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# How can we study consequences of being granted a disability pension?

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- Department of Epidemiology & Public Health, University College London (UCL)

# What do we mean by consequences?



- DP predicts negative outcomes
  - compared with better health
  - can be used as a risk indicator
  - no causal effects of DP assumed!
- Relatively trivial consequences
  - fewer work-related social contacts, more free time
  - lower income
  - difficulties to get new jobs in the future
- Non-trivial consequences
  - mortality, health, quality of life
  - likely to be worse than among working people
  - main interest is comparison with counterfactual situation
    - i.e. continuing to work with exactly the same underlying health problem

# Challenges

- We know that disability pensioners have worse health than working individuals
  - otherwise they would not be entitled to disability pension!
- Short-term effects should be beneficial
  - that is why people apply for DP, but we don't *know*
  - co-occurs with a major health crisis, so how detect a benefit?
- Long-term effects possibly negative
  - use it or lose it
  - loss of income may have negative health consequences
  - additional loss of life context: social networks, time structure, meaningful contribution, social control etc.
  - physical inactivity, alcohol abuse, suicidality?
- How do we separate any health changes from the natural history of the disease?

# The problem



- Disability pensioners are heavily selected
  - on the major outcome variable, health
  - also other interesting outcomes influenced by health
- Not only persons – timing is also selected
  - DP is granted when health is bad enough to prevent work
  - and when the prognosis is bad enough to make work unlikely also in the (foreseeable) future

# Potential solutions 1



- Adjustment for prior health status
  - likely to be ineffective
    - does not necessarily take main health problem into account
    - severity not accurately measured – if at all
    - same with prognosis
  - unfortunately, such studies are still published...
- Using propensity scores (more later!)
  - can take more factors into account
  - likely not to fully adjust for (unavailable) prognostic factors
- Stratification by type of diagnosis
  - DP with diagnoses unrelated to studied outcomes may reveal effect of DP
  - vulnerable to co-morbidities

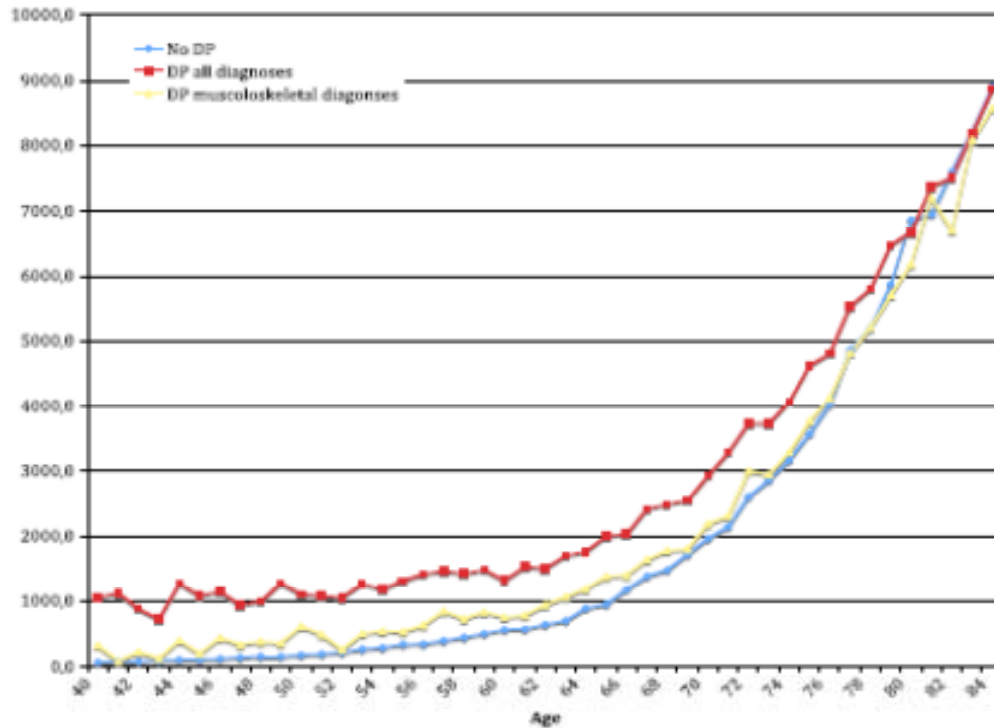


Fig. 1. Crude mortality rate for the entire cohort of construction workers by type of retirement and disability pension (DP) diagnoses.

Table 2

The risk of death between 65 and 72 years of age. Cox regression: predicted change in hazard for every unit increase in predictor.

	Model I		Model II		Model III		Model IV	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
DP musculoskeletal (versus statutory retirement)	1.25***	1.17-1.34	-	-	-	-	-	-
Full DP musculoskeletal (versus statutory retirement)	-	-	1.28***	1.19-1.37	1.13**	1.03-1.22	1.11	0.97-1.26
Partial DP in musculoskeletal (versus statutory retirement)	-	-	0.99	0.72-1.15	0.88	0.71-1.10	1.00	0.73-1.36
Retirement age: 60 years old or older (versus 59 or under)	-	-	-	-	0.72***	0.64-0.80	1.02	0.78-1.34
Generation: born 1926-1932 (versus those born 1920-1925)	-	-	-	-	0.84***	0.77-0.90	0.85***	0.78-0.93

Levels of significance: \*\*\* = *t*-value significant at 0.001 level, \*\* = 0.01 level, and \* = 0.05 level. Models I-III display results for those retiring early and receiving disability pension based on musculoskeletal diagnoses and for those retiring at statutory age. Model IV displays results for those retiring early and receiving disability pension based on musculoskeletal diagnoses and for those retiring at statutory age. Those hospitalized the year of or before receiving disability pension are excluded.

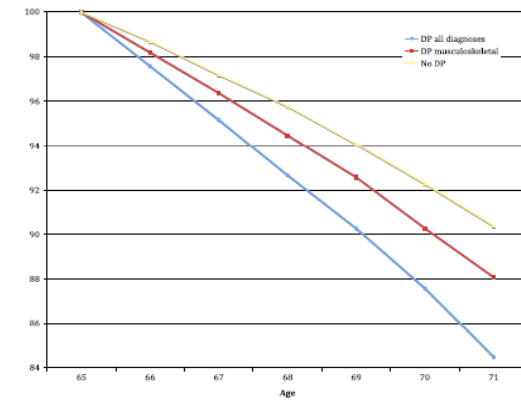


Fig. 2. The survival pattern between 65 and 72 years of age showing (i) all types of diagnosis, (ii) only musculoskeletal diagnosis, and (iii) no disability pension. All subjects born 1920-1932; Kaplan-Meier analysis.

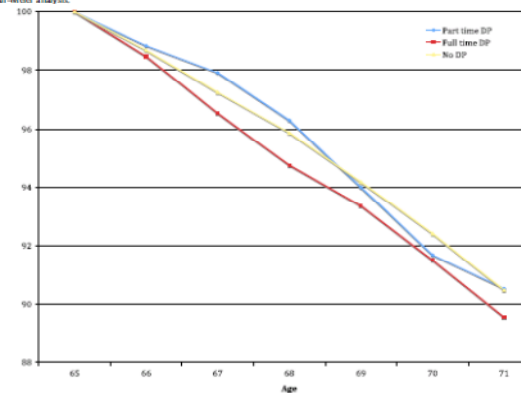


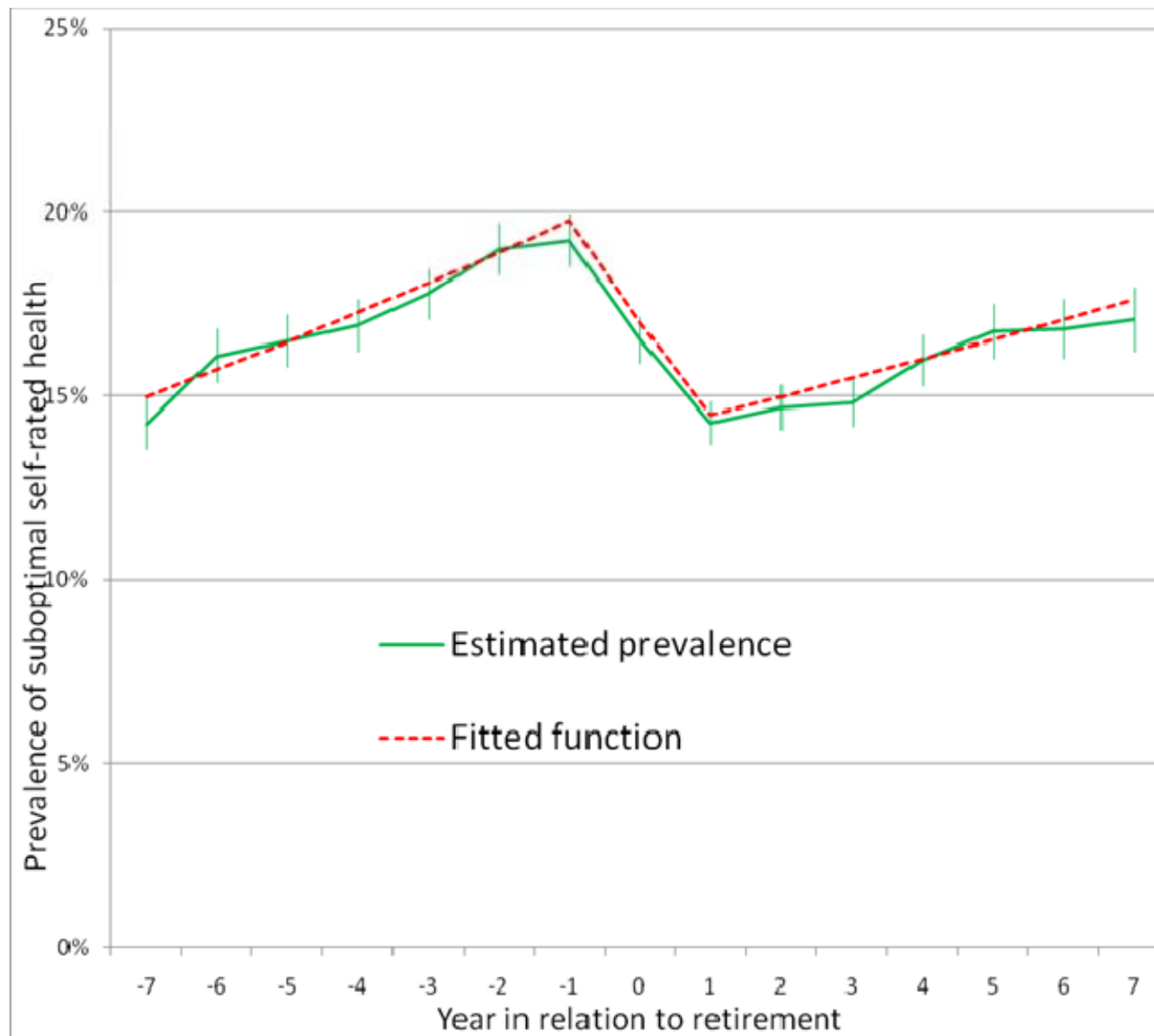
Fig. 3. Survival between 65 and 72 years of age. Musculoskeletal diagnosis and no disability pension. Splits from Cox Regression, Table 2, Model IV.

Hult C, Stattin M, Janlert U, Järholm B. Timing of retirement and mortality - A cohort study of Swedish construction workers. *Soc Sci Med* 2009.

## Potential solutions 2

- Longer intra-individual trajectories
  - may reveal time-sequences





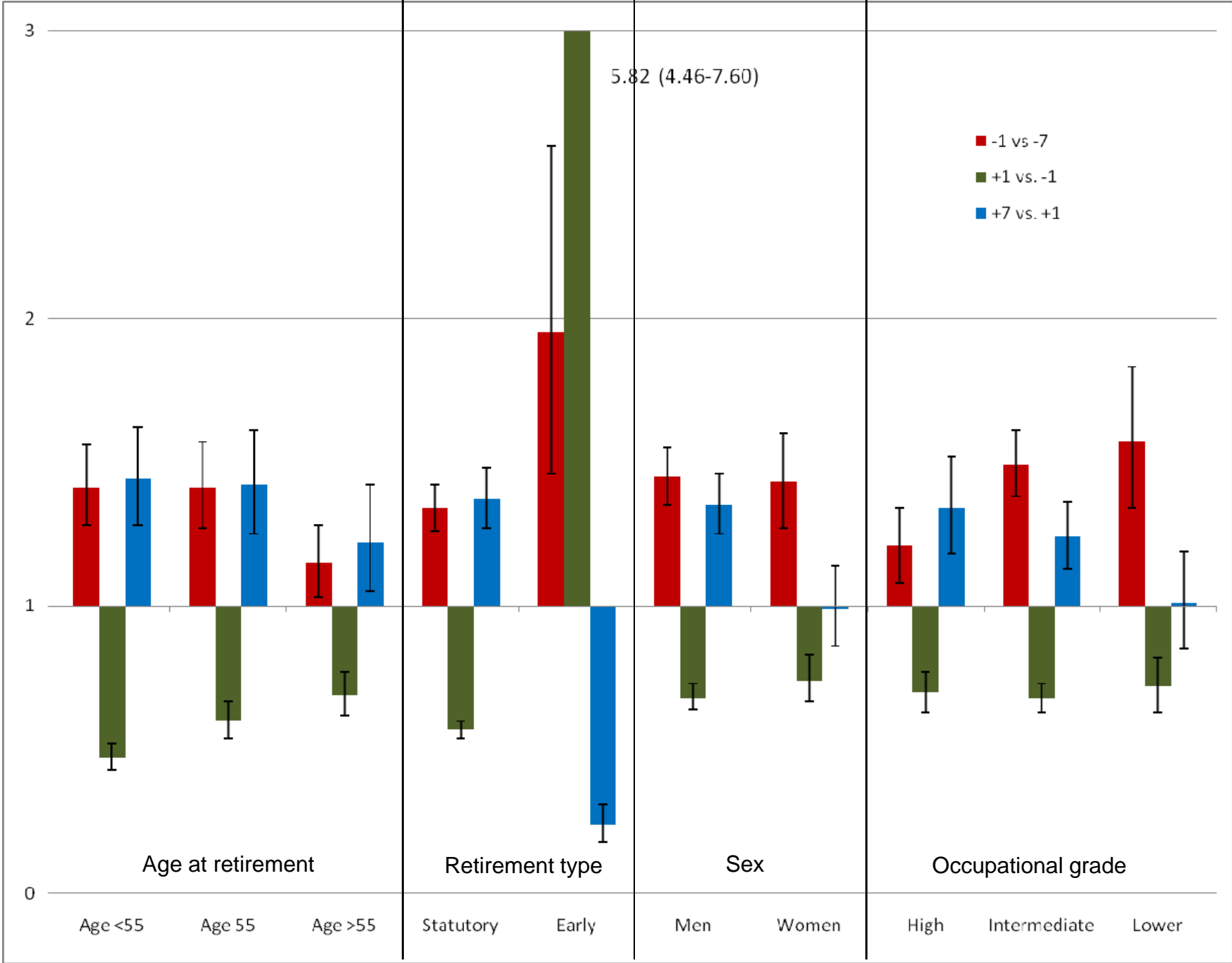
Westerlund et al. *Lancet* 2009;374(9705):1889-96.

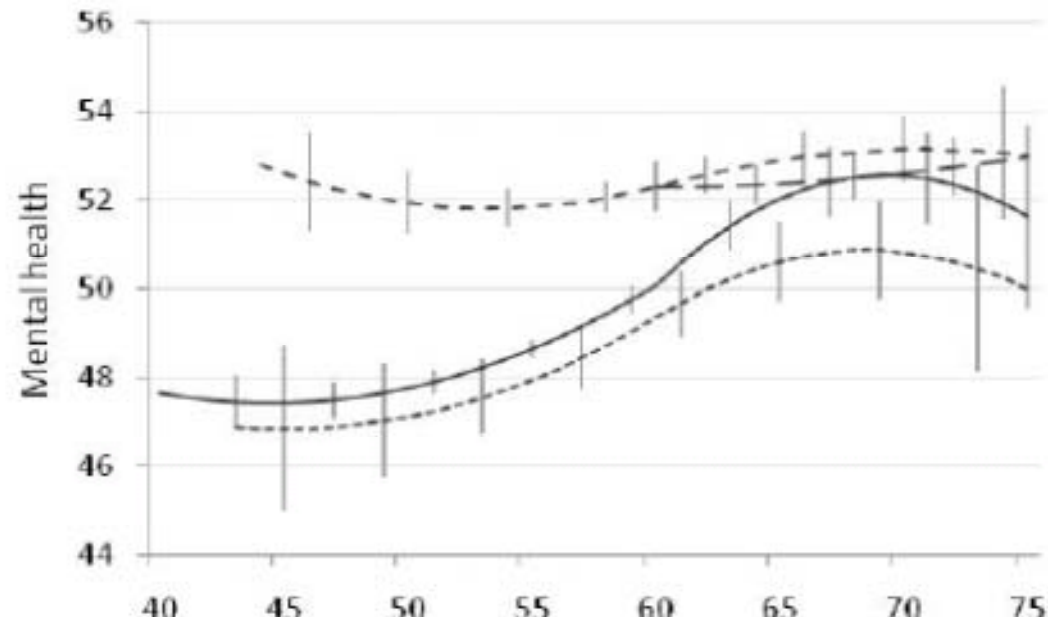


# Method

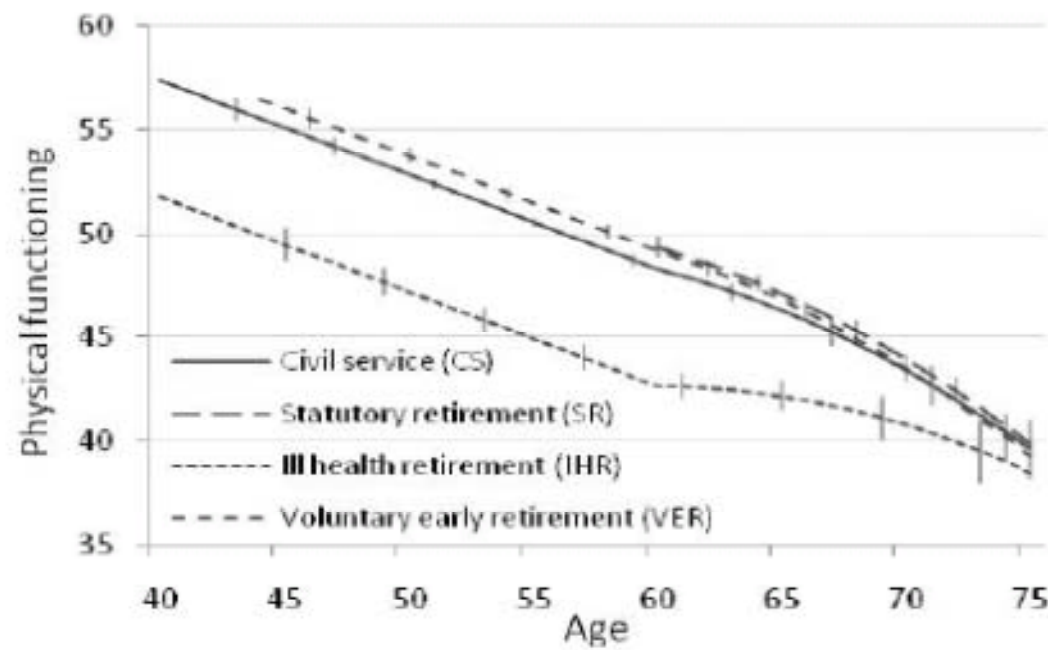


- Study based on the GAZEL cohort
  - yearly questionnaires to 20,625 volunteers since 1989
    - based on the French gas and electricity company
  - 14,714 persons in the analytic sample
- Yearly measurements from a 15-year time window centred on retirement
  - from year -7 through +7
- Self-rated health
  - 8-point Likert scale, dichotomised according to the literature
  - 174,765 person-measurement observations
- Repeated measurements logistic regression with generalised estimating equations (GEE)
  - takes account of intra-individual correlations (ARIMA)
  - not sensitive to missing (MAR) data

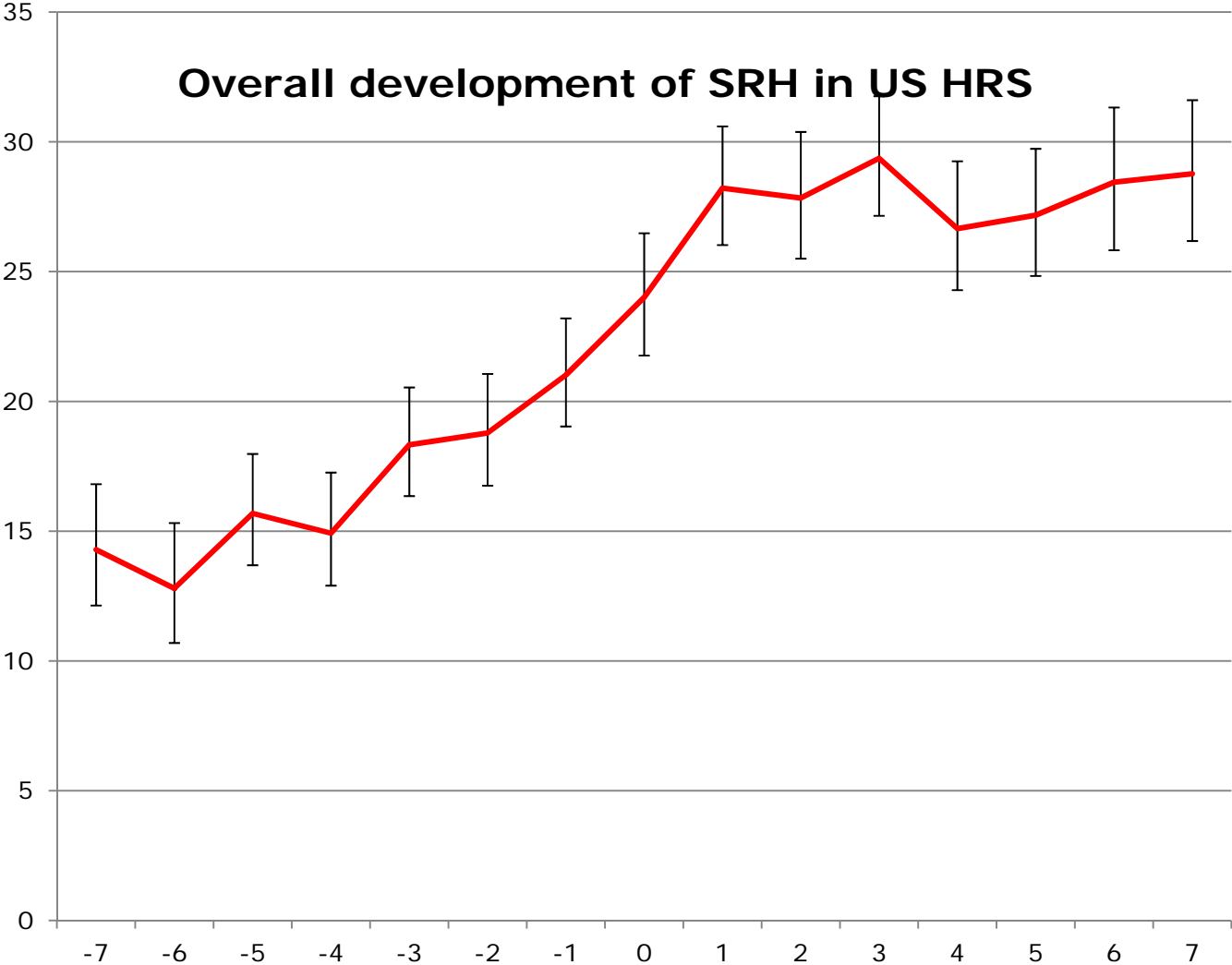




Whitehall II data



# Self-rated health in relation to retirement in the US

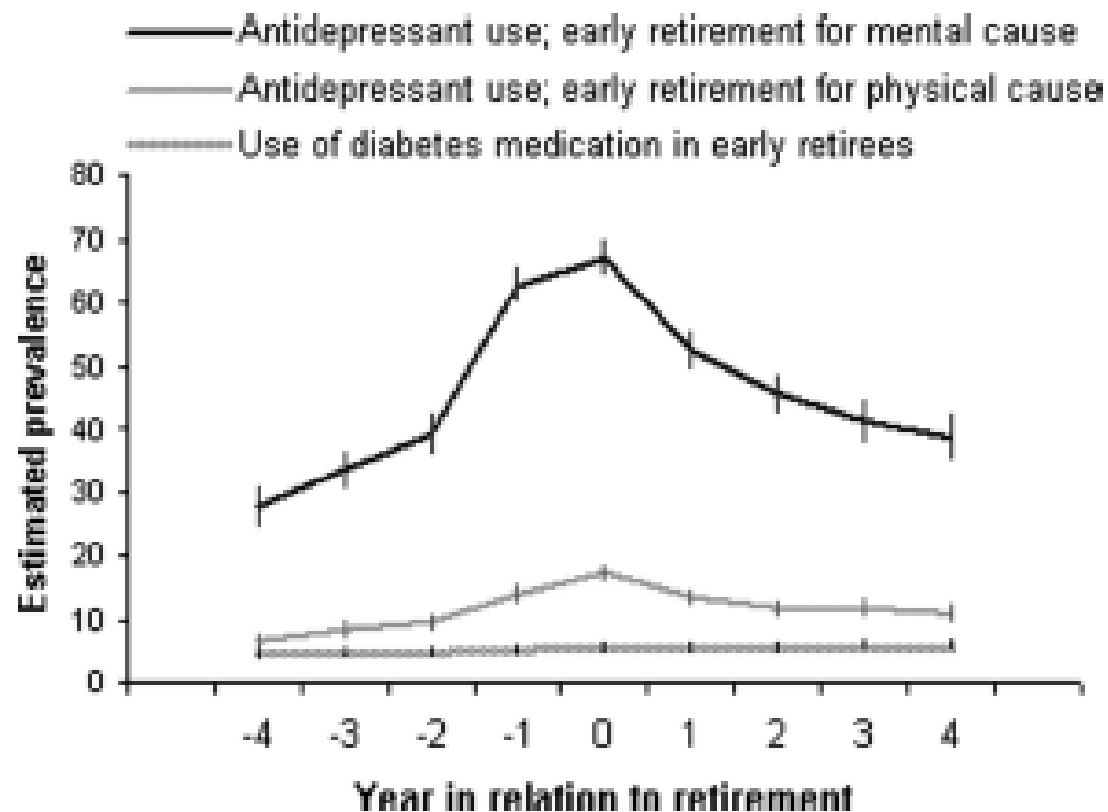


Hyde M, Vahtera & Westerlund H. Preliminary analyses of American HRS data.

## Potential solutions 2



- Longer intra-individual trajectories
  - may reveal time-sequences
  - difficult to separate effects from natural history of disease



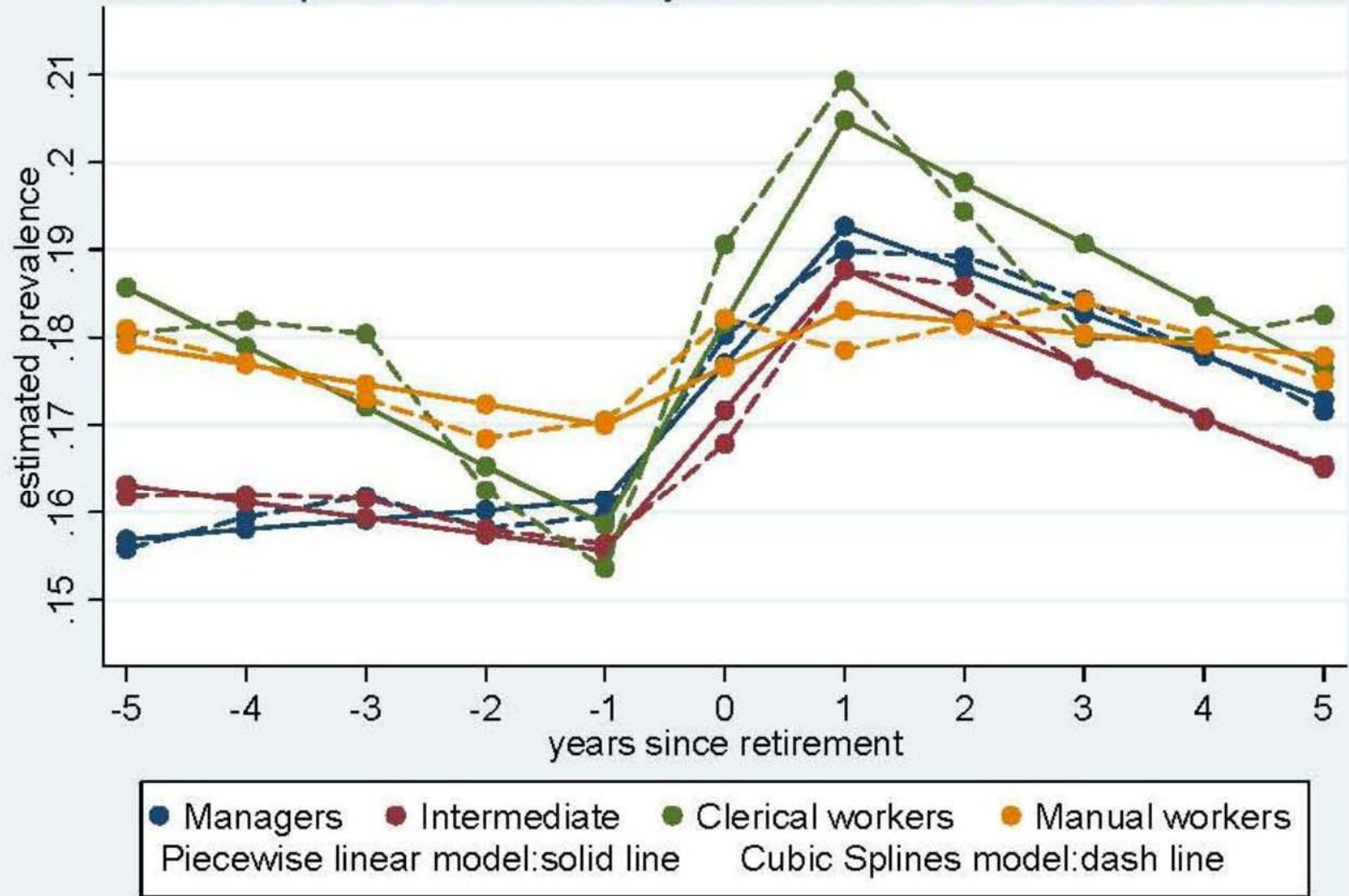
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Sector Study data

**FIGURE 2.** Prevalence of antidepressant use in relation to year of early retirement due to mental causes and physical causes separately and prevalence of use of drugs for diabetes in both these cohorts combined, adjusted for retirement age and calendar year. Error bars indicate 95% confidence intervals. Note that the figure is corrected for the increasing secular trend in prescriptions during the study period. (Note that the scale for y-axis is different than that in Fig. 1.)

## Potential solutions 2

- Longer intra-individual trajectories
  - may reveal time-sequences
  - difficult to separate effects from natural history of disease
  - comparison with propensity score matched controls may be a solution
    - successful matching should result in similar trajectories around DP award
    - long-term consequences should appear gradually several years after DP award
- Studying intermediate outcomes
  - which may lead to improved or deteriorated health
  - may be more credibly seen as consequences of DP
    - which, in turn, are known to impact on health

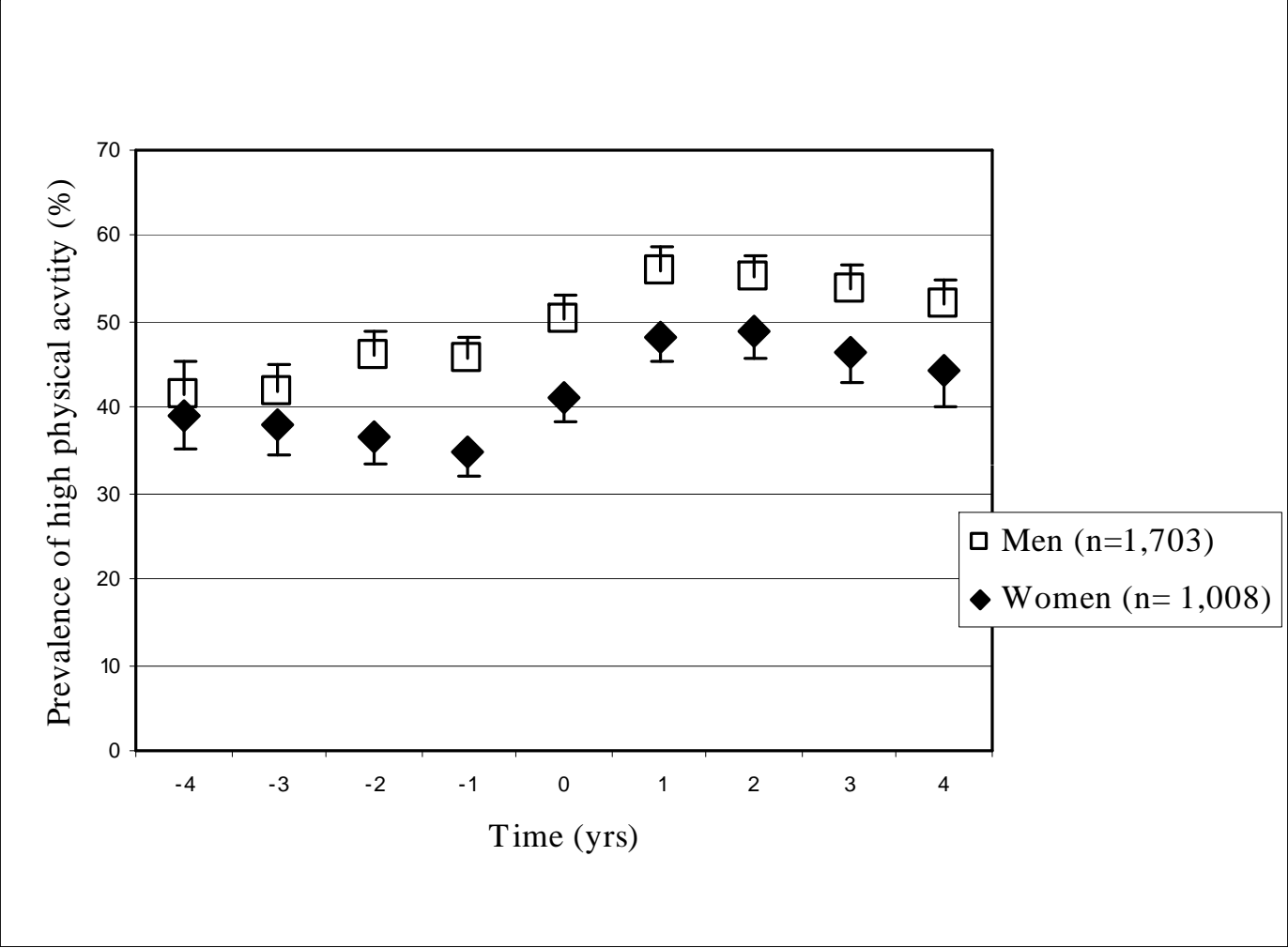
## Estimated prevalence of heavy drinkers for birth cohort 1939-1943



Zins M, Guéguen A, Kivimaki M, Singh-Manoux A, Leclerc A, Vahtera J, Westerlund H, Ferrie JE, & Goldberg M. Effect of Retirement on Alcohol Consumption: Longitudinal Evidence from the French Gazel Cohort Study. *PLoS One*, 2011,6(10):e26531.



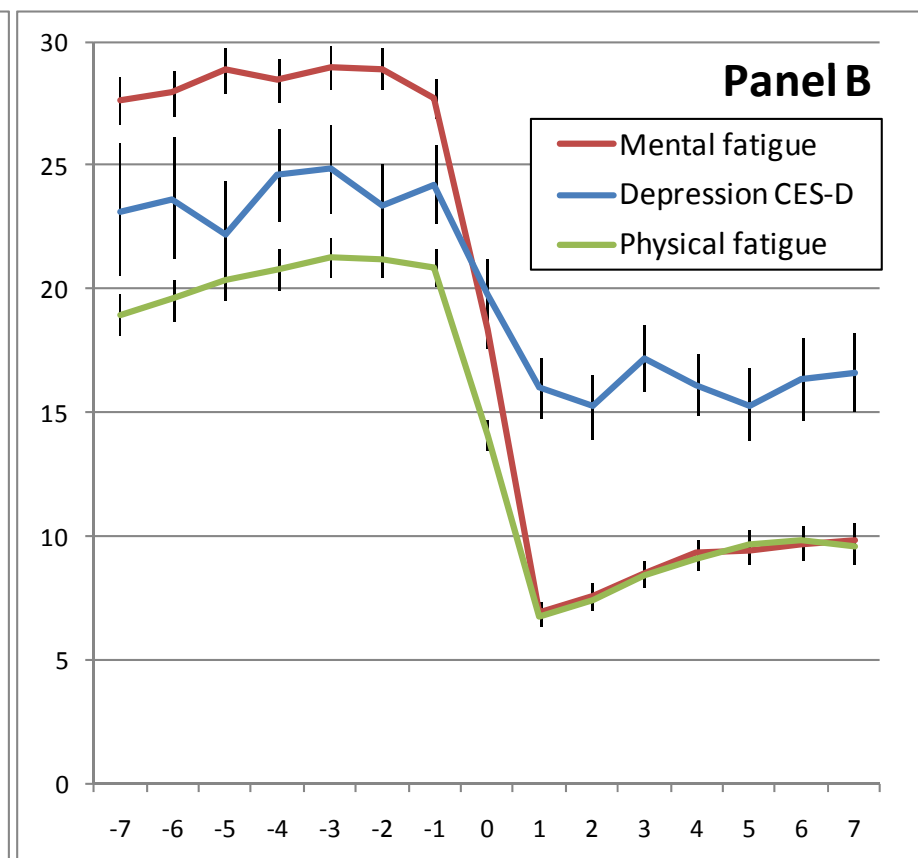
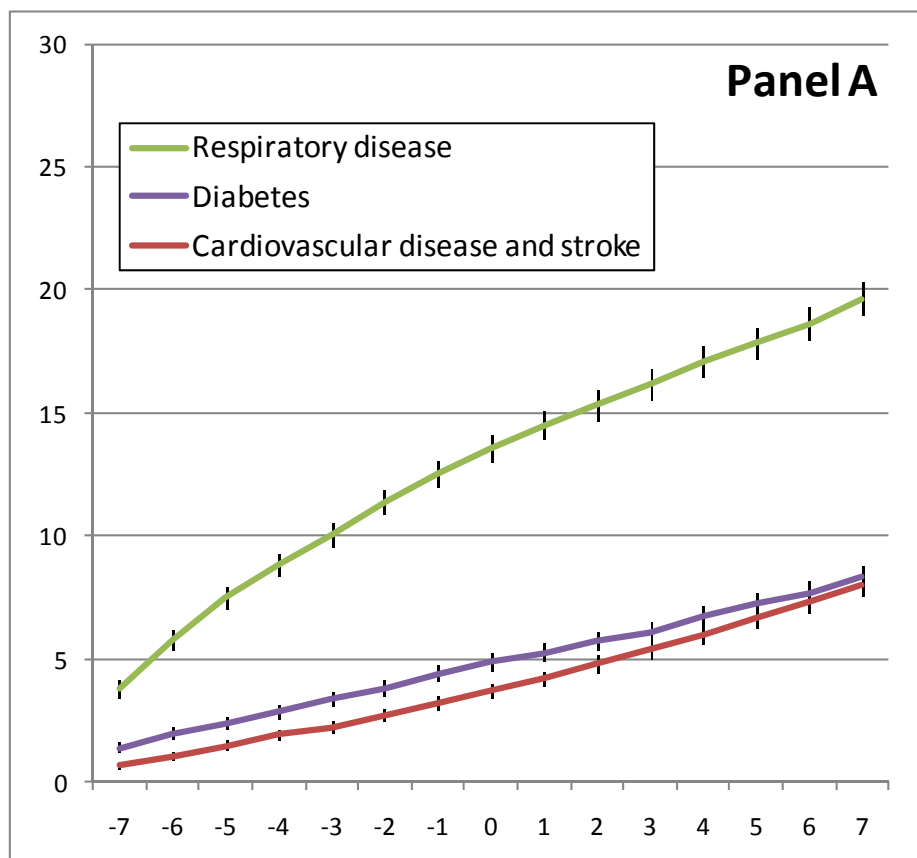
# Physical Activity around retirement in GAZEL



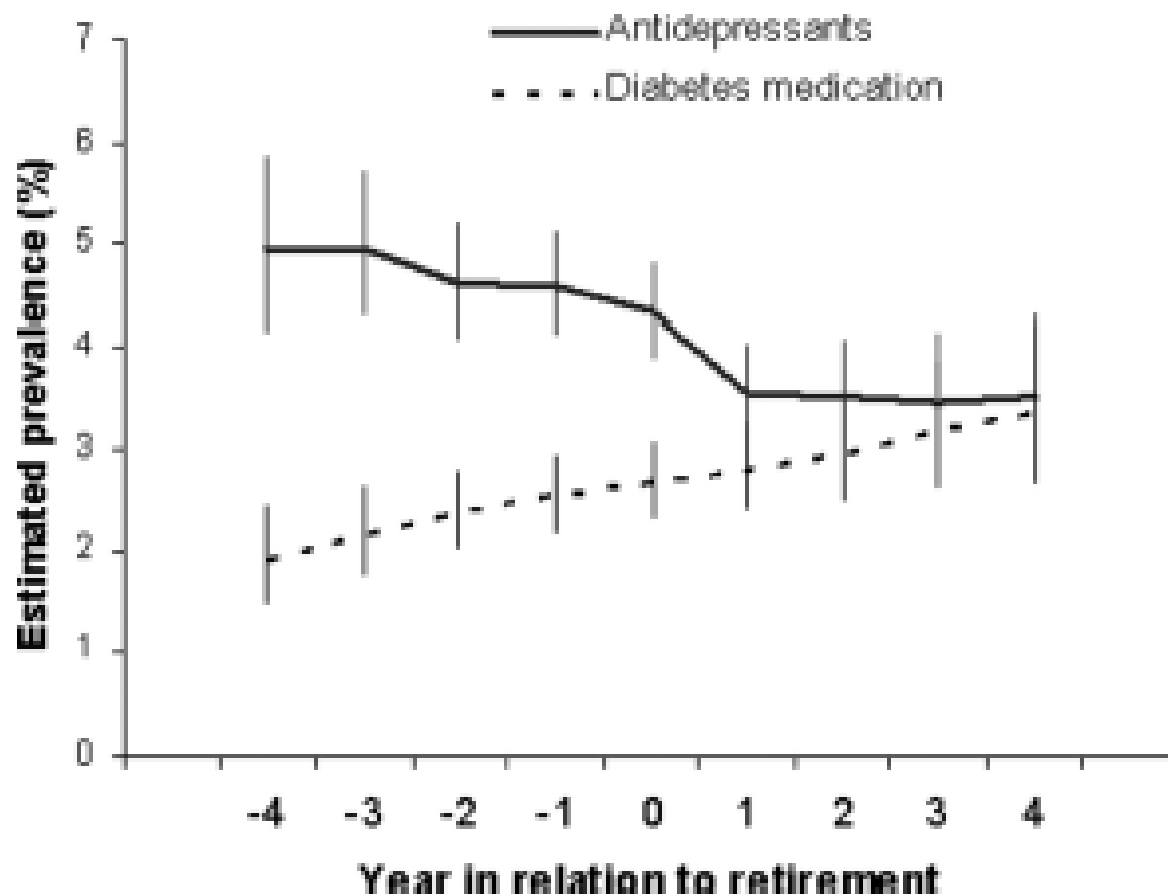
Sjösten N, Kivimäki M, Singh-Manoux A, Ferrie JE, Goldberg M, Zins M, Pentti J, **Westerlund H**, & Vahtera J. Change in physical activity and weight in relation to retirement: The French GAZEL cohort study. *BMJ Open*, 2012;**2**:e000522. [Professor Hugo Westerlund, Stress Research Institute, Stockholm University](#)

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- Studying intermediate outcomes
  - which may lead to improved or deteriorated health
  - may be more credibly seen as consequences of DP
    - which, in turn, are known to impact on health
- Studying differential effects on outcomes
  - more or less likely to be affected by health status vs. DP



Source: Westerlund et al. *BMJ*, 2010;341:c6149.



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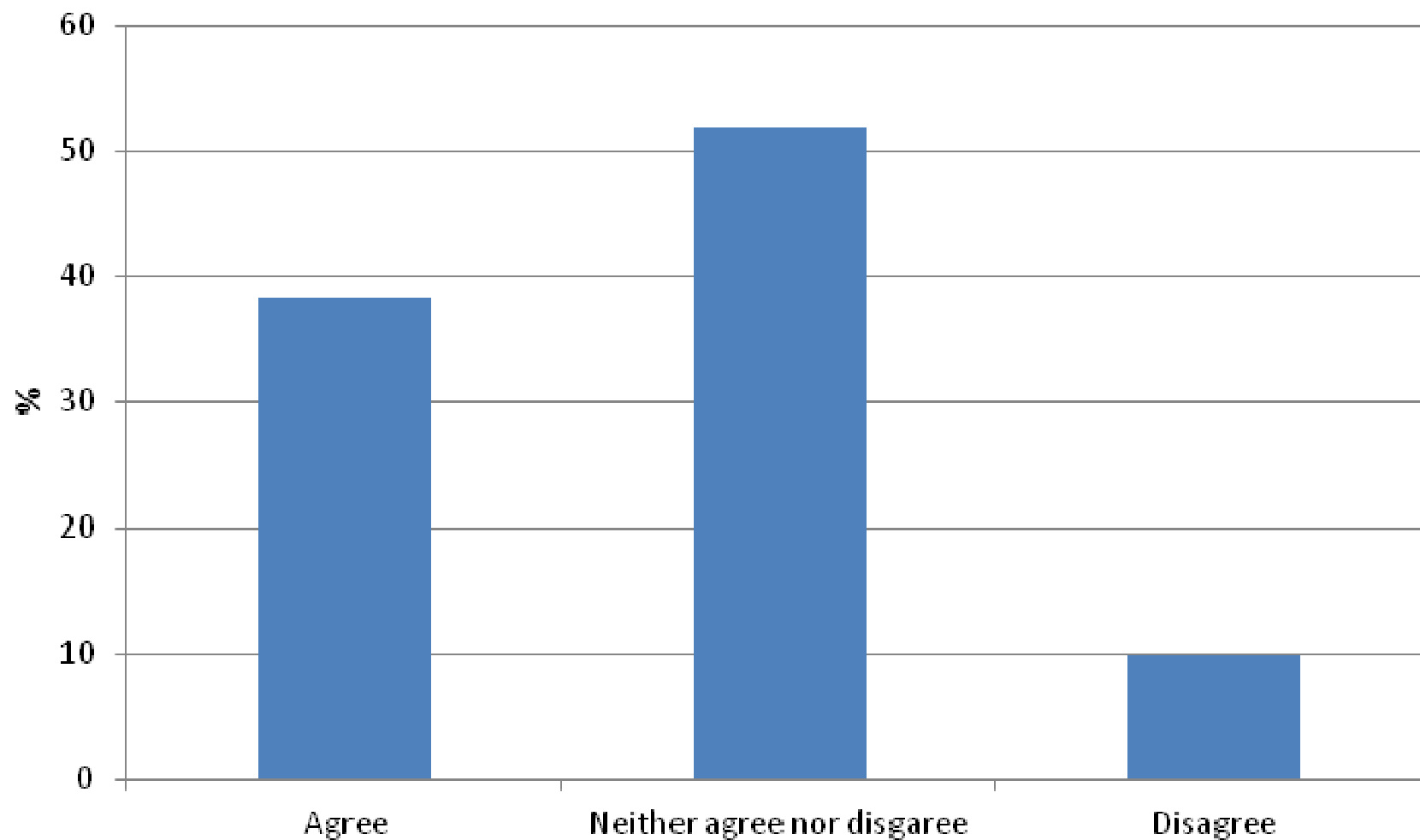
**FIGURE 1.** Prevalence of antidepressant and diabetes medication use adjusted for calendar year and retirement age, in relation to year of retirement at statutory age (error bars indicate 95% confidence intervals). Note that the figure is corrected for the increasing secular trend in prescriptions during the study period.

# Potential solutions 3



- Quasi-experimental (instrumental variable) approaches
  - utilise exogenous variation in how easily DP is awarded
    - instead of an (impossible) RCT
  - may facilitate estimation of potential intervention effects
- Qualitative studies
  - asking what people themselves think were the consequences
  - anthropological in-depth studies of people granted DP
    - possibly prospective

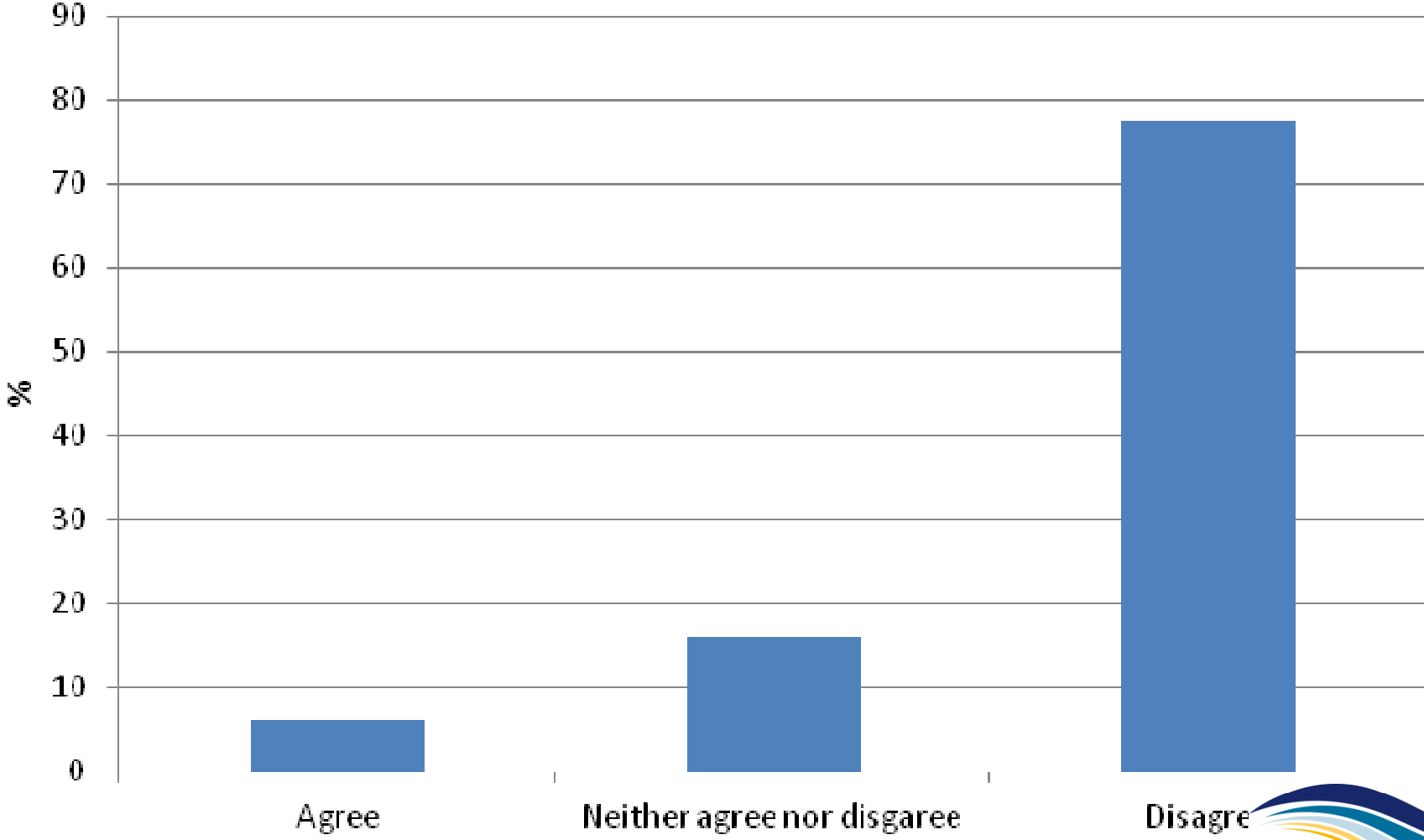
# Experiences of retiring in Sweden 2008-2010: My health has improved since I stopped working



Hyde M, & Westerlund H. Preliminary analyses of SLOSH data.



# Experiences of retiring in Sweden 2008-2010: I feel that I have lost my role in life



Hyde M, & Westerlund H. Preliminary analyses of SLOSH data.

# Potential solutions 3



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    - instead of an (impossible) RCT
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- Qualitative studies
  - asking what people themselves think were the consequences
  - anthropological in-depth studies of people granted DP
    - possibly prospective
- Studying the perceived impact of the disease



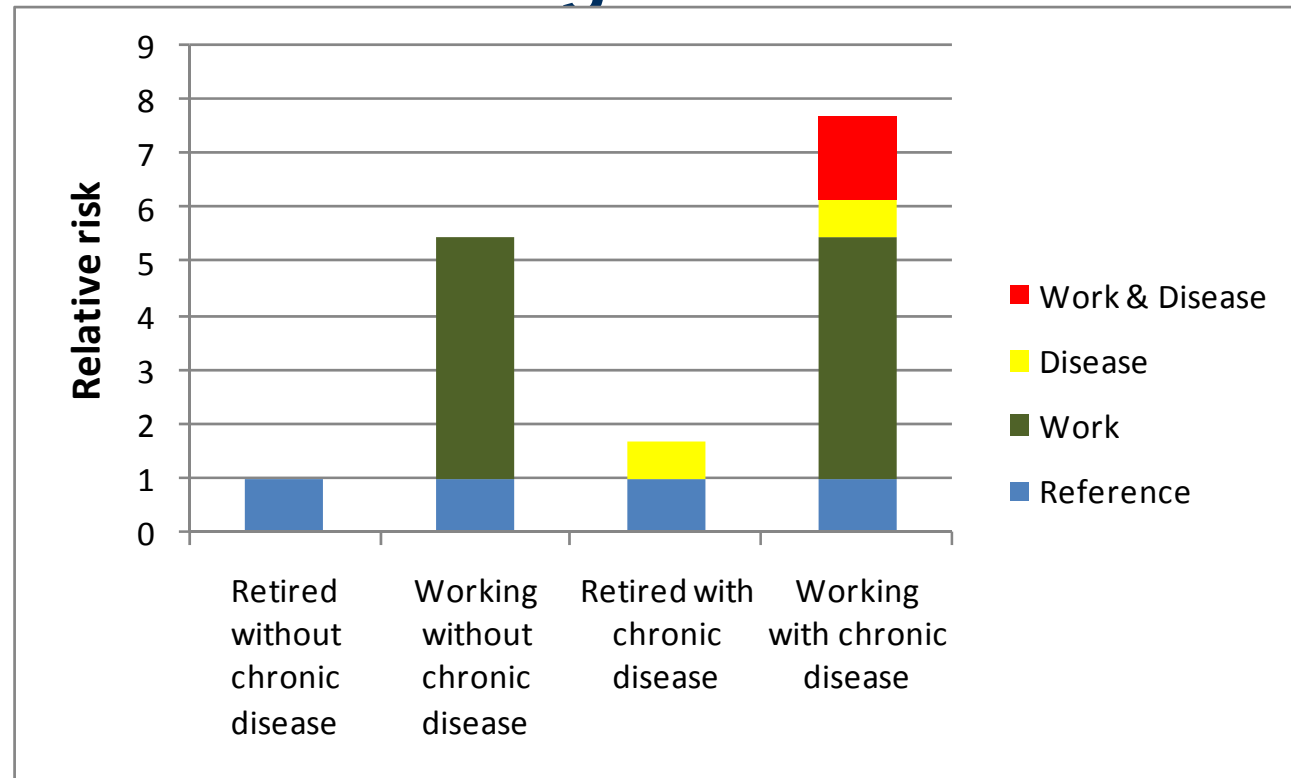
# Impact of chronic disease before and after retirement



Disease	Deteriora-tion	No change	Improve-ment	p-value
Hypertension	33	168	59	0.003
Diabetes	15	28	10	0.602
Asthma	7	20	20	0.006
Rheumatic disease	6	11	26	<0.001
Psychiatric disorder	1	9	8	0.021



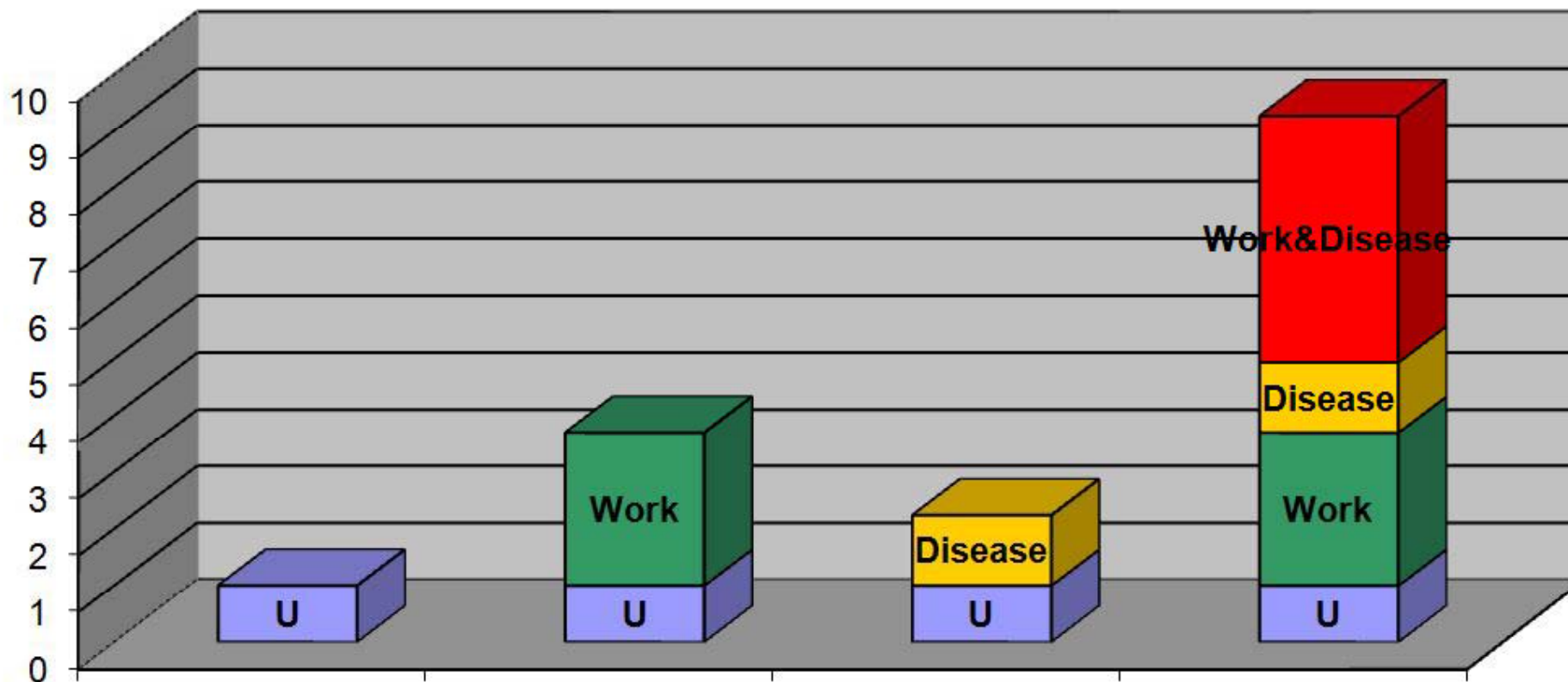
# The role of work and chronic disease in fatigue



Health condition	Synergy index (95% CI)	
	Mental fatigue	Physical Fatigue
Respiratory disease	1.21 (1.05 to 1.40)	1.34 (1.13 to 1.58)
Diabetes	1.17 (0.92 to 1.47)	1.25 (0.95 to 1.64)
Coronary heart disease or stroke	1.85 (1.44 to 2.38)	2.10 (1.58 to 2.80)
Any chronic disease <sup>1</sup>	1.30 (1.16 to 1.47)	1.43 (1.24 to 1.65)

# Synergy between work and Coronary Heart Disease in the association with Physical Fatigue

*Relative risk with contributions from different exposure categories marked  
U is the common reference category*



# A note of caution:

The better the control for confounders and reverse causality, the smaller the effect estimates tend to be.

Since no adjustment is perfect, how do we know that any remaining effect is causal and not residual confounding wishfully interpreted by the researcher?

After all, we need to publish, and might also want to prove a point. Selective citing in the background and discussion often quite revealing...



**THANKS FOR YOUR ATTENTION!**

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