Impact of wealth on loss of autonomy in the old age

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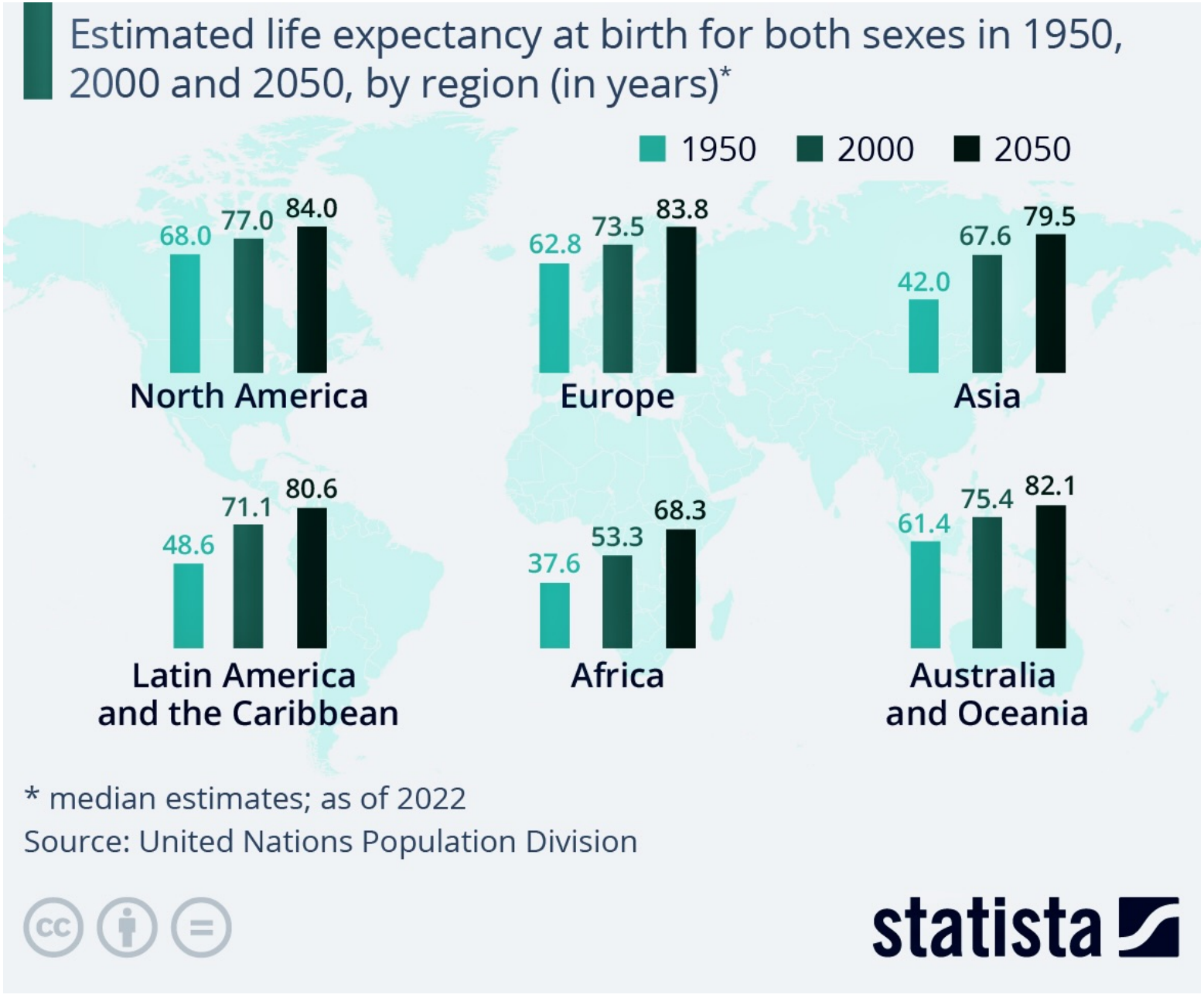
UCL Winter Doctoral Workshop

Introduction (1/3)

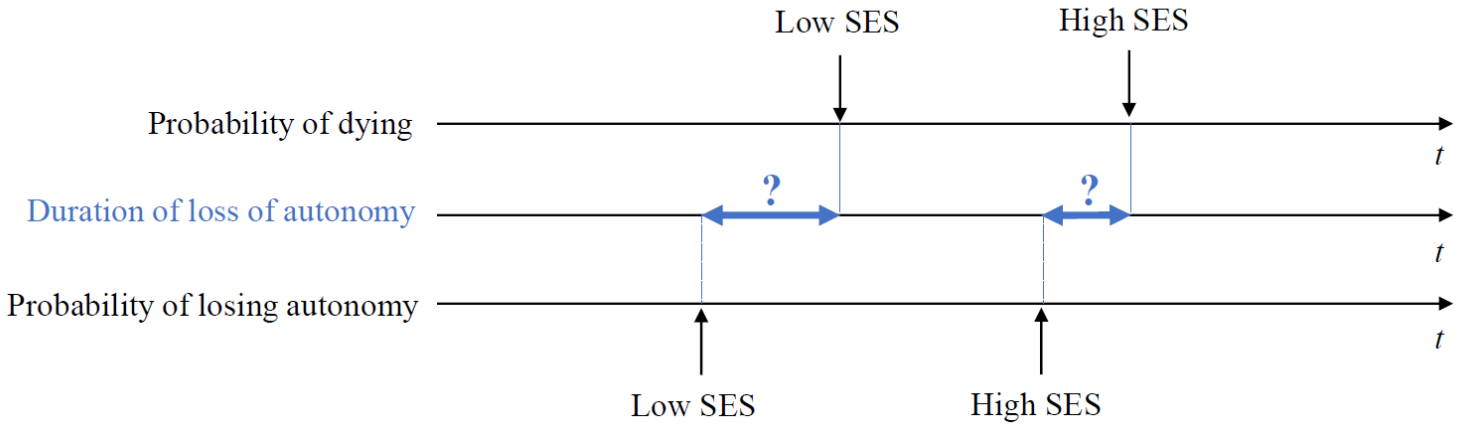


Introduction (2/3)

- heterogeneity in life expectancy (Duleep, 1989, 1998; Jusot, 2006; Cristia, 2009; Delavande and Rohwedder, 2011; Hupfeld, 2011; Kalwij et al., 2013; Lacroix et al., 2021; Milligan and Schirle, 2021)
- Living longer $\neq$ living longer in good health
  - In OECD countries: 50% of the 65 years old and older report daily limitations (ADL)(OECD, 2021)
  - Number of dependent people is expected to increase (Canta, 2020)
- Long-term care (LTC) needs will increase $\rightarrow$ costly for the individuals and the State.
  - Definition of LTC needs: the day-to-day help with activities of daily living and additional types of medical support
- Essential to understand how the loss of autonomy evolves at the end of life and which individuals are more likely to suffer from dependency.

Introduction (3/3)

- Try identify a causal impact of wealth on
  - the probability of losing autonomy ?
  - the duration of the loss of autonomy ?



- To do so we are using 2 datasets: HRS (from the US) and SHARE (from Europe).
- We estimate both OLS and correlated random effect IV regressions to control for endogeneity.
  - using inheritance/large gifts as an instrument for wealth

Literature and Contributions

- Probability of losing autonomy?
  - effect of education or income/wealth on functional limitations (Freedman and Martin, 1999; Kim and Rhum, 2012; Lefebvre et al., 2018; Connolly et al., 2023)
- Duration of loss of autonomy?
  - Cambois et al. (2011) with French data showed that manual workers have a double disadvantage: shorter life expectancy and more years in poor health and with disabilities
  - Friedberg et al. (2014) with HRS data showed that wealthier individuals are more likely to recover from dependency
- **Our contributions:**
  - *Method:* provide a stronger identification strategy
  - *Thematic:* duration of loss of autonomy

Data (1/6)

- **HRS: Health and Retirement Study (US)**
- **SHARE: Survey of Health, Ageing, and Retirement in Europe**
- biennial and longitudinal surveys that follow people over 50 years old in USA and in EU.
- Access to the evolutions of:
  - the individual health status and characteristics
  - time at which the person becomes dependent/dies
  - Household/individual socio-economic situation
- Highly harmonized: be used for pooled or comparative analyses (e.g.: U.S vs EU)
- Waves 10 to 14 for HRS; 4 to 8 for SHARE
  $\rightarrow$ time period: 2010/2011 - 2019/2020

HRS and SHARE data (2/6)

Information on ADL limitations:

- 1.Dressing, including putting on shoes and socks; 2.Walking across a room; 3.Bathing or showering; 4.Eating, such as cutting up your food; 5.Getting in or out of bed; 6.Using the toilet, including getting up or down
- Dependent if at least 2 limitations
- Keep respondents that
  - are ALIVE and NOT dependent in $t = 1$
  - are 65 and more = mostly affected by dependence

HRS and SHARE data (3/6)

Information on household wealth:

- net sum of all assets = estimated value of real estate, amounts on bank accounts, value of shares and bonds, etc. to which any debts are subtracted
- Terciles and percentiles by country
- **Wealth is fixed in t=1**: accumulation of wealth and not affected by LTC

Information on other demographic (gender, age, education), health (mental, conditions, mobility) and family (partner and children) variables

- can evolve over time (5 periods)

HRS and SHARE data (4/6)

	Regions					
	US	north EU	center EU	south EU	East EU	Total
N	6,928 (40.0%)	1,297 (7.5%)	3,953 (22.8%)	1,617 (9.3%)	3,513 (20.3%)	17,308 (100.0%)
Household wealth (in thousands)	505.97 (1,003.89)	313.22 (384.86)	386.97 (707.47)	252.41(410.55)	81.18 (119.66)	354.44 (757.02)
Household income (in thousands)	52.86 (72.77)	35.40 (22.80)	49.61 (63.06)	21.01 (35.17)	11.71 (22.43)	39.48 (59.74)
Gender (=1 women)	0.553 (0.497)	0.527 (0.499)	0.534 (0.499)	0.485 (0.500)	0.573 (0.495)	0.544 (0.498)
Number of children	3.421 (2.119)	2.312 (1.279)	2.253 (1.490)	2.506 (1.621)	1.973 (1.142)	2.692 (1.820)
Age	75.231 (6.962)	74.929 (7.362)	74.749 (6.862)	75.337 (6.769)	74.241 (6.407)	74.907 (6.854)
low education	0.221 (0.415)	0.407 (0.491)	0.385 (0.487)	0.863 (0.344)	0.422 (0.494)	0.372 (0.483)
medium education	0.351 (0.477)	0.263 (0.441)	0.348 (0.477)	0.083 (0.276)	0.329 (0.470)	0.315 (0.465)
high education	0.428 (0.495)	0.330 (0.470)	0.266 (0.442)	0.053 (0.225)	0.250 (0.433)	0.313 (0.464)
Bad mental health = 1	0.150 (0.357)	0.161 (0.368)	0.236 (0.425)	0.343 (0.475)	0.323 (0.468)	0.224 (0.417)
Bad health condition = 1	0.723 (0.447)	0.502 (0.500)	0.535 (0.499)	0.615 (0.487)	0.622 (0.485)	0.633 (0.482)

Table: Sample by regions

European Regions (SHARE): Denmark, Sweden (North); Austria, Belgium, France, Germany, Switzerland (Center); Italy, Spain (South); Czech Rep., Estonia, Slovenia (East)

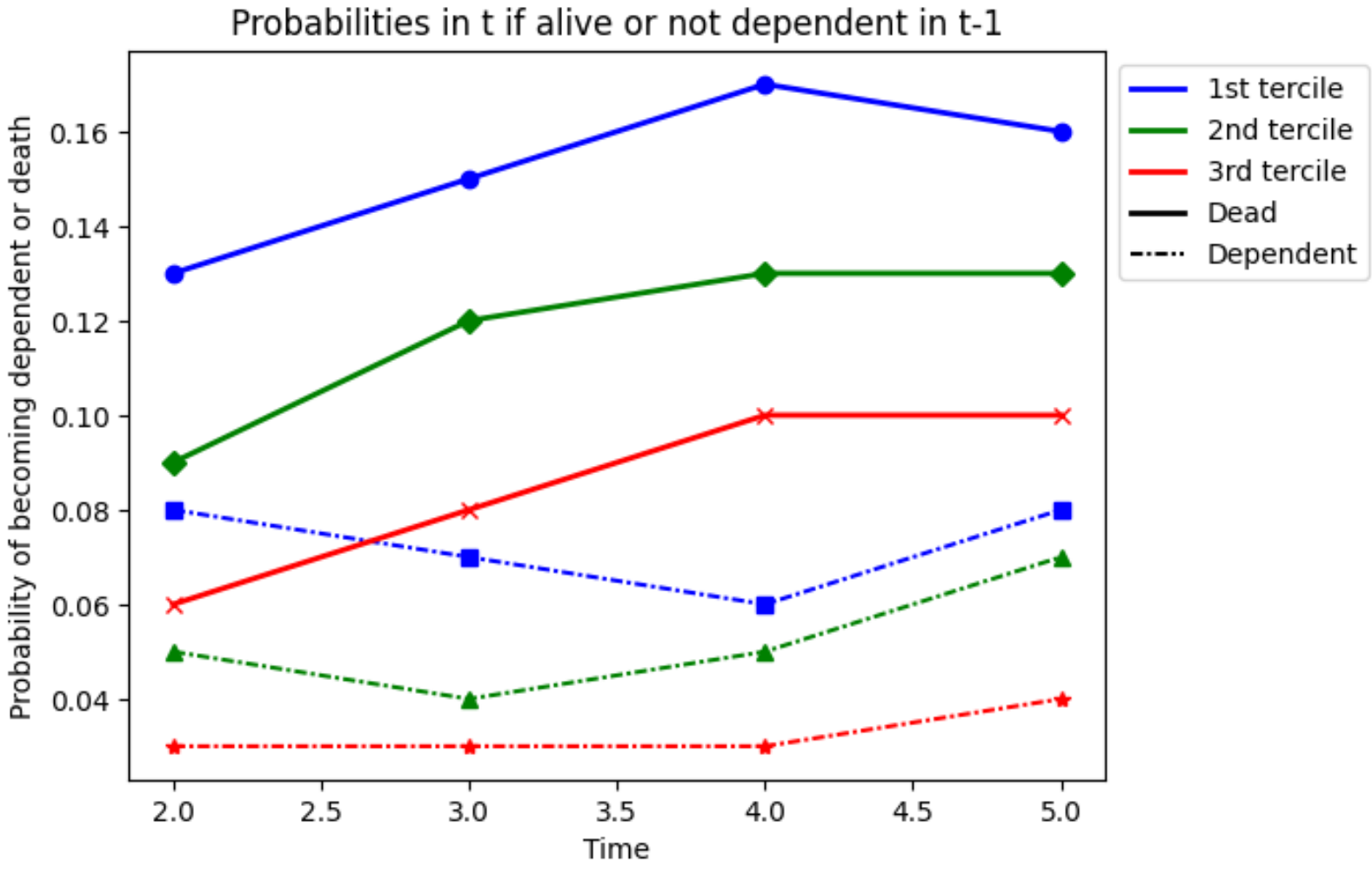
HRS and SHARE data (5/6)

Regions	***Terciles***	**t1**	**t2**	**t3**	**t4**	**t5**
HRS	*1*	0	0.09	0.13	0.15	0.18
HRS	*2*	0	0.06	0.07	0.09	0.13
HRS	*3*	0	0.02	0.05	0.06	0.08
SHARE	*1*	0	0.07	0.09	0.10	0.12
SHARE	*2*	0	0.04	0.05	0.07	0.09
SHARE	*3*	0	0.03	0.04	0.05	0.07

Table: Cumulative Probabilities of losing autonomy in t w.r.t. wealth terciles *(in t=1)* and regions

HRS and SHARE data (6/6)

Figure: Probability of the event (death/loss of autonomy) in *t* if not dependent in *t-1* w.r.t wealth terciles



Empirical strategy - Plan

- **Goal:** effect of wealth on (1) dependency and (2) its duration
- **(1) Dependent**
  - *Probability of becoming dependent in* $t+1$ *if not in* t
  - *Number of ADL (intensity)* $[0;6]$ *in* $t+1$ *if not in* t
- **(2) Duration**
  - *Probability of being alive in* $t+1$ *once dependent in* t
  - *Number of periods of dependency* $[1;4]$ *once dependent in* t *or alive in in* t

Empirical strategy - Baseline regressions

- (1) Dependent

$$D_{it+1} = \beta W_i + X_{it}^{'}\gamma + \alpha_i + \varepsilon_{it} | D_{it} = 0$$

$$ADL_{it+1} = \beta W_i + X_{it}^{'}\gamma + \alpha_i + \varepsilon_{it} | D_{it} = 0$$

- (2) Duration

$$A_{it+1} = \beta W_i + X_{it}^{'}\gamma + \alpha_i + \varepsilon_{it} | D_{it} = 1$$

- W_{it} is the indicator of the percentile of wealth in which the individual belongs in $t = 1$
  $X_{it}^{'}$ is a set of control variables, α_i is the individual effects and ε_{it} is the idiosyncratic error term
- robust and clustered standard errors at the individual level

Empirical strategy - CRE

- as wealth, W_i, is fixed, cannot use FE
- **Correlated Random Effects model** (Mundlak, 1978) to control for the within individual changes in the variables of interest.
- The individual specific effect is expressed as a linear function of the (a) average time-varying explanatory variables (b) a random individual specific effect that is assumed to be independent of the explanatory variables:

$$\alpha_i = \bar{X}_i \zeta + \xi_i$$

where $\bar{X}_i$ is the individual means of X_{it} and ξ is normal distributed with mean zero and variance σ^2_ξ.

- Baseline equation can be rewritten as

$$D_{it+1} = \beta W_i + X'_{it} \gamma + \bar{X}_i \zeta + \xi_i + \varepsilon_{it}$$

Empirical strategy - IV

- To address the endogeneity problem, we estimate a two-stage model (2SLS) by instrumentalising wealth by **having inherited or received large gifts**
  - induce a wealth shock but not loss of autonomy
- **CRE + IV** (Joshi and Wooldridge, 2019)
  - used in previous research (both linear and nonlinear models) (Papke, 2005; Papke and Wooldridge, 2008)
- The first-stage and reduced-form equations of the analysis are

$$W_{it} = \varphi_1 I_{it} + X_{it}^{'}\pi_1 + \bar{X}_i\zeta_1 + \xi_{1i} + \mu_{1it}$$

$$D_{it+1} = \varphi_2 I_{it} + X_{it}^{'}\pi_2 + \bar{X}_i\zeta_2 + \xi_{2i} + \mu_{2it}$$

where I_{it} is a dummy variable for having inherited. The covariates contained in $X_{it}^{'}$ are the same as in the above model.

Empirical strategy - IV

Good instrument? Relevance

- Inheritance/large gifts receipt have been used as an instrument for wealth in studies investigating the effect of wealth on health behaviors (Kim et al. (2012) and Kippersluis et al. (2014)) and health outcomes (Meer et al. (2003) and Carman (2013))
- First stage estimations confirm the predictive power of this instrument.

Empirical strategy - IV

Good instrument? Exclusion restriction

- Possible that the inheritance received also reflects the poor state of health in the family (Apouey et al.(2015))
- $\rightarrow$ **inheritance excluding close family members**
- Other concern: a third variable driving both our instrumental varibales and dependence. Wealthy or "priviledged" backgrounds are : particularly likely to receive inheritance and benefited from the childhood care that leads to good health as adults (Meer et al. (2003))
  - include observable variable such as education
  - Robustness check: include parent's health and education

Empirical strategy - Plan

- **Goal:** effect of wealth on (1) dependency and (2) its duration
- **(1) Dependent**
  - *Probability of becoming dependent in* $t+1$ *if not in* t: CRE IV
  - *Number of ADL (intensity)* $[0;6]$ *in* $t+1$ *if not in* t: CRE IV
- **(2) Duration**
  - *Probability of being alive in* $t+1$ *once dependent in* t: CRE IV
  - *Number of periods of dependency* $[1;4]$ *once dependent in* t *or alive in in* t: Ordered Probit (CRE) IV (?)

Results - Becoming Dependent

dep.var.: Probability of becoming dependent in $t+1$ if not in t

	POLS		CRE-IV		CRE-IV no family	
	(1) SHARE	(2) HRS	(3) SHARE	(4) HRS	(5) SHARE	(6) HRS
Wealth percentiles	-0.000188***	-0.000430***	-0.000693***	-0.000311	-0.000431	-0.000218
	(-3.89)	(-7.29)	(-2.68)	(-1.26)	(-1.15)	(-0.78)
Gender	-0.0130***	-0.00123	-0.0153***	-0.00141	-0.0152***	-0.00117
	(-4.97)	(-0.40)	(-4.69)	(-0.43)	(-4.67)	(-0.36)
Age	-0.0513***	-0.0369***	-0.221***	-0.174***	-0.222***	-0.175***
	(-8.32)	(-5.83)	(-20.15)	(-13.65)	(-20.26)	(-13.83)
Mental health	0.0440***	0.0439***	0.0172***	0.0147**	0.0170***	0.0150**
	(12.09)	(7.67)	(4.43)	(2.23)	(4.39)	(2.30)
Health conditions	0.0123***	0.0205***	-0.00482*	-0.0206***	-0.00498*	-0.0193***
	(5.12)	(7.26)	(-1.68)	(-2.90)	(-1.74)	(-2.69)
Number of observations	26040	20160	25937	19980	26040	20160

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

controlling for education, marital status and children

Results - Becoming Dependent: intensity

dep.var.: Number of daily limitations $[0, 6]$ in $t + 1$ if not dependent in t

	POLS		CRE-IV		CRE-IV no family	
	(1) SHARE	(2) HRS	(3) SHARE	(4) HRS	(5) SHARE	(6) HRS
Wealth percentiles	-0.000857***	-0.00180***	-0.00451***	-0.00226**	-0.00400***	-0.00174
	(-4.40)	(-7.81)	(-4.40)	(-2.00)	(-2.85)	(-1.39)
Gender	-0.0462***	0.00488	-0.0625***	0.00845	-0.0626***	0.00986
	(-4.34)	(0.39)	(-4.58)	(0.56)	(-4.57)	(0.66)
Age	-0.196***	-0.174***	-0.748***	-0.625***	-0.745***	-0.628***
	(-8.27)	(-6.69)	(-18.95)	(-14.01)	(-18.98)	(-14.15)
Mental health	0.196***	0.197***	0.0589***	0.0509**	0.0583***	0.0510**
	(13.81)	(9.40)	(3.87)	(2.29)	(3.84)	(2.31)
Health conditions	0.0703***	0.102***	-0.0214*	-0.0624**	-0.0223**	-0.0549**
	(7.40)	(8.79)	(-1.90)	(-2.37)	(-1.98)	(-2.03)
Number of observations	26040	20160	25937	19980	26040	20160

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

controlling for education, marital status and children

Results - Duration of Dependency

dep.var.: being alive in t+1 if dependent in *t*

	POLS		CRE-IV		CRE-IV no family	
	(1) SHARE	(2) HRS	(3) SHARE	(4) HRS	(5) SHARE	(6) HRS
Wealth percentiles	-0.000927	-0.00117	-0.000463	-0.00399	0.00280	-0.00510
	(-1.41)	(-1.64)	(-0.19)	(-1.64)	(0.81)	(-1.58)
Gender	0.164***	0.152***	0.0734***	0.0872***	0.0745***	0.0857**
	(4.23)	(3.74)	(2.78)	(2.67)	(2.68)	(2.57)
Age	0.0349	0.156***	0.359**	0.523***	0.395***	0.451**
	(0.69)	(2.88)	(2.49)	(2.82)	(2.66)	(2.42)
Mental health	-0.106***	-0.0384	-0.0802	-0.0133	-0.0817	-0.0328
	(-2.79)	(-1.04)	(-1.36)	(-0.20)	(-1.40)	(-0.49)
Health conditions	0.0581	0.0419	-0.0420	-0.0199	-0.0233	-0.145
	(1.21)	(0.47)	(-0.55)	(-0.10)	(-0.32)	(-0.59)
Number of observations	824	739	819	728	824	739

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

controlling for education, marital status and children

Results - Duration of Dependency

dep.var.:Number of dependency periods on alive people

	Ordered Probit - IV		Ordered Probit - IV no family	
	(1) SHARE	(2) HRS	(3) SHARE	(4) HRS
Wealth percentiles	-0.00388***	-0.00441***	-0.00259*	-0.00446***
	(0.00107)	(0.00107)	(0.00139)	(0.00137)
Gender	-0.100***	-0.0733***	-0.101***	-0.0730***
	(0.0157)	(0.0158)	(0.0156)	(0.0158)
Age	0.138***	0.265***	0.140***	0.262***
	(0.0373)	(0.0388)	(0.0373)	(0.0386)
Mental Health	-0.0198	-0.0647***	-0.0208	-0.0657***
	(0.0233)	(0.0240)	(0.0232)	(0.0239)
Health conditions	-0.0883***	-0.106***	-0.0905***	-0.109***
	(0.0263)	(0.0285)	(0.0262)	(0.0284)
N	60626	60475	60998	60854

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

controlling for education, marital status and children

Conclusion/discussion :

- With HRS and SHARE data, we are looking the causal impact of wealth on dependency and its duration.
- With CRE-IV models, we find little statistical evidence that people with lower wealth are more likely to become dependent.
- Do find correlations (as shown in the literature).
- Next steps:
  - Ordered Probit - CRE - IV: model combinations (?)
  - Cox (survival) model : verify our results ?
  - Number of dependency periods on *dead* people
  - Consider gender inequalities within households
  - Any suggestions ?