



Use of new guidance to profile ‘equivalent minutes’ of aerobic physical activity for adults in England reveals gender, geographical, and socio-economic inequalities in meeting public health guidance: A cross-sectional study

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ABSTRACT

English physical activity guidance now recognises a double weighting of vigorous over moderate activity; 1 min of vigorous activity is the same as two ‘equivalent’ minutes of moderate activity. In addition, concerns of over-estimation of occupational PA led to newly applied measurement methods for this domain. Vigorous activity is associated with higher socio-economic position and occupational PA has the opposite association, so these changes may increase inequalities. We profiled adults’ total and domain-specific ‘equivalent minutes’ of weekly PA in England 2012, and investigated inequalities in PA participation, accounting for the new weighting of vigorous PA, and new measurements of occupational PA.

Nationally representative cross-sectional survey data on the self-reported PA of 8158 adults was used to produce a profile of the domain and duration of weekly ‘equivalent minutes’ of PA. Vigorous PA was double-weighted compared to moderate PA, and the percentage contribution from each PA domain quantified, stratified by gender and activity status and split by socio-demographic variables.

Women, older adults, and adults without qualifications, from deprived areas, with worse employment conditions, or living in the North of England were significantly less likely to meet MVPA guidance. Type of activity was also socially patterned, particularly sport participation, which contributed a higher percentage of PA in adults of higher socioeconomic status. For active men, sporting activity was the most prevalent domain, and sports and walking for active women.

In England, there are important socio-demographic differences in how adults participate in PA, and in percentage meeting public health guidance.

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1. Introduction

Physical activity (PA) has been described as ‘the best buy in public health’ because of its beneficial effects on cardiovascular disease prevention and cost-effectiveness of related interventions (Morris, 1994), and multiple other important facets of health are substantially improved by regular PA (Helmrich et al., 1991; Myers et al., 2004; Wolff et al., 1999). Systematic reviews have identified 150 min a week of moderate intensity activity, in bouts of at least 10 min, is associated with substantial health benefits (O’Donovan et al., 2010; Warburton et al., 2010; Shiroma and Lee, 2010). Importantly, vigorous activity accrued through sports and exercise is given greater weight than moderate activity, such that 75 min of vigorous activity is equal to 150 min of

moderate activity; 2 min of ‘equivalent physical activity’ are gained for the price of one (O’Donovan et al., 2010; Warburton et al., 2010; Shiroma and Lee, 2010). Recent English Chief Medical Officer (CMO) guidance recommends adults participate in 150 min of moderate aerobic PA or 75 min of aerobic vigorous PA per week (Chief Medical Officers, 2011). Positive associations exist between vigorous PA and higher socio-economic status (defined by occupation or educational attainment) (Beenackers et al., 2012), whilst occupational PA contributes a larger proportion for lower status groups (Allender et al., 2008), making it potentially easier for higher status groups to accumulate more equivalent minutes of moderate and vigorous physical activity (MVPA) than other groups. In addition, new methods for measuring occupational PA have been employed after suggestions that it was previously inaccurately estimated (Scholes and Mindell, 2013). The effect of these changes on population-level PA, as well as on potential inequalities in PA, has not been quantified.

Representative population health surveys of health behaviours can be used to produce profiles of the amount and context (referred to as ‘domains’) of MVPA in which different groups participate. The Health

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Survey for England (HSE) is an annual, nationally-representative cross-sectional survey (Bridges et al., 2013). Using the HSE 2012, this study aimed to produce an updated profile of total and domain-specific population-MVPA, and to quantify inequalities in total and domain-specific MVPA between adults in England, taking into account the importance of vigorous activity for health.

2. Material and methods

2.1. Data source

Data were taken from the HSE 2012. All HSE survey samples include only those living in private households in England. The 2012 survey employed a multi-stage stratified probability sampling design. The sampling frame was the small user Postcode Address File (PAF) (Bridges et al., 2013). The survey was conducted throughout 2012, which avoids biasing responses due to seasonal differences (Bridges et al., 2013).

2.2. Questionnaire

The Physical Activity and Sedentary Behaviour Assessment Questionnaire (PASBAQ) was used within the HSE 2012 to ask respondents to recall daily physical activity over the past 4 weeks. The duration in minutes, frequency, and an estimate of intensity (moderate or vigorous) of episodes of PA is recorded for each PA domain of sports and exercise, walking, and housework and 'Do-it-Yourself' (DIY), but a different method was used for occupational activity (see below). When occurring in bouts of greater than 10 min duration, episodes of MVPA are summed, firstly for each domain and then for domains combined to derive a measure of total MVPA. This is then divided by 4 to provide an estimate of average weekly minutes of MVPA for each respondent. For occupational activity, the frequency (days per week) and duration with which respondents performed specific physical activities at work (stair- or ladder-climbing, and lifting, moving or carrying heavy loads) over the previous 4 weeks was recorded and divided by 4 to give a weekly average duration, which was then summed with MVPA estimates for other domains. The questionnaire has demonstrated moderate-weak convergent validity in comparison to accelerometry (Scholes et al., 2014), and strong test-retest reliability (The Health Survey for England Physical Activity Validation Study: Substantive Report, 2007) (see Section 4.2 of discussion for more detail).

The classification of activity intensity contributed by different domains is discussed in detail elsewhere (Scholes and Mindell, 2013), but PA accumulated by housework or DIY would only be counted as being of at most moderate intensity dependent upon classification of the particular domestic activity by the primary survey authors as being 'heavy' in nature (see the accompanying supplementary material for examples). Work-based occupational activities were assumed to be of moderate intensity for certain occupations only, as defined by the primary survey authors (see supplementary material for the list of occupations). Sports and exercise were classified as vigorous intensity using metabolic equivalent

(MET) levels for that activity, or if the subject 'felt warm, out of breath or sweaty' with the effort, otherwise, all sports and exercise were recorded as being of moderate intensity (see Supplementary material for MET classifications) (Scholes and Mindell, 2013). Walking was of moderate intensity if participants reported a brisk or fast pace, or if aged over 65 years, it made them 'breathe fast, feel warmer, or sweat' with the effort even if not at brisk or fast pace.

2.3. Socio-economic classification

Respondents' data were used to classify their socio-economic position (SEP) (defined as 'the socially derived economic factors that influence what positions individuals or groups hold within the multiple-stratified structure of a society' (Galobardes et al., 2007)) using the following: age and gender, index of multiple deprivation (IMD), highest attained educational qualification, and National Statistics Socio-economic Classification (NS-SEC). Ethnicity was not included as a marker of SEP as the sample sizes from the HSE 2012 were too small for robust associations to be made. Equivalised household income was not used due to the high number of respondents without this information recorded ($n = 1620$). The IMD is a household-level index derived by weighted scores in 7 domains according to the respondents' postcode: income deprivation; crime; employment deprivation; barriers in access to housing and services; health deprivation and disability; the local environment; education, skills and training (Bridges et al., 2013). NS-SEC nominally classifies the employment relations and conditions of respondents' occupations i.e. labour market factors and work situation factors of the respondent's occupation (The National Statistics Socio-economic Classification (NS-SEC rebased on the SOC2010), 2014). The collapsed format NS-SEC5, where respondents are classified into 5 response variables instead of 8, was used for this study. Full-time students, those who are long-term unemployed and those whose occupations are not adequately described are not included in this classification. Highest attained educational qualification is categorised ordinally from 'degree or equivalent' to 'no qualification', current full-time students being classified by their previous highest qualification (Bridges et al., 2013). Geographic region in which the respondents' address is located was recorded according to former Government Office region (Bridges et al., 2013) for analysis. Respondents who were not adequately classified by a SEP variable were excluded from that stratum of analysis.

2.4. Classification by activity level

Due to the skewed nature of population-level PA data, respondents were categorised by activity status for analysis: completely inactive (0 min MVPA per week), inactive (greater than 0 but less than 150 min MVPA per week), and active (greater than 150 min MVPA per week).

Table 1
Characteristics of the adult survey respondents to the Health Survey for England 2012.

Characteristic	All valid adult responses, $n = 8158$ (95% CI)	Adults excluded from any analysis by PA, $n = 118$ (95% CI)	Adults excluded from stratification by unclassified education variable, $n = 145$ (95% CI)	Adults excluded from stratification by unclassified NS-SEC5 variable, $n = 503$ (95% CI)
Mean age (yrs)	47 (46–47)	48 (45–51)	67 (64–70)	28 (27–30)
% Female	51 (50–52)	51 (42–60)	81 (74–88)	54 (49–59)
% With degree level education	26 (24–27)	18 (11–25)	n/a	11 (8–15)
% Least deprived IMD quintile	21 (18–23)	21 (12–30)	27 (19–35)	13 (8–18)
% Professional/Managerial occupation	32 (31–34)	28 (20–36)	13 (7–18)	n/a
% Southern region ^a	42 (40–43)	38 (26–51)	33 (25–41)	47 (40–54)
% reporting > 150 weekly min MVPA	61 (60–62)	n/a	40 (32–49)	55 (49–60)

IMD – Index of Multiple Deprivation; NS-SEC5 – National Statistics Socioeconomic Classification 5 tier; MVPA – moderate and vigorous physical activity.

^a South includes London, South East, South Central and South West.

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