



Trends in prolonged sitting time among European adults: 27 country analysis



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ABSTRACT

Objective. To examine trends in adult sitting time across 27 European countries.

Method. Data were from the Eurobarometer surveys collected in 2002, 2005, and 2013. Sitting time data were used to categorise respondents into 'low' (0 to 4h30min), 'middle' (4h31min to 7h30min), and 'high' levels of sitting (>7h30min). We modelled the likelihood of being in the high sitting group within a given country and overall across the three time points, controlling for age, gender, education, employment status, and physical activity.

Results. In total 17 countries had sitting data at all three time points; among these countries the prevalence of 'high sitting' decreased steadily from 23.1% (95% CI = 22.2–24.1) in 2002 to 21.8% (95% CI = 20.8–22.8) in 2005, and 17.8% (95% CI = 16.9–18.7) in 2013. A further 10 countries had data only over the latter two time points; among these countries the prevalence of high sitting decreased from 27.7% (95% CI = 26.0–29.4) in 2005 to 19.0% (95% CI = 17.6–20.5) in 2013.

Conclusion. Time spent in sedentary behaviour may not be increasing in the European region, and prolonged sitting may, in fact, be decreasing. This finding has important implications for the sedentary behaviour debate and the policy response.

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Introduction

It has long been established that participation in moderate to vigorous physical activity for at least 150 min per week is associated with improved population health, and a reduced risk of developing a wide range of non-communicable diseases (NCDs) (Physical Activity Guidelines Advisory Committee, 2008; World Health Organization, 2010). Physical inactivity (failure to meet recommended physical activity levels) has been identified as the fourth leading risk factor for global mortality (World Health Organization, 2009) and is estimated to account for 9% of premature deaths (Lee et al., 2012).

'Sedentary behaviour' has also emerged as a topical issue in public health. Sedentary behaviour is defined as 'any waking behaviour characterized by an energy low expenditure while in a sitting or reclining posture' (Sedentary Behaviour Research Network, 2012). Because sedentary behaviour refers to time spent sitting/lying, it is not the same

as a lack of physical activity (Owen et al., 2010a). Individuals can meet or exceed the public health guidelines for physical activity but still spend a considerable amount of time in sedentary behaviours (Edwardson et al., 2012; Sugiyama et al., 2008). The most common form of sedentary behaviour is 'sitting', for example while travelling by car, train or bus, at school/work, and watching television.

Epidemiological studies suggest that time spent in sedentary behaviours may be associated with increased risk of all-cause mortality, cardiovascular mortality and cardiovascular diseases, poor cardio-metabolic biomarker profiles, and increased risk of diabetes (Chau et al., 2013; Katzmarzyk et al., 2009; Bauman et al., 2013; Wilmore et al., 2012); although several studies have shown null associations between accelerometer based sedentary behaviour and cardio-metabolic outcomes (Stamatakis et al., 2012a, 2012b). In addition, some recent evidence suggests the observed risks of sedentary behaviour may not be independent of total physical activity levels (Maher et al., 2014).

Over the past 50 years, increasing use of computers at work, labour saving devices in the home, and building and transportation practices that require driving for most trips, have led to reductions in physical activity levels globally (Brownson et al., 2005; Knuth and Hallal, 2009; Kohl et al., 2012; Sallis et al., 2006). It is assumed that the reductions in physical activity are accompanied by concomitant increases in sedentary behaviour (Owen et al., 2010b; Thorp et al., 2011). Interest in

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sedentary behaviour has grown exponentially in public health and the issue has pervaded the scientific literature and the media. For example, a search of the Scopus database conducted in October 2014 (by the lead author) identified over 340 scientific papers with 'sedentary' in the title in 2014 alone, and the issue has appeared in many newspapers worldwide with headlines such as 'Sitting is the new smoking' and 'Sitting down is KILLING you!' (Berry, 2013; Levine, 2014). There has also been increasing mention of the need for sedentary behaviour reduction in national physical activity policy recommendations, for example in Australia, Canada, Finland and Switzerland.

Although it is recognised that adults in Western countries spend large amounts of time engaged in sedentary behaviours (Matthews et al., 2008; The Information Centre for Health and Social Care, 2009), to date there has been limited population surveillance data to determine whether time spent in sedentary behaviours is actually increasing. Gaining a better understanding of trends in sedentary behaviour could inform public health policy and the need for action. The aim of this study was to examine trends in sitting time across 27 European countries between 2002 and 2013 using Eurobarometer data, a standardised long-term pan-European survey covering a wide range of social, economic, and health issues.

Methods

Recruitment and participants

The Eurobarometer, established in 1973, is a set of cross-national serial surveys conducted on behalf of the European Commission (European Commission, 2014). Since 1990 (EB34), the survey has consisted of two elements. The first is the 'Standard EB' which contains the core set of questions which are similar in every survey. The second part is the 'Special EB' which is a supplementary optional survey on specific topic areas.

The 2002 Special EB (EB58.2) included physical activity and sitting time, using the International Physical Activity Questionnaire (IPAQ; Craig et al., 2003). The IPAQ provides data on total time spent in vigorous intensity activity, moderate intensity activity, and walking. In addition, it includes a validated single-item question on sitting (Rosenberg et al., 2008). These questions were also asked in EB64.3 conducted in 2005 and EB80.2 conducted in 2013, providing comparable information for our research question, to examine trend data on adult sitting time in Europe.

Eurobarometer surveys cover the population, aged 15 years and over, of the respective nationalities of the EU member states. For each survey independent samples were drawn from each member state using a multi-stage, random (probability) sampling design. The number of sampling points was drawn with probability proportional to population size (for a total coverage of the country) and to population density. The sampling points represented the whole territory of member states, and the distribution of the populations in terms of metropolitan, urban, and rural areas. Sample sizes within countries ranged from 302 in Northern Ireland in 2002 to 1039 in West Germany in 2013. The total participant numbers in 2002, 2005, and 2013 were 16,230, 29,193, and 27,919 respectively. All interviews were face-to-face in the respondent's home and in the appropriate national language. More information on the Eurobarometer series can be found at <http://www.gesis.org/en/eurobarometer/survey-series/standard-special-eb/>.

Measures and data management

The IPAQ provided data on total physical activity (walking, moderate, and vigorous intensity activity) in the last seven days and total sitting time on a typical week day. In the 2002 and 2005 surveys, participants were asked to estimate their usual weekday sitting time using an open-ended response scale; however, for the 2013 survey participants were given a choice of 11 categorical response options, ranging from '<60min' to '>8h30min'. For the purposes of this study, sitting time data over all three time points were used to categorise respondents into 'low' (0 to 4h30min), 'middle' (4h31min to 7h30min), and 'high' sitting groups (>7h30min). The threshold to define high sitting was based on the cut point for increased risk obtained from a meta-analysis of the dose-response relationship between total sitting time and all-cause mortality (Chau et al., 2013). Similarly to estimated sitting time, in the 2002 and 2005 surveys, participants were asked to estimate the amount of time they spent doing

physical activity (walking, moderate and vigorous intensity) using an open ended response scale; however this was changed to a categorical response scale for the 2013 survey. Since the 2013 data contained only categorical data of minutes of physical activity per day, it was not possible to calculate total physical activity using the IPAQ scoring system. Instead, total physical activity was calculated by summing the total number of days of walking, moderate, and vigorous intensity activity, and then classifying participants according to quartiles within each survey year. To control for the influences of socio-demographic factors on sitting time, data on age group (15–24 yrs, 25–34 yrs, 35–44 yrs, 45–54 yrs, 55–64 yrs and 65 yrs and above), gender (male or female), education level (18 years and less or 19 years and more), and employment status (student, employed, or unemployed/retired) from each Eurobarometer survey were used in the analysis. The frequency of participants in each physical activity and sitting time category in each survey year are shown in Supplemental Table 1.

Statistical analysis

Descriptive statistics were calculated to show frequencies of each sample within each sitting category (low, middle, and high) for each country across each survey year. Multiple logistic regression was used to model the probability of being in the high sitting group within a given country and overall across the three survey years. These models were controlled for age group, gender, education level, employment status, and physical activity quartile. Post stratification weights were applied across all analyses, where the data for each participant was weighted using population within country and country population within the member states. Post stratification weights are available in each Eurobarometer data set and are calibrated according to either the entire European community or particular groupings. More information can be found at <http://www.gesis.org/en/eurobarometer/survey-series/standard-special-eb/weighting-overview/>.

Results

In total 17 countries/regions had valid sitting data in all three time points (2002, 2005, 2013) and a further 10 countries/regions had valid data in the latter two time points only (2005, 2013). Table 1 presents the weighted mean, median, and interquartile range of sitting time as well as the distribution of the key characteristics of the sample

Table 1

Summary statistics for key variables in Eurobarometer 58.2, 64.3 and 80.2 by year—weighted data for the 27 member states/regions included in the analysis.

Variable		2002 (EB58.2)	2005 (EB64.3)	2013 (EB80.2)
Age	N	16,230	24,682	24,878
	Mean (SD)	44.8 (18.2)	45.5 (16.9)	47.0 (17.4)
	25% quartile	29.0	30.0	32.0
	Median	43.0	44.0	46.0
	75% quartile	59.0	60.0	62.0
Gender	N	16,230	24,682	24,878
	% male	48.3	48.2	48.3
	% female	51.7	51.8	51.7
Years of education	N	14,619	22,092	22,949
	Mean (SD)	17.5 (4.8)	18.6 (7.2)	19.0 (6.8)
	25% quartile	15.0	15.0	16.0
	Median	17.0	18.0	18.0
	75% quartile	19.0	20.0	21.0
Employment status (%)	Student	9.7	10.0	8.8
	Employed	50.4	51.1	50.0
	Unemployed or retired	39.9	39.0	41.2
Sitting time (min/day) ^a	N	15,247	23,464	24,313
	Mean (SD)	316.2 (178.6)	312.0 (165.7)	291.9 (137.5)
	25% quartile	180.0	180.0	180.5
	Median	300.0	300	300.5
	75% quartile	420.0	420.0	420.5

^a Since sitting time was collected as a categorical variable in 2013, all sitting time statistics are estimated.

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