

Examining the Relationship between Health and Wealth

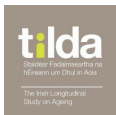
Wealth and the Effect of Subjective Survival Probability

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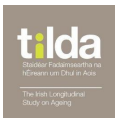
Outline:

Wealth and the Effect of Subjective Survival Probability

- 1 Research question
- 2 Motivation
- 3 Literature
- 4 Data
- 5 Methodological approach (identification: instrumental variables)
- 6 Findings



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Research question

An unhealthy 70 year old male at 20th percentile of the permanent income distribution expects to live to age 76.

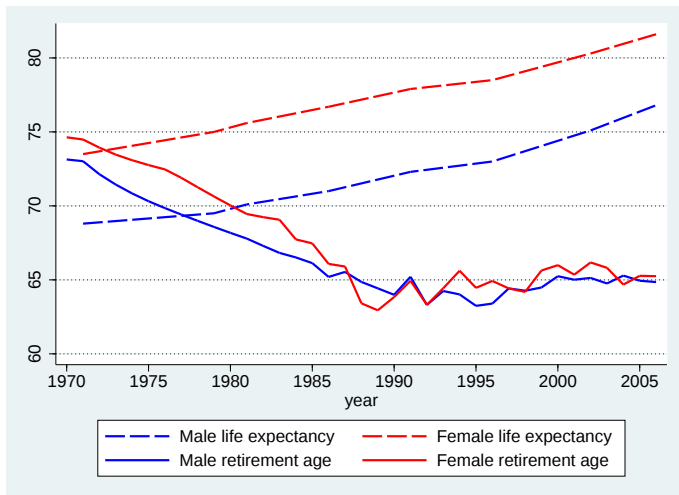
A healthy 70 year old female at 80th percentile of the permanent income distribution expects to live to age 86.

(De Nardi et al., 2009)

Keeping other things constant, expected length of life should affect individuals' and households' wealth accumulation (Life Cycle Hypothesis).

→ **Do people who expect to live a long life accumulate more wealth?**

Trends in Irish retirement ages and life expectancy



Sources: CSO Irish Life Tables and OECD

Motivation

How to fund a longer retirement?

- Delay retirement
- Save more during working life

Delaying retirement may not be an option.

Moves from Defined Benefit to Defined Contribution pensions → more individual responsibility and risk when it comes to retirement saving.

Are people rational in the way Life Cycle Hypothesis predicts?

Modelling economic decision-making

- Individuals' behavioural responses to different expectations.
- Survival probabilities are not the same for every individual.
- Using life table mortality data not ideal.
- Earlier work has adjusted life tables with **observable** mortality determinants (age, gender, income, health behaviours...)
- Individuals have better knowledge about **unobservable** personal factors that affect longevity.
- Using subjective expectation information can be useful in modelling behaviour.

Quality of Subjective Survival Probability data

- US males (general population and economists): Average SSP values coincide closely with life tables. Parental longevity strong predictor of SSP.¹
- Quality of SSP responses in HRS: correlate as expected with mortality risk factors. Predictive of actual mortality in longitudinal analysis.²
- AHEAD, SHARE data: SSP closely correlated with life-table survival estimates and factors affecting mortality.³
- Focal point responses → instruments, imputation, focal response as indicator of uncertainty.

¹Hamermesh (1985)

²Hurd and McGarry (1995, 2002), Smith et al. (2001), Elder (2007), Siegel et al. (2003), Post and Hanewald (2013)

³Siegel et al. (2003), Post and Hanewald (2013)

Subjective Survival Probability and saving/wealth

- Hurd et al. (1998)
AHEAD data (US retirees). Effect of SSP on saving among couples, not singles. Limitation: ignore reverse causality.
- Post and Hanewald (2013)
SHARE data (European retirees). No effect of SSP dispersion on wealth. Limitation: ignore reverse causality.
- Reverse causality: wealth can affect survival beliefs through its impact on health (differential access to healthcare and differences in consumption of alcohol, tobacco, certain foods, etc.) ⁴

⁴Alessie and Kapteyn (2001); Attanasio and Hoynes (2000); Meer et al. (2003); Adda et al. (2009)

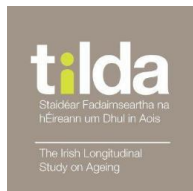
Subjective Survival Probability and saving/wealth

- Bloom et al. (2006)
HRS data (US). Positive effect of SSP on financial wealth among pre-retirement couples, not singles. Use parental longevity as instrument. Limitation: only financial wealth data.
- O'Donnell et al. (2008)
ELSA data (UK). Effect of SSP on retirement timing. Use parental longevity and smoking as instruments.

The Irish Longitudinal Study on Ageing (TILDA)

Information on health, economic and social circumstances from people aged 50 and over and spouses.

- Representative sample of older population resident in Ireland
- Longitudinal study over a 10-year period, every 2 years
 - Wave 1 collected mainly in 2010 (2009-2011)
 - Wave 2 collected mainly in 2012 (2012-2013)
 - Wave 3 currently being collected
- Sample size 8,504 individuals (Wave 1)
- Data on survival beliefs, income, comprehensive measures of wealth (including pensions)



TILDA analysis sample

2,116 individuals (living in 1,464 households)

Sample description	Remaining observations
TILDA respondents in Wave 1	8,504
Between 50 and 64 years old*	4,062
Not retired*	3,304
Household has a financial respondent	3,219
Both spouses take part in survey†	2,362
Non-missing SSP data	2,257
Non-missing control variables	2,132
Imputable wealth data	2,116
Final sample size	2,116

*both spouses if married or cohabiting

†if married or cohabiting

	Male	Female	Total
Socioeconomic status			
Employed	43.0	52.7	47.5
Self-employed	29.4	6.1	18.5
Unemployed	15.2	6.5	11.2
Permanently sick / disabled	10.6	9.4	10.0
Looking after home	1.3	24.0	11.9
In education	0.5	1.2	0.8
Age			
50 - 54	31.2	40.1	35.4
55 - 59	40.9	38.9	39.9
60 - 64	27.9	21.0	24.7
Education level			
Primary/none	28.8	20.6	25.0
Secondary	52.5	54.9	53.6
Third level/higher	18.7	24.5	21.4
Years worked			
0-9	1.2	13.0	6.7
10-19	2.1	19.4	10.2
20-29	7.2	26.2	16.1
30-39	50.0	33.0	42.0
40+	39.4	8.5	25.0
Number of children			
0	21.7	14.1	18.2
1-2	27.7	29.4	28.5
3-4	38.5	42.1	40.1
5+	12.1	14.5	13.2

	Male	Female	Total
Health			
Poor/Fair	22.5	20.0	21.3
Good	33.4	31.7	32.6
Very good	29.4	29.2	29.3
Excellent	14.7	19.1	16.8
Marital status			
Married	68.0	60.4	64.4
Single (never married)	16.7	10.2	13.7
Separated / divorced	11.4	18.8	14.8
Widowed	3.9	10.5	7.0
Equivalised HH income (1000s)			
Less than 10	20.1	16.9	18.6
10 to 19	32.6	32.3	32.5
20 to 34	29.1	32.2	30.6
35 or more	18.2	18.6	18.3
Weekly alcohol units			
Less than 1	24.7	39.2	31.5
1 to 4	19.3	26.2	22.5
5 to 19	41.6	32.0	37.1
20 or more	14.4	2.6	8.9
Weekly exercise days			
Less than 1	57.9	76.8	66.7
1 to 2	13.0	11.5	12.3
3 to 4	10.5	5.7	8.2
5 or more	18.7	6.1	12.8

Wealth calculation

- 1 Net financial wealth (saving and deposit accounts, stocks, shares, life insurance, mutual funds, investment property, land, businesses, due loans or inheritance etc., less debt)
- 2 Present discounted value of occupational and private pensions (private sector occupational DC schemes, private sector occupational DB schemes, public sector occupational schemes, PRSAs, private pension plans, and other plans)
- 3 Present discounted value of Contributory and Non-contributory State welfare pensions

Methodology: Banks et al. (2005) and Crawford and O'Dea (2012) (ELSA UK). Data: work history, current value of pensions, pension contributions, expected pension income. Assumptions: past and future work, earnings, contributions.

Validating TILDA wealth data is difficult: detailed wealth data not collected in Ireland recently. O'Sullivan et al. (2014): plausible when compared to Census data.

Percentages holding wealth, by total wealth quartile

a) Single households

	1st	2nd	3rd	4th	All
Financial wealth	24.9	50.4	67.6	83.8	54.8
Supplementary pension wealth	6.8	27.5	54.3	77.0	39.2
Contributory pension wealth	86.0	93.9	94.9	96.8	92.7
Non-Contributory pension wealth	14.0	5.6	4.3	1.8	6.7

b) Couple households

	1st	2nd	3rd	4th	All
Financial wealth	52.9	78.1	83.7	91.7	75.5
Supplementary pension wealth	22.6	41.5	60.9	74.6	48.9
Contributory pension wealth	99.4	100.0	100.0	100.0	99.8
Non-Contributory pension wealth	30.1	4.6	0.6	0.0	9.5

Mean values of wealth (€), by total wealth quartile

a) Single households

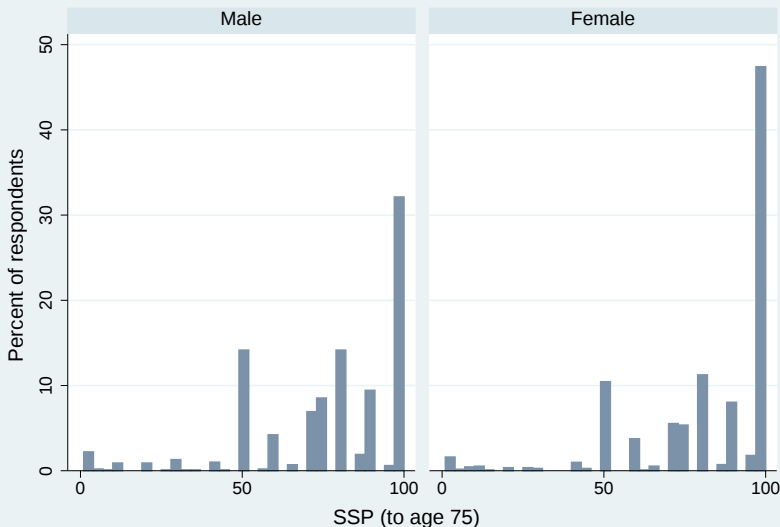
	1st	2nd	3rd	4th	All
Financial wealth	-390	15,454	46,233	242,323	66,089
Supplementary pension wealth	2,062	16,700	62,181	324,306	88,583
Contributory pension wealth	118,195	142,385	153,549	159,020	142,204
Non-Contributory pension wealth	17,648	7,623	5,104	2,546	8,570
Total wealth	137,516	182,162	267,067	728,195	307,094

b) Couple households

	1st	2nd	3rd	4th	All
Financial wealth	23,473	54,486	158,938	660,861	208,354
Supplementary pension wealth	28,666	97,664	210,523	695,072	239,014
Contributory pension wealth	286,997	425,196	450,440	452,749	398,662
Non-Contributory pension wealth	33,378	3,841	744	0	10,256
Total wealth	372,515	581,187	820,645	1,808,681	855,243

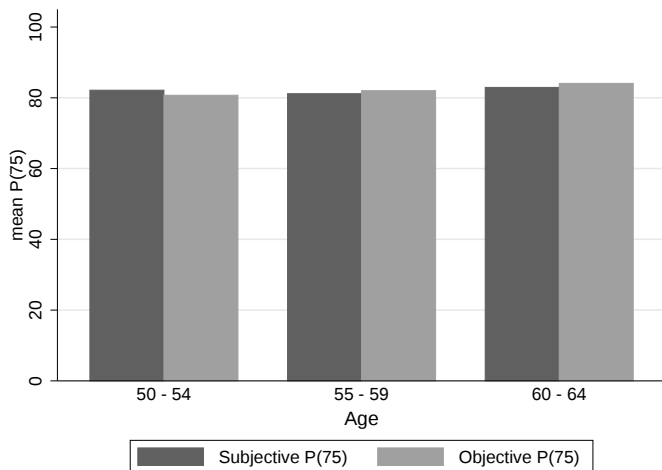
Subjective Survival Probability (SSP) data

"What is the percent chance that you will live to be 75?"

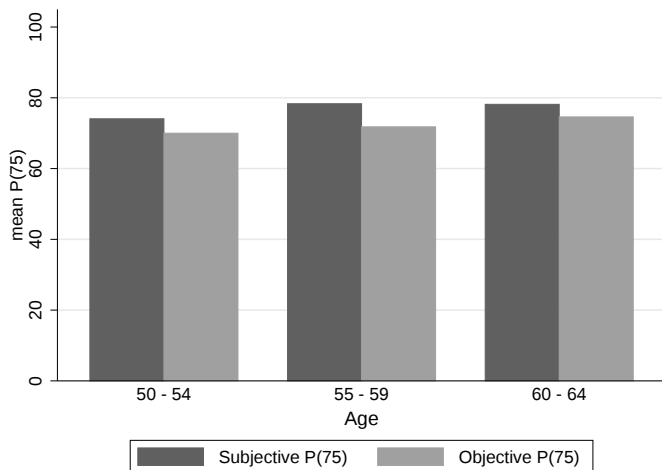


Graphs by Gender

Subjective and objective mean probability of reaching age 75, by age for Women



Subjective and objective mean probability of reaching age 75, by age for Men



Mean values of SSP, by variables correlated with mortality

	Mean
Gender	
Male	76.9
Female	81.9
Age	
50 - 54	78.3
55 - 59	79.6
60 - 64	80.1
Highest education achieved	
Primary/none	78.6
Secondary	79.0
Third/higher	80.9
Equivalised HH income (1000s)	
Less than 10	76.4
10 to 19	78.7
20 to 34	81.0
35 or more	80.4

Mean values of SSP, by variables correlated with mortality

	Mean
Health	
Poor/Fair	69.8
Good	78.9
Very good	81.2
Excellent	88.6
Smokes now	
No	81.4
Yes	72.7
Mother's (death) age	
less than 70	73.8
70-79	81.7
80-89	79.8
90+	82.9
Father's (death) age	
less than 70	74.7
70-79	79.2
80-89	83.0
90+	86.2

Effect of SSP on wealth

$$Wealth_i = \alpha_0 + \alpha_1 SSP_i + \alpha_2 I_i + \alpha_3 H_i + e_i \quad (1)$$

where:

$Wealth_i$ = wealth of individual i

α_0 = intercept term

SSP_i = subjective survival probability of individual i

I_i = vector of individual-level control variables (gender, age, work history, education and self-assessed health)

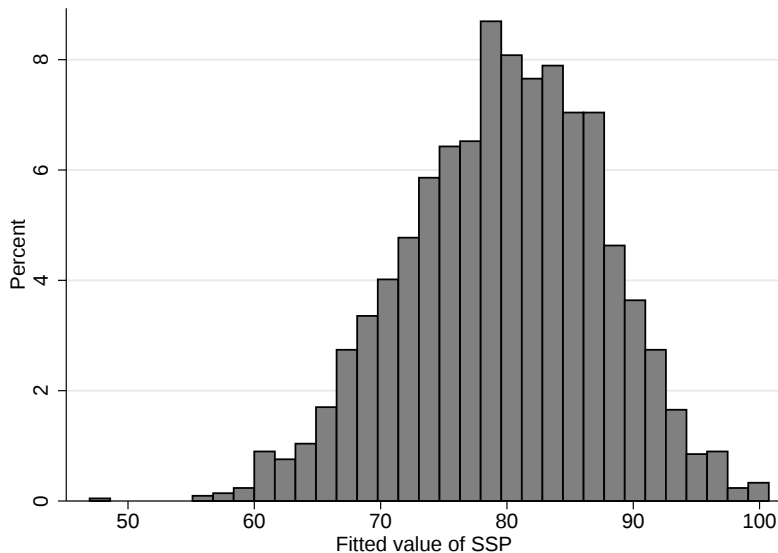
H_i = vector of household-level control variables (marital status, number of children and equivalised income)

e_i = error term of individual i

Identification: effect of SSP on wealth

- Issues:
 - Focal points in responses
 - Endogeneity (reverse causality)
 - Instrumental variables:
 - Parental longevity: age at death (or current age)
 - Smoking (O'Donnell et al., 2008)
 - *Parental longevity* affects survival beliefs, but not wealth directly.
 - *Smoking* arguably proxy measure of time preference → directly correlated with wealth, violating the exclusion restriction.
- In models with smoking instrument, alcohol consumption and exercise (proxies of time preference) included.
- All models also estimated using only parental longevity instrument.

Histogram of fitted values of SSP



First stage results of 2SLS

Dependent variable: Subjective Survival Probability

	(1)	(2)	(3)	(4)	(5)
Mother's (death) age	0.17*** (0.04)		0.16*** (0.04)		0.18*** (0.04)
Father's (death) age		0.22*** (0.04)	0.21*** (0.04)		0.20*** (0.04)
Smokes now				-6.08*** (1.55)	-5.46*** (1.55)
Observations	2116	2116	2116	1714	1714
R^2	0.094	0.099	0.105	0.101	0.120
Ftest	16.78	28.12	22.82	15.45	19.85

Standard errors in parentheses

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

Controls in models 1-3: age, gender, education, self-reported health, number of children, parents alive, years worked, current income (equivalised), marital status.

Controls in models 4-5: as above + weekly alcohol units, weekly exercise days.

Standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Second stage results of 2SLS

Dependent variable: Net financial wealth €1000

	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)
SSP (to age 75)	0.05 (0.16)	3.42** (1.66)	4.58*** (1.50)	3.96*** (1.21)	3.94*** (1.51)
Observations	2116	2116	2116	2116	1714
R^2	0.047	.	.	.	.

Controls in models 1-4: age, gender, education, self-reported health, number of children, parents alive, years worked, (equivalised) current income, marital status.

Controls in model 5: as above + weekly alcohol units, weekly exercise days.

P = parental longevity, S = smoking status

Standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Net financial wealth = saving and deposit accounts, stocks, bonds, life insurance, mutual funds, investment property, land, businesses, due inheritance etc., less outstanding debt.

Dependent variable: Total wealth €1000

	(1)	(2)	(3)	(4)	(5)
	OLS	IV(P)	IV(S)	IV(P+S)	IV(P+S)
SSP (to age 75)	0.14 (0.31)	5.10** (2.28)	7.30*** (2.64)	6.12*** (1.69)	6.04*** (2.05)
Observations	2116	2116	2116	2116	1714
R ²	0.159	0.056	.	0.010	0.013

Controls in models 1-4: age, gender, education, self-reported health, number of children, parents alive, years worked, (equivalised) current income, marital status.

Controls in model 5: as above + weekly alcohol units, weekly exercise days.

P = parental longevity, S = smoking status

Standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Total wealth = net financial wealth + supplementary pension wealth + contributory State pension wealth

Robustness check 1: Excluding annuity wealth

- Possible issue: current value of an annuity payment is a function of life expectancy (i.e. net present value of a social welfare payment = discounted sum of future payments over estimated remaining lifetime).
 - SSP is not equal to actuarial cohort level life expectancy estimate (used in estimating pension wealth), but the two are highly correlated.
- Models re-estimated only including net financial wealth and Defined Contribution pensions.

Dependent variable: Non-annuity wealth €1000

	(1)	(2)	(3)	(4)	(5)
	OLS	IV(P)	IV(S)	IV(P+S)	IV(P+S)
SSP (to age 75)	-0.14 (0.28)	3.30* (1.87)	6.21*** (1.88)	4.62*** (1.35)	4.53*** (1.66)
Observations	2116	2116	2116	2116	1714
R^2	0.049	.	.	.	.

Controls in models 1-4: age, gender, education, self-reported health, number of children, parents alive, years worked, (equivalised) current income, marital status.

Controls in model 5: as above + weekly alcohol units, weekly exercise days.

P = parental longevity, S = smoking status

Standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Non-annuitised wealth = net financial wealth + Defined Contribution supplementary pension wealth

Robustness check 2: Excluding "early orphans"

- Possible issue: the exclusion restriction of the parental mortality might be violated in case of early death of parent (influencing child's wealth directly through education and work choices).
- Models re-estimated only using observations on individuals whose parents died after the age of 50.
- Estimates very close to initial estimates → link between SSP and wealth not driven by correlation between parental mortality and the child wealth that might arise from losing a parent early in life.

Dependent variable: Wealth €1000

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
SSP	0.14 (0.16)	3.35** (1.62)	4.76*** (1.46)	4.03*** (1.14)	4.61*** (1.40)	0.23 (0.32)	4.73** (2.17)	7.05*** (2.53)	5.85*** (1.57)	6.36*** (1.86)
N	1938	1938	1938	1938	1574	1938	1938	1938	1938	1574
R ²	0.045	.	.	.	.	0.156	0.074	.	0.028	0.002

Controls in models 1-4, 6-9: age, gender, education, self-reported health, number of children, parents alive, years worked, (equivalised) current income, marital status.

Controls in model 5 and 10: as above + weekly alcohol units, weekly exercise days.

P = parental longevity, S = smoking status

Standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Robustness check 3: Excluding focal responses

- Possible issue: something unique about the focal responses driving the results.
- Models re-estimated excluding the focal responses (SSP value of 0, 50 or 100).
- Estimates very close to initial estimates → effect of SSP on wealth is different between focal and non-focal response groups, but significant result is not driven by focal respondents.

Dependent variable: Wealth €1000

	FINANCIAL					TOTAL				
	(1) OLS	(2) IV(P)	(3) IV(S)	(4) IV(P+S)	(5) IV(P+S)	(6) OLS	(7) IV(P)	(8) IV(S)	(9) IV(P+S)	(10) IV(P+S)
SSP	0.02 (0.31)	10.49** (4.71)	10.30** (4.12)	10.53*** (3.31)	9.53*** (3.25)	0.31 (0.44)	12.02** (5.54)	10.93** (5.18)	11.71*** (4.04)	11.34*** (3.988)
N	992	992	992	992	806	992	992	992	992	806
R ²	0.042	.	.	.	.	0.191	.	.	.	.

Controls in models 1-4, 6-9: age, gender, education, self-reported health, number of children, parents alive, years worked, (equivalised) current income, marital status.

Controls in model 5 and 10: as above + weekly alcohol units, weekly exercise days.

P = parental longevity, S = smoking status

Standard errors in parentheses. * $p < 0.1$ ** $p < 0.05$ *** $p < 0.01$

Conclusion (1/2)

- Do individuals who expect to live long lives accumulate higher levels of wealth?
- Empirical analysis using data from the Irish Longitudinal Study on Ageing (TILDA), addressing reverse causality between survival beliefs and wealth.
- Significant positive effect of Subjective Survival Probability on wealth.
- A percentage point increase in SSP $\rightarrow$ financial wealth increase €3,400, corresponding to a 4 per cent increase at the mean.
- A percentage point increase in SSP $\rightarrow$ total wealth increase €5,100 - €7,300, corresponding to a 1.4 to 2.0 per cent increase at the mean.
- Evidence of individuals adjusting saving behaviour according to their survival beliefs.

Conclusion (2/2)

- Relevant to discussion about the role of the State vs. the individual in retirement provision: rationality of saving behaviour.
- With an emphasis on individual responsibility for pension saving, it is necessary that individuals make decisions based on realistic expectations about risks (including mortality risk).
- Improving individuals' awareness of changes in life expectancy may affect saving.

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