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Educational inequalities in leisure-time physical activity in 15 European countries

Stefaan Demarest¹, Herman Van Oyen¹, Albert-Jan Roskam², Bianca Cox³, Enrique Regidor⁴, Johan P. Mackenbach⁵, Anton E. Kunst^{5,6}

1 Department of Public Health and Surveillance, Scientific Institute of Public Health, Brussels, Belgium

2 Statistics Netherlands, The Netherlands

3 Centre for Environmental Sciences, Hasselt University, Diepenbeek, Belgium

4 Department of Preventive Medicine and Public Health, Universidad Complutense de Madrid, Madrid, Spain

5 Department of Public Health, Erasmus MC, Rotterdam, The Netherlands

6 Department of Public Health, AMC, University of Amsterdam, Amsterdam, The Netherlands

Correspondence: Stefaan Demarest, Scientific Institute of Public Health, J. Wytsmanstraat 14, 1050 Brussels, Belgium, Tel: +32 2 642 57 94, Fax: +32 2 642 54 10, e-mail: stefaan.demarest@wiv-isp.be

Background: The aim of this study was to assess the patterns of socio-economic inequalities in leisure-time physical activity (LTPA) in the different member states of the European Union. **Methods:** Comparable data on subjects aged 16–64 years derived from national health interview surveys from 15 European countries were used for the analysis. We used log-binominal regression to assess prevalence rate ratios (PRRs). The PRR measured the risk of showing a low level of LTPA for a given educational level, relative to the highest educational group. **Results:** Within Europe, large cross-national differences in the overall prevalence of a low level of LTPA were observed. However, a low level of LTPA was always more common among those of lower educational attainment. The educational inequalities in a low level of LTPA were more pronounced in men. For the lowest compared with the highest educational level, the PRR was 1.53 (95% CI: 1.49–1.57) in males and 1.36 (95% CI: 1.33–1.39) in females. There was no consistent relationship between the absolute level of prevalence rate, as measured by the rate for the highly educated, and the magnitude of these inequalities. **Conclusions:** Throughout Europe, physical activity during leisure time is less common among the lower educational groups compared with the higher educational groups. Programs to promote LTPA should consider strategies that target people of lower educational attainment.

Introduction

Physical activity has many positive effects on both physical and mental health.¹ Yet, practising physical activity is not equally

distributed among the different socio-economic groups within society, although evidence for socio-economic inequalities in physical activity turns out to depend on the type of physical activity measured.

Table 1 Overview of the national surveys

Country	Name of survey	Year(s)	Non-response rate (%)
Finland	Finbalt Health Monitor	1994/1998/2000/2002/2004	28.0–35.0
Norway	Norwegian Survey of Living Conditions	2002	29.6
Denmark	Danish Health and Morbidity Survey (DHMS/SUSY)	2000	25.8
Germany	German National Health Examination and Interview Survey	1998	38.6
The Netherlands	General social survey (POLS)	2003/2004	41.7–38.7
Belgium	Health Interview Survey	1997/2001	41.5–38.6 ^a
Spain	National Health Survey	2001	15.0
Portugal	National Health Survey	1998/1999	NA
Italy	Health and health care utilization	1990/2000	13.4–18.3 ^a
Hungary	National Health Interview Survey Hungary	2000	21.0–28.0
Slovakia	Health Monitor Survey	2002	49.1
Czech Republic	Health Interview Survey	2002	29.3
Lithuania	Finbalt Health Monitor	1994/1998/2000/2002/2004	28.0–39.0
Latvia	Finbalt Health Monitor	1998/2000/2002/2004	20.0–40.0
Estonia	Health Behavior among Estonian Adult Population	2002/2004	33.0–38.0

a: Percent non-response households.

NA, not available.

An English study, for example, showed that higher educated people have lower levels of total physical activity. If one focuses on sports activities alone, the relation shows the opposite: higher educated people have higher levels of participation in sports.²

It has been acknowledged that measuring sport activities or leisure-time physical activity (LTPA) in general represents an underestimation of total physical activity, especially for those people with physically demanding jobs.³ Nonetheless, LTPA remains the most widely studied form of physical activity in health inequality studies.⁴

In most studies, the prevalence of LTPA is generally positively linked to socio-economic characteristics. In Scotland, clear differences were observed in LTPA in relation to education.⁵ Similarly, other studies conclude that a high level of education is associated with a high level of physical activity,⁶ that both low-education and low-occupational status were strongly associated with a low level of LTPA⁷ and that white-collar employees were more often engaged in vigorous leisure-time activities than blue-collar workers.⁸ Other studies also observed significant differences between high- and low-educated people.^{7,9} In the Greek ATTICA study, a positive association was observed between LTPA and occupational class, but no associations were found with education level and annual income.¹⁰

In a study aimed to determine the prevalence of LTPA in 15 European countries, it was found that people with primary education level were more often non-active than those with higher levels of education, with greater differences among females.¹¹ No details were presented on the magnitude of these inequalities within individual European countries. Nonetheless, such cross-national differences may be of great interest because there might be large variations between European countries in the magnitude of inequalities, similar to the inequalities in overweight,¹² diet¹³ and smoking.¹⁴ Identifying and understanding cross-national variations may be important to understand the macro-level determinants of physical activity.¹⁵

The aim of this study, which was done in the framework of the Eurothine project,¹⁶ was to study the patterns of socio-economic inequalities in LTPA in different member states of the European Union. Because previous studies reveal that females, especially females with a lower socio-economic status, exhibit lower prevalence of LTPA compared with males, the analyses will be performed separately for males and females.^{17,18}

Methods

Data

In 2006, Member States were asked to provide microdata from their most recent national health interview or similar surveys, with information on, among others, LTPA and a set of socio-economic

indicators. Fifteen countries were capable to deliver these data (table 1). Most of the survey data were obtained by means of face-to-face interviews. For Finland, Lithuania and Latvia, data were collected by mail surveys. For Finland, The Netherlands, Belgium, Portugal, Italy, Lithuania, Latvia and Estonia, several years of the same continuous survey were provided in different data files. These data files were merged into one country-specific file.

The questions used to estimate the prevalence of LTPA were, to a large extent, country-specific, but each covered a broad spectrum of possible LTPAs (Supplementary table S1). To cope with the heterogeneity in survey questions, we dichotomized the variable into the categories 'a low level of LTPA' and 'a high level of LTPA', acknowledging that by doing so information on different levels (high, moderate, light) of LTPA is ignored.

Data on LTPA were only collected for subjects aged ≥ 16 years. Because for 6 of the 15 countries no information was available on subjects >64 years of age, the results are presented for the ages 16–64 years.

As in other analyses of the Eurothine project,^{14,16} the highest educational attainment was considered to be the most useful indicator to define the socio-economic position of respondents. For those still attending school, the educational level refers to the level of school that the subject is currently attending. The national categories of the educational level were harmonized on the basis of the International Standard Classification of Education (ISCED)¹⁹ resulting in four education categories: 'no or only primary education' (ISCED 1), 'lower secondary' (ISCED 2), 'upper secondary and post-secondary non-tertiary education' (ISCED 3 + 4) and 'tertiary education (ISCED 5 + 6). Missing data on the educational level were low and did not exceed 3.6% of the entire country sample (Belgium).

Analyses

Age-adjusted prevalence rates of non-activity were calculated per gender and educational level using the direct method. The European Standard population of 1997 was used as a reference. The prevalence rates for the pooled data for all countries in the study were estimated using weights to account for differences in the sample sizes, such that each country had an equal weight in the final analysis despite different sample sizes.

The rates of the lowest educated groups were subtracted from those of the highest educated groups to estimate the absolute difference in the prevalence of non-activity. In addition, we estimated prevalence rate ratios (PRRs) and 95% confidence intervals by regression analysis with binomial distribution and the log-link function using the Genmod procedure of SAS. Country-specific PRRs were adjusted for 5-year age category.

We summarized the association between non-activity and educational level by calculating the relative index of inequality (RII) and its 95% confidence intervals.^{20,21} The RII assesses the association between non-activity and the relative position of each socio-economic group separately. This relative position is measured as the cumulative proportion of each socio-economic group within the socio-economic hierarchy, with 0 and 1 as the extreme values. The resulting measure, the RII, can be interpreted as the risk of being non-active for those at the top of the socio-economic hierarchy as compared with the lowest end of the socio-economic hierarchy. The RII can be used to make comparisons between countries while taking into account cross-national differences in educational distributions. The RII was estimated using a log-binomial regression model.

Results

Table 2 shows demographic data and the age-adjusted prevalence of non-activity. The national sample sizes summed up to $N=246\,248$ and varied from $N=1481$ (Slovakia) to $N=92\,944$ (Italy). The percentages of missing values on LTPA were 2.2% on average and ranged from 0.2 (Norway) to 14.9% (The Netherlands).

The prevalence of a low level of LTPA was 37.1% in males [range: 14.5% (Denmark) to 62.8% (Portugal)] and 41.9% in females [range 12.1% (Denmark) to 75.4% (Portugal)]. In only a few countries (Finland, Denmark, Estonia and Slovakia) the age-adjusted prevalence rates were higher in males than in females.

Table 3 shows the prevalence of a low level of LTPA by educational level for the pooled sample. The prevalence of a low level of LTPA was lowest in the highest educational group (males: 27.2%; females: 34.4%) and highest in the lowest educational group (males: 51.2%; females: 56.9%). The risk of showing a low level of LTPA increased regularly with decreasing educational level in both males and females. For the lowest compared with the highest educational level, the PRR was 1.53 (95% CI: 1.49–1.57) in males and 1.36 (95% CI: 1.33–1.39) in females.

Table 4 shows, for both genders and by country, the educational inequalities in a low level of LTPA. The magnitude of these inequalities is expressed as absolute rate differences (highest vs. lowest educational level) and as the RII. In all countries, men and women with the lowest educational level are more likely to show a low level of LTPA compared with those with the highest educational level. Among males, the RIIs are >1 with statistical significance in all countries but one (Slovakia). The RII values for the other countries range from 1.35 (for Estonia) to 3.18 (for Denmark). Among

females, the RIIs are >1 with statistical significance in all countries, with the lowest RII being 1.27 (Latvia and Lithuania) and the largest 2.55 (for Belgium).

Discussion

The Eurothine project offered the opportunity to analyse the association between educational level and non-activity during leisure time on a European scale. Almost everywhere in Europe, a low level of LTPA is more pronounced in lower educated than in higher educated subjects. The educational inequalities of presenting a low level of LTPA were more pronounced in men than in women.

The data gathered in this project were provided by general health surveys organized in about the same period. Educational level was selected as the indicator for socio-economic status because it was available for all countries included in the Eurothine data set. Education has the advantages of being fairly stable beyond early adulthood and of being especially likely to capture aspects of lifestyle and behaviour.²² Because the educational systems of the countries included in the analysis strongly differ, transposing

Table 3 Age-adjusted prevalence (%) and PRR of a low level of LTPA by educational level. Pooled data of 15 European countries

Educational level	Proportion (%)	Low level of LTPA (%)	PRR of a low level of LTPA (95% CI)
Males			
Lowest	17.8	51.2	1.53 (1.49–1.57)
Second lowest	25.9	43.1	1.38 (1.34–1.41)
Second highest	38.5	32.0	1.21 (1.18–1.24)
Highest	17.8	27.2	1 (reference)
Total	100.0	37.7	–
Females			
Lowest	18.4	56.9	1.36 (1.33–1.39)
Second lowest	22.2	48.5	1.31 (1.28–1.33)
Second highest	40.3	37.9	1.15 (1.12–1.17)
Highest	19.1	34.4	1 (reference)
Total	100.0	42.9	–

Data were weighted for country size; prop., column proportion; ages: 16–64 years; $N_{\text{total}}=239\,081$.

Total percentages for a low level of LTPA deviate from the ones reported in Table 2 due to missing values in the variable education.

Table 2 Demographic data: absolute sample size, percentage of lowest educational groups (ISCED 1–2), age-adjusted prevalence of a low level of LTPA and missing data on the LTPA indicator, in the age group 16–64 years

Gender/Country	N_{total}		% ISCED 1–2		% Non-activity		% Missing
	Males	Females	Males	Females	Males	Females	
Finland	9459	10912	26.7	21.2	24.0	20.1	1.4
Norway	2892	2791	12.6	13.1	21.6	28.7	0.2
Denmark	6816	6859	19.8	22.0	14.5	12.1	0.9
Germany	3011	3103	38.6	37.9	39.0	42.4	2.4
The Netherlands	6391	6615	31.0	38.6	16.1	16.2	14.9
Belgium	7265	7317	33.5	34.2	27.0	33.9	7.9
Spain	10 049	10 699	63.7	70.2	40.7	47.9	0.5
Portugal	15 143	15 974	76.6	73.9	62.8	75.4	0.7
Italy	46 127	46 817	56.3	56.2	33.5	40.5	0.0
Hungary	2079	2371	61.5	51.0	28.4	35.0	0.5
Slovakia	683	797	42.5	31.9	52.6	51.4	10.3
Czech Republic	1169	1307	58.1	55.0	54.3	67.1	0.6
Lithuania	5123	6482	45.6	36.2	41.2	47.0	7.1
Latvia	3649	4746	48.6	40.8	49.2	56.9	4.3
Estonia	1853	2523	53.1	44.7	57.6	55.3	3.0
Total	145 630	154 614	44.5	42.6	37.1	41.9	2.3

Table 4 Age-adjusted prevalence (%) of a low level of LTPA by educational level, with absolute differences and RII aged 16–64 years, in 15 European countries

Gender/Country	Prevalence of a low level of LTPA (%) by education				Absolute difference	RII (95% CI)
	Lowest	Second lowest	Second highest	Highest		
Males						
Finland	25.2	32.1	23.8	16.4	8.8	1.87 (1.61–2.17)
Norway ^a	a	30.4	23.5	14.2	16.2	2.71 (2.04–3.58)
Denmark	23.2	16.5	14.2	8.3	14.9	3.18 (2.51–4.03)
Germany	55.7	48.4	38.6	19.1	36.6	2.24 (1.93–2.61)
The Netherlands	22.6	17.3	17.2	14.3	8.3	2.17 (1.66–2.85)
Belgium	48.8	31.3	26.3	19.3	29.5	2.81 (2.42–3.28)
Spain	53.3	43.9	33.2	24.7	28.6	2.46 (2.21–2.73)
Portugal	68.5	57.9	54.5	50.9	17.6	1.60 (1.50–1.69)
Italy	47.6	36.6	28.9	26.0	21.6	1.97 (1.87–2.08)
Hungary	35.9	27.8	23.6	26.6	9.3	1.76 (1.34–2.32)
Slovakia	50.1	58.0	48.1	49.5	0.6	1.12 (0.85–1.47)
Czech Republic	72.0	60.3	48.8	44.6	27.4	1.76 (1.38–2.23)
Lithuania	48.4	45.5	37.9	39.8	8.6	1.40 (1.24–1.59)
Latvia	56.9	52.7	48.4	42.4	14.5	1.45 (1.28–1.64)
Estonia	67.6	56.7	62.8	42.0	25.6	1.35 (1.17–1.55)
Females						
Finland	26.1	24.6	20.2	17.6	8.5	1.45 (1.23–1.71)
Norway ^a	a	40.3	31.0	19.8	20.5	2.56 (2.03–3.23)
Denmark	21.9	15.3	10.6	10.1	11.8	3.30 (2.51–4.33)
Germany	64.5	51.1	42.0	24.7	39.8	2.20 (1.69–2.35)
The Netherlands	23.5	17.7	16.0	12.6	10.9	2.45 (1.89–3.18)
Belgium	53.4	42.7	33.0	25.2	28.2	2.55 (2.24–2.89)
Spain	59.7	50.5	40.3	34.1	25.6	2.10 (1.90–2.32)
Portugal	80.2	75.8	65.8	61.4	18.8	1.37 (1.31–1.43)
Italy	53.5	42.0	36.6	33.8	19.7	1.65 (1.57–1.73)
Hungary	43.6	37.0	32.2	28.6	14.0	1.50 (1.23–1.84)
Slovakia	53.9	63.4	48.1	50.3	3.6	1.34 (1.01–1.76)
Czech Republic	80.6	76.1	63.1	62.4	18.2	1.34 (1.13–1.59)
Lithuania	53.9	51.5	42.2	47.8	6.1	1.27 (1.14–1.41)
Latvia	57.8	59.9	59.5	49.3	8.5	1.27 (1.16–1.39)
Estonia	65.5	57.2	56.4	52.0	13.5	1.31 (1.15–1.49)

Prevalence rates are age standardized using the direct method with the ESP as a reference.

Absolute differences = lowest – highest.

a: The lowest and second lowest category are grouped in Norway.

RII, relative index of inequality, adjusted for age.

country-specific information on education into the broad categories of ISCED was necessary to enable comparison. This comparison, however, remains partly artificial because it presupposes that, between countries, the scope and contents of every educational level are comparable.

The data used in the analysis only measure LTPA. We acknowledge that LTPA represents only a part of people's total physical activity, especially for those people with physically demanding jobs, who are likely to have a low socio-economic position on average.²³ Furthermore, prevalence estimates of a low level of LTPA among females and elderly adults may be underestimated, as these groups spend substantial amounts of time engaged in activities that may supplement or replace LTPA, such as household chores.²⁴

The wording and the response categories of the instruments measuring LTPA differed between countries. By combining the response categories into two distinct categories (a low level vs. a high level of LTPA), the comparability of the data has been enhanced. Despite this procedure, we acknowledge that the cross-national comparability of LTPA levels as defined in this article can be questioned. The observed cross-national variations in the magnitude of inequalities in non-activity could be in part due to comparability problems, and therefore will be interpreted with much caution.

Non-response percentages were considerable high in some countries. This could affect our findings, e.g. if educational levels and levels of LTPA should be unequally distributed among

respondents and non-respondents. Although most statistical offices that provided the data also indicated the level of non-response, information on the demographic characteristics of the non-respondents was missing. As a consequence, we cannot exclude that under- or overrepresentation of groups with high or low levels of LTPA and/or with high or low educational levels could bias our findings.

We observed wide variations in the overall prevalence of non-activity between the 15 countries. Our findings are in line with previous research.^{11,25,26} Both in males and females, the prevalence of non-activity during leisure time is high in most of the Baltic and Eastern European countries.

A consistent finding across most countries is that inequalities in non-activity were larger among men than among women. This is in contrast to the socio-economic inequalities in the prevalence of overweight, which are consistently large among women but not among men.¹² These results imply that the smaller inequalities in overweight among men cannot be attributed to a low level of LTPA. One alternative explanation may be that inequalities in energy intake are smaller among men than among women, but the evidence for this is weak.²⁷ Most likely, inequalities in overweight are traditionally small among men because of high rates of total physical activity, owing to high work activity, among men from lower socio-economic groups.²

Inequalities in non-activity during leisure time are observed in all countries for which data were available. This consistency is in contrast to that for inequalities in smoking, for which the magnitude of inequalities strongly varied between European

countries.¹⁴ The social gradient in smoking reversed from a positive to a negative gradient, first in northern countries, to be followed by eastern and southern European countries.^{27,28} These changes and geographic variations disclose highly dynamic processes, such as social diffusion and changing valuation of smoking. Compared with smoking, inequalities in LTPA have not been subject to equally dynamic processes. Similarly, trend studies did not observe substantial changes in inequalities in LTPA.²⁹

Explanations of inequalities in LTPA should take into account their stable nature. Whether a person undertakes LTPA depends on the perceived balance between rewards and constraints. Both factors may favour those with a more comfortable socio-economic position. As for the rewards, the highly educated have been suggested to more often consider the long-term benefits of physical activity to health and well-being.^{30–32} As for the constraints, the highly educated may less often be hindered by physical and mental health problems, by financial costs of sports participation or by lack of attractive outdoor environments nearby.^{33–35}

The uptake and maintenance of LTPA may be influenced by health promotion programs. However, health-promoting messages may be differentially taken up by different social class groups.^{32,36,37} Any public health policy to promote an active lifestyle will be confronted with the dilemma that universal initiatives could result in a higher take-up by higher educated people, thus aggravating, instead of reducing, inequalities. It is therefore important to evaluate the potential impact of possible interventions in terms of reducing socio-economic gaps, and to consider strategies that are most effective in targeting deprived groups.³⁰

Supplementary data

Supplementary data are available at *EURPUB* online.

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Annex 1: In addition to the authors, the following members of the European Union Working Group on Socioeconomic Inequalities in Health participated in this study: Department of Demography and Geography, Faculty of Science, Charles University in Prague, Prague, Czech Republic—J. Rychtarikova; Department of Social Geography and Regional Development, Faculty of Science, Charles University in Prague, Prague, Czech Republic—D. Dzurova; National Institute of Public Health, Copenhagen—O. Andersen; National Institute of Public Health, University of Southern Denmark, Copenhagen—O. Ekholm; School for Health, University of Bath, Bath, England—K. Judge; National Institute for Health Development, Department of Epidemiology and Biostatistics, Tallinn, Estonia—M. Tekkel; Department of Health Promotion and Chronic Disease Prevention, National Public Health Institute, Helsinki—R. Prättälä; Department of Sociology, University of Helsinki, Helsinki—P. Martikainen; Institut National de la Statistique et des Études Économiques, Paris—G. Desplanques; Research and Information Institute for Health Economics, Paris—F. Jusot; Center for Social Policy Research, University of Bremen, Bremen, Germany—U. Helmert; Demographic Research Institute, Hungarian Central Statistical Office, Budapest, Hungary—K. Kovacs; Hungarian National Center of Epidemiology, Budapest, Hungary—F. Marton; Economic and Social Research Institute, Dublin—R. Layte; Department of Public Health, University of Turin, Turin, Italy—G. Costa; Servizio di Epidemiologia, Grugliasco, Italy—F. Vannoni; Faculty of Public Health, Riga Stradins University, Riga,

Latvia—A. Villerusa; Kaunas University of Medicine, Kaunas, Lithuania—R. Kalediene, J. Klumbiene; Centraal Bureau voor de Statistiek, Voorburg, the Netherlands—J.J.M. Geurts; Research Program Care, Health and Welfare, Oslo University College, Oslo—E. Dahl; Division of Epidemiology, Norwegian Institute of Public Health, Oslo—B.H. Strand; Department of Medical Statistics, National Institute of Hygiene, Warsaw, Poland—B. Wojtyniak; Centro de Estudos Geográficos, Universidade de Coimbra, Coimbra, Portugal—P. Santana; Košice Institute for Society and Health, Pavol Josef Safarik University, Košice, Slovakia—A. Madarasova Geckova; Department of Public Health, Faculty of Medicine, Ljubljana, Slovenia—B. Artnik; Agencia de Salut Pública de Barcelona, Barcelona—C. Borrell; Research Unit, Department of Health, Basque Government, Vitoria-Gasteiz, Spain—S. Esnaola; Department of Public Health Sciences, Karolinska Institute, Stockholm—B. Burström; Center for Health Equity Studies Stockholm, Stockholm University, Stockholm—J. Fritzell, O. Lundberg; Institute of Social and Preventive Medicine, University of Zurich, Zurich, Switzerland—M. Bopp; Office of National Statistics, Newport, United Kingdom—M. Glickman.

Conflicts of interest: None declared.

Key points

- Based on comparable data from 15 European countries, a wide variation in the prevalence of leisure-time physical activity (LTPA) could be observed.
- Despite this variation, social inequalities in LTPA were consistent, with a lower level of LTPA in lower educated people.
- Social inequalities in LTPA were more pronounced in men.
- Programs to promote LTPA should consider strategies that are most effective in targeting deprived groups.

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