



## Trends in social inequality in physical inactivity among Danish adolescents 1991–2014<sup>☆</sup>



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### ABSTRACT

The aim of this study was to investigate social inequality in physical inactivity among adolescents from 1991 to 2014 and to describe any changes in inequality during this period. The analyses were based on data from the Danish part of the HBSC study, which consists of seven comparable cross-sectional studies of nationally representative samples of 11–15-year old adolescents. The available data consisted of weekly time (hours) spent on vigorous physical activity and parental occupation from 30,974 participants. In summary, 8.0% of the adolescents reported to be physically inactive, i.e. spend zero hours of vigorous leisure time physical activity per week. The proportion of physically inactive adolescents was 5.4% in high social class and 7.8% and 10.8%, respectively, in middle and low social class. The absolute social inequality measured as prevalence difference between low and high social class did not change systematically across the observation period from 1991 to 2014. Compared to high social class, OR (95% CI) for physical inactivity was 1.48 (1.32–1.65) in middle social class and 2.18 (1.92–2.47) in lower social class. This relative social inequality was similar in the seven data collection waves ( $p = 0.971$ ). Although the gap in physical inactivity between social classes does not seem to be widening in Danish adolescents, there are still considerable differences in the activity levels between high, middle and low social class adolescents. Consequently, there is a need for a targeted physical activity intervention among adolescents from low (and middle) social class.

### Introduction

Physical inactivity in children and adolescents has a range of negative effects such as increased risk of overweight (Janssen & LeBlanc, 2010), poor mental health (Biddle & Asare, 2011; Ussher, Owen, Cook, & Whincup, 2007; Kantomaa, Tammelin, Ebelig, & Taanila, 2008), social problems, thought and attention problems (Kantomaa et al. 2008), loneliness (Page & Tucker, 1994) and learning problems at school (Davis et al., 2011; Rasberry, Lee, Robin, Laris, & Russell, 2011). Since physical activity patterns may track from childhood to adulthood (Telema et al., 2005), patterns of physical inactivity during childhood and youth may influence health in adulthood. Insight into physical activity distributions across population groups may therefore contribute to future interventions and policies to minimize physical inactivity among children and young people.

While the current body of evidence includes a large number of studies describing the distribution, determinants and outcomes of

various levels of physical activity, we know very little about the relatively small group of individuals who are not physically active at all. Physically inactive adolescents constitute a group at potentially high risk of obesity, diabetes, psychological problems and social marginalization. Investigating the social distribution of physical inactivity and the trends across time is therefore important in order to development and target primary prevention public health strategies.

A range of studies has described secular trends in physical activity among adolescents. Some studies report increasing levels of physical activity (Booth, Rowlands, Dollman, 2015; Kalman et al. 2015; Sigmundová, El Ansari, Sigmund, & Frömel, 2011) while other studies report that the secular trends are less systematic (Huhman et al., 2012). Other studies have addressed the association between socioeconomic background and physical activity among adolescents, and there is some evidence of a higher level of physical activity with more advantageous socioeconomic background (Borraccino et al. 2009; Ferreira 2006). Studies have also addressed social inequality in physical inactivity, and

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these studies suggest that the prevalence of physical inactivity is higher among adolescents with less advantageous socioeconomic background (Henriksen, Rayce, Melkevik, Due, & Holstein, 2015; Singh, Kogan, Siahpush & van Dyck, 2008) although this association is not completely consistent (Stalsberg & Pedersen 2010). This social gradient may change over time, and we have only identified one study that addressed this issue. Inchley, Currie, Todd, Akhtar and Currie (2005) reported a fairly persistent socioeconomic gradient in physical activity among Scottish schoolchildren from 1990 to 2002. It is likely that trends in social inequality in health are country-specific because such trends are related to macro-level economy. There has been a steep increase in income inequality in Denmark over the past twenty years, and since there is a general correlation between the level of income inequality and health problems among adolescents (Rathmann et al., 2015), we expect the social inequality in physical inactivity to increase over time.

This study investigated trends in social inequality in physical inactivity in comparable and representative populations of Danish, 11–15-year-old adolescents from 1991 to 2014. The analyses focused on both absolute and relative social inequalities in physical inactivity.

**Methods**

*Design and study population*

This study included data from the Danish part of the international collaborative cross-national Health Behaviour in School-aged Children study (HBSC) at seven points in time (1991, 1994, 1998, 2002, 2006, 2010, 2014) (Roberts et al., 2009; Currie & Alemán-Díaz, 2015). The overall aim of the HBSC study is to enhance the understanding of young people’s health behaviours in their social settings. The study design is a series of cross-sectional surveys of representative samples of three age groups, 11-, 13-, and 15-year-old schoolchildren. In Denmark, data were collected from a random sample of schools, drawn from a complete list of public and private schools. The analyses included data from seven comparable cross-sectional surveys from 1991 to 2014. The overall response rate (number of participants in the surveys as percentage of schoolchildren enrolled in the participating classes) was 88.2%, N=31,660. After exclusion of 686 participants with missing information on physical activity the final N was 30,974 (Table 1).

*Data collection and measurements*

The participants completed the internationally standardised HBSC questionnaire in the classroom. Vigorous physical activity was measured by the item: “OUTSIDE SCHOOL HOURS: How many hours a week do you usually exercise in your free time so much that you get out

of breath or sweat?” We dichotomised the responses into “none” vs. “about half an hour”+ “about 1 hour”+ “about 2 to 3 hours”+ “about 4 to 6 hours”+ “7 hours or more”. Booth, Okely, Chey and Bauman (2001) and Rangul, Holmen, Kurtze, Cuyper and Midthjell (2008) found that this measure has a good reliability and a fair validity in the sense that adolescents who report 0 hours of vigorous physical activity also have low levels of aerobic fitness.

Data on socioeconomic position (SEP) stem from the students’ reports of their father’s and mother’s occupation, coded by the research group into social class I (highest) to V (Christensen et al., 2014). The coding scheme is almost identical to the UK Registrar General’s classification into five social classes (Macintyre, McKay, Der & Hiscock, 2003). The coding instruction was consistent across all seven waves of data collection, but it was necessary to change the coding for some occupations with substantial changes in qualification level during the 23 year observation period. Several studies have demonstrated that schoolchildren from the age of 11 are able to report their parents’ occupation with a fair validity although often with a high proportion of unclassifiable or missing data (Ensminger, Forrest, Riley, Kang, Green, & Starfield, 2000; Lien, Friedstad, & Klepp, 2001; West, Sweeting, & Speed, 2001; Vereecken & Vandegheuchte, 2003). We added social class VI to include economically inactive parents who receive unemployment benefits, disability pension or other kinds of transfer income. Finally, the category “unclassifiable” was added to describe parents who are working, but for whom the information provided by the child was too vague for categorizing into social class I to V.

Each participating schoolchild was categorised by the highest ranking parent. We categorised social class into high (social class I-II), middle (social class III-IV), low (social class V-VI), and unclassifiable.

*Statistical analyses*

First, the Cochran-Armitage test for trend (Agresti, 2002) was used to examine trends in physical inactivity over time. This test is based on the regression coefficient for a weighted linear regression of a binomial proportion of a variable (here: prevalence of physical inactivity) on an explanatory variable (here: year of data collection). Second, two measures of social inequality in physical inactivity was applied: 1) Prevalence difference in physical inactivity between high and low social class as an absolute measure of social inequality; 2) odds ratio (OR) for physical inactivity using high social class as reference as a relative measure of social inequality. We conducted logistic regression analyses with sex, age group and year of data collection as control variables. A multivariate logistic regression analysis (Wald’s test) was used to test for interaction between social class and year, corresponding to the hypothesis that the difference in social inequality in physical activity

**Table 1**  
Study population by sex, age group, social class, year and physical inactivity.

	Data collection wave							Total
	1991	1994	1998	2002	2006	2010	2014	
Response rate	90.2%	90.9%	88.0%	89.3%	88.8%	86.3%	85.8%	88.2%
N	1860	4046	5205	4824	6269	4922	4534	31,660
N included in this study <sup>a</sup>	1837	3994	5165	4771	6210	4865	4132	30,974
Pct. boys	50.2	49.9	49.6	48.7	49.3	50.1	48.6	49.4
Pct. girls	49.8	50.1	50.4	51.3	50.7	50.0	51.4	50.6
Pct. 11-year-olds	31.7	31.6	33.9	36.4	37.6	37.2	30.5	34.7
Pct. 13-year-olds	34.7	34.7	35.7	33.7	35.6	33.7	35.5	34.8
Pct. 15-year-olds	33.6	33.7	30.4	29.9	26.9	29.1	34.1	30.5
Pct. high social class	25.8	30.3	25.8	22.1	22.3	32.8	38.2	27.8
Pct. middle social class	47.3	44.2	45.9	48.7	40.0	35.9	37.0	42.2
Pct. low social class	18.2	16.7	20.9	18.7	18.4	16.2	14.4	17.8
Pct. unclassifiable	8.8	8.8	7.5	10.5	19.4	15.1	10.5	12.2
Pct. physically inactive	8.1	9.4	10.2	10.3	5.1	7.5	6.6	8.0

<sup>a</sup> Non-respondents of the physical activity question excluded.

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