

**The long arm of childhood: Early life disadvantage, educational attainment and active life expectancy**

Mark D. Hayward  
Professor of Sociology and Population Research Center  
University of Texas at Austin  
Austin, Texas

Q-Step Masterclass  
Queen's University  
Belfast, Northern Ireland

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**Background**

Childhood conditions (e.g. socioeconomic status) are associated with both physical functioning<sup>1,2</sup> and mortality risk<sup>3</sup>

Associations *partly* explained by adult conditions (e.g., SES, behaviors)

Prior studies examined functioning & mortality largely as distinct outcomes

It is unclear how childhood conditions **JOINTLY** influence functioning & mortality that define the period of life with – or without significant health problems (**Active Life Expectancy**)?

<sup>1</sup>Alvarado et al 2007, Guralnik et al 2006, Haas 2008, Luo & Waite 2005, Turrell et al 2007;  
<sup>2</sup>Bollen & Gotman 2010, Freedman et al 2008  
<sup>3</sup>Hayward and Gotman 2004, Barker 1997, Montez and Hayward 2011, Finch & Crimmins 2004, Davey Smith et al 1998

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**What do we mean by “JOINTLY influencing” physical functioning and mortality?**

A Birth ← age → Death

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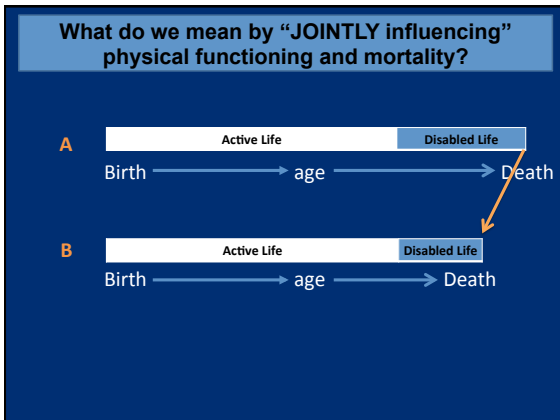
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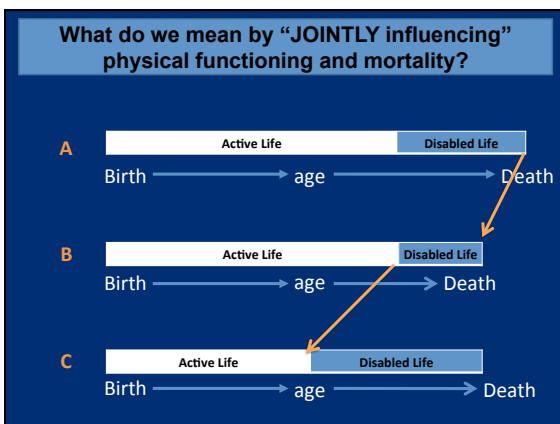
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**Aims of this Study**

To what extent is active life expectancy (ALE) shaped by two critical childhood conditions (health and socioeconomic context)?

To what extent can educational attainment overcome the consequences of a disadvantaged childhood on ALE?

How do childhood conditions *combine* with education to influence ALE?

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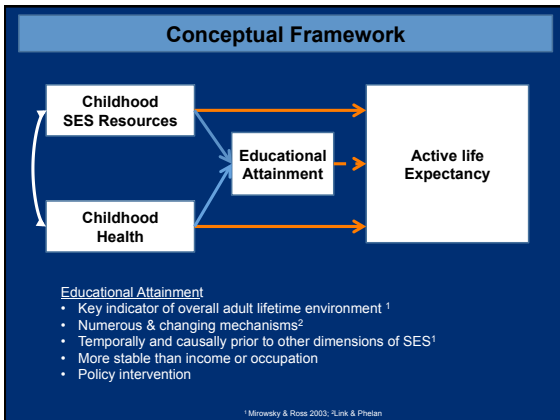
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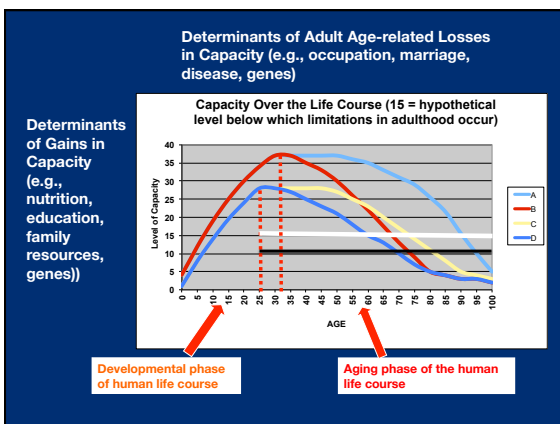
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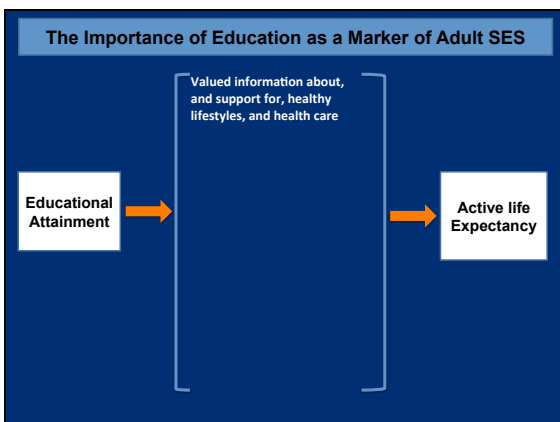
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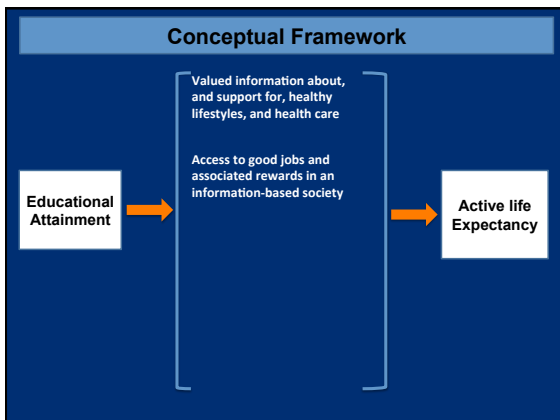
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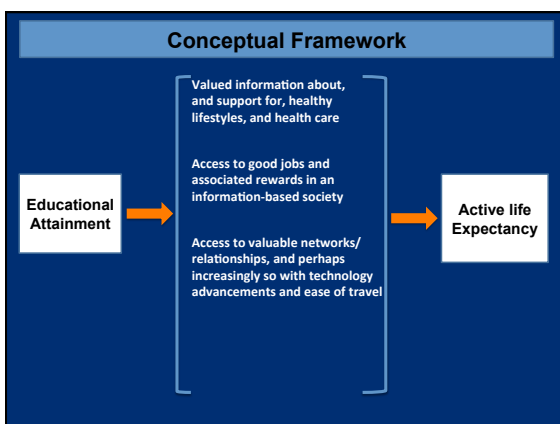
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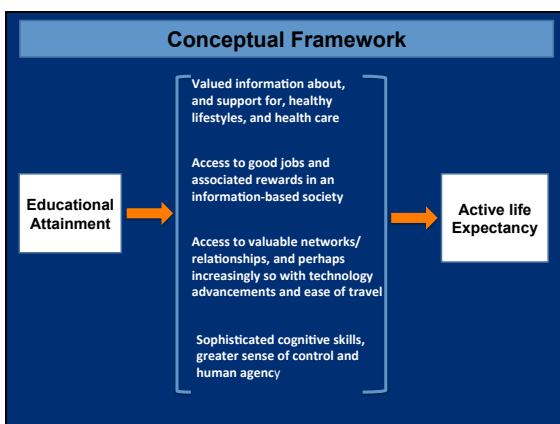
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**Data**

1998–2008 biannual waves of the Health & Retirement Study

- U.S.-born, non-Hispanic white & black men & women
- 50-100 years of age

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**Measuring Childhood & Adult Conditions**

**Index of Cumulative Childhood SES Adversities**

- Father had <8 years education 35.2%
- Mother had <8 years education 25.6%
- Family was poor 28.2%
- Moved for financial reasons 17.1%
- Received help from relatives 13.0%
- Never lived with father 7.3%
- Father had blue collar occupation 77.6%

**Childhood Health**

- 1=fair/poor; 0=good, very good, excellent

**Educational attainment**

- Less than HS, HS, Some College, BA+

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**Person-Year Sample Characteristics (N=148,232)**

Characteristics	Mean (or %)
Age (years)	66.0
Male (%)	43.9
Black (%)	9.7
Cumulative Childhood SES Adversity (%)	
0	14.6
1	30.0
2	19.3
3	18.3
4	11.0
5+	6.9
Fair/poor Childhood Health (%)	5.7
Educational Attainment (%)	
Less than High School	17.7
High School or GED	36.9
Some College	22.7
BA or higher	22.7

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**Active Life Expectancy**

STEP 1: Define State Space (16 possible transitions)

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    graph TD
      Healthy --> IADL
      Healthy --> FL
      Healthy --> ADL
      IADL --> Healthy
      IADL --> FL
      IADL --> ADL
      FL --> Healthy
      FL --> IADL
      FL --> ADL
      ADL --> Healthy
      ADL --> IADL
      ADL --> FL
      Healthy --> Death
      IADL --> Death
      FL --> Death
      ADL --> Death
  
```

ADL: difficulty with 1+ of 6 ADLs (e.g., bathing, eating, dressing)  
 IADL: no difficulty with ADLs, but difficult with 1+ of 5 IADLs (e.g., shopping)  
 FL: no difficulty with ADL or IADS, but difficulty with 1+ of 11 functions  
 Healthy: no difficulty

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**Active Life Expectancy**

STEP 2: For each of the 16 transitions, estimate transition rates from multivariate hazard models

$$\ln \mu_{ij}(x) = \beta_{j0} + \beta_{j1} \text{Age} + \beta_{j2} \text{ELH}$$

All models control for gender, race, and survey weights.

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**Active Life Expectancy**

STEP 2: For each of the 16 transitions, estimate transition rates from multivariate hazard models

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$$\ln \mu_{ij}(x) = \beta_{j0} + \beta_{j1} \text{Age} + \beta_{j2} \text{ELSES}$$

All models control for gender, race, and survey weights.

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**Active Life Expectancy**

STEP 2: For each of the 16 transitions, estimate transition rates from multivariate hazard models

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$$\ln\mu_{ij}(x) = \beta_{ij0} + \beta_{ij1} \text{ Age} + \beta_{ij2} \text{ ELSESES}$$

$$\ln\mu_{ij}(x) = \beta_{ij0} + \beta_{ij1} \text{ Age} + \beta_{ij2} \text{ ELSESES} + \beta_{ij3} \text{ ELH}$$

All models control for gender, race, and survey weights.

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**Active Life Expectancy**

STEP 2: For each of the 16 transitions, estimate transition rates from multivariate hazard models

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$$\ln\mu_{ij}(x) = \beta_{ij0} + \beta_{ij1} \text{ Age} + \beta_{ij2} \text{ ELSESES} + \beta_{ij3} \text{ ELH} + \beta_{ij4} \text{ ED}$$

All models control for gender, race, and survey weights.

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**Key Findings from These Models**

- Adults who experienced adverse childhood conditions were much more likely to make **unfavorable transitions**
- Childhood SES & health **independently** predicted transitions
- Childhood SES showed **threshold & dose-response** patterns

SES Level	Transition Rate (approx.)
SES 0	1.0
SES 1	1.0
SES 2	1.1
SES 3	1.2
SES 4	1.3
SES 5	1.4

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### Key Findings from the Multivariate Models

- Education only *partly* mediated the effects of childhood SES.
- Education did not mediate *any* of the effect of childhood health
- Childhood SES, health, and education combined in an **additive cumulative** way to influence the ALE transitions

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### Active Life Expectancy

STEP 3: Use the matrix of transition rates to estimate total and active life expectancy using multi-state life tables

Analyses stratified by gender

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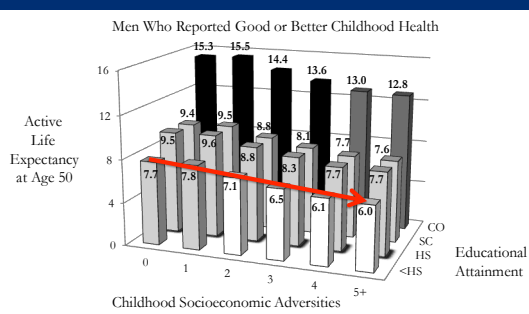
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### Active Life Expectancy at age 50 for white men who experienced favorable childhood health




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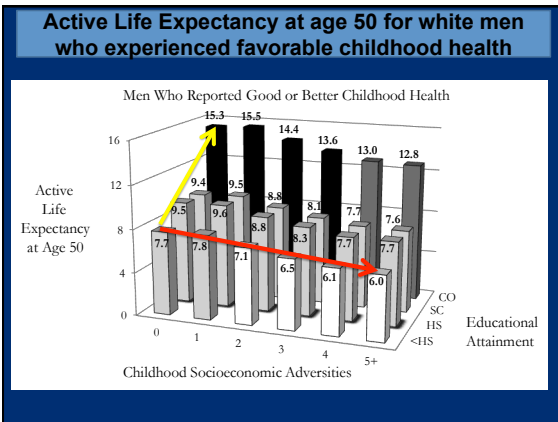
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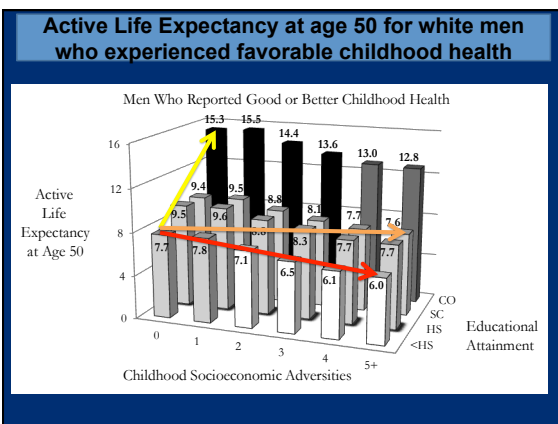
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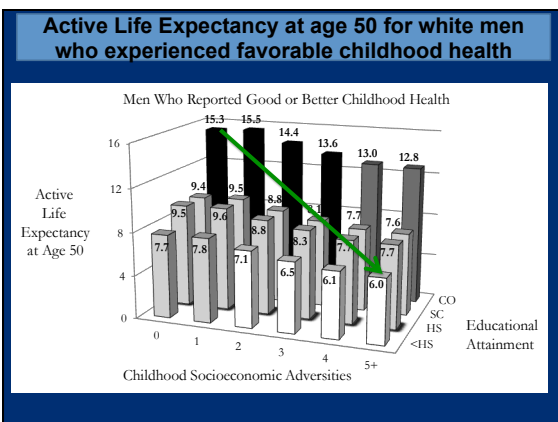
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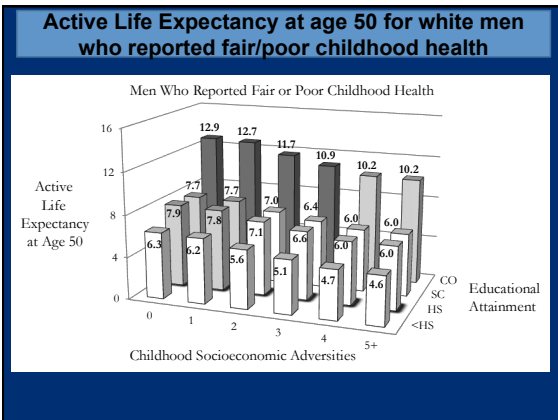
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### Conclusions

Adverse childhood contexts and education...

- shorter TLE & ALE & greater % of life impaired
- stronger impact on ALE than TLE
  - White men aged 50 w/ every advantage
    - TLE = 30.1 years, ALE = 13.7 years
  - White men aged 50 w/ every disadvantage
    - TLE = 26.7 years, ALE = 7.1
    - 30.1-26.7 = 3.4 TLE
    - 13.7-7.1 = 6.6 ALE
- Scenario C for disadvantaged persons

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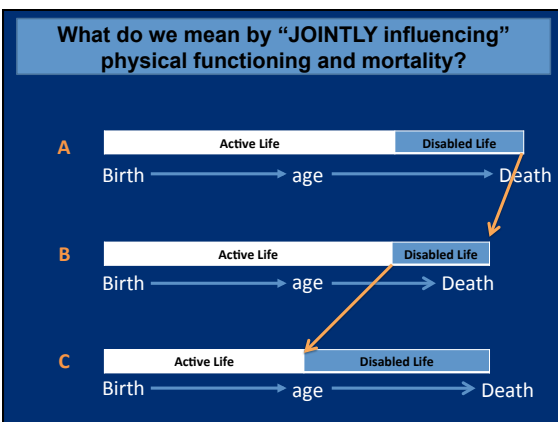
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**Conclusions**

Adverse childhood contexts...

- shorter TLE & ALE & greater % of life impaired
- stronger impact on ALE than TLE

Education increased TLE & ALE most for adults from advantaged childhoods (cumulative advantage?)

The capacity for education to overcome early adversity was more pronounced among men

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**Questions for Future Research**

How is the balance of the influences of childhood conditions and adult conditions changing across birth cohorts?

Are changes in the relative effects of childhood and adult conditions shared broadly across important population subgroups, e.g., minority status groups?

Is the American context unique or is this a broader phenomenon, perhaps concentrated in high income countries?

How might these patterns differ in countries that experienced closely spaced demographic, epidemiological, and technological revolutions?

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**In the American Context: Findings support "Education as Health Policy"<sup>1</sup>**

- Educated often "leveled or bettered" the playing field among adults raised in disparate contexts – a "turning point"
- Weight of the evidence here and many other studies suggests that enhanced educational attainment may represent an important step in improving population health
- The benefits of investing in education today may compound among future generations
- A multi-pronged approach to improve population health and reduce disparities should include education policy

<sup>1</sup> House, Shoeni, Kaplan, and Pollak 2008; Low, Low, Baumler, and Huynh 2005

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Thank you



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