The Lifetime Medical Spending of Retirees

Older households in the U.S. face the risk of catastrophic medical expenditures during retirement. While Medicare covers some hospital expenses starting at age 65, as well as doctor’s visits and prescription drugs for beneficiaries who sign up and pay for Part B and Part D coverage, there remain substantial uncovered costs. For example, Medicare does not cover long hospital or nursing home stays and requires copayments for many medical goods and services. Medicaid provides coverage of long-term care expenses for the poor, but families with significant assets are not eligible (unless they first expend most of their wealth).

Understanding the level and risk of medical spending on retirees is important for households seeking to save adequately for retirement and manage the decumulation of their retirement savings, as well as for policymakers interested in retirement security.

In “The Lifetime Medical Spending of Retirees,” (NBER Working Paper No. 24599), researchers John Bailey Jones, Mariacristina De Nardi, Eric French, Rory McGee, and Justin Kirschner estimate the distribution of lifetime medical spending for retired households with a head age 70 or above. Their estimates include out-of-pocket costs.

At age 70, the 95th percentile of medical spenders will incur roughly $330,000 in medical expenses over the remainder of their lives.

Source: Researchers’ calculations using data from the Health and Retirement Study and the Medicare Current Beneficiary Survey.

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spending as well as Medicaid expenditures, as this represents the risk that wealthier households face, as well as the medical spending risk less wealthy households would face were Medicaid not available.

The researchers make use of data from the Health and Retirement Study (HRS), focusing on households age 70 and above at the first interview, who are followed for up to 20 years. The HRS provides information on all out-of-pocket medical spending. These data are supplemented with information on Medicaid spending from the Medicare Current Beneficiary Survey, using characteristics available in the two data sets to estimate Medicaid spending for HRS respondents.

The researchers use these data to estimate the probability that individuals transition over time between being in good health, in poor health, in a nursing home, and deceased, based on the individual’s current health status and demographic and socioeconomic characteristics. They also estimate models relating medical spending to health status and these other factors. Results from the two models are combined to predict how health and medical spending will evolve with age for each household.

Focusing first on annual household spending, the researchers find that this measure rises rapidly with age, with mean out-of-pocket and Medicaid expenditures of $5,100 at age 70, rising to $29,700 at age 100. At the 95th percentile, annual expenditures are $13,400 at age 70 and $111,200 at age 100.

Spending at each age can be aggregated to create an estimate of lifetime medical spending. At age 70 and each age thereafter, the researchers calculate the present discounted value of remaining medical expenditures from that age forward. The resulting values can be considerable. Households who turned 70 in 1992 will on average incur over $122,000 in out-of-pocket and Medicaid spending over the remainder of their lifetime. The top 5 percent of spenders will incur expenditures of over $330,000. This value does not fall with age, as might be expected — older households have fewer remaining years of life but higher annual expenditures, and the latter drives remaining medical spending to continue rising until about age 90.

The researchers uncover a number of other interesting patterns in lifetime medical spending. Women have higher spending than men, as might be expected due to their longer life expectancy. Perhaps more surprisingly, those who are initially in good health have higher spending than those in poor health, since the former tend to live longer and medical expenditures rise with age. An important caveat to this is that individuals who are initially in nursing homes have the highest expenditures, despite having high mortality, due to the high cost of nursing home care. High-income households have higher lifetime expenditures due both to their longer life expectancy and their tendency to spend more at each age. Only 40 percent of the variation in medical expenditures can be explained by factors such as income and health status, indicating that much of the variation in spending is due to idiosyncratic health shocks.

The share of medical expenditures that is covered by Medicaid is highly relevant for retirement planning. This share varies considerably by the household’s permanent income level. At the bottom of the income distribution, mean lifetime out-of-pocket expenditures as of age 70 are about 43 percent of mean combined (out-of-pocket and Medicaid) expenditures, implying that Medicaid covers about 57 percent of the total. By contrast, at the top of the income distribution, Medicaid covers 21 percent of lifetime expenditures as of age 70 and 30 percent as of age 100. These figures reflect the fact that, on the one hand, most high-income households do not receive Medicaid; however, those that do have had their assets exhausted by high medical expenses, leading to large Medicaid benefits. At every income level and age, households with higher combined expenditures have a larger share of their expenditures covered by Medicaid.

In concluding, the researchers note that the level and dispersion of medical spending is high and diminishes only slowly with age. While some fraction of medical spending is predictable, a large share is due to unanticipated health shocks. Medicaid covers the majority of health costs for the poor and reduces their risk of medical expenditures; to a lesser extent, it does so for higher-income households as well.

The researchers caution that their analysis does not examine the extent to which medical spending may reflect choices made by the individual, such as when to enter a nursing home or whether to spend more on higher-quality care. They also suggest that future work incorporating spending by Medicare and private insurers would provide a more complete picture of medical spending by the elderly.

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The Bulletin is edited by Courtney Coile.

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The Emergence of the Female Advantage in Life Expectancy

In the U.S. and other developed countries, life expectancy at birth for women is four to six years longer than the equivalent figure for men. Recent evidence suggests that this has not always been the case, however. When and why did the female advantage in life expectancy arise?

In “XX>XY?: The Changing Female Advantage in Life Expectancy,” (NBER Working Paper No. 24716), researchers Claudia Goldin and Adriana Lleras-Muney explore this issue. The researchers begin by documenting trends in life expectancy in the U.S. Prior to 1890, male life expectancy at age 15 was about one year longer than female life expectancy, except during the Civil War, when war-related mortality led to a temporary female advantage. Starting around 1890, however, a permanent female advantage emerged.

The gap grew throughout most of the 20th century (except for a brief decline due to the 1918 flu pandemic), reaching a peak of around 20 years in the 1970s. The gap has since narrowed to less than 5 years. Interestingly, starting in the late 1980s, the gap grew throughout most of the 20th century (except for a brief decline due to the 1918 flu pandemic), reaching a peak of around 20 years in the 1970s. The gap has since narrowed to less than 5 years. The researchers caution that with present available data, it is difficult to rule out the possibility that public and private health innovations were the reasons for the female advantage. Using new data from Massachusetts containing information on cause of death starting in the late 1800s, the researchers show that females ages 5 to 25 initially had higher rates of infectious disease mortality than did males of the same age. For example, mortality from the 1918 flu pandemic was higher for girls ages 10 to 15 than for boys. When the burden of infectious disease declined, largely due to public health interventions such as clean water and sewerage systems, young women had more to gain.

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Interestingly, the direct effect of declining infectious disease mortality on the male-female life expectancy gap was fairly small. But as infectious disease mortality fell, there were also fewer survivors who carried markers from illness into adulthood. Later cohorts therefore had lower mortality later in life from causes associated with the long-term burden of infectious disease.

This phenomenon translated into a greater increase in life expectancy for women because of their initially higher rates of infectious disease.

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Machine Learning in Health Care

The use of machine learning (ML) in economics is on the rise, including in the analysis of health care questions. In June, the NBER hosted a conference on “Machine Learning in Health Care,” organized by David Cutler, Sendhil Mullainathan, and Ziad Obermeyer.

Susan Athey led off the meeting with a discussion of “The Impact of Machine Learning in Economics.” She offered a “relatively narrow” definition of ML as “a field that develops algorithms designed to be applied to datasets, with the main areas of focus being prediction (regression), classification, and clustering or grouping tasks.” She notes that a strength of ML is its ability to estimate and compare many models, which is particularly useful when there are many covariates or when the researcher wishes to estimate the model flexibly. ML works well when the problem is simple, such as a prediction or classification task, where the model can be estimated using one part of the data and tested on another. However, many questions in economics involve causal inference, where there is no unbiased estimate of the truth available for comparison; Athey suggested that more work will be needed to apply an algorithmic approach in such cases. She predicted “the combination of ML and newly available datasets will change economics in fairly fundamental ways, ranging from new questions, to new approaches to collaboration (larger teams and interdisciplinary interaction), to a change in how involved economists are in the engineering and implementation of policies.”

Ziad Obermeyer and Sendhil Mullainathan explore the potential of ML to identify low-value health care in their new study, “Are We Over-Testing? Using Machine Learning to Understand Doctors’ Decisions.” The researchers apply ML tools to study testing for heart attack in the emergency setting. Intensive tests such as stress testing or catheterization allow doctors to detect an acute or impending blockage, enabling patients to receive life-saving treatments such as a stent or open-heart surgery. However, these tests cost thousands of dollars and the average yield of the test (share of tested patients with a serious blockage) is often as low as 1 to 2 percent.

The researchers use national Medicare claims, as well as detailed electronic health record data from a large hospital, to compare doctors’ testing decisions to individualized, prospective risk estimates obtained via ML. They find a substantial number of patients with very low model-predicted risk ex ante, whom doctors nevertheless decide to test. Tests for these patients have very low yield and would not be considered cost-effective at the standard threshold of $100,000 per life-year saved. Testing is cost-effective for patients in the top quartile of model-predicted risk, yet there are untested patients within this population. Many of these patients go on to develop serious complications, or to die, in the weeks after their emergency visits.

There is substantial variation across doctors in their propensity to test, and doctors who test more than average tend to test more high-risk patients as well as more low-risk patients. This suggests that rather than encouraging high-testing doctors to behave like low-testing doctors, there may be greater gains from using algorithmic decision-making to identify high-risk patients — the researchers estimate that by so doing, doctors could find 55 percent more heart attacks while testing at the rate of low-testing doctors. They conclude, "these results suggest that both under-testing and over-testing are prevalent, and that targeting mis-prediction is an important but understudied policy priority.”

The other papers presented at the conference also showcased the potential of ML for providing key insights on health care questions. In “Triage Judgments in the Emergency Department,” David C. Chan Jr. and Jonathan Gruber examine triage nurses’ assignment of an emergency severity index (ESI) to emergency department patients. They find that nurses’ triage decisions can affect mortality among those patients at risk of dying.
Association between Playing American Football in the National Football League and Long-term Mortality

Acute Myocardial Infarction Mortality during Dates of National Interventional Cardiology Meetings

Reduction in Firearm Injuries during NRA Annual Conventions

Infant Health and Future Childhood Adversity

Physicians’ Political Preferences and the Delivery of End of Life Care in the United States: Retrospective Observational Study

Financial Burden of Healthcare Utilization in Consumer-Directed Health Plans

Adherence to Guidelines for Screening and Medication Use: Mortality and Onset of Major Macrovascular Complications in Elderly Persons with Diabetes Mellitus

Identifying the Causes of Changes in Prevalence of Diabetes in Older Adults: A New Trend Partitioning Approach

Health Care Employment Growth and the Future of U.S. Cost Containment
Productivity Growth of Skilled Nursing Facilities in Treating Post-Acute-Care-Intensive Conditions

Adverse Selection into and within the Individual Health Insurance Market in California in 2014

Provider and Patient Satisfaction with the Integration of Ambulatory and Hospital EHR Systems

Patterns of Potential Opioid Misuse and Subsequent Adverse Outcomes in Medicare, 2008 to 2012

Predictive Modeling of U.S. Health Care Spending in Late Life

Not All Insurance Is Equal: Differential Treatment and Health Outcomes by Insurance Coverage Among Nonelderly Adult Patients With Heart Attack

Suicide and Additional Homicides Associated with Intimate Partner Homicide: North Carolina 2004-2013

Gun Theft and Crime

Do Incentives Undermine Intrinsic Motivation? Increases In Intrinsic Motivation Within An Incentive-Based Intervention For People Living With Hiv In Tanzania

Cash Incentives versus Defaults for HIV Testing: A Randomized Clinical Trial

Odds Ratios—Current Best Practice and Use

High-Impact and Transformative Science (HITS) Metrics: Definition, Exemplification, and Comparison

Is Inpatient Volume Or Emergency Department Crowding A Greater Driver Of Ambulance Diversion?

The Association of Firearm Caliber with Likelihood of Death from Gunshot Injury in Criminal Assaults
A. A. Braga and P. J. Cook, JAMA Network Open, July 2018, (published online).

Abstracts of Selected Recent NBER Working Papers

w24311
How Persistent Low Expected Returns Alter Optimal Life Cycle Saving, Investment, and Retirement Behavior
Vanya Horneff, Raimond Maurer, and Olivia S. Mitchell
This paper explores how an environment of persistent low returns influences saving, investing, and retirement behaviors, as compared to what in the past had been thought of as more “normal” financial conditions. Our calibrated lifecycle dynamic model with realistic tax, minimum distribution, and Social Security benefit rules produces results that agree with observed saving, work, and claiming age behavior of U.S. households. In particular, our model generates a large peak at the earliest claiming age at 62, as in the data. Also in line with the evidence, our baseline results show a smaller second peak at the (system-defined) full retirement age of 66. In the context of a zero return environment, we show that workers will optimally devote more of their savings to non-retirement accounts and less to 401(k) accounts, since the relative appeal of investing in taxable versus tax-qualified retirement accounts is lower in a low return setting. Finally, we show that people claim Social Security benefits later in a low interest rate environment.

w24347
Effects of Expanding Health Screening on Treatment — What Should We Expect? What Can We Learn?
Rebecca Mary Myerson, Darius Lakdawalla, Lisandro D. Colantonio, Monika Safford, and David Meltzer
Screening interventions can produce very different treatment outcomes, depending on the reasons why patients had been unscreened in the first place. Economists have paid scant attention to these complexities and their implications for evaluating screening programs. In this paper, we propose a simple economic framework to guide policy-makers and analysts in designing and evaluating the impact of screening on treatment uptake. We apply these insights to several salient empirical examples that illustrate the different kinds of effects screening programs might produce. Our empirical examples focus on contexts relevant to the top cause of death in the United States, heart disease. We find that currently undiagnosed patients differ from currently diagnosed patients in important ways, leading to lower predicted uptake of recommended treatment if these patients were diagnosed. Additionally, changes in the composition of diagnosed patients can produce misleading conclusions during policy analysis, such as spurious reductions in measured health system performance as screening expands.

w24405
The Retirement-Consumption Puzzle: New Evidence from Personal Finances
Arna Olafsson and Michaela Pagel
This paper uses a detailed panel of individual spending, income, account balances, and credit limits from a personal finance management software provider to investigate how expenditures, liquid savings, and consumer debt change around retirement. The longitudinal nature of our data allows us to estimate individual fixed-effects regressions and thereby control for all selection on time-invariant (un)observables. We provide new evidence on the retirement-consumption puzzle and on whether individuals save adequately for retirement. We find that, upon retirement, individuals reduce their spending in both work-related and leisure categories. However, we feel that it is difficult to tell conclusively whether expenses are work related or not, even with the best data. We thus look at household finances and find that individuals de-lever upon retirement by reducing consumer debt and increasing liquid savings. We argue that these findings are difficult to rationalize via, for example, work-related expenses. A rational agent would save before retirement because of the expected fall in income, and dissave after retirement, rather than the exact opposite.

w24528
Do Opioids Help Injured Workers Recover and Get Back to Work? The Impact of Opioid Prescriptions on Duration of Temporary Disability
Bogdan Savych, David Neumark, and Randall Lea
We estimate the effect of opioid prescriptions on the duration of temporary disability benefits among workers with work-related low back injuries. We use local opioid prescribing patterns to construct an instrumental variable that generates variation in opioid prescriptions but is arguably unrelated to injury severity or other factors affecting disability duration. Local prescribing patterns have a strong relationship with whether injured workers receive opioid prescriptions, including longer-term prescriptions. We find that more longer-term opioid prescribing leads to considerably longer duration of temporary disability, but little effect of a small number of opioid prescriptions over a short period of time.

w24595
Developing Novel Drugs
Joshua L. Krieger, Danielle Li, and Dimitris Papanikolaou
We analyze the economic tradeoffs associated with firms’ decisions to invest in incremental and radical innovation, in the context of pharmaceutical research and development. We develop a new, ex ante, measure of a drug candidate’s innovativeness by comparing its chemical structure to that of previously developed drug candidates: this allows us to better distinguish between novel and so-called “me-too” drugs. We show that, on average, novel drug candidates 1) generate higher private and social returns conditional on approval (as measured by revenues, stock market returns, clinical value added, and patent citations) but 2) are riskier in that they are less likely to be approved by the FDA. Using variation in the expansion of Medicare prescription drug coverage, we show that firms respond to a plausibly exogenous positive shock to their net worth by developing more chemically novel drug candidates, as opposed to more “me-too” drugs. This pattern suggests that, on the margin, firms perceive novel drugs to be more valuable ex-ante investments, but that financial frictions may hinder their willingness to invest in these riskier candidates.
w24623
Pauvreté, Egalité, Mortalité: Mortality (In)Equality in France and the United States
Janet Currie, Hannes Schwandt, and Josselin Thuilliez

We develop a method to compare levels and trends in inequality in mortality in the United States and France in a similar framework. The comparison shows that while income inequality has increased in both the United States and France, inequality in mortality in France remained remarkably low and stable. In the United States, inequality in mortality increased for older groups (especially women) while it decreased for children and young adults. These patterns highlight the fact that despite the strong cross-sectional relationship between income and health, there is no necessary connection between changes in income inequality and changes in health inequality.

w24642
Genetic Endowments and Wealth Inequality
Daniel Barth, Nicholas W. Papageorge, and Kevin Thom

We show that genetic endowments linked to educational attainment strongly and robustly predict wealth at retirement. The estimated relationship is not fully explained by flexibly controlling for education and labor income. We therefore investigate a host of additional mechanisms that could help to explain the gene-wealth gradient, including inheritances, mortality, savings, risk preferences, portfolio decisions, beliefs about the probabilities of macroeconomic events, and planning horizons. The associations we report provide preliminary evidence that genetic endowments related to human capital accumulation are associated with wealth not only through educational attainment and labor income, but also through a facility with complex financial decision-making. Our study illustrates how economic research seeking to understand sources of inequality can benefit from recent advances in behavioral genetics linking specific observed genetic endowments to economic outcomes.

w24686
Air Pollution and Mental Health: Evidence from China
Shuai Chen, Paulina Oliva, and Peng Zhang

A large body of literature estimates the effect of air pollution on health. However, most of these studies have focused on physical health, while the effect on mental health is limited. Using the China Family Panel Studies (CFPS) covering 12,615 urban residents during 2014 – 2015, we find significantly positive effect of air pollution — instrumented by thermal inversions — on mental illness. Specifically, a one-standard-deviation (18.04 μg/m³) increase in average PM2.5 concentrations in the past month increases the probability of having a score that is associated with severe mental illness by 6.67 percentage points, or 0.33 standard deviations. Based on average health expenditures associated with mental illness and rates of treatment among those with symptoms, we calculate that these effects induce a total annual cost of USD 22.88 billion in health expenditures only. This cost is on a similar scale to pollution costs stemming from mortality, labor productivity, and dementia.

w24691
Does Prenatal WIC Participation Improve Child Outcomes?
Anna V. Chorniy, Janet Currie, and Lyudmyla Sonchak

Large literatures document positive effects of WIC on birth outcomes, and separately connect health at birth and future outcomes. But little research investigates the link between prenatal WIC participation and childhood outcomes. We explore this question using a unique data set from South Carolina which links administrative birth, Medicaid, and education records. We find that relative to their siblings, prenatal WIC participants have a lower incidence of ADHD and other common childhood mental health conditions and of grade repetition. These findings demonstrate that a “WIC start” results in persistent improvements in child outcomes across a range of domains.

w24753
Childhood Health Shocks, Comparative Advantage, and Long-Term Outcomes: Evidence from the Last Danish Polio Epidemic
Miriam Gensowski, Torben Heien Nielsen, Nete Munk Nielsen, Maya Rossin-Slater, and Miriam Wüst

A large literature documents that childhood health shocks have lasting negative consequences for adult outcomes. This paper demonstrates that the adversity of childhood physical disability can be mediated by individuals’ educational and occupational choices, which reflect their comparative advantage. We merge records on children hospitalized with poliomyelitis during the 1952 Danish epidemic to census and administrative data, and exploit quasi-random variation in paralysis incidence. While childhood disability increases the likelihood of early retirement and disability pension receipt at age 50, paralytic polio survivors obtain higher education and are more likely to work in white-collar and computer-demanding jobs than their non-paralytic counterparts.