HALCyon
Healthy Ageing across the Life Course

MRC Unit for Lifelong Health and Ageing

A LIFE COURSE APPROACH TO PHYSICAL CAPABILITY - What have we found in HALCyon and where will we go from here?

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with acknowledgements to Rebecca Hardy & Diana Kuh

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What is HALCyon?

A collaborative research programme:

- 9 UK cohorts born early 1900's to 1958
- 27 investigators, 8 doctoral and post-doctoral researchers, 19 collaborators
- Core project + 8 work packages
- Funded from Sept 2008 – March 2012 (with follow up no cost extension to December 2013)

Aim: to improve the lives of older people by understanding how healthy ageing is influenced by factors operating across *the whole of life*

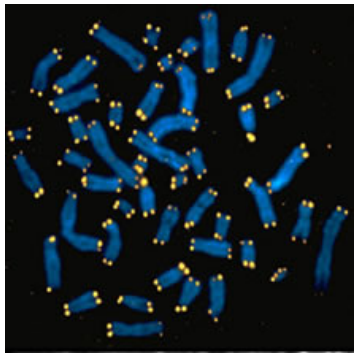
HALCyon

What has been studied?

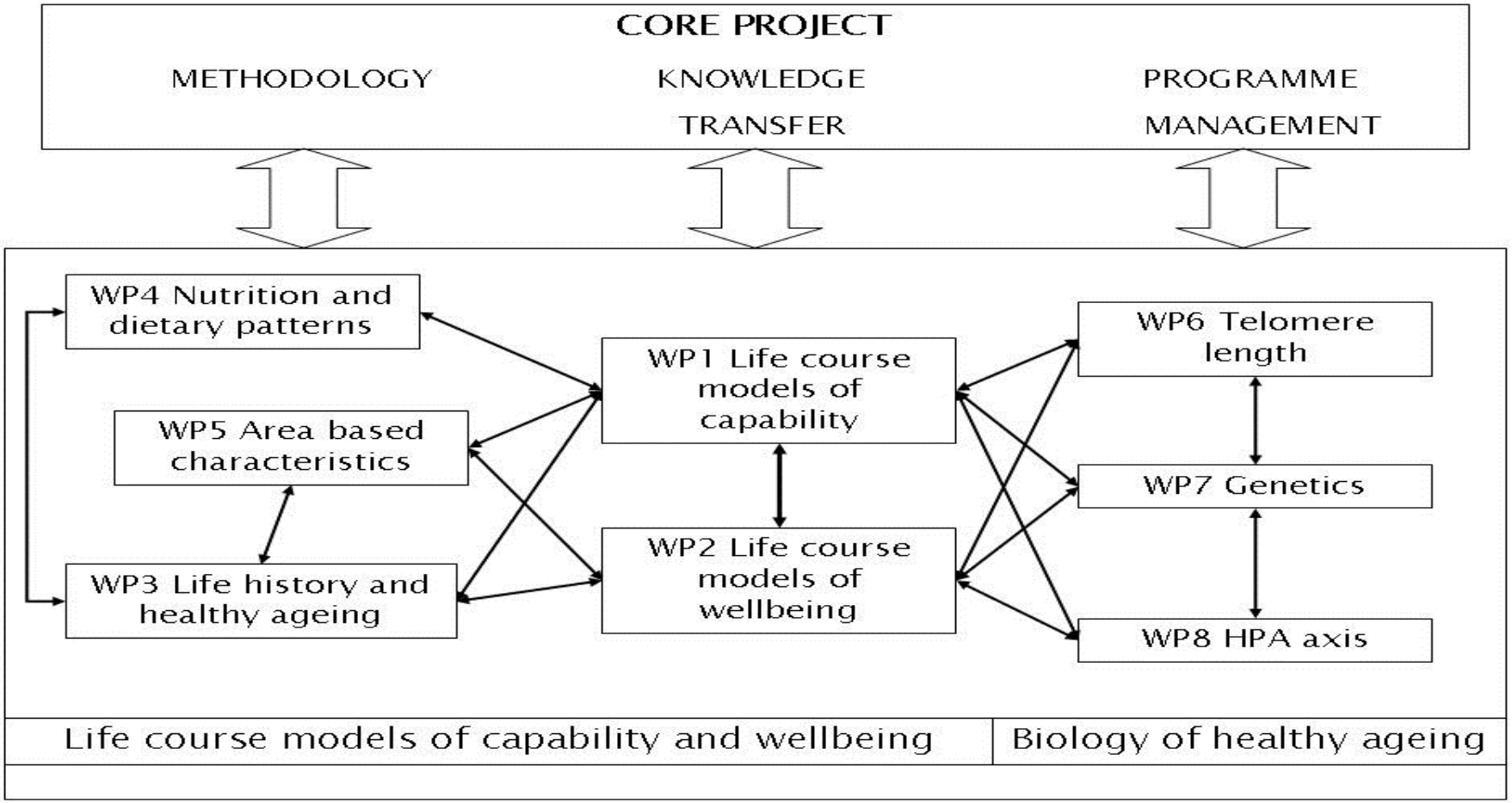
Indicators of healthy ageing:

- Capability: the capacity to undertake the physical and mental tasks of daily living
- Wellbeing: psychological and social
- Underlying biology: physiology and genetics



8 integrated work packages



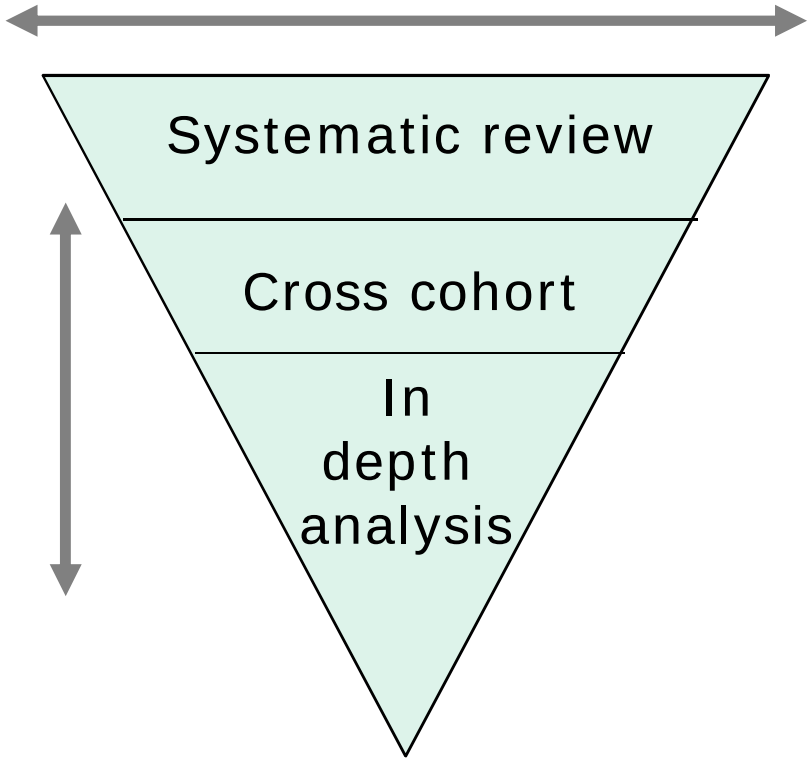
HALCyon cohorts

Cohort (birth yr/s)	Birth	Childhood	Early Adulthood	Mid Adulthood	Late Adulthood
Lothian (1921)		→	- - -	- - -	→
Hertfordshire Ageing Study (1920-30)	→	- - -	- - -	- - -	→
Boyd Orr (1925-37)		→	- - -	- - -	→
Aberdeen (1936)		→	- - -	- - -	→
Hertfordshire Cohort Study (1931-39)	→	- - -	- - -	- - -	→
Caerphilly (1920-1934)				→	→
ELSA (early 1900s-1952/56)					→
NSHD (1946)	→	→	→	→	
NCDS (1958)	→	→	→	→	

+ other cohorts for specific studies

Analytical strategy

- Systematic review (and where possible meta-analysis)
- Across HALCyon cohorts – data harmonisation (using existing data or coordinated collection of new data) and consistent analysis
- In depth analysis in relevant cohorts to answer specific life course questions



Physical capability

1) What is it? how is it usually assessed? and, why is it important?

2) How did we study physical capability in HALCyon?

Two examples:

3) Childhood socioeconomic position and physical capability (systematic review and cross-cohort work (using existing data))

4) Physical capability and subsequent mental wellbeing (cross-cohort work (using new data))

What is physical capability?

The capacity to undertake the physical tasks of daily living

'Capability' used to emphasise healthy ageing at the individual level and to delineate it from the physiological functions of each body system

Maintaining physical capability for the maximal period of time is key to functioning well in later life




How is physical capability assessed?

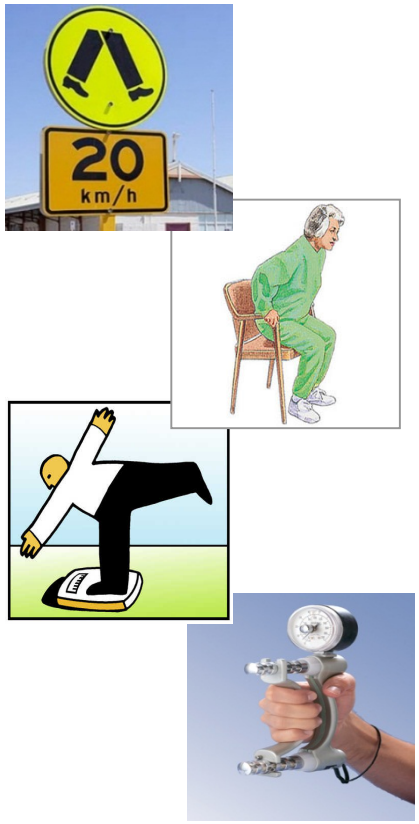
Earlier assessments based on self-reports of functional limitations and ability to perform ADLs

But concerns over:

- validity and reproducibility
- how to capture change over time
- influence of cognitive function, culture, language and education and impact on comparability

Objective assessments introduced & widely used in US since late 1980s and more recently in other countries (incl. UK)

Objective assessment of physical capability



Commonly used measures:

- Walking speed & timed get up and go (TUG)
- Chair stands
- Standing balance
- Grip strength

Benefits:

- variation across full spectrum of ability
- identification of people performing most well
- facilitates study of processes from early life onwards prior to manifestation of disability & frailty

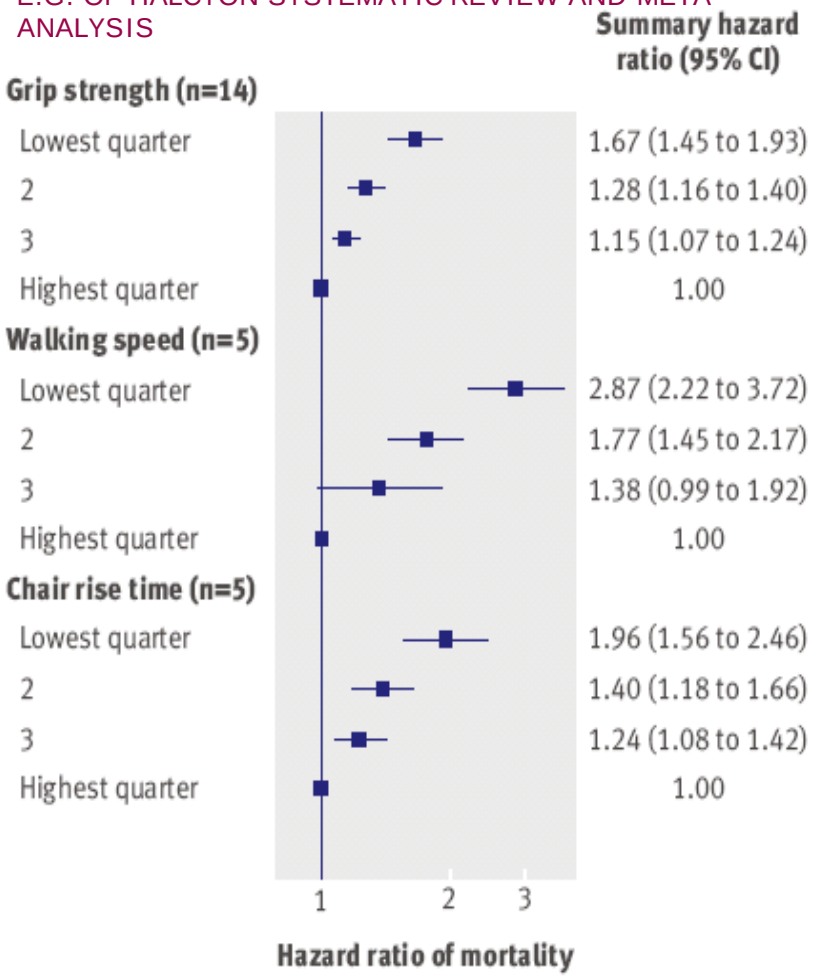
Why is physical capability important?

Higher levels of objective measures of physical capability linked to key components of healthy ageing including:

- higher survival rates
- delayed onset of disease & disability

Qualitative work: 'physical decline' perceived as an important disadvantage of ageing (Parsons et al, in press)

E.G. OF HALCYON SYSTEMATIC REVIEW AND META-ANALYSIS



[Cooper et al BMJ 2010;341:c4467]

Physical capability and subsequent morbidity and disability

- Systematic reviews linking physical capability and: fracture; cognitive decline; CVD; hospitalisation and institutionalisation (Cooper et al, Age and Ageing 2011;40:14-23 & Clouston et al, Epidemiol Rev 2013)
- 3 systematic reviews show links to subsequent disability (Vermuelen et al, 2011; den Ouden et al, 2011; Michikawa et al, 2009)
- Most studies conducted in older community-dwelling populations
- Meta-analyses often cannot be conducted due to variations in assessment of physical capability and outcomes between studies

Patterns of change in physical capability over the life course

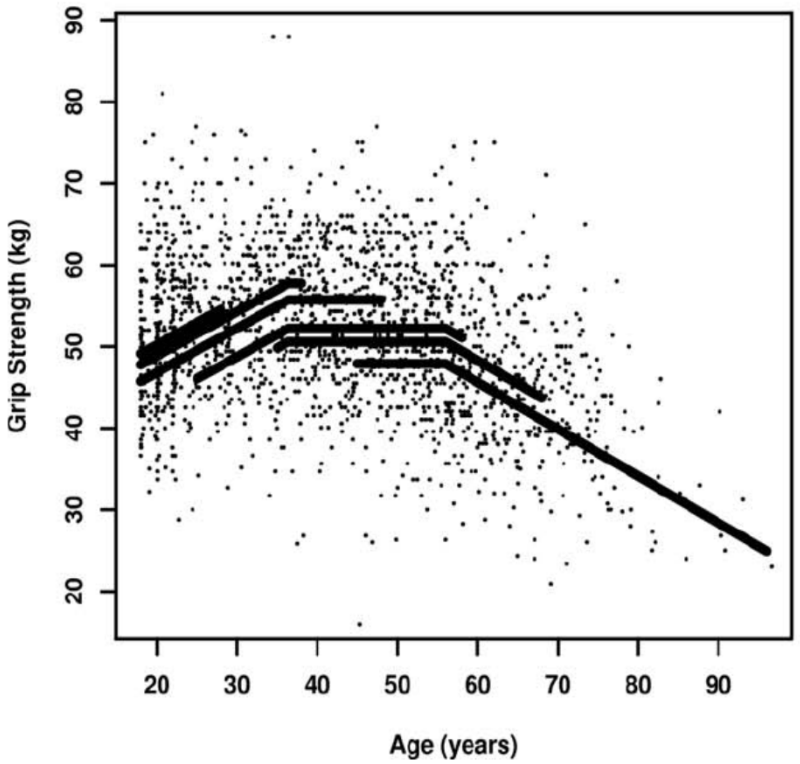
Physical capability and the systems on which it depends:

- increase in early life
- plateau in early-mid adulthood
- decline in later life

Factors across life may influence development, maintenance and/or the timing of onset and rate of decline

Some data available from individual studies (e.g. NSHD and HCS) but difficult to assess consistency of associations

GRIP STRENGTH TRAJECTORIES IN THE FELS LONGITUDINAL STUDY (OHIO, US)



Taken from Nahhas et al Am J Hum Biol 2010;22:648-56

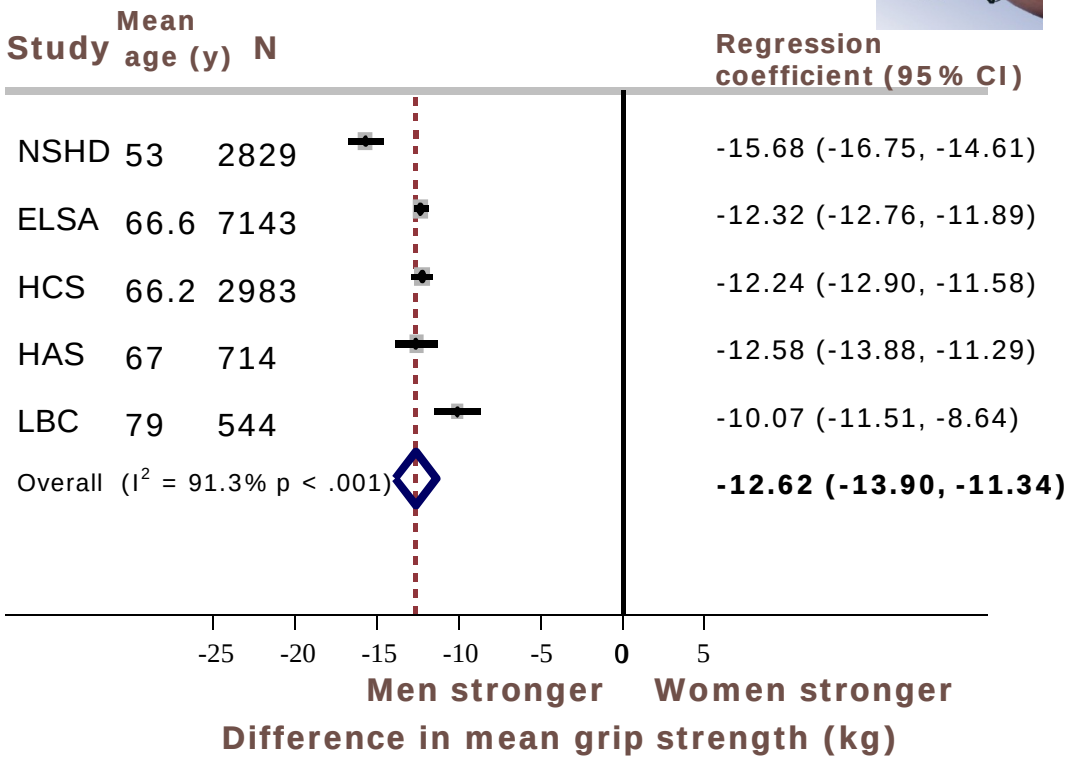
(Plot for men shown but results similar for women)

Age and gender differences in physical capability (cross cohort work: harmonising existing data)

- Physical capability declines with age
- Men perform better than women
- Gender difference in walking speed attenuated after adjustment for height
- Gender difference in grip strength diminishes with increasing age

Gender differences in grip strength (kg)

adj. for age, height & weight

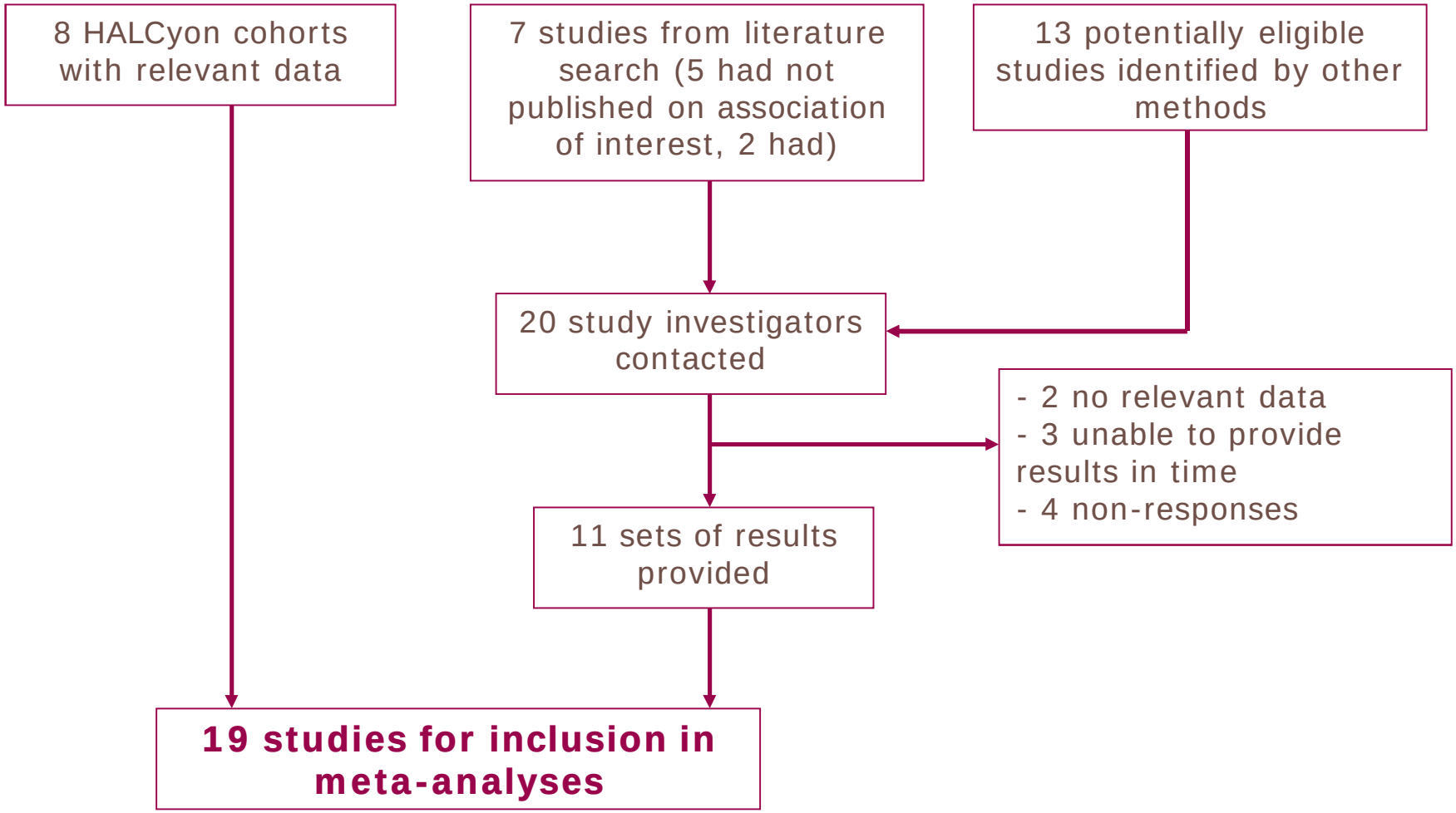


[Cooper et al, PLoS ONE, 2011;6(11):e27899]

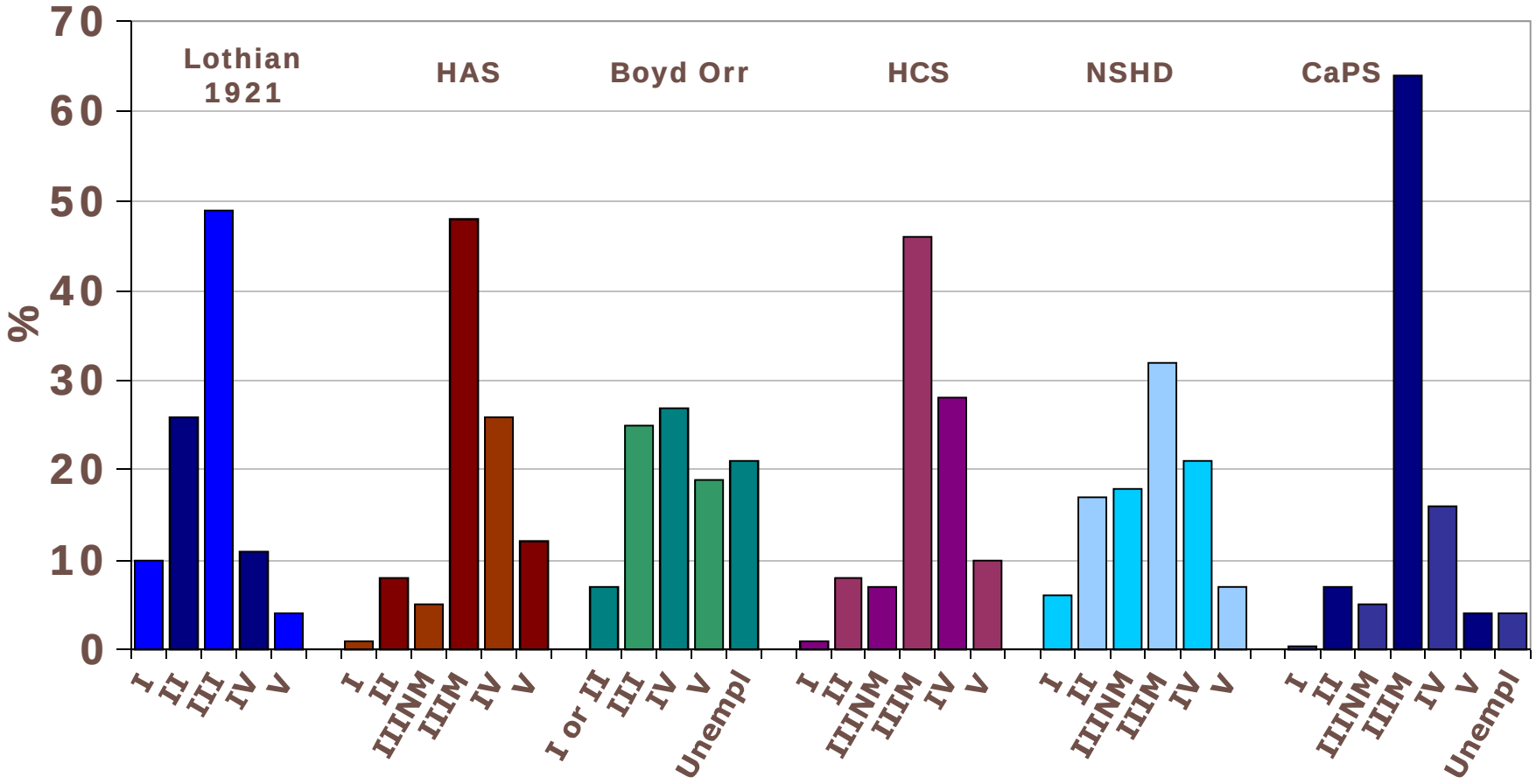
Childhood socioeconomic position and physical capability (systematic review & cross cohort work)

- Evidence indicates that socioeconomic disadvantage in childhood is associated with a range of adverse health outcomes in adulthood
- Childhood SEP, through its association with factors, including growth and early life nutrition, may influence the peak level of physical capability attained
- Adverse effects of SEP may also accumulate across the life course
- Poor adult SEP is associated with worse objectively measured physical capability levels however, it was unclear whether this effect was also seen with childhood SEP (independent of adult SEP)

Identifying studies



Distribution of father's occupation in HALCyon cohorts



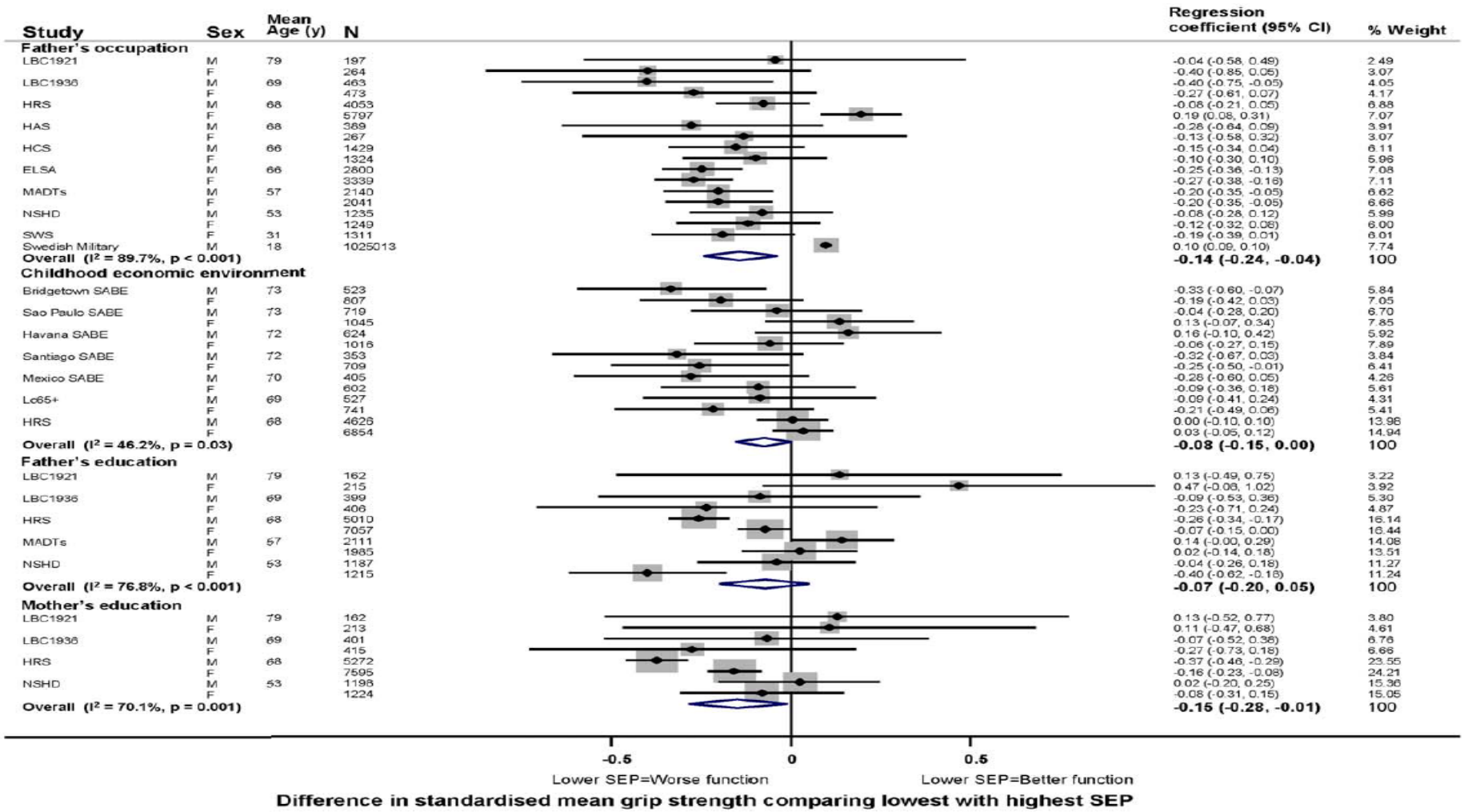
Indicators of childhood SEP in other cohorts

- Parental occupation
- Childhood economic environment
  - Family economic environment at birth: high, middle, low
  - Overall childhood SEP: pretty well off, average, poor
  - Family's economic situation during first 15y of life: good, average, poor
- Parental education

Modelling childhood SEP (harmonisation)

- Indicators of childhood SEP modelled as ridit scores
- Score between 0 (highest SEP) and 1 (lowest SEP) assigned to each category of SEP variable based on the proportion of the population above the mid-point in that category
- Regression coefficients show effect for those in lowest SEP compared with those in the highest SEP

Differences in grip strength (kg) comparing lowest with highest childhood SEP



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[Birnie, Cooper et al PLoS One 2011;6(1):e15564]

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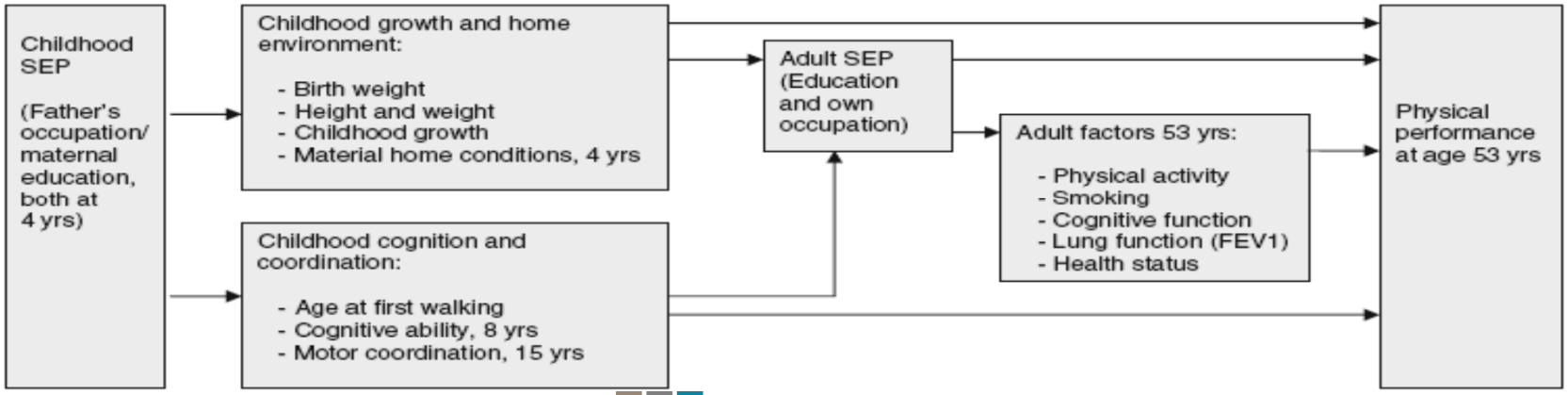
Childhood SEP and physical capability: main findings and implications

- Lower childhood SEP associated with poorer physical capability in adulthood

- Modest associations remained with walking speed and chair rise time after adjustment for adult SEP + body size suggesting that policies targeting SE inequalities in childhood may help promote maintenance of capability in later life

- Considerable heterogeneity between studies: influence of childhood SEP is contextual and varies by time and place

- In depth studies needed to investigate pathways



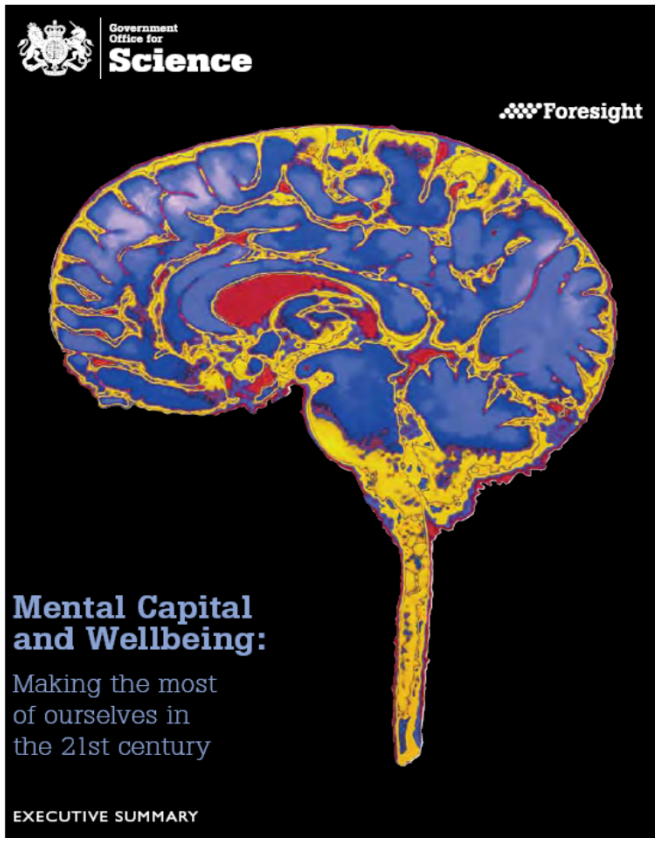
[Strand et al, Eur J Epidemiol 2011]

Physical capability and subsequent wellbeing (cross cohort work: coordinated data collection)

Systematic reviews - associations between physical capability and subsequent health BUT, little evidence on association with positive mental wellbeing

Importance of wellbeing has been highlighted by a number of agencies incl. WHO and UK Government

Poor physical capability associated with depression (Gale et al, 2011) but also need work on positive mental wellbeing as it is not simply absence of symptoms of poor mental health



OBJECTIVE: To test the associations of objective measures of physical capability with subsequent levels of positive mental wellbeing across the HALCyon cohorts

Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS)

14 positively worded items including:

I've been:

- feeling optimistic about the future
- feeling confident
- feeling loved
- able to make up my own mind about things

5 response options (based on experience over past 2 weeks):

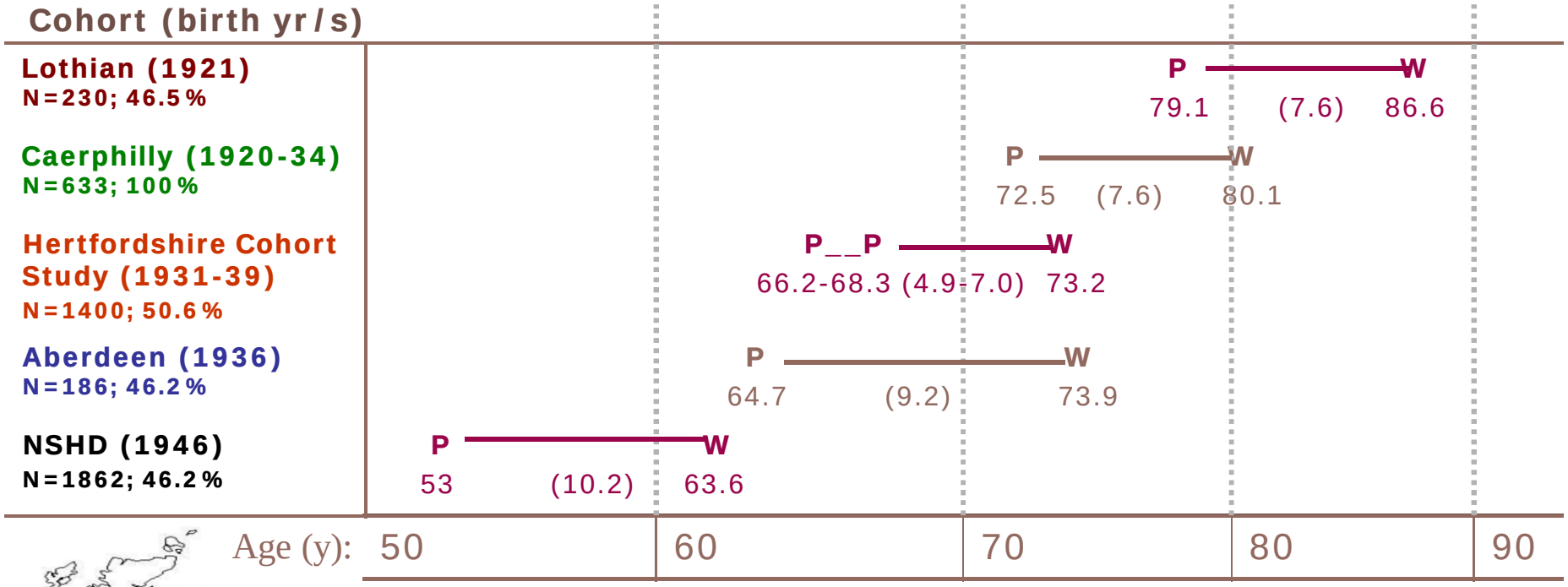
None of the time (1) – All of the time (5)

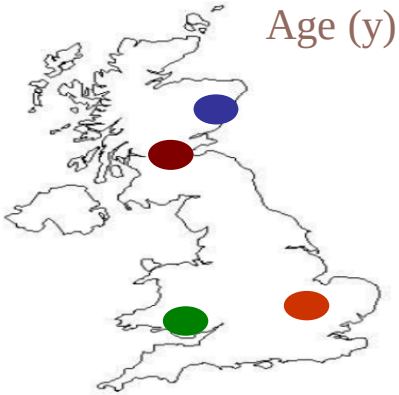
Total score: 14-70 (higher score = greater mental wellbeing)

Validated in British general population sample (Tennant et al, 2007)
Cronbach's α in HALCyon cohorts = 0.89 – 0.93

[Tennant et al. *Health Qual Life Outcomes* 2007]

HALCyon cohorts included





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P = Physical capability assessment

W = Wellbeing assessment

% = proportion of sample who are male

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Results being prepared for journal submission presented

Physical capability and subsequent wellbeing: main findings

- Consistent evidence across cohorts of modest associations between higher levels of physical capability and higher levels of subsequent mental wellbeing
- Most associations were maintained, albeit with attenuation, after adjustment for important covariates
- Highlights importance of maintaining physical capability in later life
- Suggests areas for further research in studies with more detailed data (e.g. on change in physical capability, wellbeing earlier in life and functional limitations)

What have we learnt?

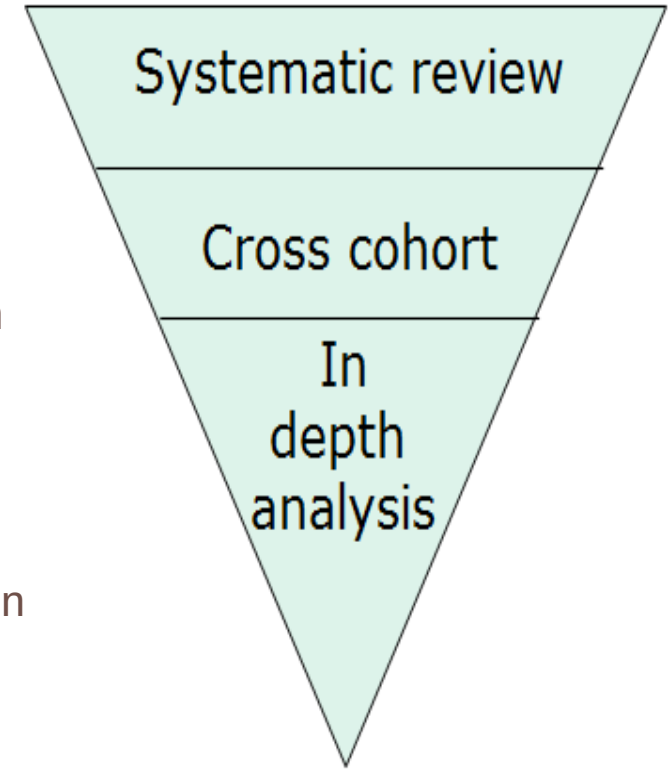
- Compiling and harmonising data from multiple cohorts is challenging and takes time but….
- Results provide empirical evidence that is often more robust than that from an individual study
- Cross-cohort work complements more in-depth work conducted within individual studies (and helps identify appropriate hypotheses to test)

Physical capability levels in later life:

- are associated with survival, subsequent morbidity and positive mental wellbeing
- differ by gender and decline with age across UK cohorts
- are influenced by factors across life including childhood socioeconomic circumstances
- *are associated with body size at different life stages (Hardy et al, Dodds et al), lifetime neighbourhood characteristics (Murray et al), dietary factors (Mulla et al), cortisol levels (Gardner et al), some genetic variants (but not others) (Alfred et al) but not with telomere length (Gardner et al)*

Where do we go from here?

- Use knowledge gained to help inform and guide other cross-cohort initiatives
- Identify specific hypotheses to test which will benefit from investigation across cohorts, ensuring work is science-led & capitalises on existing data
- Identify cohorts in addition to those included in HALCyon which would enable study of age, birth cohort and geographical differences
- Consider possibilities for collection of a core set of common measures across cohorts
- Investigate underlying pathways of association in cohorts with more detailed life course data



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