



Socioeconomic Differentials in Physical Activity by Age and Cohort:

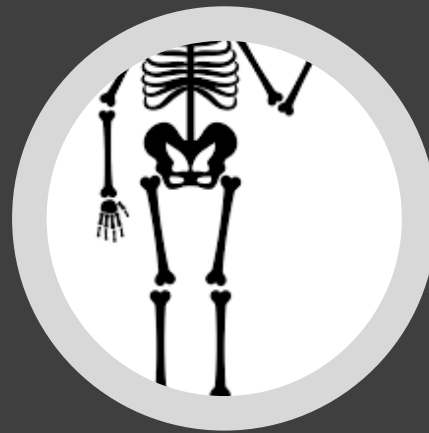
Findings from Six UK Longitudinal Studies

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Physical activity

- Physical activity refers to any bodily movement produced by skeletal muscles that results in energy expenditure.
- Physical activity is an important modifiable determinant of health across life.
- Its benefits are well documented including improvements in the musculoskeletal system, maintenance of healthy weight, protection against cardiovascular disease, and reduction in symptoms of depression and anxiety



Domain specific physical activity

2011 Compendium			2011 Compendium			2011 Compendium			2011 Compendium		
		Sports			Occupation			Inactivity Quiet/Light			Occupation
Codes	METs	Description	Codes	METs	Description	Codes	METs	Description	Codes	METs	Description
15000	5.5	Alaska Native Games, Eskimo Olympics, general	11003	2.3	active workstation, treadmill desk, walking	07010	1.0	lying quietly and watching television	11003	2.3	active workstation, treadmill desk, walking
15010	4.3	archery, non-hunting	11006	3.0	airline flight attendant	07011	1.3	lying quietly, doing nothing, lying in bed awake, listening to music (not talking or reading)	11006	3.0	airline flight attendant
15020	7.0	badminton, competitive (Taylor Code 450)	11010	4.0	bakery, general, moderate effort	07020	1.3	sitting quietly and watching television	11010	4.0	bakery, general, moderate effort
15030	5.5	badminton, social singles and doubles, general	11015	2.0	bakery, light effort	07021	1.3	sitting quietly, general	11015	2.0	bakery, light effort
15040	8.0	basketball, game (Taylor Code 490)	11020	2.3	bookbinding	07022	1.5	sitting quietly, fidgeting, general, fidgeting hands	11020	2.3	bookbinding
15050	6.0	basketball, non-game, general (Taylor Code 480)	11030	6.0	building road, driving heavy machinery	07023	1.8	sitting, fidge	11030	6.0	building road, driving heavy machinery
15055	6.5	basketball, general	11035	2.0	building road, directing traffic, standing	07024	1.3	sitting, smol	11035	2.0	building road, directing traffic, standing
15060	7.0	basketball, officiating (Taylor Code 500)	11038	2.5	carpentry, general, light effort	07025	1.5	sitting, lister reading) or v	11038	2.5	carpentry, general, light effort
15070	4.5	basketball, shooting baskets	11040	4.3	carpentry, general, moderate effort	07026	1.3	sitting at a d	11040	4.3	carpentry, general, moderate effort
15072	9.3	basketball, drills, practice	11042	7.0	carpentry, general, heavy or vigorous effort	07030	0.95	sleeping	11042	7.0	carpentry, general, heavy or vigorous effort
15075	7.8	basketball, wheelchair	11050	8.0	carrying heavy loads (e.g., bricks)	07040	1.3	standing quietly, standing in a line	11050	8.0	carrying heavy loads (e.g., bricks, tools)
15080	2.5	billiards	11060	8.0	carrying moderate loads up stairs, moving boxes 25-49 lbs	07041	1.8	standing, fidgeting	11060	8.0	carrying moderate loads up stairs, moving boxes 25-49 lbs
15090	3.0	bowling (Taylor Code 390)	11070	4.0	chambermaid, hotel housekeeper, making bed, cleaning bathroom, pushing cart	07050	1.3	reclining, writing	11070	4.0	chambermaid, hotel housekeeper, making bed, cleaning bathroom, pushing cart
			11080	5.3	coal mining, drilling coal, rock				11080	5.3	coal mining, drilling coal, rock



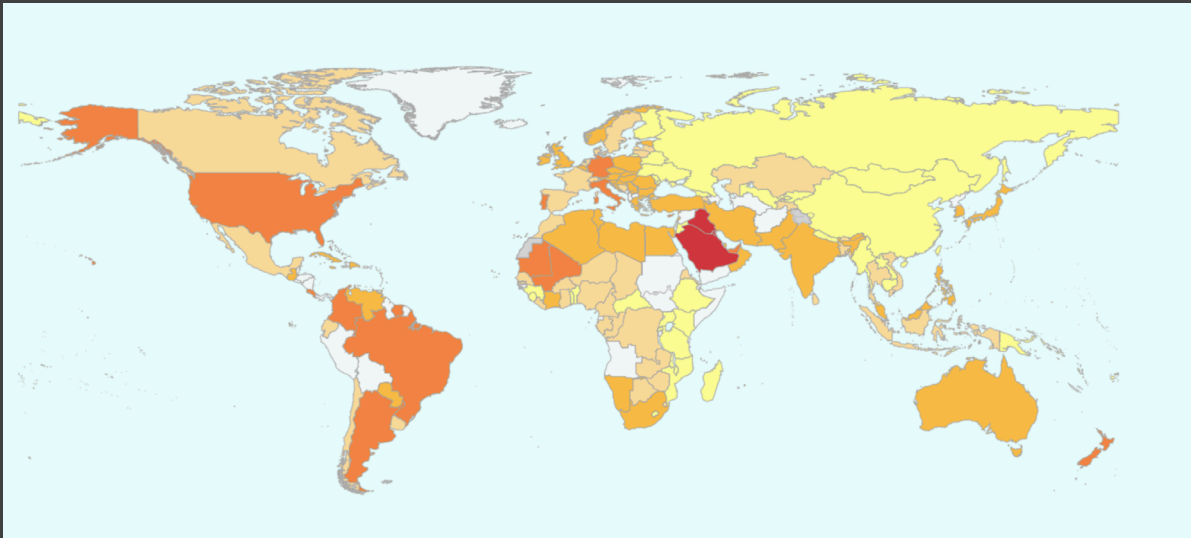
MET (metabolic equivalent): The ratio of the work metabolic rate to the resting metabolic rate. One MET is defined as 1 kcal/kg/hour and is roughly equivalent to the energy cost of sitting quietly.

Med Sci Sports Exerc. 2011 Aug;43(8):1575-81. doi: 10.1249/MSS.0b013e31821ece12.

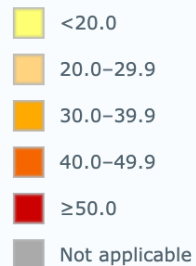
2011 Compendium of Physical Activities: a second update of codes and MET values.

Ainsworth BE¹, Haskell WL, Herrmann SD, Meckes N, Bassett DR Jr, Tudor-Locke C, Greer JL, Vezina J, Whitt-Glover MC, Leon AS.

Physical inactivity



WHO global inactivity 2016 (sex combined)



There is a global trend towards high levels of leisure time physical inactivity contributing to:

- ~6-10% of major non-communicable diseases
- ~5.3 million deaths annually
- ~\$67.5 billion per year in health care expenditure.

Despite public health campaigns the prevalence of physical inactivity remains particularly amongst socioeconomically disadvantaged groups.

However, it is unclear if these inequalities vary systematically by age, sex, or ethnicity

Domain specific physical activity

Examining different domains may provide evidence to help inform where possible interventions could be targeted.

Understanding differences in participation may help identify which forms of activity could be intervened on to reduce socioeconomic disparities in health.



Socioeconomic position and physical inactivity

BMC Public Health. 2018; 18: 926.

Published online 2018 Jul 28. doi: [10.1186/s12889-018-5857-z](https://doi.org/10.1186/s12889-018-5857-z)

PMCID: PMC6064072

PMID: [30055611](https://pubmed.ncbi.nlm.nih.gov/30055611/)

Education-related disparities in reported physical activity during leisure-time, active transportation, and work among US adults: repeated cross-sectional analysis from the National Health and Nutrition Examination Surveys, 2007 to 2016

[Shaun Scholes](#)^{#1} and [David Bann](#)^{#2}

Previous research has documented associations between socio-economic position and levels of physical activity.

However this work has not been conducted in the UK, investigated different domains, or using a nationally representative dataset

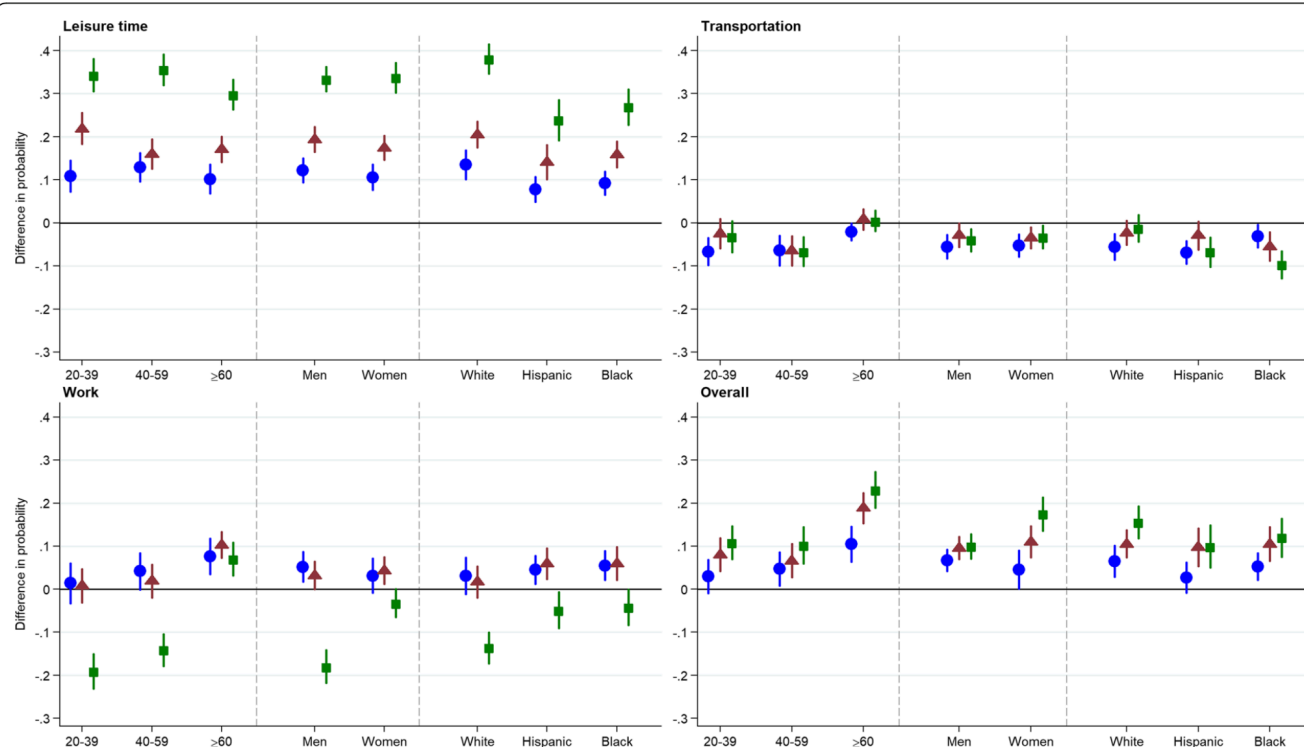


Fig. 1 Estimated differences in physical activity outcomes by educational group, stratified by age, gender, and race/ethnicity. Estimated differences in physical activity outcomes (95% CI) according to highest educational attainment, stratified by age, gender, and race/ethnicity among US adults aged 20+ years, National Health and Nutrition Examination Survey, 2007–16. Education groups are: less than high school (referent), high school graduate (circles), some college (triangles), and college graduate (squares)

Project aims

1. Identify and document all measures of physical activity and sedentary behaviour available
2. Test whether associations between lifetime socioeconomic position and physical activity vary by:
 - A. age, sex and ethnicity in Understanding Society
 - B. age, sex and birth year in the British birth cohorts

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(1) Physical activity harmonisation across five UK birth cohorts

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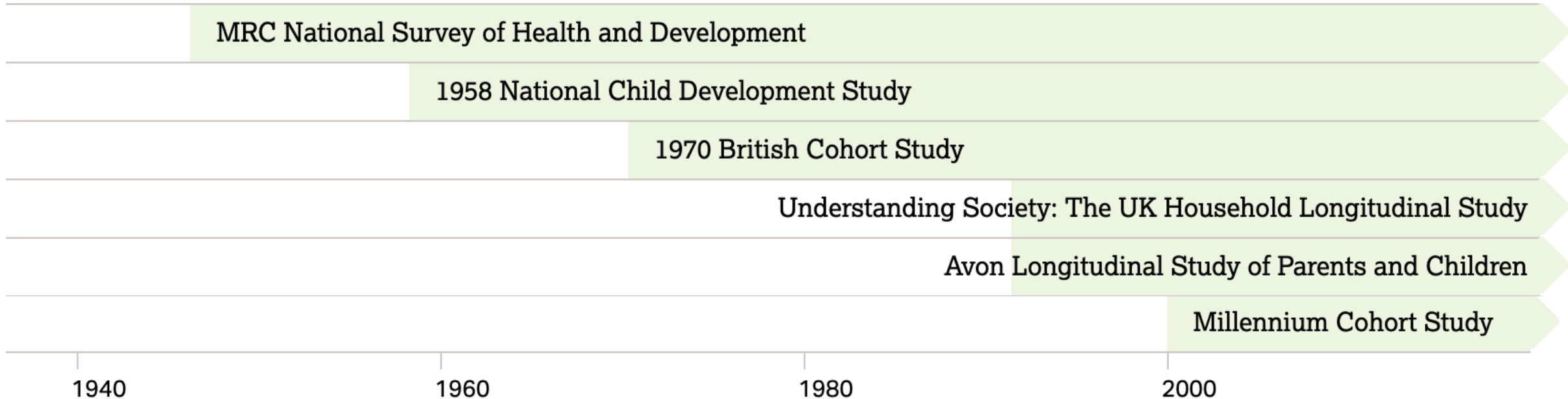
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Included CLOSER cohorts



CLOSER physical activity collection

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?

☐ Yes
☐ No

→ **Skip to PART 2: TRANSPORTATION**

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing up stairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.

_____ days per week

☐ No vigorous job-related physical activity

→ **Skip to question 4**

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?

_____ hours per day
_____ minutes per day

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

_____ days per week

☐ No moderate job-related physical activity

→ **Skip to question 6**

LONG LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised October 2002.

Figure 1. A Principle diary

Diary/ person id	Starting time	Ending time	Main activity	Parallel activity	Who with:				Where/mod e of transport
					Alone	Spouse	Small child	Other pers.	
A	04:00	07:20	Sleep						At home
a	07:20	07:50	Shower						At home
a	7:50	08:30	Had breakfast	Read newspaper			Ch		At home
a	08:30	08:40	Walked to bus		A				By foot
a	08:40	09:00	Bus to job					OP	By bus
a	09:00	11:20	Paid work					OP	At work
a	11:20	11:50	Lunch break: meal	Talked with colleag.				OP	At work
a	11:50	12:00	Lunch break: walk	Talked with colleag.				OP	By foot
a	12:00	12:30	Lunch break: walk		A				By foot
a	12:30	16:30	Paid work					OP	At work
a	16:30	16:50	Bus to home	Read newspaper	A				By bus
a	16:50	17:00	From bus by foot		A				By foot
a	17:00	17:40	Cooked supper	Talked with children			Ch		At home
a	17:40	18:20	Had supper	Talked with family		Sp	Ch		At home
a	18:20	19:10	Dish washing	Listened to radio	A				At home
a	19:10	21:00	TV			Sp	Ch		At home
a	21:00	22:10	Took a walk	Talked with spouse		Sp			By foot
a	22:10	22:20	Shower						At home
a	22:20	04:00	Sleep						At home



Inclusion and exclusion criteria

Have you done anything at work, in the home or during your spare time that made you feel warm in the last 4 weeks? [WRM1] [N82] [H82] [M82] [WRM2] [N82] [H82] [M82] [WRM3] [N82] [H82] [M82]	[Number of times last month] [Average hours] [Average mins]
Have you done anything at work, in the home or during your spare time that made you perspire in the last 4 weeks? [PRS1] [N82] [H82] [M82] [PRS2] [N82] [H82] [M82] [PRS3] [N82] [H82] [M82]	
Have you done anything at work, in the home or during your spare time that made you out of breath in the last 4 weeks? [OOB1] [N82] [H82] [M82] [OOB2] [N82] [H82] [M82] [OOB3] [N82] [H82] [M82]	

Does [^name of older sibling] sometimes go to sports classes or sports clubs that are not connected to their school to do sport, gymnastics, swimming, martial arts, horse riding, chess and so on? [bosdsc00]	Yes No
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How far do you usually walk on an average weekday? [WLKWD89] For how many months in the year do you do this? [WLKW89]	[WLKWD89] No distance/less than 1 mile/1-3 miles/4 or more miles [WLKW89] 3 months or less/4-6 months/more than 6 months
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On a scale of 0 to 10, with 0 being 'doing no sport at all' to 10 being 'very active through sport', where would you rank yourself? [Sportact]	0 = No sport at all, 10 = Very active, all numbers, 0 to 10, to be shown
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Inclusion

- A measure of reported physical activity (frequency, duration, and/or intensity) across any domain (eg, leisure, travel, work, domestic) or where no specific domain was noted
- Prominent measures of sedentary behaviour (e.g., time spent sitting, watching television)
- Data collections available in July 2019 (ie, upcoming sweeps of cohorts were not included)

Exclusion

- Whether physical activity affects activities/ leads to fatigue etc.
- Non-core sweeps of cohort studies
- Other activities which may in fact be classified as sedentary
- Preferences regarding physical activity

High level summary of physical activity measures across five British birth cohort studies

Age range of measure	Physical activity measure					
	Leisure time activity	Active travel	Occupational	Domestic	Physical inactivity	Accelerometry
7	1991, 2001	1991			1991, 2001	2001
11	1958, 1970, 1991, 2001	1991, 2001			1970, 1991, 2001	1991
14/16y	1958, 1970, 1991, 2001	1991, 2001		1970	1970, 1991, 2001	2001
23/26y	1958, 1991	1991			1958, 1991	
33/36	1946, 1958, 1970	1958, 1946	1946, 1958	1946, 1958		
42/46y	1946,1958, 1970	1958	1958	1946, 1958	1958, 1970	1970
50/53	1946, 1958		1958	1946, 1958		
60/64y	1946	1946	1946	1946	1946	1946
69/70y	1946					

1946 NSHD
1958 NCDS
1970 BCS
1991 ALSPAC
2001 MCS

Examining comparability by domain (occupational)

Similar ages of measurement	Overall capturing same construct	Whether (if intensity noted) is equivalent	Whether (if duration noted) is equivalent	Whether (if frequency noted) is equivalent	Same activities included	Timespan of recall is the same	Whether respondent is the same	Other differences in questionnaire wording
Ages 33-36								
NCDS	physical activity in work	intensity (none, a little, some, a lot)	n/a	n/a	n/a	not specified - 'current'	cm	how much physical effort is involved in your job
NSHD	physical activity in work	intensity (a lot, moderate very little, little)	n/a	n/a	n/a	not specified - 'current'	cm	do you find that in physical terms work 'takes it out of you'
NSHD	physical activity in work	n/a	n/a	frequency (all the time/ more than half/ half/ less than half/ none)	walking sitting, standing, heavy objects/ other	not specified - 'current'	cm	how much physical effort is involved in your job
Ages 44-45								
NCDS	physical activity in work	intensity (light, moderate heavy)	duration (hours/week)	n/a	walking sitting, standing, heavy objects/ other	not specified - 'current'	cm	how much physical effort is involved in your job
NCDS	physical activity in work	n/a	n/a	frequency (days/week)	stairs	not specified - 'current'	cm	how much physical effort is involved in your job
Ages 50-55								
NCDS	physical activity in work	n/a	n/a	n/a	walking sitting, standing, heavy objects/ other	not specified - 'current'	cm	how much physical effort is involved in your job
Ages 62-64								
NSHD	physical activity in work	intensity (light, moderate heavy)	duration (hours/week)	frequency occurrences/day)	walking sitting, standing, heavy objects/ other	not specified - 'current'	cm	how much physical effort is involved in your job

Examining comparability by domain (domestic)

Similar ages of measurement	Overall capturing same construct	Whether (if intensity noted) is equivalent	Whether (if duration noted) is equivalent	Whether (if frequency noted) is equivalent	Same activities included	Timespan of recall is the same	Whether respondent is the same	Notes
Childhood measures								
Age 16								
3CS	Housework, DIY or gardening	n/a	n/a	Everyday - never	housework/gardening	n/a	CM	
3CS	Housework, DIY or gardening	Possible - list of activities	n/a	Regularly - never	housework/DIY	n/a	CM	specifies list of activities
Adulthood measures								
Ages 33-36								
NCDS	Housework, DIY or gardening	Yes	n/a	Everyday - less often than 2 per month	unspecified	n/a	CM	every day activities
NSHD	Housework, DIY or gardening	Possible - list of activities	Hours/month	Times per month	DIY	Past 4 weeks	CM	
NSHD	Housework, DIY or gardening	Possible - list of activities	Hours/week; hours/month	Times per week/month	Gardening/DIY	n/a	CM	
Ages 43-46								
NSHD	Housework, DIY or gardening	Yes	Hours/week	More than once per week - less than once a month	housework	n/a	CM	
NSHD	Housework, DIY or gardening	Yes	Hours/week	More than once per week - less than once a month	Gardening	n/a	CM	
NSHD	Housework, DIY or gardening	Yes	Hours/week	More than once per week - less than once a month	DIY	n/a	CM	
NCDS	Housework, DIY or gardening	Possible - list of activities	Hours/day	Everyday - never	Gardening/DIY	n/a	CM	
Ages 50-53								
NCDS	Housework, DIY or gardening	Possible - list of activities	n/a	Once a week - never	Gardening/DIY	n/a	CM	
NSHD	Housework, DIY or gardening	Possible - list of activities	n/a	Several times a day - never	unspecified	n/a	CM	Use your hands in strong movements
Ages 62-64								
NSHD	Housework, DIY or gardening	Possible - list of activities	Hours/day	n/a	Gardening/DIY	Past 12 months	CM	

Examining comparability within cohort (ALSPAC- travel)

Similar ages of measurement	Overall capturing same construct	Whether (if intensity noted) is equivalent	Whether (if duration noted) is equivalent	Whether (if frequency noted) is equivalent	Same activities included	Timespan of recall is the same	Whether respondent is the same
Childhood measures							
Ages 4-5							
ALSPAC	travel to school	distance (km)	n/a	n/a	cycling & walking	not specified - 'current'	parent
Ages 6-8							
ALSPAC	travel to school	distance (km)	duration (min)	n/a	cycling & walking	not specified - 'current'	parent
Age 11-13							
ALSPAC	travel to school	n/a	duration (min)	n/a	cycling & walking	not specified - 'current'	parent
ALSPAC	general travel	n/a	duration (min)	n/a	cycling & walking	not specified - 'current'	parent
Age 14-16							
ALSPAC	travel to school/college	n/a	duration (min- groups 5-4 min)	n/a	cycling & walking	today/ last time journey was made	cm
Adulthood measures							
Age 22							
ALSPAC	general travel	walking pace (slow, average, brisk, fast)	duration (h/wk)	n/a	cycling & walking	daily	cm

Conclusions and outputs

The cohorts contained a wide range of detailed physical activity variables across descriptions of physical activity across each cohort including:

- Inclusion/exclusion criteria was created to address ambiguous variables.
 - Descriptions of physical activity and domains
 - Cohort descriptions with information on sample sizes, sweeps, and data access policies
 - Variables differed in reporting intensity, duration, and frequency, and often differed in response scale.
 - Cross cohort physical activity data by Harmonisation on a large scale may only be possible at the domain level (e.g. binary engagement in activity).
 - Detailed information on origin of variables (cohort, sweep, collection method, respondent, and variable code)
- We have focused on creating a descriptive report of the available data across and within each cohort.



CLOSER work package 15:

Descriptive guide to physical activity measures across five cohorts

Prepared by: Meg Fluharty, Aase Villadsen, Aaron Kandola, and David Bann

[September 2019]

2. Introduction 2.1. Brief overview of Cohort and Longitudinal Studies Enhancement Resources (CLOSER)

Cohort and Longitudinal Studies Enhancement Resources (CLOSER) is a project funded by the Economic and Social Research Council (ESRC) and the Medical Research Council (MRC) that aims to maximise the use, value and impact of longitudinal studies in the UK. CLOSER brings together eight leading studies, the British Library and the UK Data Service, to stimulate interdisciplinary longitudinal research, develop shared resources, provide training and share expertise.

The CLOSER partnership includes the following eight cohorts and longitudinal studies:

- Avon Longitudinal Study of Parents and Children (ALSPAC): Children of the 90s
- The UK Household Longitudinal Study (UKHLS): Understanding Society
- Southampton Women's Survey (SWS)
- 1958 National Child Development Study (NCDS)
- MRC National Survey of Health and Development (NSHD)
- Hertfordshire Cohort Study (HCS)
- 1970 British Cohort Study (BCS)
- Millennium Cohort Study (MCS): Child of the New Century

CLOSER is working to bring longitudinal data together in a consistent format- known as [data harmonisation](#). This process allows researchers to compare data from different studies, revealing how and why the country is changing over time. Additionally, CLOSER are leading research to [link data](#) held by government to survey data collected by longitudinal studies. Linking this data enables researchers to gain rich insights into how different aspects of people's lives interrelate. [CLOSER Discovery](#) enables researchers to search and browse questionnaires and data from the UK's leading longitudinal studies to find out what data are available. CLOSER provides training and capacity building opportunities for experienced researchers and those running longitudinal studies. [The Learning Hub](#) has information and resources aimed at those in academia, government and the third sector who are new to longitudinal studies, to help them better understand the value of the studies and how to use the data. Furthermore, CLOSER [fund research projects](#) that use longitudinal data to investigate a wide range of areas of interest, including obesity, physical activity, mental health, and ageing. Finally, CLOSER is working to achieve the greatest possible [impact](#) for outputs and activities by influencing government, producing longitudinal resources for the academic community and funding research that addresses the biomedical, social, economic and environmental challenges facing the UK.

2.2. Physical activity 2.2.1. General definitions and overview

Physical activity refers to any bodily movement produced by skeletal muscles that results in energy expenditure (Caspersen, 1985). While physical activity can be broadly conceptualised in terms of

Sweep	Year	Age of CM	Life stage	Subject	Informant	Administrator	Method	Questionnaire	PA domain	Sub domain	Questions	Response scale	PA frequency	PA duration	PA intensity
NCDS S2	1969	11	Childhood	CM	Parent	Interview	Questionnaire	Parental Interview Form	LEISURE	SPORTS/EXERCISE	Frequency of using the following in the last 12 months: A park, public garden, heath, common, or fields where children are allowed to play [N1139] A recreation or other outdoor play centre (other than school) [N1140] Swimming or paddling places which are safe for children [N1141]	Not available, never goes though available, goes sometimes, goes often			
NCDS S2	1969	11	Childhood	CM	CM	Self-completed	Questionnaire	Test Booklet	LEISURE	SPORTS/EXERCISE	Playing outdoor games or taking part in sports outside school hours [N941]	Often (nearly every day), sometimes, never or hardly			
NCDS S2	1969	11	Childhood	CM	CM	Self-completed	Questionnaire	Test Booklet	INACTIVITY	TV	Watching television after school hour [N949]	Often (nearly every day), sometimes, never or hardly			
NCDS S3	1974	16	Childhood	CM	CM	Self-completed		Individual questionnaire	LEISURE	SPORTS/EXERCISE	Frequency of the following in spare time: Plays outdoor games & sport [N2866] Plays indoor games & sport [N2867] Swimming [N2866]	Often, sometimes, never or hardly ever, would like to do but do not have the chance.			
NCDS S3	1974	16	Childhood	CM	CM	Self-completed	Questionnaire	Individual questionnaire	INACTIVITY	TV	Frequency of the following in spare time: Watching television [N2868]	Often, sometimes, never or hardly ever, would like to do but do not have the chance.			
NCDS S4	1981	23	Adulthood	CM	CM	Interview	Questionnaire	CM interview	LEISURE	SPORTS/EXERCISE	How often have you done these in the last 4 weeks? Played sport of any kind ("including keep fit, yoga and similar exercise") [N5916]	5 times a week, 3-4 times a week, 1-2 times a week, 2-3 times in the last 4 weeks, once in the last 4 weeks, not done in			
NCDS S4	1981	23	Adulthood	CM	CM	Interview	Questionnaire	CM interview	INACTIVITY	TV	How often have you done these in the last 4 weeks? Watching television [N5913]	5 times a week, 3-4 times a week, 1-2 times a week, 2-3 times in the last 4 weeks, once in the last 4 weeks, not done in			
NCDS S5	1991	33	Adulthood	CM	CM	Interview	Questionnaire	Cohort member interview	WORK	WORK	How much physical effort is involved in your job? [N504361]	None, a little, some, a lot			
NCDS S5	1991	33	Adulthood	CM	CM	Interview	Questionnaire	Cohort member interview	LEISURE	SPORTS/EXERCISE	Do you regularly take part in exercise/sport activities [listed on show cards] (regularly means at least one a month for most of the year)? [N504362] How often do you take part in these exercise/sports activities? [N504363]	[N504362] Yes/No [N504363] None, everyday or most days, 4-5 days a week 2-3 days a week, once a week, 2-3 times a month, less often			
NCDS S5	1991	33	Adulthood	CM	CM	Interview	Questionnaire	Cohort member interview	HOUSEWORK	HOUSEWORK	Do you ever exert yourself enough doing everyday activities (i.e. housework, childcare, gardening, DIY, or just walking around) enough to get out of breath? [N504364] How often do you get out of breath doing these everyday activities? [N504366]	[N504364] yes/no [N504366] Every day or most days/4-5 days a week/2-3 days a week/Once a week/2-3 times a month/Less often			
NCDS S6	2000	42	Adulthood	CM	CM	Computer assisted personal interview (CAPI)	Questionnaire	CM interview	LEISURE	SPORTS/EXERCISE	Do you regularly take part in exercise/sport activities [listed on show cards] (regularly means at least one a month for most of the year)? [exercise] How often do you take part in these exercise/sports activities? [breathless] When you take part in these exercise/sports activities, do you get out of breath or sweaty [sweat]	[exercise] Yes/no [breathless] Everyday, 4-5 days a week 2-3 days a week, once a week, 2-3 times a month, less often [sweat] Most times, sometimes, rarely, never			
Biomechanical	2002	44/45	Adulthood	CM	CM	Self-completed	Questionnaire	Self-completion booklet 2	LEISURE	SPORTS/EXERCISE	Frequency and duration of participation in the following activities during leisure time: leisurely swimming [swimslo] [swimsloh] [swimslom]; competitive swimming [swimlap] [swimlapm] [swimlapm]; walking for pleasure ("not as a means of transport") [easywlk] [easywlkh] [easywlkm]; backpacking, hill walking, or mountain climbing [hillwlk] [hillwlkh] [hillwlkm]; cycling for pleasure ("not as a form of transport") [bikeslo] [bikesloh] [bikeslom]; racing or rough terrain cycling [bikehd] [bikehdh] [bikehdm]; high impact aerobics, step aerobics [aerobhi] [aerobhih] [aerobhim]; other aerobics [aeroblo] [aerobloh] [aeroblom]; exercises with weights [gymwt] [gymwth] [gymwtm]; conditioning exercises ("eg, using an exercise bike or rowing machine") [gymov] [gymovh] [gymovm]; floor exercises ("eg, stretching, bending, keep fit") [gymflr] [gymflrh] [gymflrm]; dancing ("eg ballroom, disco") [dance] [danceh] [dancem]; competitive running [running] [runningh] [runningm]; jogging [jogging] [joggingh] [joggingm]; bowling [bowling] [bowlingh] [bowlingm]; tennis or badminton [tennis] [tennish] [tennis]; squash [squash] [squashh] [squashm]; table tennis [tabten] [tabtenh] [tabtenm]; golf [golf] [golfh] [golfm]; football, rugby or hockey [footie] [footieh] [footiem]; cricket [cricket] [cricketh] [cricketm]; rowing [rowing] [rowingh] [rowingm]; netball, volleyball, basketball [netball] [netballh] [netballm]; fishing [fishing] [fishingh] [fishingm]; horse riding [hriding] [hridingh] [hridingm]; snooker, billiards, darts [snooker] [snookerh] [snookerm]; musical instrument playing [music] [musich] [musicm]; ice skating [skating] [skatingh] [skatingm]; sailing, windsurfing, boating [sailing] [sailingh] [sailingm]; winter sports ("eg, skiing") [skiing] [skiingh] [skiingm]; martial arts [boxing] [boxingh] [boxingm]; wrestling [wrestling] [wrestlingh] [wrestlingm]; other	Not done, <once a month, once a month; 2-3 times a month, once a week, 2-3 times a week, 4-5 times a week, every day; [vars ending on h] average hours per episode [vars ending on m] average min per episode			

Sweep	Year	Age of CM	Life stage	Subject	Informant	Administrator	Method	Questionnaire	PA domain	Sub domain	Questions	Response scale	PA frequency	PA duration	PA intensity
NCDS S2	1969	11	Childhood	CM	Parent	Interview	Questionnaire	Parental Interview Form	LEISURE	SPORTS/EXERCISE	Frequency of using the following in the last 12 months: A park, public garden, heath, common, or fields where children are allowed to play [N1139] A recreation or other outdoor play centre (other than school) [N1140] Swimming or paddling places which are safe for children [N1141]	Not available, never goes though available, goes sometimes, goes often			
NCDS S2	1969	11	Childhood	CM	CM	Self-completed	Questionnaire	Test Booklet	LEISURE	SPORTS/EXERCISE	Playing outdoor games or taking part in sports outside school hours [N941]	Often (nearly every day), sometimes, never or hardly			
NCDS S2	1969	11	Childhood	CM	CM	Self-completed	Questionnaire	Test Booklet	INACTIVITY	TV	Watching television after school hour [N949]	Often (nearly every day), sometimes, never or hardly			
NCDS S3	1974	16	Childhood	CM	CM	Self-completed		Individual questionnaire	LEISURE	SPORTS/EXERCISE	Frequency of the following in spare time: Plays outdoor games & sport [N2866] Plays indoor games & sport [N2867] Swimming [N2866]	Often, sometimes, never or hardly ever, would like to do but do not have the chance.			
NCDS S3	1974	16	Childhood	CM	CM	Self-completed	Questionnaire	Individual questionnaire	INACTIVITY	TV	Frequency of the following in spare time: Watching television [N2868]	Often, sometimes, never or hardly ever, would like to do but do not have the chance.			
NCDS S4	1981	23	Adulthood	CM	CM	Interview	Questionnaire	CM interview	LEISURE	SPORTS/EXERCISE	How often have you done these in the last 4 weeks? Played sport of any kind ("including keep fit, yoga and similar exercise") [N5916]	5 times a week, 3-4 times a week, 1-2 times a week, 2-3 times in the last 4 weeks, once in the last 4 weeks, not done in			
NCDS S4	1981	23	Adulthood	CM	CM	Interview	Questionnaire	CM interview	INACTIVITY	TV	How often have you done these in the last 4 weeks? Watching television [N5913]	5 times a week, 3-4 times a week, 1-2 times a week, 2-3 times in the last 4 weeks, once in the last 4 weeks, not done in			
NCDS S5	1991	33	Adulthood	CM	CM	Interview	Questionnaire	Cohort member interview	WORK	WORK	How much physical effort is involved in your job? [N504361]	None, a little, some, a lot			
NCDS S5	1991	33	Adulthood	CM	CM	Interview	Questionnaire	Cohort member interview	LEISURE	SPORTS/EXERCISE	Do you regularly take part in exercise/sport activities [listed on show cards] (regularly means at least one a month for most of the year)? [N504362] How often do you take part in these exercise/sports activities? [N504363]	[N504362] Yes/No [N504363] None, everyday or most days, 4-5 days a week 2-3 days a week, once a week, 2-3 times a month, less often			
NCDS S5	1991	33	Adulthood	CM	CM	Interview	Questionnaire	Cohort member interview	HOUSEWORK	HOUSEWORK	Do you ever exert yourself enough doing everyday activities (i.e. housework, childcare, gardening, DIY, or just walking around) enough to get out of breath? [N504364] How often do you get out of breath doing these everyday activities? [N504366]	[N504364] yes/no [N504366] Every day or most days/4-5 days a week/2-3 days a week/Once a week/2-3 times a month/Less often			
NCDS S6	2000	42	Adulthood	CM	CM	Computer assisted personal interview (CAPI)	Questionnaire	CM interview	LEISURE	SPORTS/EXERCISE	Do you regularly take part in exercise/sport activities [listed on show cards] (regularly means at least one a month for most of the year)? [exercise] How often do you take part in these exercise/sports activities? [breathless] When you take part in these exercise/sports activities, do you get out of breath or sweaty [sweat]	[exercise] Yes/no [breathless] Everyday, 4-5 days a week 2-3 days a week, once a week, 2-3 times a month, less often [sweat] Most times, sometimes, rarely, never			
Biomechanical	2002	44/45	Adulthood	CM	CM	Self-completed	Questionnaire	Self-completion booklet 2	LEISURE	SPORTS/EXERCISE	Frequency and duration of participation in the following activities during leisure time: leisurely swimming [swimslo] [swimsloh] [swimslom]; competitive swimming [swimlap] [swimlaph] [swimlapm]; walking for pleasure ("not as a means of transport") [easywlk] [easywlkh] [easywlkm]; backpacking, hill walking, or mountain climbing [hillwlk] [hillwlkh] [hillwlkm]; cycling for pleasure ("not as a form of transport") [bikeslo] [bikesloh] [bikeslom]; racing or rough terrain cycling [bikehd] [bikehdh] [bikehdm]; high impact aerobics, step aerobics [aerobhi] [aerobhih] [aerobhim]; other aerobics [aeroblo] [aerobloh] [aeroblom]; exercises with weights [gymwt] [gymwth] [gymwtm]; conditioning exercises ("eg, using an exercise bike or rowing machine") [gymov] [gymovh] [gymovm]; floor exercises ("eg, stretching, bending, keep fit") [gymflr] [gymflrh] [gymflrm]; dancing ("eg ballroom, disco") [dance] [danceh] [dancem]; competitive running [running] [runningh] [runningm]; jogging [jogging] [joggingh] [joggingm]; bowling [bowling] [bowlingh] [bowlingm]; tennis or badminton [tennis] [tennish] [tennis]; squash [squash] [squashh] [squashm]; table tennis [tabten] [tabtenh] [tabtenm]; golf [golf] [golfh] [golfm]; football, rugby or hockey [footie] [footieh] [footiem]; cricket [cricket] [cricketh] [cricketm]; rowing [rowing] [rowingh] [rowingm]; netball, volleyball, basketball [netball] [netballh] [netballm]; fishing [fishing] [fishingh] [fishingm]; horse riding [hriding] [hridingh] [hridingm]; snooker, billiards, darts [snooker] [snookerh] [snooker]; musical instrument playing [music] [musich] [musicm]; ice skating [skating] [skatingh] [skatingm]; sailing, windsurfing, boating [sailing] [sailingh] [sailingm]; winter sports ("eg, skiing") [skiing] [skiingh] [skiingm]; martial arts [boxing] [boxingh] [boxingm]; wrestling [wrestling] [wrestlingh] [wrestlingm]; other	Not done, <once a month, once a month; 2-3 times a month, once a week, 2-3 times a week, 4-5 times a week, every day; [vars ending on h] average hours per episode [vars ending on m] average min per episode			

(2) Socioeconomic differentials in physical activity across ethnicity, age, and sex in Understanding Society

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Michaela Benzeval, Institute for Social and Economic Research, University of Essex

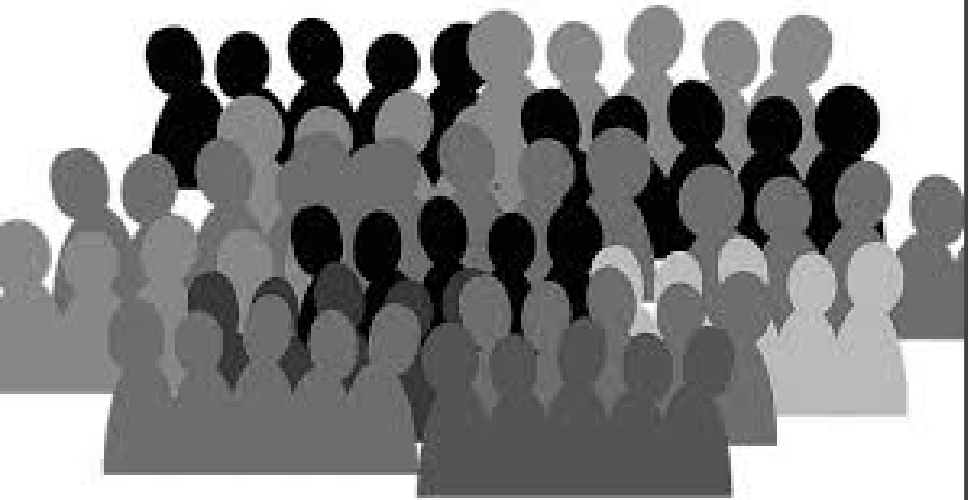
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Rachel Cooper, Department of Sport and Exercise Sciences, Manchester Metropolitan University

David Bann, Centre for Longitudinal studies, UCL



Participants

- Understanding Society: the UK Household Longitudinal Study (UKHLS) is a nationally representative study which started in 2009 aiming to recruit individuals in 40,000 households
- The sample for our analysis includes adult (20 years or over) responders who took part in Wave 5 (2013-2015) and responded to demographic and physical activity questions via interviewer led and self-completed questionnaire.

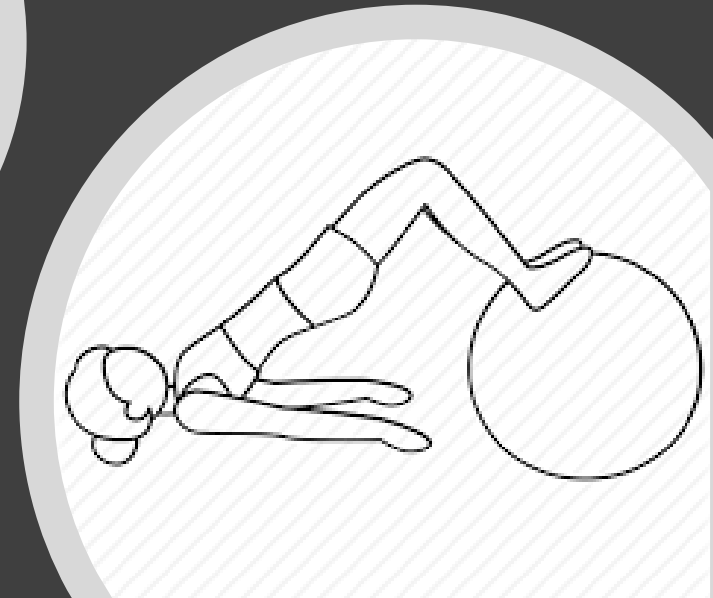
Exposure and outcome variables

Domain specific physical activity

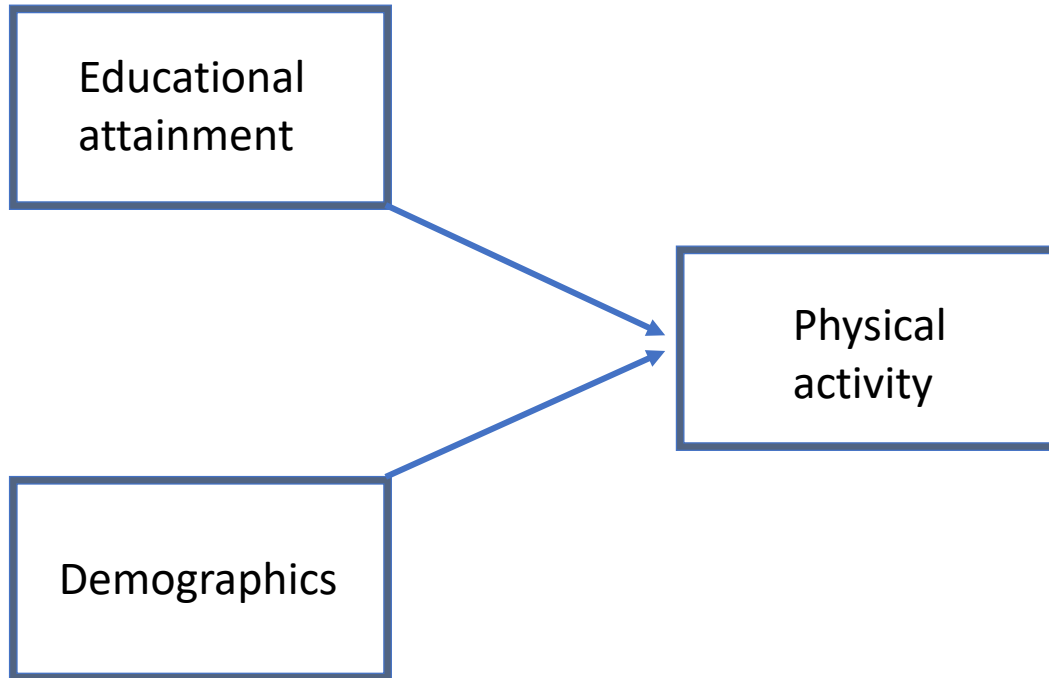
- Active travel
- Occupational physical activity
- Light and moderate-to-vigorous leisure time

Socio demographics

- Highest educational attainment
- Ethnicity
- Sex
- Age group

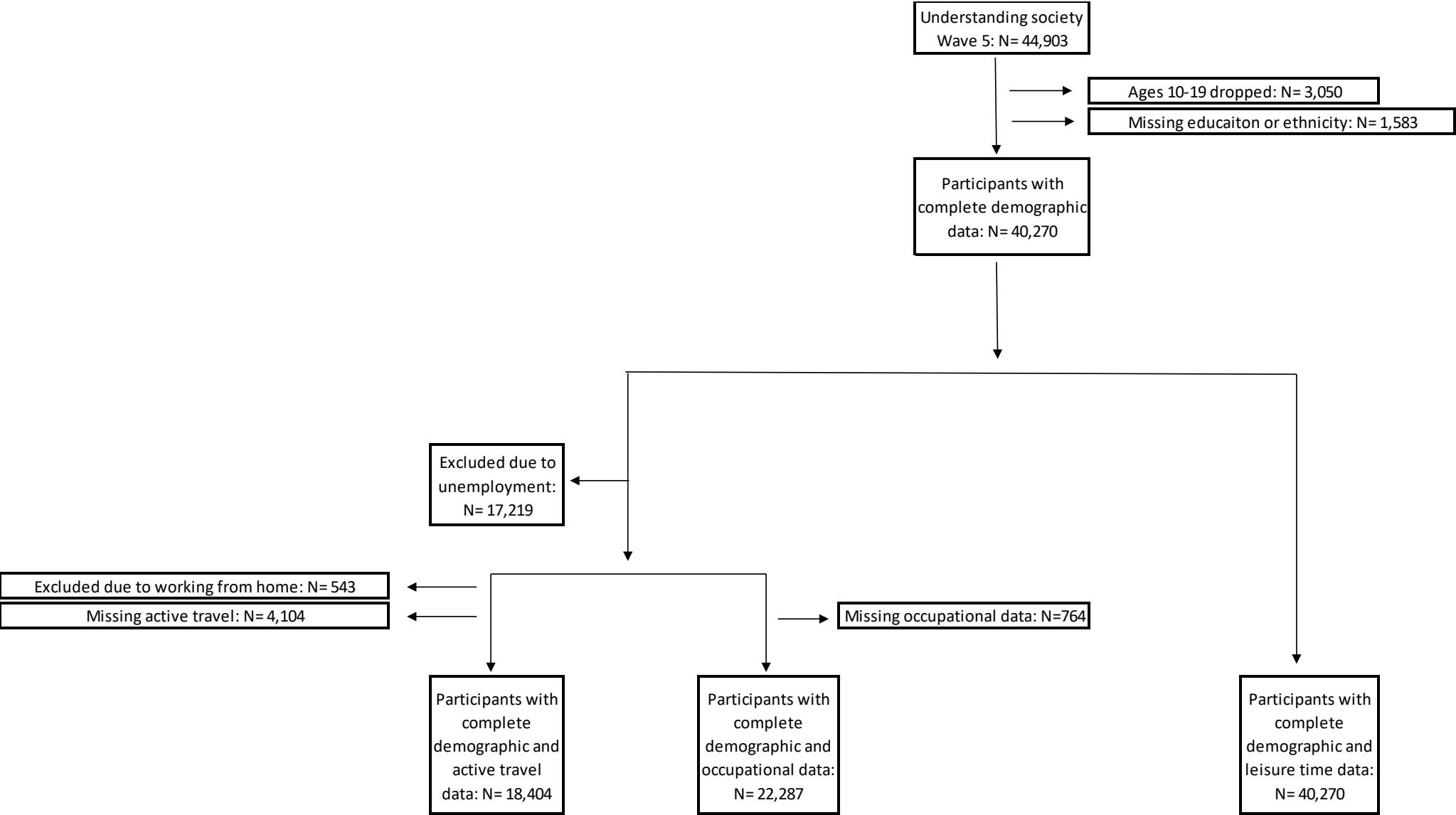


Statistical analyses

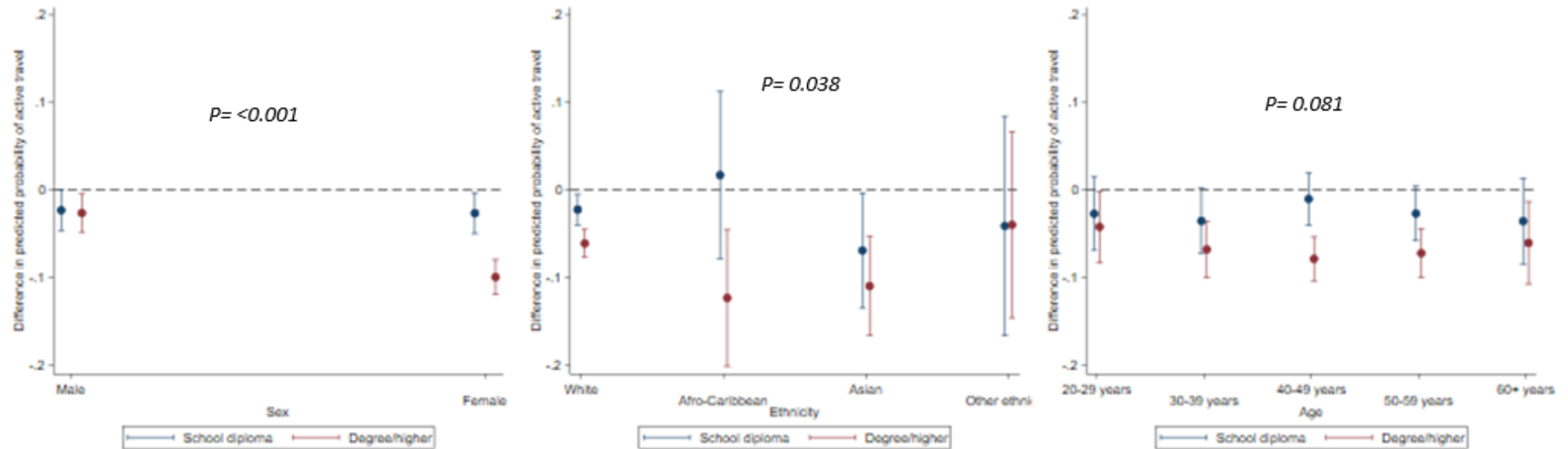


- Logistic regression models were conducted to examine independent and effect modification association of sociodemographics with physical activity in each domain
- Analyses were assessed before and after mutual adjustment for each demographic variable and weighted according to design and attrition.
- Those with missing demographic and education data yet valid outcome data were excluded from analysis.

Flow diagram of analysis in Understanding Society

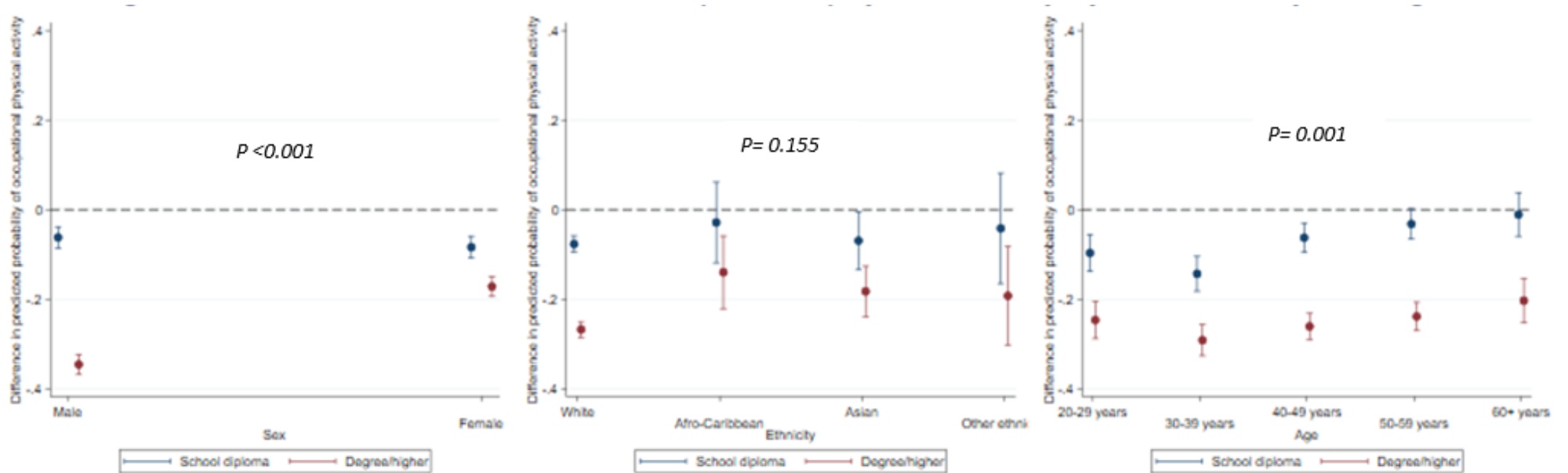


Educational differences in active travel by sex, ethnicity, and age



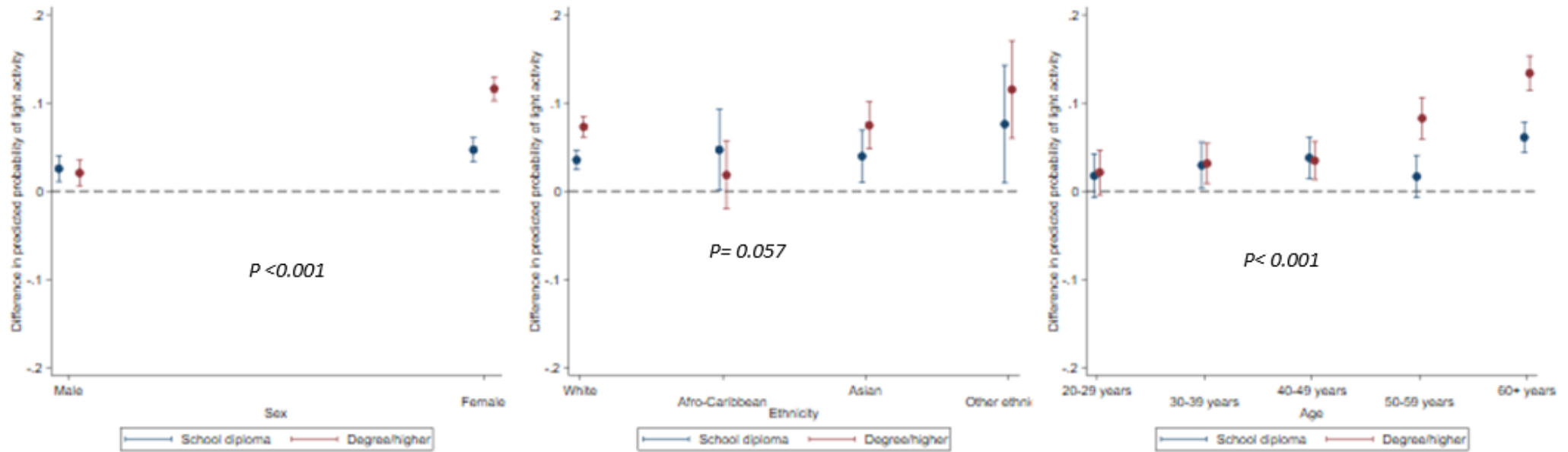
- Highest active travel: highly educated, male, older ages.
- Education disparity: largest amongst females and Black individuals

Educational differences in occupation by sex, ethnicity, and age



- Highest occupational PA: highly educated, white, male, younger age.
- Education disparity: largest amongst men and those aged 30-39

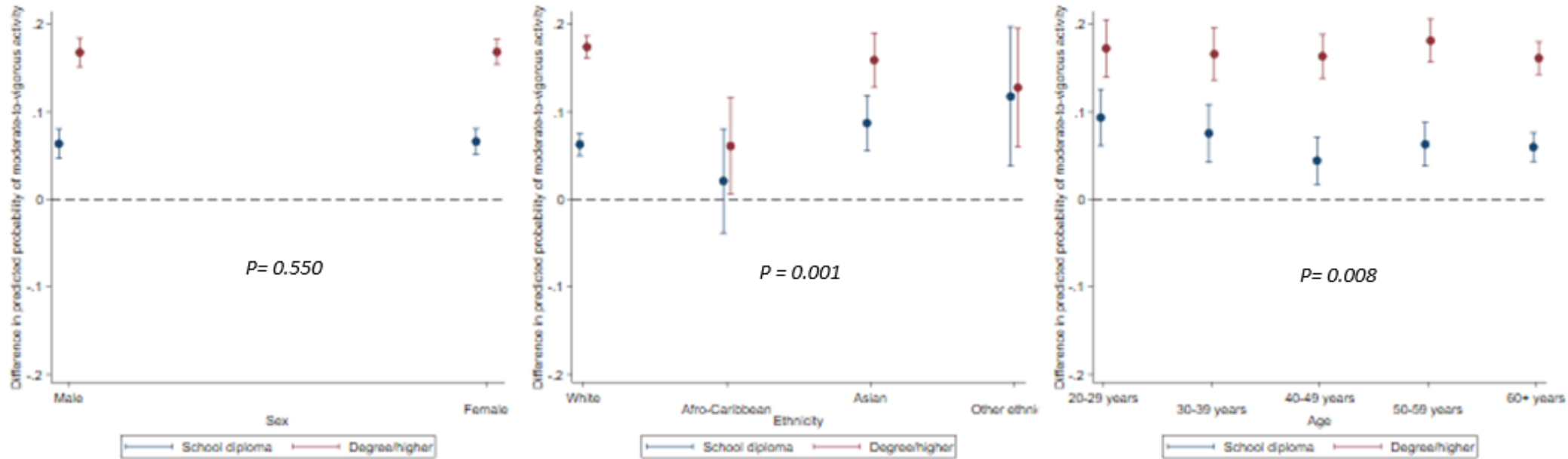
Educational differences in light leisure time activity by sex, ethnicity, and age



Highest light LTPA: highly educated, white, female, and older ages

Education disparity: largest amongst female and older adults

Educational differences in moderate-to-vigorous leisure time activity by sex, ethnicity, and age

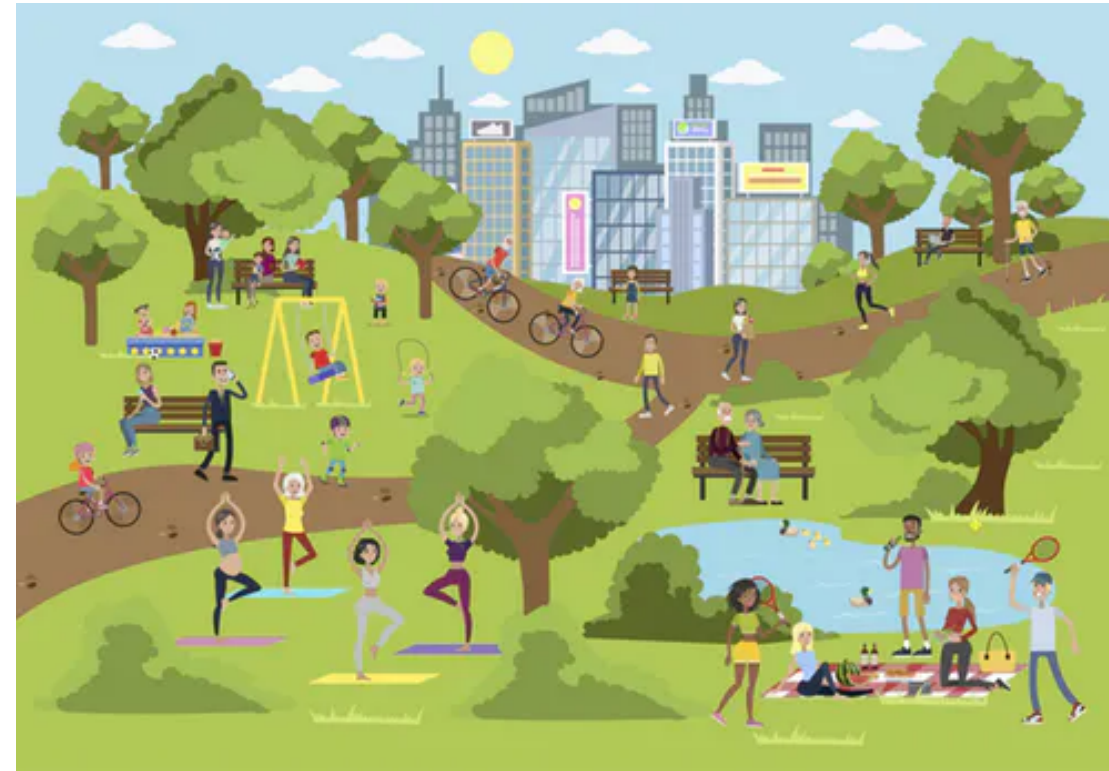


Highest moderate-to-vigorous LTPA: highly educated, white, male, younger age.

Education disparity: largest amongst White and Asians, and aged 40-59y

Discussion

- Individuals with higher education were less likely to engage in active travel and occupational physical activity, but were more likely to engage in LTPA.
 - However, these education disparities were substantially modified by ethnicity, age, and sex.
 - We were unable to distinguish age from cohort, hence need for future cross-cohort research
- Previous evidence suggest a number of possible disparities such as health status, environment, cultural preferences, financial resources, perceived safety, and domestic requirement may exist within each sociodemographic group or given a level of educational attainment.



Strengths and Limitations

Strengths

- Large nationally representative sample
- Examined previously seldom-examined role of ethnicity as a modifier in PA- education relationship
- Examined activity outcomes across three activity domains



Limitations

- Lacked information on activity duration
- Did not capture housework/domestic domain
- Measures were captured via self-report
- Some domains restricted by question routing
- Due to the cross-sectional design we cannot infer causality



Conclusions

In summary, we found sex, age, and ethnicity modified associations between educational attainment and multiple physical activity outcomes.

Our findings imply there may be unequal access or additional barriers to physical activity across both education and demographic sub-groups.

Better understanding the characteristics of physically inactive sub-groups may aid development of tailored interventions to increase activity levels and reduce health inequalities.



Thanks and acknowledgements



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CLOSER consortium

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- **Lucy Griffiths**, Health Data Research UK, Wales and Northern Ireland, Swansea University Medical School
- **Rachel Cooper**, Department of Sport and Exercise Sciences, Manchester Metropolitan University
- **Aaron Kandola**, Division of Psychiatry, UCL
- **Aase Villadsen**, Centre for Longitudinal studies, UCL

Cohorts involved:

- 1946 National study of health and development
- 1958 National child development study
- 1970 British cohort study
- Avon Longitudinal Study of Parents and Children
- Millennium Cohort Study
- Understanding Society

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