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The socioeconomic gradient in physical inactivity: Evidence from one million adults in England

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ABSTRACT

Understanding the socioeconomic gradient in physical inactivity is essential for effective health promotion. This paper exploits data on over one million individuals (1,002,216 people aged 16 and over) in England drawn from the Active People Survey (2004–11). We identify the separate associations between a variety of measures of physical inactivity with education and household income. We find high levels of physical inactivity. Further, both education and household income are strongly associated with inactivity even when controlling for local area deprivation, the availability of physical recreation and sporting facilities, the local weather and regional geography. Moreover, the gap in inactivity between those living in high and low income households is already evident in early adult life and increases up until about age 85. Overall, these results suggest that England is building up a large future health problem and one that is heavily socially graded.

1. Introduction

The World Health Organisation (WHO) estimates that physical inactivity causes 1.9 million deaths per year worldwide, over 10 per cent of breast, colon cancer and diabetes cases, and about 22 per cent of coronary heart disease cases (WHO, 2004). Physical inactivity is also recognised as potentially the most important modifiable health behaviour for chronic diseases (Scarborough et al., 2011; also see HSCIC, 2013). As a result, knowing who is physically inactive is important for the design of cost-effective policy interventions (Hamer et al., 2012). Studies that have examined the correlates of physical inactivity have repeatedly identified education, income and aspects of the local geographical environment as important (e.g. Giles-Corti and Donovan, 2002; Humpel et al., 2002; WHO, 2004, 2007; Frost et al., 2010; Sport England, 2010; van Dyck et al., 2010). However, most studies are based on relatively small-scale samples, so while they have drawn attention to education and income as important factors in understanding physical inactivity, they have been more limited in their ability to disentangle the individual associations and to separately control for a wide range of local area factors such area resources, supply of sports facilities and geographical configuration.

In this paper we aim to do exactly this by exploiting a unique dataset on the physical activity of just over one million people in England. Associated geographical identifiers allow us to match in information on local area attributes including the local area deprivation, availability of sport and exercise facilities, funds awarded through the National Lottery, the amount of green space and the weather. This extensive information enables us to obtain more precise estimates of the association between education, income and physical inactivity while controlling for correlated individual, household and local geographical variables. We can also examine a number of physical inactivity measures, providing checks that our findings are robust to the definition of inactivity used.

2. Background

The importance of physical activity as a determinant of good health has been well established in the literature (for example, U.S. Department of Health and Human Services (1996); WHO, 2002). The WHO identified physical inactivity as a leading global risk factor for morbidity and premature mortality (WHO, 2004). Das and Horton (2012) argue that a lack of physical activity is a major risk factor in non-communicable diseases internationally and the first US

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Surgeon General's Report on Physical Activity and Health, released almost twenty years ago, recommended that adults engage in thirty minutes of moderate physical activity at least five days per week. There are many routes by which income and education may be associated with inactivity. Physical activity has a direct cost. Philipson (2001) argues that long-term technological change in methods of production means that the cost of expending calories has increased, and this cost represents a higher proportion of the budget of a poor than a rich individual. Education increases the productivity of a given set of healthcare and other inputs, so education enables individuals to increase the amount of physical activity from a given set of resources (Grossman, 2006). Individuals who are better educated may also be more aware of the consequences of inactivity and better motivated to overcome the changes brought about by technological change (Cutler and Lleras-Muney, 2010). The costs of physical activity will also be determined by the physical configuration of the localities in which individuals work and live. Housing markets mean that low-income individuals tend to live near other low-income individuals and these areas may have poor tax bases with which to finance recreation and other facilities that enable individuals to take exercise (Moore et al., 2008; Powell et al., 2006). These areas are also likely to have fewer general physical and recreational amenities and higher crime rates that also make physical activity more difficult (Gomez et al., 2004).

There are many studies of the associations between income, education and local geography, with physical activity in different countries and settings. We focus on key findings from recent systematic reviews. Gidlow et al. (2006) examined over 25 studies and found consistent evidence of higher prevalence, or higher levels, of activity among those with higher income and education levels. Education has been most commonly examined and cross-national studies have confirmed this association (for example, de Almeida et al., 1999). Education has also been found to be an important determinant of leisure-related (as distinct from work) physical activity (for example, Borodulin et al., 2008, for Finland). Recent studies examining longitudinal data have also confirmed the importance of education (for example, Hamer et al., 2012, for England). Gidlow et al. (2006) found most studies report a positive relationship between income and physical activity, but most studies used only three or fewer income bands. Studies have also identified the importance of local area factors. For example, Parks et al. (2003) for the USA found individuals in rural settings were less likely to meet the US Government recommended levels of physical activity; Pascual et al. (2013) for Madrid and Powell et al. (2004) for the USA found the availability of sports facilities explained a meaningful proportion of the variance of physical inactivity; Turrell et al. (2010) found those in advantaged neighbourhoods in Australia had significantly higher levels of total and moderate physical activity and walking.

However, the existing literature has some limitations. Firstly, education is generally better measured than income and as a consequence provides the most robust results (Gidlow et al., 2006). However, it does not follow from this that income is unimportant. Secondly, even studies that have adopted explicitly quantitative approaches tend to suffer from either sample size or sample selection issues. In many cases studies focus only on one city, identifying variation from between different areas in the city or restrict their attention to one geographical area (a notable exception is Saffer et al., 2011). Thirdly, many studies to date have used diverse, and often crude, measures of physical activity, income and (to a lesser extent) education, making it difficult to establish robust effects. As a consequence, reviews such as Gidlow et al. (2006) and Loukaitou-Sideris (2006) call for further studies using better outcome measures, the need to use larger samples and the need to measure neighbourhood and community attributes.

To contribute to the literature and address these issues we use a dataset containing over one million individuals, representative of the adult population of England. Our approach has a number of advantages. The number of observations allows us to identify the patterns in the lack of physical activity by various correlated factors (i.e. education, income and local area deprivation) to establish whether each contributes independently to differences in inactivity levels. The large sample means we can examine whether the physical activity gap across income increases with age, which is important for understanding lifetime health inequalities. The size of the sample also means that we can separate out the effect of geographical variation in the physical environment from individual characteristics by allowing for unobserved time invariant heterogeneity at the local level. Further we match the respondents to data at the local area level on the availability of sports and recreation facilities, enabling us to assess whether these supply side factors contribute to income and education gradients over and above individual and household characteristics.

3. Data description and research design

3.1. Data

Our primary dataset is the Active People Survey (APS) collected by Sport England (see Sport England, 2010). This is collected annually for a large sample of English adults (between 166,000 and 363,000 each year). The data are cross-sectional. Sampling is clustered at the Local Authority (LA) level. Interviews are spread evenly across the 12 months of each year. The survey is conducted by telephone using Random Digit Dialing and one person aged 16 or over is randomly selected from eligible household members. The survey contains detailed measures of participation in physical recreation and sport undertaken in the four weeks prior to interview and a large set of individual and household level demographic and socioeconomic characteristics. We use data from five waves of the APS, covering the period from October 2005 to October 2011 (the first wave of data was collected in 2005/06 and it has been collected annually since 2007/08), giving a total pooled sample of 1,104,155 individuals aged 16 and over. The APS identifies English LAs that during our sample period fell in number from 354 to 326. After eliminating missing values for the variables used to construct our main physical inactivity measure, as well as dropping APS5 respondents who as part of the questionnaire were not asked about their household income, we are left with a working sample of 1,002,219 adults (91 per cent of the total sample).

The analysis of this data is exempt from Institutional Ethics Approval on the grounds that it is research about living persons using pre-existing data.

3.2. Dependent variables

A key contribution of this paper is that we examine a number of alternative measures of physical inactivity using a common dataset. The focus is on inactivity and its correlation with education and income, but it is worth noting that not all inactive pursuits are equivalent in terms of their impact on current and future health outcomes. A fuller understanding of the impact of inactivity would require detailed knowledge of inactive pursuits. A number of studies have considered the health effects of different inactive pastimes (i.e. watching TV, social media etc.), mostly in regard to child and adolescent populations; for example see Crespo et al. (2001), Rey-Lopez et al. (2008) and see Biddie et al. (2004) for a review of this literature. Our data contains only information on active pursuits. While recognising that time spent inactive is not homogeneous, it is nevertheless generally accepted that increasing