

Area deprivation across the life course and health: challenges, value and the future

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CLOSER workshop: Using geographic data in longitudinal studies: Value, challenges & case studies

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Original Contribution

Area Deprivation Across the Findings From the 1946 Briti

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Physical capability in later life conditions have only been exami a longitudinal study of a 1946 Bri as percentage of employed peop (residential addresses linked to age 53 years: grip strength, stanc als nested within areas at the 3 ; contributions to physical capabili midlife were robust to adjustmen for a 1-standard-deviation increa (95% CI: -0.1, 4.3)). In addition, hood socioeconomic position (-) physical capability should target childhood.

geography; Great Britain; health residence characteristics; socioe

Abbreviations: CI, confidence interval; GI deviation; SEP, socioeconomic position.

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Challenges in examining area effects across the life course on physical capability in mid-life: Findings from the 1946 British Birth Cohort

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ABSTRACT

A major limitation of past work linking area socioeconomic conditions to health in mid-life has been the reliance on single point in time measurement of area. Using the MRC National Survey of Health and Development, this study for the first time linked place of residence at three major life periods of childhood (1950), young adulthood (1972), and mid-life (1999) to area-socioeconomic data from the nearest census years. Using objective measures of physical capability as the outcome, the purpose of this study was to highlight four methodological challenges of attrition bias, secular changes in socioeconomic measures, historical data availability, and changing reporting units over time. In general, standing balance and chair rise time showed clear cross-sectional associations with residing in areas with high deprivation. However, it was the process of overcoming the methodological challenges, which led to the conclusion that in this example percent low social class occupations was the most appropriate measure to use when extending cross-sectional analysis of standing balance and chair rise to life course investigation.

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MRC National Survey of Health and Development (NSHD)

Stratified random sample of all single, legitimate births in 1 week of March 1946 (n=5,362) in England, Scotland & Wales

Data collected on cohort members across childhood and adolescence and at ages 20, 26, 36, 43, 53 and 60-64 years in adulthood [see Wadsworth et al, *IJE* 2006;35:49-54 and Kuh et al, *IJE* 2011;40:e1-9]



Methods

1. At every data collection, address of current residence collected: ages at birth, 2, 4, 6, 7, 11, 15, 20, 26, 36, 43, 53, 60-64, 68 years.
2. Chose 3 ages to represent life stages:
 - a. Childhood – aged 4 years (1950)
 - b. Early adulthood – aged 26 years (1972)
 - c. Midlife – aged 53 years (1999)

Methods

3. Two-step address linking -> Local Government District matching method
 - a. Automatic – postcode matching to Ordnance Survey's Address-Point database.
 - b. Manual – Ordnance survey maps used to identify District.

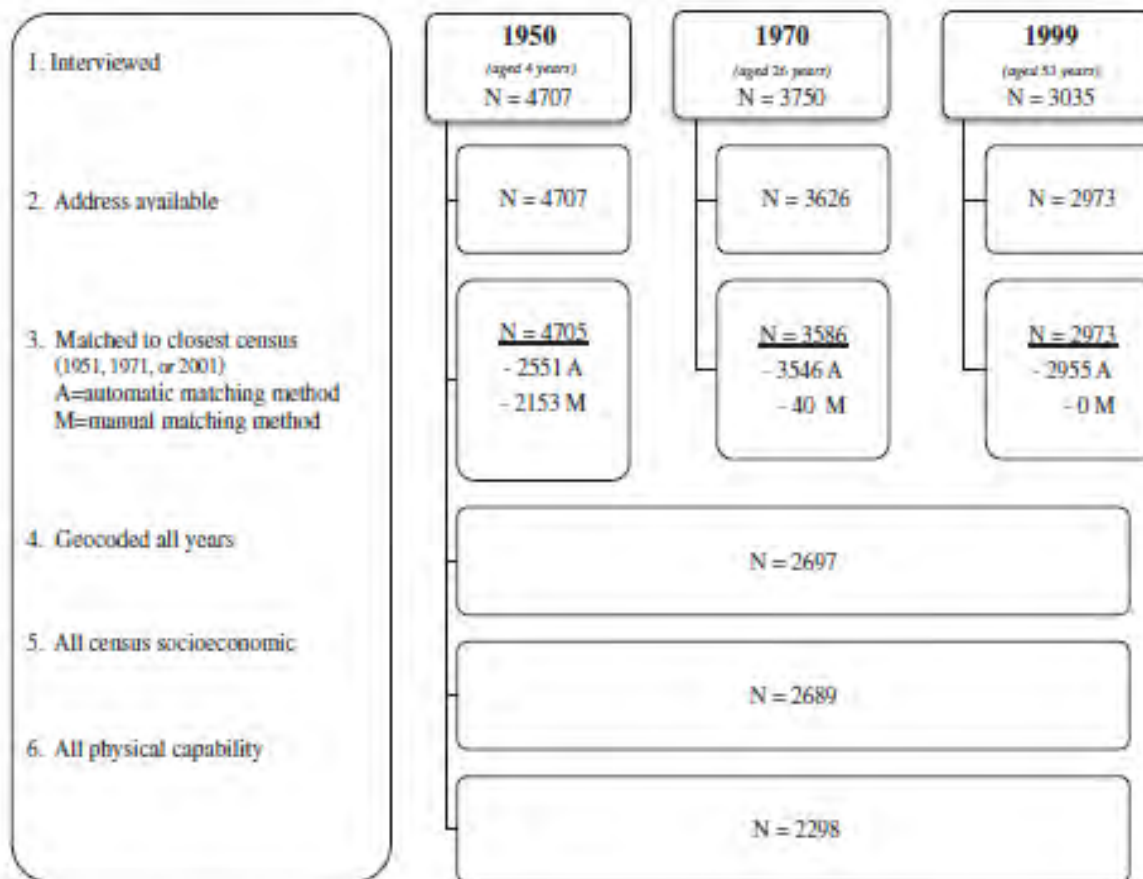
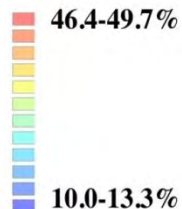
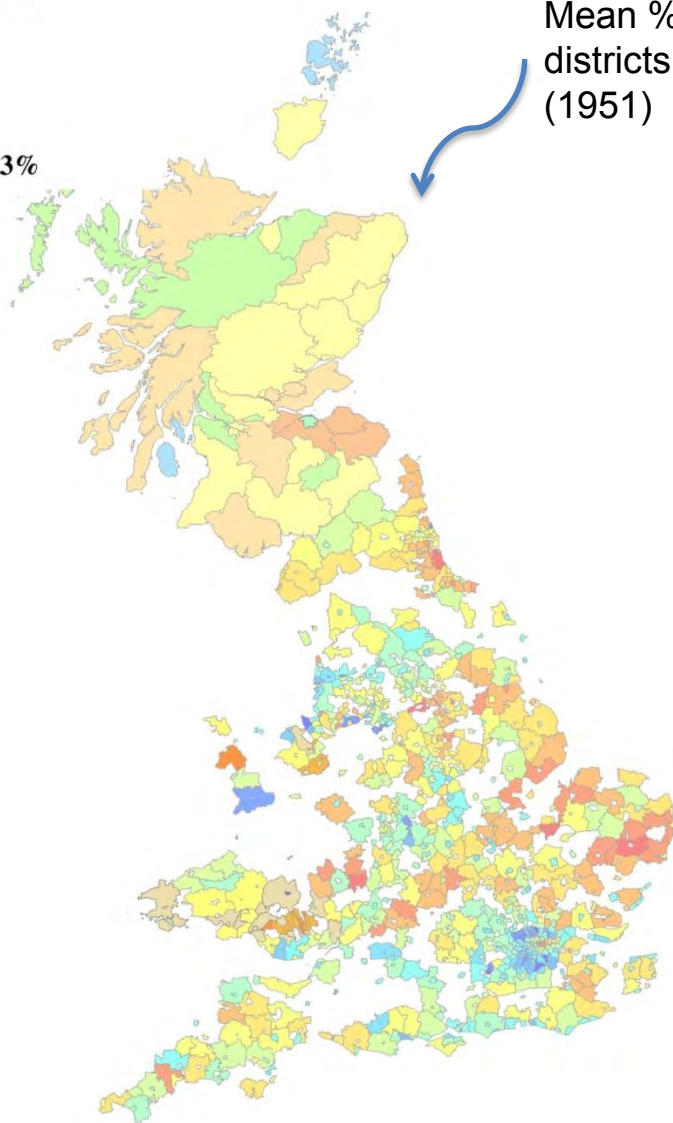


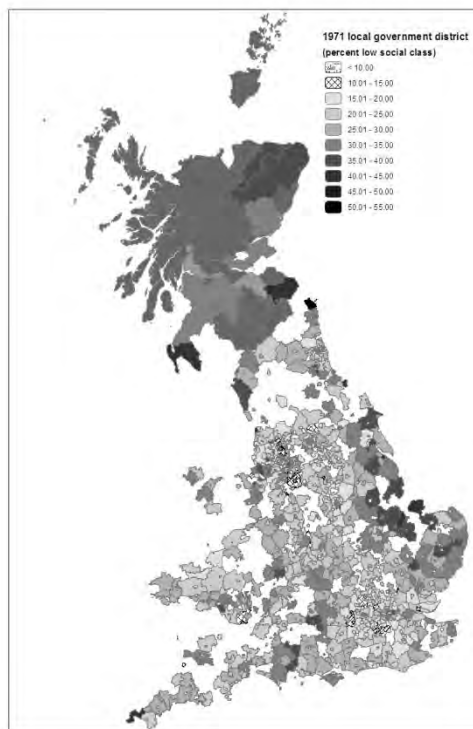
Fig. 1. Flow of cohort member's addresses included in the analyses, by study year.



Mean % area low social class for local government districts in which cohort members lived: aged 4 years (1951)



1971



2001





CHALLENGES

Challenge #1: Lack of consistently collected data across time

Area deprivation indices:

Townsend:

- Unemployment
- Overcrowding
- No car
- Renting

Carstairs:

- Male unemployment
- Overcrowding
- No car
- Low social class

Index of Multiple deprivation:

- many, many variables...

Table 1: Selected topics in censuses 1931-2001

Topic	1931	1951	1961	1971	1981	1991	2001
Education							
Whether scholar or student		GB					
Age at which full-time education ceased		GB	GB				
School level qualifications				GB			
Scientific and technical qualifications			GB	GB	GB	GB	GB
Higher qualifications				GB	GB	GB	GB
Employment							
Activity	GB	GB	GB	GB	GB	GB	GB
Students of working age	GB	GB	GB	GB	GB	GB	GB
Working full-time or part-time		GB	GB		GB	GB	GB
Weekly hours worked			GB ³	GB			
Employment status (employee, self-employed)	GB	GB	GB	GB	GB	GB	GB
Apprentice or trainee		GB	GB	GB	GB	GB	GB
Industry	GB	GB	GB	GB	GB	GB	GB
Address of business	GB	GB	GB	GB	GB	GB ⁴	GB
Occupation							
Households							
Number of rooms	E, W	GB	GB	GB	GB	GB	GB
Number of rooms with one+ windows	S						
Sharing accommodation				GB	GB	GB	GB
Tenure of accommodation			GB	GB	GB	GB	GB
Car or vans							
				GB	GB	GB	GB
Household amenities							
Cooking stove		GB	GB	GB			
Kitchen sink		GB	GB	GB			
Piped water supply		GB	GB				
Hot water supply				GB			
Fixed bath or shower		GB	GB	GB	GB	GB	GB
Inside WC		GB		GB	GB	GB	GB
Outside WC				GB	GB		
Central heating						GB	GB

GB: Great Britain; E: England; W: Wales; S: Scotland
 Source: Norris & Mounsey 1985; Champion 1996; ONS 2004

Challenge #2: Secular changes in area socioeconomic conditions

Table 2

Distribution of area socioeconomic measures^a with geocoded addresses from 1950, 1972, and 1999 and physical capability outcomes at age of 53 years ($n=2298$).

	1950 (aged 4 years)		1972 (aged 26 years)		1999 (aged 53 years)	
	Mean (SD)	Range	Mean (SD)	Range	Mean (SD)	Range
Area measures						
Low social class	29.4 (7.7)	9.3–49.7	25.0 (6.0)	8.2–52.1	19.8 (2.9)	13.8–30.0
Unemployment	1.2 (0.7)	0.2–5.3	2.3 (0.9)	0.5–6.8	4.7 (1.9)	2.0–11.4
Lacking higher education	97.5 (1.5)	84.4–99.7	95.5 (1.8)	85.9–99.1	80.5 (6.7)	48.5–91.5
Overcrowding ^b	15.7 (5.5)	4.2–36.5	10.2 (4.2)	2.2–27.8	1.5 (1.1)	0.5–12.5
Lacking household amenities	48.2 (18.0)	3.4–89.5	15.1 (7.9)	1.6–50.7	7.9 (5.1)	1.6–27.3
No car	–	–	44.1 (13.0)	18.4–76.4	23.8 (9.7)	8.4–57.6
Rent	–	–	48.3 (14.8)	13.8–90.3	25.2 (8.4)	9.6–72.3
Physical capability						
Balance time, s ^c	–	–	–	–	5.0 (2.2)	1.0–30.0
Char rise time, s ^c	–	–	–	–	20.3 (1.4)	5.0–322.0
Grip strength, kg/cm	–	–	–	–	2.2 (0.8)	0.1–5.1

^a Derived from addresses/postcodes geocoded and linked to a local government district from census years 1951, 1971, and 2001.

^b England and Wales only in 1951 and 1971.

^c Geometric mean (standard deviation).

Challenge #3: Lack of consistently collected data across time

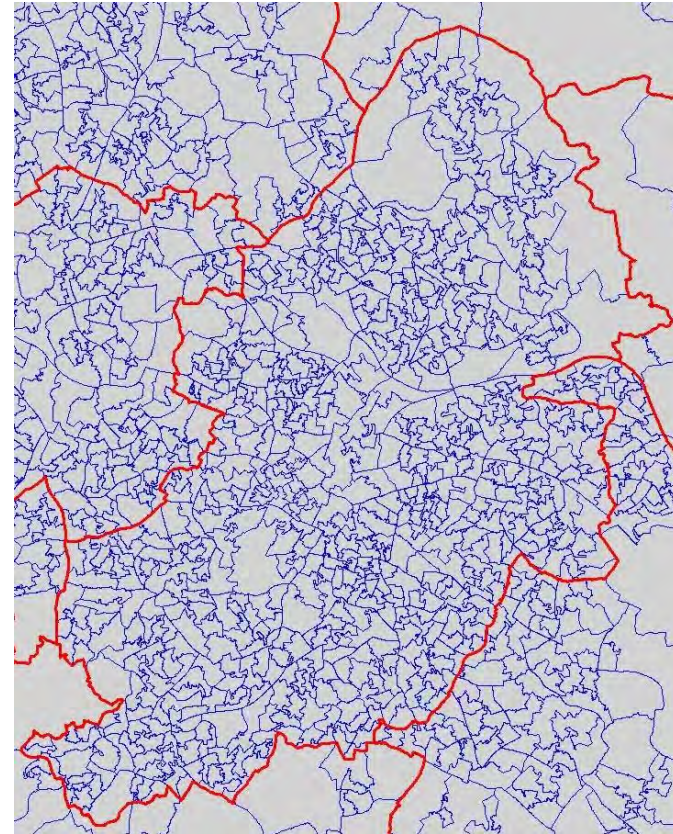
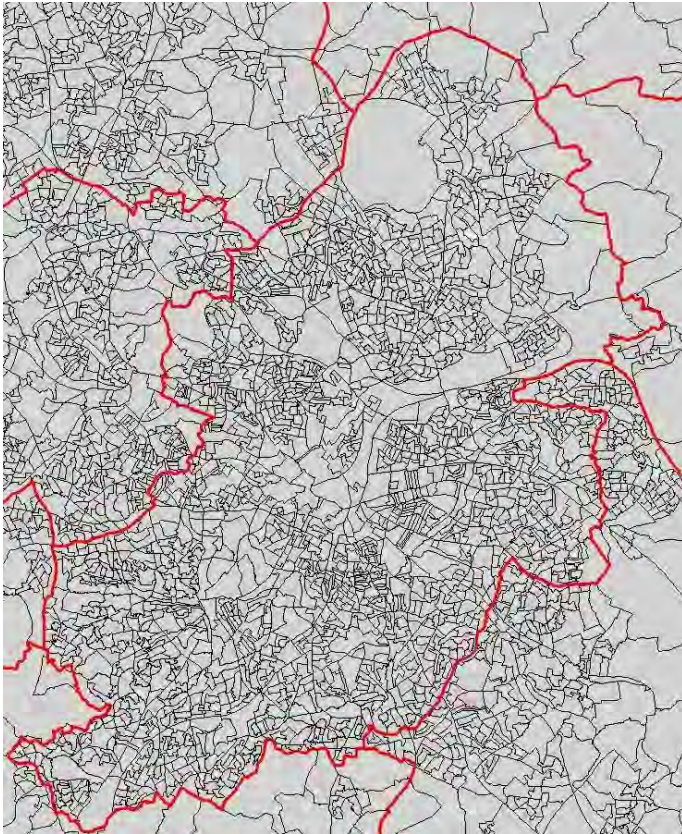
Table 2: Output geographies of censuses

Year	Geography			
	Enumeration district	Output area	Ward	Local authority
1951				GB
1961	Partly on demand		GB	GB
1971	GB		GB	GB
1981	GB		GB	GB
1991	E,W	S	GB	GB
2001		GB	GB	GB
2011		GB	GB	GB

Note: for Scotland pseudo postcode sectors are used instead of ward in 1981, 1991 and 2001 censuses.

Source: Denham & Rhind 1983; Coombes, M. 1995

Challenge #4: Changes in geographic boundaries



Challenge #5: Attrition bias

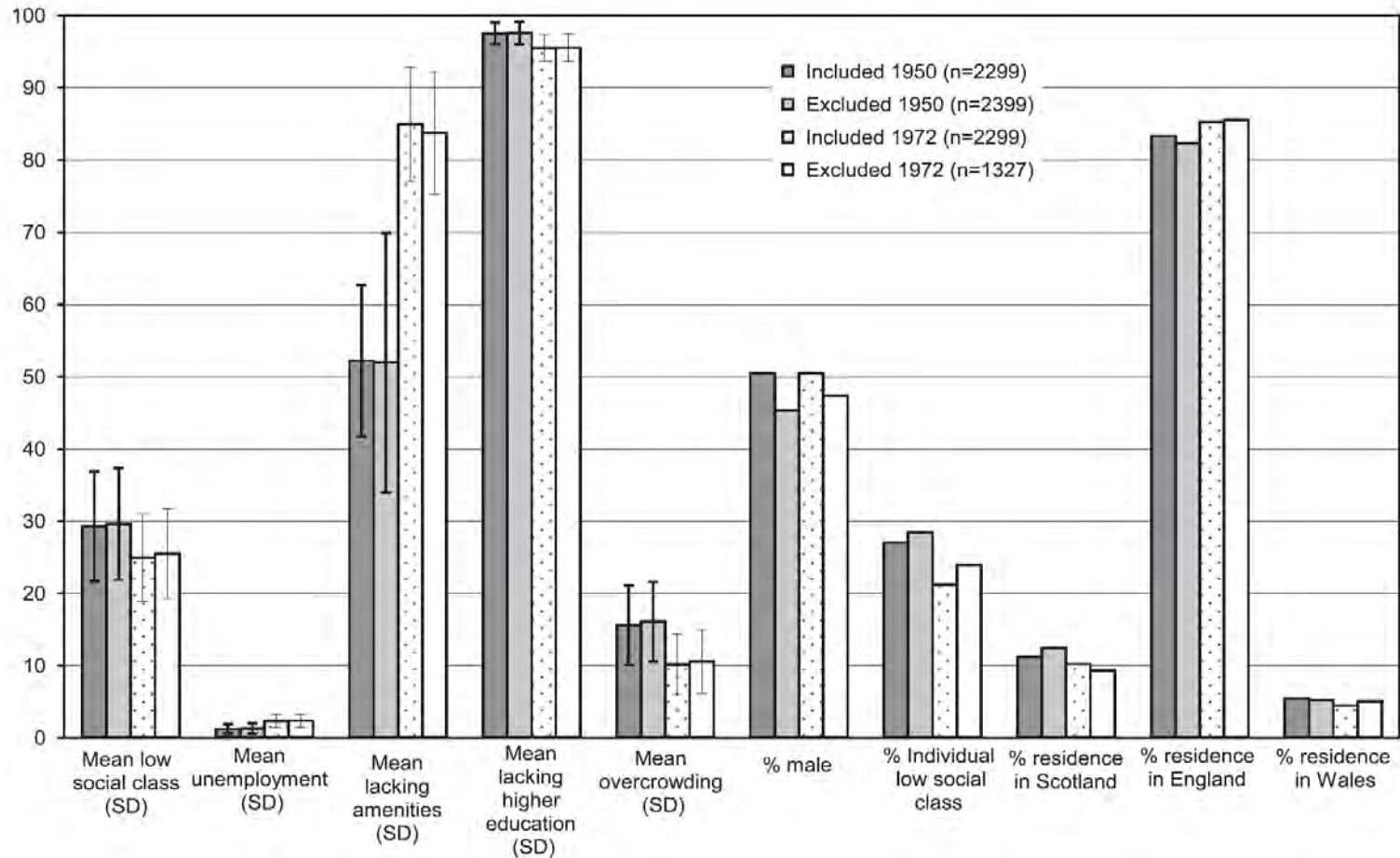
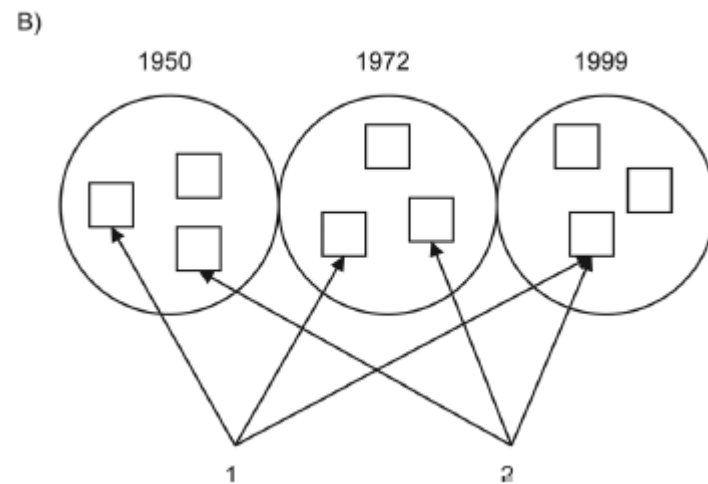
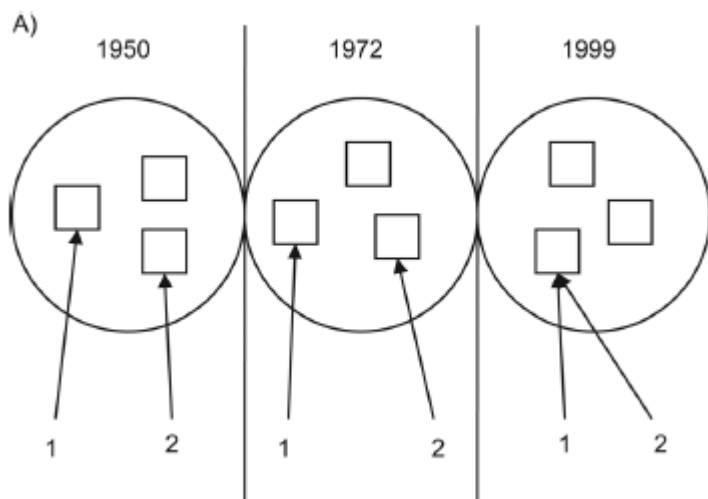


Fig. 2. Selected area and individual characteristics of cohort members who were included and excluded in 1950 (aged 4 years) and 1972 (aged 26 years).



VALUE

Value #1: Life-course perspective (aka more accurate exposure data)



Physical capability

Standing balance



Grip Strength



Figure 1. The hand dynamometer (Model 2011) measures force. Biological capacity for muscle fibres to contract normally varies and may increase with age but people who are frail may have a reduced range of motion. Figure courtesy of Lifetools Research Company.

Chair Rise



Value #1: Life-course perspective (aka more accurate exposure data)

Table 2. Variance in Measures of Physical Capability at Age 53 Years (1999) Explained by Area of Residence in 1950, 1972, and 1999 in 2-Level Nested Models^a Compared With Cross-Classified Models^b ($n = 2,300$), United Kingdom, 1946–1999

	1950		1972		1999		Total Life Course ^c	
	Variance Between Areas	% of Total Variance	Variance Between Areas	% of Total Variance	Variance Between Areas	% of Total Variance	Variance Between Areas	% of Total Variance
Standing-balance test, seconds								
2-level models	0.0287**	4.6	0.0518**	8.4	0.0532**	8.6	— ^d	
Cross-classified models	0.0130	2.1	0.0278*	4.5	0.0392**	6.3	0.0800	12.9

Value #2: Life-course analyses

Figure 2. Mean percent change in standing balance at age 53 years for a 1-standard deviation increase in area deprivation in 1950, 1972 and 1999 (from cross-classified models), United Kingdom, 1946-1999.

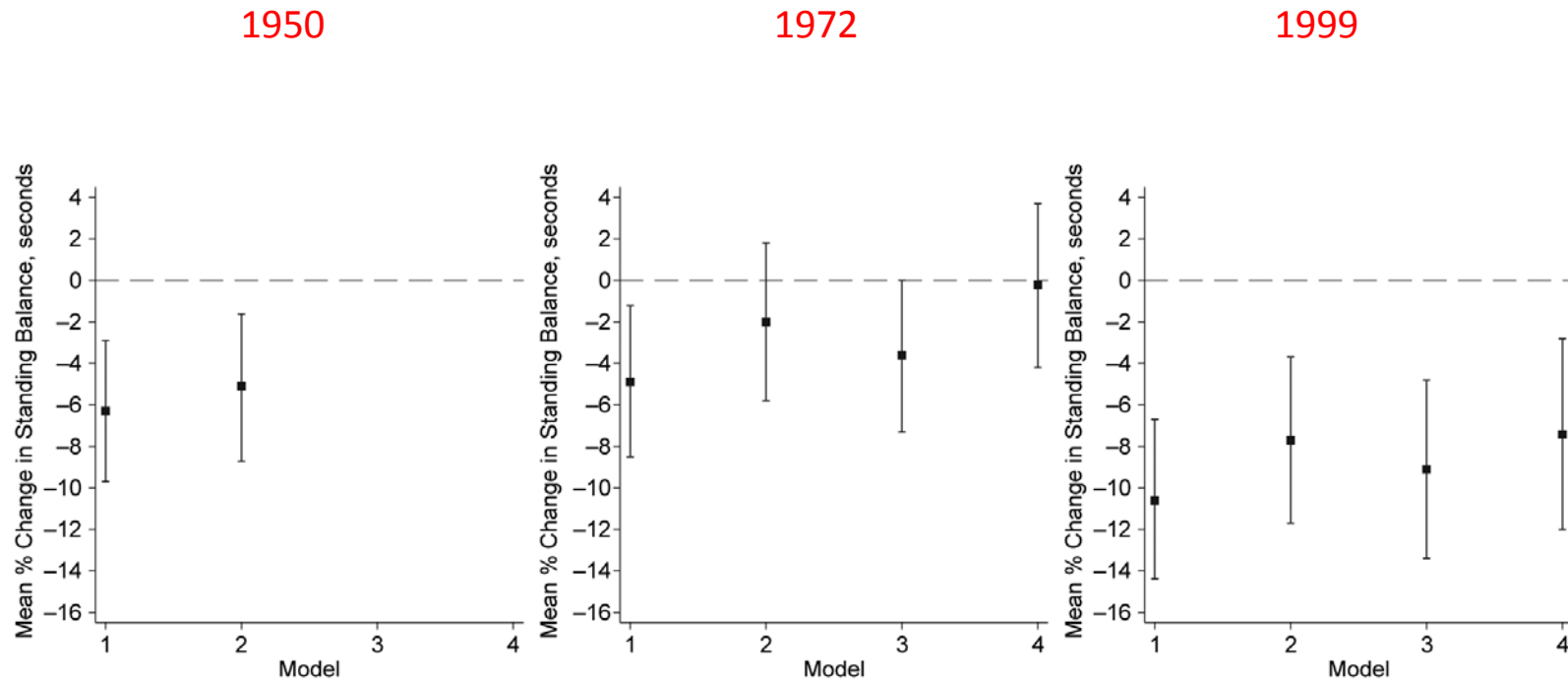


Figure 2. Mean percent change in physical capability measures at age 53 years for a 1-standard-deviation increase in area deprivation in 1950, 1972 and 1999 (from cross-classified models), United Kingdom, 1946-1999. Left column, age 4 years (1950); middle column, age 26 years (1972); right column, age 53 years (1999). In model 1, results were unadjusted ($n = 2,300$); in model 2, results were adjusted for cross-sectional individual socioeconomic position (SEP) (i.e., area deprivation in 1950 adjusted for childhood SEP only); in model 3, results were adjusted for prior area deprivation (i.e., area deprivation in 1972 adjusted for 1950); and model 4 was the full model fitted for all previous area deprivation and current and prior individual SEP (i.e., area deprivation in 1999 adjusted for area deprivation in 1950 and 1972 and individual SEP in 1950, 1972, and 1999 (ages 4, 26, and 53 years)). Area deprivation was measured as the percentage of employed persons in the area working in partly skilled or unskilled occupations. Because of missing data, models adjusting for individual SEP (models 2 and 4) contained fewer than 2,300 participants. Bars, 95% confidence interval.



THE FUTURE



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A life course approach to neighbourhood effects

Stephen Jivraj (UCL), Emily Murray (UCL), Paul Norman (Leeds) & Owen Nichols (UCL)



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Timeline of studies

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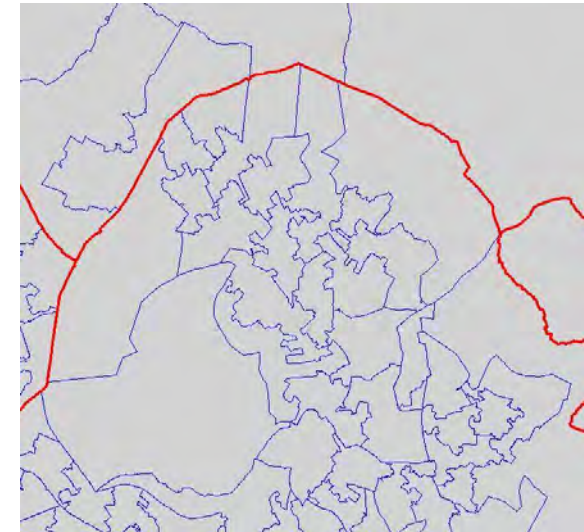
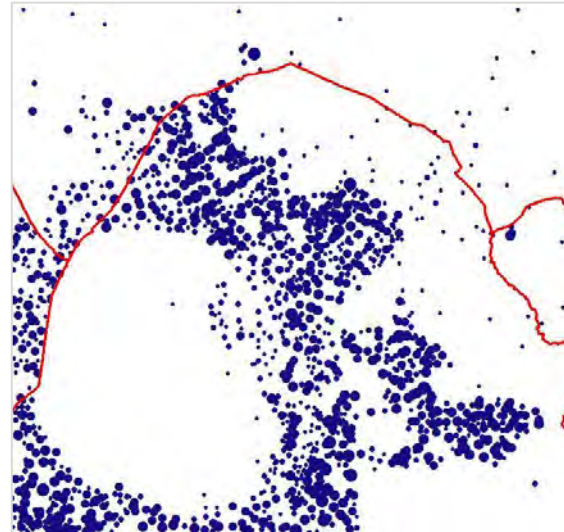


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A life course approach to neighbourhood effects

- Prospectively collected address data:
 - 1958 cohort: ages 0, 7, 11, **16, 23, 33, 42, 46, 50, 55**
 - 1970 cohort: 0, 5, 10, 16, **26, 30, 34, 38, 42**
- Matched to consistent census geographies, using the nearest census year, 1971-2011
- 2011 Census Lower Super Output Areas (LSOAs) in England and Wales and 2011 Data Zones (DZs) in Scotland using a methodology developed by Norman et al.

Boundary change: data conversion from EDs 1991 to LSOAs 2011



ED91	LSOA11-Code	LSOA11-Name	Add	Source	Weight
07CNGL05	E01009415	Birmingham 002A	126	223	0.5650
07CNGL05	E01009416	Birmingham 003A	27	223	0.1211
07CNGL05	E01009418	Birmingham 001B	30	223	0.1345
07CNGL05	E01009423	Birmingham 002C	40	223	0.1794
07CNGL06	E01009417	Birmingham 001A	37	247	0.1498
07CNGL06	E01009421	Birmingham 004A	210	247	0.8502
07CNGL07	E01009417	Birmingham 001A	112	264	0.4242
07CNGL07	E01009419	Birmingham 001C	152	264	0.5758
07CNGL08	E01009419	Birmingham 001C	260	260	1.0000

Source	Unemployed	Weight
07NGL05	45	0.5650
		0.1211
		0.1345
		0.1794
Targets	Unemployed	
002A	25.43	
003A	5.45	
001B	6.05	
002C	8.07	

1971, 1981, 1991, 2001 & 2011

Lower Super Output Areas in England & Wales and Datazones in Scotland (2011 boundary definitions)

Populations by sex and five year age-group

Townsend scores & population weighted quintiles

(comparable over time in terms of more or less deprived)

& components

- Unemployment
- Non-home ownership
- No car
- Overcrowded households

Population density: persons per hectare



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A life course approach to neighbourhood effects

1. Does it matter whether you live in a disadvantaged neighbourhood in childhood on the health and wellbeing you experience in later life?
2. Are neighbourhood effects stronger in childhood than at other stages of the life course?
3. To what extent do negative neighbourhood effects on health and wellbeing accumulate during the life course?
4. Can you offset any negative neighbourhood effects by permanently moving to a less.



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