HRS | HEALTH AND RETIREMENT STUDY
A Longitudinal Study of Health, Retirement, and Aging
Sponsored by the National Institute on Aging

Longitudinal Study Design

International Seminar on Design, Collection, And Analysis of Longitudinal Data in Mexico

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Centro de Investigación y Docencia Económicas, sede Región Centro. Aguascalientes, México.

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Outline

- HRS
- Examples of longitudinal research
- Methods research on longitudinal study designs for
  - Tracking
  - Response
  - Item response

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Key features of HRS

- Public use
- Longitudinal
- Multi-disciplinary
- Innovative
- Nationally representative
- Internationally comparable (harmonized)

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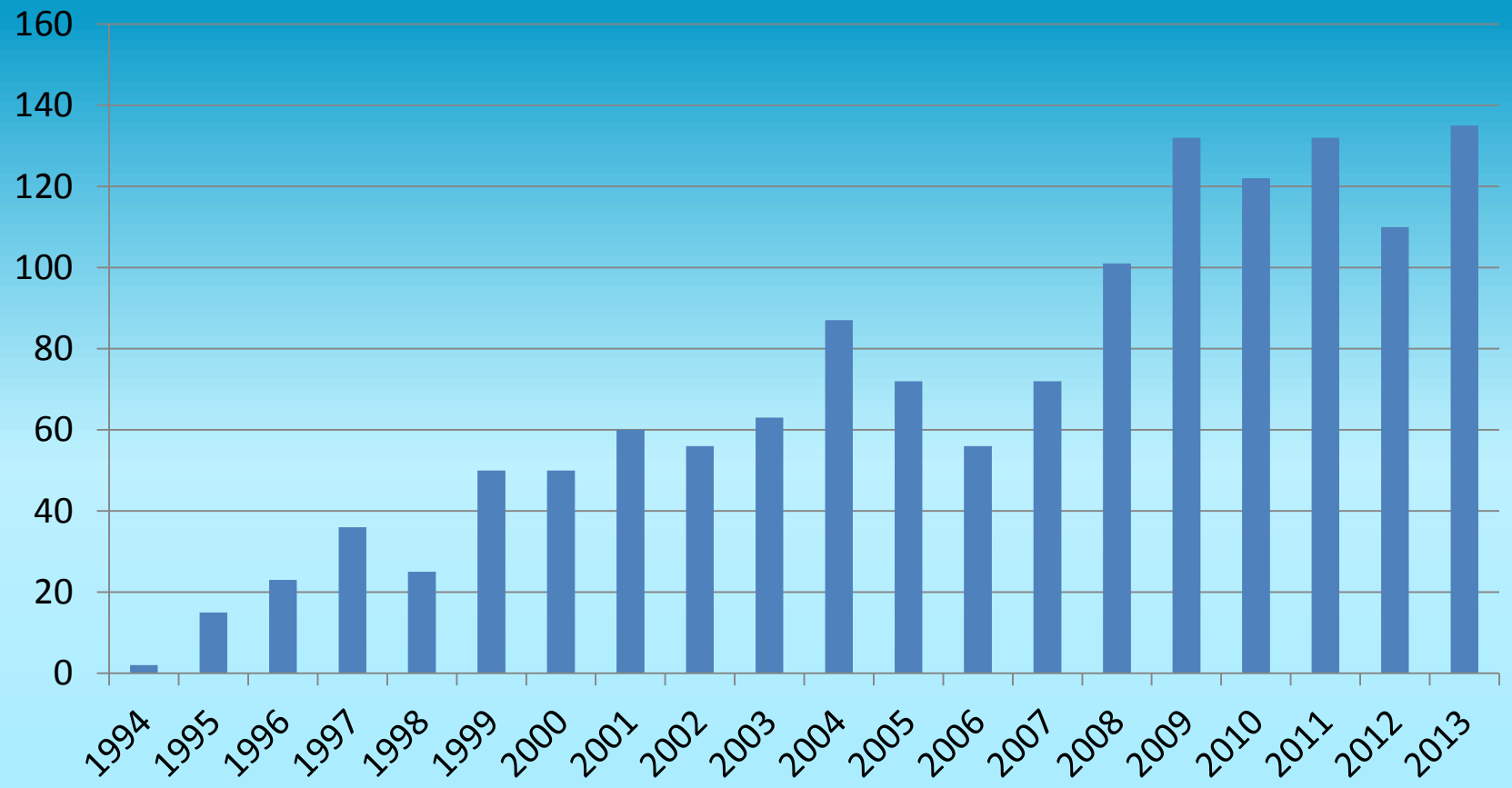
Number of New Peer-Reviewed Journal Articles per Year Using HRS



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HRS has been built up over time, both in sample and in content

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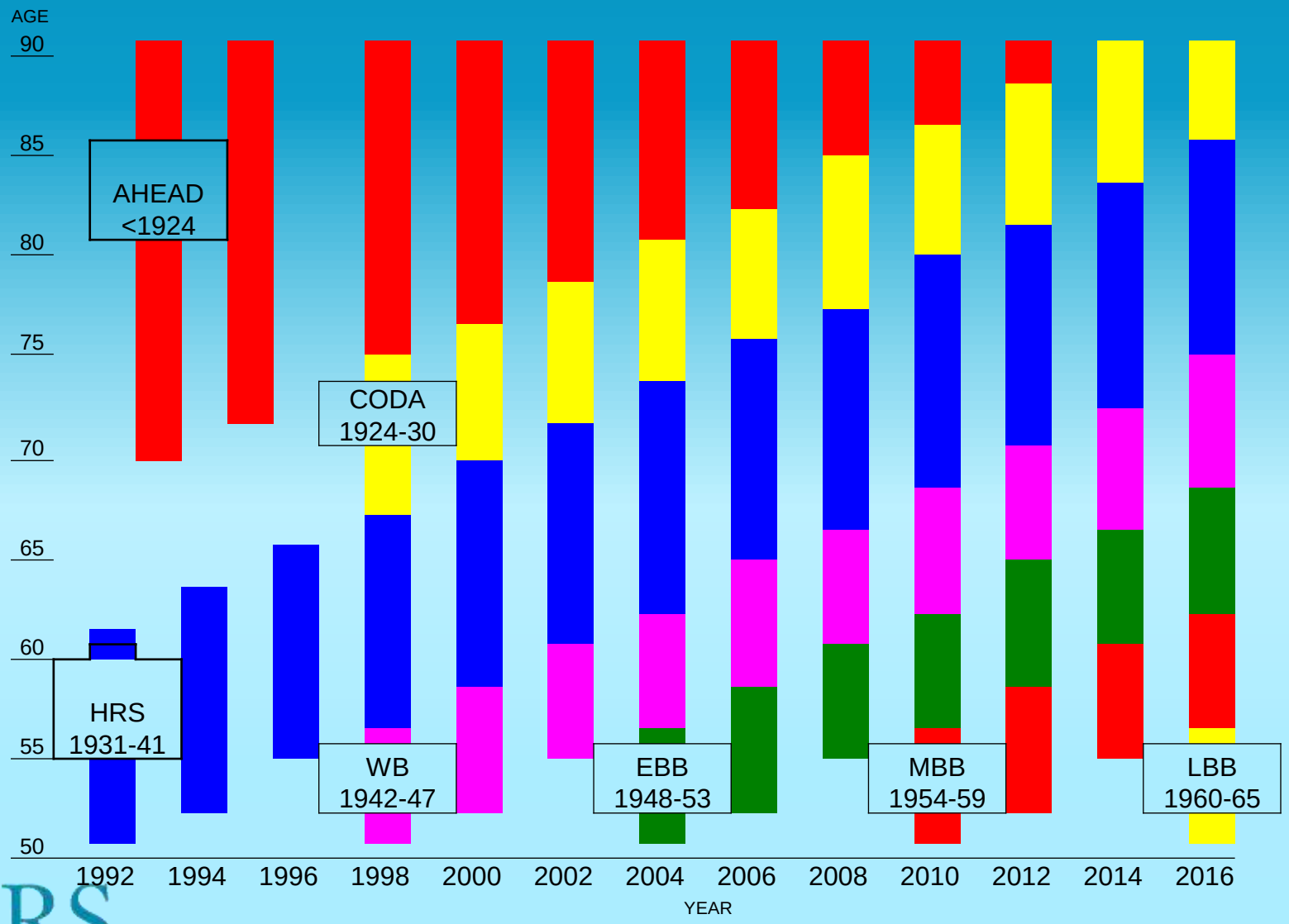
HRS Longitudinal Sample Design



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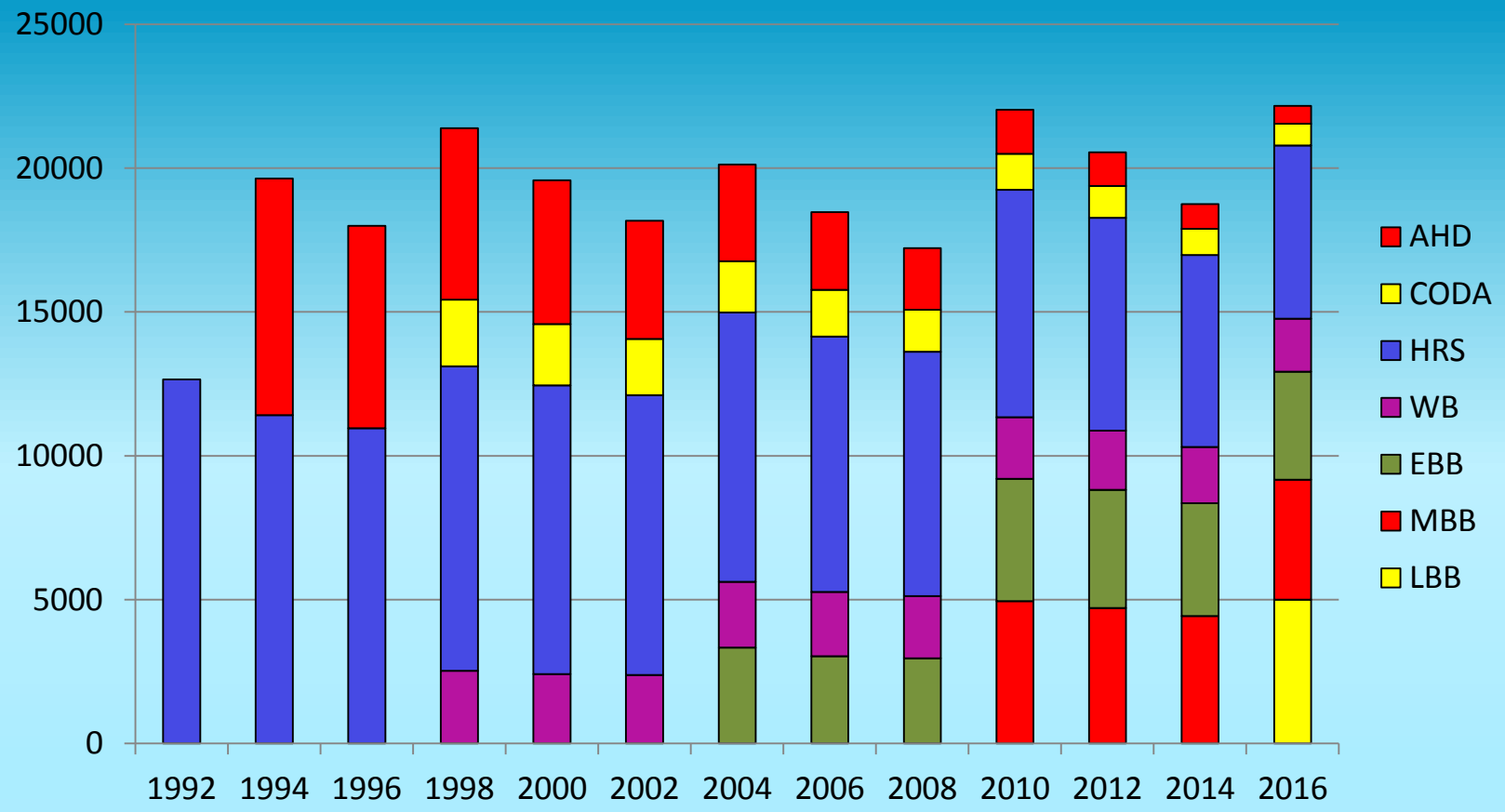
Number of Interviews by Entry Cohort and Year



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Steady-state sample

- Goal is to maintain a total sample of about 22,500 persons giving 20,000 interviews each wave
- Requires each new cohort to be about 5,000 people to replace deaths in the older cohorts
- We are a longitudinal study, but also a fresh cross-section recruiter

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Ancillary studies: the main sample serves as a source for sub-samples

- In-depth studies of specific conditions
  - Dementia (ADAMS 2002; HCAP 2016)
  - Diabetes (2003)
- Mail surveys
  - Prescription drug use
  - Consumption expenditure (panel started in 2001)
  - Nutritional intake (2013)
- Internet surveys

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Administrative Linkages

- Supply data more accurately and easily than asking people to report it
- Individual match:
  - Social Security earnings and benefits
  - Medicare records
  - National Death Index
  - Veteran's Administration (in progress)
- Employer
  - Pension plans
  - Census Business Register (in progress)

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Major expansion in 2006

- Psychology
  - Personality, well-being, stress, social support
- Biology
  - Direct measures of health status, risk factors
  - Genetics
- In-person interviewing

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Major components of new HRS interview

- Anthropometry
  - Height, weight, waist
- Blood pressure
- Physical performance measures
  - Gait speed, grip strength, lung function, balance
- Dried blood spots
  - HbA1c, cholesterol, CRP, cystatin-C, more?
- Saliva for DNA
- Psychosocial questionnaire

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Biomarkers

- GWAS plus exome on 19,000 people available through dbGaP
- Whole blood draws planned for 2016
  - Assays of immunosenescence, inflammation, epigenetic changes

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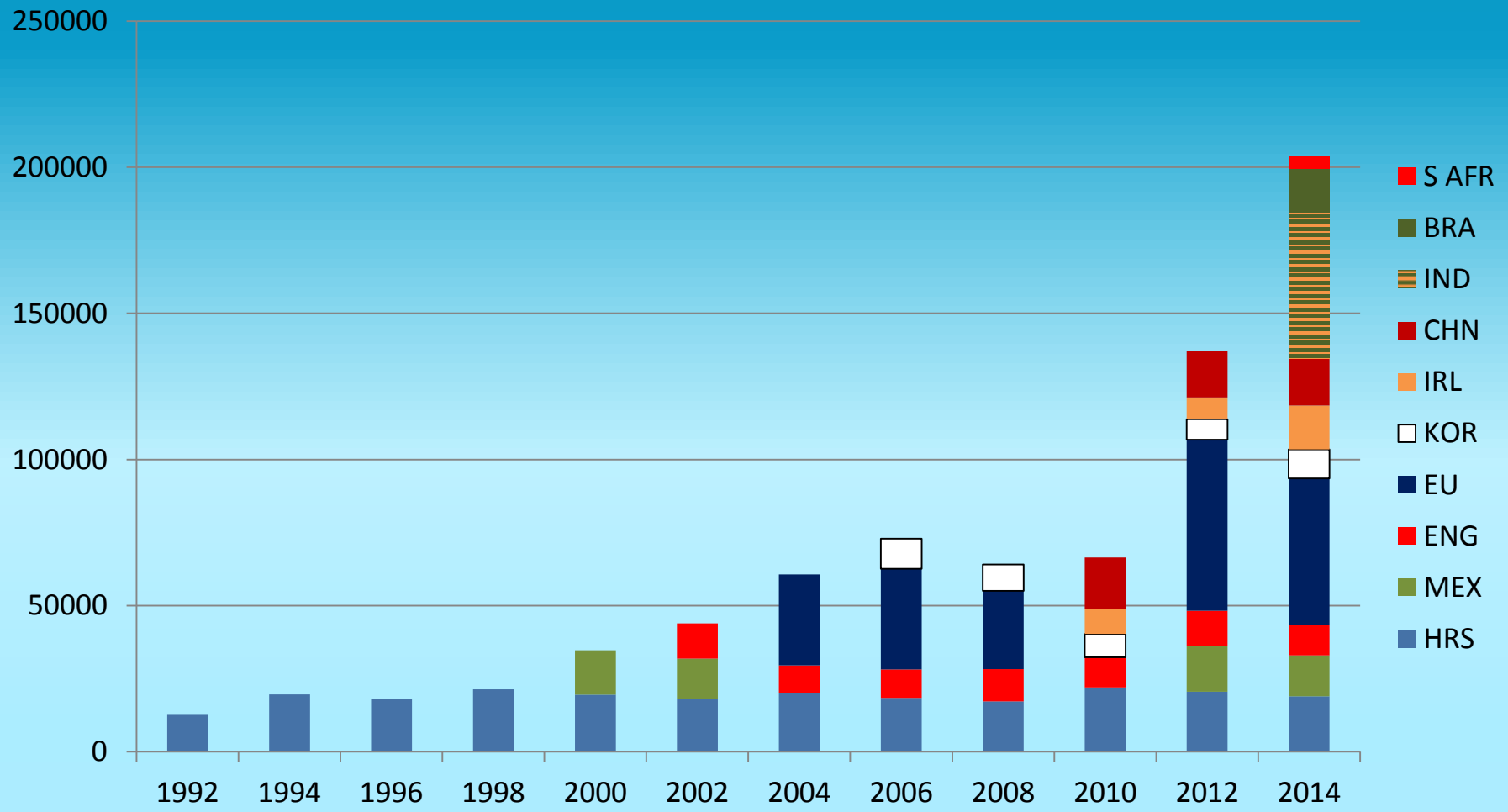
Global expansion of the HRS Model:

Number of interviews per wave, by country or region



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Some examples of research supported by longitudinal design

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Example 1: Infectious disease

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CARING FOR THE
CRITICALLY ILL PATIENT

Long-term Cognitive Impairment and Functional Disability Among Survivors of Severe Sepsis

Theodore J. Iwashyna, MD, PhD
E. Wesley Ely, MD, MPH
Dylan M. Smith, PhD
Kenneth M. Langa, MD, PhD

Context Cognitive impairment and functional disability are major determinants of caregiving needs and societal health care costs. Although the incidence of severe sepsis is high and increasing, the magnitude of patients' long-term cognitive and functional limitations after sepsis is unknown.

Objective To determine the change in cognitive impairment and physical functioning

Severe sepsis was independently associated with substantial and persistent new cognitive impairment and functional disability among survivors. The magnitude of these new deficits was large, likely resulting in a pivotal downturn in patients' ability to live independently.

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Iwashyna et al., 2010, JAMA

What went into this result?

- Linkage to Medicare health care records
  - Sepsis is not part of self-reports, or accurate so these events are found in Medicare records
- Longitudinal data before sepsis event
  - Allow us to see whether sepsis patients were different before the event
- Longitudinal data after sepsis event
  - Measures of cognitive performance, physical disability

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Example 2: retirement age and cognition

- Population aging puts pressure on government budgets for elderly income and health care
- Retirement age is almost unavoidably a centrally important policy target
- But what will be the effect of later retirement on health and well-being?
  - Depression, health events, obesity, life satisfaction
- Exogenous variation is hard to come by
  - People who have poor health retire sooner

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Effects of retirement on cognition

- Rohwedder, Susann; Willis, Robert, "Mental retirement," *The Journal of Economic Perspectives* 24:1, p119-138 [2010]
- Use SHARE (Europe) and ELSA along with HRS.
- international variation in policy to identify causal effect of retirement on pace of cognitive decline
- Find that working longer slows pace of cognitive decline

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What went into this finding?

- Longitudinal data on cognition
- Comparably measured in many countries

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Example 3. Long-Term Care for Elders with Dementia

- How is the burden shared between families, the market, and government?

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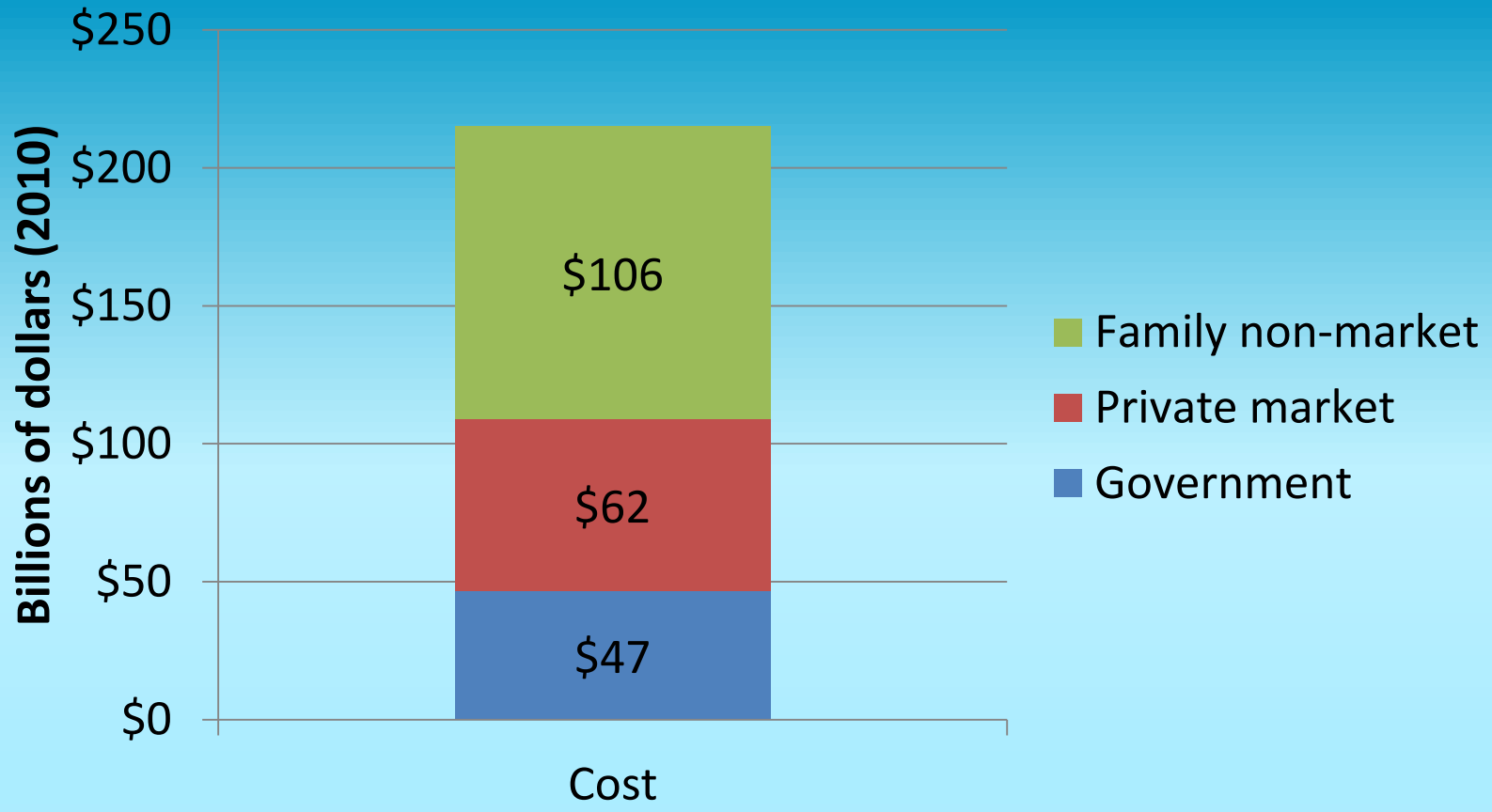
Costs of Dementia, by Source of Payment



Michael Hurd, et al. "Monetary Costs of Dementia in the United States" New England Journal of Medicine April 4, 2013

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What went into this finding?

- HRS measures of cognition, including proxy interviews
- HRS dementia sub-study (ADAMS) used to estimate dementia status for entire HRS sample based on relationship to HRS cognition measures
- Medicare spending from linked Medicare records
- Out of pocket spending from HRS self-reports
- Nursing home use from HRS
- Hours of unpaid care provided by family members from HRS self-reports

The HRS and Policies for An Aging Population

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Policies, not politics

- HRS is apolitical
  - The purpose of HRS is to support research and provide objective information for policy makers, not to support any particular political agenda
- Policies are political
  - created by political process, often with winners and losers
- HRS cannot be credited for specific policies

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What is role of HRS?

- Widely used by government agencies that evaluate or “score” policy proposals
  - Congressional Budget Office
  - Treasury Department
  - Government Accountability Office
  - Treasury Department
  - Social Security Administration
- Used by researchers
  - To document needs
  - To model behavior relevant to policy
  - To follow impact of policies after introduction

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Health Insurance has been a major area of policy activity

- Through Medicare the government provides good medical coverage to persons 65 and older
- Prior to 2006 it did not cover prescription medicine
- It does not cover people who retire before 65

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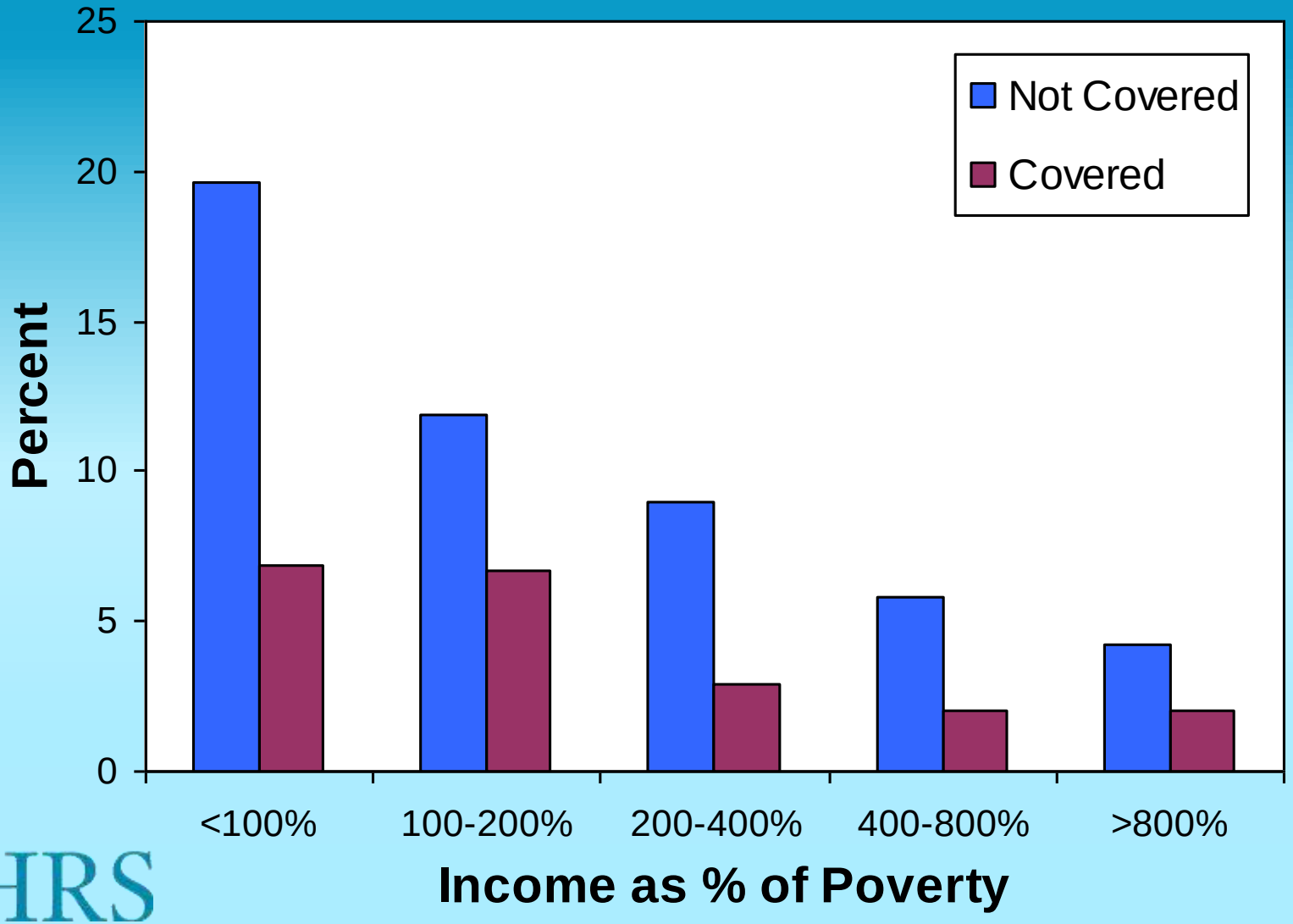
Relationship of Income and Prescription Drug Coverage to Cutbacks in Drug Purchases Because of Cost



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Health Consequences of Prescription Cutbacks

- In controlled multivariate analyses of outcomes following a report of cutbacks (or not)
- Relative risks for those who cutback vs not:
  - Overall health decline 1.76
  - Non-fatal incident MI 1.85
  - Incident angina 1.45
  - Worsening of depression 1.16

Source: M. Heisler, et al., "The Health Effects of Restricting Prescription Medication Use Because of Cost". Medical Care. July, 2004.

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Medicare Part D

- Helen Levy and David Weir, "Take-up of Part D" Journals of Gerontology (2009)
  - Utilized HRS data on cognitive ability
  - Special surveys on Part D

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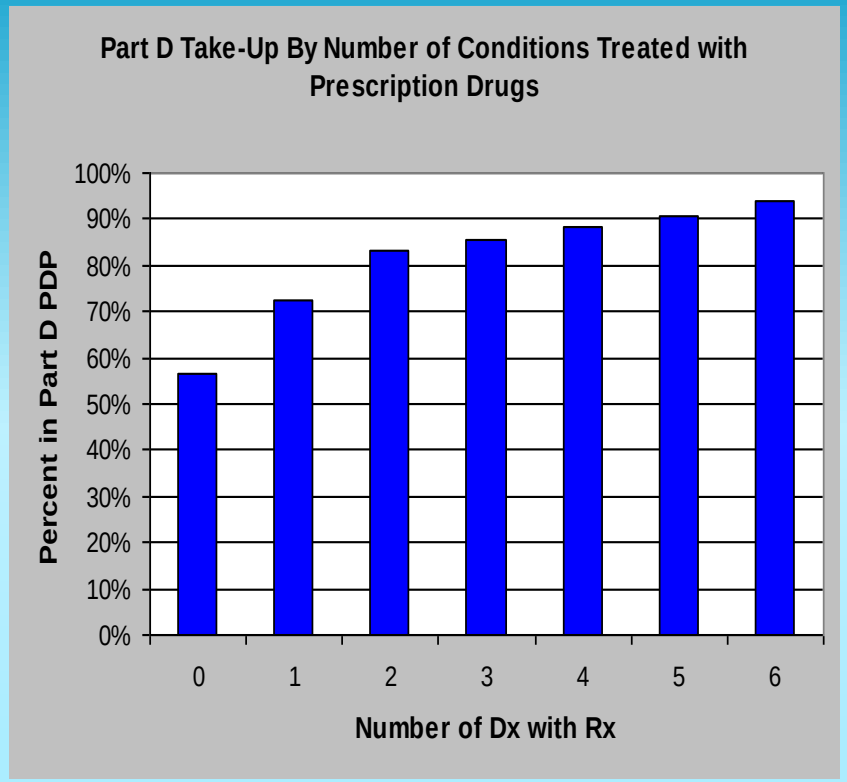
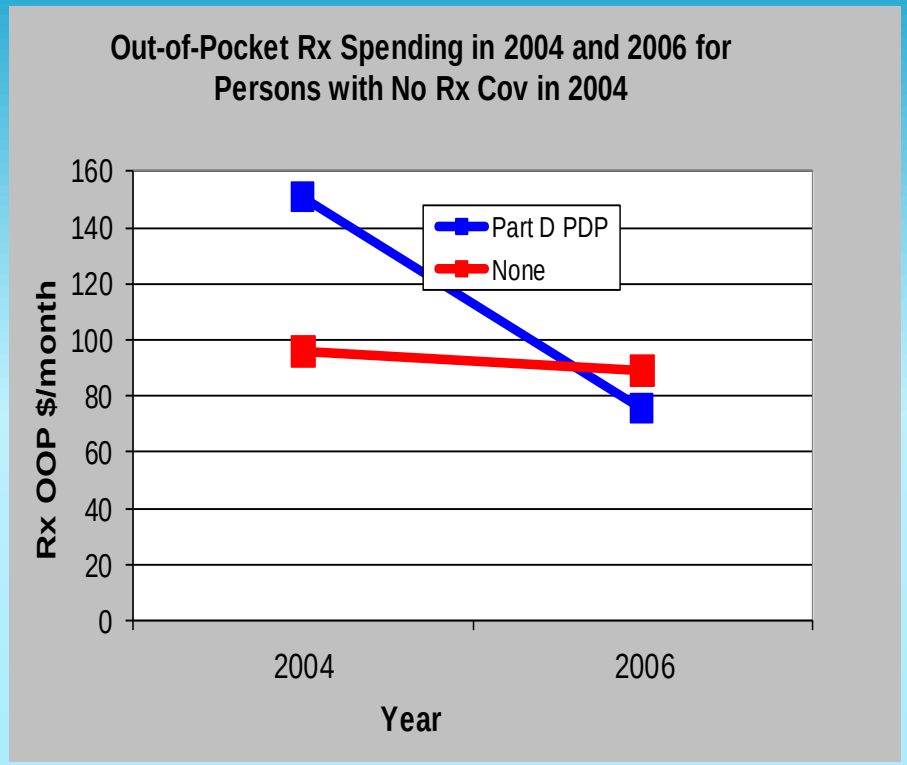
People who signed up for Part D used more prescriptions and paid more for them than those who did not





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Lack of health insurance prior to age 65

- Uninsured get fewer preventive services prior to 65
  - McWilliams, J. Michael; Zaslavsky, Alan M.; Meara, Ellen; Ayanian, John Z., "Impact of Medicare Coverage on Basic Clinical Services for Previously Uninsured Adults," *Journal of the American Medical Association* 290:6, p757-764 [2003]
- Uninsured spend more when they get to Medicare at 65
  - McWilliams, J. Michael; Meara, Ellen; Zaslavsky, Alan M.; Ayanian, John Z., "Use of Health Services by Previously Uninsured Medicare Beneficiaries," *The New England Journal of Medicine* 357:2, p143-53 [2007]
- We will see in a few years whether “Obamacare” solved these problems

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Mortality in HRS

- National sample of approximately 25,000 persons over age 50
- Roughly 2 deaths per day
- Vital status is perhaps the single most important thing to know about someone
- We try to obtain “exit” interview with next-of-kin following death to learn about end of life circumstances, disposition of estate,…
- We link to National Death Index

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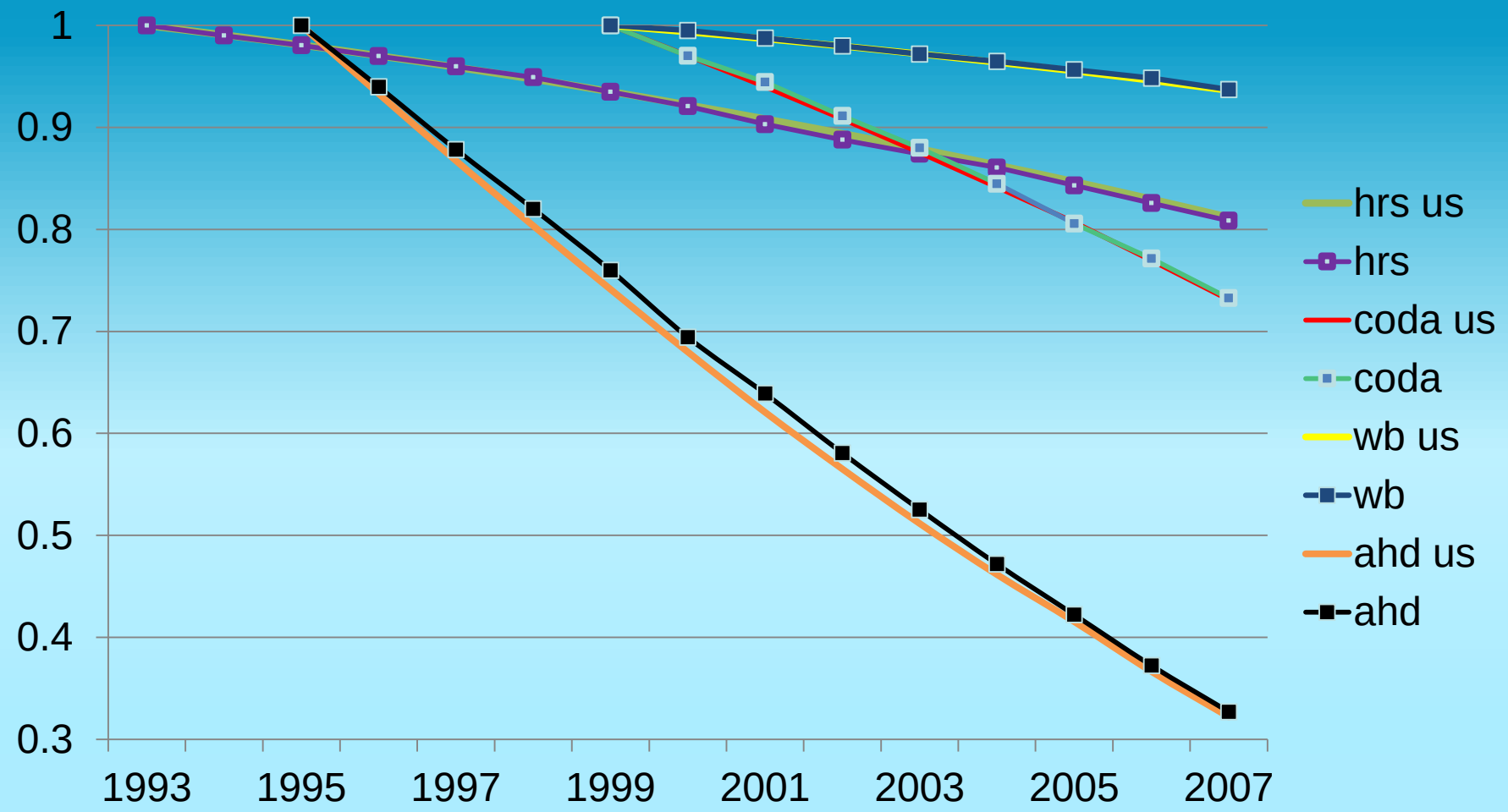
HRS Mortality by Cohort Compared with Life Tables



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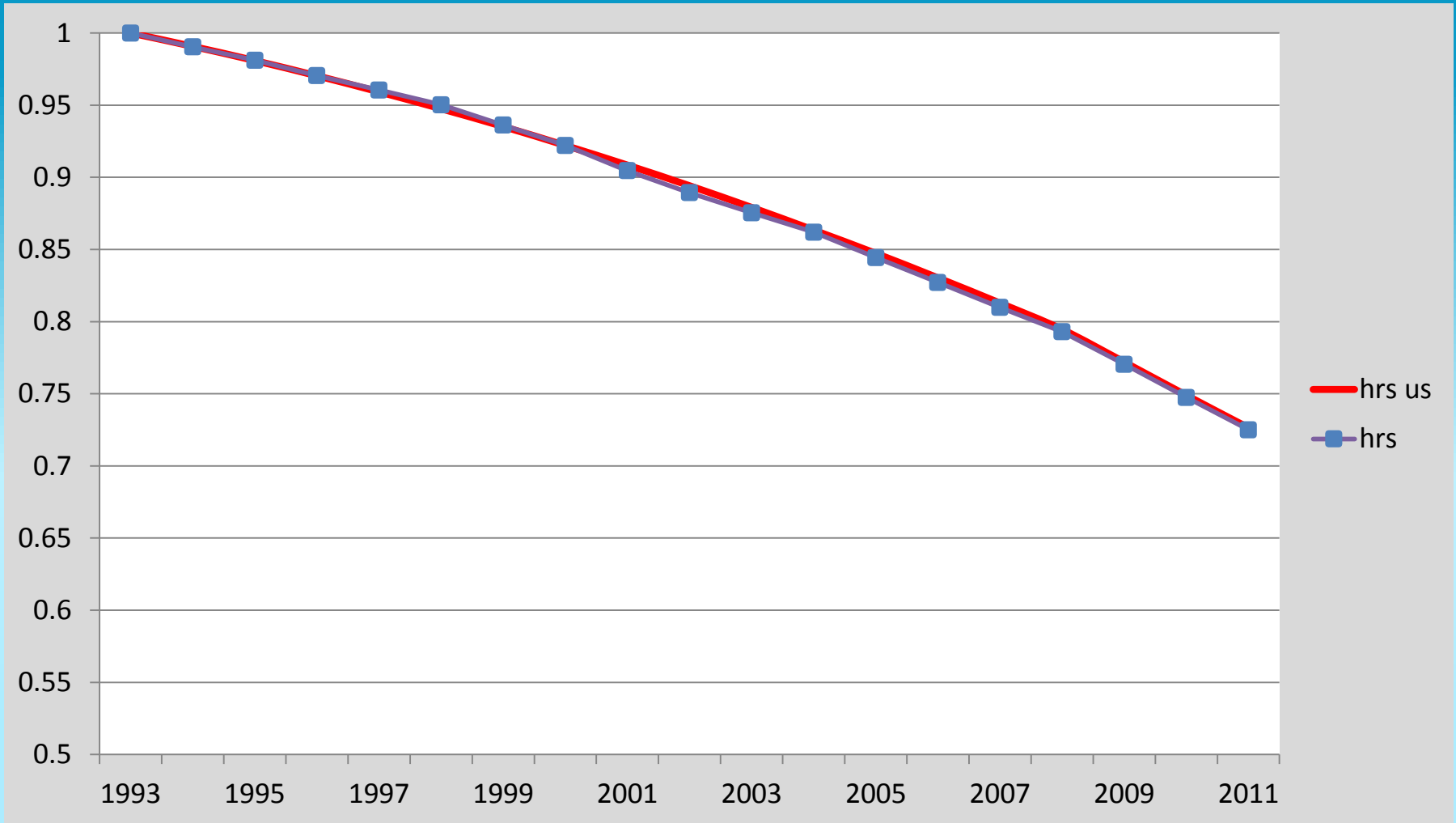

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Mortality is an important research outcome to all disciplines

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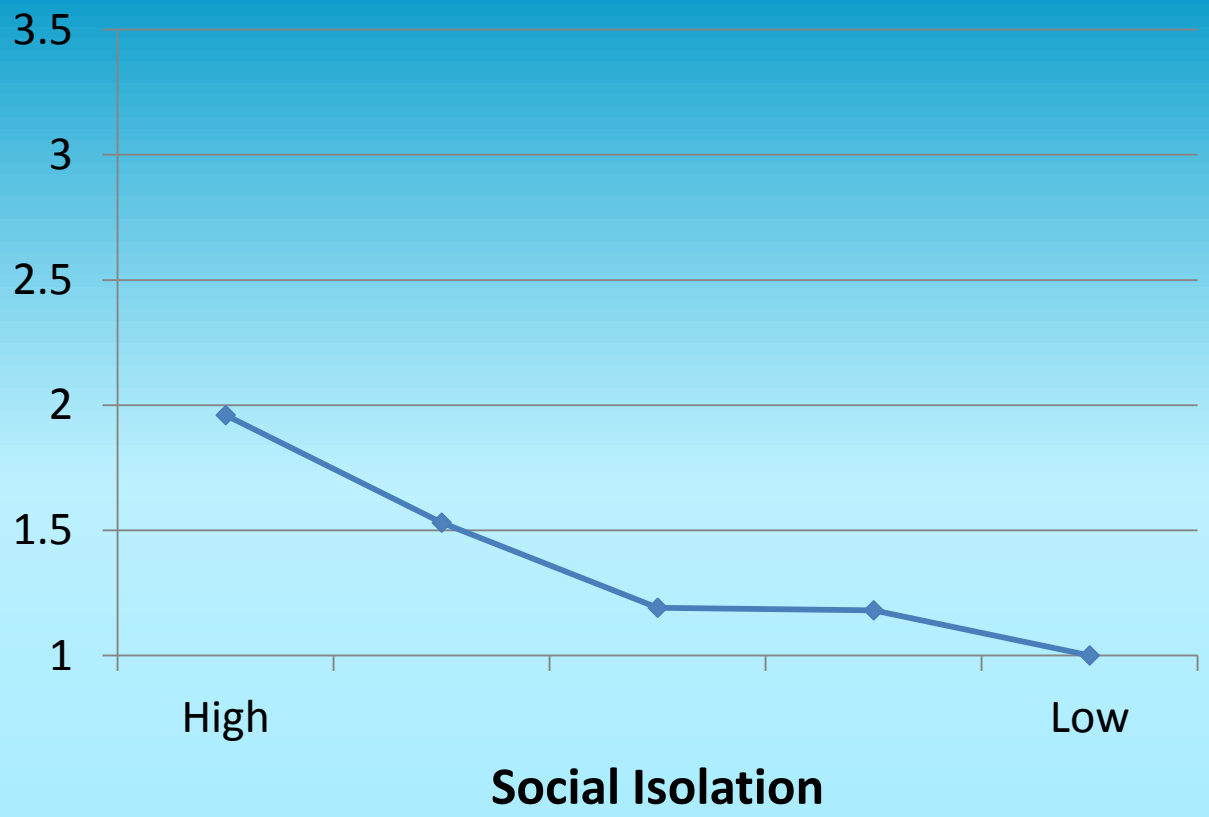
The Gradient in Social Isolation:
Relative risk of mortality by quintile of social isolation (controlling for age and sex)



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The Gradient in Conscientiousness: Relative risk of mortality by quintile of conscientiousness (controlling for age and sex)

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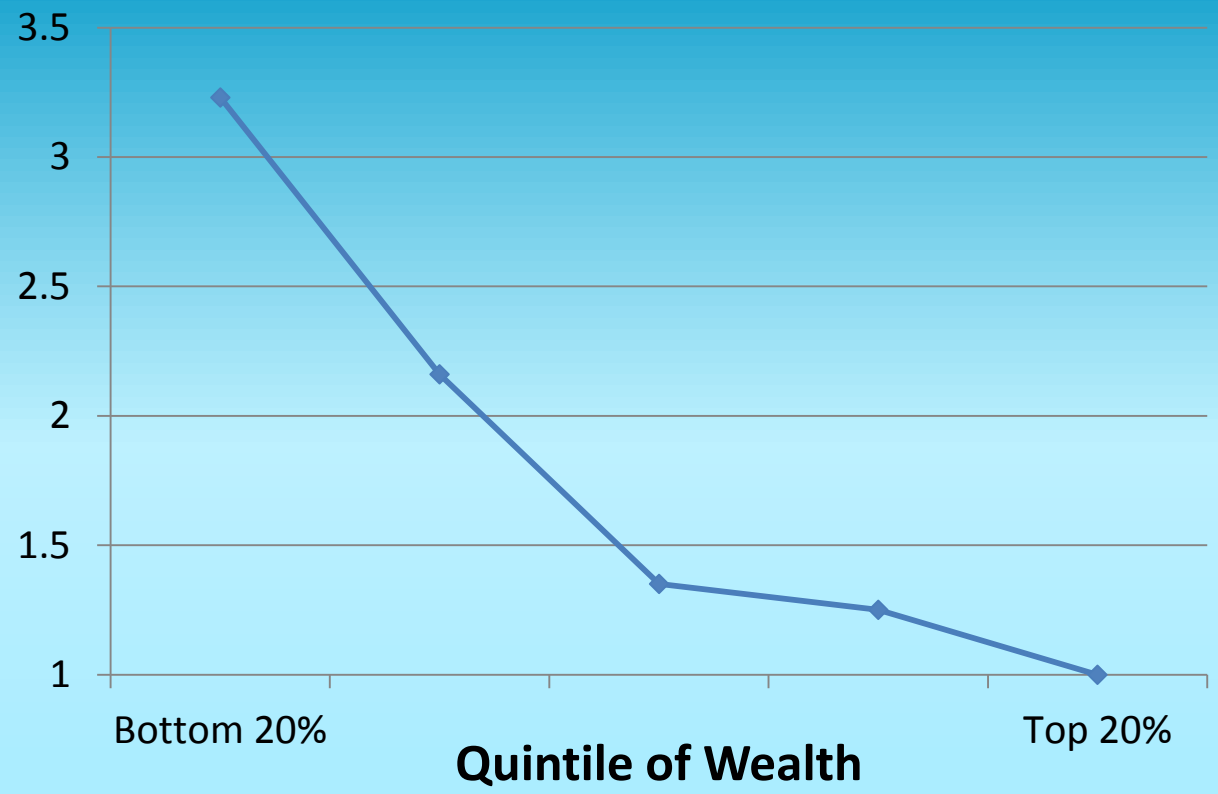
The Gradient in Wealth:
Relative risk of mortality by quintile of wealth (controlling for age and sex)



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Mortality ascertainment is also critically important to survey quality and assessment of survey quality

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Field outcomes in MHAS and HRS compared

	Two-year interval	
	MHAS	HRS
Outcome	2001-03	2000-02
Interviewed alive	89.2	88
Deceased	3.7	7.2
Not eligible	1.6	
Lost	3.9	0.3
Refused	1.5	4.3
Removed		0.2
	100	100

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Field outcomes in MHAS and HRS compared

	Two-year interval		Ten-year interval	
	MHAS	HRS	MHAS	HRS
Outcome	2001-03	2000-02	2003-12	2002-12
Interviewed alive	89.2	88	69.4	59.8
Deceased	3.7	7.2	20.5	33.0
Not eligible	1.6			
Lost	3.9	0.3	7.2	0.5
Refused	1.5	4.3	2.9	4.8
Removed		0.2		1.9
	100	100	100	100

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Conclusions

- MHAS is better than HRS at obtaining interviews with located survivors
- MHAS did a remarkable job locating people after ten years for wave 3 but still appears to be worse than HRS at locating sample members
- But, it is unclear if MHAS is as good at determining mortality
- Hard to tell if location failure is failure to find a person or failure to find a death
- Use of life tables won't solve this for an individual sample member but it will help determine how many deaths may be missing

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Methods research and longitudinal studies

- Shortage of true experiments
- Because maintaining response is so important to longitudinal studies, we are generally unwilling to risk poor response in “control” group
- Very hard to make us stop doing something we believe in
- Somewhat easier to adopt something new if it is shown to work

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Methods research and longitudinal studies

- Prohibitively expensive to maintain a longitudinal study ONLY as a place to test new methods
- Generalizability is an issue – different populations may respond to different things so what works in US may not always work in Mexico, and vice versa

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Steps to response (Lepkowski and Couper, 2002)

1. Location (finding participants)
2. Contact
3. Cooperation

- Different strategies for each step
- In modern studies with biomarkers, administrative linkages, etc., cooperation is now multi-dimensional

4. Item non-response and survey cooperation become blurred distinctions

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Location / Tracking

- Couper and Ofstedal (2006,2009) discussed ways to get information about moves between waves
- HRS relies mainly on passive tracking through electronic monitoring of address change, etc.
- Then active tracking during field period as needed
- INEGI strategy of sending advance locating teams is too expensive in US or UK

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Location / Tracking

- Several studies have experimented with how to encourage respondents to report addresses
- Main approach is to send a letter or postcard asking them to report their address
- Options are how to encourage them to return the card

British Household Panel Study (BHPS) address card incentive

Type of incentive	Return rate
Advance	41%
Upon delivery	32%
None	7%

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PSID contact experiment

- Experimented with
  - Incentive in advance or upon delivery (no effect)
  - Look of materials (no effect)
  - One or two mailings (two got more response)
- Overall rate of return was about 60%, much higher than BHPS

Longitudinal study design strategies to reduce attrition, improve cooperation

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Biggest insight in survey methodology of longitudinal studies: If you want to retain people in your study, don't drop them from the study

- Seems pretty obvious but early longitudinal studies would take one wave refusal as "attrition"
- In current practice it's very important to distinguish between a wave refusal and a permanent removal

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Effects have been studied in HRS

- Michaud, Kapteyn, Smith and van Soest (2011)
- Looked at bias in 2004 sample due to attrition from 1992 to 2004
- Found relatively little bias in the 2004 sample
- Took out of 2004 sample people who had ever missed a wave
- That “hypothetical” sample was not just smaller, it was more biased.

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Strategies to maintain interest

- Study newsletters
- Make participants feel they belong to something bigger than themselves
- Show value produced by research using the data
- Some experimentation with “targeting” to different age groups or people with different interests

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Social media

- Can be a good way to engage people
- Big risk of loss of confidentiality

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Same interviewer?

- Casual evidence (including on HRS) that using the same interviewer as in the previous wave is associated with higher response rates
- Perhaps establishing interpersonal rapport is beneficial to longitudinal participation
- But,
  - Prior wave interviewers are on average more experienced than new ones

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Experiment

- Lynn, Kaminska, and Goldstein (2011)
- NatCen Omnibus Study, n=1188
- Mix of prior and new interviewers, in 3 "grades" of experience/ability
- Random assignment to follow-up interviews
- Findings:
  - Interviewer quality matters
  - same interviewer makes no difference compared to a new one of same ability

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Same race interviewer? (Ofstedal and Weir, 2011)

- HRS in 2006 had much lower cooperation with fingerstick blood test among African-Americans
- Race of interviewer did not matter to that difference among respondents
- In 2008 we did substantially better
- Again, race-matching made no difference
- All interviewers got better training, most had experience

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Cognition and Non-response

- More than any other trait we measure, cognition directly affects ability to participate in interview
- Measuring prevalence of cognitive impairment requires careful attention to participation rate by cognitive level
- Longitudinal studies have an advantage over fresh cross-sections if they keep track of everyone as CI develops

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Proxy interviews

- A proxy is someone who completes an interview on behalf of the sample subject
- HRS maintains a separate interview protocol for a proxy reporter
- Very similar to the core interview in most respects (health, finances, health care,..)
- Can't do cognition testing
  - We do have standardized protocols for proxy reporting (Jorm IQCODE; AD8)

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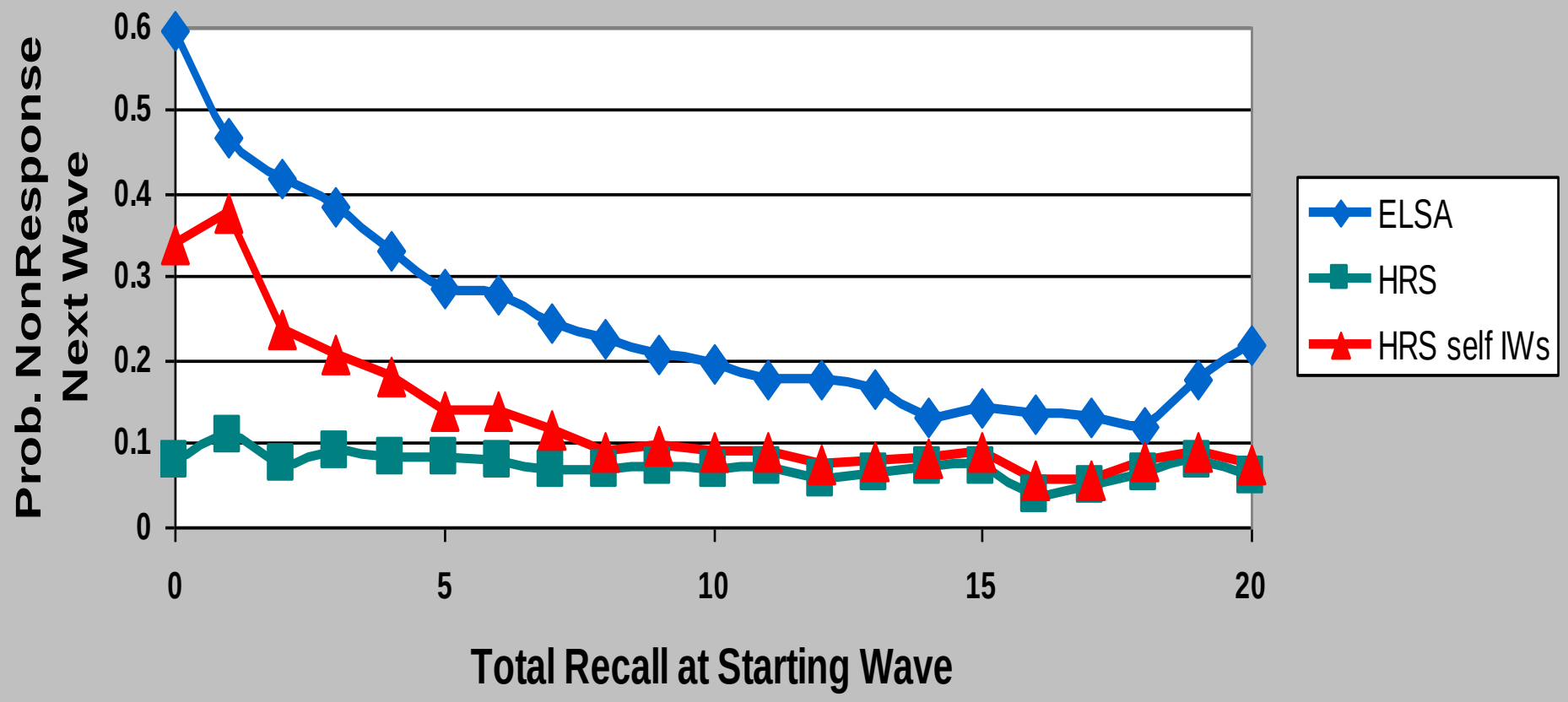
Non-response by Cognitive Score at Prior Wave, ELSA and HRS with and without proxy interviews



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Source: Weir, Faul, and Langa, 2011

Financial incentives in the HRS international family of studies

Country / region	Study	Incentive ($US)
USA	HRS	80 (check, advance)
England	ELSA	30 (gift card, post)
EU	SHARE	
China	CHARLS	10 (cash, post)
Mexico	MHAS	None (glasses?)
Brazil	ELSI	None (by law)
India	LASI	None

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Experiments?

- Rather few have been done
- In HRS, for resistant cases, we have compared offering money to continuing to work the case and found little difference – offer of money does not save money
- Some evidence that offering something is better than nothing, less evidence that offering a lot is much better than a little

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General observations (see Laurie and Lynn, 2009)

- Incentives tend to matter most where attachment is lowest
- Interviewers are generally a good substitute for incentives
- Mail surveys benefit a lot from incentives
- In-person surveys can benefit but it is not always clearly cost-saving compared to interviewer effort

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Project Talent

- 500,000 high school students across the US were intensively studied in 1960
- Now in their late 60s, how have they aged?
- Used a mail survey to reestablish contact (1% subsample)
- Experimental design
  - Different financial incentive amounts
  - Some received telephone follow-up

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Project Talent: Response rate by incentive and follow-up treatment

Incentive	NoTel	Tel	All
$0	42.8%	53.2%	47.9%
$2	47.7%	58.6%	53.0%
$20	53.9%	61.5%	57.5%
All	48.2%	57.8%	52.8%

Telephone follow-up raised RR by 10%,
Incentive of $20 vs none about the same

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Summary on approaches to reducing attrition

- Get the best interviewers you can
- Go back to everyone every time
- Use proxies when necessary
- Engage respondents between waves to maintain contact information and their interest
- Use financial incentives if they seem to help

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Item non-response

- Very important to allow item non-response because you don't want to lose an entire interview because someone doesn't want to answer one or a few questions
- Also required by IRBs
- Try to minimize by good question design that avoids confusion

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Dependent interviewing (preload)

- Insufficiently studied
- Should you ask questions in wave 2 that depend on answers to wave 1?
- Clearly can speed up interview, make it seem more relevant to respondent (you are listening to them and remembering the conversation)
- Can affect the data you get
- In HRS we do this for health conditions, but not for income or wealth

HRS

Brackets for quantitative variables

- In economic surveys, non-response to questions about income or wealth is often high
- This is a mix of not wanting to provide information, not wanting to provide precise information, and not knowing precise information
- Tom Juster (HRS founding PI) developed unfolding bracket strategy

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Brackets vs range cards

- In unfolding bracket, you ask a series of questions "is it more than X", is it less than Y
- Usually three questions
- If X and Y are chosen well, this will sort people into ranges that capture most of the variance
- Random start point reduces anchoring effects on population distribution
  - In longitudinal studies, we use same starting point for same person over time
- Range cards can't be done over the phone, lead to overuse of first and last range

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Brackets in Wealth Measures (for people with any of the asset)

Item response	House	Stocks
Good answer	84.5%	68.9%
Bracket answer	11.3%	15.8%
Fully imputed	4.2%	15.3%

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Longitudinal studies?

Sí se puede

Yes we can

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A Longitudinal Study of Health, Retirement, and Aging
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THANK YOU!

Gracias!

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