

# Association of Youth Age at Exposure to Household Dysfunction with Outcomes in Early Adulthood

By Signe Hald Andersen  
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James J. Heckman



# Introduction

- Social scientists are currently advocating the importance of the association of positive and negative experiences in early childhood with biological, behavioral, and social outcomes in part because of heightened brain sensitivity from conception to age 3 years.
- In response, policy makers, child educators, and others have focused on the first years of childhood for securing cognitive functioning and physical and mental health in the adult population.
- However, insights from neuroscience provide a second perspective that adolescence is also a sensitive period in brain development, implying that experiences during this period are similarly crucial for later outcomes.
- This perspective has reached the United Nations Children's Fund (UNICEF), which now describes adolescence as an important second window of opportunity for developing appropriate interventions.

# Methods

## Data

- This cohort study used prospective population data for all Danish individuals born from 1987 to 1995 who were living in Denmark at 19 years of age (N = 605 344).
- All Danish residents have a unique personal number that identifies their interactions with the public sector (eg, when receiving welfare benefits, being incarcerated, or attending school) and several private institutions (eg, banks, private hospitals) and that enables family linkages.
- Statistics Denmark collects information on these interactions by the start and ending dates (since 1980) and grants access to this administrative data for research purposes.
- Data were analyzed in July 2020.

## HDI Measures

- With use of the data registers, I measured occurrences in childhood and adolescence of 6 household dysfunction items (HDIs) commonly recognized as factors associated with a range of later adverse outcomes<sup>9,12-19</sup>:
  - 1) parental divorce,
  - 2) prolonged unemployment (>9 months within a year) of 1 or both parents,
  - 3) incarceration of the father,
  - 4) inpatient treatment of a parent for mental illness,
  - 5) foster care placement of the child, and
  - 6) death of 1 or both parents (the eMethods in the Supplement gives definitions).

## Outcome Measures

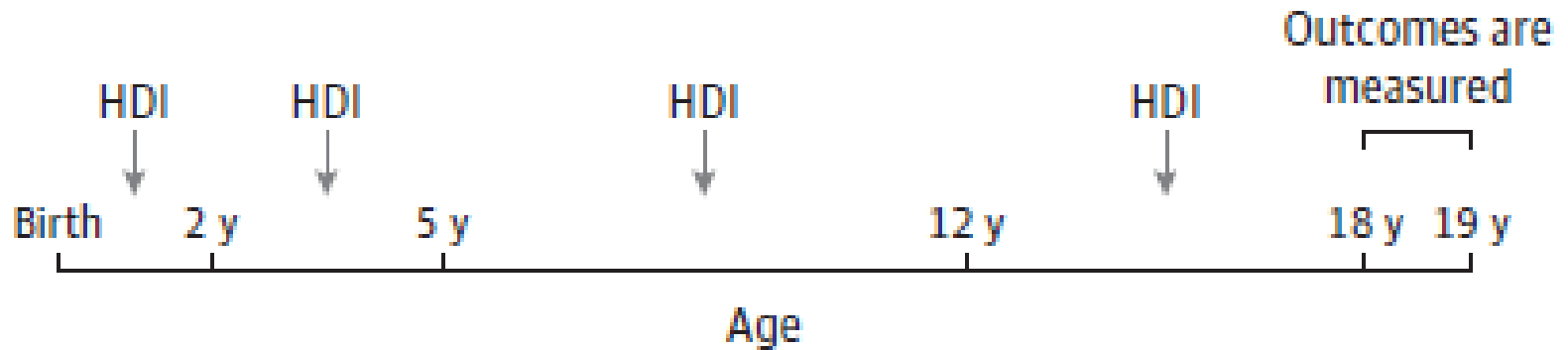
- In the analyses, I tested the association between HDI exposure and the risk of being diagnosed with a mental disorder, being charged with a criminal offense, being disconnected from education and the labor market, and not graduating from primary school.
- Each outcome measured the nature and success of the transition into adulthood, and these outcomes are among those needing to be reduced to sustain societies.
- **Figure 1** shows the sample, data, and variables structure. Cohorts born from 1987 to 1995 were followed up, HDIs that occurred before age 18 years were measured, and outcomes at ages 18 and 19 years were observed.

## Statistical Analysis

- I used a sibling fixed-effect model to estimate the dose-response and age-specific associations between HDI exposure and the collated outcome measure (eMethods in the Supplement).
- I also used the sibling fixed-effect model in the analysis of the dose-response association within age groups, and all models controlled for birth year, birth order, and sex (eTable 3 in the Supplement).
- From the models, I report the  $\beta$  coefficient, which is the change in the probability of experiencing the outcome variable for every 1-unit change in the HDI measure while holding all other variables in the model constant..



## Figure 1: Data Structure for the Study



Data are based on a birth cohort from 1987 to 1995.  
The vertical arrows indicate the age when household dysfunction item (HDI) exposure may occur.

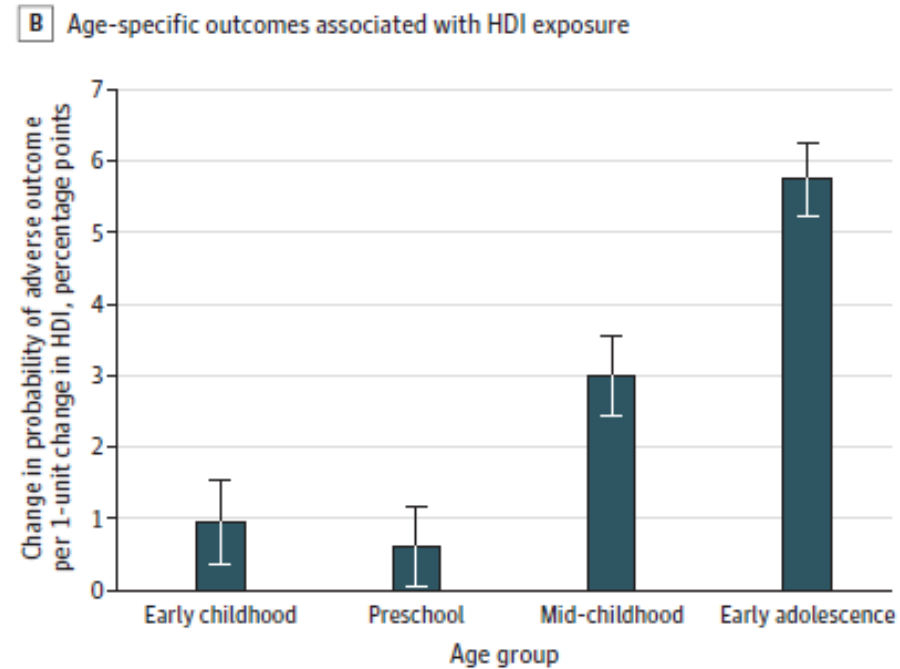
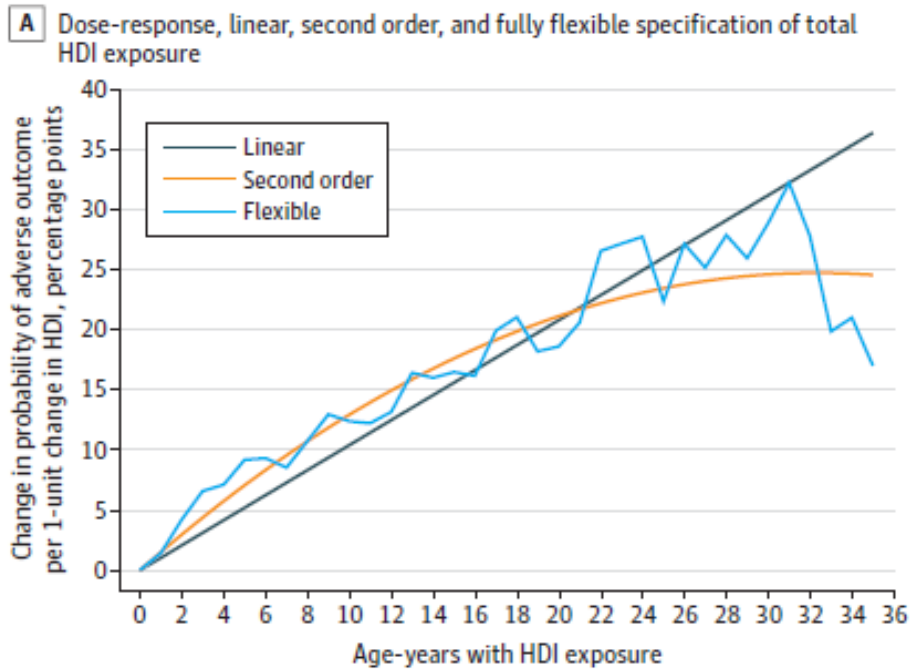
## Results

- Of the 605 344 individuals in the study sample (mean [SD] birth year, 1991 [2.56] years; range, 1987- 1995; 335 725 [55%] male), 278 115 (45.94%) had been exposed to 1 or more of the 6 HDIs between birth and 18 years of age (eTable 1 in the Supplement).
- The maximum number of HDIs experienced was 55 (eFigure 1 in the Supplement); a mean (SD) of 8.2% (27.4%) to 11.3% (31.7%) of individuals experienced 1 or more HDIs at each age (lowest at age 17 years and highest at age 1 year), and the cumulative proportion increased monotonically by age (eTable 1 in the Supplement).
- The 6 HDIs were correlated, although not strongly (eTable 2 in the Supplement).

## Dose Response and Age at Exposure

- Figure 2A shows the dose-response analysis of the association between the risk of experiencing adverse outcomes and HDI exposure across specification of the HDI measure (linear, second order, or fully flexible function).
- Figure 2B shows the age-specific association between HDIs and the adverse outcomes.
- Exposure in early childhood was associated with an increased risk of experiencing adverse outcomes of 1.0 percentage point ( $\beta = 0.010$ ; 95%CI, 0.004-0.015;  $P = .001$ ), and exposure in early adolescence was associated with an increased risk of 5.8 percentage points ( $\beta = 0.058$ ; 95%CI, 0.052-0.063;  $P < .001$ ).

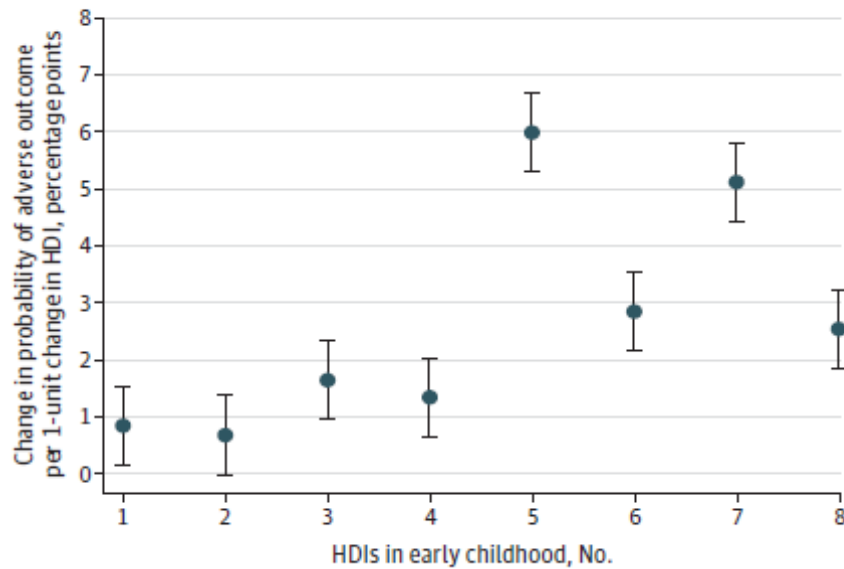
## Figure 2: Associations Between Household Dysfunction Items (HDIs) and Later Outcomes



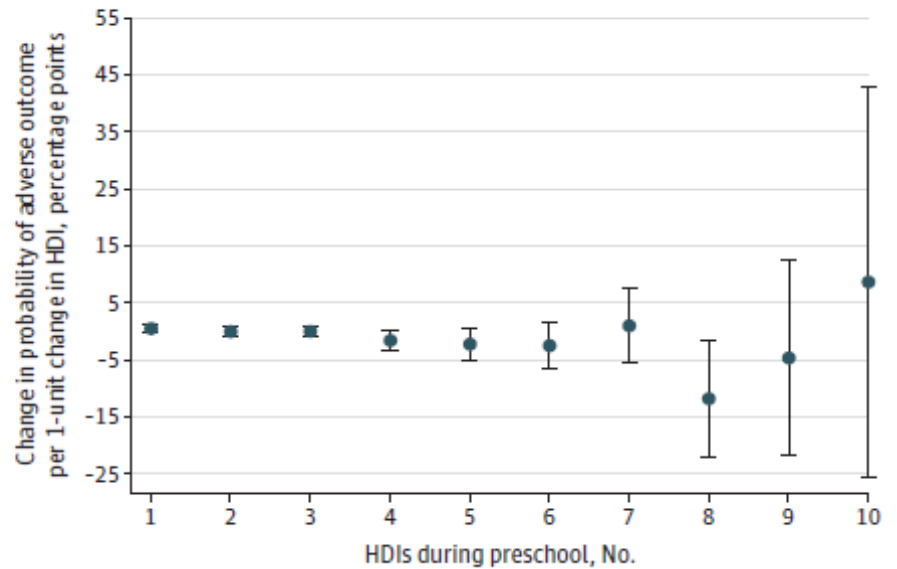
- Figure 3 shows flexible specification of HDI exposure within age groups.
- The dose-response association reappeared in early adolescence at least until a child had been exposed to 7 HDIs.

# Figure 3: Dose-Response Association Between Household Dysfunction Items and the Risk of Experiencing an Adverse Outcome by Age Category

**A** Early childhood

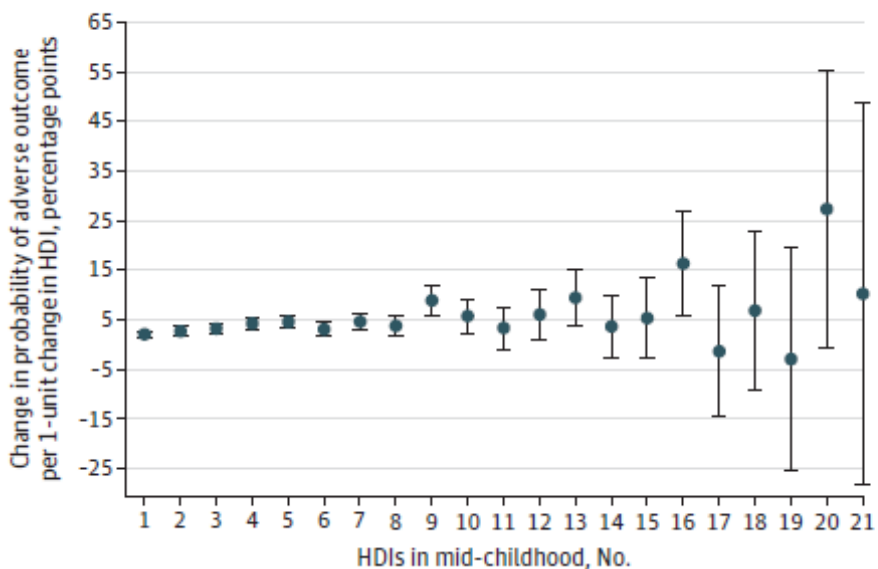


**B** Preschool

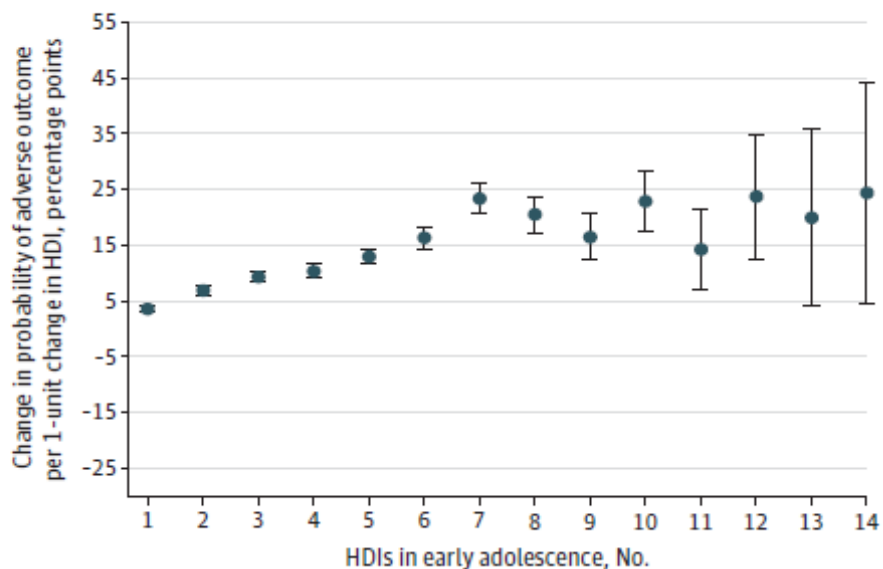


# Figure 3: Dose-Response Association Between Household Dysfunction Items and the Risk of Experiencing an Adverse Outcome by Age Category, Cont'd

**C** Mid-childhood



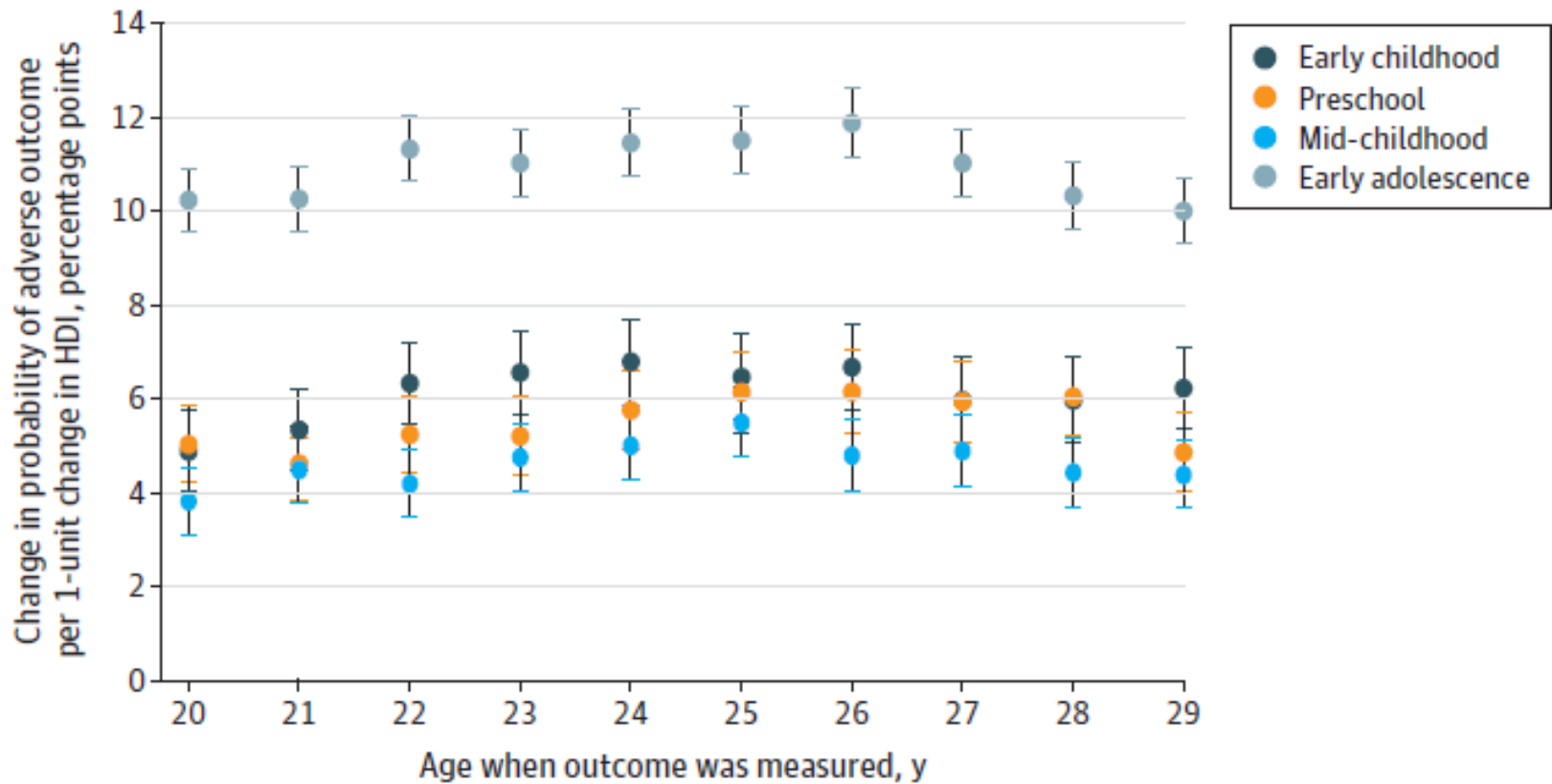
**D** Early adolescence



- I tested this theory by modeling the association between exposure in each of the 4 age groups and the risk of experiencing adverse outcomes, measured at each age from 20 years to 29 years.
- There was a stronger association between exposure in early adolescence and the outcome when measured at age 29 years ( $\beta = 0.100$ ; 95%CI, 0.093-0.107;  $P < .001$ ) compared with exposure in early childhood and outcomes at 20 years of age ( $\beta = 0.049$ ; 95%CI, 0.040-0.047;  $P < .001$ ) (**Figure 4**).



**Figure 4: Time Between Household Dysfunction Item (HDI) Exposure and the Outcome in Focus**



- **Figure 5** shows the association of age at HDI with outcomes exposure by type of HDI.10,11 Exposure to incarceration of the father ( $\beta = 0.030$ ; 95%CI, 0.014-0.044;  $P < .001$ ), mental illness treatment ( $\beta = 0.032$ ; 95%CI, 0.009-0.054;  $P = .005$ ), and parental divorce in early childhood was associated with adverse outcomes ( $\beta = 0.009$ ; 95%CI, 0.001-0.018;  $P = .03$ ).
- Furthermore, exposure to foster care ( $\beta = 0.273$ ; 95%CI, 0.263-0.283;  $P < .001$ ), incarceration of the father ( $\beta = 0.032$ ; 95%CI, 0.015-0.049;  $P < .001$ ), and mental illness treatment ( $\beta = 0.018$ ; 95%CI, 0.005-0.031;  $P = .008$ ) in early adolescence was associated with adverse outcomes.

**Figure 5: Association Between Household Dysfunction Item (HDI) Exposure and Adverse Outcome by Type of HDI**

