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Understanding cause without the story? Quantitative longitudinal research on ageing

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ELSA English Longitudinal
Study of Ageing

Causal reasoning in quantitative research (1)

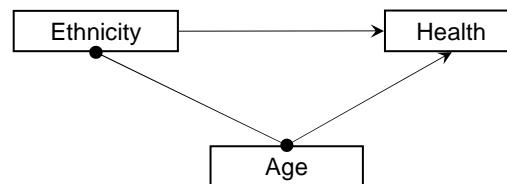
If X is a cause of Y, we have in mind that change in X produces a change in Y, and not merely that a change in X is followed by or associated with a change in Y

(Blalock 1961: 9)

- Has its roots in the approach of experimental natural sciences
- When studying the social world, however, we typically cannot manipulate X and so cannot conduct the experiment:
 - Often X is an attribute that cannot be manipulated in the research (marital status, occupation)
 - Or an attribute that is fixed in some sense (sex, place of birth + age)
 - And causal relationships typically unfold over time, are complex, are poorly represented by variables measured at discrete time points, and social systems are 'open'.

Causal reasoning in quantitative research (2)

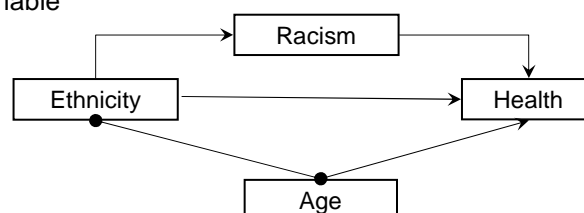
- However, we can draw comparisons between those with different attributes (different values of X)
- If we substitute someone who is alike in all characteristics except X we can observe the impact of changing X on Y
- In practice, we achieve this by statistically **controlling** for difference in factors other than X that we judge to be correlated with both X and Y, but not involved in their causal connection, and estimating the remaining change in Y
- For example:



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Causal reasoning in quantitative research (3)

- But why does changing X lead to a change in Y?
- To answer this, we have to consider the sequence of changes that flow from the change in X to the change in Y
- We achieve this by statistically controlling for factors that we judge to be causally between the X-Y relationship, *i.e.* **intervening** variables occurring after X and leading to the change in Y
- We can then estimate the reduction in the change in Y, which is the amount of the relationship between X and Y that is explained by the intervening variable
- For example:



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Why longitudinal research

- This discussion illustrates the importance of time order and the consequent attraction of longitudinal research methods:
 - (Change in) X must precede change in Y
 - Control variables precede X and Y
 - Intervening variables follow X but precede Y
- But if variables are used, measurement becomes key: what we measure and how we measure it

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An extended example

- English Longitudinal Study of Ageing (ELSA) (www.ifs.org.uk/elsa)
- Inequalities in health at older ages
 - Class (how do we understand class in older age?)
 - Retirement
 - (Age and generation)
- Concepts are not straightforward
- Causal paths operating throughout the life course

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The English Longitudinal Study of Ageing

A panel study of people aged 50 and older, interviewed every two years since 2002, currently in its fourth wave of data collection.

- Sample at wave 1 is approximately 11,500 people born before 1st March 1952 who are in the private household sector at baseline. Refreshed with younger people at wave 3 and a top-up sample at wave 4.
- Drawn from Health Survey for England (1998, 1999, 2001 years).
- Includes spouses outside the age range and partners who joined the household since the HSE baseline (giving 12,100 cases in total).
- Those incapable of doing the interview have a proxy interview.
- Interviewed every two years, with a biomedical assessment every four years and a life-history interview at wave 3 (n = 7,850).
- Exit interviews are carried out with the partners or carers of people who died after wave 1.

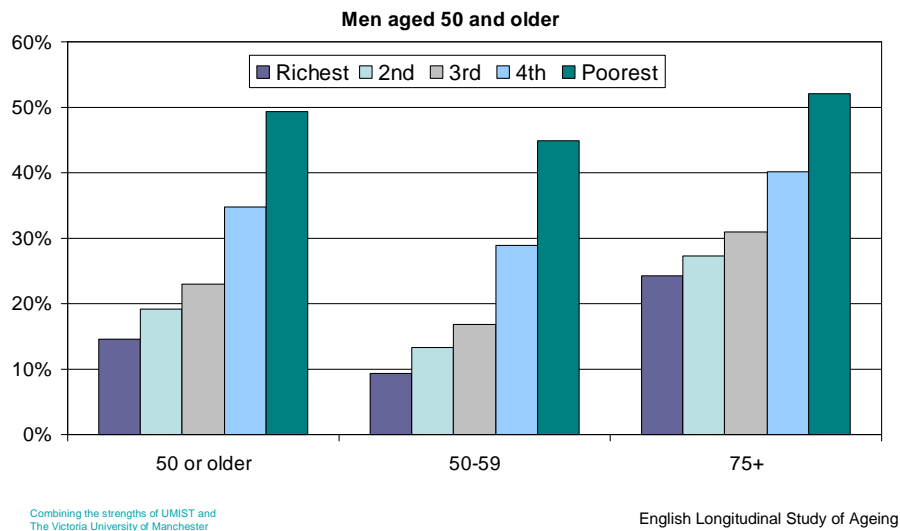
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ELSA: broad questionnaire coverage

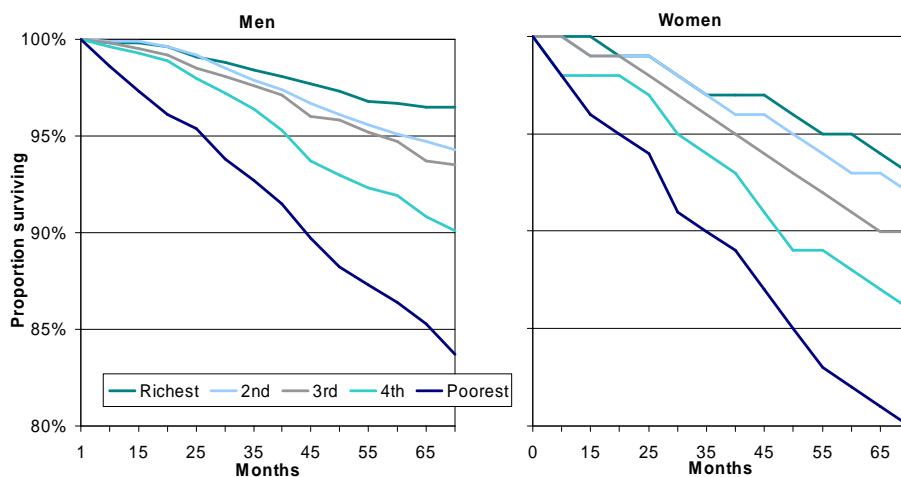
- Demographics
- Administrative data
- Self-assessed health
- Diagnosed disease & symptoms
- Quality of received medical care
- Activities of daily living and Instrumental ADLS
- Eyesight, hearing, pain, falls
- Mental health
- Health behaviours
- Cognitive function measures
- Physical performance measures
- Biomedical measures
- Housing (tenure, quality, value)
- Household wealth and income
- Relative deprivation
- Pensions and retirement
- Employment status, earnings and job characteristics
- Consumption/spending
- Psychosocial factors & well-being
- Social, cultural and civic activities
- Expectations for the future
- Life history: childhood, education, work, marriage/family, migration, health, traumatic events

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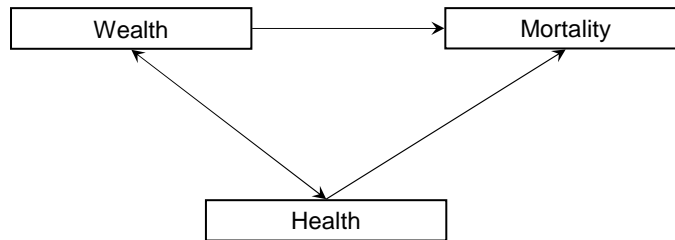
Fair/poor self reported health and wealth: A cross sectional relationship



Survival rates by wealth, age 50+: A longitudinal relationship

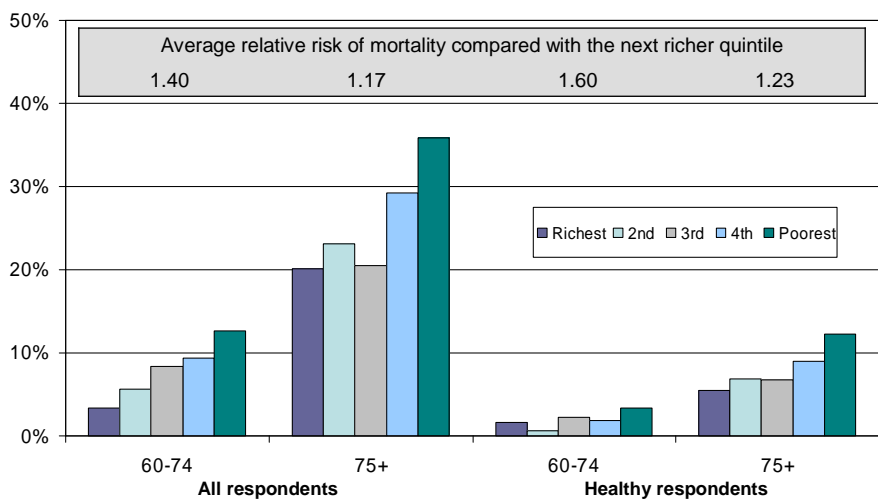


Elaborating the wealth mortality relationship



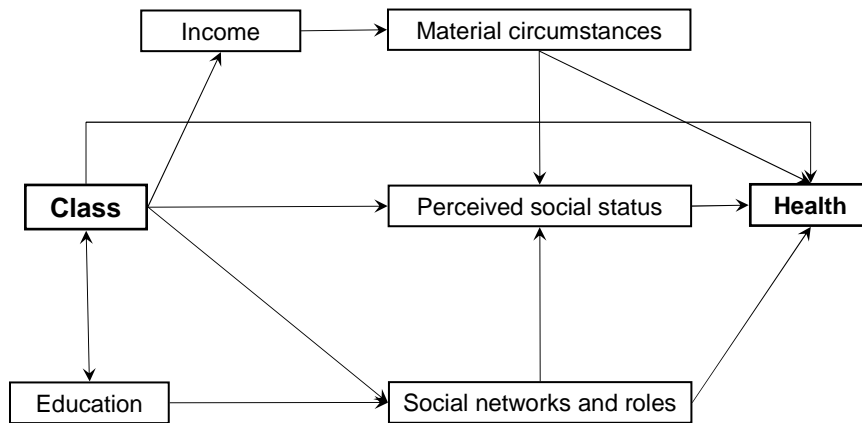
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Mortality and wealth



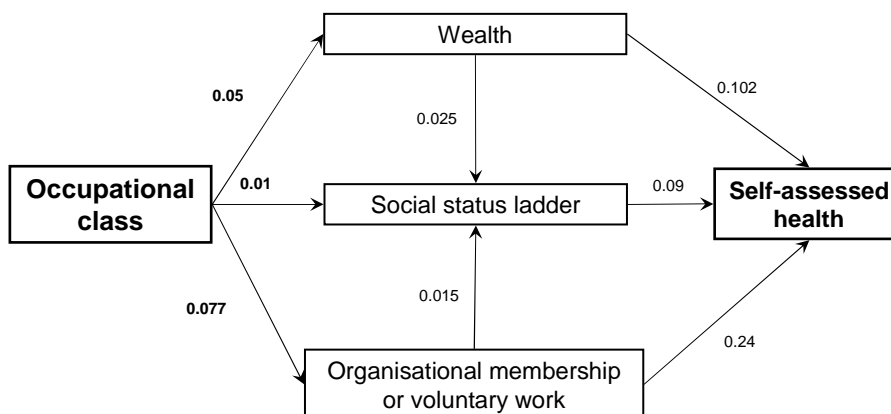
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Causal pathways linking class to health post-retirement



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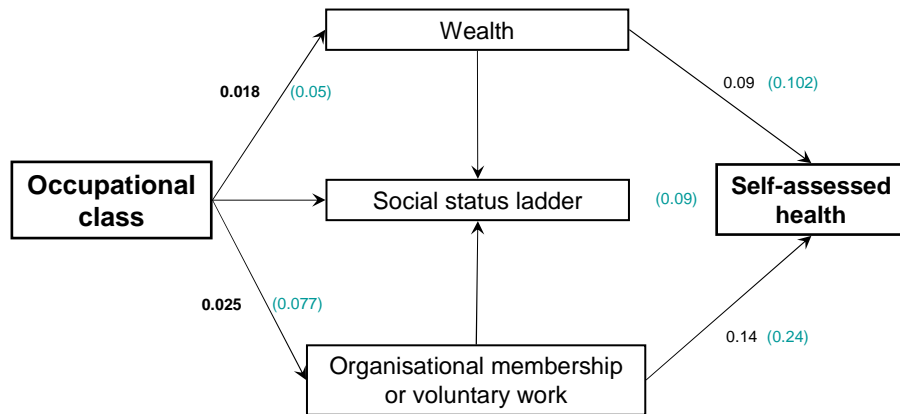
Causal pathways: cross-sectional analysis



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Preliminary analysis, coefficients in bold are for the total path

Causal pathways: longitudinal analysis



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Preliminary analysis, figures in brackets
are cross-sectional coefficients

Causal direction and anticipated events: is time order enough?

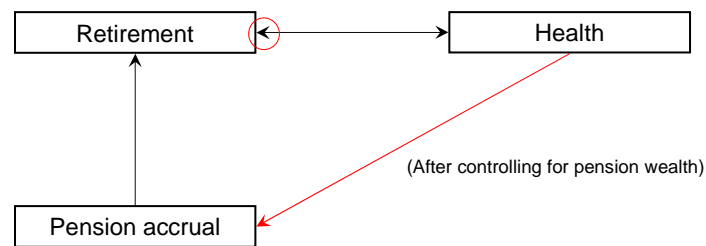
Early-retirement and health

- Does retirement impact on health? Problem of identifying causal direction.
- In a simple longitudinal model, retirement is related to an increased risk of experiencing new chest pain (~50%).
- After adjusting for health prior to retirement, this relationship remains. But is the adjustment enough?
- Use an 'instrument' to deal with 'endogeneity', *i.e.* possible reverse causation: in this case use a variable representing yearly accrual of pension wealth.

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Preliminary analysis

Causal direction and anticipated events: early retirement and health



Causal direction and anticipated events: is time order enough?

Early-retirement and health

- Does retirement impact on health? Problem of identifying causal direction.
- In a simple longitudinal model, retirement is related to an increased risk of experiencing new chest pain (~50%).
- After adjusting for health prior to retirement, this relationship remains. But is the adjustment enough?
- Use an 'instrument' to deal with 'endogeneity', *i.e.* possible reverse causation: in this case use a variable representing yearly accrual of pension wealth.
- After adjusting for the correlation between pension accrual and health (removing the health to retirement effect), retirement leads to a decrease in risk of experiencing chest pain (~35%, non-significant). And this seems to capture all of the effect that controlling for prior health would.

Retirement and depression: the meaning of events

A transition model for those \leq state pension age

Modelling depression score at wave 2: ordinal logistic regression coefficients

	Basic model
Remain working	0
Start working	0.02 (-0.40, 0.44)
Remain not working	0.44 (0.30, 0.60)
Become unemployed	-0.05 (-0.71, 0.62)
Stop working, sick	1.16 (0.66, 1.67)
Start looking after the home	-0.60 (-1.18, -0.03)
Retire	0.04 (-22, 0.31)

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Models adjusted for gender, age and depression score at wave 1

Retirement and depression: the meaning of events

A transition model for those \leq state pension age

Modelling depression score at wave 2: ordinal logistic regression coefficients

	Undifferentiated model	Differentiated model	Differentiated model and health
Remain working	0	-	0
Start working	0.02 (-0.40, 0.44)	-	-0.12 (-0.55, 0.30)
Remain not working	0.44 (0.30, 0.60)	-	0.19 (0.03, 0.35)
Become unemployed	-0.05 (-0.71, 0.62)	-	-0.15 (-0.84, 0.54)
Stop working, sick	1.16 (0.66, 1.67)	-	0.49 (-0.02, 1.00)
Start looking after the home	-0.60 (-1.18, -0.03)	-	-0.61 (-1.19, -0.03)
Retire	0.04 (-22, 0.31)	n/a	n/a
Retire wealthy	n/a	-0.41 (-0.82, 0.01)	-0.46 (-0.89, -0.04)
Retire not wealthy	n/a	0.37 (0.03, 0.70)	0.29 (-0.04, 0.63)

Is it health or is it health-related retirement that is important?

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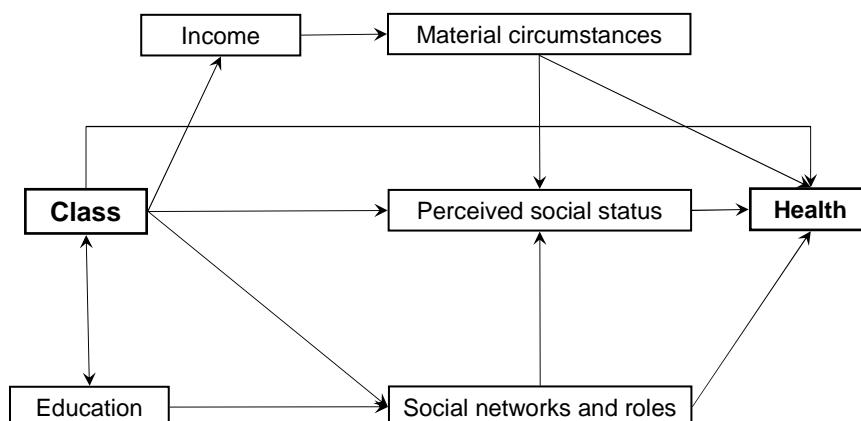
Models adjusted for gender, age and depression score at wave 1

Moving beyond variables to tell the story

- Class and health
- Retirement and health
- Class, retirement and health
- Period (generation), class, retirement and health

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Causal pathways linking class to health post-retirement



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White man, age 75, ex lorry driver, interviewed with his wife

R: I enjoy driving that's all there's to it ... Like as I say it's a bit rough at the moment with the cost of petrol and all that but we like to ... that's our pleasure getting around.

W: We only can go out say once fortnight or a month now, can't we?

R: If we can keep the car moving we're quite happy ... we bomb off to a different town nearly every week. When it's good weather we'll do over the mountain way to Aberystwyth and up round the dams (Laughs) some people think we're a bit crazy ... In the winter and that we're just the same, we go off out and ... the car's warm.

W: It's warmer in the car than in here because we can't afford to have our central heating on all the time, can we ... ?

R: It don't matter who you vote for ... that's out of all sense and reason what they've done to it. If you work out you're paying above four pound a gallon. Four pound a gallon for blooming petrol.

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White man, age 66, retired aged 58

We travel a lot. That's the other thing I do in my spare time, I do travel talks for the local hospice for charity. I did two last week actually. People like ... the groups like Probus ... retired businessman's association, and I talked to them about Japan where my daughter had lived for 4 years and we visited them quite a lot. So I do slide shows. And I did Peru on Friday ... I do those I suppose ... well once or twice a month I suppose. Have lunch and ... or evening sessions with different groups of people, talk to them about different places round the world that we've visited.

When I was at the county high school I looked after Modern Languages for a period of time as a governor. And so I had a talk about ... the area around Avignon. So I had some slides and did a talk in French ... we then set a test for the youngsters. And we tried to make the subject live rather than ... you know. So I could bring from something outside into the school. You know with my own knowledge of languages, which is reasonable, and with [the teacher's] expertise we could actually together make the language more interesting than just learning for the sake of learning.

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Concluding comments

- Causal questions are central to social science research. We may start with description, but we want to know:
 - Why differences occur across people, groups, societies and periods
 - Or how particular events might lead to changes in a particular characteristic
 - Or why attributes are related.
- Quantitative surveys provide the opportunity for a good description, including showing how attributes are related.
- To show why attributes are related, or how events can lead to change requires additional techniques and information.
- To explain difference, however, requires us to go beyond our data and start telling stories.