Measuring the Cost of Disease
With Applications to ADRD

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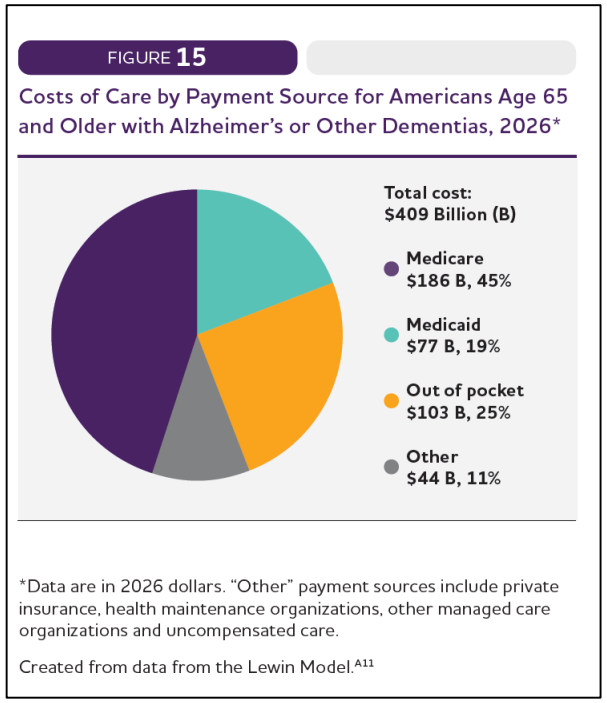
The cost of disease shows up in many questions

What would be the gains from slowing down the progression of ADRD?

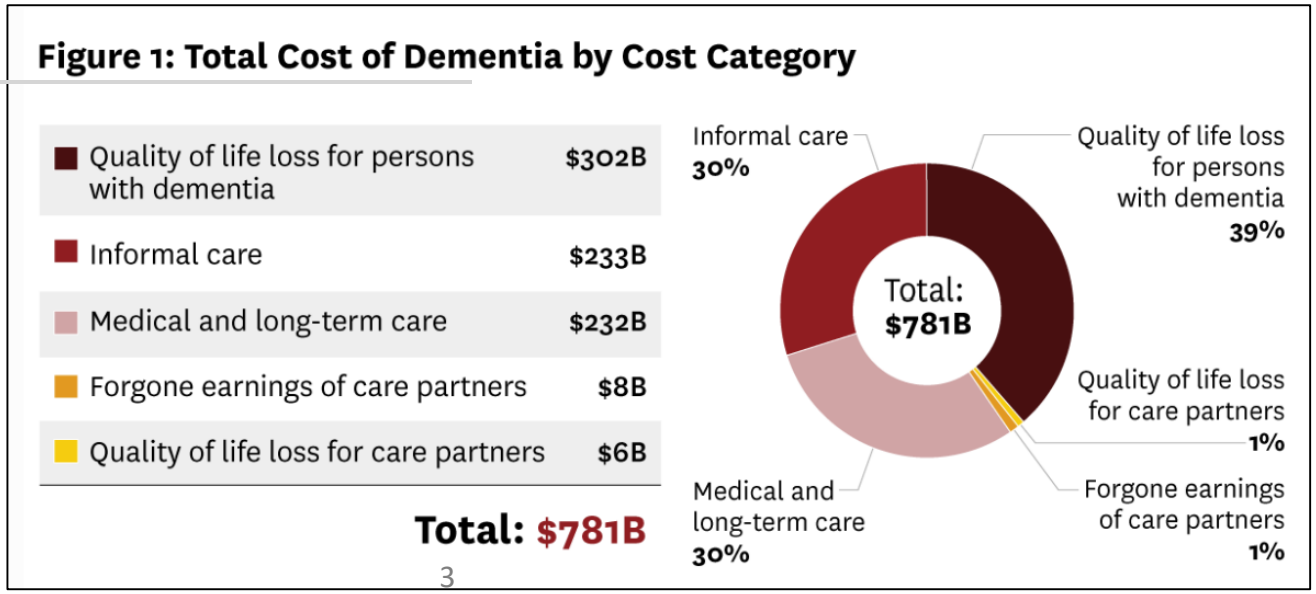
Would it be more valuable to cure cancer or prevent ADRD?

Two estimates of the cost of dementia

Alzheimer's Association, 2026



Schaeffer Center, 2026



Issues

- Be precise about the question
  - How would {social welfare / medical spending} be different if {we could eliminate ADRD / we were able to slow the progression of ADRD}
  - Note that “where should we invest in research?” is a different question – it also depends on how much value the research would bring in different areas?

What counts in social welfare?

Social Costs

- (Formal and informal) resources devoted to caring for people that would otherwise not be needed
- (Monetized) value of health loss for individual and their family
- Deadweight loss of raising money to pay for transfers

Transfer

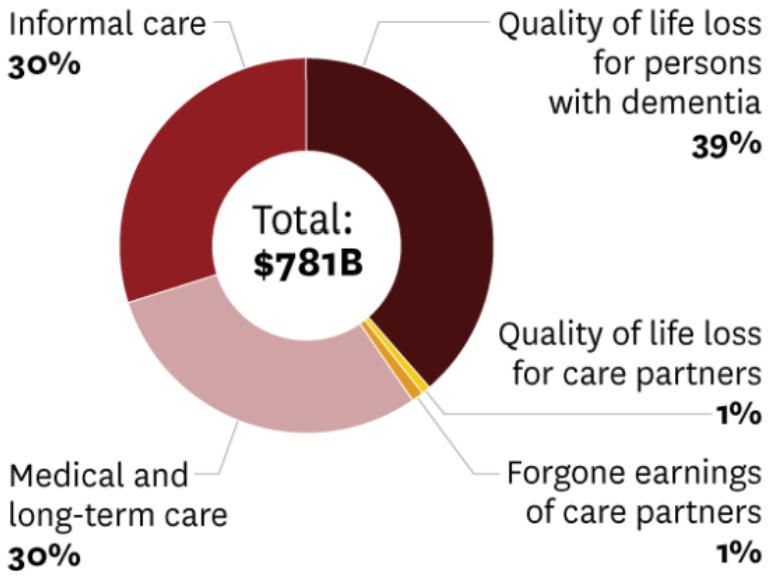
- Housing in one building (nursing facility) vs. another building (apartment or house)
  - Just become money changes hands, that doesn't make it a social cost
- Profits paid by one party to another (Rx meds)

The utility loss is often greater than the dollar cost

Figure 1: Total Cost of Dementia by Cost Category

Quality of life loss for persons with dementia	$302B
Informal care	$233B
Medical and long-term care	$232B
Forgone earnings of care partners	$8B
Quality of life loss for care partners	$6B

Total: $781B



Issues

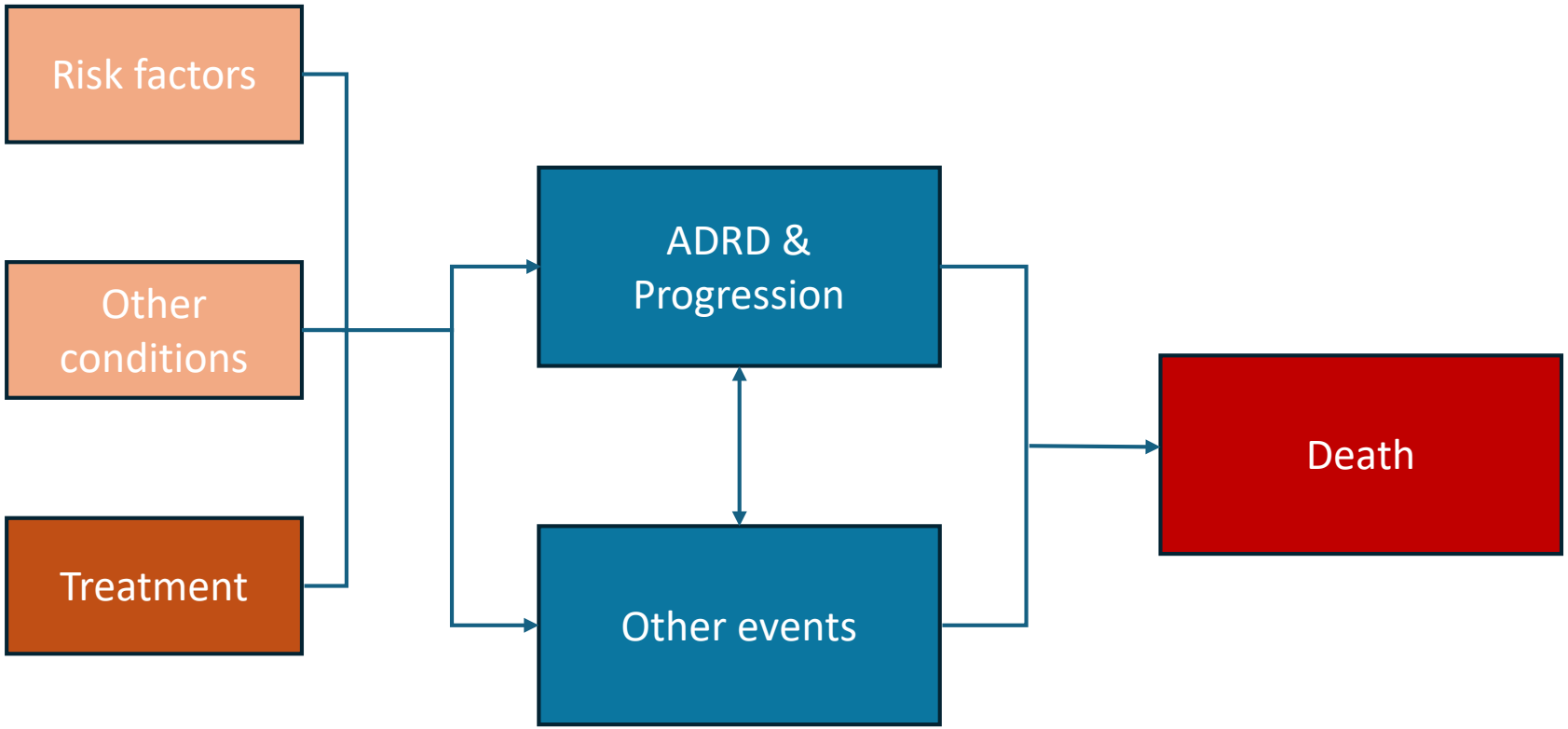
- Be precise about the question

- Disease costing
  - Diagnosed conditions often don’t tell the whole story about the cost of a disease
    - Was the patient in the hospital because of a stroke or because mental/physical health challenges made taking medications difficult?
    - As prevalence of one disease changes, does prevalence of other diseases change as well?

Some questions require more

- What would be the value of an intervention that reduced the prevalence and severity of ADRD?
  - A new medication
  - Education early in life (strong association with cognition)
  - Sensory impairment (seeing, hearing)
  - Chronic diseases leading to ADRD (stroke, heart disease, depression)
  - Environment (small particulate matter pollution)

The model for ADRD



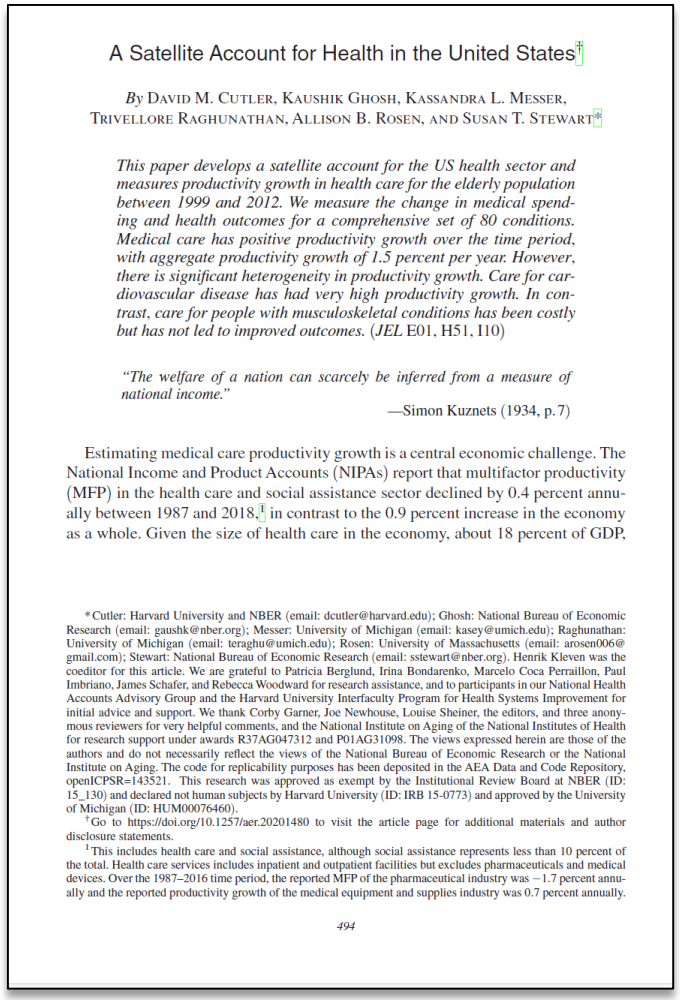
Important questions

- How do we compare investments in new medications vs pollution reduction / people taking anti-hypertensives, etc.?

- How does ADRD treatment affect future conditions and need for medical care?

One way to do this

- How much additional **total** medical care does a person with condition X use relative to an otherwise similar person without condition X?
  - Total = paid + unpaid
  - E.g., ADRD, mood disorder, etc.
- Reallocate from “final diseases” to “risk factors” (e.g., dementia → mood disorders)



A Satellite Account for Health in the United States†

By David M. Cutler, Kaushik Ghosh, Kassandra L. Messer, Trivellore Raghunathan, Allison B. Rosen, and Susan T. Stewart*

This paper develops a satellite account for the US health sector and measures productivity growth in health care for the elderly population between 1999 and 2012. We measure the change in medical spending and health outcomes for a comprehensive set of 80 conditions. Medical care has positive productivity growth over the time period, with aggregate productivity growth of 1.5 percent per year. However, there is significant heterogeneity in productivity growth. Care for cardiovascular disease has had very high productivity growth. In contrast, care for people with musculoskeletal conditions has been costly but has not led to improved outcomes. (*JEL* E01, H51, I10)

“The welfare of a nation can scarcely be inferred from a measure of national income.”

—Simon Kuznets (1934, p. 7)

Estimating medical care productivity growth is a central economic challenge. The National Income and Product Accounts (NIPAs) report that multifactor productivity (MFP) in the health care and social assistance sector declined by 0.4 percent annually between 1987 and 2018,[1] in contrast to the 0.9 percent increase in the economy as a whole. Given the size of health care in the economy, about 18 percent of GDP,

*Cutler: Harvard University and NBER (email: dcutler@harvard.edu); Ghosh: National Bureau of Economic Research (email: gaushk@nber.org); Messer: University of Michigan (email: kasey@umich.edu); Raghunathan: University of Michigan (email: teraghu@umich.edu); Rosen: University of Massachusetts (email: arosen006@gmail.com); Stewart: National Bureau of Economic Research (email: sstewart@nber.org). Henrik Kleven was the coeditor for this article. We are grateful to Patricia Berglund, Irina Bondarenko, Marcelo Coca Perraillon, Paul Imbriano, James Schafer, and Rebecca Woodward for research assistance, and to participants in our National Health Accounts Advisory Group and the Harvard University Interfaculty Program for Health Systems Improvement for initial advice and support. We thank Corby Garner, Joe Newhouse, Louise Sheiner, the editors, and three anonymous reviewers for very helpful comments, and the National Institute on Aging of the National Institutes of Health for research support under awards R37AG047312 and P01AG31098. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research or the National Institute on Aging. The code for replicability purposes has been deposited in the AEA Data and Code Repository, openICPSR=143521. This research was approved as exempt by the Institutional Review Board at NBER (ID: 15_130) and declared not human subjects by Harvard University (ID: IRB 15-0773) and approved by the University of Michigan (ID: HUM00076460).

†Go to https://doi.org/10.1257/aer.20201480 to visit the article page for additional materials and author disclosure statements.

[1]This includes health care and social assistance, although social assistance represents less than 10 percent of the total. Health care services includes inpatient and outpatient facilities but excludes pharmaceuticals and medical devices. Over the 1987–2016 time period, the reported MFP of the pharmaceutical industry was −1.7 percent annually and the reported productivity growth of the medical equipment and supplies industry was 0.7 percent annually.

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This matters

Table 1. Estimated total cost in 2009 (billions of 2010 US $) using different methods.

	Total Attributed Cost (Billions)			% of Total Spending		
Multi-level CCS	**Claims**	**Regression**	**Propensity Score**	**Claims**	**Regression**	**Propensity Score**
7-Diseases of the circulatory system	$148.1	$119.3	$144.8	23.0%	18.5%	22.5%
16-Other conditions	41.3	121.1	83.4	6.4%	18.8%	13.0%
8-Diseases of the respiratory system	53.4	35.5	62.4	8.3%	5.5%	9.7%
3-Endocrine; nutritional; and metabolic disease	49.2	48.9	54.9	7.6%	7.6%	8.5%
6-Diseases of the nervous system	64.0	43.0	44.9	9.9%	6.7%	7.0%
10-Diseases of the genitourinary system	38.1	28.6	41.6	5.9%	4.4%	6.5%
5-Mental Illness	30.8	18.3	39.5	4.8%	2.8%	6.1%
15-Injury and poisoning	27.5	26.1	37.0	4.3%	4.1%	5.7%
13-Diseases of the musculoskeletal system	62.2	41.6	36.1	9.7%	6.5%	5.6%
4-Diseases of the blood	17.7	12.9	32.8	2.7%	2.0%	5.1%
9-Diseases of the digestive system	28.1	33.1	28.5	4.4%	5.1%	4.4%
2-Neoplasms	41.4	27.6	22.5	6.4%	4.3%	3.5%
1-Infectious and parasitic diseases	20.3	12.6	14.4	3.2%	2.0%	2.2%
12-Diseases of the skin and subcutaneous tissue	12.6	12.7	7.9	2.0%	2.0%	1.2%
14 -Congenital Anomalies & perinatal	4.6	2.4	4.6	0.7%	0.4%	0.7%
11-Complications of pregnancy; childbirth, etc.	1.4	0.5	-0.2	0.2%	0.1%	0.0%
17-Screening	3.0	1.9	-11.5	0.5%	0.3%	-1.8%
Other covariates (including intercept)	X	57.7	X	X	9.0%	X
Total	$643.7	$643.7	$643.7	100.0%	100.0%	100.0%

Spending on diseases of the nervous system are somewhat overstated (as is CVD). Mental health and ‘frailty’ are understated.

Issues

- Be precise about the question
- Disease costing
- Quality of life
  - This is often one of the largest costs

Disutilities

- Often determined based on self-assessments of health
  - This is hard to do with ADRD – need cognitive capacity to answer surveys
  - Estimates are relatively sparse: most estimates based on 679 people, published in 1999.
  - Disutilities are -0.27 to -0.86, based on severity of disease.

- Also disutility for caregivers
  - This is important. Why do we are about whether someone had a ‘good death’.

- Is ‘fear of the disease’ a cost to take into account?
  - What if people are afraid of a disease that people with the disease don’t think is that bad?

- Value of health is ‘hard’ (but not really – just choose a number)

Conclusion

- Cost of disease is a tricky business

- The issues are not just statistical. There are important conceptual concerns too.