (HCAP). Working with several of its international partner studies, the HRS is spearheading a global study of dementia in older populations, generating population-representative estimates of prevalence, providing longitudinal data for epidemiologic investigation, and gauging its impact on individuals, families, and the health care system. The new HCAP project will make HRS and international data even more valuable in understanding who is at risk for dementia and how that risk can be reduced as people age.



WORKING LONGER



CHAPTER 1 | WORKING LONGER

After steadily declining for several decades, Americans' average age at retirement began increasing in the early 1990s and continues to increase. Tracking this trend and understanding its implications is especially important as the large Baby Boom generation enters retirement. Policy makers can prepare for the aging of the Baby Boom generation with a better understanding about who works longer and why. Who decides to work at older ages, and what impact do things like health, health insurance, and pensions have on this decision? Are we healthy enough to keep working past normal retirement age? What impact does retirement have on health? This chapter addresses these questions by examining HRS research on health and well-being at retirement and beyond.



Improvements in health at older ages coupled with increased take-up of Social Security Disability Insurance (SSDI) make the issue of health trends important and unresolved. For example, HRS research finds that half of men aged 65 to 74 report no work-limiting physical impairment. Yet a significant proportion report limitations that make working at older ages difficult. Using the rich set of information available in the HRS and leveraging its longitudinal aspect, researchers are evaluating predictors of labor force participation as well as consequences of decisions about working at older ages. As a whole, HRS research reveals that health is highly relevant in work decisions. External incentives such as Social Security, Medicare, health insurance and pensions play large roles in retirement timing as

well. In addition, retirement appears to affect us both physically and mentally — sometimes for better, sometimes for worse.

Trends in Working Lives

Few national statistics are as closely watched as the number of people in the labor force. The Current Population Survey, a study conducted by the US Census Bureau for the Bureau of Labor Statistics, is the primary source of information on trends in labor force participation. These statistics and other sources confirm that Americans are working longer than in past decades. These large surveys offer accurate estimates but contain little information to explain this trend. The HRS helps fill this gap.

Who is Working Longer?

HRS research confirms trends found in labor statistics: we are working longer (Figures 1-1a and 1-1b). Because the HRS continues to enroll younger cohorts, researchers can document how retirement patterns change over time, comparing the behavior of younger workers to older workers at the same age. The HRS also asks participants to evaluate their probability of working past certain ages to provide a window on cohort differences in likely retirement plans. Beyond just documenting trends, however, HRS research also reveals important information about who works longer and why.

FIGURE 1-1a Trends in women's labor force participation by age: 1998-2014

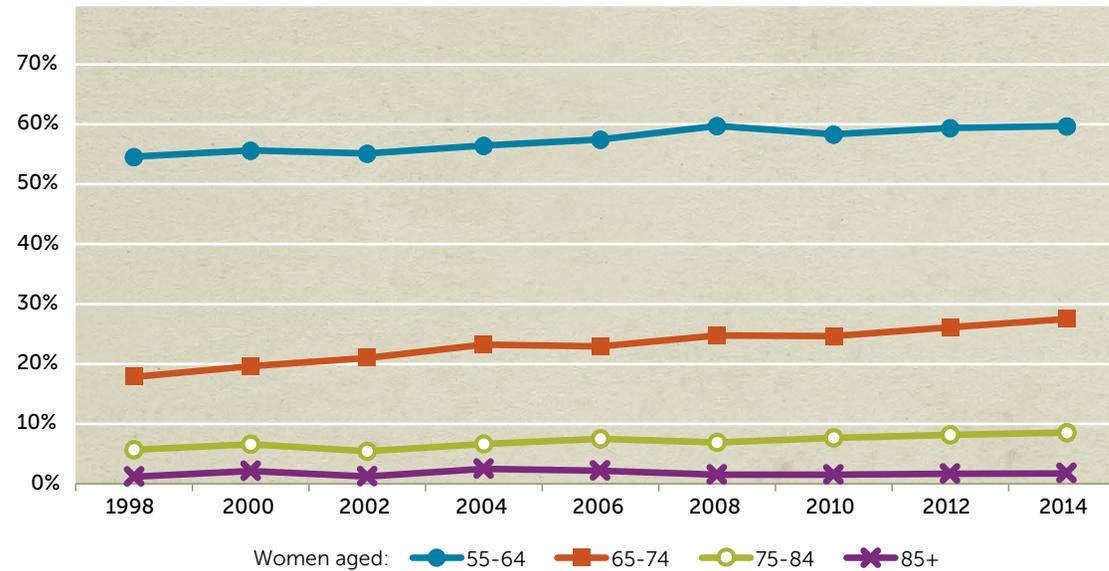
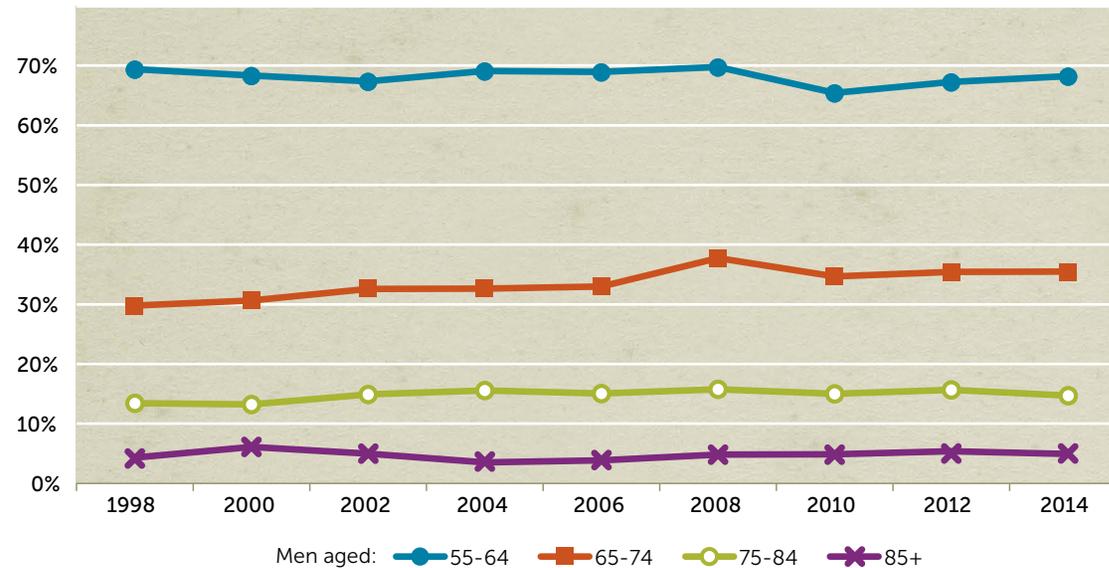


FIGURE 1-1b Trends in men's labor force participation by age: 1998-2014



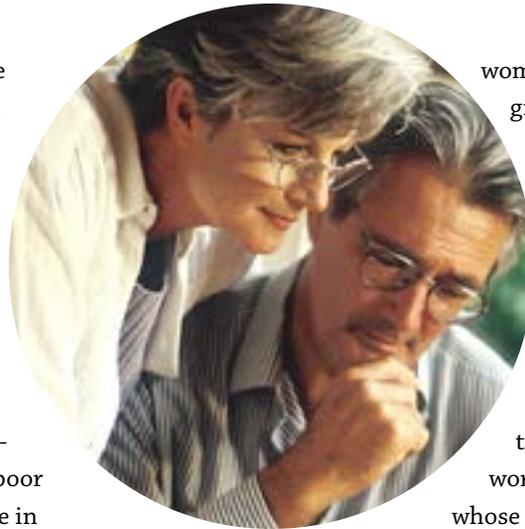
Source: HRS 1998-2014.

HRS information on subjective expectations about retirement is useful in comparing older and younger cohorts before actual retirements have yet to occur. Early Baby Boomers aged 51 to 56 in 2004 report expecting to work longer, on average, than workers of the same ages in 1992 (Mitchell et al. 2016). Early Baby Boomers have lower rates of employer-sponsored retiree health insurance and higher levels of education than older cohorts. Younger workers are also less likely to hold defined benefit (DB) pensions. Generally, DB pensions offer workers an income stream in retirement after a certain number of years of service, which often allows retirement at earlier ages. McInerney et al. (2013) also find that Early Baby Boomers expect to work an average of one year longer compared to the preceding cohort. This difference is not fully explained by cohort differences in health or economic status, both of which can affect retirement.

As younger cohorts begin to retire, research is looking at their actual retirement rates compared to older cohorts. Kelley, Ettner, Morrison, et al. (2011) compare retirement rates for those born 1913 to 1917, 1933 to 1937, and 1943 to 1947. Interestingly, men in the 1933 to 1937 cohort have the earliest age of retirement compared to the other two cohorts. Forty percent of the 1943 to 1947 cohort are working at age 65 compared to 20% of the 1933 to 1937 cohort. A more recent cohort comparison shows the working longer trend continuing. Aaron and Callan (2011) compare retirement rates of men and women aged 55 to 66 in the HRS cohort, the War Babies, and the Early Baby Boomers. The probability of retiring is declining in this age group across cohorts.

While women are more likely to stop working than men, there is no racial difference in who works longer. Greater wealth is generally associated with leaving the workforce, but those with more education are likely to work longer. The major factor associated with stopping work is self-reported poor health. Even a small decline in health status decreases the likelihood of working longer. Despite these differences, those who leave work versus continuing to work at older ages are alike in many other ways (Aaron and Callan 2011).

A similar study compares the later life work decisions of men and women using longitudinal HRS data from 1992 through 2004. Both men and women are more likely to remain at work longer if they are younger and healthier, guardians to dependent children, more educated, self-employed, and earning a higher hourly wage. Men with spouses who are in good health are less likely to be working, but men with spouses in poor health are more likely to remain in the workforce at older ages (Cahill et al. 2008). Analyses including Early Baby Boomers also show that child and parental caregiving are not major factors in the retirement decisions of either men or women (Cahill et al. 2013). Another study focuses specifically on the question of women's retirement decisions and caring for grandchildren. Lyu and Burr (2016) find that for



women, the arrival of a new grandchild is associated with more than an 8% increase in the chances of retiring.

Spouses have a big impact on each other's retirement decisions. Men aged 70 and older in 1993 with working spouses were nearly three times more likely to be working themselves as men whose spouse was not working (Ozawa and Lum 2005). Other research

sheds some light on this finding. Gustman and Steinmeier (2004) use information on how much spouses enjoy spending time with each other to help explain the apparent interdependence of married people's retirement decisions. For wives, all of the interdependence in spousal retirement rates is explained by whether or not she reports that she would enjoy spending time with her husband in retirement. About half of the interdependence for husbands is accounted for by this

For women, the arrival of a new grandchild is associated with more than an 8% increase in the chances of retiring.

preference.

Other HRS research suggests that it is important to consider the interaction of various

factors, showing that women with lower education and Black adults in poor health are especially unlikely to work longer (Williamson and McNamara 2001). Unemployment near retirement compounds the challenge. Black, Hispanic, and female older workers are most likely to experience job loss in the years prior to retirement, and this period of unemployment often results in departure from the labor force altogether (Flippen and Tienda 2000).

Retirement is a process, often occurring in a series of steps over several years.

Paths to Retirement

Traditionally, workers transitioned from full-time work to full and permanent retirement. Increasingly, retirement is a process, often occurring in a series of steps over several years. Studies using longitudinal and cohort data from HRS demonstrate multiple paths to retirement, revealing changes over time and between cohorts in how and when people choose to leave the workforce. Some studies demonstrate a path leading from full-time to part-time work to full retirement. Others go from a full-time career job to another shorter duration job to full retirement. These intermediate jobs are often referred



to as bridge jobs. Other studies reveal a pattern of unretirement in which workers retire completely from full-time work and, after a period out of the workforce, return to either full- or part-time work.

Younger generations are not only working longer, but they are much less likely to move from full-time employment to full and permanent retirement. [Johnson et al. \(2010\)](#) show that the traditional pattern was followed by over 50% of men born 1913 to 1917. Of men born just two decades later, 34% follow this traditional path. Forty-five percent of men born 1943 to 1947 move to part-time work before retiring, and 26% of men and 29% of women in this cohort return to work after a period of retirement. Transitional retirements are increasingly the norm. Early Baby Boomers, especially women, are more likely than those in earlier cohorts to move to a bridge job before retiring. Both men and women in this cohort are also more likely than earlier cohorts to leave the workforce



involuntarily through layoffs ([Cahill et al. 2015](#)).

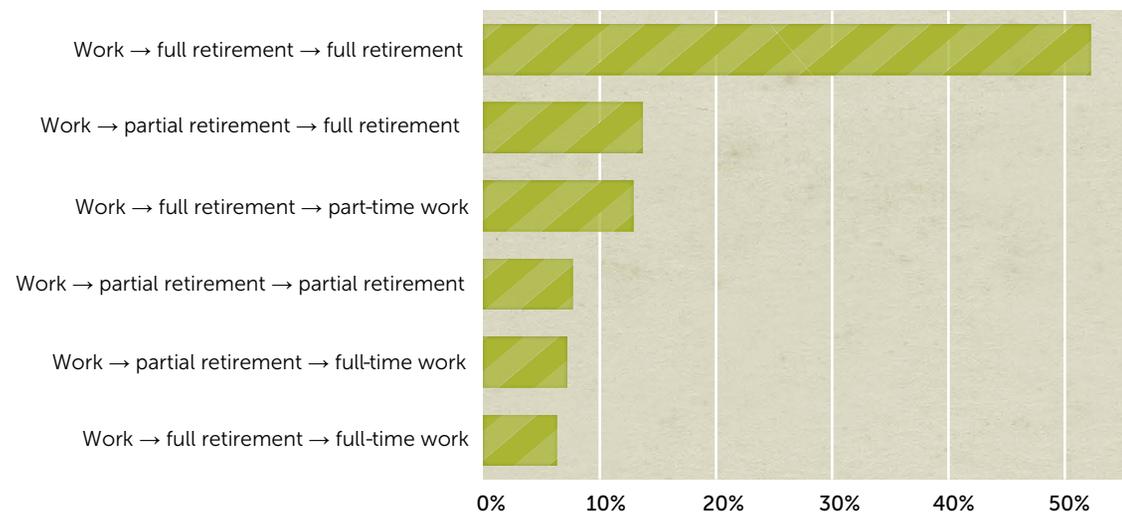
[Maestas \(2010\)](#) explores alternative explanations for unretirement, for example, that returning to work is the result of an unexpected event or unanticipated financial shortfall or, alternatively, that a return to work is anticipated and even part of retirement plans. Full retirement is defined as reporting currently not working any hours for pay and describing oneself as retired. Partially retired workers are defined as people who report that they are retired but are also working fewer than 35 hours per week.

Over the period 1992 to 1998, about 52% of workers followed a traditional path (see [Figure 1-2](#)). The balance of participants reveal

a range of retirement patterns: 12.9% move to full retirement and then to part-time work; 6.3% go from retirement back to full-time work; nearly 8% remain partially retired throughout; 13.7% move from work to partial retirement to full retirement; and 7.2% go from work to partial retirement back to full-time work. Thus about 30% of workers unretire within six years of retiring. Overall, younger workers and men are most likely to unretire. HRS participants are asked if they would like to continue doing some paid work after they retire. The vast majority of workers anticipate their retirement pattern. For this cohort, born 1931 to 1941, only 8% of those who say they had not expected to return to work actually ended up returning to work. Workers are more likely to return to part-time work than full time, especially if they are eligible for full Social Security retirement benefits.

FIGURE 1-2 Percent of workers taking various retirement paths: 1992-1998

Source: [Maestas \(2010\)](#).



Younger workers in good health are the most likely to return to work after retiring.

Other research looks at who chooses particular retirement paths. Younger workers in good health are the most likely to return to work after retiring (Cahill et al. 2011). One study specifically looks at transitions to bridge employment over time. Men and women who are younger, in better health, more educated, less stressed at work, and more satisfied by their job are more likely to move to bridge employment in their career jobs than to retire (Wang et al. 2008).

Retirement transitions differ for men and women. Forty-three percent of female retirees are reemployed following retirement compared with 50% of retired men in the HRS cohort (Pleau 2010). While women with higher earnings before retirement are more likely to return to work, wealth and earnings are negatively associated with reemployment for men. Marital status affects these findings. Married women with higher household wealth are less likely to be employed after retirement compared to married women with less wealth. Divorced and separated women have a greater likelihood of postretirement employment than married women. Kail and Warner (2013) show that among those who return to work after retirement, men are more likely than women to return to full-time work whereas women are more likely to return to part-time work.

Older workers who would like to work longer may face age discrimination and find it more difficult than younger workers to secure employment. Many states have laws that complement and sometimes go beyond federal law prohibiting age discrimination against older workers. Some states allow compensatory or punitive damages, which federal law does not. Stronger state-level age discrimination laws appear to encourage working longer and transition into partial retirement (Neumark and Song 2013). Keeping options open for older workers can have macroeconomic benefits but also personal benefits.

Having the option to choose a preferred retirement path can affect our well-being. How people feel about their retirement transition — whether they are happy in retirement — appears to be mostly affected by whether they report choosing their particular transition or whether it is forced upon them (Calvo et al. 2007).

Are We Healthy Enough to Work?

Health is clearly important in the decision to work longer. Evidence from HRS studies reveals significant levels of good health among those no longer working, suggesting there may be unused capacity to work at older ages. Other studies use the detailed longitudinal information on health and physical functioning in the HRS to characterize changes in the health of middle-aged people as they age and the factors that influence those changes. HRS research on chronic disease investigates the relationship of chronic disease, pain, and the onset of limitations in physical functioning. Many studies address the interplay of health and economic resources.

Unused Capacity

Several studies use HRS data on physical functioning to identify people who might be healthy enough to work at older ages. One report shows that in 2004 about 50% of those aged 51 to 56 report no limitations (Weir 2007). Only 20% of 70- to 74-year-olds report no limitations. Among those not working at various ages, many report either no or some limitations. Of the 50% or so not working between age 62 to 64, 34% report zero to five limitations. Among the 80% of 70- to 74-year-olds no longer working, about 50% report zero to five limitations. The study categorizes remaining life expectancy at each age into work years, years not working while in health that permits work, and years unable to work. Taking into account the average life expectancy in 2002, average 51- to 56-year-olds could expect to live about another 27 years with 9.7 as years working, 9.9 as years of not working but physically able, and 7.7 years not able to work.

Stronger state-level age discrimination laws appear to encourage working longer and transition into partial retirement.

ADLs and More

HRS includes three commonly used measures of physical functioning.

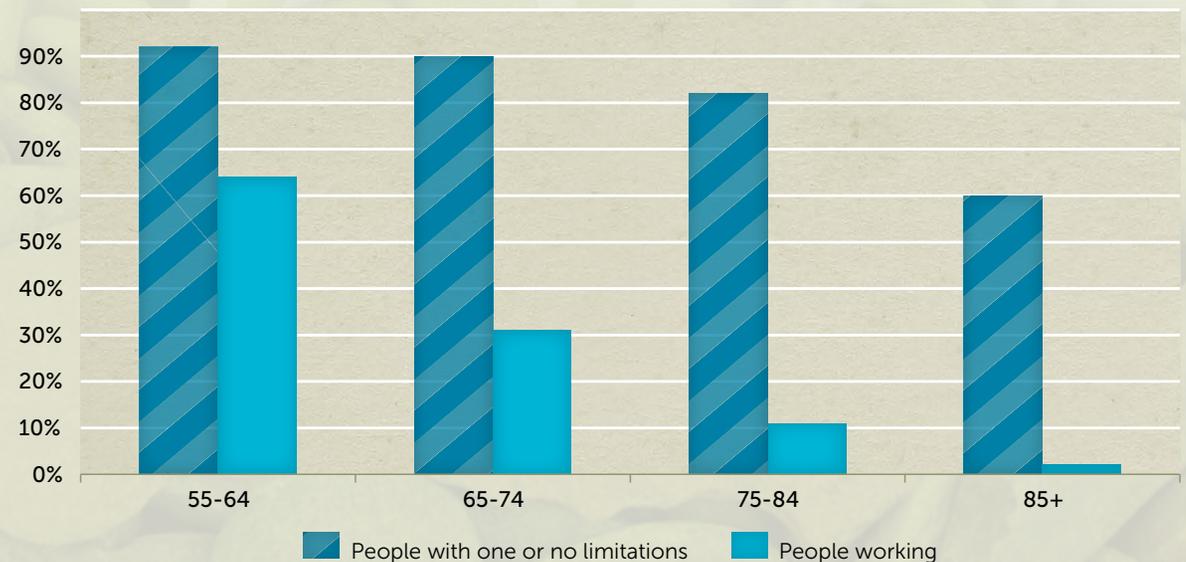
Activities of Daily Living (ADL) assess things like bathing, eating, dressing, walking across a room, and getting out of bed. Instrumental Activities of Daily Living (IADL) include preparing a meal, shopping, using a telephone, taking medication, and handling money.

Limitations with these fundamental life tasks can indicate fairly severe disability.

A third set of measures evaluates less critical tasks but ones which might also bear on work ability. They include things like jogging a mile, walking up a flight of stairs, pushing a heavy object across the floor, and picking up a coin. Figure 1-3 shows the percent of people with one or no work limitations and the percent working within four age categories. Over the ages when most people retire, the proportion with one or no limitations is very high.

FIGURE 1-3 Percent of people with one or no limitations and percent working by age: 2014

Source: HRS 2014.



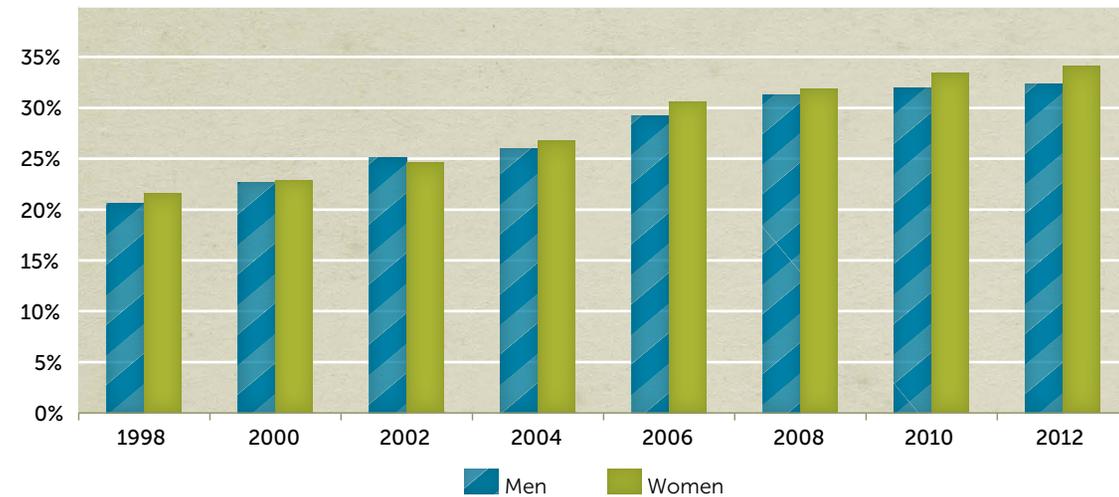
Rehkoph et al. (2011) also estimate unused capacity for work at older ages. They construct four categories: working, not working with a major impairment, not working with a minor impairment, and not working with no impairment. Major impairment is defined as one or more difficulties with activities of daily living (ADLs) or instrumental activities of daily living (IADLs) and minor impairment as inability to do at least one of these activities: walk several blocks, climb a flight of stairs, sit for two hours, and stoop, kneel, or crouch. Over 30% of men and over 35% of women older than 65 are not working but have no physical impairment. Fifty percent of men aged 70 to 74 are not working and have either one or no limitations. For women aged 70 to 74, the proportion with potential work capacity is nearly 60%.

Comparing the AHEAD, Children of the Depression, HRS, and War Baby cohorts, Gordo (2011) finds successively lower rates of disability at similar ages across these birth cohorts. Other evidence suggests that this trend may not be continuing in later birth cohorts. Early Baby Boomers perceive their health as slightly worse than the two earlier cohorts. Declines in physical limitations through the 1980s and 1990s appear to have slowed since 2000 (Freedman et al. 2013). Between 2000 and 2008, those aged 55 to 64 report a slight increase in physical limitations with no change for adults aged 65 to 74 and 75 to 84. However, the oldest-old — age 85 and older — are making gains.

Health behaviors and related health conditions may help explain some of the flattening of progress in reducing disability. Figure 1-4 shows the increasing prevalence of obesity, defined as a

FIGURE 1-4 Trends in obesity prevalence by gender: 1998-2012

Source: HRS 1998-2014.



body mass index (BMI) greater than 29, for men and women over the period 1998 to 2012.

Weir (2007) compares younger and older birth cohorts and finds that obesity increased by 7% for men and nearly 10% for women in the Early Baby Boomer cohort compared to the original HRS cohort. Smoking decreased, which is reflected in the lower rates of lung conditions. But conditions associated with overweight, such as diabetes and arthritis, are on the rise. In a similar analysis, Soldo et al. (2007) finds that Early Baby Boomers report more difficulty with everyday tasks as well as more pain, more chronic conditions, more alcohol use and depression than the original HRS cohort at comparable ages. Of course, the life history of younger cohorts is yet to come, and some evidence suggests that improvements in medical treatment may improve the health status of younger cohorts as they age (Weir 2007).

While the majority of men and women in their 50s and early 60s are in good health with no work-limiting disability, the percentage that experience poor health and work limitations is significant. Figure 1-5 shows that of those who retired between 2012 and 2014, 22% cite poor health as a very important reason for retiring.

The next section reviews some of what HRS tells us about health and physical functioning at older ages that may be especially relevant for the question of how long we can work.

Chronic Disease and Disability

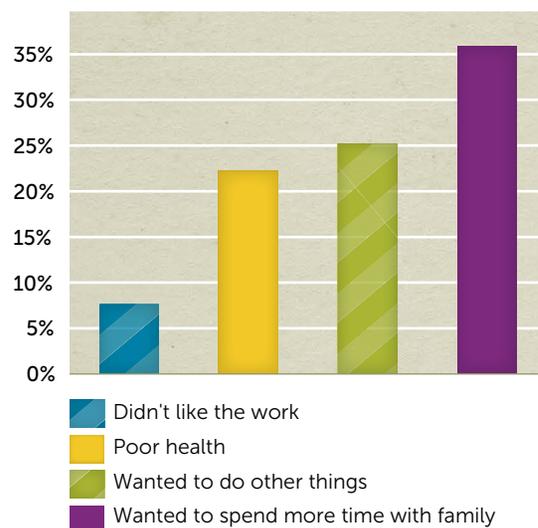
Physical functioning decreases as we age, and a range of issues can put people at higher risk of decline. Diseases like arthritis may lower the age at which limitations begin. Covinsky et al. (2008) study the onset over 10 years of persistent physical limitations in the original HRS cohort. They select participants with no physical limitations

at the beginning of the study and evaluate the incidence of mobility limitations and difficulties with ADLs. Even in this higher functioning group, 29% report a history of arthritis in 1992. Risk factors for arthritis include female gender, older age, higher BMI, hypertension, diabetes, cancer, lung disease, depressive symptoms, and lower socioeconomic status. Yet even after accounting for these differences, those with arthritis in middle age are much more likely to develop mobility and ADL limitations over 10 years.

Another study by this same group of researchers looks specifically at the impact of pain in middle age on functioning (Covinsky et al. 2009). Those with significant pain at age 50 to 59 have much higher rates of physical limitations than those without pain and are similar to 80- to 89-year-olds without pain in terms of mobility limitations. Along similar lines, Covinsky et al.

FIGURE 1-5 Percent reporting various “very important” reasons for retiring: 2014

Source: HRS 2014.



(2010) study HRS participants from 1992 to 2004 to investigate the impact of depressive symptoms at the beginning of the study on the risk of developing physical limitations in later life. Those with a high level of depressive symptoms at the beginning of the study are 40% more likely to develop mobility limitations and difficulties with ADLs over 12 years. Interestingly, Ayyagari (2016a) shows that the increased access to prescription drugs associated with the introduction of the Medicare Part D program in 2006 improved pain management for older adults and reduced pain-related activity limitations.

Researchers use the longitudinal data in the HRS to identify racial, ethnic and gender differences in health status trajectories of middle-aged and older adults. As expected, self-rated health worsens at all ages over the period 1995 to 2006 with a greater rate of decline for older people and for Black and Hispanic individuals (Liang et al. 2010). The poorer rating of health is not explained by racial or ethnic differences in socioeconomic status, social networks or prior health. Research along similar lines using HRS confirms these racial and ethnic differences in health. Yang and Lee (2010) use HRS data to create a frailty index comprised of self-reports of eight chronic illnesses, difficulties with ADLs and IADLs, depression and obesity. Black and Hispanic individuals score higher than Whites on the frailty index. Despite having longer life expectancy, women have higher frailty index scores than men at all ages, regardless of race or ethnicity.

HRS data are also used to study changes in the relationship between health and disability over time. For example, Hung et al. (2012) report

on changes between 1998 and 2008 in the prevalence of disability— as measured by difficulties with ADLs and IADLs— and the prevalence of various chronic diseases and cognitive, visual or hearing impairment. Although the prevalence of some chronic diseases increased between that period, disability prevalence actually decreased. Stroke, coronary heart failure and arthritis are associated with mobility disability and limitations in self-care ADLs. Cognitive impairment has the strongest and most consistent impact on a range of ADL difficulties. Eating and dressing limitations are especially significant predictors of nursing home admissions (Fong et al. 2015).

Despite having longer life expectancy, women have higher frailty index scores than men at all ages, regardless of race or ethnicity.

Other evidence suggests that older Americans may be experiencing greater disease burden in recent times. Beltrán-Sánchez et al. (2016) show that several chronic diseases actually increased in prevalence between 2004 and 2010, with 37% higher diabetes prevalence and a 41% higher prevalence of arthritis. These burdens appear to be greatest at younger ages suggesting that, as life expectancy continues to increase, there may not be a compression of morbidity.

A topic of growing interest is the relationship between obesity and disability. While excessive weight is a well-documented risk factor for certain diseases and disability (Lee and Kim 2008), less attention is paid to the mechanism through which it might lead to exit from the labor force.

F E M

The Future Elderly Model (FEM)

As people age, they are much less likely to fall victim to a single isolated disease. Instead, competing causes of death more directly associated with biological aging cluster and elevate mortality risk, as well as create the frailty and disability profile that can accompany old age.

The FEM is designed to illuminate these complex dynamics and to explicate the consequences of social policy, social forces, and biomedicine for health, health spending and health care delivery.

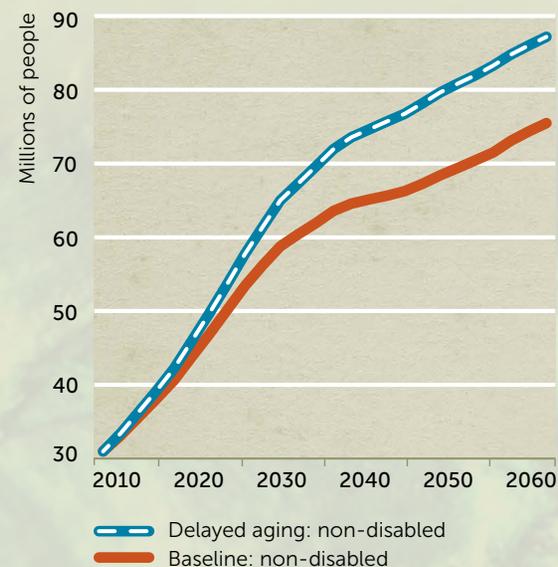
The Health and Retirement Study is the primary data source for the FEM.

The model takes into account initial demographic characteristics and health conditions to project medical spending, health conditions and behaviors, disability status, and quality of life well into the future.

Scientific advances suggest that slowing the aging process may be a realistic goal. Using the FEM, Goldman et al. (2013, 2016) compare a baseline with a hypothetical delayed aging scenario in terms of the impact on longevity, disability, and major entitlement program costs. Delayed aging could increase life expectancy by an additional 2.2 years, most of which would be spent in good health. The economic value of delayed aging is estimated to be \$7.1 trillion over 50 years.

FIGURE 1-6 Number of non-disabled Americans in a delayed aging scenario: 2010-2060

Source: Goldman et al. (2016).



Renna and Thakur (2010) show that those with obesity are more likely to retire before age 64 because of its effects on physical impairments and diseases that limit work.

Preventing obesity or reducing obesity could have important impacts on health. The [Future Elderly Model \(FEM\)](#) uses the rich health and health care data in HRS to develop long-term forecasts of health and health care costs and allows researchers to test the potential impact of various medical interventions. For example, [Michaud et al. \(2012\)](#) use the model to evaluate the impact of medical and pharmaceutical interventions to reduce obesity and find that bariatric surgery yields high social benefits relative to drug treatments.

Those with obesity are more likely to retire before age 64 because of its effects on physical impairments and diseases that limit work.

Another study leverages the HRS linkage to Medicare records to study excess medical spending related to obesity. [Clark et al. \(2016\)](#) show that higher obesity-related Medicare spending is present only for adults aged 65 to 69. Spending for obese and severely obese adults in this age group is nearly twice that of normal-weight claimants. Interestingly, for those who are aged 70 and older, there is no difference in Medicare claims between normal-weight and even severely obese adults.

Impact of Health and Economic Resources on Retirement

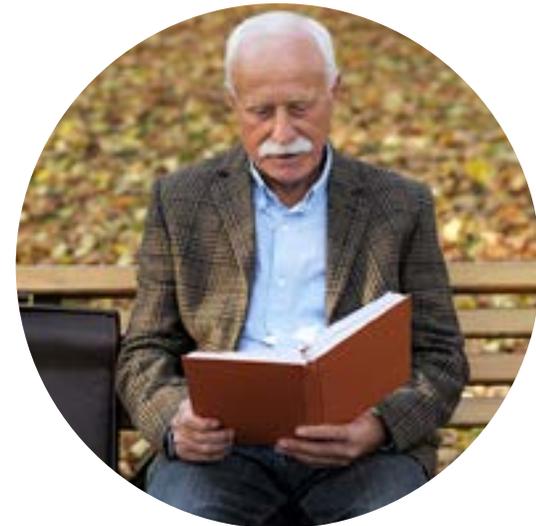
Elucidating the complex interplay of health, economic resources, and retirement is at the heart of HRS objectives. The dynamic relationships among health, financial resources, and decisions about work can unfold over many years leading up to retirement, which is part of why the HRS seeks to enroll participants at middle age. Poor health can deplete economic resources through direct out-of-pocket medical (OOPM) costs, but it can also hinder wealth accumulation through lost wages when people are too sick to work and may also affect work decisions. Very poor health is often a reason for leaving the work force; on the other hand, low wherewithal can delay workforce departure.

One study assesses the impact of health on asset accumulation during working years and the indirect impact of health through asset accumulation on retirement ([Miah and Wilcox-Gök 2007](#)). Poor health is associated with a higher probability of retiring. But those with a chronic health condition (asthma, cancer, heart disease, stroke or diabetes) accumulate fewer financial resources for retirement, which tends to keep them on the job. The majority of those with a chronic illness do not report poor health or activity limitations, which may be why they are able to stay on the job despite having a health condition. The detailed longitudinal health information in the HRS helps clarify these complex relationships.

Financial resources interact with health to predict retirement. Men in good health are not likely to retire without fairly substantial economic resources behind them ([Bound et al. 2010](#)).

On the other hand, men in poor health are 10 times more likely than similar men in average health to retire even without pension benefits. There is a substantial effect of self-reported poor health on retirement. A potential problem arises in the study of health and work, namely, when people are in poor health and are considering leaving the workforce, their self-report of health can also reflect their sense of justification for leaving work. So rather than relying solely on self-reported health status, the study creates an index of health that includes the range of detailed health measures available in the HRS. Use of the health index reduces the strength of the association between health and retirement. However, poor health remains a potent predictor of retirement.

A limitation of many studies looking at the effect of health and economic status on retirement is that they do not include complete measures of



both health and the full range of potential economic influences like Social Security and pensions.

Gustman and Steinmeier

(2014) address this issue, taking an approach that traces the impact of smoking, obesity, alcohol consumption and depression on the onset of chronic health conditions and the consequent evolution of disability. Their approach includes major sources of uncertainty for older workers, such as job loss, loss of health insurance, large medical and nursing home expenditures, uncertainty about the availability of SSDI, life expectancy, and returns on investments. At age 61, 58% of men in good health work full time whereas only 30% of men in poor health and 10% of men in terrible health work full time. The study poses several hypothetical scenarios. In a situation in which everyone has the health status of the average worker, the mean retirement age would increase by about one year. Whereas diabetes has only a minor impact on retirement, smoking has a relatively large effect on work, reducing the average retirement age by four to five months. Interestingly, including detailed modeling of health does not change the role of economic influences on retirement, which are explored in the next section.

Program Effects on Work

Decisions about working longer are strongly influenced by public and private programs. In the private sector, the shift from employer-sponsored DB to defined contribution (DC) pension plans and rollbacks of retiree health insurance coverage have tended to discourage early retirement. Public

At age 61, 58% of men in good health work full time whereas only 30% of men in poor health and 10% of men in terrible health work full time.

policy is more mixed. The abolition of mandatory retirement predated the 1990s turnaround in retirement age, and Social Security began increasing the age at which retirees receive full benefits with the birth cohort of 1938, who turned 65 early in the 21st century. Removing the earnings test and increasing the delayed retirement credit may also influence work incentives. Conversely, eligibility for SSDI has expanded, which could encourage earlier retirement. Research using HRS data attempts to assess the influence of these and other policy changes that may influence work.

Changes to Social Security

The availability of Old Age and Survivors Insurance (OASI) through Social Security has a profound impact on retirement. For eligible workers, the program provides full retirement benefits at age 65 — known as the full retirement age (FRA) — gradually increasing to 67 in coming years. The program also provides for an Early Entitlement Age (EEA) at age 62. Claiming benefits at 62 reduces their amount by 25% compared to claiming at the FRA. A strong incentive to retire later is built in: the full benefit rises by 8% for every year claiming is delayed between ages 66 and 70. Overall, this means that the benefit amount is 76% more when retiring at age 70 rather than 62. These numbers refer to the average person, however. Claiming early would actually make more sense for

a person with a much shorter than average life expectancy. Other factors, like marital status and the interest rate figure in on the relative wisdom of delaying claiming. HRS data are linked at the individual level with benefits information from Social Security. This allows researchers to use the rich information in the HRS to study choices about benefit claiming.

One study investigates the predictors of claiming between 1992 and 2008 (Shoven and Slavov 2012). People do not seem to be strategic in their claiming behavior in terms of maximizing their potential benefit. The benefit adjustment from delaying OASI benefit receipt is better than actuarially fair, especially for two-earner households. Similar to results found in Gustman and Steinmeier (2005), 42.6% of people claim benefits just after age 62 with another spike in claiming around age 65. The decision to leave the labor force is the strongest predictor of claiming, whereas higher education is associated with delaying claiming. Glickman and Hermes (2015) find that those who work in physically demanding blue-collar jobs are 55% more likely to claim benefits early. Those with lower expectations of living to age 75 are also more likely to claim early.

Gustman and Steinmeier (2015) report on an update of their retirement model that tries to explain actual patterns in Social Security claims data. Time preference, or the value a person places on something at an earlier rather than a later time, helps explain claiming behavior. Those with a low time preference might be likely to delay

Increasing the Social Security Early Entitlement Age by two years to 64 would encourage more workers to remain in full-time employment.

claiming and vice versa. Yet even with many other explanations, time preference does not fully explain the spike in claiming at age 62. Including subjective expectations about the potential future insolvency of Social Security helps explain some of the spike at 62. The study also includes different hypothetical policy scenarios, showing that increasing the EEA by two years to 64 would encourage more workers to remain in full-time employment. Why so many workers claim Social Security benefits as soon as they are available remains an open research question with important bearing on policy debates over increasing the EEA.

Proposals to increase the EEA raise concerns that this would lead to an increase in applications for SSDI. [Bound et al. \(2010\)](#) compare health care utilization patterns in four groups: SSDI recipients, rejected SSDI applicants who go on to claim EEA retirement benefits, those who claim Social Security benefits after EEA but before FRA, and those who claim Social Security retirement benefits at the FRA. Those who claim before their FRA are not quite as healthy as those who delay claiming, but they are much healthier than SSDI recipients or rejected SSDI applicants. Rejected applicants appear more similar to SSDI recipients than to beneficiaries who never apply for SSDI benefits. There could be a modest increase in SSDI applications if the EEA



and FRA were raised. Many applicants, however, would be too healthy to receive SSDI.

Shift from Defined Benefit to Defined Contribution Pensions

Employer-provided DC pension plans allow workers to save a certain amount in a retirement account that can be drawn down at retirement.

In contrast, DB pension plans provide an annuity payment depending mostly on the type of job and years of service. Unlike savings in DC plans, DB payments typically last until death. Their value is less dependent on the performance of the economy or the stock market than DC plans. As average life expectancy increases and the size of the retired and benefit-collecting population grows, these plans are less commonly offered, while — since their emergence in the 1980s — DC plans are increasingly the norm. HRS data contain a detailed accounting of both types of pension plans.

Several studies with HRS data demonstrate that the availability of a DB pension has the effect of lowering expectations of working longer ([Mermin et al. 2007](#)) and of encouraging workforce departure ([Cahill et al. 2012](#)). Having a DC pension plan from the career job makes people more likely to return to work, but having a DB pension does not ([Cahill et al. 2011](#)).

[Hurd and Rohwedder \(2011\)](#) quantify the effect of the shift from DB to DC plans in

accounting for the trend toward longer working lives. They compare members of the original HRS cohort who were 51 to 56 in 1992 with the War Babies who were 51 to 56 in 1998 and the Early Baby Boomers who were 51 to 56 in 2004.

Thirty-nine percent of men in the original HRS cohort have a DB plan compared to 28% of the War Babies and 21% of the Early Baby Boomers. DC plans increase from 29% to 49% across these cohorts. Trends are similar for women. These changes account for 68% of the increase in expectations of working past 62 and 38% of the increase in expectations of working past 65.

The Role of Health Insurance

Public health insurance is available to low-income Americans through Medicaid and becomes available to all Americans at age 65 through Medicare. While the Affordable Care Act creates new routes of access to health insurance, most private health insurance is still provided through employers and thus tied to employment. Many firms offer spousal benefits and some offer retiree health insurance, especially to their early retirees up until age 65 when Medicare is available. Taking these facts and other features of the retirement landscape into account, research using HRS data weighs the effects of health insurance on the retirement of individuals as well as couples.

Retiree health insurance clearly influences retirement. A study using data on men in the HRS finds the presence of retiree health insurance appears to provide a path to early retirement for men in poor health ([Blau and Gilleskie 2008](#)). In the original HRS cohort of men, [Marton and Woodbury \(2010\)](#) find that retiree health insurance has the largest effect on the

retirement of men aged 60 to 64, making them 5 to 7.5% more likely to retire than men in their 50s. [Robinson and Clark \(2010\)](#) consider retirement transitions from 1992 to 2006 and show that those who have access to retiree health insurance are 21% more likely to leave their career jobs than those without it, and having retiree coverage is associated with a higher probability of retiring at age 62 ([French and Jones 2011](#)). Those with retiree health insurance save less, as they do not need to make provision for their own health care coverage ([Clark and Mitchell 2014](#)).

Comparing retirement for individuals who have health insurance tied to their jobs with those who do not, [French and Jones \(2011\)](#) find that those with employer-provided health insurance are slightly more likely to work until age 65, a situation known as job lock. To get at this directly, HRS asks participants if they would like to retire but plan to keep working because they need the health insurance. About 75% of those who were 62 to 65 and working in 2010 report job lock in this sense ([Fisher et al. 2016](#)).

Spousal health insurance benefits can influence how couples decide to time their retirements. Households do a good job of maintaining coverage for both partners through a range of options including purchasing private coverage when employer-provided insurance ends, usually for the wife when the husband retires ([Schimmel 2006](#)). Husbands tend to delay retirement until some form of other insurance is available such as Medicare or spousal benefits, but wives tend to transition into the private insurance market, which can be costly. A similar study examines the effect of employer-provided health insurance on

the likelihood that couples retire together. Couples are twice as likely to jointly retire when the wife holds employer-provided health insurance ([Kapur and Rogowski 2007](#)). A recent study finds that men are less likely to retire if that means they or their wives would lose their health insurance ([Congdon-Hohman 2013](#)).

Aspects of public and private pension and insurance programs vary across countries, and some researchers are using information from the HRS combined with HRS sister studies to take advantage of the cross-country variation to study specific program effects. In both England and the US, self-employed workers have different access to health insurance and pensions ([Zissimopoulos et al. 2007](#)). Wage and salary workers have a higher retirement rate than the self-employed in both countries, and this is largely due to retirement incentives created by DB pensions. The retirement rate is higher in England compared to the US, and the overall earlier age at retirement is partly accounted for by the availability of public health insurance.

Consequences of Retirement

Retirement is often thought of as a well-earned rest at the end of a long work life, a time to relax and enjoy. Yet, work may have some benefits that are missed in retirement. Other changes that come with retirement may have a downside.

Men are less likely to retire if that means they or their wives would lose their health insurance.

For example, physical activity increases for some but decreases for others. Some eat out more; others do more cooking at home. Some may find themselves more engaged in hobbies and interests; others may find themselves lacking stimulation. Two different lines of research in HRS examine these and other possible changes. One line describes the impact of retirement on physical activity, changes in eating, and weight; another line examines retirement effects on health and cognitive functioning.

Most people seem to spend less money on eating out after retirement.

Lifestyle Changes in Retirement

Many studies show that BMI tends to increase with age. The average weight gain in our 50s is 1.30 BMI units, or about 10 pounds for the average woman and 15 pounds for the average man. The question is whether or not some weight gain is due to lifestyle changes that can come with retirement. Longitudinal studies like the HRS allow researchers to observe changes in weight and other things over time. [Chung et al. \(2007\)](#) use HRS data from 1992 to 2002 to look at changes in food spending with retirement. Most people seem to spend less money on eating out after retirement. Among married couples, this is especially true when the wife retires, which reduces household spending on eating out. This reduction in spending on eating out leads to a small reduction in BMI. Looking at the relationship between home meal preparation and changes in hours worked

supports the idea that available time makes a difference. Increasing work hours by 10 hours per week is associated with spending about 30 minutes less per week on cooking at home (Dunn 2015).

Both gender and the kind of job we hold seem to matter for weight changes in retirement (Foreman-Hoffman et al. 2008). There is no effect of retirement on weight gain for men, but women who retire are at risk for weight gain. Women of normal weight when they retire and who worked in blue collar jobs are most likely to gain weight over time. Workers who retire from strenuous or physically demanding jobs seem to be at higher risk of weight gain following retirement. Taking into account the fact that some weight gain is a normal part of aging, men who retire from physically demanding jobs gain an additional 0.5 to 0.6 units of BMI. But men who retire from sedentary jobs gain only 0.1 unit of BMI (Goldman et al. 2008).

Workers who retire from strenuous or physically demanding jobs seem to be at higher risk of weight gain following retirement.

Chung et al. (2009a) find that retirement leads to a modest weight gain of 0.24 BMI units overall. Similar to Goldman et al., these researchers find that people retiring from physically demanding jobs are more likely to gain weight after retiring. But they also find that those with lower wealth tend to gain weight in retirement. People who were already overweight are more likely to

gain weight. Those retiring from physically demanding jobs are less active in retirement, whereas people retiring from a sedentary job actually increase their level of physical activity (Chung et al. 2009b). Kampfen and Maurer (2016) find a positive effect of retirement on physical activity, especially for those with higher levels of education and wealth.

Another health behavior that can change with retirement is smoking. The effect could go either way, though. Given widespread laws that ban smoking in public places, retirement could reduce this barrier to smoking. On the other hand, if retirement leads to less stress, those who were smoking as a way to cope with work-related stress might find it easier to quit smoking. Ayyagari (2016b) studies those who had a history of smoking and finds that retirement increases the probability of taking up smoking again among those who had quit.

Retirement and Health: Use It or Lose It?

Does retirement lead to a decline in cognitive abilities and physical health? Intellectual stimulation may help prevent cognitive decline. And physical activity on the job can help keep us active. Work may serve to keep us cognitively alert, physically active, and socially connected. For example, HRS research finds that some of the potentially negative effects of retirement



on physical and mental health seem to be related to lifestyle changes, such as declines in physical activity and social interaction (Dave et al. 2008). Transition to partial employment or to a bridge job appears to be associated with fewer physical declines and better mental health (Zhan et al. 2009). Another HRS study suggests that having a mentally stimulating job is associated with slower cognitive decline later on in retirement (Fisher et al. 2014).

Some of the potentially negative effects of retirement on physical and mental health seem to be related to lifestyle changes, such as declines in physical activity and social interaction.

Pinpointing the effect of retirement on cognitive functioning and health is tricky, however. Work can keep us sharp and active, but it may also be the case that workers who are beginning to experience cognitive or health problems are more likely to leave work. To untangle cause and effect, researchers look for a factor that is related to retirement but not to either health or cognition. Rohwedder and Willis (2010) use variation in public pension systems as that factor

because they vary across countries and cause people to retire early in some countries and late in others. Their study uses HRS data along with data from HRS sister studies in England and 11 other European countries. Information on a word recall task is used to indicate cognitive ability. Countries with earlier retirement ages have much lower cognitive scores than those with workers who stay in the labor force longer.

Another study uses early retirement offers to estimate the effect of retirement on cognitive functioning (Coe et al. 2011). Early retirement windows are defined in HRS as a financial incentive offered at a particular time to encourage workers to leave a firm. Such offers should be independent of an individual’s health status since in general they are only offered to broad groups of workers, not to individuals. Overall, there is no relationship between the length of retirement and cognitive functioning given the condition of

early retirement windows. In fact, there appears to be some benefit of retirement to the cognitive functioning of blue collar workers. Possibly the options for intellectual stimulation are more limited on blue collar jobs, and retirement may offer more opportunities in this regard.

Another study took a novel approach to sorting out cause and effect between retirement and health by using individuals’ retirement expectations to isolate the effect of retirement on a health index that includes both objective and subjective measures of health status (Inslar 2014). Using HRS data from 1992 through 2010, this study finds a beneficial effect of retirement on health status, especially for those who quit smoking. Similarly, Fonseca et al. (2014) use cross-national variation in pensions to study the effects of retirement on subjective well-being and find that, across several countries, retirement leads to increased life satisfaction overall.

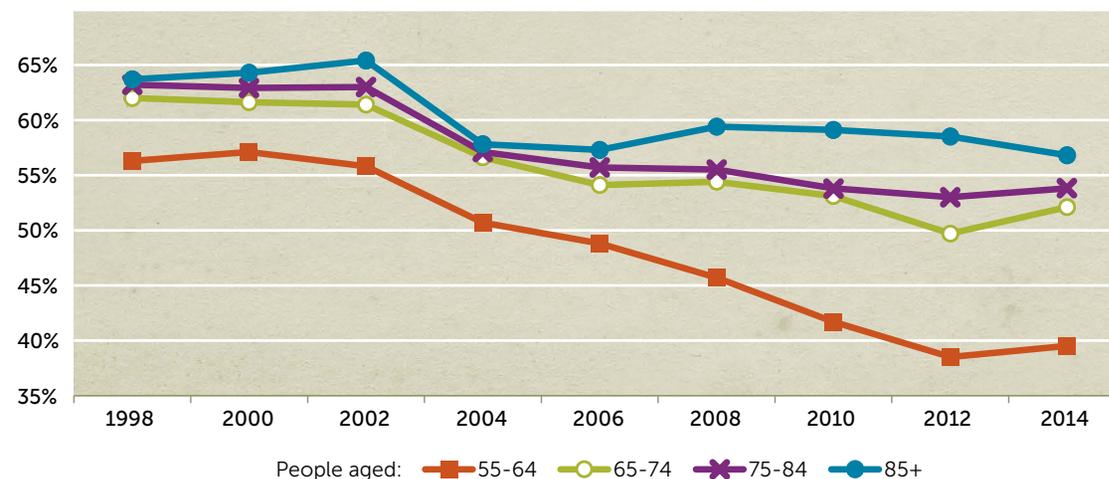
Working longer may be associated with longer lives. Wu et al. (2016) follow the original HRS cohort from 1992 until their retirement or death over the next 18 years. In the group who say that health was not an important reason for their retirement, working an extra year is associated with an 11% lower risk of death. Even those who say poor health affected their decision to retire, working longer is associated with slightly greater longevity.

Retirement leads to increased life satisfaction overall.

Retirement Satisfaction

HRS can also be used to track trends in retirement satisfaction and to follow individuals to see how retirement satisfaction might change as we age. An Employee Benefits Research Institute (EBRI) report shows that in 1998, 60.5% of HRS retirees reported feeling very satisfied with retirement (EBRI 2016a). By 2012, this percentage decreased to 48.6% (Figure 1-7). On the other hand, those reporting being moderately satisfied increased. The share that report being not at all satisfied remains relatively steady over this period at about 10%. Following the same individuals as they age, retirement satisfaction tends to decrease with age. Not surprisingly, those with higher net worth report higher retirement satisfaction than those with lower net worth. Likewise, those in worse health report lower retirement satisfaction, which may help explain the aging effect.

Figure 1-7 Trends in percent “very satisfied” with retirement by age: 1998-2014
Source: EBRI (2016a).



THE AGING BRAIN



CHAPTER 2 | THE AGING BRAIN

The human brain is a remarkable organ, but it too experiences aging. Most cognitive abilities begin declining early in adulthood. For most people it's only at relatively advanced ages that cognitive decline begins to create significant impairment, and there is great diversity in when or if significant impairment occurs. The rapid growth in the size of the elderly population as the Baby Boom generation reaches retirement translates to a significant rise in the size of the population with dementia and other cognitive problems, despite some favorable evidence that age-specific dementia rates may be declining. The number of individuals over age 65 with Alzheimer's disease (AD) is likely to grow from 5.1 million in the US now to 13.8 million in 2050 (Alzheimer's Association 2015). These statistics demonstrate a vital need for reliable information on the size of the problem, as well as the causes, consequences, and the economic and societal impact of dementia.



To meet the need for data on the aging brain, the HRS has included measures of cognition since it began in 1992. With many years of data on cognitive functioning across multiple birth cohorts, researchers are now reporting on changes in cognitive functioning with age and time. Extensive information on social and medical factors in the HRS enables the tracking of new trends—such as changes in family structure or growth in the prevalence of obesity—that may also affect cognition. To facilitate even more in-depth research, the HRS conducted an in-home clinical interview study designed to produce estimates of the incidence and prevalence of AD and other forms

of dementia known as the Aging, Demographics, and Memory Study (ADAMS). Initially fielded in 2001 as a supplement to the HRS, and therefore linked to the rich information available in the main survey, ADAMS enables researchers to identify risk factors and outcomes of AD and dementia subtypes such as medical, economic and social costs. A new supplemental study, the Healthy Cognitive Aging Project (HCAP), is underway to continue collecting high-value data on cognition and dementia. Taken together, these data resources provide unprecedented opportunities for studying the aging brain and for providing critical information to plan for the needs of the aging population.

Assessing Dementia in the Population

Challenges

Dementia is challenging to study for several reasons. Foremost is the fact that the typical cognitive decline of dementia is gradual and takes place over a number of years, making it hard to determine when a threshold for diagnosis of illness is reached. Similarly, it can be difficult to differentiate between mild levels of cognitive decline that are typical of normal aging as opposed to the more significant and pathological changes of AD or dementia. Diagnostic criteria for dementia and the pre-dementia stage of mild cognitive

impairment (MCI) are evolving as we learn more about dementia.

Estimating the prevalence of dementia and related disorders depends not only on how diagnostic criteria are defined but also on how they are translated into questions and assessments for research purposes. While several measures of cognitive functioning are widely used, different epidemiologic studies have used different measures and different cut-off scores to indicate disease threshold along the continuum. Scientists must weigh the tradeoffs involved in setting a particular threshold for diagnosis. Those set very high ensure that only true cases of dementia are counted yet risk increasing false negatives, thus underestimating the prevalence of disease. On the other hand, by setting a lower threshold scientists risk including false positives and inflating disease estimates. Against this backdrop, HRS researchers have sought to create public data that could be useful in addressing these and other important issues.

HRS embraced a broad definition of health to include aspects of mental health and cognitive functioning.

When the HRS began in 1992, measures of cognitive functioning were uncommon in large epidemiologic studies. Notwithstanding the fact that the HRS was launched with a focus on health and aging in the transition from work to retirement, HRS embraced a broad definition of health to include aspects of mental health and cognitive

functioning. Measures of cognitive functioning included in most waves of the HRS since 1992 include: 10-word immediate and delayed recall to assess memory (see example at right); a serial sevens subtraction test of working memory; counting backwards to assess attention and processing speed; object naming test to assess language; and recall of the date, president and vice president to assess orientation.

Information from these survey measures is often summarized as a composite score ranging from zero to 35 with a higher score indicating better cognitive functioning. Early research sought to define ranges using this measure that would correspond to clinical states. For example, [Langa et al. \(2008\)](#) used a score of 11 or higher to define normal cognitive functioning, eight to 10 to indicate MCI and seven or lower as moderate to severe impairment. This composite measure has been widely used to study trajectories of cognitive functioning.

However, without a clinical diagnosis — a gold standard — to compare to, there was no way to be sure that severe dementia corresponded to a typical clinical diagnosis of dementia that a patient could receive during a diagnostic work-up in the health care system. Yet conducting a clinical interview with the entire HRS sample was unrealistic and probably undesirable for younger participants. The solution to this problem was to select a subsample of the HRS population aged 71 and older, at higher risk for cognitive impairment, and administer a full neuropsychological assessment. ADAMS collected extensive information designed to provide a diagnostic determination of dementia, cognitive

Testing Cognitive Functioning

Immediate Word Recall

I'll read a set of 10 words and ask you to recall as many as you can. We have purposely made the list long so that it will be difficult for anyone to recall all the words—most people recall just a few. Please listen carefully as I read the set of words because I cannot repeat them. When I finish, I will ask you to recall aloud as many of the words as you can, in any order.

- | | |
|----------|-----------|
| 1. Hotel | 6. Market |
| 2. River | 7. Paper |
| 3. Tree | 8. Child |
| 4. Skin | 9. King |
| 5. Gold | 10. Book |



impairment without dementia (CIND), and normal cognitive functioning. These data can now be used for validation studies and to develop predicted probabilities of dementia and CIND in the HRS (Langa et al. 2005).

One report demonstrates how diagnostic data from ADAMS can be used to develop methods for classifying HRS respondents in the same diagnostic categories on the basis of cognitive measures available in the larger survey (Crimmins et al. 2011). Overall, the cognitive tests in the HRS predict dementia cases in 74% of the sample who could answer questions for themselves. Not surprisingly, classification of CIND was not as high.



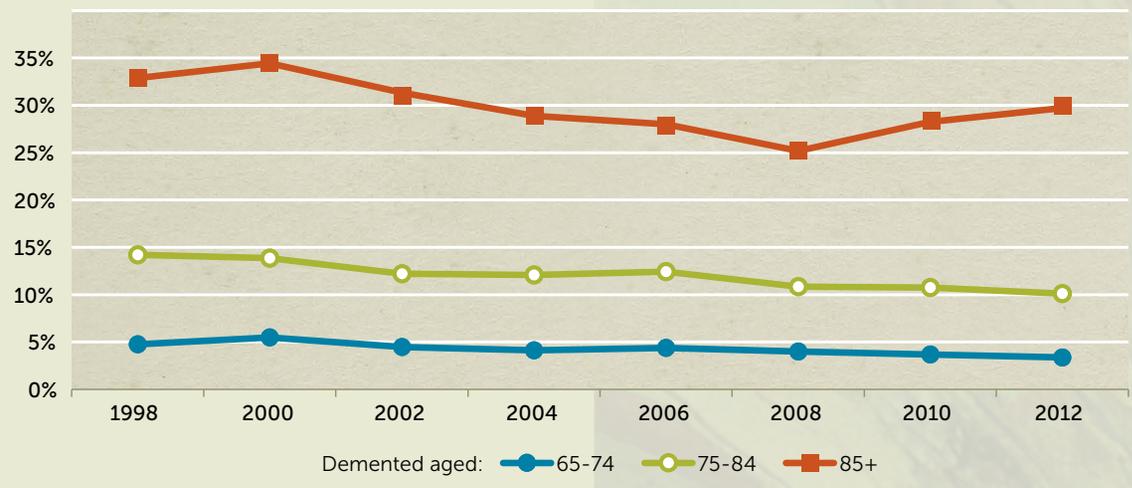
Dementia Prevalence

As the US population becomes older in the decades ahead, we can expect a large growth in the number of people with AD and dementia, simply because the risk for these conditions is so much higher as we age. Some have called this a looming “dementia epidemic.” Figure 2-1 shows higher rates of dementia in older age groups. For example, in 2012, dementia affects 3% of those aged 65 to 74 compared to 30% for those aged 85 and older.

Through a combination of factors like education and better medical treatment for conditions that affect dementia risk, rates of dementia are slowly trending downward, as Figure 2-1 also shows. In the youngest group, those aged 65 to 74, the percentage with dementia moves steadily from 5% in 1998 to 3% in 2012. The next oldest group, those aged 75 to 84, experienced even larger declines, from 14% in 1998 to 10% in 2012.

FIGURE 2-1 Trends in dementia prevalence by age: 1992-2012

Source: HRS 1998-2012.



Proxy Informants

Bias arises in surveys when respondents decline or are unable to participate because they are too sick. This can result in underestimating the true prevalence of health conditions like dementia. To address this form of attrition bias, family members of participants in the HRS and ADAMS are often called upon to provide survey information on behalf of participants, serving as proxy respondents. Approximately 10% of HRS interviews are obtained through proxies, and a large proportion of ADAMS respondents with dementia provide information through proxies. [Weir et al. \(2011\)](#) compare results from HRS to those from the English Longitudinal Survey of Ageing (ELSA), which is based on the HRS but uses proxies much less often. In the HRS, proxy respondents are asked a series of questions about the respondent's change in memory for various types of information in the last two years. Use of proxies in the HRS leads to significantly higher overall response rates and virtually eliminates attrition bias in the estimation of cognitive function.

Informant Reports

Another source of information that can be used to improve the accuracy of dementia determination is the informant report. ADAMS asks a close family member to complete an additional



questionnaire about the main survey participant. The informant is most often a family member involved in caregiving. The informant also serves as the proxy respondent if one was needed.

Potential racial bias in cognitive measures is a concern both for self-reported and proxy information. [Potter et al. \(2009\)](#) investigate this in ADAMS and find no evidence of racial bias in self-reported information. They also compare informant reports of African Americans and Whites in ADAMS. Results for dementia reveal no significant racial differences. However, African American informants are much less likely than Whites to identify symptoms corresponding to CIND in their family members with this condition.

The First National Data

Reliable data on dementia incidence and prevalence is critical for establishing benchmarks against which to measure population-wide changes over time. ADAMS provides the first national data on the prevalence of clinically diagnosed dementia and CIND. A random sample of 1,770 HRS participants aged 70 years or older in 2001 were invited to take part in ADAMS. The sample was stratified on five levels of cognitive functioning based on cognitive

scores from the HRS. The cognitively normal group was further stratified by age (70 to 79, and 80 or older) and sex in order to ensure adequate numbers in each of these subgroups.

A nurse and a neuropsychology technician conducted interviews and assessments in the homes of ADAMS participants. The information collected in the home was then reviewed by a board of qualified scientists and medical doctors to determine a diagnosis. The medical team determined three general categories: normal cognition, CIND and dementia. Dementia often arises from different medical conditions, so dementia was further categorized as dementia, AD and vascular dementia (VaD).

Using these landmark data, [Plassman et al. \(2007\)](#) report the first national estimates of the prevalence of dementia and dementia subtypes in individuals over the age of 70.

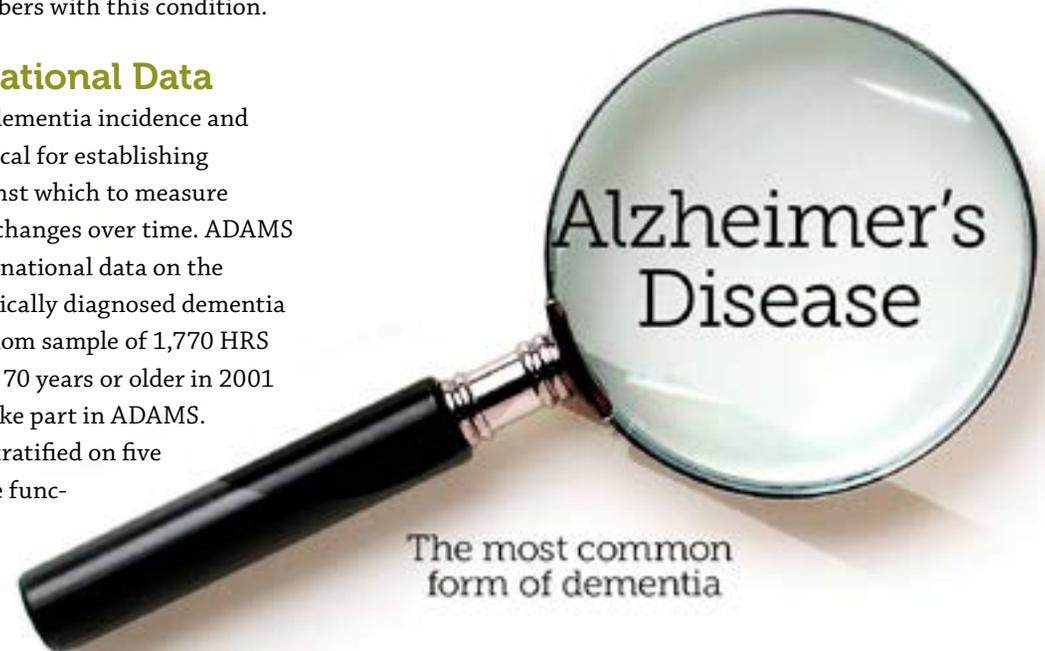


FIGURE 2-2 Prevalence of dementia, AD and VaD by gender: 2002

Source: *Plassman et al. (2007)*.

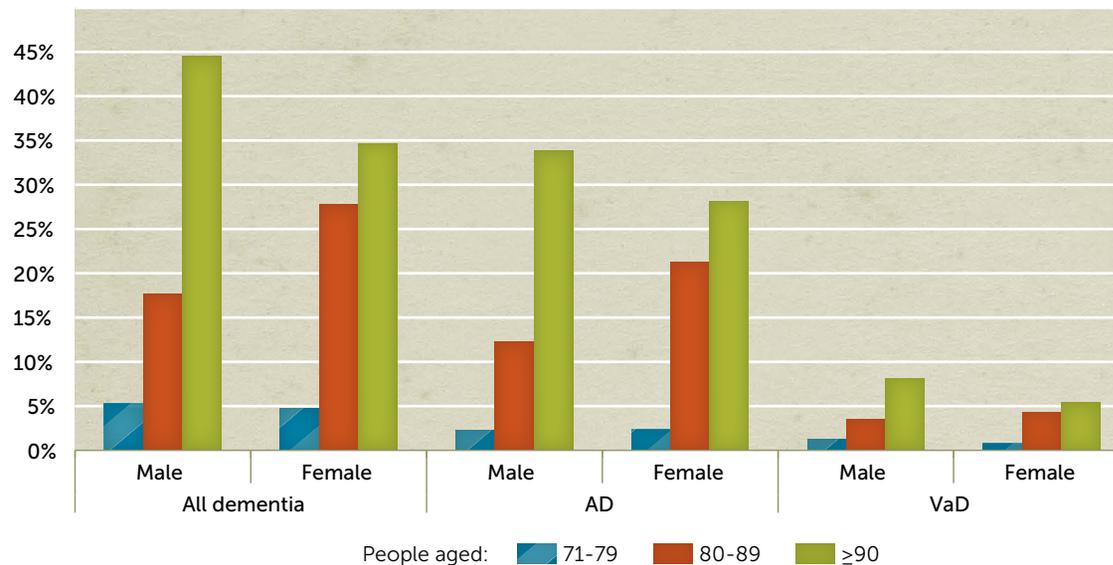
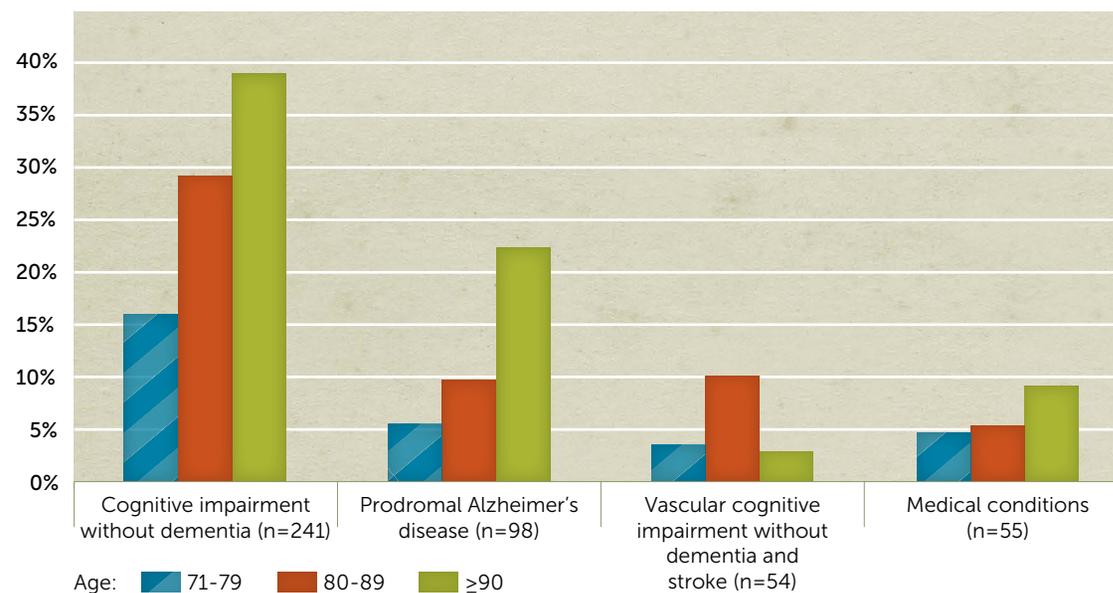


FIGURE 2-3 Prevalence of CIND subtype by age: 2002

Source: *Plassman et al. (2008)*.



The prevalence of dementia in those aged 71 and older was 13.7%, corresponding to approximately 3.4 million individuals in 2002. AD prevalence was 9.7%, or 2.4 million nationally. AD increases as the leading cause of dementia with age, accounting for 79.5% of all dementia among those aged 90 and older. Figure 2-2 shows the prevalence of dementia is comparable for men and women in the youngest age group but higher among women aged 80 to 89. Interestingly, in the oldest age group (90 and older), the prevalence of dementia is higher for men. These patterns are similar for both AD and VaD.

Another study reports on the prevalence of CIND. This form of cognitive impairment was 22.2% in 2002, which was about 70% higher than the estimated prevalence of AD (Plassman et al. 2008). CIND was further categorized as prodromal AD (a form of early AD), vascular cognitive impairment without dementia and stroke, and impairment arising from other medical conditions. Figure 2-3 shows the prevalence of each of these CIND subtypes by age group. Even in the youngest group, 71- to 79-year-olds, about one in seven individuals has some type of cognitive impairment.

With follow-up every two years through 2009, ADAMS data could be used to determine the number of new cases of dementia and CIND (Plassman et al. 2011). Figure 2-4 shows the incidence of dementia was 33.3 cases per 1,000, while AD was 22.9 cases per 1,000. Extrapolating from the study sample to the US population, the overall number of new cases of dementia during the study period is estimated to be 3.4 million, which included approximately 2.3 million new cases of AD. There were an additional 4.8 million new cases of CIND.

FIGURE 2-4 Incidence of dementia subtype by age: 2001-2009

Source: *Plassman et al. (2011)*.

Dementia	Age	Estimate of incidence/1,000 person-years (SE)	Estimate of population incident cases
	72-79	18.9 (4.3)	938,949
	80-89	42.2 (7.9)	1,965,362
	90+	82.1 (20.5)	503,009
	Total	33.3 (4.2)	3,407,320
Alzheimer's disease (AD)	72-79	16.6 (4.2)	821,592
	80-89	24.2 (4.5)	1,127,323
	90+	64.0 (15.7)	392,057
	Total	22.9 (2.9)	2,340,972
Cognitive impairment without dementia (CIND)	72-79	39.3 (8.2)	1,653,503
	80-89	73.1 (11.8)	2,538,220
	90+	206.4 (56.1)	630,925
	Total	60.4 (7.2)	4,822,649
Dementia (among CIND)	72-79	102.3 (21.8)	741,835
	80-89	123.8 (26.5)	1,474,533
	90+	124.6 (35.6)	341,135
	Total	120.3 (16.9)	2,557,503

Risk Factors for Dementia

The HRS and ADAMS are used to identify risk factors for cognitive impairment and dementia. Studies identify risk factors that may be directly modified through intervention and risk groups who may be the focus of intervention. Numerous studies use HRS and ADAMS data to contribute to our understanding of genetic and demographic risk, including educational level. A range of studies investigate medical conditions that may put individuals at risk for cognitive decline. A new area of investigation is the impact of behavioral risks.

Genetic and Demographic Risk

With a large database of genetic information on participants, the HRS is at the forefront of discovery of genetic and medical risks for dementia. Research using HRS data is beginning to shed light on how genes work to affect dementia. There is likely no single memory gene, but the APOE gene, specifically the $\epsilon 4$ variant, has been widely identified as a very significant risk factor for cognitive decline. *Llewellyn et al. (2010)* find that both APOE $\epsilon 4$ and having a stroke increase the risk of dementia, but having both creates a

higher level of risk that is greater than simply the sum of these two separate risks. Another study leverages the longitudinal nature of ADAMS to evaluate the contribution of the genetic marker to progression of dementia. Interestingly, APOE $\epsilon 4$ predicts cognitive decline over time but not progression to AD (*Brainerd et al. 2013*). Another study creates a genetic risk score for dementia using other dementia genes and finds that more genetic risk is associated with increased risk of cognitive decline (*Hayden et al. 2015*).

Research using HRS data has actually identified a new gene that influences memory. Those with the gene FASTKD2 perform better on some memory tests than those without it. This discovery could point the way to new treatments for the memory impairments caused by AD or other age-related conditions. Although the influence of FASTKD2 is modest, it is similar to research in diabetes, cancer and hypertension that uncovered genes with similar effects that led to targets for drugs that are now commonly used (*Ramanan et al. 2015*). HRS research also supports the idea that memory decline is influenced by multiple genes. *Marden et al. (2016)* use HRS genetic data to create a polygenic risk score based on the top 22 AD-associated genes as an alternative to exclusively using APOE $\epsilon 4$.

The first study of prevalence in the ADAMS population shows, not surprisingly, that age is a powerful predictor of AD and other dementias. As other studies show, the APOE $\epsilon 4$ allele is also associated with an increased risk of dementia, and a higher level of education is significantly protective. In contrast to other studies, female gender is not a predictor of Alzheimer's risk. African Americans have an elevated risk, but

The HRS is at the forefront of discovery of genetic and medical risks for dementia. Research using HRS data is now learning more about how genes work to affect dementia.

this seems to be explained by the effect of education and APOE ε4 (Plassman et al. 2007). Similar risks are identified in the study of incident, or new cases of dementia (Plassman et al. 2011), except that male gender is significantly associated with incident AD. Further, race is not a risk factor for new diagnosis of CIND, AD, or other dementias. More recently, Hurd et al. (2013) used a predicted probability of dementia in the HRS, validated against ADAMS. Nonwhite race, female gender, single status, older age, lower educational level, and lower household income are associated with greater dementia risk in 2010. While there are race differences in cognitive functioning at baseline, Castora-Binkley et al. (2015) find no racial difference in the rate of cognitive decline over time.

Interestingly, as individuals begin to experience symptoms of cognitive impairment, they appear to be aware of it. In addition to objective tests, the HRS asks participants to give their own subjective assessments of their memory. Hülür et al. (2015) find that those who report steeper declines of subjective memory indeed show steeper declines of memory performance over time.

Education

Higher educational levels have long been thought to confer protection against cognitive decline in older adults. A number of studies use data from the oldest HRS cohort to evaluate the effects of education on late-life cognitive functioning. As expected, higher educational levels are associated with higher cognitive functioning, but these studies show that the effect of education does not affect the rate of decline in cognitive functioning

(Alley et al. 2007). Similarly, over time, the risk difference between those with lower and higher educational levels remains the same (Karlaman-ga et al. 2009).

Figure 2-5 demonstrates the strong relationship between educational level and cognition. The figure shows a mean cognition score in 2012 (that goes from zero to 27) across four levels of education, and across four different age groups. At every age group, there is a positive association between education and cognitive functioning. Interestingly, the mean score for those with less than a high-school education at ages 55 to 64 is the same as that for those with a college degree or more at age 85 and older.

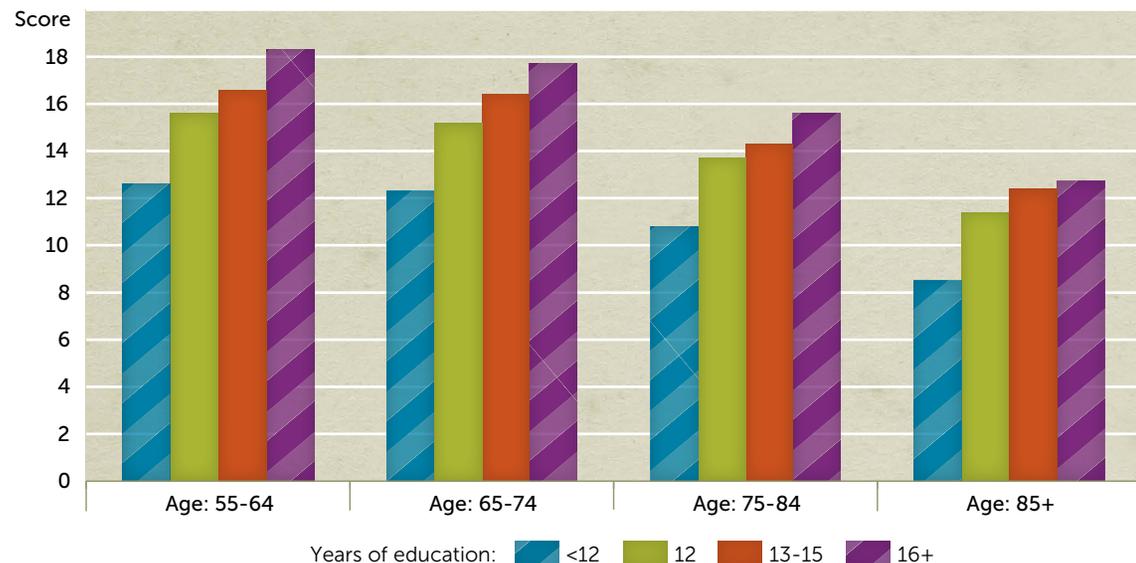
The benefits of education for dementia risk appear to span generations. Rogers et al. (2009) use ADAMS data combined with parental

education from the HRS to investigate the effects of mother’s education on dementia risk. Compared to participants whose mothers had at least eight years of education, those with mothers having fewer than eight years of education have a significantly elevated risk of CIND or dementia, 31% versus 45%, respectively. This strong risk remains even after taking into account other known dementia risk factors, such as the APOE ε4 allele and the individual’s own educational level.

The APOE ε4 allele is also associated with an increased risk of dementia.

FIGURE 2-5 Mean cognitive score by age and educational level: 2012

Source: HRS 2012.





Those who say they did well in school, regardless of the level completed, have a much lower risk of being diagnosed with Alzheimer's disease later in life.

Another study uses ADAMS to investigate educational quality as an independent risk for dementia later in life (Mehta et al. 2009). Below-average self-assessed school performance is associated with a four-fold risk of AD independent of educational level, literacy score, and other relevant risk factors. Educational level attained is an important asset, but educational quality may do even more to build cognitive capacity. Those who say they did well in school, regardless of the level completed, have a much lower risk of being diagnosed with AD later in life. These findings suggest that merely staying in school may not result in the full benefits of education for dementia risk.

Medical Risks

Medical risks are a promising area of investigation, especially given that their identification has great potential for intervention to reduce the burden of the medical risk itself as well as potentially associated dementia. Llewellyn et al. (2010) examine hypertension, heart disease, diabetes, stroke, APOE ϵ 4, and dementia risk. Supplemental information, such as medication use, allows

researchers to assign treated versus untreated status to each of the four medical conditions investigated. Both treated and untreated stroke and APOE ϵ 4 allele significantly elevate dementia risk. Treated hypertension decreases dementia risk. Interestingly, heart disease and diabetes are not associated with dementia. The interaction of APOE ϵ 4 allele with stroke confers very high risk for dementia. D. Levine et al. (2015) find that race differences in cognition and cognitive decline are not explained by differences in the higher stroke risk for African Americans compared to Whites.

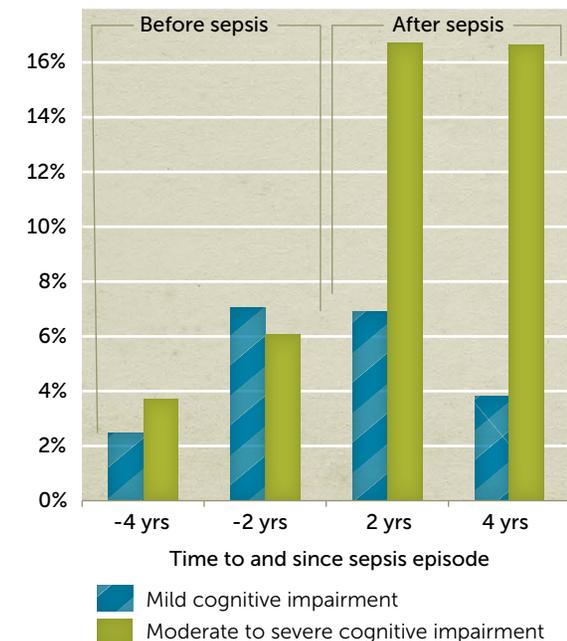
Building on clinical research findings that visual problems are associated with cognitive impairment, Rogers and Langa (2010) investigate the role of visual impairment in the development of dementia. They follow ADAMS participants for 8.5 years to see if changes in vision are associated with changes in cognitive functioning. HRS data are also linked with Medicare treatment records to estimate the effects of vision procedures like corneal transplant or cataract removal/lens implantation. Those diagnosed with dementia, especially AD, have poorer vision at baseline and have received fewer eye services prior to their diagnosis than those who do not experience serious cognitive decline. Uncorrected poor vision is a very significant risk factor for dementia.

HRS findings show that acute health events may also lead to cognitive decline. Severe sepsis, or blood infection, is a major cause of critical

illness requiring hospitalization. Information on hospitalization for severe sepsis was obtained from linked Medicare data (Iwashyna et al. 2010) and used to identify HRS participants who had an episode of severe sepsis. Severe sepsis is associated with substantial and persistent new cognitive impairment and functional disability among survivors. Figure 2-6 shows that among those who survive severe sepsis, 6.1% had moderate to severe cognitive impairment at the last survey prior to the episode of sepsis. This percentage increased to 16.7% by the first survey after the episode and persisted even two years later. Severe sepsis episode has no impact on changes in MCI.

FIGURE 2-6 Percent of patients with cognitive impairment before and after severe sepsis: 1998-2006

Source: Iwashyna et al. (2010).



Other health events put patients at risk for cognitive decline, including hip fracture (Bentler et al. 2009) and a new diagnosis of chronic obstructive pulmonary disease (Hung et al. 2009). Having diabetes is associated with dementia, but over eight years of follow-up, a new diagnosis of diabetes does not predict the onset of dementia (Q. Wu et al. 2015).

Cross-national comparisons also provide useful insight on factors associated with cognitive functioning. Langa et al. (2009) compare non-Hispanic whites over age 64 on the same measures of memory and orientation available in both the HRS and ELSA. Compared to their counterparts in England, US adults score significantly better on a cognitive scale. Older adults in the US have more risks for heart disease and other diseases that may lead to poorer cognitive function. But US adults tend to be wealthier, better educated, and have less depression, which accounts for some of the US cognitive advantage. US adults are also more likely to be taking medications for hypertension, which may help cognitive function.

Interestingly, although depression is a risk factor for cognitive decline, Saczynski et al. (2015) follow HRS participants for six years and show that the use of antidepressants does not make any difference in cognitive changes.

Behavioral Factors

Recent research examines the potential impact of exercise and other modifiable risks on cognitive decline. With longitudinal data from HRS linked to dementia diagnosis in ADAMS, Bowen (2012) examines whether a history of vigorous physical activity three or more times per week affects the risk of subsequent dementia. Age, female sex, presence of the APOE ε4 allele, a history of stroke, and poorer cognitive functioning at baseline are all associated with an increased risk of dementia. Mild drinking (one to three drinks per week) as well as being overweight or obese confer significant protection against dementia. In addition, vigorous physical activity for at least 12 months over the study period reduces dementia risk by 21%. Maintaining optimal body weight may be especially important to reduce risk of cognitive decline. Xiang and An (2015a) show that being underweight, having a body mass index less than 18.5, is a robust risk factor for onset of cognitive impairment in later life.

Loneliness is emerging as a significant health risk. One study follows HRS participants aged 65 and older from 1998 to 2010 and finds that loneliness and depressive symptoms both lead to cognitive decline over that period. Looking at the reciprocal direction of effect, they show that low cognitive function predicts increasing loneliness (Donovan et al. 2016).

Comorbid Conditions

Some studies examine the association of medical conditions and dementia with the goal of providing information to increase clinician awareness in treating older patients with multiple chronic conditions and risks. For example, Gure et al. (2012) find that approximately 40% of HRS participants over age 66 with heart failure have some degree of cognitive impairment. In this group, the prevalence of cognitive impairment consistent with dementia is 15%.

Multiple studies identify other neuropsychiatric symptoms as comorbid with dementia. For example, depressive symptoms are associated with lower immediate and delayed word recall in the HRS (Gonzales et al. 2008). The prevalence of depression in the ADAMS sample is 8.5% for those with normal cognitive status increasing to 13.4% for those with CIND, and to 20.0% for those with dementia (Steffens et al. 2009).

Similarly, Okura et al. (2010) show that other neuropsychiatric symptoms, such as anxiety, agitation, elation and delusions are prevalent among those with cognitive impairment. The percentage of those with three or more symptoms increases sharply going from mild to moderate dementia (from 15.2% to 44.3%) but then decreases slightly with severe dementia (38.2%). Some research suggests that neuropsychiatric symptoms may actually precede dementia (Beaudreau et al. 2012).

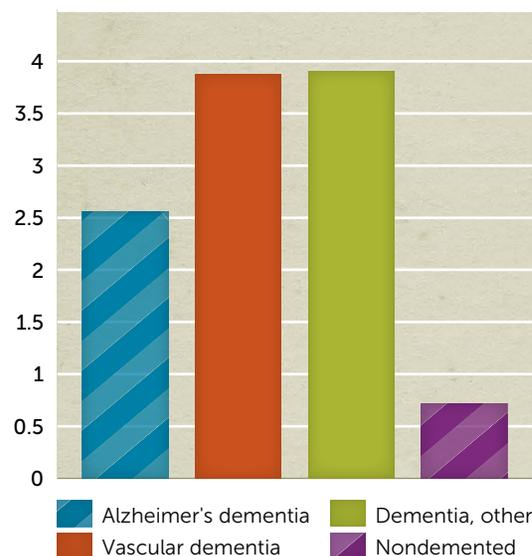


Medical, Social, and Economic Impact

Dementia has far-reaching impacts. For individuals with dementia, the medical consequences are numerous. One line of research using the HRS and ADAMS examines the impact of dementia on functional limitations. These limitations lead to a substantial need for caregiving, often provided by family members. The extensive information in the HRS on the amount and type of help provided to those with dementia offers insight into the extent of the social impact of dementia. Another line of research seeks to determine the monetary costs of dementia by estimating the dollar value of that caregiving, and the value of medical services used by those

FIGURE 2-7a **Mean number of activity of daily living (ADL) limitations by dementia subtype: 2002**

Source: Gure et al. (2010).



with dementia. Linkage to Medicare claims data enables researchers to include government payments for dementia care in these estimates.

Medical Consequences

Research examines the differences in functional limitation across different dementia subtypes. Gure et al. (2010) show that AD, vascular dementia, and other dementia are all associated with a significant increase in the mean number of limitations to activities of daily living (ADLs) and instrumental activities of daily living (IADLs). Examples of ADLs are walking, bathing and dressing.

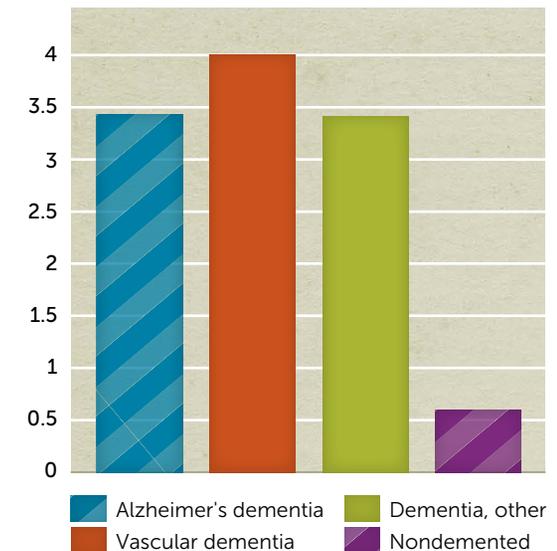
IADLs are things like shopping, preparing meals and managing money. Compared to AD, vascular and other types of dementia appear to cause more significant limitations in ADLs (Figure 2-7a). However, the limitations to IADLs are similar across all three subtypes (Figure 2-7b). This makes sense given the natural history of AD, where deterioration in ability to perform IADLs tends to precede ADL limitations.

A related ADAMS study finds that certain neuropsychiatric symptoms, which are common in dementia and CIND, are associated with more functional impairment (Okura et al. 2010). For example, dementia patients with clinical depression are much more likely than those without depression to have significant problems with ADLs.

Importantly, depressive symptoms and cognitive decline appear to contribute additively to mortality (Mehta et al. 2003). Davydow et al. (2015) find that individuals with co-occurring depression and CIND represent a high-risk group that may benefit from targeted interventions to prevent stroke.

FIGURE 2-7b **Mean number of instrumental activity of daily living (IADL) limitations by dementia subtype: 2002**

Source: Gure et al. (2010).



A study of the medical consequences of dementia in the 1990s, which uses data from one of the earliest cohorts in the HRS, finds that dementia is a primary cause of nursing home admission, even after taking into account its impact on functional limitations (Banaszak-Holl et al. 2004).

Dementia is a primary cause of nursing home admission, even after taking into account its impact on functional limitations.

Caregiver Burden

As part of the in-home ADAMS assessment, informants who were present were asked to complete a questionnaire about their role as a caregiver. Fisher et al. (2011) report on data from caregivers who report being a family member with primary responsibility for providing care to the person with dementia or CIND. Caregivers are asked a wide range of questions about their experiences providing care to their relative. Caregivers are most often female children of the care recipient. Sixty-two percent of caregivers live with the care recipient. The researchers compare the experiences of those caring for relatives with dementia and CIND.

Those providing care to relatives with CIND report an average of 133.7 care hours per month. Care of a relative with dementia was twice as hard, involving an average of 278 hours per month. Around 44% of those caring for a relative with dementia report feeling depressed compared to 26% of those caring for someone with CIND. Despite this, caregivers also reported on the reward of caring for their relative, including feeling closer to the person they were caring for and more in control of their relative's well-being.



When dementia is accompanied by other neuropsychiatric symptoms like depression and anxiety, the number of caregiving hours increases. This is because these additional symptoms increase the number of functional limitations the person with dementia experiences. Okura et al.

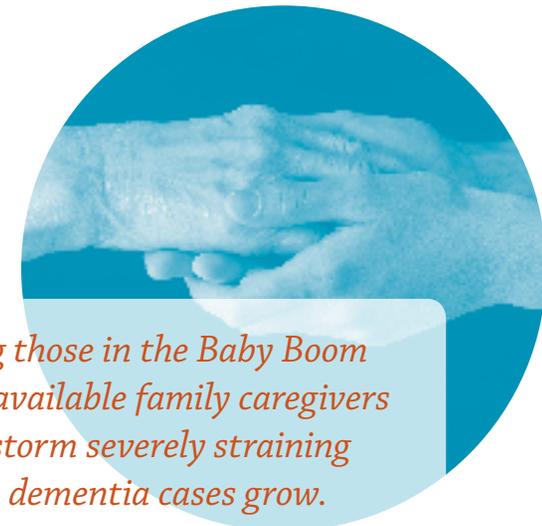
(2010) show that the increased functional impairment associated with neuropsychiatric symptoms, like depression and anxiety that are common in dementia and CIND, translates into a higher number of caregiving hours. Caregiving for those with dementia may itself be a risk for cognitive decline. Husbands and wives who are caregivers for their spouse with dementia are themselves more likely to experience cognitive decline compared to caregivers of spouses with other diseases (Dassel et al. 2015).

Women who are disabled from dementia are much less likely than men to receive informal home care (Katz et al. 2000). Women are more likely to be living alone, but even among married couples, wives receive less care than husbands. Among those receiving informal care, children are most likely to be providing care to mothers,

and wives are most likely to be providing care to husbands. Because of lower birthrates among those in the Baby Boom generation, the resulting decline in available family caregivers (Ryan et al. 2012) may lead to a caregiving perfect storm severely straining families and public programs as dementia cases grow.

Economic Costs

One way that dementia represents a substantial economic burden is in out-of-pocket medical (OOPM) expenses. Delavande et al. (2013) show that OOPM costs for those with dementia are \$8,440 per year (in 2016 dollars) compared to \$2,570 for those with normal cognition at similar ages; increased expenses are mainly due to nursing home care. Projecting this amount up to the US population over age 70 in 2009, which they estimate to be about 28 million based on census records, the excess cost of OOPM spending associated with dementia was \$22 billion in 2010.



Because of lower birthrates among those in the Baby Boom generation, the resulting decline in available family caregivers may lead to a caregiving perfect storm severely straining families and public programs as dementia cases grow.

Other research aims to determine the dollar value of the informal caregiving provided to those with dementia. Before ADAMS data were available, [Langa et al. \(2001\)](#) performed this calculation with HRS by using measures of cognitive functioning that approximated mild, moderate and severe dementia, and estimated the hours of care provided in each category. A common way to measure the cost of informal care is to think of it as the foregone potential wages the caregiver could have earned if he or she were not providing care. Another way to estimate this opportunity cost is to assign it the value of the cost of equivalent services, such as a home health aide. They find the number of hours of care rises very sharply progressing from mild to severe dementia—from 8.5 to 41.5 additional hours of care per week (compared to those with normal cognition). The cost of this care is substantial as well.

Combining all sources of cost information—informal care, formal in-home care and nursing home care—into one analysis can yield an estimate of the total cost of dementia to the US economy ([Hurd et al. 2013](#)). [Figure 2-8](#) summarizes costs across several categories. The total cost of dementia in 2010 was between \$161 billion and \$221 billion, depending on how the cost of informal care is calculated. The size of this estimate means that dementia has a social and economic impact as large as other important and common chronic diseases, such as heart disease and cancer. [Kelley et al. \(2015\)](#) also show that, in the last five years of life, health care expenditures for those with dementia are much larger than the cost associated with other diseases. They show that these large OOPM expenses are born by those who are least prepared for financial risk. Depression adds

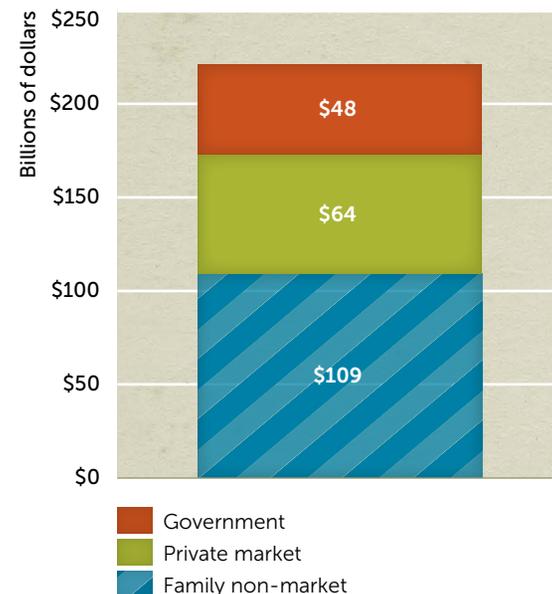
to the financial burden. Compared with cognitive impairment or depression alone, cognitive impairment plus depression is associated with greater costs ([Xiang and An 2015b](#)).

Positive Trends

Despite growing numbers of people with cognitive impairment, social, medical and demographic trends may have a positive impact on cognitive health. Two positive outcomes are possible: 1) decreasing prevalence of dementia over time and 2) delayed onset of clinical symptoms of dementia. The latter refers to the goal of reducing the duration of illness for chronic diseases that lead to death by delaying disease onset, so-called morbidity compression.

FIGURE 2-8 **Costs of caring for persons with dementia, by source of payment: 2010**

Source: [Hurd et al. \(2013\)](#)



Despite growing numbers of people with cognitive impairment, social, medical and demographic trends may have a positive impact on cognitive health.

[Langa et al. \(2008\)](#) used HRS data on cognitive functioning to investigate both of these possibilities. They find that the prevalence of cognitive impairment consistent with dementia declined from 12.2% in 1993 to 8.7% in 2002. Earlier research shows that higher levels of education and wealth are linked to lower levels of dementia. Indeed, they find that increasing education and net worth over time and between cohorts accounts for about 40% of the decrease in prevalence. They also compare two-year mortality rates between the two cohorts to investigate the question of morbidity compression and find that those with moderate to severe cognitive impairment have a significantly higher risk of death in 2002 than in 1993.

Is Cognitive Reserve the Key?

The finding that higher levels of education are associated with increased two-year mortality for those with cognitive impairment in both time periods (1993 and 2002) is actually good news and lends support to the concept of cognitive reserve. According to this hypothesis, greater mental stimulation, which is associated with education, leads to increased neuronal development and an increased number of connections among brain cells, and thus greater brain capacity. Brains with

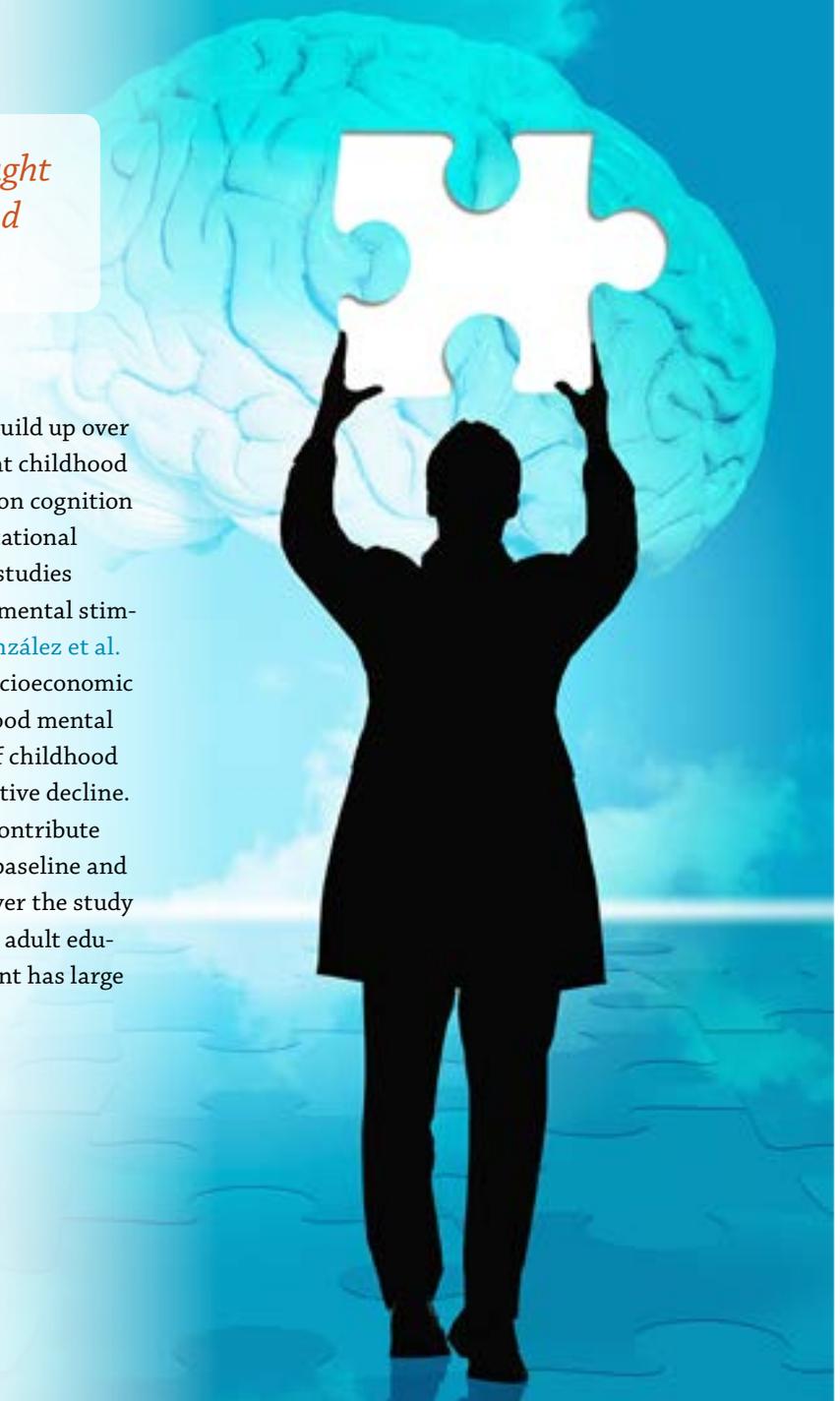


Brains with greater capacity are thought to weather the insults of disease and aging more effectively.

greater capacity are thought to weather the insults of disease and aging more effectively. Thus, the faster time to death reflects a longer period of resistance before showing outward signs of cognitive decline.

Other studies provide strong evidence to support the cognitive reserve hypothesis. Using 17 years of cognitive testing information, [Clouston et al. \(2015\)](#) show that each year of schooling is associated with significantly higher baseline cognition and delayed onset of serious cognitive problems. Another study establishes the causal association between education and cognition by using genetic risk scores, finding a 1.1% reduction in dementia risk per year of schooling between 1998 and 2010 ([Nguyen et al. 2016](#)).

Cognitive reserve is thought to build up over a lifetime. There is some evidence that childhood cognitive functioning has an impact on cognition in later adulthood, regardless of educational attainment and occupation. But few studies evaluate the relative contribution of mental stimulation at different points in life. [González et al. \(2013\)](#) use HRS data on childhood socioeconomic position as a marker for early childhood mental stimulation to compare the impact of childhood and adult achievement on later cognitive decline. Interestingly, childhood conditions contribute only modestly to cognitive status at baseline and have no effect on cognitive decline over the study period, from 1998 to 2010. However, adult educational and occupational achievement has large impacts on both.



ECONOMIC PREPARATION FOR RETIREMENT



CHAPTER 3 | ECONOMIC PREPARATION FOR RETIREMENT

In the ideal retirement scenario, households have sufficient economic resources to maintain or even improve on the lifestyle they had during their working years. Currently, this is feasible for many Americans through a combination of sources including Social Security, employer-provided public and private pensions, and personal savings. HRS research has increased our understanding of the value and importance of each of these resources by addressing a range of questions. What motivates people to save for retirement? What factors affect financial security in retirement? How do households spend or conserve their savings throughout retirement?

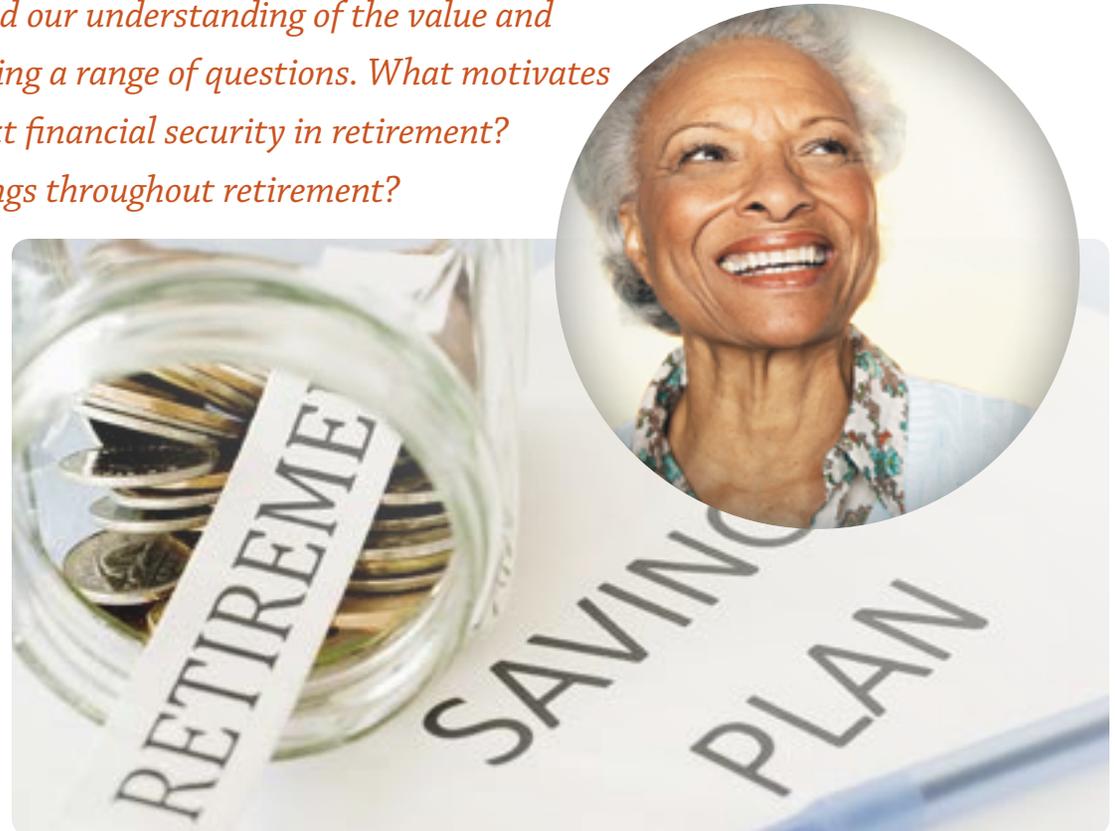
Research on economic readiness for retirement focuses on two stages of the life cycle: the accumulation of wealth during working years and the drawdown of wealth during retirement. Both aspects influence financial well-being in retirement. On average, many households are well prepared, though some groups are much less so. Public and private programs are influential in decisions about whether to save and how much. Personal factors, such as financial literacy and personality, come into play as well. Spending patterns change before, after, and throughout retirement with health expenditures playing an increasingly larger role at older ages.

Ready or Not?

Social Security, pensions and private savings comprise the well-known three-legged stool of retirement. Together these sources of income can provide a secure foundation of financial well-being in retirement: none is meant to serve as the only source. For many people, income needs

tend to fall in retirement for a variety of reasons: tax rates are generally lower in retirement; work-related costs diminish or disappear; children are less of an expense; and people substitute time for purchased goods. Thus, some experts suggest

that individuals should aim to have enough across all three legs to replace about 70 to 85% of the income they had while working — though advice regarding the ideal replacement rate varies.



Using HRS data on all three sources of retirement income, numerous studies address the following questions: How much do Americans need to save? Do we have enough to retire at the ages we are currently electing to stop work? Is the concept of a replacement rate itself in need of updating? A wide range of research is exploring these questions from many different angles with findings that are sometimes at odds. Results depend, to some extent, on how adequacy and wealth are measured, and assumptions made regarding retirement patterns and spending—particularly on medical and long-term care.

Determining Adequacy

Reviewing some of the earliest HRS studies on this topic that use information from the first wave of the HRS in 1992, one study shows that the average household could achieve a replacement rate of up to 86% (Uccello 2001). On the other hand, Moore and Mitchell (2000) find evidence of under-saving if HRS households want to maintain their pre-retirement level of spending. In 1992, the median household in the original HRS cohort held about \$945,175 (2016 dollars) in pension, Social Security, housing and other financial wealth, growing to about \$1,105,069 by retirement at age 62. These households needed to have increased their savings annually by 16% if they wished to maintain their current spending and retire at age 62. Thirty percent would not need to change their savings plans, but 40% needed to have saved at least an additional 20% annually. One solution to a retirement shortfall: delay claiming Social Security benefits until age 65 to significantly increase retirement wealth.

Scholz et al. (2006) incorporate a more complete set of potential factors affecting household financial decision-making such as family size, uncertain longevity, uninsurable earnings and medical expenses, progressive taxation, government transfers, and pension and Social Security benefits. Fewer than 20% of households under-save relative to optimal targets. Updating the model with HRS data from more recent cohorts, Scholz and Seshadri (2008) show the percentage of households not meeting optimal target replacement rates could be as low as 4%. However, traditional replacement rates do not account for the fact that adults in households with children have higher spending during their working years but lower spending when their children move out. Their target replacement rates could be lower on average than

households without child-related expenses (Scholz and Seshadri 2007).

Most replacement rate calculations do not include the value of housing and other assets, which could potentially be converted into an annuity payment. Annuities can be purchased with various conditions but generally require a large lump-sum payment in exchange for a guaranteed monthly payment for life. Including annuitized wealth substantially increases replacement rates (Purcell 2012). For those with very high wealth, full annuitization could overshoot the mark, leading to replacement rates well in excess of 100%.

One solution to a retirement shortfall: delay claiming benefits until age 65 to significantly increase retirement wealth.



CAMS

The Consumption and Activities Mail Survey (CAMS) is a supplemental biennial survey in a random subsample of the HRS. Conducted in the off-year from the main HRS survey since 2001, CAMS collects very detailed questions about spending before and during retirement. CAMS data are linked to the extensive information on retirement assets in the HRS.

Categories of Spending

- **Home-related expenses** include mortgage, property taxes, homeowner's or renter's insurance, rent, utilities, home repairs, home furnishings, household cleaning supplies, housekeeping and laundry services, gardening and yard supplies, and gardening and yard services.
- **Food expenses** include food and drink, including alcoholic beverages that are bought in grocery and other stores (dining out is not included).
- **Health expenses** include out-of-pocket (uninsured) health insurance costs (including Medicare supplemental insurance); out-of-pocket costs for prescription and nonprescription drugs; out-of-pocket cost for hospital care, doctor services, lab tests, eye, dental, and nursing home care; and out-of-pocket costs for medical supplies.
- **Transportation expenses** include car payments (principal and interest), vehicle insurance, vehicle maintenance and gas.
- **Clothing expenses** include clothing and apparel (including jewelry), and personal care products and services.
- **Entertainment expenses** include trips and vacations, tickets to movies, sporting and performance events; hobbies and leisure equipment (photography, reading, camping, etc.); dining out in restaurants, cafes, and diners; and take-out food.
- **Other expenses** include contributions to religious, educational, charitable, or political organizations, and cash and gifts to family and friends outside the household (including alimony and child-support payments).

For those in the 25th wealth percentile, including all sources of wealth in the form of an annuity results in a 67% replacement rate. Replacement rates fall over time in retirement, however, and by the ninth year in retirement, even a fully annuitized household in the 25th percentile would achieve only a 60% replacement rate.

Early Baby Boomers have slightly less wealth than those in the previous cohort.

Traditional replacement rate measures focus on relative incomes before and after retirement but do not capture the chances of falling into poverty in retirement. Thus an apparently adequate retirement replacement rate could be found for households living in poverty. To address this, [Love et al. \(2008\)](#) estimate poverty-line wealth, which they define as the amount of wealth a household needs to ensure that every member maintains a living standard over the poverty line throughout the rest of his or her life. As other studies find, the median household is in reasonably good financial shape. About 18% of households, though, have insufficient wealth to remain above 150% of the poverty level during retirement. Comparing the Early Baby Boomers to households of the same age in 1998, they find that Early Baby Boomers have slightly less wealth than those in the previous cohort. Nonetheless, median wealth, even for Early Baby Boomers, appears to be adequate. Another line of research uses spending in retirement to create an alternative to the replacement rate in the assessment of retirement wealth adequacy. In a series of studies,

Hurd and Rohwedder take advantage of the longitudinal nature of the Consumption and Activities Mail Survey (see facing page) data to create a consumption path, i.e., how spending changes as people age. This allows them to determine if assets are adequate to fund the consumption path through retirement.

Using a consumption-based rather than an income-based measure of financial well-being in retirement lowers estimates of poverty, especially among older widows ([Hurd and Rohwedder 2006](#)). This is because a consumption-based measure of adequacy recognizes that older people can spend out of their wealth. Using the consumption path to estimate retirement preparedness, [Hurd and Rohwedder \(2012\)](#) suggest that if households have at least a 95% chance of solvency, they are considered prepared for retirement. They account for different risks faced by most retirees including taxes, widowhood, as well as different levels of mortality risk and out-of-pocket medical (OOPM) spending risk. Given this conceptualization, they find that 71% of new retirees aged 66 to 69 are adequately prepared. However, marital status has a big impact: 80% of those who are married are adequately prepared compared with just 55% of singles. Educational level has a similarly large impact. The lowest level of retirement preparation is among single women with less than a high school education.

A consumption-based measure of adequacy recognizes that older people can spend out of their wealth.

To understand more about the adequacy of resources in retirement, HRS asks questions about material hardships including food insecurity, skipped meals, medication cutbacks, difficulty paying bills, and dissatisfaction with one's financial situation. About 20% of the elderly report at least one of these hardships ([Levy 2015](#)). Poor health affects material hardship by lowering income and increasing OOPM spending. Even accounting for these effects, though, poor health has a direct effect on hardship, perhaps by making it more difficult to get around.

The Composition of Wealth at Retirement

Another angle to consider in retirement preparation is the value of wealth holdings at different wealth deciles for different categories of wealth. [Poterba et al. \(2013\)](#) compare all households aged 65 to 69, single households, and married households for a range of wealth deciles and wealth categories including net worth, Social Security, defined benefit (DB) pensions, non-annuitized wealth, financial assets, personal retirement account benefits, and housing and other real estate wealth. Not surprisingly, the wealth of married households is substantially greater — in many cases more than double — than that of single households. Taken together, Social Security and DB pension wealth represent 34.9% of the mean value of average household wealth. Home equity accounts for 20.2% of all wealth; the share of all real estate combined is 31.1%. The median net worth at the 10th percentile is \$141,465 (in 2016 dollars), and at the 90th percentile is \$2,029,634.

Turning their attention to older households, [Poterba et al. \(2012\)](#) examine the evolution of assets in later retirement and the wealth holdings of Asset and Health Dynamics Study (AHEAD) respondents (born before 1924) toward the end of their lives. Median wealth is \$157,363 (in 2016 dollars) for singles, \$280,985 for widows, and \$768,545 for married households. But 46% of this older population dies with less than \$11,113 in assets and is much more likely to have been in poor health.

The financial situation at the end of life also depends on how long we live. An Employee Benefit Research Institute (EBRI) report shows that 20.6% of those who die at 85 or older have no non-housing assets, and 12.2% have no assets left. The percentages are higher for those who are single at the time of death with 9.1% also holding outstanding nonmortgage debt ([EBRI 2015a](#)).



Increasingly, married women are earning Social Security benefits through their own labor force participation .

Social Security Replacement Rates

Social Security plays a very important role in retirement readiness. For example, [Hurd and Rohwedder \(2012\)](#) estimate that a reduction in Social Security benefits of 30% would reduce the percentage adequately prepared by 7.8% for married individuals but as much as 10.7% among singles. In addition, [Bender \(2007\)](#) shows that income from pensions and Social Security accounts for the majority of retirement income.

Besides replacing earnings for retired individuals, Social Security benefits are progressive; that is, they replace a higher fraction of low earners’ pay than high earners’ pay. But because benefits are calculated at the level of the individual instead of the household, and because of the spousal benefit, much of the redistribution goes from higher-earning husbands to their lower-earning wives ([Gustman and Steinmeier 2001](#)). As women’s labor force participation increases, this is likely to change. Indeed, with more women working, the Social Security system is becoming more redistributive ([Gustman et al. 2013](#)). [Figure 3-1](#) shows the labor force participation rates and the Social Security average indexed monthly earnings (AIME) in 2016 dollars, multiplied by 12 to calculate an annual estimate. Men and women in the original HRS cohort are compared with the Early Baby Boomers.

While the percentage of men in the paid labor force decreased between the two cohorts from 83 to 79%, women increased their labor force participation rate by seven percent, from 64 to 71%. Their earnings increased dramatically as well. [Figure 3-2](#) shows the impact on redistribution, measured as the fraction of total Social Security benefits that is distributed among wealth deciles. The amount of redistribution increases from about 10% for the 1992 cohort to over 12% for the 2004 cohort. Redistribution at the household level increases from about 5% to nearly 7%. These trends are likely to continue as women’s labor force participation grows.

FIGURE 3-1 Percent in the labor force and working full-time and Social Security earnings for men and women aged 51-56: 1992 and 2004

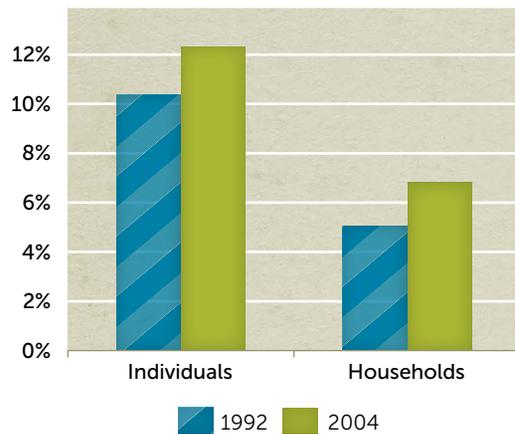
Source: [Gustman et al. \(2013\)](#).

	HRS cohort 1992	Early Boomers 2004
	<i>Percent in the labor force</i>	
All respondents:	73%	75%
Males:	83%	79%
Females:	64%	71%
	<i>Percent working full time</i>	
All respondents:	64%	66%
Males:	77%	74%
Females:	52%	58%
	<i>Social Security earnings *</i>	
All respondents:	\$30,215	\$42,429
Males:	\$45,949	\$55,458
Females:	\$16,001	\$26,896

* Converted to 2016 dollars

FIGURE 3-2 Fraction of total benefits re-distributed among deciles: 1992 and 2004

Source: *Gustman et al. (2013)*.



Others also consider the impact of changing work patterns of men and women on Social Security replacement rates. *Wu et al. (2013)* calculate the replacement rate as the Social Security benefit amount divided by the AIME, so changes that result in higher earnings will tend to lower the replacement rate. The replacement rate goes from 47% for the HRS cohort to 39% for Early Baby Boomers. One-third of this decline is accounted for by the increase in female labor force participation and the resulting increase in earnings between the cohorts. The decline is larger for women than for men, and especially for women who are currently married, divorced or widowed, compared to women who never married. Increasingly, married women are earning Social Security benefits through their own labor force participation, which tends to reduce their eligibility for spousal benefits.

One of the most important ways that households can maximize their Social Security benefit is to delay claiming benefits until their full retirement age rather than filing for benefits early at age 62. Even when income is the same between those who claim at 62 and those who claim at 65, average household income for those who delay claiming is higher at age 72 than for those who claim early (*Glickman and Hermes 2015*).

Gender Differences in Retirement Preparation

Women face very different economic circumstances in retirement than men. Single women and African American women appear to be especially vulnerable. Widowhood is one important risk but does not account for all of the discrepancy. Other factors may be at play, like household bargaining power and gender differences in financial savvy and risk-taking.

Women live much longer than men on average and tend to marry men who are older than them. As a result, most women live the last years of their lives as widows, many for as long as 15 to 20 years. Depending on how well the couple prepares, widowhood can put some women at risk of financial strain or even poverty. *Sevak et al. (2004)* show that of women who were not living in poverty when they were married in 1992, 10.8% were living in poverty by 1998. Women who were poor before their husbands died face an even greater challenge because their husbands die at younger ages than more affluent men. This leaves poorer women widowed at younger ages and for a longer time. Thus part of the association observed between widowhood and poverty is explained by persistent poverty.



Single women in general fare much worse than their married counterparts in terms of retirement finances.

Single women in general fare much worse than their married counterparts in terms of retirement finances. Yet important differences exist even among single women. *Lee and Rowley (2009)* compare financial portfolios of widowed, divorced, and never married women between the ages of 51 and 64 in 2004. Across all asset types, widowed women hold higher asset values than divorced and never married women. Divorced women have especially low levels of stock holding. Total net worth is highest for widowed women compared to divorced women and is lowest for never married women. Other studies confirm the risk associated with divorce for women. *Ulker (2009)* shows that, while divorce has negative consequences for wealth accumulation for both men and women, declines for women are more severe.

All three groups of women in the Lee and Rowley study hold relatively low proportions of their net worth in stocks, bonds, CDs/Tbills, IRAs and other investments. This can have a negative impact on wealth accumulation. Hogan and Perrucci (2007) find that women in poor health are least likely to hold adequate risk in their financial portfolios. Earning less than a high school degree is associated with a low-risk portfolio. Black women are 68% less likely to hold a well-balanced portfolio than White women. Other forces contribute to worse retirement prospects for Black women as well. Even after accounting for employment earnings and the decision to retire, Black women in the HRS receive the lowest level of retirement income.

If there were no gender difference in risk aversion, the wealth gap between men and women would diminish.

Some of the wealth differences between men and women at retirement may be the result of women's lower level of risk tolerance. Using questions in the HRS from 2006 about participants' willingness to gamble their money, Neelakantan and Chang (2010) show that lower willingness to



gamble — being more risk averse — is associated with lower wealth accumulation at retirement.

Women are indeed more risk averse than men, and there is a negative association between risk aversion and wealth. This association is most pronounced for the wealthiest households.

Interestingly, for households with very low wealth, being risk averse is actually positively associated with wealth. If there were no gender difference in risk aversion, the wealth gap between men and women would diminish. Women also tend to report lower levels of financial knowledge (Lusardi and Mitchell 2008), which may help explain their lower inclination to gamble with finances.

Babiarz et al. (2012) use couples data from 1992 through 2004 to study the effect of household bargaining power on wealth accumulation. In the HRS, couples in married or partnered households are asked to say who is the more financially knowledgeable. That person is designated as the financial respondent for the interview and answers all financial questions on behalf of the household. Sixty-seven percent of husbands or male partners are designated as the financial respondent. Participants are also asked who has the final say in financial decisions. Forty-four percent of households say they both have an equal say in major financial decisions, but 35% disagree about who has the final say. Sixteen percent agree

that husbands have the final say, but only 5% agree that the wife has the final say.

For the purposes of this study, being the financial respondent, having the final say in financial decisions, and having higher income together comprise an index of bargaining power. Spouses with bargaining power are less likely to experience declines in their living standard at widowhood.

Will the change from defined benefit to defined contribution pensions leave retirees less financially prepared?

The Changing Pension Landscape

The most striking feature of the pension landscape over the last 40 years is the ongoing shift from defined benefit (DB) to defined contribution (DC) plans. Traditional DB pensions depend primarily on employees' years of service and salary. On the other hand, DC plan benefits depend on how much employers and employees contribute to investment funds, how long the funds are invested, and how well they do. Will the change from DB to DC pensions leave retirees less financially prepared? Poterba et al. (2007) find that DC plans generate more wealth on average than private sector DB plans, but not more than public sector DB plans, which tend to have more generous plan provisions. A relatively small fraction of workers remain with firms long enough, often 30 years, to qualify for DB pensions, however.

Why Do We Save?

Concerns about retirement preparation are rooted in Americans' low saving rate. A common explanation is that people do not earn enough to both pay for their current expenses and save for retirement. Yet even accounting for different levels of income, there is a very wide distribution of household wealth in the original HRS cohort in 1992 (Venti and Wise 2001). A substantial proportion of high-income households have low wealth, and many low-income households have substantial savings. Sociodemographics appear to account for relatively little of the wide dispersion in retirement wealth. Instead, the choice to save and how much to save appears to be the strongest predictor of retirement wealth.

The choice to save and how much to save appears to be the strongest predictor of retirement wealth.

Clearly, the decision to save is important for retirement preparation, and understanding what motivates people to save for retirement and to conserve financial resources in retirement is an important goal. Researchers use the HRS to explore a wide range of factors such as the desire to save money in case of poor health and associated OOPM costs. Others study personal characteristics like conscientiousness that may influence saving. Another line of research suggests that financial literacy plays an important role in retirement savings. External incentives such as employer-based pension contribution matching can also be important in encouraging retirement savings.

Medical Costs

Many people recognize that if they live a long time, they may face potentially large medical costs. The risk of poor health and associated medical expenses appears to be a powerful driving force in precautionary saving. Multiple studies using the rich longitudinal information on health conditions, costs and retirement wealth in the HRS demonstrate that these fears are not unfounded. One line of research, using the AHEAD cohort, studies the impact of longevity on saving (De Nardi et al. 2012). HRS contains extensive information on net worth and the value of retirement income sources like Social Security, pensions and annuities. These are used to calculate permanent income, a measure of lifetime wealth. For 1993 and 1995, when AHEAD was a separate study focused on an older cohort, the survey contains information on OOPM expenses including insurance premiums, drug costs, doctor and dental visits, and any extra costs for hospital stays and outpatient care.

Medical costs rise very rapidly with age, and those with the highest income have very high OOPM expenses. OOPM costs rise from \$1,875 (in 2016 dollars) per year for the average 75-year-old to \$15,690 at age 95.

Many people recognize that if they live a long time, they may face potentially large medical costs.

However, a 95-year-old in the lowest range of permanent income pays only \$2,900 in medical expenses, and the top income individual pays \$26,945 per year. Those in the top income bracket appear to be very frugal, even at older ages, and the main reason is the desire to be able to pay for these potentially large medical costs. Those with low income and wealth are more likely to rely on government programs like Medicaid and Medicare. Interestingly, Levy (2007) finds that about 23% of the original HRS cohort experience a period of having no health insurance coverage in the six years leading up to age 65, the age of eligibility for Medicare. Fortunately, only 2% of this cohort experience an uninsured hospitalization during that period.

Another study looks at the unfolding impact over time of acute health events and chronic health conditions on the wealth of older adults (Lee and Kim 2008). The development of health conditions leads to wealth depletion. Despite being eligible for Medicare, some individuals appear

to self-insure by saving, and spending little, so that they have enough savings to pay for the medical care they want.

Similarly, Coile and Milligan (2009) show that health problems lead to significant changes in retirement portfolios over time. Ownership rates for principal residences, vehicles, financial



assets, businesses and real estate fall dramatically with age, while liquid assets rise with age. Beyond these changes associated with normal aging, negative changes in health often lead to selling the home, vehicles, businesses and real estate. The share of liquid assets increases with poor health. Widowhood has a similar effect on changes over time in the household wealth portfolio.

Negative changes in health often lead to selling the home, vehicles, businesses and real estate.

Hurd and Rohwedder (2010a) use longitudinal data from CAMS data to explore the impact of OOPM on retirement preparation. Some households report very large OOPM spending, which could serve as a powerful motivation to conserve wealth especially for those with higher socioeconomic status because they are much more likely to live to older ages. Overall, OOPM spending substantially reduces the economic preparation of some households, especially given that individuals can experience multiple health problems and events over time. Single female households are most affected since they tend to have lower amounts of wealth to pay for these expenses. Taking OOPM expenses into account increases the estimate of the number of people living in poverty. Butrica et al. (2010) compare the official poverty measure with alternatives that account for OOPM costs and find a larger share of older people living in poverty if OOPM expenses are included.

Yilmazer and Scharff (2013) examine individuals who are at higher risk of OOPM expenses.

They select a sample of HRS participants aged 51 to 61 and married (or living with a partner) from 1992 through at least 2002. In this younger sample, during the period of follow-up, they find no evidence that couples at risk of at least one member experiencing work-limiting health problems have lower wealth in the follow-up period. It may be that the impact of health on wealth is not apparent for less acute health events.



Financial Literacy and Planning

A common-sense assumption is that people who have more information about how to plan for retirement and actually do plan for retirement are likely to end up with more retirement savings. Yet it is unclear exactly what skills and information are required for good retirement planning. The HRS provides information on financial decision-making, sources of financial information, and general financial literacy. Three questions are used to assess financial literacy: one each on compound interest, effects of inflation, and risk diversification (see facing page). Lusardi and Mitchell (2011) find that half of respondents are able to give the correct response to the interest and inflation questions, and only one-third correctly answer the risk diversification question. About 30% of respondents report having developed a plan for retirement saving; of these, about two-thirds report being able to stick with the plan. People who report having a plan are also more likely to report using formal sources of information like financial experts or retirement calculators.

Early Baby Boomers are somewhat less likely than the original HRS cohort to report that they had thought about retirement, an indicator of retirement planning (Lusardi and Mitchell 2007). Their wealth is somewhat higher than the earlier cohort, but this is largely due to larger home equity values in 2004, prior to the Great Recession. Even accounting for demographic and other factors that may be associated with retirement planning, those with greater financial literacy are more likely to say they had thought about retirement and hold higher levels of wealth. Retirement planning may have other benefits

as well. Individuals who report in 1992 that they had discussed retirement with their spouses and had some type of tax-deferred retirement plan are more satisfied with life in 2004, even after accounting for health status, reason for retiring, and income (Noone et al. 2009).

The 2008 Financial Sophistication and Investment Decision-making module collects information about knowledge of capital markets, risk diversification, fees, financial savvy/numeracy, and attitudes toward investing and risk (Lusardi et al. 2013). The overall level of financial sophistication is found to be fairly low. However, knowledge of risk diversification is fairly high. Over 60% of HRS participants understand that it is better to invest in more rather than fewer stocks and mutual funds. More than 60% know that fees are important to consider when investing long-term in mutual funds. Nonetheless, only around 25% of respondents overall can be considered financially sophisticated.

Those with greater financial literacy are more likely to say they have thought about retirement and hold higher levels of wealth.

Concern may be especially warranted for some groups. Lusardi and Mitchell (2014) show that women report less understanding of the stock market than men and are less knowledgeable about risk diversification. It may be that some of this gender difference reflects higher risk aversion among women. Level of formal education is important as well. Knowledge of asset pricing is fairly low among those with less than a high-school education, but better for those with a college degree. Older people also demonstrate less financial sophistication. African American and Hispanic participants demonstrate lower levels of financial sophistication generally. Lack of financial literacy has serious implications for the amount of consumer debt. Accounting for differences in financial sophistication overall, those with little understanding of borrowing and financial debt have higher debt loads (Lusardi and Tufano 2015).

Measuring Financial Literacy

HRS attempts to measure basic financial concepts akin to the notions of the rudimentary ABCs for reading literacy. Three economic concepts that individuals should have some understanding of are measured: interest compounding, inflation, and risk diversification. The following three questions have become the benchmark by which a wide variety of analysts measure financial literacy:

Financial Literacy

- Suppose you have \$100 in a savings account and the interest rate is 2% per year. After five years, how much do you think you will have in the account if you left the money to grow: more than \$102, exactly \$102, or less than \$102?
- Imagine that the interest rate on your savings account is 1% per year and inflation is 2% per year. After one year, will you be able to buy more than, exactly the same as, or less than today with the money in this account?
- Is the following statement true or false? "Buying a single company stock usually provides a safer return than a stock mutual fund."

answers: more than \$102; less than; false



Highly conscientious participants earned an additional \$114,000 over their lifetimes and have more positive emotions and greater life satisfaction.

Personality

How much people save for retirement can also be influenced by their personality. Research suggests that the personality trait of conscientiousness is associated with a range of positive life outcomes. Is one of those outcomes saving for retirement? Conscientious individuals are organized, responsible, hardworking, thorough and careful. Taking into account gender, ethnicity, age, years of education, cognitive ability, and other personality traits, highly conscientious participants earned an additional \$114,000 (in 2016 dollars) over their lifetimes and have more positive emotions and greater life satisfaction (Duckworth et al. 2012). Husbands and wives who are both conscientious earn \$202,945 more. Interestingly, the personality traits of openness and agreeableness

are associated with slightly lower income and less wealth accumulation; agreeableness is also associated with lower life satisfaction.

A similar study finds that conscientiousness is also associated with retirement preparedness (Hurd et al. 2012). Conscientiousness has a large effect on the probability of being retirement ready, in the sense of having a 95% chance of not running out of savings before death. Conscientious households also appear to spend more cautiously during retirement, holding on to their retirement savings longer.

Employer Incentives

Employer-sponsored DC pension plans are typically voluntary: employees have the option to save a portion of their salary in 401(k)-type investments. However, many workers fail to take advantage of this opportunity to save for retirement. To encourage saving in these plans, many employers offer to match, at some level, the employee contribution. For example, a 100% match would mean that for every dollar the employee contributes to the plan, the employer will match with one dollar. Some employers cap the amount that can be matched and vary in the extent of matching from a 25% match up to 200%, although the latter is rare (Engelhardt

and Kumar 2007). Comparing HRS participants whose companies offer matching to those who do not shows that matching increases savings on average. Despite matching incentives, however, only 3% of HRS participants whose employers offer matching plans contribute up to the maximum allowed. Dushi and Honig (2015) find that people are not well-informed about their employer-provided DC plans including whether or not they are even participating, how much they may be contributing, and how much they have in their accounts.

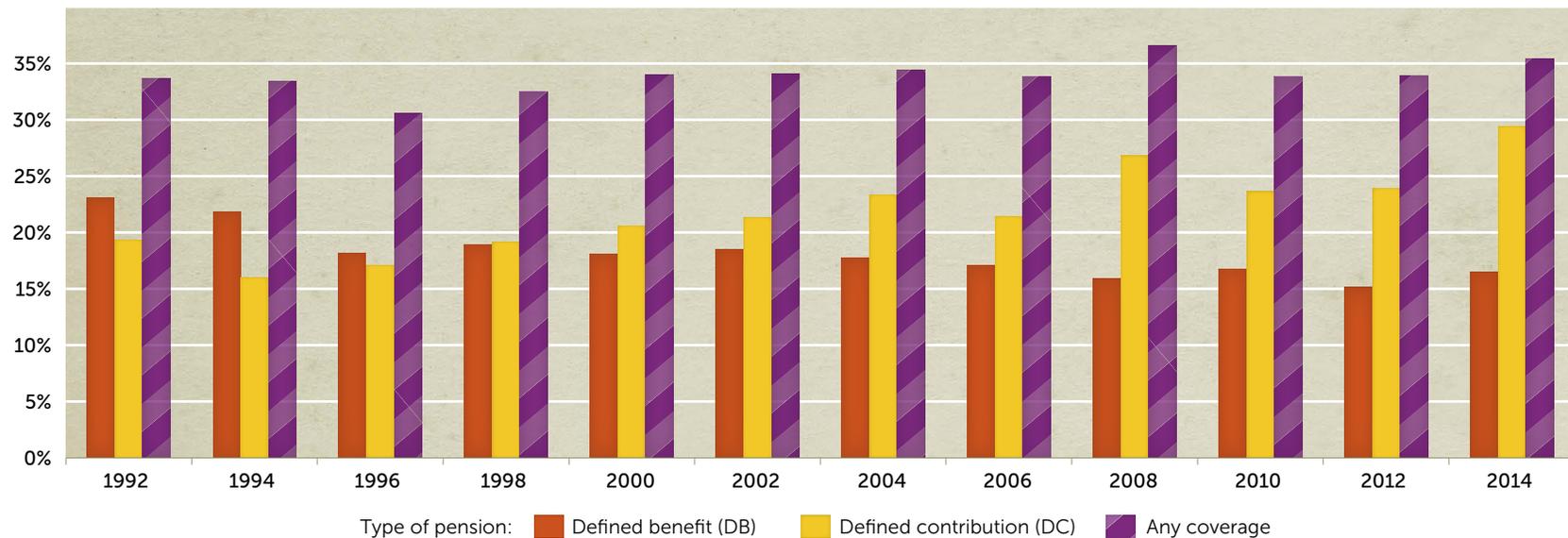
Other research shows that those with lower incomes are the least likely to participate in employer-provided retirement plans — not only because of low take-up rates but because they are also much less likely than higher-income individuals to work for firms that offer retirement pension plans (A. Wu et al. 2015).

Figure 3-3 demonstrates the shift from DB to DC pensions over the past 20 years. In 1992, 19% of HRS participants held DC pensions compared to 29% in 2014. DB pension coverage went from 23% to 17% over that same time.

The Retirement-Consumption Puzzle

The life-cycle theory of savings suggests that people save money during their working lives to be able to maintain the same living standard they had while working. However, early research

People are not well-informed about their employer-provided defined contribution plans including whether or not they are even participating, how much they may be contributing, and how much they have in their accounts.

FIGURE 3-3 Percent with DB or DC pension, and any pension coverage: 1992-2014 *Source: HRS 1992-2014.*

showed a drop in spending at retirement, even for those who retired when they planned, which was at odds with the theory and came to be known as the retirement-consumption puzzle. A potential concern for policy makers is that a steep drop in spending at retirement could reflect an underlying lack of economic preparation. In the past, research on this topic was hindered in part by a lack of quality longitudinal data on consumption expenditure and time use in retirement linked to relevant financial and health information.

The CAMS questionnaire asks about spending, how people spend their time in retirement, and how spending changes at the time of retirement (for those who are retired). For those who are not yet retired, it asks participants how they expect their spending to change when they retire.

Researchers use these data to shed light on the retirement-consumption puzzle to determine

whether or not a puzzle even exists. [Hurd and Rohwedder \(2004\)](#) examine actual changes in spending at retirement and to what extent these changes were anticipated. In the group not yet retired, about 69% say they expect to decrease spending with retirement, while 4% expect to increase spending. Fifty-two percent of retirees report that they reduced spending when they retired, while about 12% say they increased spending.

Using longitudinal data on spending, [Hurd and Rohwedder \(2005\)](#) follow the same people to see if the changes they anticipated were the changes that actually occurred. Of those who retired between waves, 59% anticipated a decline in spending, but only 46% recalled their spending declining after they retired. There is no evidence of unanticipated declines in spending at retirement and no change in spending at the median.

A potential concern for policy makers is that a steep drop in spending at retirement could reflect an underlying lack of economic preparation.

There are considerable increases and decreases in spending across some households, however ([Hurd and Rohwedder 2008](#)). Households with less retirement wealth are more likely to experience declines in spending at retirement and are also more likely to retire early because of poor health. In follow-up work that uses four waves of CAMS data (2001 to 2007), [Hurd and Rohwedder \(2013\)](#) confirm earlier findings of relatively small drops in spending at retirement on average, which could be accounted for by lower work-related expenses or from having more time to cook at home rather than eating out. However, those in the lowest

wealth quartile experience declines in spending that are substantially greater than expected.

Spending can decrease at retirement for other reasons. [Blau \(2008\)](#) finds that there is no mean change in spending at retirement, but some households experience a significant drop in spending at retirement. Unexpected events such as a layoff or health events that lead to early retirement can lead to lower lifetime resources and thus, a significant drop in spending.

Households with less retirement wealth are more likely to experience declines in spending at retirement and are also more likely to retire early because of poor health.

Where Does the Money Go?

CAMS collects longitudinal information on 32 categories of durable and non-durable spending, which can be aggregated into categories like health, leisure, transportation and so on. [Hurd and Rohwedder \(2010b\)](#) show that, as people age, they spend less on transportation, vacations and food, and more on health care, donations and gifts. Similarly, an EBRI report ([EBRI 2012](#)) shows that spending steadily decreases with age. The share of the budget spent on different categories changes as well. For example, home-related expenses represent 47% of the budget for people aged 50 to 64. These expenditures drop to 44% of the budget for people aged 65 to 74.

Transportation costs drop from 14% of the budget of 50- to 64-year-olds to only 8% for

those 85 and older. The same share is spent on food (about 12%) and clothing (about 3%) after retirement as before. Entertainment expenses account for about the same share of the budget before retirement and in early retirement, tapering off after age 86. One category rises dramatically: health costs account for about 9% of costs between ages 50 and 64, doubling to 18% after age 85. Comparing expenditures from 2001 to 2009 for each age group shows that housing and home-related costs remain the largest category of expense for all age groups in both periods. The other age-related patterns of change remain about the same as well.

Spending declines appear to level off fairly quickly after retirement. Household spending drops by 5.5% in the first two years after retirement, and by 12.5% in the third to fourth year of retirement. Spending declines slow after that. However, changes in spending are not all about declines: a large percentage of households actually increase their spending in retirement ([EBRI 2015b](#)).

Spending patterns at older ages also vary in important ways depending on whether an individual is single or part of a couple and depending on his or her level of economic resources ([Hurd and Rohwedder 2010b](#)). [Figures 3-4a-c](#) show income, wealth and total spending across nine age groups and whether individuals are part of a couple or not. As expected, income declines over time, and for nearly every age group couples have more than double the income of singles. Singles spend more of their wealth as they age to supplement their income. Despite the much greater economic resources of couples, [Figure 3-4c](#) shows that they spend much less

proportionally than singles. Some of this difference can be accounted for by the fact that two can share some living expenses. Couples spend twice as much on clothing as singles but much less than twice on housing and housing-related costs. The share of the household budget spent on transportation is lower for singles with low levels of economic resources; whereas couples even in the lowest wealth category do not reduce their spending on transportation.

Another study suggests that couples save on health care costs related to caregiving ([EBRI 2016b](#)). Looking at OOPM expenses over a two-year period for those aged 65 and older, the average spending per person on doctor visits, dentist visits, and prescription drugs is about \$2,500 (in 2016 dollars) for both single and couple households. But couples spend less on in-home health care and nursing-home expenses than singles.

As people age, they spend less on transportation, vacations and food, and more on health care, donations and gifts.

[DeLeire and Kalil \(2010\)](#) study the association between various components of consumption expenditure and happiness in CAMS. Only one type of expenditure is positively related to happiness: entertainment. The boost in happiness associated with leisure spending comes, in part, from the increase in social connections that are often a part of leisure activities.

FIGURE 3-4a Total income of single and coupled households by age: 2003

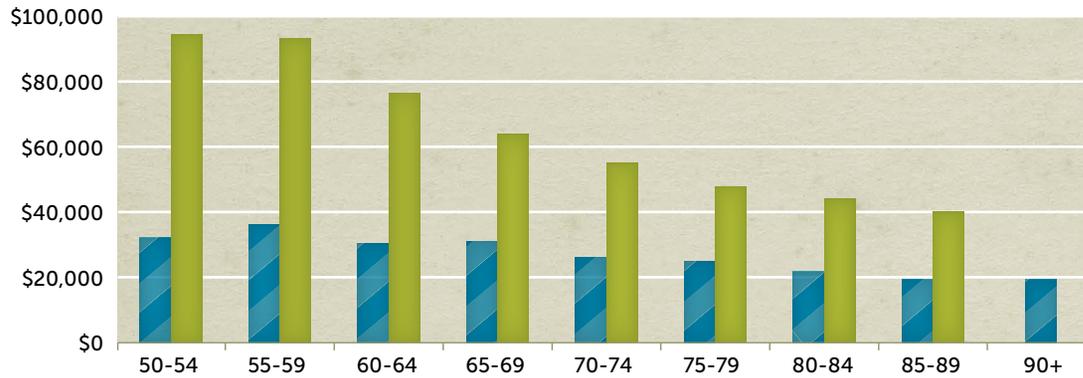


FIGURE 3-4b Total wealth of single and coupled households by age: 2003

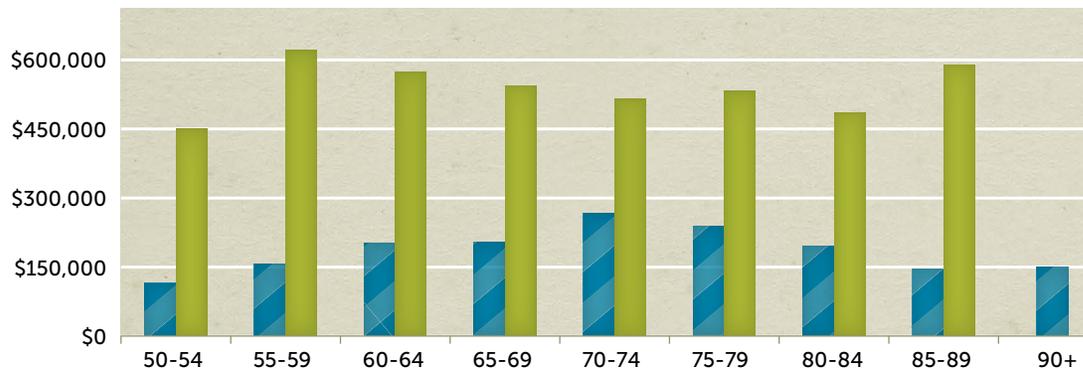
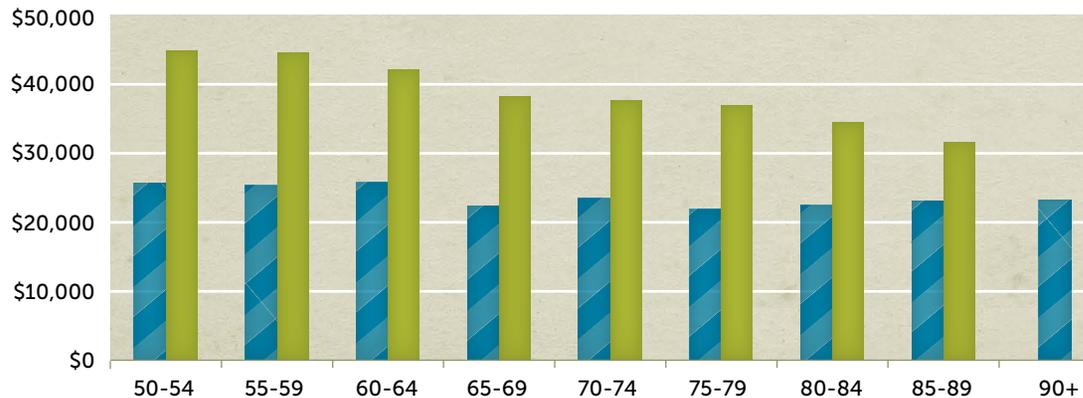


FIGURE 3-4c Total spending by single and coupled households by age: 2003



Source: Hurd and Rohwedder (2010b).

■ Singles ■ Couples

Making Money Last

Households have a number of options to help maintain their standard of living in retirement. Products like reverse mortgages and home equity loans allow them to access wealth held in housing equity, and long-term care insurance (LTCI) can help prevent large OOPM expenses. Those who expect to be very long-lived face a greater risk of running out of money before they die, and private annuity products allow them to convert some or all of their wealth into a guaranteed income stream for life. Yet none of these financial products is particularly popular. HRS research shows that the strategy of holding onto assets as a form of self-insurance can make sense for some groups. Other research provides insights into the conditions under which households can expect to benefit from these financial products.

Housing equity is a large part of the retirement wealth of Americans.

Housing equity is a large part of the retirement wealth of Americans that is often liquidated when homeowners experience health problems at older ages or need long-term care. Davidoff (2009) explores the relative benefits of annuitization and LTCI for those with more rather than less home equity. For both single and married households over age 62 at the median, nearly 40% of portfolio wealth is home equity. For nearly half of homeowners, home equity is twice as large as non-housing assets. As one indication of the low

use of reverse mortgages, the mean ratio of home equity to home value is 0.90 overall. Housing wealth only appears to grow more illiquid with age: the home equity to value ratio grows from 0.84 for those aged 60 to 70 in 2004 to 0.96 for the oldest old.

For homeowners with a high level of illiquid home equity who are likely to use that equity only when absolutely needed to pay for OOPM costs and the transition to long-term care, the benefits of annuitization and LTCI are minimal since home equity serves as a reasonable substitute, especially for risk-averse households. [Coronado et al. \(2007\)](#) evaluate differences in the value of housing as a share of the retirement portfolio across two cohorts, the original HRS participants and the Early Baby Boomers. Boomers have more valuable homes but are more likely to have borrowed against that value than earlier cohorts. Nonetheless, they have similar home equity as the earlier cohort. They are more likely, however, to consider home equity as a financial asset for spending in retirement.

Boomers have more valuable homes but are more likely to have borrowed against that value than earlier cohorts.

In the 2002 wave of the HRS, the health insurance section asked participants, “Not including government programs, do you now have any LTCI that specifically covers nursing

home care for a year or more, or any part of personal or medical care in your home?” [Li and Jensen \(2012\)](#) use longitudinal information on this question and other information on health insurance in the HRS from 2002 to 2008 to study the prevalence of LTCI usage, why and how often individuals let LTCI policies lapse, and the welfare implications of lapsing. Those holding LTCI have higher education and income compared to the general US population.

However, those who let their policies lapse are more likely than those who retain their policies to be non-White and living without a spouse, with lower education and income, and in worse health. OOPM expenses are higher among lapsers than non-lapsers. The policies themselves that are more likely to be dropped are less comprehensive. Interestingly, those with lapsed policies are more likely to answer “unknown” or “uncertain” to questions about their policy. Taken together, these findings suggest that some households lack full information about LTCI policies and may experience a kind of buyer’s remorse.

Some retirement pensions can be paid to pensioners as a lump-sum. Others, such as annuities, are paid out regularly in fixed amounts for life. Some firms only provide mandatory annuitization. It is well-known that wealthier individuals live longer than poorer ones. In general, this means that mandatory annuitization can end up shifting resources from those who die at younger ages, who will be poorer, to those who are longer-lived and richer ([Gong and Webb 2008](#)).

Those holding long-term care insurance have higher education and income compared to the general US population

Compared to no annuitization, though, most individuals will benefit from some level of annuitization. They calculate the value each household would place on annuitization based on how long the husband and wife expect to live, the household’s degree of risk aversion, and amount of annuitized wealth. Nearly 17% of households would not receive any benefit from mandatory annuitization. This percentage is even higher for those with low socioeconomic status.



CROSS-NATIONAL HEALTH DISPARITIES AND US DISADVANTAGE



CHAPTER 4 | CROSS-NATIONAL HEALTH DISPARITIES AND US DISADVANTAGE

Despite having the highest level of health care spending in the world — nearly \$9,000 per capita annually — the US ranks among the lowest of high-income nations for life expectancy (OECD 2014). Other health indicators besides longevity show a similar pattern (Crimmins, Preston and Cohen 2011). For example, research examining the health of the US and English populations shows that Americans in middle age at every socioeconomic level are much less healthy than their English counterparts (Banks et al. 2006). Using the HRS sister studies — which are designed to facilitate direct comparisons of health, wealth, and well-being across countries — researchers are beginning to elucidate reasons for these discrepancies. While other national and international data sources provide more depth on health, the HRS and the network of harmonized aging studies around the world provide rich longitudinal measurement across several topic areas including income and wealth; health, cognition, and use of health care services; work and retirement; and family connections.



This combination of data resources provides the foundation for research that may help explain cross-national variation in health outcomes such as disease prevalence and incidence, physical limitations and disability, and mortality. Information on health behaviors and socioeconomic indicators may also yield insights about the nature of US disadvantage. Life expectancy in the US varies widely depending on things like education, income, race and residential characteristics. Improving the outlook

will certainly involve further improvements to behavioral factors like diet, smoking and physical activity. Yet health is also powerfully determined by social and environmental conditions.

The association between socioeconomic status (SES) and health — poorer people are less healthy and die at younger ages than richer people — is nearly universal. Understanding more about the SES-health gradient in the US may shed light on the cause of the nation's global disadvantage in health. HRS research

on economic disadvantage, neighborhood quality, and childhood health reveals important directions for future policy research. As more data become available from other HRS sister studies, the opportunities will grow, especially to compare developed and developing countries with similar challenges (Weir et al. 2014).

Going Global

The HRS Family of Studies

Because of its innovation and importance, HRS has become the model for a network of harmonized longitudinal aging studies around the world. Studies that have adapted the HRS model use the same basic study design and measures that are either the same or similar enough to be equivalent across data sets. The availability of comparable cross-national data presents opportunities for new research.

The HRS global enterprise includes a growing number of sister studies (see list to right). Some are only just beginning; others now have several waves of data collection such as the Chinese Health and Retirement Longitudinal Study (CHARLS) (Zhao et al. 2014). Studies included in this chapter include the Mexican Health and Aging Study (MHAS), English Longitudinal Study of Ageing (ELSA) (Stephens et al. 2013), the Irish Longitudinal Study on Ageing (TILDA) (Kearney et al. 2011), and the Survey of Health, Ageing and Retirement in Europe (SHARE).



HRS Sister Studies

ELSA	English Longitudinal Study of Ageing
SHARE	Survey of Health, Ageing and Retirement in Europe (Austria, Belgium, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Luxemborg, Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, and Switzerland)
JSTAR	Japanese Study of Aging and Retirement
TILDA	The Irish Longitudinal Study on Ageing
MHAS	Mexican Health and Aging Study
HAGIS	Healthy Ageing in Scotland
KLoSA	Korean Longitudinal Study of Ageing
CHARLS	Chinese Health and Retirement Longitudinal Study
ELSI-BRASIL	Brazilian Longitudinal Study of Aging
LASI	Longitudinal Aging Study in India
IFLS	Indonesian Family Life Survey
HART	Study on Health, Aging, and Retirement in Thailand
NICOLA	Northern Ireland Cohort Longitudinal Study of Ageing
CLSA	Canadian Longitudinal Study on Aging
HAALSI	Health and Aging in Africa
CRELES	Costa Rican Longevity and Healthy Aging Studies
SAGE	WHO Study on Global Aging and Adult Health

Differences in Disease Rates and Mortality

It is not surprising that developing countries have worse health outcomes than developed nations. Striking differences exist, however, in the health status of developed countries. Researchers are beginning to use the rich data available in the network of HRS sister studies to understand more about these differences.

One of the first published cross-national comparisons of health status using HRS sister-study data finds prominent differences between the US and England (Banks et al. 2006). This study uses 2002 data from ELSA and HRS to compare the prevalence of diabetes, hypertension, heart disease, myocardial infarction, stroke, lung disease and cancer among 55- to 64-year-olds. Because of well-documented racial health disparities in the US, the analysis is limited to non-Hispanic whites. Despite much greater per-capita annual spending on health care in the US, \$7,014 (in 2016 dollars) versus \$2,878 in England, Americans aged 54 to 64 are much less healthy than English of the same age. SES is indicated by education and income. The health-SES gradient exists in both countries for all diseases except cancer. However, the US health disadvantage is present at every level of SES.

Extending the comparison to Europe by using 2004 data from SHARE (along with 2004 data from ELSA and HRS) and expanding the ages covered from 50 to 74, Avendano et al. (2009) identify a strong US health disadvantage in comparison to western Europeans as well. As in Banks et al. (2006), the analysis is limited to non-Hispanic whites. In 2004, SHARE included Sweden,

Denmark, Germany, the Netherlands, France, Switzerland, Austria, Italy, Spain and Greece. Rates of heart disease, stroke, hypertension, diabetes, cancer, lung disease and disability are highest in the US, lower in the UK, and in some cases substantially lower in Western Europe. For example, the prevalence of hypertension is about 45% in the US, compared to about 40% in England and 30% in Western Europe (Figure 4-1). Health disparities by wealth are significantly smaller in Europe than in the US and England. Some of the difference could be explained by lower disease incidence in Europe and longer survival with disease in the US, which combine to create higher prevalence. But even wealthier Americans are worse off and have health that is comparable to poorer Europeans.

Crimmins, Garcia and Kim (2010) report similar findings on the prevalence of diabetes, stroke and heart disease in the 2004 waves of SHARE, ELSA and HRS. Nearly 11% of American men over age 50 and almost 9% of American women report having more than one of these conditions. Europeans and the English, by contrast, are far less likely to report more than one condition. Across all countries studied, women experience more arthritis, depressive symptoms and hypertension, whereas self-reported heart disease is higher for men. There are no consistent differences between men and women in prevalence of stroke and diabetes. Women's self-reported health is worse than men's across nations, but

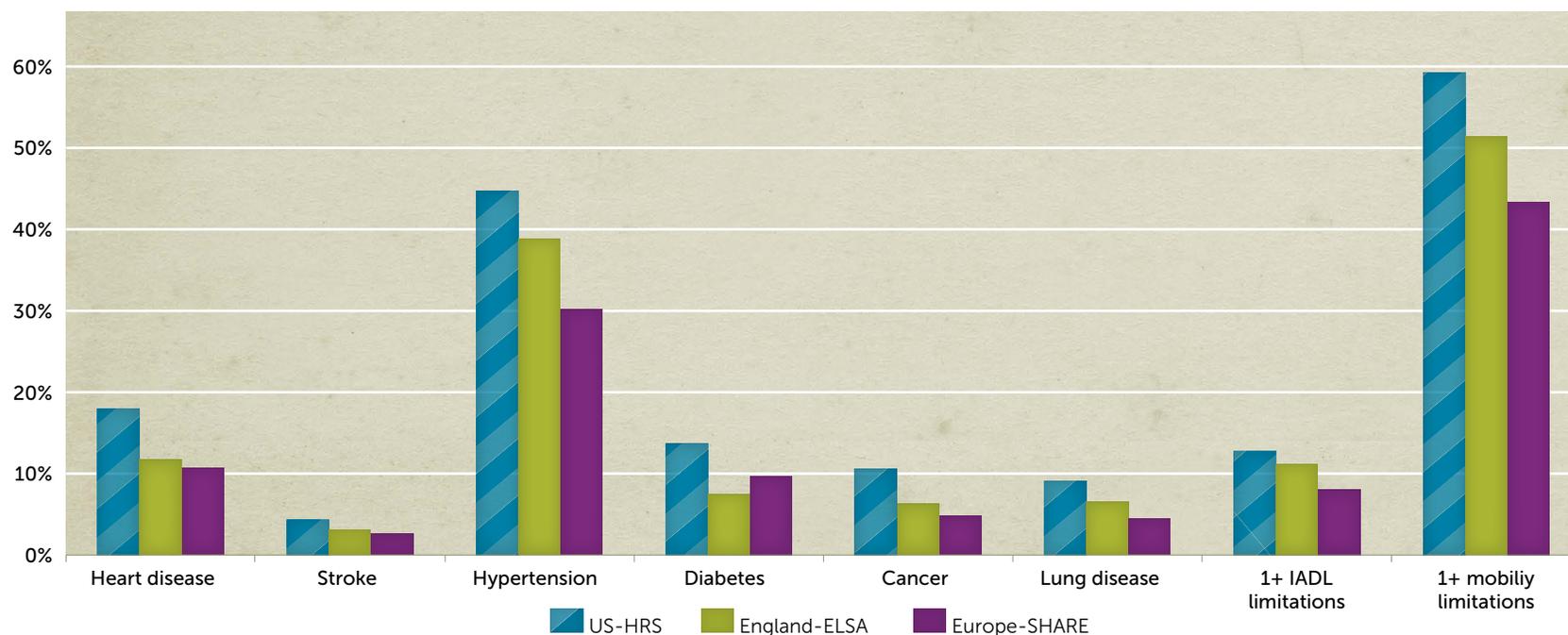
accounting for gender differences such as physical functioning, disability, and disease reduces the difference.

In 2010, the first wave of TILDA launched. The health of 57- to 64-year-olds in Ireland is closer to that of the English than the Americans (Savva et al. 2013). Health inequalities across educational levels are present in all three countries but are strongest in the US. Despite these differences, Americans are less likely to report having fair or poor health than their counterparts in England or Ireland. Part of the observed cross-national differences in health could be accounted for by differences in rates of disease diagnosis. Rates of undiagnosed hypertension are higher in Ireland compared to the US (Mosca and Kenny 2014).

In follow-up work to their earlier study, Banks et al. (2010) again compare data from ELSA and HRS using information from 2002 to 2006 to determine the rate of new illness and mortality. For both younger (55 to 64) and older (70 to 80) individuals, Americans have a



FIGURE 4-1 Prevalence of chronic disease and disability among those aged 50-74 in the US, England and Europe: 2004

Source: *Avendano et al. (2009)*.

higher prevalence of disease compared to the English, but also a higher risk of new disease incidence. The incidence rates of disease are closer in the two countries in the older age group. Comparison of mortality, on the other hand, tells a somewhat different story. Age-specific mortality is only slightly higher in the US in the younger age group, and is actually lower in the older age group. This may suggest that investments in health care at older ages in the US helps offset earlier life health problems. Another line of HRS research shows that health care utilization increases after age 65 when Americans become eligible for Medicare

(*McWilliams et al. 2007*), which may help account for smaller cross-national differences in health at older ages.

Work and marital status, as well as obesity, exercise and smoking explain income gradients for the younger groups in the US and the UK, and to a large extent in the 70- to 80-year-old Americans. For both birth cohorts and in both countries, many individuals who smoked in the past are able to stop. Yet relative to those with higher income and wealth, individuals with lower income and wealth appear to have a harder time quitting. The absence of an SES gradient for the older cohort relates to the English system of

income benefits, which raises the income floor for poorer households. Interestingly, a recent study using ELSA and HRS shows that the English health advantage is reduced significantly when data includes information about physical functioning (*Cieza et al. 2015*).

Age-specific mortality is only slightly higher in the US in the younger age group, and is actually lower in the older age group.

Sole-Auro et al. (2015) use HRS and SHARE data from 2004 and 2006 for participants aged 50 to 79 to study age-specific differences in prevalence and incidence of heart disease, stroke, lung disease, diabetes, hypertension, and cancer, and mortality associated with each disease. Americans have higher disease prevalence across all diseases. Incidence of lung disease is higher in Europe, though, and there is no difference in the incidence of hypertension and stroke between Europe and the US. Incidence of heart disease, diabetes and cancer incidence is higher in the US. They suggest that the basis of higher disease prevalence at older ages in the US is higher prevalence of disease at younger ages and, for some conditions, higher incidence over age 50. Among those who have a disease, however, they find no mortality difference between Europe and the US.

Physical limitations are most severe for those with lower levels of wealth across the US, England and European countries, but these differences are larger in the US and England, especially at younger ages.

Another study tracks changes in life expectancy between the US and Europe using information from SHARE and HRS (Michaud et al. 2011). Prior to 1975, the US held the advantage in life expectancy at age 50 compared to Western Europeans. But by 2005, American

life expectancy had fallen behind that of most Western European countries. This longevity gap is explained by declines in the health of Americans over age 50 relative to Western Europeans at similar ages.

Differences in Physical Functioning

Studies also compare countries in the HRS family across a range of measures of physical functioning, disability and limitations. As with health conditions, the pattern of gender differences in physical functioning and disability are similar across countries (Crimmins, Kim and Sole-Auro 2010). One set of measures assesses difficulty performing at least one of 10 tasks related to mobility, strength and endurance. Another set of questions assesses activities of daily living (ADLs), which indicate difficulty performing self-care tasks. Instrumental activities of daily living (IADLs) assess the ability to live independently.

Women are more likely than men to have functioning problems related to mobility, strength and endurance, and to have IADL difficulties. Gender differences for ADLs are not as consistent across countries. As noted, women also report more arthritis, which may help explain the gender difference in physical limitations. The higher rate of physical difficulties also appears to explain women's poorer self-reported health. Men are significantly more likely than women to smoke, and to be overweight and obese across countries. Accounting for this difference does not eliminate the gender difference in physical functioning and disability.

Wahrendorf et al. (2013) use data from the 2006 HRS, ELSA and SHARE to study differences in mobility limitations and limitations in IADLs

in a wide age range from 50 to 85 years old. Two new studies were added to SHARE in 2006: Czech Republic and Poland. Because of important differences within SHARE, they group the European countries into North/West (Sweden, Denmark, Germany, Austria, Netherlands, Belgium, France and Switzerland), South (Italy, Spain and Greece), and East (Poland and Czech Republic). The highest disability rate is in the US, with the next highest in Eastern Europe, followed by England and Southern Europe. Northern and Western Europe have the lowest levels of disability overall.

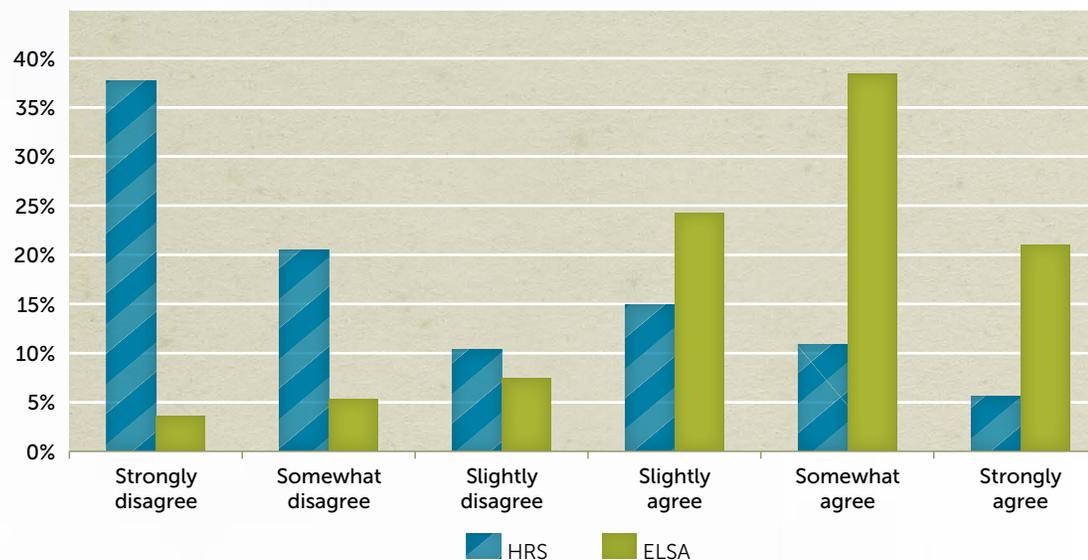
The analyses account for cross-country difference in relevant risk factors like hypertension, diabetes, obesity, smoking and physical inactivity. The prevalence of disability increases with age, but increases most sharply in Eastern and Southern Europe. The prevalence of disabilities at older ages is higher in these regions than in the US. Physical limitations are most severe for those with lower levels of wealth across the US, England and European countries, but these differences are larger in the US and England, especially at younger ages.

A sense of personal control may buffer the impact of disability. Clarke and Smith (2011) compare the impact of this outlook on physical functioning in older American and English adults. US adults over age 50 have higher levels of disability than their counterparts in England. As shown in Figure 4-2, however, Americans report a very high sense of personal control, whereas older adults in England are much more likely to agree that events in life are not always under their control. Accounting for other risks, disability is much lower for Americans with a high sense of control.

FIGURE 4-2 Control beliefs in the US and England, age 65 and over: 2006

Source: Clarke and Smith (2011).

How much respondents agree or disagree with several statements* indicating a feeling of helplessness



* I often feel helpless in dealing with the problems of life; Other people determine most of what I can and cannot do; What happens in my life is often beyond my control; I have little control over the things that happen to me; There is really no way I can solve the problems I have.

Higher educational levels in the US might help; education is associated with having a sense of control over the things that happen in life. Mitchell et al. (2016) show that those with less than a high school education are more likely than those with a high school education or higher to experience decreased sense of mastery, and greater perceived constraints and hopelessness over a four-year period.

How and where people living with physical limitations receive the help they need as they age is likely to vary across countries with different cultures and welfare systems. The percent of people over age 50 with functional limitations receiving care is slightly lower in Spain — 15.3% compared to about 17% in the US and England — but more care comes from outside the household in the US and England than in Spain (Sole-Auro et al. 2015).



The Role of Lifestyle and Health Behaviors

Lifestyle and health behavior risk factors — such as smoking, physical inactivity and obesity — have a large impact on health and disability in old age. Both the prevalence of these factors and their impact vary across developed countries with the prevalence of obesity and inactivity generally higher in the US and England compared to Europe. A number of studies explore these differences as a possible mechanism to explain cross-national differences in health and mortality. Another set of studies examines differences in behavioral risks in Mexico and the US.

Steptoe and Wikman (2010) use comparable data from the second wave of ELSA in 2004, wave two of SHARE (2004-2007), and the seventh wave of HRS in 2004 on the frequency, duration and

intensity of physical activity. Vigorous activity includes things like cycling, digging, running, jogging or swimming. Examples of moderate activities are dancing, gardening or walking. Light activity includes home repairs and laundry. Figure 4-3 shows the proportion of adults over age 50 who report doing moderate or vigorous physical activity at least once a week, ranging from a low of 56% in Poland to a high of 83% in Sweden. The prevalence of weekly moderate to vigorous activity in the US is 69% and nearly 75% in England. Americans report the highest levels of inactivity at 22%. Physical inactivity is associated with self-reported poor health and diabetes.

Obesity is another important risk factor for disease that varies across countries (Michaud et al. 2007). Figure 4-4 shows the obesity rate — indicated by a body mass index,

or BMI, greater than or equal to 30 — for the US, Austria, Germany, Sweden, The Netherlands, Spain, Italy, France, Denmark and Greece. The US obesity rate of 30% for men and 36% for women is almost 10% higher than the next highest country, Spain. The overall obesity rate for the European countries is 17.6% for men and 24.2% for women. The study also considers rates of severe obesity, indicated by a BMI greater than 35. The difference between the US and these European countries is even greater at the higher end with 9.2% of American men severely obese (16.5% of women), but only 3.3% for men (6.7% for women) in Europe as a whole. Waist circumference at all levels of BMI is higher in the US compared to the UK, accounting for a large degree of the cross-country differences in diabetes risk (Banks et al. 2012).

FIGURE 4-3 Percent reporting moderate or vigorous activity in the last week and percent reporting inactivity in Europe and the US: 2004

Source: Steptoe and Wikman (2010).

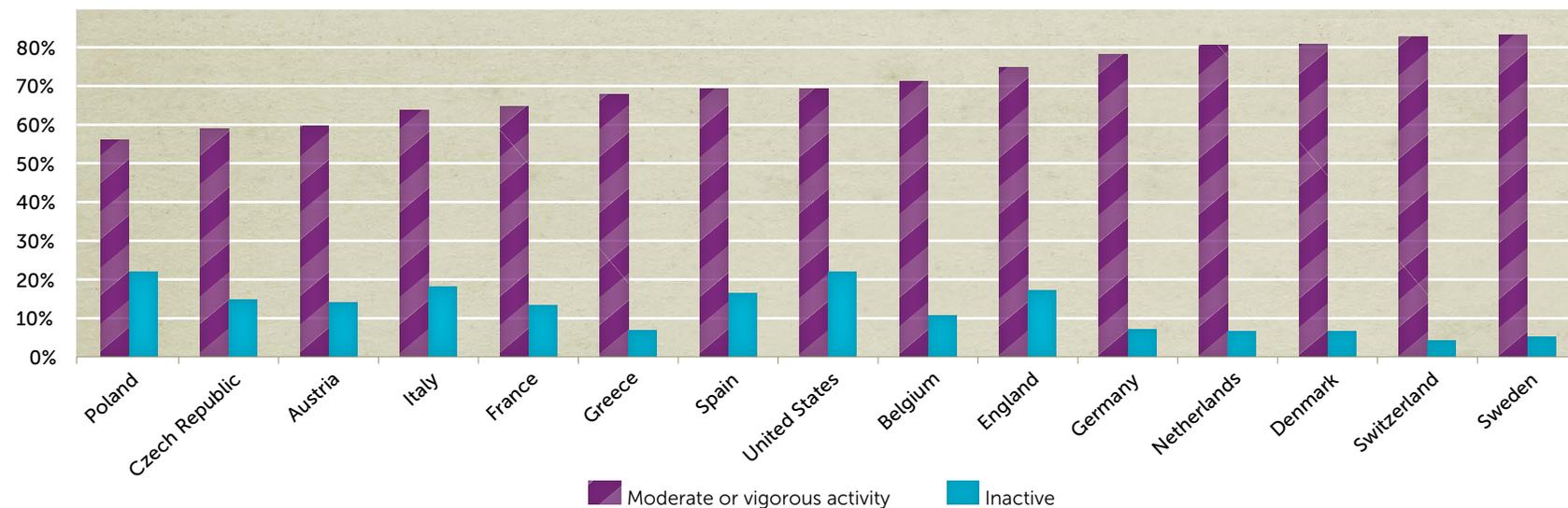
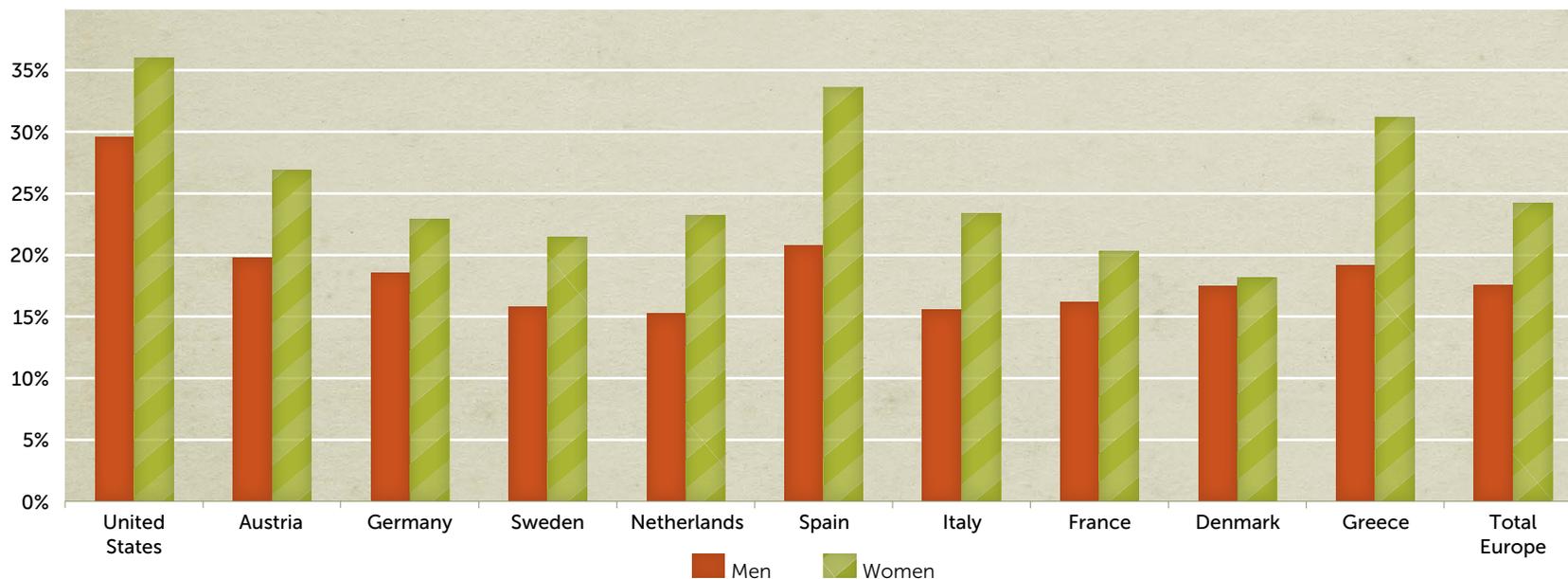


FIGURE 4-4 Percent obese in the US and Europe: 2004

Source: *Michaud et al. (2007)*.

Lack of physical activity, caloric intake, time spent on cooking, and time and money spent on eating at home and away from home are all associated with obesity, but not consistently so across countries. For example, men from Spain and Italy have the highest levels of physical inactivity but lower levels of obesity than American men who are slightly more active. Whereas physical activity is strongly correlated with obesity in the US, it is only weakly associated with obesity in southern European countries. Eating out is also much more prevalent in the US and associated with obesity; in Europe, there is no clear association between eating out and obesity rates. A strong association between SES and obesity appears across all countries with

lower SES linked to higher weight. Yet accounting for the differences in physical activity and other behavioral risks in this study, the gradient between SES and obesity is not eliminated.

Moderate alcohol use is shown to have health benefits, but the amount of alcohol use considered harmful depends on age. Ten percent of US men, 28.6% of English men, 2.9% of US women, and 10.3% of English women drink more than the US National Institute on Alcohol Abuse and Alcoholism recommended limit for people aged 65 and older (*Lang et al. 2007*). However, physical functioning and mortality outcomes in older people with alcohol intakes above US recommended levels for the old (but within recommendations for younger adults) are not poor in either country.

Inclusion of health behavior risks — smoking, obesity, low physical activity levels, and alcohol consumption — explains part but not all of the cross-national health disparities, according to *Banks et al. (2006)*, *Avendano et al. (2009)*, and *Crimmins, Garcia and Kim (2010)*. Moreover, these risks are also socially and economically patterned, and research using HRS and sister studies investigates the possibility that they can help explain some of the SES-health gradient. Yet after accounting for health behaviors, poorer Americans remain at significantly greater risk for disease than their English or European counterparts. Higher wealth Americans report similar health to much poorer Europeans (*Avendano et al. 2009*).

An important aspect of health behaviors is that different countries are at different stages of adopting health habits. For example, current elderly cohorts in the US are more likely to have ever smoked than European cohorts. In 2004, Europeans were more likely to be current smokers than Americans, but the percentage of former smokers is significantly higher in the US than in Europe (Michaud et al. 2011).

Comparative data in Mexico have also allowed researchers to compare the impact of the transitioning health risks in relatively low- and high-income countries. Monteverde et al. (2010) assess the magnitude of excess mortality due to obesity and overweight in Mexico and the US using two waves of HRS and MHAS. In both countries, excess body weight is a significant risk factor for death among those aged 60 and older, but the mortality risk associated with obesity is much larger in Mexico than in the US. Despite the fact that Americans with higher BMI have a higher prevalence of chronic diseases than their Mexican counterparts, mortality associated with these diseases is higher in Mexico. Part of this disparity could be due to better treatment of disease in the US.

The US may be further along in a transition from less to more healthy lifestyles associated with social and economic development. Transitions in smoking and physical activity are moving toward healthier lifestyles among older adults in the US, but not in Mexico (Wong et al. 2008). The percentage of men currently

smoking in Mexico in 2001 is 27%, but only 15.6% in the US. The percent of former smokers in Mexico is 64% and 72% in the US. In Mexico, those with more schooling are more likely to smoke whereas schooling is negatively associated with smoking in the US. A trend toward reduced levels of obesity appears to have begun in the US, but not in Mexico. Despite this, there appears to be a higher level of onset and development of disability over a two-year period in the US (Gerst-Emerson et al. 2015).

Other research uses these data resources to investigate the well-documented paradox of better-than-expected health among Hispanics in the US despite lower SES on average than non-Hispanic whites. Aguila et al. (2013) explores the possibility that Mexicans in the US return to Mexico due to poor health as an explanation for the health paradox. They compare the health of Mexicans living in the US and Mexico from the 2003 wave of MHAS and the 2004 HRS. The evidence is mixed across health outcomes and does not provide a ready explanation for the Hispanic health paradox.



Differences in Cognitive Functioning

In contrast to the finding that physical health is worse in the US than in England, Americans appear to have better cognitive functioning than their English counterparts (Langa et al. 2009). Americans score significantly higher on delayed recall and somewhat higher on the measure of immediate recall. Comparing cognitive function of those aged 65 to 74 years to the oldest group (85 and older), the cross-country differences are especially large for the oldest old — comparable to about 10 years of aging. This is surprising given that US adults have a significantly higher prevalence of cardiovascular disease and risk factors like hypertension which are significant risks for cognitive decline. Part of the explanation for these differences may be higher levels of education and wealth in the US compared to England. Americans are also more likely than the English to be taking medications for hypertension, which can lower risk of stroke and may help cognitive function.

A similar comparative study uses more recent data from the 2010 wave of HRS and ELSA, and includes information from the first wave of TILDA

Americans are also more likely than the English to be taking medications for hypertension, which can lower risk of stroke and may help cognitive function.

(Savva et al. 2013). The same measure of immediate recall used in Langa et al. (2009) is used, but a new measure of verbal fluency added to the surveys later is also used. This task asks participants to name as many items from a particular category as possible in 60 seconds. They also use a measure of self-reported assessment of memory as excellent, very good, good, fair or poor. In contrast to Langa et al. (2009), they find no significant difference on the measure of immediate recall, and those in England and Ireland score better than Americans on the measure of verbal fluency. The English are the most likely to report fair or poor memory, however. Unlike findings from other studies of educational inequality in physical health, the difference in cognitive scores across educational levels is larger in England and Ireland than in the US.

Treated prevalence is higher in the US for all conditions.

Detecting and Treating More Disease

Disease prevalence results from a combination of incidence (new disease) and duration of disease. Better treatment of chronic diseases can mean that people with these diseases live longer. Some evidence suggests that the treatment rates for these conditions may be higher in the US. This may translate to a survival advantage, especially at older ages, and could help explain the higher prevalence of chronic disease in the US.

Americans are more likely than Europeans and the English to report that a doctor told them they had hypertension and high blood cholesterol levels (Crimmins, Garcia and Kim 2010). Yet, when objectively measured hypertension and high blood cholesterol are considered, Americans have among the lowest levels of these conditions across all countries studied. It may be that Americans are more likely to be taking drugs to control hypertension and high cholesterol.

Other research using HRS sister-study data confirms that treatment rates are relatively high in the US. Thorpe et al. (2007) use data from HRS and SHARE to examine differences in disease prevalence and treatment rates for heart disease, high blood pressure, stroke, diabetes, chronic lung disease and arthritis. They calculate treated prevalence by multiplying the prevalence of the condition by the prevalence of medication use; treated prevalence is higher in the US for all conditions.

In the US, the expansion of coverage for prescription drugs with Medicare Part D means that control of blood pressure may improve further. Diebold (2016) finds that not taking medications because of cost decreased by 7% in those newly covered by Part D. This translated into a 4% decline in the likelihood of being diagnosed with high blood pressure.

Another study uses these data to evaluate cross-national differences in cancer screening rates (Howard et al. 2009). More aggressive screening could lead to a higher rate of disease detection and earlier detection, both of which could contribute to higher disease prevalence at a given point in time. Medical practice guidelines



between the US and Europe are very different, especially in screening recommendations for older individuals. Most European cancer screening programs have firm upper age limits (usually between ages 60 and 70), whereas US guidelines only suggest less screening at older ages. Indeed, Americans over age 50 receive more cancer screening overall compared to their European counterparts. This is true at younger as well as older ages. For example, mammography screening rates are 77% for 50- to 64-year-old women in the US, while only 46% in Europeans of the same age. The prevalence of mammography is 13% for Europeans over age 76, but is 58.5% for older Americans.

Americans over age 50 receive more cancer screening overall compared to their European counterparts.

Investigating the Source of US Disadvantage

While socioeconomic health inequalities are present in all countries, they are more pronounced in the US. Many of the studies in this chapter examine the association between SES and health and seek to explain the generally sharper gradient in the US. Overall, most studies confirm greater SES disparities in health conditions in the US compared to other countries. Even though the gradient is also present for mortality, the difference between countries is smaller. There are clear differences across countries in behavioral health risks like smoking and obesity, but they do not explain the US health disadvantage and also do not explain the fact that health disparities are greater in the US compared to other countries. The answers may lie elsewhere in the broader social and economic context of each nation. Several lines of research using HRS data seek to understand more about socioeconomic differentials in health in the US.

There are clear differences across countries in behavioral health risks like smoking and obesity, but they do not explain the US health disadvantage and also do not explain the fact that health disparities are greater in the US compared to other countries.

Understanding Health Disparity in the US

What does it mean to be poor in the US? What impact does it have on health? HRS is well-designed to address these important questions. Numerous studies using HRS data document the SES health gradient and try to disentangle the ways in which disadvantage can lead to poor health outcomes. Other studies consider the impact of neighborhood environment on health. Another line of research finds that the roots of health disparities at older ages may begin in childhood.

Disease and Disadvantage

Income and education are commonly used indicators of SES. Personal wealth may be an equally important resource for older people. Income, education and wealth are all independent risk factors for stroke in men and women aged 50 to 64 (Avendano and Glymour 2008). These results account for the negative effects of other known risk factors such as smoking, physical inactivity, higher BMI, hypertension, diabetes and heart disease. Conversely, wealth, income and education are not associated with stroke

risk past age 65. A potential explanation for this lessening of the impact of all three indicators of SES is selective survival. That is, those with lower SES tend to die at younger ages than those with higher SES, making the survivors a much healthier group at older ages.

Health at middle age is a very important predictor of eventual death. The 10-year mortality rate is 4.7% for those reporting excellent health, and 35.8% for those reporting poor health in middle age.

Attempting to elucidate the path through which SES affects mortality over the life course, Feinglass et al. (2007) use HRS data from 1992 to 2002 linked to the National Death Index to determine all-cause mortality over the 10-year span.

Health at middle age is a very important predictor of eventual death. The 10-year mortality rate is 4.7% for those reporting excellent health, and 35.8% for those reporting poor health in middle age. After accounting for baseline health and



behavioral risk factors, education and wealth are not significantly associated with mortality risk. Income remains a significant predictor of mortality, but this effect is largest for those reporting excellent to good health at baseline.

Alley et al. (2009) examine associations between material resources and late-life declines in self-rated health and the onset of walking limitations over two years. Material disadvantage includes being uninsured and underinsured, and also taking less medication than prescribed because of cost. Food insufficiency is measured with the following two questions: “In the last two years, have you always had enough money to buy the food you need?” and “In the last two years, has anyone in the household received government food stamps?” Housing disadvantage reflects renting versus owning, housing quality, percentage of housing cost relative to income, and neighborhood safety. All of these aspects of material disadvantage are each associated with declines in self-rated health over two years; multiple material disadvantage is especially deleterious. The associations between Black race, poverty, single marital status, lower education and health declines are largely explained by material disadvantage.

Others investigate the role of preventive health services in understanding SES health disparities. Even accounting for insurance coverage, education and other sociodemographic characteristics, the working poor remain significantly less likely to receive breast cancer, prostate cancer and cholesterol screening than the working non-poor, but not less likely to receive cervical cancer screening or influenza vaccination (Ross et al. 2007).

Neighborhood Effects

Where people live can affect their health. Features of the residential environment can affect how easily individuals are able to walk and engage in other forms of physical activity. Poorer individuals are less likely to engage in physical activity (Tucker-Seeley et al. 2009). After controlling for SES, demographic characteristics, and functional limitations, older adults who perceive their neighborhood as safe are more likely to exercise compared to older adults who perceive their neighborhood as unsafe.

Researchers have begun using HRS data linked to information from the US Census and other sources of linked data to add greater depth to characterization of residential environments. Census tract information is commonly used to approximate the concept of neighborhood. Grafova et al. (2008) use information from the 2000 Census linked to the 2002 wave of the HRS to describe the economic and social conditions, and the built environment of neighborhoods where HRS participants reside and the potential impact on BMI.

Women living in areas of high street connectivity are less likely to be overweight or obese.



Economic disadvantage of a neighborhood includes the percentage living in poverty, the percentage over age 65 living in poverty, the percentage of households receiving public assistance, and the unemployment rate. Economic advantage is indicated by the value of owner-occupied housing, the percentage of households earning \$75,000 or more, and the percentage of adults with a college degree. Living in a neighborhood with a high level of economic advantage is associated with a lower likelihood of being obese for both men and women. Women living in areas of high street connectivity are less likely to be overweight or obese, but are more likely to be obese in areas of high residential stability. Interestingly, men living in areas with a high concentration of immigrants are also more likely to be obese.

Other research studies the effect of neighborhood on the disablement process, a set of stages from the onset of chronic diseases to impairments in functioning to actual limitations in activities (Freedman et al. 2008). Economic conditions and qualities of the built environment are important for physical functioning. Neighborhood economic advantage is associated with a reduced risk of lower body limitations for both men and women. For men, neighborhood economic disadvantage increases the reporting of personal care limitations, while high street connectivity is

associated with reduced risk of limitations in activities like cooking and shopping. Race plays a central role in the impact of neighborhood on disability. [Brown et al. \(2015\)](#) show that racial and ethnic differences in SES, stress, perceived discrimination and neighborhood conditions help to explain the higher level of functional limitations experienced by Black men compared to White men. Another study shows that increased neighborhood disorder is associated with lower odds of recovery from mobility limitation over two years and influences recovery through barriers to physical activity ([Latham and Williams 2015](#)).

Other work examines the potential impact of neighborhood quality on health conditions. Information from the HRS on neighborhood characteristics in 2002 is used to predict the onset of heart problems, hypertension, stroke, diabetes, cancer and arthritis in 2004 ([Freedman et al. 2011](#)). Living in more economically disadvantaged areas predicts the onset of heart problems. Segregated, higher-crime areas increase the risk of developing cancer.

Similarly, [Wight et al. \(2008\)](#) study the association of neighborhood characteristics and chronic health conditions in the AHEAD cohort. Accounting for other relevant risks, neighborhood disadvantage is significantly associated with self-rated poor health but not with cardiovascular disease or functional limitations. Beginning in 2006, HRS began asking participants to provide personal evaluations of various qualities of their neighborhood. Using these data, [Kim et al. \(2013\)](#) examine the effect of perceived neighborhood social cohesion on the risk of stroke incidence between 2006 and 2010. Higher perceived neighborhood social cohesion is associated with a lower risk of stroke. Some aspects of neighborhoods may even influence mortality. Neighborhood affluence is associated with a lower risk of dying over two years ([Wight et al. 2010](#)).

Neighborhood characteristics may also influence cognitive functioning of older adults. Older adults living in low-education areas have lower cognitive functioning than those living in high-education areas, even accounting for the effect of personal education ([Wight et al. 2006](#)). A related study examines the impact of urban neighborhood socioeconomic disadvantage and racial/ethnic segregation on cognitive functioning ([Aneshensel et al. 2011](#)). Poorer individuals living in economically advantaged urban areas may be especially likely to benefit in terms of cognitive

functioning from living in an economically advantaged neighborhood. On the other hand, neighborhood socioeconomic disadvantage is especially harmful to cognitive functioning for those who are poor themselves.

The link between the sociodemographic environmental context and the trajectory of cognitive health in older life is complex. Higher Hispanic composition and higher Hispanic-White neighborhood segregation are positively associated with better initial cognitive function but with greater cognitive decline over time ([Kovalchik et al. 2015](#)). [Ailshire and Crimmins \(2013\)](#) examine the association between neighborhood air



Older adults living in areas with higher concentrations of particulate matter (a measure of air pollution), have worse cognitive function, especially episodic memory.

pollution and cognitive function. Older adults living in areas with higher concentrations of particulate matter (a measure of air pollution), have worse cognitive function, especially episodic memory.

A similar set of studies evaluates the effect of neighborhood characteristics on depressive symptoms in urban settings. In urban residents over age 70, depressive symptoms are significantly associated with residential stability (Aneshensel et al. 2007). A second study examines associations between urban neighborhood characteristics and changes over time in late-life depressive symptoms (Wight et al. 2009). After accounting for personal characteristics, change in depressive symptoms is significantly associated with neighborhood disadvantage.

Childhood Influences on Later Life Health

The negative impact of disadvantaged life conditions on health can begin long before health problems arise in adulthood. Indeed, both socioeconomic circumstances and health in childhood may set the stage for health in adulthood.

Several studies use the HRS to explore the effect of childhood socioeconomic disadvantage on a range of health outcomes. Moody-Ayers et al. (2007) use HRS information from 1998 to consider the influence of childhood SES on self-reported health status. Childhood SES includes parental education and two measures of HRS participants' perception of their family's

financial status when they were growing up. The first asks, "While you were growing up, before age 16, did financial difficulties ever cause you or your family to move to a different place?" Another question asks, "Now think about your family when you were growing up, from birth to age 16. Would you say your family during that time was pretty well off financially, about average, or poor?"

Poor childhood SES is associated with worse adult health, even considering the impact of adult SES. Parental education has the largest impact. Interestingly, these effects tend to diminish with age and are not present for Hispanics. Another study supports this finding. Childhood health and SES impact chronic health trajectories for both African American and White respondents. The negative health effects of poor childhood health and disadvantaged socioeconomic conditions are higher for women than for men (Basu 2015).

Other studies explore effects of childhood socioeconomic conditions on specific chronic health conditions. Hamil-Luker and O'Rand

For women, growing up without a father and/or under adverse economic conditions confers a significant risk for heart attack over 10 years of follow-up.



Both socioeconomic circumstances and health in childhood may set the stage for health in adulthood.

(2007) use HRS data to investigate childhood SES and risk of heart attack between 1992 and 2002. This study uses a larger set of measures to represent childhood SES including mother's education, father's occupation, family's financial status, needing to move because of financial difficulties, needing to receive help from relatives, father's extended unemployment, and father's absence. A significant gender difference emerges. Childhood SES has no impact on the risk of heart attack in men. For women, however, growing up without a father and/or under adverse economic conditions confers a significant risk for heart attack over 10 years of follow-up.

An important question is whether the impact of childhood SES has a direct impact on adult health or whether it affects adult health primarily through its effect on adult SES. Nandi et al. (2012) use parental education, father's occupation, region of birth, and childhood rural residence to indicate childhood SES, while using



the participant’s own education, occupation, labor force status, household income, and household wealth to define SES in adulthood. Childhood SES itself is associated with onset of heart disease and diabetes between 1992 and 2006, and not just through its impact on adult SES. A similar study explores the association among childhood financial hardship, lifetime earnings, and presence of one or more chronic health conditions (cancer, heart disease, lung disease, stroke, diabetes and hypertension) from the 2004 HRS (Tucker-Seeley et al. 2011). Childhood financial hardship, as indicated by needing to move in childhood due to financial difficulties, is associated with having one or more chronic health conditions. Lifetime earnings may offset some of the negative impact of childhood financial hardship. Among older adults with a history of childhood financial hardship, those with higher lifetime earnings

have a lower chance of having chronic conditions in adulthood than those with lower earnings.

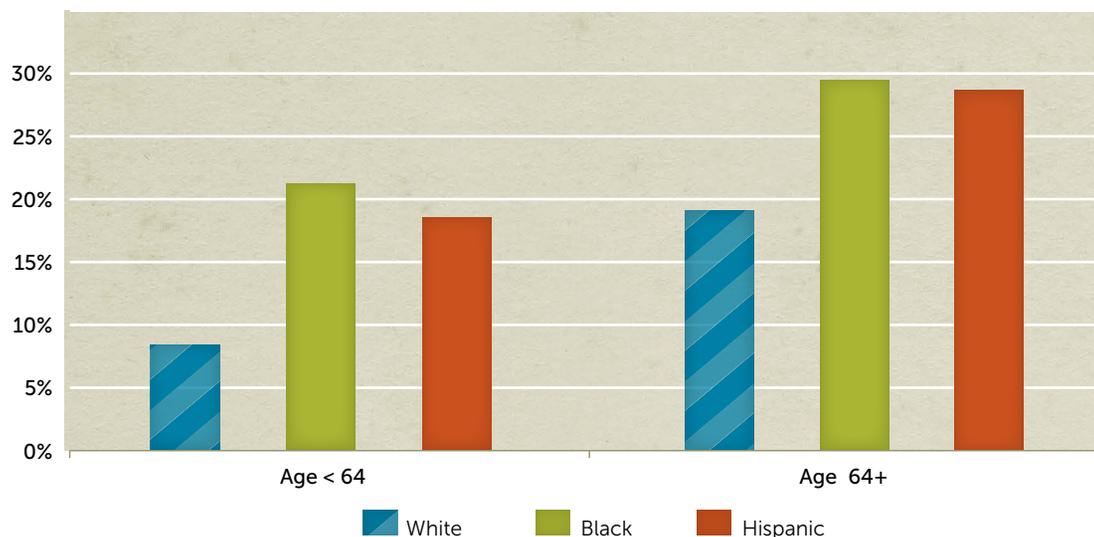
Health in childhood may affect adult health. However, adults who experience diseases like cancer or heart disease may be more likely to recall childhood illnesses than their healthy counterparts. However, Smith (2009) finds that older respondents’ recollection of specific childhood health problems is quite reliable. Blackwell et al. (2001) use information from a module in the 1996 wave of HRS on childhood health to study the impact of health in childhood on health in later life. Accounting for SES both in childhood and adulthood, poor childhood health is associated with a higher risk of cancer, lung disease, cardiovascular conditions, and arthritis/ rheumatism.

Disadvantage in childhood may also affect adult physical functioning. Some participants report that their father was disabled and unable to work, or that their father died or was absent when they were growing up. These measures of childhood socioeconomic position are related to an increased risk of disability in later life (Bowen and González 2010). Adult SES and health behaviors are highly important predictors of ADL and IADL limitations, however, and explain much of the association between childhood SES and later-life disabilities.

Differences in childhood SES may also help account for persistent racial disparities in disability at older ages. Despite evidence that disabilities may be declining in the population overall, as Figure 4-5 shows, Blacks remain at higher risk for physical limitations than Whites at similar ages.

FIGURE 4-5 Percent with one or more ADL or IADL by race and age: 2014

Source: HRS 2014.



[Bowen \(2009\)](#) finds that Black parents of HRS participants had lower education than White parents, and Black fathers had lower occupational status. Accounting for relevant risks, these measures of childhood disadvantage explain part of the racial disparity in adult disabilities. [Haas \(2008\)](#) examines the impact of both childhood health and socioeconomic disadvantage on trajectories of change in functional limitations. Accounting for chronic diseases in adulthood and adult SES at the beginning of the study, greater childhood health problems and worse socioeconomic conditions in childhood predicts a faster decline in physical functioning. Because of the importance of childhood health on later life outcomes, the HRS is now expanding its measurement.

Using data on biomarkers in the HRS, [Lin et al. \(2015\)](#) find a link between traumatic events in adulthood and inflammation, indicated by elevated levels of high sensitivity C-reactive protein. Bodily inflammation is an important biomarker

indicating risk for a range of health conditions, especially heart disease. Those with childhood adversity are almost three times as likely to have experienced trauma as an adult. Childhood adversity and adulthood trauma are independently associated with elevated inflammation. Another study suggests a genetic mechanism. [M. Levine et al. \(2015\)](#) show that childhood trauma increases the expression of genes that determine inflammation. Having low SES in adulthood has the greatest effect on inflammatory gene expression for those who had traumatic events in childhood.

Other studies evaluate effects on cognitive functioning. Examining the influence of psychiatric history on cognitive functioning at older ages, [Brown \(2010\)](#) finds that childhood health influences later life cognition through its effect on later life health. Another study finds that adult SES affects the relationship between childhood SES and cognitive function. Those with higher cumulative SES have an advantage in cognitive function. Childhood SES and adult SES are both related to cognitive status and to cognitive changes at older ages ([Lyu and Burr 2016](#)). Other

research examines the potential impact of the disease environment of HRS participants when they were children. Linking to census region-level information on mortality from typhoid, malaria, measles, influenza and diarrhea, [Case and Paxson \(2009\)](#) find evidence that those who grew up in regions of the country with higher disease-specific and overall infant mortality have lower scores on cognitive tests in old age.



Those who grew up in regions of the country with higher disease-specific and overall infant mortality have lower scores on cognitive tests in old age.

Compound Disadvantage

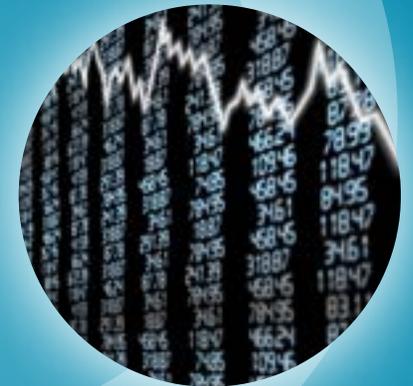
The US has large and enduring racial health disparities. For example, [Sloan et al. \(2010\)](#) find a 17% higher mortality rate for Blacks compared to Whites in the HRS—a mortality gap they show is also present and of similar degree at the beginning of the 20th century. To facilitate the study of racial differences, the HRS has always oversampled Black and Hispanic households at about a rate of two-to-one compared to White households, with a significant supplemental recruitment effort in 2010. There are clearly important health benefits of higher SES in adulthood associated with cleaner, safer, more affluent neighborhoods, and of early childhood health and socioeconomic conditions. While some of the foregoing studies explicitly investigate racial differences, race is typically considered an important risk that needs to be accounted for. Nearly all of the studies discussed in this section find that Black Americans experience compound disadvantage, that is, disadvantage in adult SES, neighborhood context, and childhood health and socioeconomic conditions. As noted, cross-national comparisons of health often limit the analysis to non-Hispanic whites to rule out this significant source of variation between the US and other countries. The mechanism by which racial differences come about is a major topic for future research.

Life expectancy in the US varies widely depending on things like education, income, race and residential characteristics. Improving the outlook will certainly involve further improvements to behavioral factors like diet, smoking and physical activity. Yet health is also powerfully determined by social and environmental conditions. These and other factors directly affect our health and are topics in need of further research. As more data become available from other HRS sister studies, the opportunities will grow, especially to compare developed and developing countries ([Weir et al. 2014](#)).

Black Americans experience disadvantage in adult socioeconomic status, neighborhood context, and childhood health and socioeconomic conditions.



TRACKING THE IMPACT OF THE GREAT RECESSION



CHAPTER 5 | TRACKING THE IMPACT OF THE GREAT RECESSION

The Great Recession of 2007 to 2009 led to the loss of more than 7.5 million jobs in the US. At the peak of the recession, the unemployment rate was over 10%. At the same time, the crash of the housing and stock markets cost Americans trillions of dollars of wealth. The security of retirement plans was challenged by the same fall in asset prices and in some cases by cuts in employer contributions for current workers. An economic shock of this magnitude has implications for older Americans' decisions about when to retire, how much to spend and how to invest. Even though older adults were more insulated from some aspects of the crisis, such as job loss and mortgage foreclosure, their children and other family members were often in need of support. Because the longitudinal HRS followed its members before, during, and after the Great Recession, it provides uniquely valuable data for researchers to track its impact on individuals and families.



There are substantial effects of the recession on work expectations as well as actual work transitions. A number of studies demonstrate that Americans seem to have adjusted their spending in response to the recession. While many older Americans weathered the Great Recession well, several studies support the concern that the downturn had a disproportionate impact on certain vulnerable groups. Future studies will evaluate the potential longer-term impact as more post-recession HRS data become available.

Effects of the Great Recession Effects on Wealth

One of the hallmark events of the Great Recession was the substantial decline in stock market values, which dropped by more than 40% from October 2007 to April 2009. The effects of this decline on those near retirement age might depend on how much wealth they held in the stock market. What was their exposure? Did the recovery mean a return of those losses?

Gustman et al. (2010) examine this question by looking at the wealth of Early Baby Boomers, aged 53 to 58 in 2006, to see what losses they would be likely to experience as a result of the decline in value of both the stock and housing markets. A major advantage of HRS data is its comprehensive coverage of sources of retirement wealth, especially non-liquid sources like defined benefit (DB) pensions and Social Security benefits. It turns out that stocks are not a large part of the retirement portfolio of Early Baby Boomers, and DB pensions are still the dominant

source of pension wealth. Overall, only 15.2% of their wealth was held in equities through defined contribution (DC) plans, individual retirement accounts (IRAs), and direct stock holdings. Similarly, while housing values fell substantially through the recession, many homeowners in this cohort had already paid off their mortgages or already held substantial equity, and therefore did not find themselves under water with a mortgage lender.

With longitudinal information on wealth changes during the recession, researchers show that for the Early Baby Boomers, by 2010 real wealth had fallen by 2.8% (Gustman et al. 2012). Early Baby Boomers with the lowest levels of wealth experienced a 1% wealth loss. On the other hand, those with the highest levels of wealth lost the most during the recession. In follow-up work, Gustman et al. (2014) study the effect of the economic recovery on the wealth of American households. For Early Baby Boomers overall, by 2012 — when they were aged 59 to 64 — real wealth was still 3.6% lower than before the 2006 recession. They show that the largest percentage wealth losses are in the highest wealth households. In the top wealth decile the decrease from 2006 to 2012 is 26%, whereas the lowest decile actually experienced an increase in wealth.

Comparing the experiences of these younger cohorts to older cohorts, they also find that real wealth increased in earlier cohorts at the same age (for example War Babies who were aged 51 to 56 in 1998), largely due to increases in the housing and stock markets in the 1990s and early 2000s. Younger cohorts being followed in the HRS will have greater exposure to stock markets as an increasing share of their retirement

portfolios are held in DC plans. Gustman et al. (2014) report that in 2012, DC plans for the first time represented a larger share of pension wealth than DB plans, but only for Mid Baby Boomers who were aged 53 to 58 in that year. Nonetheless, Social Security is the most important asset owned by members of all of the cohorts examined and is a major source of stability through economic change.

Other research examines mental health effects of wealth losses. Similar to Gustman and colleagues, McInerney et al. (2013) find large recession-related wealth losses among those with high levels of stock holdings. They also show that these losses are associated with increased symptoms of depression and use of antidepressant drugs. On average, older Americans' perceptions of financial strain actually lessened over the recession between 2006 and 2010, with 41% of respondents indicating a decrease in financial strain over the four-year period (Wilkinson 2016). Nonetheless, a quarter of HRS participants experienced increased financial strain during that period, leading to worsening anxiety and depressive symptoms.

Figures 5-1a and 5-1b show the impact of the recession reported by HRS respondents in 2009. Impacts of the recession appear to be similar for men and women, but are more strongly felt by younger age groups.

Effects on Retirement Expectations

Large wealth losses could cause individuals who are nearing retirement age to continue working in order to offset their losses. Gustman et al. (2010) show that, as a result of the economic downturn, about 7% of those near retirement in 2006 are likely to delay retiring by a year, and almost 2% are likely to delay retirement by two years. Another study examines changes in expected retirement age over the course of the recession from 2006 to 2008 (Goda et al. 2011). These researchers map the date of the HRS interview to the value of the S&P 500 (an index of the value of the stock market), to quarterly fluctuations in the housing market at the state level, and to county-level unemployment rates during the month of the interview. Expectations about likely retirement are influenced by these economic indicators. Between 2006 and 2008, the percentage of workers expecting to work past age 62 increased from 47.5 to 54.5%, and those expecting to work past age 65 increased from 31.1 to 36.6%.

A 2009 HRS survey assessed response to the economic downturn. Hurd and Rohwedder (2010c) compare expectations of working past age 62 for those who are over age 55 and working in 2008 based on their work status in 2009. For those still working in 2009, the subjective expectation of working past age 62 increased by 5%. The numbers are even more striking for

Younger cohorts being followed in the HRS will have greater exposure to stock markets as an increasing share of their retirement portfolios are held in DC plans.

Affected by the Recession

The 2009 Internet Study asked HRS participants to assess the personal impact of the recession. "Over the past months there have been reports about the nation's financial problems, including large drops in the stock market and in the housing market,

and increasing rates of foreclosures and joblessness. As this financial crisis unfolds, more and more people have been affected in different ways. Have you been affected by these problems?" Response options are "a lot," "a little" or "not affected."

About 28% of HRS participants overall reported being affected a lot, 46% reported that they had been affected a little, and 26% said they had not been affected.

FIGURE 5-1a Percent of women affected by the recession by age: 2009

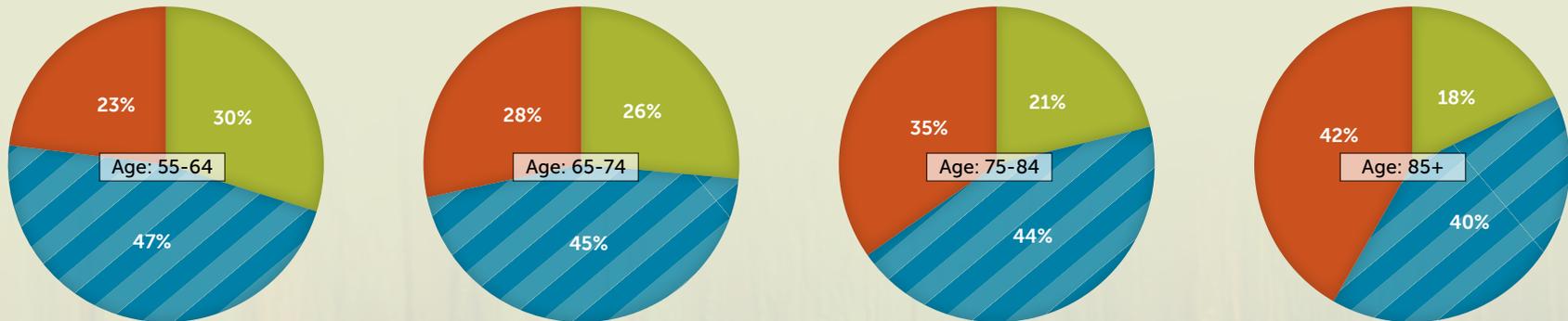
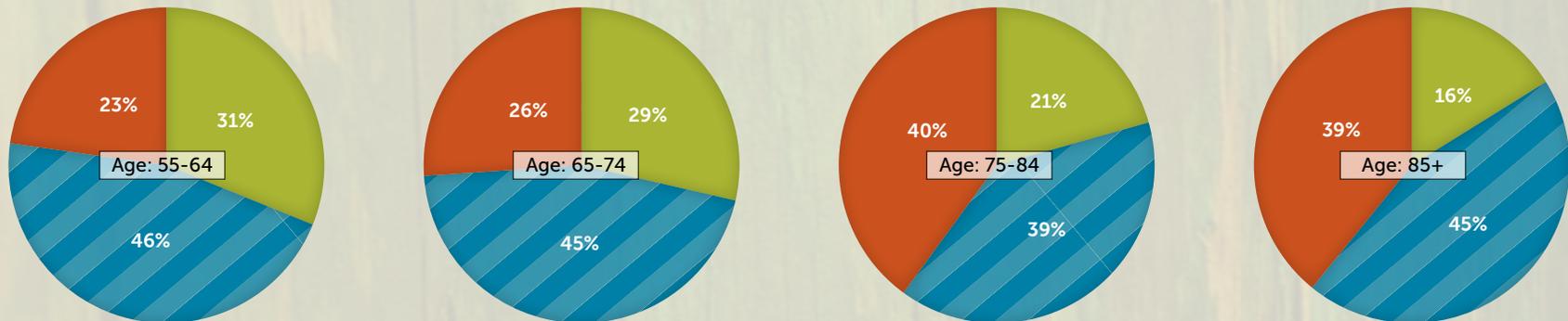


FIGURE 5-1b Percent of men affected by the recession by age: 2009



■ Not affected
 ■ Affected a lot
 ■ Affected a little

Source: HRS 2009.

the expected probability of working past age 65, which increased from 39.6% to 49.5%.

HRS also assesses work plans by asking, “Do you plan to stop working altogether or reduce work hours at a particular date or age, have you not given it much thought, or what?” The economic environment influences retirement plans, but personal factors such as the amount of personal debt and characteristics of the individual’s work environment are also strong predictors of work plans (Szinovacz et al. 2013).

*Flexibility in work hours
is associated with plans to
continue working*

Szinovacz et al. (2015) construct a model that captures several levels of influence, such as changes in the Dow Jones Industrial Average and the unemployment rate between 2006 and 2008. Mid-level factors include the size and degree of unionization, pension and health insurance benefits, and opportunities to work part-time at the firms HRS participants work for. The model also includes individual characteristics like personal income and wealth, health status, tenure on the job, hours worked, and stressfulness and physical demands of the job. They find that unionization, having a DB pension, job stress, and onset of a new health condition are all associated with plans to stop working at younger ages. On the other hand, flexibility in work hours is associated with plans to continue working. These effects may have changed as the recession evolved, which can be investigated using data from subsequent waves in the HRS.

FIGURE 5-2a Average expected probability of working full time past age 62 for currently employed persons aged 55 to 60: 1998 to 2014

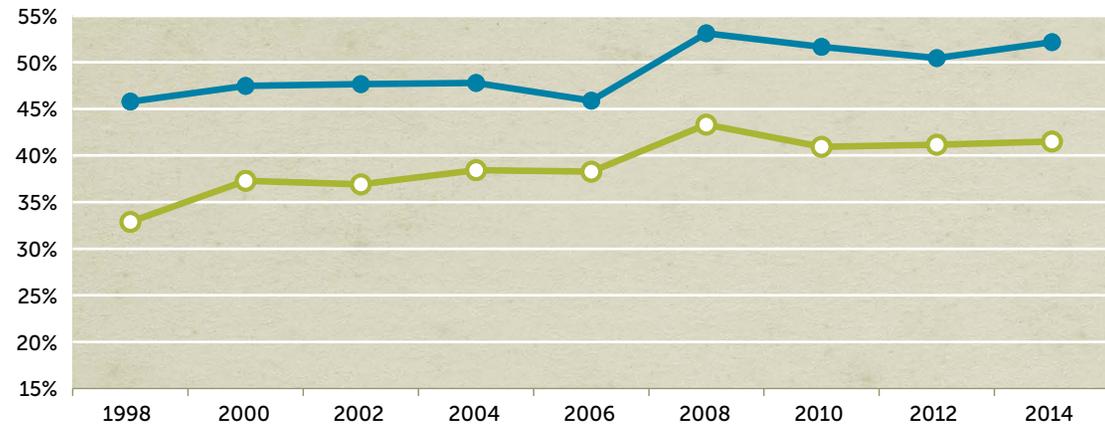
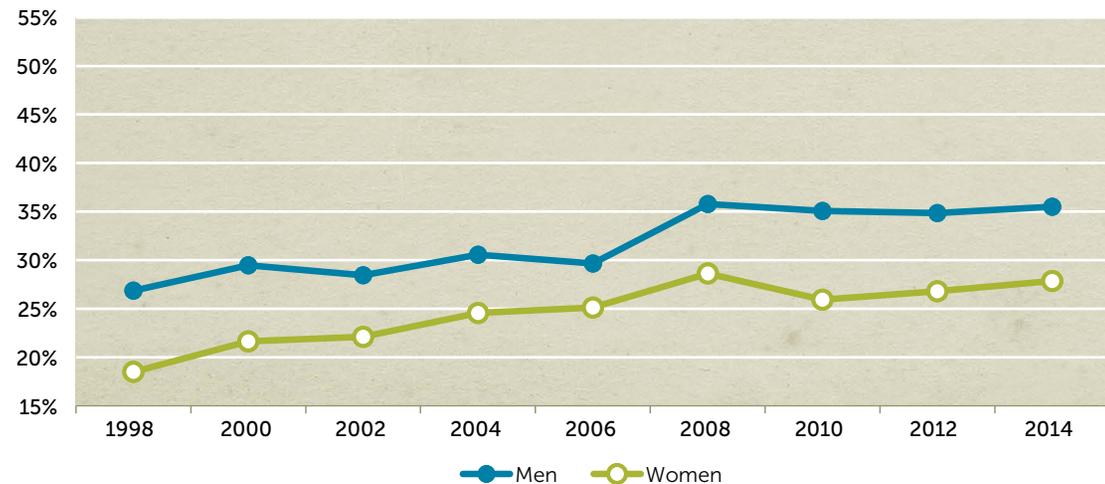


FIGURE 5-2b Average expected probability of working full time past age 65 for currently employed persons aged 55 to 60: 1998 to 2014



Source: HRS 1998-2014.

While work expectations generally predict actual work outcomes, it may be that the increase in expectations of working past age 62 and past age 65 found over the recession will prove to be an overstatement of work outcomes. Figures 5-2a and b show that there has been a slow upward

trend since 1992 in expectations of working past the early (age 62) and normal (age 65) retirement ages for Social Security. The 2008 wave of HRS saw a big increase, followed by a decline back to the trend line in 2010.

Effects on Work Status

While expectations of working longer increased during the recession, were these expectations realized? A common-sense speculation was that those with jobs might try to work longer than they had planned in order to offset wealth losses. Some older workers were laid off during the recession. Were they able to return to work as the economy recovered? How do they compare to earlier cohorts? [Gustman et al. \(2015\)](#) explore the labor market outcomes of the Early Baby Boomers who were in their mid-50s at the beginning of the Great Recession looking at various work transitions.

The percentage of Early Baby Boomers who were still working in 2006 when they were aged 53 to 58 is 62%, and 40% in 2012 when they were aged 59 to 65. Interestingly, these changes are very similar in the prior cohorts. The original HRS cohort, aged 53 to 58 in 1994, transitioned from 63% not retired to 42% six years later. A key difference between cohorts is in layoffs and unemployment. Eleven percent of those in both the

HRS and War Babies cohorts reported a layoff over six years compared to 14% of Early Baby Boomers in the six years between 2006 and 2012. Similarly, 8% of Early Baby Boomers reported a spell of unemployment over the 6 years compared to only 4% for the older cohorts.

Higher proportions of workers claimed Social Security benefits at age 62 during the Great Recession.

themselves to be “not retired” or “partially retired, not working” had experienced a layoff. Most of the increase in “not retired” or “partially retired, not working” appears to reflect a change in expectations about the potential or need for future work—a change that is not the result of an actual job loss ([Gustman et al. 2015](#)). Another study finds that declines in housing wealth during the Great Recession lowered retirement probabilities of married males by as much as 14% to 17%. This delay is offset in cases where the household had either DB or DC pensions ([Ondrich and Falevich 2016](#)).



Job loss during the recession led to a 10% decrease in spending overall.

Social Security Claiming

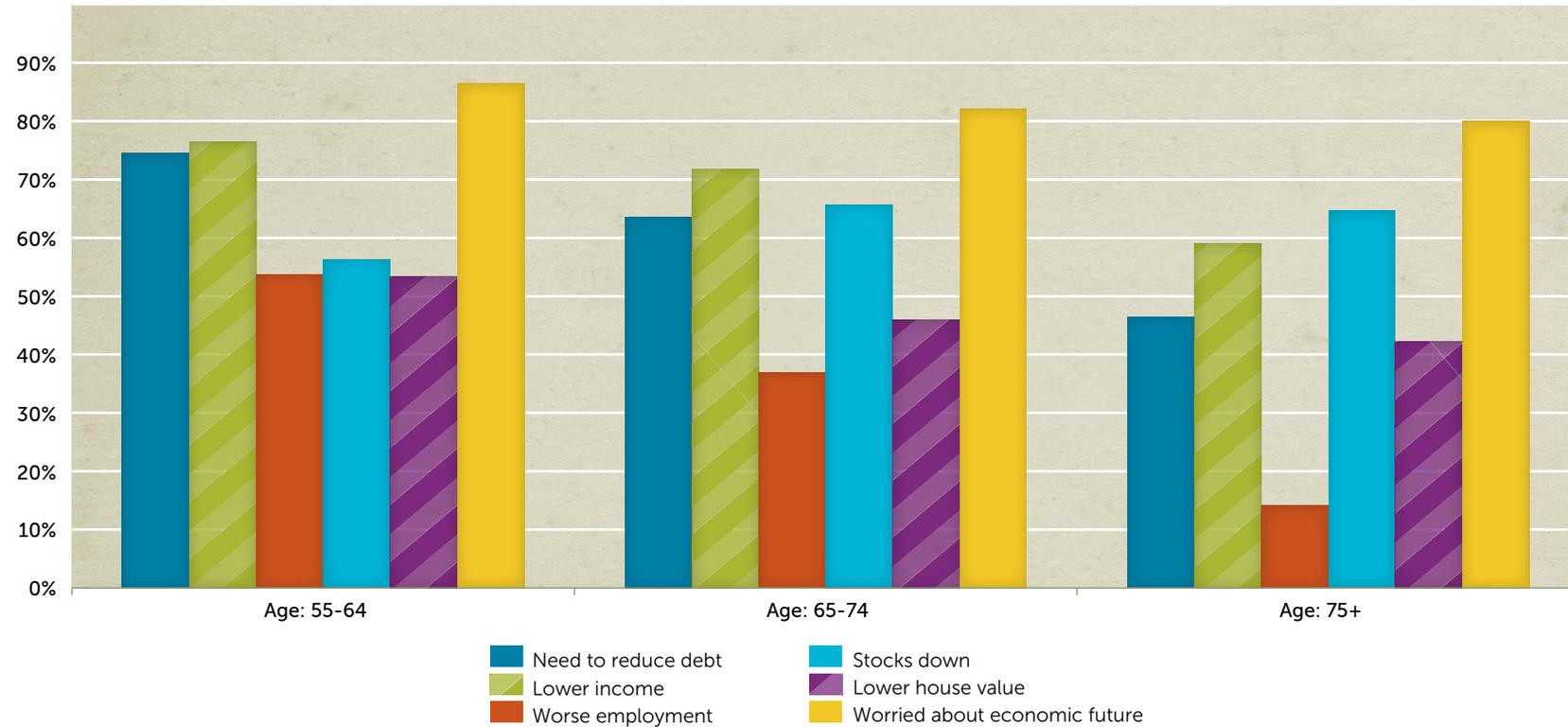
Social Security may serve as an important safety net for older, displaced workers. HRS research shows that the majority of workers who qualify for Social Security retirement benefits claim those benefits at the Early Entitlement Age of 62, despite potentially higher benefits associated with delaying claiming ([Gustman and Steinmeier 2005](#)). Higher proportions of workers claimed Social Security benefits at age 62 during the Great Recession. High unemployment rates in 2008 led to a 5% increase in the probability of early Social Security claiming relative to a less severe recession in the years 2001 to 2003 ([Rutledge and Coe 2012](#)). On average, early claimers filed for Social Security six months earlier than they would have in the earlier recession, reducing their monthly Social Security benefit by 4.6% of average monthly benefits. While lower-income individuals in both recessions are the most likely to claim at age 62, surprisingly, individuals at all levels of socioeconomic status increased claiming at the same rate in the more recent recession.

Spending Changes

Reducing household spending might be another response to hard economic times. Almost 33% of those aged 54 to 64 in 2009 report decreasing their spending in the prior years. Spending decreases are lower in older groups: a 24% decrease for 65- to 74-year-olds, and a 16.8% decrease for those aged 75 and older ([Hurd and Rohwedder 2010c](#)). Typically, spending would tend to increase, especially for the youngest group.

[Figure 5-3](#) shows various reasons for reducing spending, stated by participants as “somewhat”

FIGURE 5-3 Percent reporting important reasons for spending decline by age: 2009

Source: *Hurd and Rohwedder (2010c)*.

or “very important.” Nearly 85% of participants indicate that being worried about the economic future is an important reason for reducing spending in the past year. Those in the older age groups are less likely to have reduced spending because of the need to reduce debt, having a lower income, or rising unemployment levels. Actual spending changes from the CAMS show that changes during the recession are sharply larger than in the period from 2001 to 2006. Among those aged 50 to 64, spending declines by 7.6% more in 2007 to 2009 compared to 2001 to 2006. In contrast, for those over age 64, spending declines 3.4% more in the later period when compared to the earlier

period, suggesting that older households are better protected against the impact of recession.

The 2009 internet survey also asks HRS participants to estimate percentage changes in the value of their homes, employer retirement saving plans, individual retirement accounts (Keogh plans), investment trusts, mutual funds, directly held stocks, and stocks held through other assets. Another question assesses their subjective expectation that the stock market will recover in one year’s time. Housing and financial losses have a large negative impact on spending. Job loss during the recession led to a 10% decrease in spending overall ([Christelis et al. 2015](#)).

Those who thought that the stock market would not be likely to recover within a year decreased their spending by a significantly larger degree than those who were more optimistic.

Vulnerable Groups

Researchers have also investigated the impact of the recession on more vulnerable populations who may have been hit particularly hard by the recession. Older workers with disabilities may have been more likely to lose their jobs during the recession and less likely to find another job. There were significantly higher rates of involuntary job loss in the period from 2006 to 2008

compared to 2004 to 2006. While the effect of the recession on employment overall is not different for those with health-related limitations, increases in job losses over the period of the recession are 30% greater for those with greater underlying risk of disability than for the general HRS population (Altindag et al. 2012). It may be that those with disabilities switched jobs to adapt to work limitations. Decreases in spending are 20% greater for those with disabilities.

Another study examines the impact of the recession on the risk of experiencing food insecurity and foregoing medications. The HRS includes a variety of measures intended to evaluate the experiences of those with significant economic need. One question asks, “In the past two years, have you always had enough money to buy the food you need?” Those who answer “no” to this question can be considered as experiencing food insecurity. Another question asks, “In the past two years, have you ended up taking less medication than is prescribed... because of the cost?” In the 2010 wave of the HRS, participants are asked if the housing crisis affected them or their family. Those who owned their homes and still owed money to a mortgage lender are asked if they had ever fallen more than two months behind on mortgage payments in the past two years. Unemployment and the participant’s own (or a family member’s) mortgage delinquency is associated with experiencing food insecurity or foregone medications (Burgard et al. 2013). Compared to those who are working, those who became unemployed are more than twice as likely to experience food insecurity between 2008 and 2010, and are almost five times more likely to have foregone medication because of the cost.

Compared to those who are working, those who became unemployed are more than twice as likely to experience food insecurity between 2008 and 2010, and are almost five times more likely to have foregone medication because of the cost.

Others examine the possible impact of the Great Recession on an individual’s use of preventative health care. Manski et al. (2012) find that a 50% or more decrease in household income during the Great Recession led older adults to reduce their use of dental care.

One important source of help during hard times can be family. Researchers have long recognized that financial help, or transfers, between family members might act as a kind of insurance against the risk of income shortfalls associated with job loss or other financial problems. Recessionary pressures could cause household transfers to increase or decrease. Family members may have greater need, but the resources of those who might want to help could be less.

In 2009, 30.4% of those in the original HRS cohort who were aged 67 to 77 in 2008 had given a transfer of \$500 or more to grown children, relatives or friends in the past 12 months (Cox and Way 2011). Only 3.4% received such a transfer. Those receiving a transfer were more likely to be unemployed, single and non-White.

To evaluate the effect of the recession, they divide the sample into those who said they were affected by the Great Recession “a lot,” “a little,” and “not at all.” Those affected by the recession a lot were wealthier and had higher incomes. Interestingly, this group also has the highest rates of both giving and receiving. Despite their own wealth losses, older parents increased their financial help to adult children and others. This help seems to go to those who need it most, such as the recently unemployed. HRS participants are 34% more likely to make a financial transfer if they have a family member who is two or more months behind on their mortgage payment.

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IN CLOSING | REFERENCES | GLOSSARY



IN CLOSING

As this volume attests, the HRS serves as a major public resource for research and analysis of important societal trends and issues. The aging of the population and the retirement of the Baby Boom generation are among the most transformative demographic changes ever experienced in this country. By observing the dynamics of retirement and health, and people's social and economic well-being following retirement, the HRS will continue to be a powerful research tool for tracking and understanding this major national social transformation.

The HRS has always been committed to early and open access to data while protecting the confidentiality of respondents. As data sharing becomes more common in the scientific community, the HRS will continue to lead in this regard. Continuing to expand the base of users and the accessibility of the data will remain a high priority in the years to come.

The HRS works to build and support its user community in a number of ways. The website is the primary point of contact between the study and its users (hrsonline.isr.umich.edu). In addition to a range of user-friendly documentation, the website provides user guides for a number of different content areas such as psychosocial functioning, cognition, physical functioning, chronic diseases, physical measures, biomarkers, health insurance,

and Social Security wealth measures. The email helpdesk service provides individual support for specific questions about using the data (hrsquestions@umich.edu). A summer introductory course is offered within the ISR Summer Institute on an annual basis. Visit the Summer Institute website to register for this weeklong course, which provides morning lectures on the survey content and afternoon labs providing hands-on experience using the data (<http://si.isr.umich.edu>). A half-day workshop is offered every other year at the Gerontological Society of America (GSA) annual meetings. Lastly, the HRS provides an exhibit at major conferences where HRS users or potential users may be found.

This book is a useful introduction to some of the important topics addressed with HRS data. Visit the HRS website for more information about publications using HRS. All of the publications referenced in this volume are contained in the online searchable bibliography, with live links to the full text of many of the publications hrsonline.isr.umich.edu/publications/biblio.

In the coming years, the HRS will continue to be a major public asset to help our nation address the challenges and opportunities of aging in the 21st century.



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GLOSSARY

ADAMS: The Aging, Demographics, and Memory Study (ADAMS), a supplement to the Health and Retirement Study, was funded by the National Institute on Aging with the specific aim of conducting a population-based study of dementia.

AD: Alzheimer's disease is a chronic neurodegenerative disease that is the leading cause of dementia.

ADLs: Activities of daily living are routine activities that people tend to do every day without needing assistance. There are six basic ADLs: eating, bathing, dressing, toileting, transferring (walking) and continence.

AIME: Average indexed monthly earnings are used by the Social Security system to calculate the Primary Insurance Amount (PIA), which determines the value of retirement benefits.

APOE: Apolipoprotein E plays an important role in transporting cholesterol in and out of the central nervous system. Having the APOE allele increases the risk of AD possibly related to improper functioning of this protein.

BMI: Body mass index is a value derived from the mass (weight) and height of an individual. BMI is defined as weight divided by the square of height. It is usually reported in units of kg/m², for mass in kilograms and height in meters.

Bridge Employment: Refers to any paid work after an individual retires or starts receiving a pension.

CAMS: The Consumption and Activities Mail Survey is a paper-and-pencil survey that is collected biennially in odd-numbered years from the core HRS survey. One of its primary objectives is to measure total household spending over the previous 12 months.

CIND: Cognitive impairment not dementia describes individuals whose cognitive functioning falls below normal but who do not yet have dementia. An important goal within CIND is to identify subgroups that will likely progress to Alzheimer's disease.

DB: Defined benefit pension insurance is an employer-provided pension that is determined by a formula based on the employee's earnings history and tenure of service and age, rather than depending directly on individual investment returns.

DC: Defined contribution pension insurance is a type of pension plan in which a certain amount or percentage of money is saved in a 401(k)-type account. The defined-contribution plan places restrictions that control when and how employees withdraw these funds without penalties.

EEA: Early eligibility age is the earliest age to claim Social Security retirement benefit. If benefits are claimed before the full retirement age, they are reduced a fraction of a percent for each month before the full retirement age.

FEM: The Future Elderly Model is a demographic and economic simulation model designed to predict the future costs and health status of the elderly and explore what current trends or future shifts imply for policy.

FRA: Full retirement age is the age at which beneficiaries can claim their full Social Security retirement benefits. Traditionally, the full benefit age was 65, and early retirement benefits were first available at age 62, with a permanent reduction to 80 percent of the full benefit amount. Currently, the full benefit age is 66 for people born in 1943-1954, rising to 67 for those born in 1960 or later.

IADLs: Instrumental activities of daily living are not necessary for fundamental functioning, but they let an individual live independently in a community. They include things like housework, preparing meals, taking medications as prescribed, and managing money.

LTCI: Long-term care insurance is an insurance product that helps provide for the cost of long-term care beyond a predetermined period. Long-term care insurance covers expenses not covered by health insurance, Medicare, or Medicaid.

MCI: Mild cognitive impairment causes a slight but noticeable and measurable decline in cognitive abilities, including memory and thinking skills. MCI increases the risk of developing Alzheimer's or other dementia.

OASI: Old-age Survivor's Insurance is also known as Social Security retirement. Based on social insurance principles, the program provides monthly benefits designed to replace, in part, the loss of income due to retirement, disability, or death. Coverage is nearly universal: About 96% of the jobs in the United States are covered. Workers finance the program through a payroll tax that is levied under the Federal Insurance and Self-Employment Contribution Acts (FICA and SECA).

OOPM: Out-of-pocket medical expenses encompass a range of costs not covered by medical insurance.

SES: Socioeconomic status is an economic and sociological measure of a person's work experience and of an individual's or family's economic and social position in relation to others, based on income, education, and occupation.

SSDI: Social Security Disability Insurance is tied to the Social Security retirement program but is for workers who become disabled before retirement age. Only workers who have worked and paid Social Security taxes are insured by the SSDI program.

VaD: Vascular dementia. Alzheimer's disease results from the breakdown of nerve cells in the brain. Vascular dementia results when the brain does not get enough blood carrying the oxygen and nutrients it needs.



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**HEALTH AND RETIREMENT STUDY
SURVEY RESEARCH CENTER**

Institute for Social Research
University of Michigan
426 Thompson Street
Ann Arbor, MI 48104
Phone: 734 936-0314
Website: hrsonline.isr.umich.edu
E-mail: hqsquestions@umich.edu