

# Childhood Conditions and Cognitive Functioning Later in Life

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# Motivation

- Important role of health in the decision to participate in the labor force, specifically for retirement (Dwyer & Mitchell 1998)
  - Health conditions may affect preferences for work, wage opportunities, and the time horizon workers face (Grossman 1972)
  - The OECD, in a report on the consequences of population ageing, suggests that '[t]he present employment problems of older workers seem to be rooted in their relatively low levels of foundation skills, such as literacy and numeracy' (OECD 1998:)
- ▶ but: where do the roots of cognitive functioning sprout?

# Motivation



$$E = m * c^2 ?$$

# Theoretical Background

- ▶ At some planning period, a worker chooses a retirement age that maximizes utility over the remainder of his life
- ▶ The present value of labor earnings and non-labor income (income from pensions and social security), as well as leisure, determine his lifetime budget constraint.
- ▶ The present discounted value of income over the remainder of his lifetime (PVY) includes the discounted sum of lifetime earnings net of taxes until retirement, plus pension contributions (PVE), and the net income from pensions and social security (PVP) from retirement to death.
- ▶ The worker retires when the utility gain from leisure exceeds that from working another year.

# Theoretical Background

**Two economic variables play an important role in the selection of the optimal retirement date:**

- ▶ (A) “Base year” wealth, or total discounted wealth available at early retirement, induces the worker to retire earlier
- ▶ (B) a higher gain to delaying retirement, which is an increase in the slope of the budget constraint, has a theoretically ambiguous effect [prior empirical research suggests however, that the net effect is positive, i.e. the substitution effect dominates the income effect]

# Theoretical Background

Incorporating **health problems** is somewhat difficult, have many ways through which retirement decision may be influenced...

- ▶ (1) altered productivity (decrease in earnings)
- ▶ (2) altered preferences (utility of consumption & leisure)
- ▶ (3) altered life expectancy

## Theoretically ambiguous effects of poor health on retirement age

- ▶ Empirical evidence suggests that poor health leads to earlier retirement because its effects on preferences and productivity dominate (Loprest et al. 1995; Bound 1991; Sickles & Taubman 1986; Anderson & Burkhauser 1985; Bazzoli 1985)
- ▶ ...what about cognitive functioning (CF) in particular?

## Related Work

- ▶ **CF as a determinant of labor force participation**
- ▶ Pryor and Schaffer (2000): use the Current Population Survey (CPS) and the 1992 National Adult Literacy Survey (NALS); argue that 'if functional literacy is one standard deviation higher than the mean, men and women have respectively a 3.5 and 7.2 percent greater probability of employment
- ▶ Cawley et al. (2001) and Heckman & Vytlačil (2001): use the National Longitudinal Survey of Youth (NLSY79); find evidence for an increase of the education/ability wage premium between 1980 and 1994
- ▶ Anger and Heineck (2006): use the GSOEP; find that an increase of speed of cognition by one standard deviation reduces men's unemployment probability by 5% and women's by 3%
- ▶ Haardt (2007): uses ELSA; finds that changes in cognitive functioning over time do not have any significant effects on the probability to enter or exit employment



## Related Work

- ▶ **Childhood conditions and cognitive functioning**
- ▶ Case & Paxson (2008): use HRS; find that taller men and women have greater cognitive function; argue that childhood height may proxy childhood health and nutrition which themselves may determine cognitive functioning later in life either directly or mediated by adult diseases (diabetes, hypertension, vascular disease) [proxied]
- ▶ Case & Paxson (2009): match historical data from the beginning of the 20th century with HRS data; find that burden of disease in early life (measured using infant mortality rates) is significantly associated with performance on cognitive skill tests in old age [proxied]
- ▶ Van den Bergh et al. (2010): use Longitudinal Aging Study Amsterdam (LASA); show that being born under adverse conditions results in strong decline of cognitive abilities following a stroke (effect is stronger for women than for men) [coping]
- ▶ ...direct effect of childhood health conditions on CF later in life?

# Dataset (SHARELIFE) & Empirical Strategy

- ▶ **SHARELIFE** (Release 0), i.e. the **third wave of SHARE**
- ▶ data collected between autumn 2008 and summer 2009
- ▶ matches data on life conditions of persons aged 50+ with restrospective information as obtained on basis of a life history calender (Belli 1998)
- ▶ have up to 48,413 observations from 14 European countries
- ▶ particularly provides information on health conditions during childhood
- ▶ also entails section which evaluates a person's current cognitive functioning

# Dataset (SHARELIFE) & Empirical Strategy

## Dependent variables (at age 50+)

### (1) Verbal fluency

*"Now I would like you to name as many different animals as you can think of. You have one minute to do this. Ready, go."*

### (2) Word recall

*"A little while ago, I read you a list of words and you repeated the ones you could remember. Please tell me any of the words that you can remember now?"*

### (3) Numeracy

*"If the chance of getting a disease is 10 per cent, how many people out of 1000 (one thousand) would be expected to get the disease?"*

- ▶ **Explanatory variables:** specifically have retrospective information on childhood conditions such as
  - self-rated health during childhood
  - specific health conditions (infectious diseases, polio, asthma, allergies, diarrhoea, meningitis, migraine, bone fractures, psychiatric problems, appendicitis, diabetes, leukaemia, other cancer)
  - socioeconomic conditions (number of books in household, number of rooms per household)
  - parental smoking when ten years old
  - occupation of main breadwinner when ten years old

**present only OLS results today** (further work currently in progress)

Table 1: Summary statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
verbal fluency score	18.872	7.616	0	100	33599
ten words list learning delayed recall total	3.575	2.045	0	10	33793
numeracy (disease chance)	0.810	0.393	0	1	32794
childhood health (1 = excellent; 5 = poor)	2.052	1.001	1	5	27614
infection	0.449	0.497	0	1	49304
polio	0.004	0.06	0	1	49304
asthma	0.01	0.102	0	1	49304
respiratory	0.016	0.127	0	1	49304
allergy	0.017	0.13	0	1	49304
diarrhoea	0.006	0.075	0	1	49304
meningitis	0.004	0.066	0	1	49304
ear	0.014	0.116	0	1	49304
speech	0.003	0.055	0	1	49304
eyes	0.01	0.098	0	1	49304
migraine	0.026	0.16	0	1	49304
epilepsy	0.004	0.066	0	1	49304
psychiatric	0.011	0.106	0	1	49304

*Continued on next page...*

... table 1 continued

Variable	Mean	Std. Dev.	Min.	Max.	N
fracture	0.049	0.215	0	1	49304
appendicitis	0.054	0.227	0	1	49304
diabetes	0.005	0.072	0	1	49304
heart	0.006	0.076	0	1	49304
leukaemia	0.012	0.108	0	1	49304
cancer	0.003	0.051	0	1	49304
country identifier	18.824	5.631	11	30	49304
rooms when ten years old	3.65	2.046	0	50	27458
number of people living in household when ten	5.603	2.402	0	50	27621
number of books in household when ten	2.071	1.204	1	5	27514
occupation of main breadwinner when ten	11.424	71.192	1	999	27297
did parents smoke during childhood	.347	.476	0	1	49304
female	0.528	0.499	0	1	39609
age of respondent	65.517	10.73	40	108	32912
rooms per household member	2.283	21.563	0	999	27766

	(1)	(2)	(3)
	verbal fluency	numeracy	word recall
childhood health status	-0.133** (-3.07)	-0.00747** (-2.89)	-0.0207 (-1.70)
number of people living in household when ten	-0.0782*** (-4.03)	-0.00574*** (-4.93)	-0.0311*** (-5.65)
age	0.222*** (4.38)	0.0128*** (4.18)	0.0821*** (5.74)
(age) <sup>2</sup>	-0.00294*** (-7.89)	-0.000142*** (-6.32)	-0.00107*** (-10.17)
female	-0.522*** (-6.20)	-0.107*** (-21.17)	0.306*** (12.84)
number of books in household when ten	1.116*** (25.69)	0.0362*** (14.02)	0.204*** (16.61)
rooms per household member	-0.0122*** (-4.33)	-0.000257 (-1.45)	-0.00152 (-1.93)
_constant	19.04*** (10.81)	0.849*** (8.02)	2.850*** (5.73)
<i>N</i>	22189	21677	22279

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for country fixed effects, father's profession, parental smoking

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	numeracy	numeracy	numeracy	numeracy	numeracy	numeracy	numeracy
infection	0.0278*** (4.29)						
polio		-0.0875** (-2.75)					
asthma			-0.0526** (-2.86)				
respiratory				-0.0211 (-1.46)			
allergy					-0.0227 (-1.57)		
diarrhoea						-0.0613* (-2.41)	
meningitis							-0.00459 (-0.16)
<i>N</i>	21769	21769	21769	21769	21769	21769	21769

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for respondent's age, age\_2, sex & household size, number of books per household, rooms

per household member, country fixed effects, father's profession, parental smoking.



	(1)	(2)	(3)	(4)	(5)	(6)
	numeracy	numeracy	numeracy	numeracy	numeracy	numeracy
ear	-0.0259 (-1.59)					
speech		-0.0563 (-1.68)				
eyes			0.00259 (0.14)			
migraine				0.000036 (0.01)		
epilepsy					-0.151 *** (0.04)	
psychiatric						-0.0537* (0.03)
<i>N</i>	21769	21769	21769	21769	21769	21769

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for respondent's age, age\_2, sex & household size, number of books per household, rooms per household member, country fixed effects, father's profession, parental smoking.

	(1)	(2)	(3)	(4)	(5)	(6)
	numeracy	numeracy	numeracy	numeracy	numeracy	numeracy
fracture	.00007 (0.01)					
appendicitis		-0.00000167 (-0.00)				
diabetes			0.0459 (0.52)			
heart				-0.0228 (-0.78)		
leukaemia					0.0887 (0.54)	
cancer						-0.171 (-1.15)
<i>N</i>	21769	21769	21769	21769	21769	21769

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for respondent's age, age\_2, sex & household size, number of books per household, rooms per household member, country fixed effects, father's profession, parental smoking.

## Discussion

- ▶ Find some evidence for influence of childhood diseases on cognitive functioning later in life
- ▶ Can't claim causality yet (as per OLS)
- ▶ We're currently making some steps towards identifying causal effects as per IV (potential instruments: introduction of new vaccines, pandemics, quarter of birth, business cycles, previously unknown side effects of new drugs)
- ▶ If there should be a nexus between childhood conditions and cognitive functioning later in life: is it a direct effect or is it mediated/reinforced through e.g. education?
- ▶ Need to quantify variations in labor force participation as attributable to differences in cognitive functioning which are **rooted** in childhood...still a long way to go!!!
- ▶ Policy implications: address income inequalities, health (care), or education?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	verbal fluency	verbal fluency	verbal fluency	verbal fluency	verbal fluency	verbal fluency	verbal fluency
infection	0.983*** (9.12)						
polio		0.350 (0.66)					
asthma			0.401 (1.29)				
respiratory				1.116*** (4.58)			
allergy					0.439 (1.79)		
diarrhoea						-0.609 (-1.43)	
meningitis							0.270 (0.57)
N	22288	22288	22288	22288	22288	22288	22288

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for respondent's age, age\_2, sex & household size, number of books per household, rooms

per household member, country fixed effects, father's profession, parental smoking.

	(1)	(2)	(3)	(4)	(5)	(6)
	verbal fluency	verbal fluency	verbal fluency	verbal fluency	verbal fluency	verbal fluency
ear	0.0104 (0.04)					
speech		-1.207* (-2.13)				
eyes			0.838** (2.63)			
migraine				0.108 (0.54)		
epilepsy					0.0688 (0.14)	
psychiatric						0.328 (1.11)
<i>N</i>	22288	22288	22288	22288	22288	22288

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for respondent's age, age\_2, sex & household size, number of books per household, rooms per household member, country fixed effects, father's profession, parental smoking.

	(1)	(2)	(3)	(4)	(5)	(6)
	verbal fluency	verbal fluency	verbal fluency	verbal fluency	verbal fluency	verbal fluency
fracture	0.668*** (4.50)					
appendicitis		0.147 (1.04)				
diabetes			-0.897* (-2.00)			
heart				1.019* (2.55)		
leukaemia					0.0263 (0.09)	
cancer						-0.768 (-1.28)
<i>N</i>	22288	22288	22288	22288	22288	22288

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for respondent's age, age\_2, sex & household size, number of books per household, rooms per household member, country fixed effects, father's profession, parental smoking.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	word recall	word recall	word recall	word recall	word recall	word recall	word recall
infection	0.0458 (1.50)						
polio		0.153 (1.02)					
asthma			-0.139 (-1.59)				
respiratory				-0.0198 (-0.29)			
allergy					-0.0654 (-0.95)		
diarrhoea						-0.0465 (-0.39)	
meningitis							-0.220 (-1.66)
<i>N</i>	22381	22381	22381	22381	22381	22381	22381

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for respondent's age, age\_2, sex & household size, number of books per household, rooms

per household member, country fixed effects, father's profession, parental smoking.

	(1)	(2)	(3)	(4)	(5)	(6)
	word recall	word recall	word recall	word recall	word recall	word recall
ear	-0.0271 (-0.35)					
speech		-0.580*** (-3.63)				
eyes			0.0932 (1.03)			
migraine				-0.0140 (-0.25)		
epilepsy					0.0617 (0.46)	
psychiatric						-0.0463 (-0.56)
<i>N</i>	22381	22381	22381	22381	22381	22381

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for respondent's age, age\_2, sex & household size, number of books per household, rooms per household member, country fixed effects, father's profession, parental smoking.



	(1)	(2)	(3)	(4)	(5)	(6)
	word recall	word recall	word recall	word recall	word recall	word recall
fracture	0.0548 (1.30)					
appendicitis		0.0571 (1.43)				
diabetes			-0.0247 (-0.19)			
heart				-0.106 (-0.94)		
leukaemia					0.00661 (0.08)	
cancer						-0.680*** (-4.00)
<i>N</i>	22381	22381	22381	22381	22381	22381

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

model controls for respondent's age, age\_2, sex & household size, number of books per household, rooms per household member, country fixed effects, father's profession, parental smoking.