THE GENDER GAP IN HEALTHY LIFE EXPECTANCY: DOES WOMEN'S LONGER LIFE IN WORSE HEALTH COMPARED TO MEN ORIGINATE IN EARLY LIFE?

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Population Research Center

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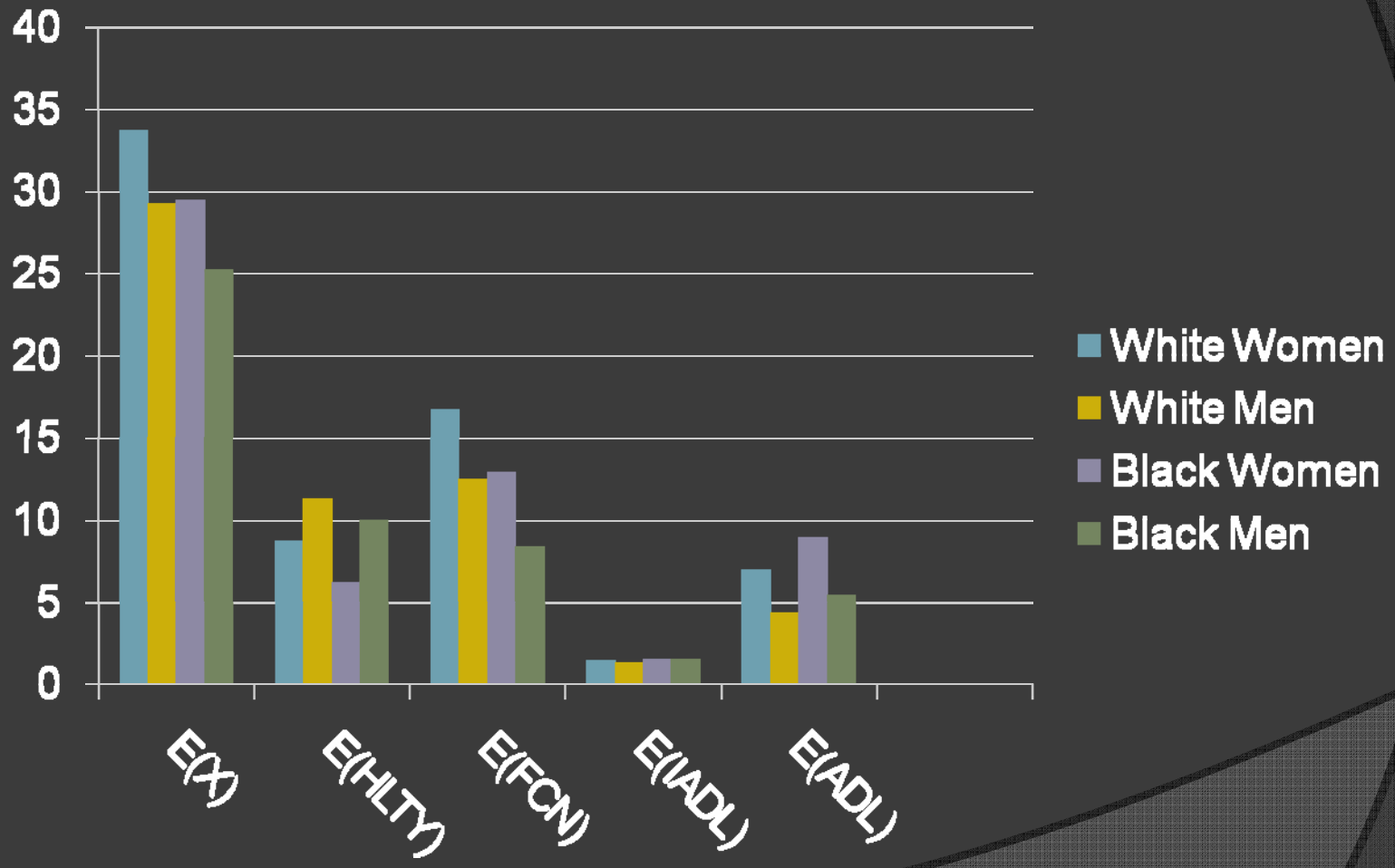
The “paradox” of women’s longer life in worse health: HRS 1998-2008



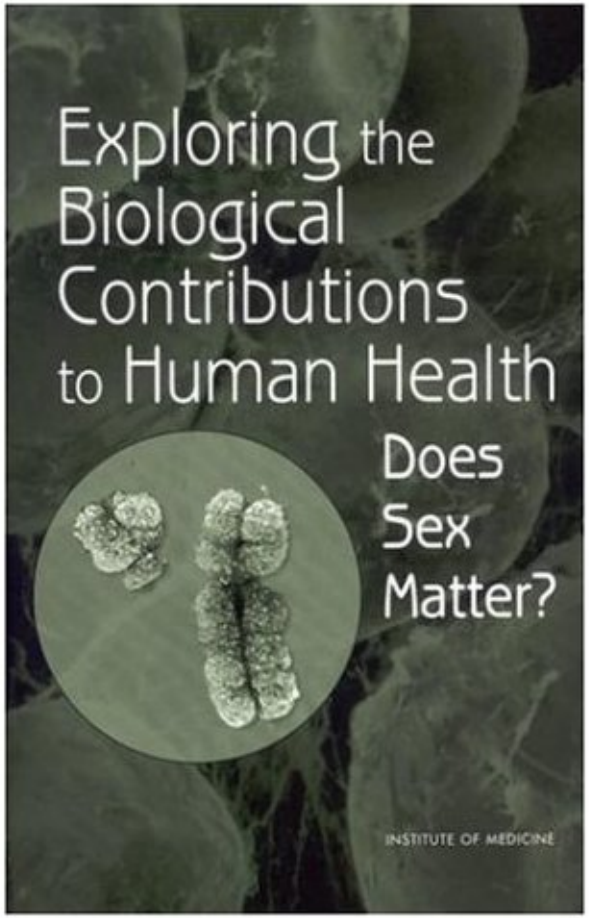
The major aims of this study

- To verify gender differences in biological aging as indicated by functional changes and disability using the HRS 1998-2008
  - MSLT models integrating changes in functioning, disability and mortality
- To assess whether women's and men's deterioration and improvements are differentially hinged to early life SES and health (distal origins)
- To assess whether women and men differ in how early life SES and health combine with adult SES, as indicated by education, to influence HLE (pathways)

Taking gender – & sex – seriously in studies of population health and aging

- Demographic and epidemiological research largely focuses on socioeconomic origins of health and mortality
- Gender is typically treated as a control variable and not something to be explained
- Research explicitly examining gendered origins of health disparities focuses on gendered social relationships, differences in SES, and differences in health behaviors
- Possible biological differences largely ignored

Institute of Medicine report published in 2001



Sex matters. Sex, that is, being male or female, is an important basic human variable that should be considered when designing and analyzing studies in all areas and at all levels of biomedical and health-related research. Differences in health and illness are influenced by individual genetic and physiological constitutions, as well as by an individual's interaction with environmental and experiential factors. The incidence and severity of diseases vary between the sexes and may be related to differences in exposures, routes of entry and the processing of a foreign agent, and cellular responses (Executive Summary)

What do social scientists think they know about gender differences in adult health?

- Gender differences in mortality partially reflect differences in power, behavior (e.g., smoking), & social roles (marriage)
- Some evidence that SES gradients in health & mortality are greater for men than women
  - Recent contradictory evidence in a series of papers by Montez, Hayward and Hummer
  - Early life SES effects may be greater for women than men
    - O'Rand, Hamil-Luker, & Elman (2009)
    - Best, Hayward, & Hidajat (2005)
- Need for specificity of health outcomes when considering ways in which health processes are "gendered."
- **Gender differences in health and mortality highly persistent regardless of "controls."**

From womb to tomb?

- Studies of life course origins of the gender gap in health are sparse!
  - O'Rand and colleagues (2007, 2009); Best, Hayward and Hidajat (2005)
    - Child health has more negative consequences for women than men
    - Child SES may have greater effects for women than men
    - "Pathways" by which life course exposures combine to influence gender differences in health may differ
- Difficult to extrapolate results beyond heart disease and diabetes-II

The need for specificity in understanding gender differences in health

- Growing evidence that the “gendered life course” intersects “biological vulnerability” to certain diseases (CVD and diabetes)
  - E.g., roles of menarche and menopause for women, sex-based hormonal differences
- Less obvious how “gendered life course” intersects sex differences in biological aging
- Potentially gender/sex operate differently for specific pathological and “whole organism” biological aging processes

Some (very naïve) thoughts about gender/sex & biological aging

- Biological aging represents reduced capacity to respond to environmental challenges due to loss of physiologic reserve
- Sex differences in functioning, an indicator of biological aging, potentially explained by sex differences in the distribution of conditions
- Women's biological aging "appears" to start earlier but progresses more slowly than for men

Research/theory ambiguous about how life course exposures combine to affect “biological aging” for women & men

- H_o: Women’s “morbidity phenotype” set more in childhood than men’s due to men’s advantages in garnering resources in adulthood that are important for health
- H_A: Sex differences in basic biological aging may “shift” risks of functional change, disability, and mortality
  - Life course exposures of men and women may define *within-sex* heterogeneity in biological aging

MSLT life table approach

- MSLTs allow us to integrate mortality, functioning and disability experiences
- Traditional way of assessing age-related changes in physical and cognitive capacity at the population level – a gross approximation of biological aging
- MSLTs calculated using incidence rates derived from a series of nested hazard models.

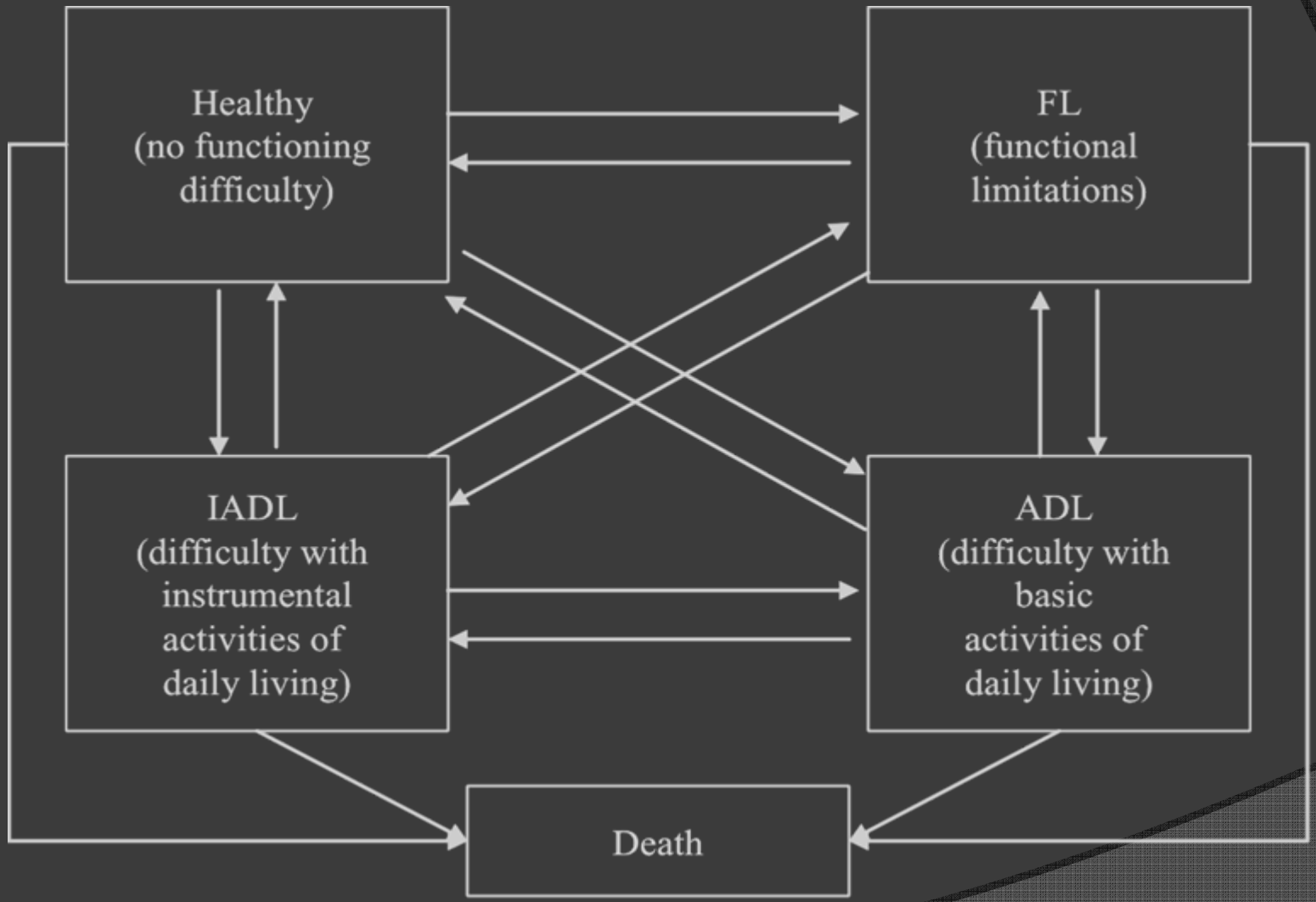
Nested hazard modeling approach

- Reduced form model to identify total effect of gender
- Inclusion of childhood SES and health to assess whether EL conditions mediated/moderated effect of gender
- Inclusion of education to assess possible “pathway“ differences linking early life conditions with later life health

Data sources and measures

- Health and Retirement Study (1998-2008)
  - Functioning, disability and mortality incidence for NH whites and blacks 50-100 years of age
- State space definitions –because of health/memory problem expected to last 3 months +
  - ADL – difficulty with at least 1 of 6 ADLs
  - IADL - no ADL but some difficulty with 1 of 5 IADLs
  - Functionally limited -no ADLs or IADLs but reported some difficulty with at least 1 of 11 functions
  - Healthy – no functional difficulties of any kind

Figure 1. Health States and Potential Transitions across States and Death



Early life and adult measures

- Childhood health problem (from birth to age 16)
  - Would you say that your health was excellent, very good, fair, or poor? (1=fair/poor)
- Childhood SES measured as the cumulative disadvantages reported from birth to age 16
  - Family SES
  - Moving because of financial difficulties
  - Received help from relatives
  - Father lost job
  - Parental education
  - Father's usual occupation
- Own education
  - <12, 12, >12

Table 2. Weighted Distribution of Person-Year Records among Adults Aged 50-100 Years	
	Mean (in percents, except for age)
# Childhood SES Disadvantages	
0	14.5
1	30.1
2	19.3
3	18.3
4	11.0
5-7	6.9
Early Life Health	
Excellent	53.2
Very good	25.1
Good	16.0
Fair or poor	5.7
Unweighted Number of Person-year Records	148,247

Gender differences in effects of childhood and pathways linking childhood with later life health?

- Women are generally more likely to experience a deterioration in capabilities while men are more likely to experience improvements
  - This is *not* a surprise!
- Effects of childhood health and SES do *not* differ by gender; neither do effects of education
  - No evidence that child health matters more for women's biological aging than men's
  - No evidence that the early life SES gradient differs by gender
- "Pathways" do *not* differ by gender
  - No evidence that childhood plays a greater role in establishing women's "cohort morbidity" phenotype in terms of biological aging

How is gender associated with biological aging measured in terms of functional change?

- On average, women experience greater risks of deterioration in functioning than men but lower risks of death *within* levels of functioning.
- Men appear to be both more resilient – in terms of recovering physical capacity – and frail – in terms of greater mortality within levels of functioning
- Women experience earlier onset of biological aging compared to men but the pace is much slower for women.
- Socioeconomic resources and child health problems define the degree of heterogeneity *within* the sex groups.

Table 2a. State Life Expectancies for Persons Aged 50 years by Early Life Conditions, Non-Hispanic White Females

	e(x)	e(hlthy)	e(fcn)	e(iadl)	e(adl)	% of Race/Sex Group
White Females	**33.68**	**8.70**	**16.68**	**1.38**	**6.92**	
a. Poor child health, zero SES disadvantages	**31.37**	**7.58**	**14.29**	**1.83**	**7.68**	**0.73**
b. Poor child health, 3 SES disadvantages	**29.12**	**5.18**	**13.40**	**1.63**	**8.92**	**1.26**
c. Poor child health, 5+ SES disadvantages	**30.21**	**4.41**	**13.26**	**1.74**	**10.79**	**0.89**
Highest vs. lowest	**4.65**	**6.14**	**3.69**	**-0.30**	**-4.87**	
d. Good+ child health, zero SES disadvantages	**34.86**	**10.55**	**16.95**	**1.44**	**5.93**	**14.9**
e. Good+ child health, 3 SES disadvantages	**32.91**	**7.38**	**16.85**	**1.38**	**7.30**	**16.8**
f. Good+ child health, 5+ disadvantages	**33.70**	**6.27**	**17.03**	**1.52**	**8.89**	**4.6**

Table 2b. State Life Expectancies for Persons Aged 50 years by Early Life Conditions, Non-Hispanic White Males

	e(x)	e(hlth)	e(fcn)	e(iadl)	e(adl)	% of Race/Sex Group
White Males	29.24	11.22	12.41	1.30	4.31	
a. Poor child health, zero SES disadvantages	29.35	11.49	12.49	0.79	4.57	0.43
b. Poor child health, 3 SES disadvantages	27.73	8.01	11.86	1.33	6.53	1.21
c. Poor child health, 5+ SES disadvantages	26.76	7.02	11.05	1.61	7.09	0.49
Highest vs. lowest	3.33	6.66	1.27	-0.74	-3.86	
d. Good+ child health, zero SES disadvantages	30.09	13.68	12.31	0.87	3.23	15.76
e. Good+ child health, 3 SES disadvantages	28.81	9.92	12.44	1.57	4.88	15.41
f. Good+ child health, 5+ disadvantages	28.31	8.80	11.92	1.95	5.64	5.42

Table 2b. State Life Expectancies for Persons Aged 50 years by Early Life Conditions, Non-Hispanic Blacks

	e(x)	e(hlthy)	e(fcn)	e(iadl)	e(adl)	% of Race/Sex Group
Black Males	25.22	10.05	8.33	1.48	5.36	
a. Poor child health, zero SES disadvantages	25.85	11.58	8.31	0.79	*5.17*	0.07
b. Poor child health, 3 SES disadvantages	24.54	8.03	7.93	1.30	*7.28*	1.35
c. Poor child health, 5+ SES disadvantages	23.54	6.89	7.29	1.55	*7.82*	1.91
Highest vs. lowest	2.84	6.81	0.88	-0.68	-4.17	
d. Good+ child health, zero SES disadvantages	26.38	13.69	8.17	0.87	*3.65*	1.89
e. Good+ child health, 3 SES disadvantages	25.48	10.00	8.40	1.58	*5.50*	24.42
f. Good+ child health, 5+ disadvantages	24.97	8.70	7.99	1.95	*6.34*	15.81
Black Females	29.42	6.13	12.86	1.51	8.92	
a. Poor child health, zero SES disadvantages	27.65	5.80	10.91	1.96	8.98	0.04
b. Poor child health, 3 SES disadvantages	25.90	3.88	9.98	1.72	10.32	2.3
c. Poor child health, 5+ SES disadvantages	27.16	3.32	9.81	1.85	12.18	2.35
Highest vs. lowest	3.03	5.13	3.51	-0.34	-5.26	
d. Good+ child health, zero SES disadvantages	30.19	8.45	13.32	1.50	6.92	2.45
e. Good+ child health, 3 SES disadvantages	29.09	5.84	13.11	1.47	8.68	24.04
f. Good+ child health, 5+ disadvantages	29.93	4.94	13.13	1.61	10.24	15.62

Tentative Conclusions

- Paradox of women's longer life but worse health may be less of a paradox and more of an indication of sex differences in the onset and pace of biological aging
- Life course socioeconomic resources and childhood health largely *add* to the effects of gender to define heterogeneity in biological aging
- Life course differentiation of men's and women's biological vulnerability and social lives may be more pertinent to sex differences in the development of specific pathologies and diseases rather than to biological aging

Limitations – there are many

- Better measures of biological aging
- Need to understand how the composition of conditions influences gender differences in functioning and mortality within levels of functioning
- Need greater theoretical sophistication in integrating concepts of disease, functional changes and biological aging
- Need to develop a better understanding of the orthogonal nature of the associations of childhood health, SES, and later life health outcomes

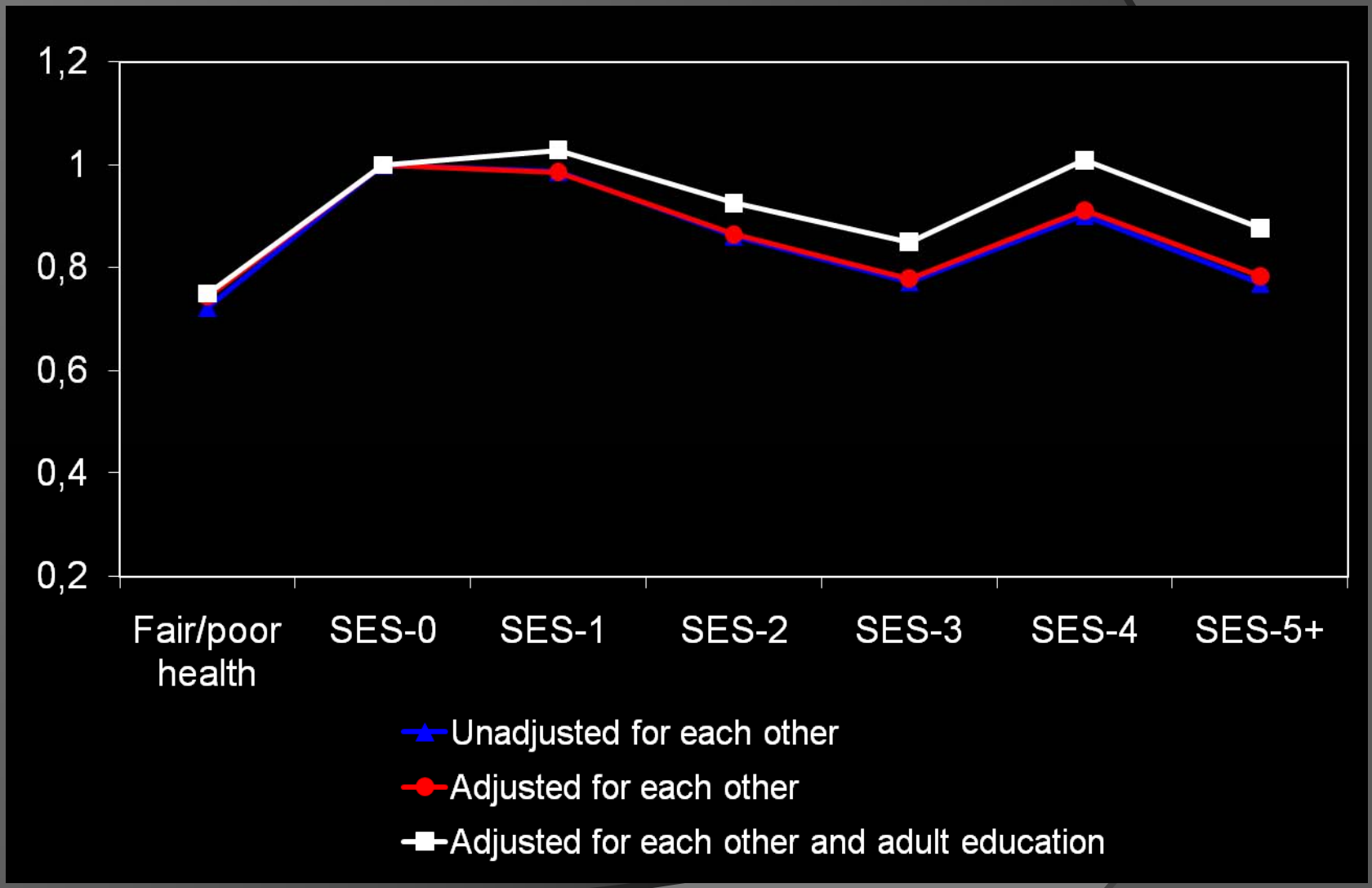
Questions and suggestions?

Additional slides

Table X . State life expectancies at age x showing cumulative advantages and disadvantages

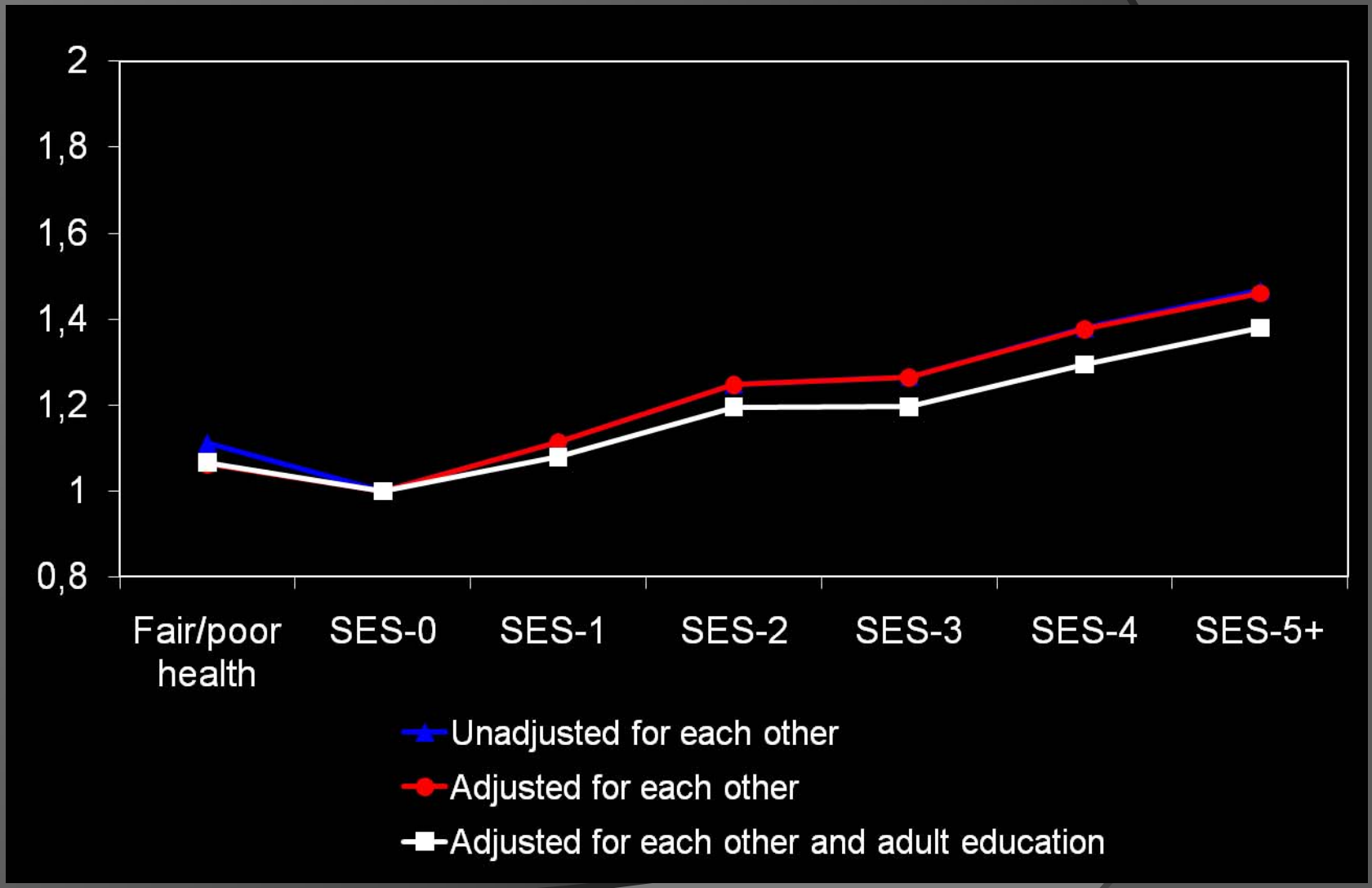
	e(tot)	e(hlthy)	e(fcn)	e(iadl)	e(adl)	% of sex subgroup	Fraction of remaining years disabled
White Males							
a. Poor child health, 5+ SES disadvantages, LT HS	**25.65**	**5.50**	**10.46**	**1.93**	**7.77**	**0.2**	**37.8%**
b. Good+ child health, 0 disadvantages, >HS	**30.68**	**14.42**	**12.34**	**0.82**	**3.09**	**12.72**	**12.8%**
Black Males							
a. Poor child health, 5+ SES disadvantages, LT HS	**22.87**	**5.83**	**7.08**	**1.71**	**8.25**	**1.32**	**43.5%**
b. Good+ child health, 0 disadvantages, >HS	**27.58**	**15.33**	**8.17**	**0.74**	**3.34**	**0.83**	**14.8%**
White Females							
a. Poor child health, 5+ SES disadvantages, LT HS	**28.58**	**3.94**	**11.45**	**1.90**	**11.29**	**0.36**	**46.1%**
b. Good+ child health, 0 disadvantages, >HS	**35.38**	**11.20**	**16.81**	**1.43**	**5.94**	**10.86**	**20.8%**
Black Females							
a. Poor child health, 5+ SES disadvantages, LT HS	**26.21**	**2.93**	**8.70**	**1.98**	**12.60**	**1.17**	**55.6%**
b. Good+ child health, 0 disadvantages, >HS	**31.21**	**9.20**	**13.72**	**1.42**	**6.88**	**1.58**	**26.6%**

Figure 2. Antilogs of Regression Coefficients Predicting Risk of Transition from *Functional Limitations to Healthy* for Childhood Health, Cumulative Childhood SES Disadvantages, and Adult Education



*Models include non-Hispanic white and black, US-born adults 50-100 years and control for sex, age, and race

Figure 3. Antilogs of Regression Coefficients Predicting Risk of Transition from *Healthy to Functional Limitations* for Childhood Health, Cumulative Childhood SES Disadvantages, and Adult Education



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A comment about how childhood SES, health, and education combine to influence biological aging

- Similar to many studies, the effects of childhood health and SES are almost orthogonal to each other
- Childhood SES is partially mediated by education, pointing to the importance of “pathways” and the importance of adults socioeconomic as proximate causal factors influencing biological aging – for these birth cohorts
- Childhood health effects are not mediated by adult conditions

Biology of aging background information

- Epi studies increasingly model biological aging based on age-related change in functional capability(e.g., grip strength, chair rising, standing balance, and gait speed), cognitive performance (both crystallized and fluid intelligence), and sensory function (such as visual and auditory acuity).
  - Markers of biological aging strongly associated with quality of life, ability to carry out everyday tasks, and subsequent frailty, disability, and death.
  - Allow the full spectrum of function to be studied, from high-functioning individuals showing healthy aging to low-functioning or frail individuals.
- Biological aging, in effect, represents a reduced capacity to respond to these challenges due to loss of physiologic reserve; frailty is one end of this spectrum. Of interest from a population health and prevention perspective is to identify the characteristics of those who maintain their level of capability and biological function at a higher level than would be expected from their lifetime risk exposure, or are able to recover after adverse health events.

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Definitions of Health States

- Rs classified into one of four mutually exclusive and exhaustive functioning states based on a series of questions about physical functioning
- Rs asked whether they had difficulty with certain activities because of a health or memory problem, excluding difficulties that they expected to last less than three months.
- Rs reporting difficulty with (including inability to do) at least one of six activities of daily living—walking across a room, dressing, bathing, eating, getting in and out of bed, toileting—are classified as ADL
- Rs not experiencing any difficulties with ADLs, but some difficulty with at least one of five instrumental activities of daily living—using a telephone, managing money, taking medications, shopping for groceries, preparing meals—are classified as IADL
- Rs not experiencing difficulty with any of the eleven ADL/IADL activities listed above, but reported some difficulty with at least one of eleven functions—walking one block, walking several blocks, sitting for two hours, getting up from a chair after sitting for long periods, climbing several flights of stairs without resting, climbing one flight of stairs without resting, stooping/kneeling/crouching, lifting or carrying weights over 10 pounds, picking up a dime from a table, reaching arms above shoulder level, pushing or pulling large objects—are classified as having a functional limitation
- Rs reporting no functional difficulties of any kind are classified as healthy

Table 1. Unweighted Distribution of Person-Year Records by at the Beginning and End of Each Person-Year Interval for Adults Aged 50 to100 Years

	State at t+1					
State at t0	Healthy	FL	IADL	ADL	Death	Total
Healthy	**37,065**	**6,985**	**496**	**582**	**321**	**45,449**
FL	**5,209**	**58,046**	**1,482**	**4,137**	**1,081**	**69,955**
IADL	**264**	**979**	**4,489**	**1,109**	**368**	**7,209**
ADL	**203**	**2,668**	**759**	**20,027**	**1,977**	**25,634**
Total	**42,741**	**68,678**	**7,226**	**25,855**	**3,747**	**148,247**