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Social Vulnerability as a Predictor of Physical Activity and Screen Time in European Children

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Social vulnerability as a predictor of physical activity and screen time in European children

Abstract

Objectives

To examine associations between social vulnerabilities and meeting physical activity (PA) and screen time (ST) recommendations during a 2-year follow-up.

Methods

13,891 children aged 2.0-<9.9 from eight European countries were assessed at baseline and 8,482 children at follow-up. Children's sports club membership, PA and ST were collected via parental questionnaires. Moderate-to-vigorous physical activity (MVPA) was objectively-assessed with accelerometers. Performing at least one hour of MVPA daily and spending less than two hours of ST defined physically-active and non-sedentary children respectively. Vulnerable groups were defined at baseline as children whose parents had minimal social networks, from non-traditional families, with migrant origin or with unemployed parents. Logistic mixed-effects analyses were performed adjusting for classical socioeconomic indicators.

Results

Children whose parents had minimal social networks had a higher risk of non-compliance with PA recommendations (subjectively-assessed) at baseline. Migrants and children with unemployed parents had longer ST. All vulnerable groups were less likely to be sports club members.

Conclusions

Migrants and children with unemployed parents are at risk for excessive ST and all vulnerable groups have lower odds of being sports club members.

Keywords:

Vulnerable groups

Physical activity

Accelerometry

Screen time

36 Children
37 IDEFICS study
38
39 *Abbreviations:* PA, Physical Activity; MVPA, Moderate to Vigorous Physical Activity;
40 IDEFICS, Identification and prevention of Dietary- and lifestyle-induced Health EFfects
41 in Children and infantS; ST, Screen Time; SES, Socio-Economic Status; T0, baseline;
42 T1, follow-up after the intervention
43
44 **Introduction**
45
46 Regular physical activity (PA) during childhood is associated with improved
47 musculoskeletal and cardiovascular health and lower adiposity (Janssen and Leblanc
48 2010; Strong et al. 2005). Insufficient PA and excessive screen time (ST) are
49 independently associated with negative health outcomes (Ekelund et al. 2012). Therefore,
50 increasing PA and decreasing sedentary time are public health priorities. Current
51 guidelines for children aged 5 to 18 recommend at least one hour of moderate-to-vigorous
52 physical activity (MVPA) per day (World Health Organization 2010) and to limit ST to
53 no more than two hours a day (American Academy of Pediatrics 2001). Despite these
54 benefits, many children do not meet the recommended level of PA or ST (Konstabel et
55 al. 2014).
56
57 Socio-economic status (SES) is an important determinant of health in adults but results
58 for children and adolescents are less consistent (Drenowatz et al. 2010). Some studies
59 showed that youth from higher SES are more physically active than youth from lower
60 SES (Hanson and Chen 2007) while one study in China reported that high SES was
61 positively associated with insufficient PA (Wang et al. 2016). One reason for these
62 differences may be that associations may vary by domain of PA. The association between
63 SES and sport may be different to that for active transport, both of which contribute to
64 overall PA. Regarding ST results also seem ambiguous (Pate et al. 2011). Similarly,
65 studies vary according to the sedentary measure used. Some studies showed children from
66 high SES groups spent more time on non-screen sedentary behaviours (such as sitting or
67 lying down) and those from low SES spent more time in screen-based sedentary
68 behaviours (e.g. watching TV). However, no significant differences between children
69 from low and high SES backgrounds were found for total sedentary time (sum of non-
70 screen sedentary behaviours and ST) (Klitsie et al. 2013). Using subjective and objective

71 methods, Foley et al. (Foley et al. 2011) showed that, children and adolescents in New
72 Zealand from areas of lower deprivation (i.e., higher SES) accumulated more total
73 sedentary time than those from higher deprivation.
74 Inconsistent findings could be partially due to differential methods used to assess PA
75 levels and sedentary time by e.g. subjective procedures such as questionnaires compared
76 to objectives measures, such as accelerometers (Raudsepp and Viira 2008).
77 Accelerometers are more accurate at assessing total time spent engaging in PA at different
78 intensity levels and recording inactive time (Hagströmer et al. 2010). However,
79 questionnaires are preferable to assess domains of PA (e.g. transport, sport, leisure) and
80 sedentary-related behaviours (Atkin et al. 2012).
81 The majority of studies to-date have focused on the relationship between classical SES
82 indicators (such as income, education and occupation), PA and sedentary behaviours
83 (Tandon et al. 2012) but other indicators of social vulnerability, such as children whose
84 parents lack a social network, children from non-traditional families (the child does not
85 live with both parents), migrant children or children with unemployed parents, are rarely
86 explored in the literature. Social vulnerabilities can be defined as social (e.g. migrant) and
87 economic (e.g. unemployment) situations that can increase the susceptibility to harm and
88 that eventually amount to social disconnectedness (Haudenhuyse et al. 2012). These
89 social vulnerable groups tend to adopt unhealthier behaviours and to be less active
90 compared to non-vulnerable groups (Hawkins et al. 2009; Labree et al. 2014).
91 We hypothesized that children from vulnerable groups would have lower levels of PA
92 and higher levels of ST compared to non-vulnerable groups due to financial constraints
93 and negative experiences faced by vulnerable children. Some investigations reported that
94 migrant children had lower levels of PA compared to native children as a result of the
95 acculturation and a different body image perception (Labree et al. 2014). Non-traditional
96 families could be at risk of being more inactive and of having lower sports participation
97 levels because they might have lower modelling abilities and financial capacity compared
98 to traditional families (Quarmby et al. 2011). Children with unemployed parents reported
99 lower levels of PA and higher levels of ST compared to children with employed parents
100 (Federico et al. 2009). Job loss raises TV-watching and since parents exert an impact on
101 children, this may negatively affect children. Finally, we expect that children whose
102 parents lack a social network could have a lower participation in PA and higher ST levels
103 because of less access to resources and personal contact that could encourage activity
104 levels.

105 To our knowledge no studies have examined a set of social vulnerabilities in the same
106 population. Four vulnerable groups were investigated: children whose parents lack a
107 social network; children from non-traditional families; migrant children and children with
108 either one or both parents unemployed. This paper aims to explore (i) the cross-sectional
109 and prospective associations between being a member (vs. non-member) of a vulnerable
110 group at baseline and PA (reported and objectively-assessed with accelerometers), sports
111 club membership and ST, at two time points, in European children and (ii) the association
112 of accumulated vulnerability (belonging to multiple vulnerable groups) with PA, sports
113 club membership and ST at baseline. This will allow us to understand whether the
114 disadvantages of socio-economic circumstances in European children are associated with
115 unhealthy activity behaviours.
116
117 **Methods**
118
119 Design and study population

120 IDEFICS is a multi-centre prospective cohort study, including a school- and community-
121 based obesity prevention intervention in eight European countries (Belgium, Cyprus,
122 Estonia, Germany, Hungary, Italy, Spain and Sweden). At baseline (T0), 16,228 children
123 aged 2.0-9.9 years were examined from September 2007 to June 2008 (response rate
124 51%). The first follow-up (T1) took place two years later (September 2009-June 2010)
125 when 11,038 children aged 4.0-11.9 years were re-examined. In all survey centres,
126 recruitment was carried out at the community level. Parents of children eligible for
127 inclusion were identified and recruited through local kindergartens and schools. The
128 survey comprised anthropometrical measurements, examinations of children and parental
129 self-completion questionnaires on lifestyle habits and dietary intakes of children.
130 Standardised procedures were used by all survey centres. A detailed description is given
131 by Ahrens et al. (Ahrens et al. 2011).

132 Parents or legal guardians gave written informed consent for examinations and data
133 collection for their children, while children expressed oral consent. Ethical approval was
134 obtained from the research ethics authority of each participating centre.

135 Measurements
136
137 *Physical activity and Screen Time assessed with a questionnaire.*

A parental questionnaire was used to collect a proxy measure of children's subjectively-measured PA and ST (Burdette et al. 2004). Parents reported the total hours and minutes children spent playing outdoors during weekends and weekdays and the weekly duration their children spent doing sport in a sports club for a typical week in the previous month. Reported PA was calculated as: [(hours playing outdoors on weekdays*5)+(hours playing outdoors on weekend days*2)+weekly sports participation]/7. Thereafter, participants were classified depending on whether they met the current PA guidelines of <1h/d vs. ≥1h/d (World Health Organization 2010). Parents also reported children's sport club membership (dichotomized into belonging or not belonging to a sport club).

Moreover, parents reported hours of TV/DVD/video viewing and computer/games-console use for weekdays and weekend days by their children. Response options were: not at all; <0.5h/d; <1h/d; 1-<2h/d; 2-<3 h/d; and >=3 h/d. Total ST per day was calculated as:(5*weekday values + 2*weekend values)/7. Participants were divided into two groups depending on whether they met current ST guidelines of ≤2h/d vs. >2h/d (American Academy of Pediatrics 2001).

Objectively-measured MVPA

Children were instructed and asked to wear a uniaxial accelerometer (ActiGraph or ActiTrainer, ActiGraph, Pensacola, FL, USA) on a hip belt for at least two days including one weekend day and one-week day (weekdays were weighted by five and weekend days by two and the sum was divided by seven). An average of 730 minutes of valid time was obtained in the final sample. To obtain comparable data despite differing valid times, adjusted MVPA was calculated by dividing raw minutes of MVPA by wear time and multiplying by 730 (Konstabel et al. 2014). Only children with a minimum duration of 8 h monitoring time per day were considered, where non-wear time was defined as at least 20 min of consecutive zeroes. The sampling epoch was set to 15s but data were re-integrated into 60 second epochs for analysis. The duration of MVPA was determined according to the cut-offs of Evenson (Evenson et al. 2008).

Classical SES indicators as possible confounder

Education: parents indicated the highest level of education of both themselves and their partners. The particular response categories for each country were coded according to the International Standard Classification of Education (ISCED 1997) and re-categorized into: low (ISCED level 0-2), medium (ISCED level 3-4) and high (ISCED level 5-6) educational levels (UNESCO. 1997).

Income: parents provided information on the monthly net income of the household after taxes and deductions responding to nine country-specific categories (1: lowest income category to 9:highest income category). The category cut-offs were country-specific according to a scheme based on the median equivalent income, thus guaranteeing comparability between countries. The result was organised into three categories: low (1-3), medium (4-6) and high (7-9) income.

Occupation: parents indicated their occupational position with 18 possible options, which were later transformed into the three-class version of the European Socioeconomic Classification (ESeC): working class, intermediate and salaried (Harrison and Rose 2006).

For occupation and education, the highest level of either the mother or the father was considered for the purpose of the study.

Vulnerable groups as predictors

Four vulnerabilities (dichotomised as vulnerable vs. non-vulnerable) were defined as our main exposures using baseline information from parent-reported questionnaires:

Social network: based on the Single Item Measure of Social Support developed by Blacke and McKay (1986) parents were asked how many persons they could rely on in case of need including their family. A minimal social network (vulnerable group) was assessed if the parental answer on the question was either ‘Nobody’ or ‘1 person’. Further answer categories were ‘2–3 persons’ and ‘more than 3 persons’ and were labelled as non-vulnerable (Bammann et al. 2013). This measure has been strongly associated with a composite social support index (Blake and McKay 1986).

Family structure: If the child did not live with both his/her parents, the family was defined as a ‘non-traditional family’ (including single-parent families, stepparent families, living with grandparents or foster parents or in an institution).

Origin of parents: A migrant background (vulnerable group) was assumed if one or both parents were born in a country different from where the study took place.

Employment status: If at least one of the parents was unemployed or living on social assistance or welfare, the child was considered as belonging to the vulnerable group.

A total vulnerability score was calculated by adding up the numbers of vulnerabilities a child was exposed to. Six vulnerability indicators (minimal social network, non-traditional family, migrant, unemployed, low-income and low-education) were considered. Occupation status was not included as it was highly correlated with

208 employment status. The vulnerability score ranged from 0 (the child had no
209 vulnerabilities) to 6 (the child had all six vulnerability indicators) and was divided into
210 four categories (three to six vulnerabilities, two vulnerabilities, one vulnerability and no
211 vulnerability).
212

213 *Weight categories*
214 Anthropometric measurements were assessed at T0 according to standardised procedures
215 in all participating countries. Barefoot body height was measured to the nearest 0.1 cm
216 by trained staff using a portable stadiometer (SECA 225). Body weight in kg was
217 measured by a child-adapted version of electronic scale TANITA BC 420 SMA with the
218 children weighted in a fasting state and wearing only light clothes. Body mass index
219 (BMI) was calculated by dividing body weight in kilograms by squared body height in
220 metres and then transformed into an age- and gender-specific z-score (Cole et al. 1998).
221 Weight groups were categorised using age and gender-specific cut points according to the
222 criteria of the International Obesity Task Force (Cole and Lobstein 2012).

223 *Sample size*

224 Two analysis datasets were defined, one for the subjective and one for the objective
225 measurements. Regarding the subjective measurements, 13,891 children were included
226 for the cross-sectional analysis and 8482 children for the longitudinal analysis after
227 excluding children with missing values in any of the outcomes (see figure 1). Children
228 lost to follow-up belonged more often to the minimal social network group (12.0% vs.
229 9.0%), to non-traditional families (25% vs. 18.4%,), migrants (16.5% vs. 12.8%) and
230 unemployed parents (7.0% vs. 4.8%) than those included in the present study.

231 Concerning objective measurements, 9,021 children had at least some valid accelerometer
232 data at T0 but only 5,892 children met the following quality requirements (Konstabel et
233 al. 2014): having at least 8h daily wearing time for at least 2 days (1 weekend day and 1
234 weekday) using 60 second epoch. After two years of follow-up, only 2,285 children
235 measured at both T0 and T1 met the accelerometer quality criteria and were included in
236 the longitudinal analysis (see Figure 2). Children lost to follow-up belonged more often
237 to non-traditional families (21.3% vs. 16.2%) and had more often a migrant background
238 (16.5% vs. 12.8%) than those who were finally included in this study.

239

240 Statistical analyses

241 Logistic mixed-effects models were used to assess the cross-sectional and longitudinal
242 associations between the four exposures (social network, family structure, migrant origin
243 and employment status) and each outcome (meeting recommendations for objectively-
244 and subjectively- measured PA and ST, sports club membership). The reference category
245 used was the healthiest behaviour for each outcome (subjective PA≥1 h, ST≤2 h, sports
246 club membership and objective MVPA≥1h), respectively. The cross-sectional models
247 were adjusted for baseline age, gender, BMI z-score and classical SES indicators; the
248 objectively-measured PA (MVPA) model was additionally adjusted for season. The
249 longitudinal analyses were again adjusted for baseline age, gender, BMI z-score and
250 classical SES indicators, but also for region (intervention versus control region) and
251 baseline outcomes. A further analysis was conducted to estimate the accumulation of
252 vulnerability at T0 and PA (subjectively and objectively assessed), sports club
253 membership and ST. All models included a random kindergartens/school and a random
254 country effect to account for the clustered study design.
255 Respondents with missing socioeconomic information may not be a random subset of
256 population-based survey participants and excluding them may bias study results (Kim et
257 al. 2007). Therefore, missing values of socioeconomic data were coded as a separate
258 category.
259 Before model building, correlations among SES indicators were checked resulting in the
260 exclusion of occupation status in models with employment status as main exposure to
261 avoid collinearity problems.
262 The significance level was set at 0.01 to account at least partially for multiple testing. The
263 analyses were performed using the Statistical Package for the Social Sciences (version
264 22.0; SPSS, Inc.).
265
266 **Results**
267
268 Table 1 summarises the distributions of predictors and background variables for the three
269 parent reported outcomes (reported PA, ST and sports club membership) at T0 and T1
270 (see Table S1). Older children presented a higher percentage of meeting PA
271 recommendations than younger children (88.6% and 86.1% respectively), exceed ST
272 recommendations (19.6% and 36.9% respectively), and being a member of a sports club
273 (27.1% and 58.5% respectively). By sexes, males had a lower percentage of children
274 reporting ≥ 1 h of PA (87%) and sports club membership (43.7%) than females (88% and

275 45% respectively). By countries, Germany had the highest percentage of children being
276 member of a sports club (58.3%) and Cyprus the lowest (38.5%).
277 Table 2 shows the distributions of predictors and background variables for the
278 objectively-measured PA (MVPA) at T0 and T1. The percentage of children reporting
279 ≥1h of MVPA was lower than subjectively-measured PA.
280
281 Children from vulnerable groups and with missing values presented a lower percentage
282 of meeting PA recommendations, a higher percentage of exceeding ST recommendations
283 and a lower percentage as members of a sports club than non-vulnerable groups.
284 Regarding T1, results were similar to T0 (see Table 1).
285
286 Table 3 and Table S2 present odds ratio (OR), 99% confidence interval (CI) and p-values
287 for the models assessing the cross-sectional and longitudinal associations between the
288 four vulnerability indicators at T0 and the reported PA, ST and sports club membership
289 at T0 and T1, respectively. Regarding T0, children whose parents had minimal social
290 networks (OR=1.30, [99%CI 1.10-1.61]) were more likely not to reach PA
291 recommendations. Migrants (OR=1.32, [99%CI 1.17-1.48]) and children with
292 unemployed parents (OR=1.33, [99%CI 1.07-1.66]) were less likely to meet ST
293 recommendation. Those children whose parents had minimal social networks (OR:1.30,
294 [99%CI 1.10-1.61]), non-traditional families (OR=1.15, [99%CI 1.01-1.31]), migrants
295 (OR=1.49, [99%CI 1.33-1.68]) and children with unemployed parents (OR=1.34, [99%CI
296 1.06-1.70]) were less likely to belong to a sports club. After two-year follow-up,
297 associations remained for non-traditional families and children with unemployed parents
298 who were less likely to belong to a sports club at T1.
299
300 Table 4 shows the models assessing cross-sectional and longitudinal associations between
301 the four vulnerability indicators at T0 and MVPA at T0 and T1, respectively. No
302 associations were found between any of the social vulnerabilities and MVPA at T0 or T1.
303 Table S3 and S4 from supplementary material show the association between the
304 accumulation of vulnerabilities and the four outcomes (reported and objectively-assessed
305 PA, ST and sports club membership) at T0. A higher number of vulnerabilities was not
306 associated with a higher risk of non-compliance with PA recommendations (subjectively
307 and objectively measured) but it was associated with a higher risk of non-compliance with
308 ST recommendations, where the OR increased with the number of present vulnerabilities.

Likewise, a greater number of vulnerabilities was associated with a lower likelihood of being a member of a sports club.

To estimate the change produced when including the classical SES indicators (full adjusted models), we added basic adjusted models (adjusted for baseline age, sex and BMI z-score) as supplementary material (see Table S5). ORs were greater when excluding classical SES compared to the full adjusted models. However, overall results remained unaltered.

Discussion

This paper investigated the association between PA (objectively- and subjectively-assessed), sports club membership, ST and social vulnerabilities over a two-year period in children aged 2.0-9.9 years participating in a large European cohort study. Vulnerable children presented a higher risk of showing excessive ST cross-sectionally and tended to be less active at sports clubs cross-sectionally and longitudinally, compared to non-vulnerable groups. Regarding PA, our results did not show a strong association with social vulnerability indicators. Only those children whose parents reported to have minimal social networks were found to be at higher risk of non-compliance with subjectively-assessed PA recommendations.

Adjusting for classical SES indicators allowed investigation of whether the associations between social vulnerabilities and ST/PA were independent of classical SES indicators or whether only the classical SES indicators were finally relevant in the model. We observed that associations may be partly explained by classical SES variables but still independent of classical SES indicators. Therefore, belonging to a vulnerable group seems to be an independent factor of excessive ST and lower participation/activity at sports clubs. A greater effect of the vulnerabilities was observed in cross-sectional analyses as opposed to longitudinal analyses. Consequently, current vulnerability (at the time of outcome assessment) seems the most relevant one for children´s PA and ST.

The findings of our study are in line with previous research (Gorely et al. 2009; McMillan et al. 2015; Singhammer et al. 2015) despite some differences.

Regarding family structure, no significant associations were found between children from non-traditional families and PA or ST, which is in agreement with some studies (McMillan et al. 2015; Singhammer et al. 2015). However, other studies have reported

375 that children from non-traditional families accumulate more ST and a higher risk of not
376 meeting PA recommendations as a result of differences in role modelling abilities and
377 financial capacity (Bagley et al. 2006; Quarmby et al. 2011).
378
379 Concerning migrant status, we found statistical differences between migrant children and
380 exceeding ST recommendations at baseline. The acculturation in the host society
381 acquiring Western lifestyle characterized by lower levels of PA and higher levels of
382 sedentary behaviours and different body image perceptions maintained from the country
383 of origin could be the reason of differences found between migrant and native children.
384 However, no association was found between migrant children and not meeting PA
385 recommendations. Similar to our study, Puder et al., (2013) showed that migrant children
386 had a significantly higher amount of ST compared with children born in the country of
387 measurement. Contrary to what we observed, it was showed that PA levels in children
388 were significantly lower among migrant children compared to children in the native
389 population (Labree et al. 2014).
390 Children whose parents were unemployed were more likely to exceed ST
391 recommendations at baseline compared to non-unemployed parents. These conclusions
392 were confirmed by previous papers (Hawkins et al. 2009; van Rossem et al. 2012).
393 Unemployed people are at a higher risk of depression and inactivity compared to
394 employed people. Since parents are important role models for children this could lead to
395 lower activity levels in children (Van Domelen et al. 2011). Nonetheless, our results did
396 not show any association between children with unemployed parents and being at higher
397 risk of not meeting PA recommendations, like other investigations have demonstrated
398 (Federico et al. 2009).
399
400 Children whose parents had minimal social networks had a higher risk of non-compliance
401 with PA recommendations (subjectively-assessed) at baseline but they did not show a
402 higher risk of exceeding ST recommendations. Not only parents but their networks can
403 influence children´s behaviours. Therefore, children whose parents have large social
404 networks could have a positive influence for performing higher levels of PA. To our
405 knowledge, no studies have investigated the associations between parent's social network
406 and children's PA and ST.
407
408 In line with previous studies, we found that all vulnerable groups were less likely to
409 participate at sports clubs than children from non-vulnerable groups at baseline and

410 follow-up (McMillan et al. 2016; Toftegaard-Støckel et al. 2010). These associations
411 were rather weak for children from non-traditional families and higher for children with
412 unemployed parents.
413
414 Some limitations of the present study should be acknowledged. Firstly, the IDEFICS
415 study is not representative of the European population nor of the participating countries.
416 Each survey centre only covered a delimited geographic area within a country making
417 extrapolation of the results difficult and only a sub-sample of the participants wore an
418 accelerometer. Furthermore, a selection bias cannot be precluded as the children lost to
419 follow-up had more social vulnerabilities at baseline and as voluntary participation
420 might be less frequent from very high or very low SES families. Besides, since self-
421 reported PA usually overestimates total PA compared to accelerometers, subjective PA
422 data should be interpreted with caution. It is questionable how reliably the duration of
423 outdoor-play and sports club membership capture total PA and how reliable the
424 dichotomization of meeting the PA guidelines is according to self-reported PA. On the
425 other side, accelerometers may underestimate the overall activity because they cannot
426 accurately capture activities that are not step-based (such as swimming or cycling)
427 (Colley et al. 2011). Therefore, MVPA may be diminished, which may partly explains
428 the current results as associations would be attenuated. Moreover, valid data on
429 accelerometers was considered when children had at least two days of recording time
430 (including one weekend day and one-week day) with a minimum 8-hour duration of
431 monitoring time per day, which could be insufficient for a correct assessment of
432 whether they meet the PA guidelines. Finally, even though we have controlled for
433 several potential confounders, we cannot preclude unmeasured confounding e.g.
434 through parents' health status, parents' mental health and other socio-cultural factors.
435
436 A particular strength of this study is that to our knowledge, no research has been done
437 concerning the association of vulnerabilities such as social network, family structure and
438 unemployment status with objectively- and subjectively-assessed PA and ST in children
439 in a longitudinal study. Having two measures of PA (subjectively and objectively-
440 assessed) provide different information. For example, sports club participation usually
441 requires regular payments and it has hence other barriers than playing on a playground.
442 Accelerometers could register both activities but it could not distinguish these differences.
443 The large sample size of eight countries following standardised procedures is also a
444 strength.

Future studies may investigate children with a different country of origin and family structure in more depth to help identify children at higher risk of low PA and high ST. Moreover, more studies including both subjective and objective measures of PA levels and sedentary behaviours are needed to test different constructs which provide additional information and compare possible discrepancies in results to analyse the causes.

Conclusion

The results suggest a higher risk for excessive ST cross-sectionally in children with unemployed parents and migrants as well as lower odds of being a member in a sports club cross-sectionally and longitudinally in all vulnerable groups independent of family income, parental occupation and parental education. However, no associations were found between any of the social vulnerabilities and objectively-assessed PA. Policy makers should focus on decreasing ST sedentary behaviours among vulnerable groups as well as on offering subsidised access to external exercise, fitness, sports clubs and facilities.

Compliance with Ethical Standards

The authors declare that there are no conflicts of interest regarding this manuscript.

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