Tracking the Burden of Alzheimer's Disease and Dementia in the United States: The Health and Retirement Study (HRS)

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HRS

No Financial Conflicts of Interest

Overview

- Definitions and Background
- Tracking the Burden of Alzheimer's Disease and Dementia in the US with the Health and Retirement Study (HRS)
- Trends in Dementia Incidence / Prevalence

Definitions and Background

Definitions: Epidemiology of Dementia

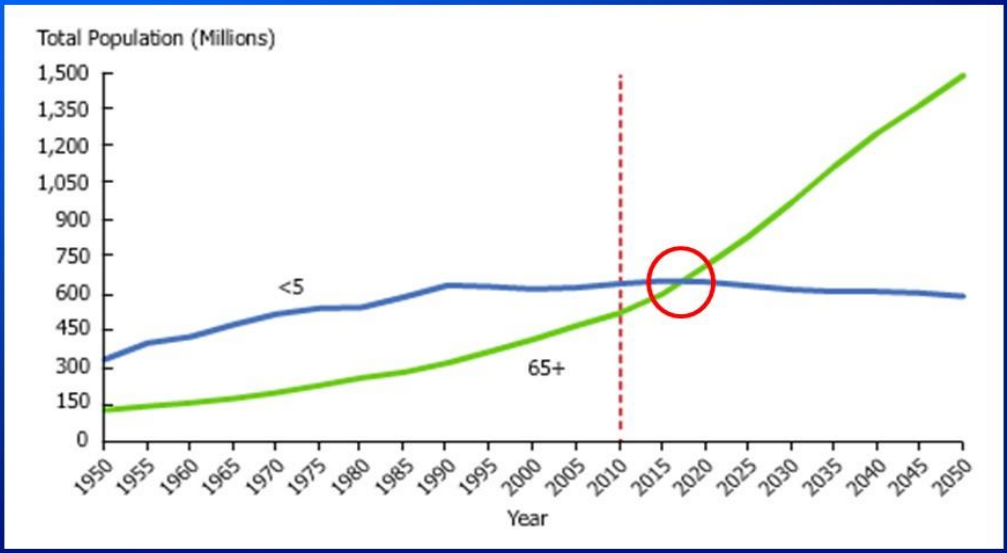
- Prevalence Rate
  - The proportion of individuals in a defined population with the disease / condition
- Incidence Rate
  - Number of new cases of disease in a defined population during a specified time interval
- Prevalence is a function of the incidence rate, and life expectancy with the disease
- The number of cases of disease can increase, even if the incidence / prevalence rate declines
  - "Age-specific" individual risk vs. Total cases in population

Complexities in Dementia Epidemiology

- Identifying the "Dementia Threshold"
  - Typically a slowly progressive condition, so difficult to define time of onset of "impairment of usual activities"
- Methodological Challenges
  - Need for proxy respondents
  - Institutional populations
  - Population-based vs. Clinic-based samples?
- International Comparisons
  - Differences in language, education, social structures complicate comparisons of testing and definitions of "disability"
  - Differences in life-expectancy may lead to different populations at risk across countries

Demographic Imperative

World Population, Age 65+ and Age <5



Source: Population Reference Bureau

Tracking AD and Dementia using the Health and Retirement Study (HRS)

Health and Retirement Study (HRS)

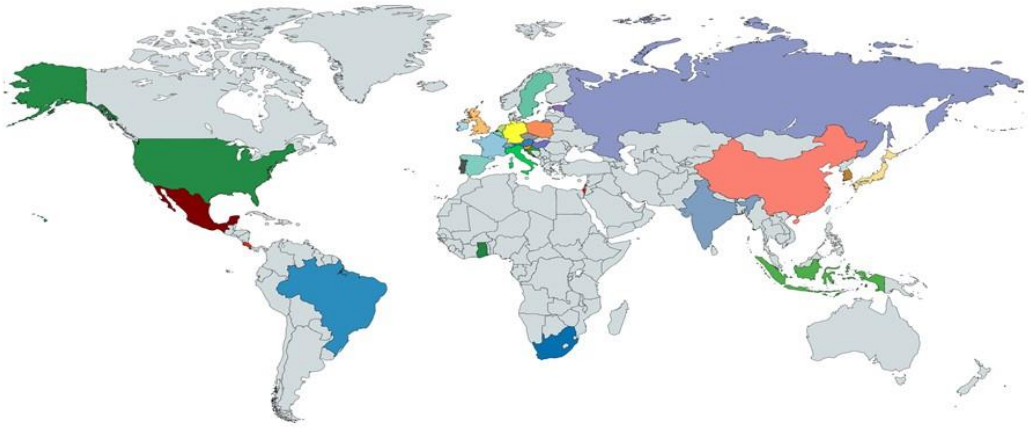
- Ongoing, nationally representative, longitudinal, biennial survey of ~ 20,000 Americans aged > 50
- Performed at the UM Institute for Social Research, funded by the NIA and SSA (PI: David Weir)
- Data collection started in 1992
- Extensive data on health, cognition, economics, work, and family from a national sample
- Face-to-face and telephone interviews (50 / 50)
- > 4,000 HRS publications by > 2,000 authors; >20,000 registered data users

Source: Sonnega et al, *International J of Epidemiology*, 2014.

HRS Survey Content

- Demographic characteristics
- Physical and functional health
- Performance-based cognitive testing
- Family structure and transfers
- Employment status, job history, and disability
- Retirement plans and perspectives
- Assets, income, and net worth
- Housing and services use
- Health insurance and pension plans
- Out-of-pocket health costs
- Links to data from employers, Medicare, NDI, VA, and SSA
- Biomarkers (2006)
  - Cholesterol, HgbA1c, CRP, Cystatin C, BP, Pulse, Peak flow, Balance, Gait
  - Venous Blood in 2016
- Genetics (2012)
  - 2.5 M SNPs on 20,000 people

HRS INTERNATIONAL PARTNER STUDIES AROUND THE WORLD



Harmonization tool at USC Gateway to Global Aging
g2aging.org

HRS

Tracking Brain Health in the HRS

- Modified Telephone Interview for Cognitive Status
  - orientation to day, date, month, year
  - immediate and delayed recall of 10 nouns
  - serial 7 subtraction
  - counting backwards
  - object naming
  - naming of the president and vice-president
- Verbal fluency
- Number Series
- Numeracy questions
- Speed of processing
- Self report of:
  - Memory function; ADL / IADL limitations; prior diagnosis of AD or dementia; medications for AD or dementia

Tracking Brain Health in the HRS (2)

- Protective and risk factors for brain health
  - CV disease risks (measured BP, obesity, health behaviors)
  - Acute medical events (stroke, sepsis, CABG => Medicare)
  - Genetics (ApoE, 2.5 million SNPs)
  - Education and leisure time activities (reading, puzzles, etc.)
  - Employment history, wealth
  - Social ties and extent of social interactions
  - Early-life factors (childhood health, parents' education)
- Respondents represented by proxy:
  - IQCODE
  - Memory function, judgment, and change over the last 2 years
  - Doctor diagnosed AD or dementia
  - ADL / IADL limitations
- "Exit" Interview for those who have died

Aging, Demographics, and Memory Study (ADAMS)

- Supplemental study to the HRS funded by the NIA
- First US national, population-based study of dementia to include subjects from all regions of the country
- Initial field period: 2001 – 2005, follow-up through 2010
- 856 HRS subjects, evaluated in their homes
  - 3-4 hour neuropsychological assessment, neuro exam, informant interview, ApoE genotype
- Consensus panel diagnosis of CIND or dementia, with differential diagnosis of cause (AD, Vascular, Other)

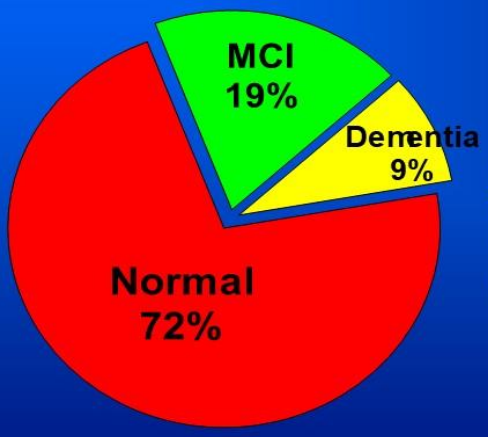
Source: Langa et al, *Neuroepidemiology*, 2005.

Defining Dementia in the HRS

- Equipercentile Equating
  - Define cut-points on HRS cognitive (and other) measures that result in similar dementia prevalence estimates as the "gold-standard" ADAMS estimates
- Regression-based Algorithms
  - Multivariable models derived from relevant HRS cognitive, health, and sociodemographic measures that provide probability of dementia for each respondent
  - Wu – Glymour, 2012; Hurd et al, 2013; Cleret de Langavant – Yaffe 2018; Gianattasio et al, 2019 and 2020
  - Accuracy ≥ 90% with most models; important to consider differing accuracy across race / ethnicity (Gianattasio papers)

Sources: Langa et al, *Alz Assoc*, 2009; Crimmins et al, *J. of Geron*, 2011; Wu et al, *ADAD*, 2012; Hurd et al, *NEJM*, 2013; Cleret de Langavant et al, *Med Int Res*, 2018; Gianattasio et al, *Epid*, 2019, 2020.

HRS-ADAMS Estimates of 2012 US Population Prevalence, Age 65+

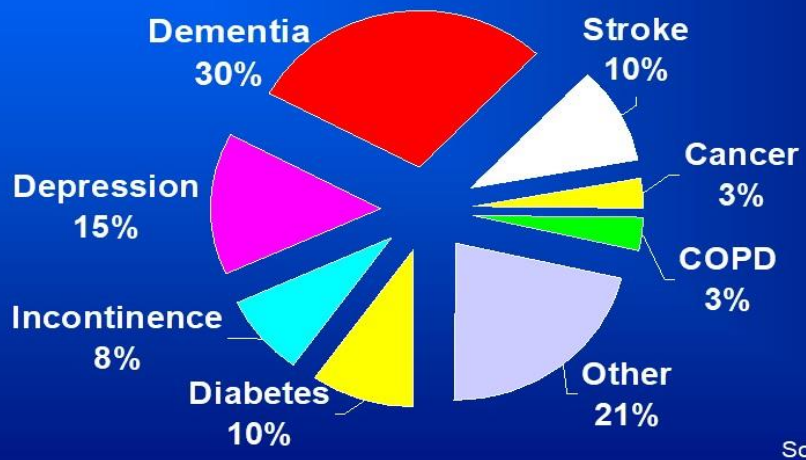


US Population, Age 65+:

Dementia	**4.0 – 4.5 million**
MCI	**8.0 – 8.7 million**

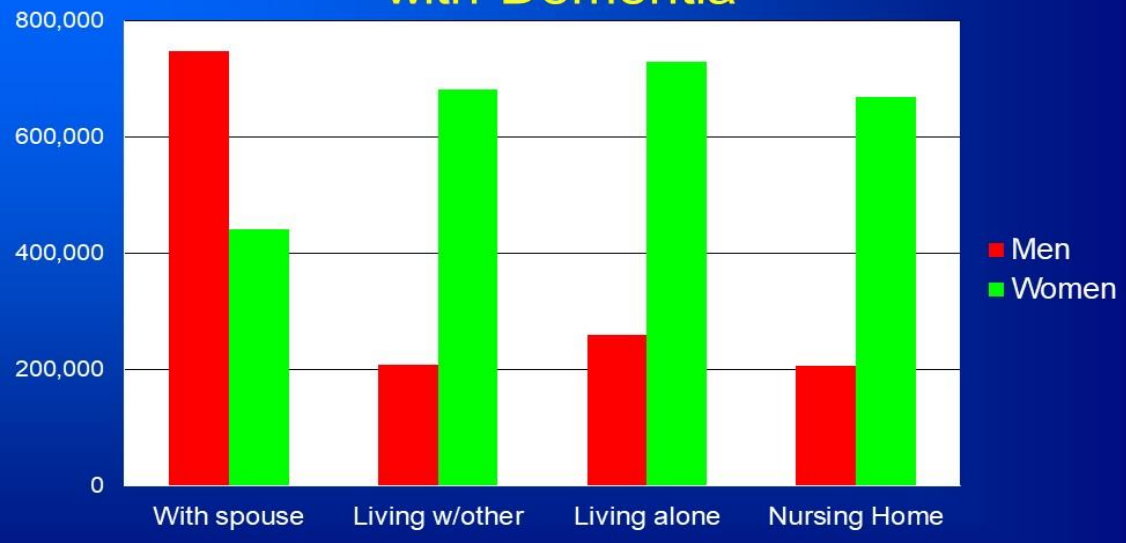
Sources: Plassman, et al, *Neuroepidemiology*, 2007; *Annals of Internal Medicine*, 2008; Langa et al, *JAMA IM, 2017.*

Dementia and the Family
Informal Caregiving Time and Cost, USA

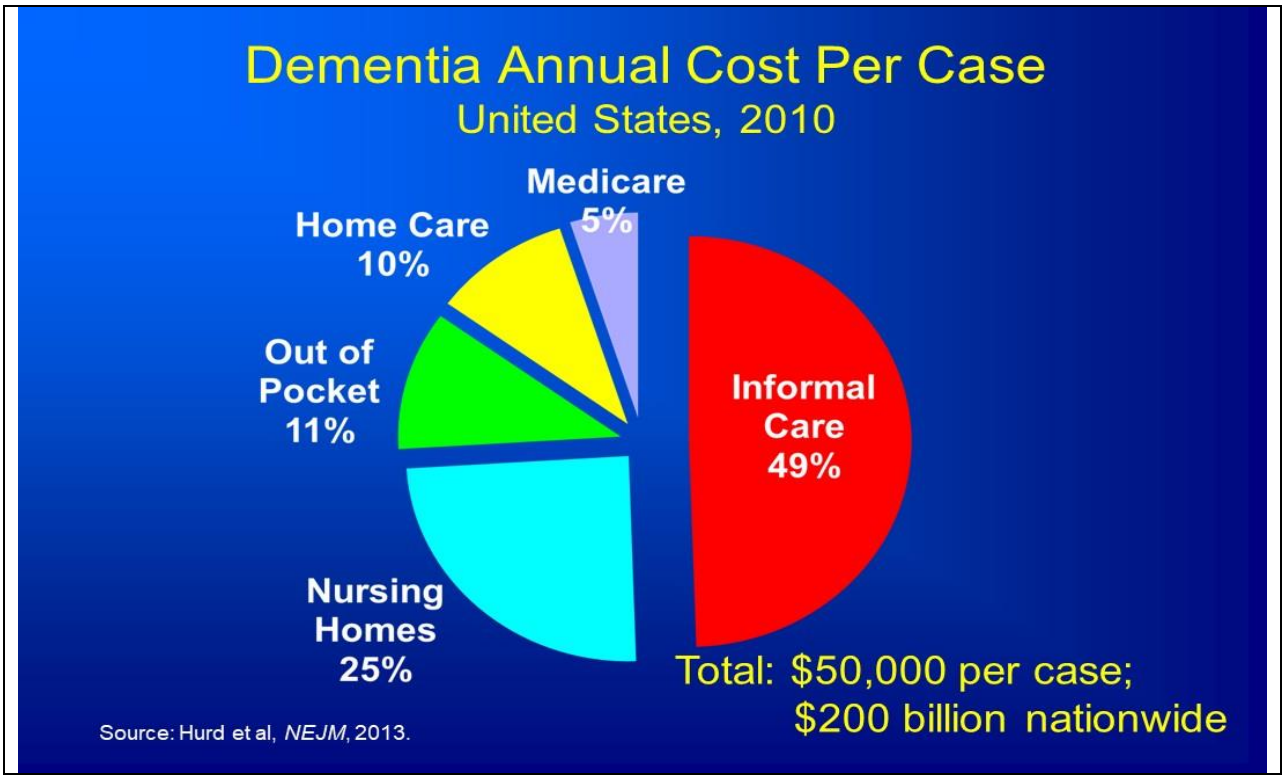


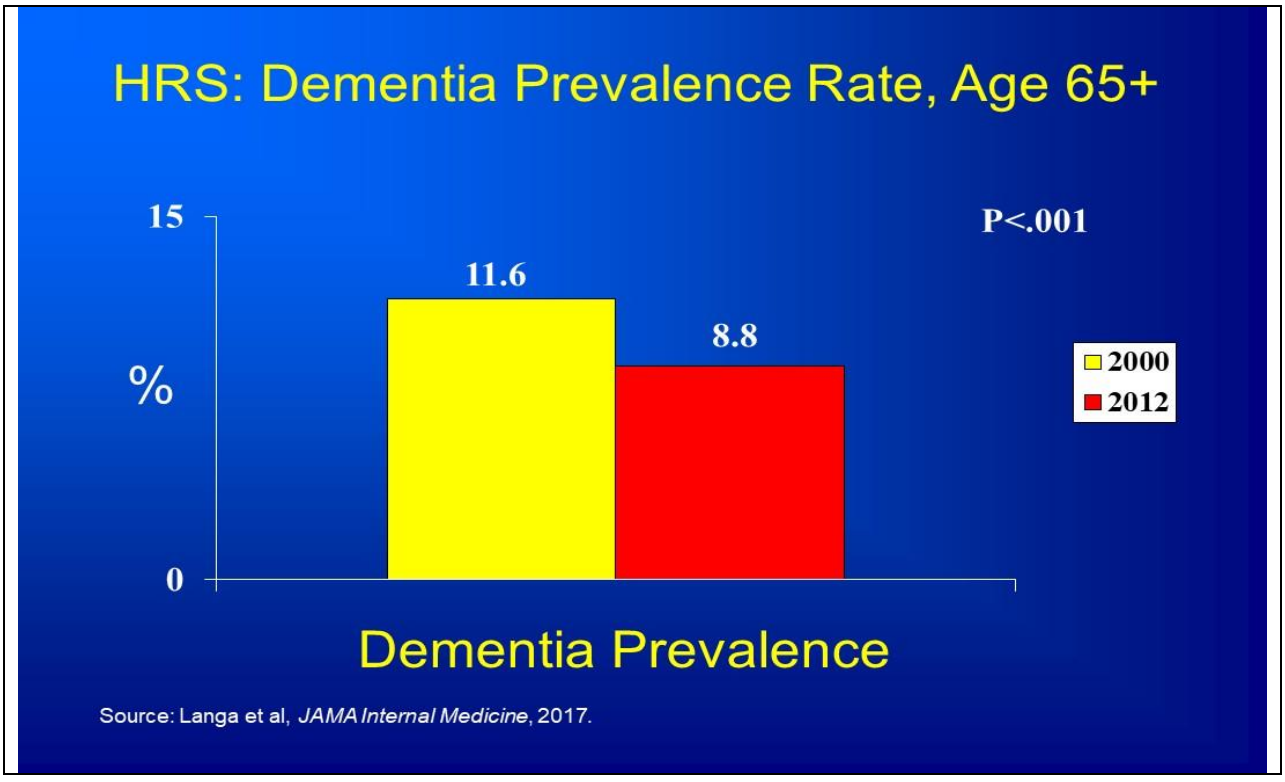
Sources: Langa et al, 2000 - 2004.

Living Arrangements of US Adults 65+ with Dementia



Source: Langa, Kabeto, Weir, HRS 2012, unpublished data.


Dementia Annual Cost Per Case
United States, 2010
Medicare 5%
Home Care 10%
Out of Pocket 11%
Informal Care 49%
Nursing Homes 25%
Total: $50,000 per case; $200 billion nationwide
Source: Hurd et al, NEJM, 2013.


HRS: Dementia Prevalence Rate, Age 65+
15
0
%
11.6
8.8
P<.001
2000
2012
Dementia Prevalence
Source: Langa et al, JAMA Internal Medicine, 2017.

Studies of Population Trends

- Declining Age-Specific Prevalence / Incidence of Dementia:
  - US NLTCS (Manton et al, 2005)
  - US HRS (Langa et al, 2008, 2017; Hudomiet et al. 2018)
  - UK CFAS / ELSA (Llewellyn and Matthews, 2009)
  - US Mayo Clinic Study on Aging (Rocca, 2011)
  - Rotterdam Study (Schrijvers et al, 2012)
  - Swedish Kungsholmen Project (Qiu et al, 2013)
  - Danish Cohorts Study (Christensen et al, 2013)
  - UK Cognitive Function and Ageing Study (Matthews et al, 2013, 2016)
  - US MoVIES Cohort (Dodge et al, 2014, 2016)
  - US Framingham Heart Study (Satizabal et al, 2016)
  - Indianapolis-Ibadan Project (Gao et al, 2016; Hendrie et al, 2018)
  - US NLTCS (Stallard and Yashin, 2016)
  - US Americans' Changing Lives Study (Leggett et al, 2017)
  - US Einstein Aging Study (Derby et al, 2017)
  - US NHATS (Freedman et al, 2018)

Recent Studies Suggesting Declining Age-Specific Dementia Risk

Selected Recent Studies of the Dementia Epidemic.

Study	Outcome	Data Source	Key Findings	Factors
Manton et al. (United States)[1]	Prevalence of severe cognitive impairment	National long-term care survey interviews, 1982–1999	Decline in dementia prevalence among people ≥65 yr of age (5.7% to 2.9%)	Higher educational level, decline in stroke incidence
Langa et al. (United States)[2]	Prevalence of cognitive impairment	Ongoing population-based survey of people ≥51 yr of age	Prevalence of cognitive impairment among people ≥70 yr of age (12.2% in 1993 vs. 8.7% in 2002)	Higher educational level; combination of medical, lifestyle, demographic, and social factors
Schrijvers et al. (Rotterdam)[3]	Incidence of dementia	Population-based cohort ≥55 yr of age in 1990, extended in 2000	Incidence rate ratios (6.56 per 1000 person-yr in 1990 vs. 4.92 per 1000 person-yr in 2000)	Higher educational level, reduction in vascular risk, decline in stroke incidence
Qiu et al. (Stockholm)[4]	Prevalence of DSM-III-R dementia*	Cross-sectional survey of people ≥75 yr of age, 1987–1989 and 2001–2004	Age- and sex-standardized dementia prevalence (17.5% in 1987–1989 vs. 17.9% in 2001–2004); lower hazard ratio for death in later cohort suggests decreased dementia incidence	Favorable changes in risk factors, especially vascular risk; healthier lifestyles
Matthews et al. (England)[5]†	Prevalence of dementia in 3 regions	Survey interviews of people ≥65 yr of age, 1989–1994 (in CFAS I) and 2008–2011 (in CFAS II)	Dementia prevalence (8.3% in CFAS I vs. 6.5% in CFAS II)	Higher educational level, better prevention of vascular disease

Source: Larson, Yaffe, and Langa, *NEJM*, 2013.

Harmonized Cognitive Assessment Protocol (HCAP)

- New HRS sub-study of dementia funded by the NIA
- One-hour of cognitive testing and 20-minute informant interview in sub-sample (N~3,500) of HRS respondents
- Will produce a replicable algorithmic diagnosis for use in HCAP sub-samples and the full samples of a number of the HRS international family of studies
- Creates a public data resource to track dementia burden in high- and low-income countries around the world

Source: Langa et al, *Neuroepidemiology*, 2019.

Conclusions

- Nationally-representative population-based studies are important resources for tracking the epidemiology of dementia as populations age around the world
- Rising levels of education and better control of cardiovascular risk factors may have contributed over the last few decades to a decline in age-specific dementia risk in older adults in high-income countries
- Primary prevention of dementia through social and behavioral interventions appears possible and valuable

HRS / ADAMS / HCAP Funding

National Institute on Aging

Social Security Administration

THANK YOU