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Population levels of, and inequalities in, active travel: A national, cross-sectional study of adults in Scotland

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ABSTRACT

This study aimed to describe active travel (walking or cycling) in Scotland and explore potential demographic, geographic, and socio-economic inequalities in active travel. We extracted data for the period 2012–13 (39,585 journey stages) from the Scottish Household Survey. Survey travel diaries recorded all journeys made on the previous day by sampled individuals aged 16 + living within Scotland, and the stages within each journey. Descriptive statistics were calculated for journey stages, mode, purpose and distance. Logistic regression models were fitted to examine the relationship between the likelihood of a journey stage being active, age, sex, area deprivation and urban/rural classification. A quarter of all journey stages were walked or cycled (26%, n: 10,280/39,585); 96% of these were walked. Those living in the least deprived areas travelled a greater average distance per active journey stage than those in the most deprived. The likelihood of an active journey stage was higher for those living in the most deprived areas than for those in the least deprived (Odds Ratio (OR) 1.21, 95% CI 1.04–1.41) and for those in younger compared to older age groups (OR 0.44, 95% CI 0.34–0.58). In conclusion, socio-economic inequalities in active travel were identified, but – contrary to the trends for many health-beneficial behaviours – with a greater likelihood of active travel in more deprived areas. This indicates a potential contribution to protecting and improving health for those whose health status tends to be worse. Walking was the most common mode of active travel, and should be promoted as much as cycling.

1. Introduction

Physical inactivity has a major health effect worldwide (Lee et al., 2012) and the prevalence of non-communicable diseases and conditions linked to insufficient physical activity, such as coronary heart disease (Lee et al., 2012), has recently risen world-wide. Furthermore, those who are phsycially active are at lower risk of cardiovascular disease, then those who aren't (Celis-Morales et al., 2017). The World Health Organisation (WHO) is currently implementing the first European strategy on physical activity (Rütten et al., 2016), which aims to promote physical activity, reduce sedentary behaviours, remove environmental barriers to activity and provide equal opportunities to be active (World Health Organisation, 2015).

Individual-level demographic and socio-economic characteristics are important predictors of physical activity (Turrell et al., 2010). In addition, environmental settings can affect behaviours and restrict people from acting in a healthy way (Kamphuis and van Lenthe, 2013); for example, those living in rural settings often have lower levels of physical activity than those living in urban areas (Barrett et al., 2016; Hutchinson et al., 2014; Kurti et al., 2015; Patterson et al., 2014).

One strategy to increase physical activity is to shift journeys from motorised to 'active' modes of travel, such as making a journey on foot or by bicycle as opposed to by car. This strategy has been agreed globally as one of the seven best investments for increasing physical activity (Global Advocacy for Physical Activity, 2011). However, increasing active travel is likely to be easier in some settings, and for certain individuals, than others. It may be particularly challenging if, for example, rural residents have to travel long distances between home and their place of work or study (Hansen et al., 2015). The relationship between walking, cycling and socioeconomic status is complex (Shortt

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et al., 2014); studies have shown that individuals living in the most deprived areas of urban Australia were more likely to walk for transport than those living in the most affluent areas (Rachele et al., 2015), potentially offsetting the negative effects of other, less healthy behaviours for those living in disadvantaged areas (Turrell et al., 2013).

Scotland is a nation notorious for high levels of poor health and health inequality (Walsh et al., 2016). Yet in Scotland the prevalence of physical inactivity in adults, defined as not achieving at least 150 min of moderate or 75 min of vigorous intensity physical activity per week, is similar to that of other developed Western nations including the rest of the United Kingdom (U.K.) and the United States (U.S.) (Global Observatory for Physical Activity, 2016). With a large proportion of the Scottish population resident in an urban 'central belt' dominated by Glasgow in the west and Edinburgh in the east, the potential for active travel to make a significant contribution to increasing physical activity levels is clear and has been the subject of policy focus. Since 2011, adult active travel has been monitored annually using data from the Scottish Household Survey (SHS) at a national level through the Scottish Governments' National indicator in the 'Active Scotland Outcomes Framework' (Scottish Government, 2016). The indicator records the proportion of adults who made a walking journey of over 0.25 miles for a reason other than recreation during the previous week. At baseline (2011) 63% of Scottish adults aged 16 + achieved this target; this increased to 67% by 2014 (Brown et al., 2015).

Exploring levels of active travel remains important and further enquiry is required, particularly within Scotland, because many studies are either focused on one local area, use reported physical activity rather than transport for all routine journey stages taken during a single day, and/or have failed to examine active travel by socio-demographic or geographical subgroup. As highlighted in the previous sub-sections, it is important to understand prevalence in subgroups defined by age, sex, geography and socioeconomic status because of the possibility that interventions which are effective for some but not others will increase population level health inequalities. The aims of this study were, therefore, (a) to describe the proportion of journey stages actively travelled (walked or cycled) in Scotland by mode and purpose, (b) to explore differences in distance travelled by socio-economic factors, and (c) to explore demographic, geographic and socio-economic factors as correlates of the likelihood of active travel.

2. Methods

2.1. Survey data

Travel diary data were obtained from the 2012–13 Scottish Household Survey (SHS), a nationally representative rolling cross-sectional survey of adults aged 16 + selected from a cluster-random sample of households in Scotland (Scottish Goverment, 2015). The SHS is a general purpose survey covering a wide range of issues, including transport and travel. Face-to-face interviews were conducted and participants completed a travel diary which detailed all journeys undertaken the previous day. Each diary was divided into individual journey stages which describe each phase of a journey (e.g. one journey may include three stages: walk to bus stop, travel on bus, and walk to destination). For each journey stage, data collected included the origin, destination, purpose (assigned to all stages that comprised a given journey), distance, and mode of travel. Journey stage distances were calculated by Transport Scotland using the straight-line distance between origin and destination (Transport Scotland, 2010).

The response rate of the 2012 Scottish Household Survey was 67.2%. The rate varied by region, whereby the lowest rates were in urban/city regions (three lowest: Aberdeen City (57%), Midlothian (60%) and Glasgow City (59%)) and the highest were in rural areas (three highest: Orkney Islands (86%), Shetland Islands (78%), and North Ayrshire (78%)) (Scottish Goverment, 2014). After weighting, 48.3% (n: 19,112) of the sample were male, similar to the 2013 mid-year estimate for the population aged 16 and over in Scotland (48.0%, n: 2,120,629) (National Records of Scotland, 2016). The individual-level weighting corrected for differences in selection probabilities across areas of Scotland and socioeconomic status, allowing comparisons in active travel between these groups.

Travel diary data were provided for the 2012–13 survey for all areas of Scotland. Each participant's home, as well as the origin and destination of each journey stage, was assigned to a Scottish Intermediate Zone; these zones are geographical polygons containing groups of approximately 4000 household residents which respect physical boundaries and natural communities, have a regular shape and contain households with similar social characteristics (Scottish Government, 2011).

The origin of each journey stage was linked to: the eight-category Scottish urban/rural index (which classifies the urbanicity of the area (Scottish Government, 2014)); a local authority (Intermediate Zones follow local authority boundaries); and quintile of the 2012 Scottish Index of Multiple Deprivation (SIMD), a multivariate, area-based indicator of relative social, economic and environmental deprivation (Scottish Government, 2012) (1 = most deprived, 5 = least deprived). For this study, an area was classified as 'urban' if it was within either of the following two Scottish urban/rural index categories; (1) Large Urban Areas: settlements of over 125,000 people, or (2) Other Urban Areas: settlements of 10,000 to 125,000 people (Scottish Government, 2014).

2.2. Active travel

Active travel was defined as a journey stage that was either walked or cycled; these are the only active modes of travel captured in the survey. All journey stages were included and 'active travel' was an attribute assigned to each journey stage.

2.3. Statistical analysis

2.3.1. Description of journey stages

2.3.1.1. Descriptive statistics. Summary statistics described population characteristics in terms of sex, age, urban/rural classification, and area socio-economic status (SIMD quintile). The proportion of journey stages made by an active mode of travel was described for each stratum. As geographical location was provided for both the respondent's home and the origin of each journey stage, descriptive statistics were calculated for both home and stage-origin deprivation quintile. All analyses were conducted using both classifications, but there were no substantive differences in the results. We therefore present only the results based on deprivation quintile of residence.

2.3.1.2. Journey mode and distance travelled. Mode of travel was described as a proportion of total travel for all journey stages and individually by socio-economic status (SIMD quintile). The distribution of journey purpose was described for all journeys, active journeys only and by socio-economic status (SIMD quintile).

Linear regression was used to estimate coefficients (β) for the continuous variable of distance (km) of active journey stages by deprivation quintile, to represent the mean change in journey distance for each increment of deprivation quintile.

2.3.2. Likelihood of an active journey stage

2.3.2.1. Multivariable models. Journey stage was the unit of analysis, and we assessed the likelihood of a stage being 'active' by regressing the binary outcome variable for each stage (active yes/no) against the explanatory variables in a logistic model. Models were firstly fitted without covariates and then adjusted for age, sex, local authority, health status, rural urban status, deprivation and employment. The models were performed without adjustment for urban rural status and we found no substantial change in the results. Models took account of