





# Late start of upper secondary education and health-compromising behaviours among Finnish adolescents—a follow-up study

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**Background:** The Finnish government has emphasized the need to expedite educational transitions. We study if a late start of upper secondary education is related to health-related selection, namely health-compromising behaviours in adolescence. **Methods:** A large cohort of adolescents from the seventh (12–13 years) and ninth (15–16 years) grades answered online classroom surveys (total  $n = 10\ 873$ ). They were followed to the start of upper secondary education, obtained from the Joint Application Registry. We compared those who continued studies directly from the ninth grade with later starters. We measured late bedtime, breakfast not every school day, tooth brushing less than twice-a-day, monthly alcohol consumption, weekly smoking, daily energy drinks, physical activity <6 days/week and excessive screen time. Multilevel logistic regressions and latent class analyses were conducted. **Results:** In gender and school adjusted models in the seventh grade, all behaviours except physical activity predicted the late start. The strongest predictor was smoking, OR = 2.96 (CI = 2.25–3.89). In the ninth grade, smoking, breakfast, tooth brushing and energy drinks, OR = 1.80, (CI = 1.36–2.39, strongest), were predictive. After controlling for sociodemographic background and academic achievement, associations for alcohol and screen time became non-significant in the seventh grade. In the ninth grade, only screen time remained significant, OR = 1.33 (CI = 1.04–1.71). Health-compromising behaviours formed clusters. Belonging to the unhealthy cluster predicted the late start in both grades, in adjusted models only in the seventh grade. **Conclusions:** Students with health-compromising behaviours are less likely to start upper secondary education directly after the compulsory education. This may increase the risk for fragmentary educational trajectories and work careers.

## Introduction

Adolescence is a crucial period for health and education. Many health-compromising behaviours are adopted at this age<sup>1</sup> and, in Finland, students complete their compulsory education at the age of 16, after 9 years of schooling. After this, adolescents apply for a place in schools offering general upper secondary education or vocational education and training marking a transition to upper secondary education. The choices adolescents make during this educational transition remarkably influence their level of education in adulthood and through that adult income, occupation, and socioeconomic status (SES). The Finnish government has emphasized the need to expedite the transition from education to working life, while recent surveys indicate that students often have difficulties in deciding which track and study field they want to continue or if they wish to continue schooling at all.<sup>2</sup> A delay in transition to upper secondary education may follow with an increased probability of dropping out of education;<sup>3</sup> or it can be a starting point for a life trajectory defined by unstable education and work or belonging to the NEET group (not in employment, education or training).<sup>4</sup> At the same time, a late start can be advantageous, since at least some of the pupils show educational resilience when applying again, whereas for others taking part in preparatory schooling can be the beginning of a successful pathway to graduation. Adolescents with a late start of

upper secondary education; however, will complete education and enter working life later than average. Sociodemographic background and particularly academic achievement at school also have a strong influence on adolescents' educational trajectories.<sup>3,5</sup>

Finnish studies have shown that selection into educational tracks as well as adult level of education and family SES are associated with adolescents' health-compromising behaviours and the adoption of unhealthy lifestyles.<sup>6–10</sup> Health differences by education based on health-compromising behaviours were also found in the USA,<sup>11,12</sup> the UK<sup>13</sup> and many other European countries.<sup>14,15</sup> Further, there seems to be an association of adolescent unhealthy behaviours with school drop-out and the NEET status.<sup>16</sup> What is less known is whether health-compromising behaviours are related to the timing of the transition into secondary education. Here, we are interested in determining whether already in adolescence traces of health-related selection can be identified.

Moreover, it is an established finding that unhealthy behaviours cluster within individuals.<sup>17</sup> Only a few previous studies have analyzed which behaviours are likely to be adopted together as indicators of an unhealthy lifestyle potentially influencing educational variables conjointly.<sup>6,9,12</sup> Revealing health-related lifestyles, or clusters of behaviours has been regarded as valuable because of the efficiency of interventions in which several risk factors can be efficiently targeted simultaneously.<sup>18</sup>

A postponed start of upper secondary education may be a mechanism through which health differences in adulthood are born. Two broad explanations have been suggested as to why health and education in adulthood are strongly associated: social causation and health-related selection.<sup>19,20</sup> Social causation means that a person's SES affects their health, whereas health-related selection means that health can affect their SES. In adolescence, own SES and level of education are not yet established and major health concerns are relatively rare, why an indirect health-related selection is more relevant at this age. Indirect selection suggests that while the association of education with actual health becomes visible only later in adulthood health-related behaviours may mediate this relationship.<sup>21</sup> Here, we study the relationship of a late start of upper secondary education with health-compromising behaviours. We ask the following research questions:

- Do health-compromising behaviours in the seventh (12–13 years) and ninth (15–16 years) grades predict the late start of upper secondary education?
- Are health-compromising behaviours related to the late start over and above academic achievement and sociodemographic background?
- Are health-compromising behaviours clustering and do the clusters predict the late start?

## Methods

### School surveys

All schools in the Helsinki Metropolitan Region were invited in 2011 and 2014. The total number of the age cohort was around 13 500. School data were collected by online classroom surveys at the beginning of the seventh (age of 12–13 years) and at the end of the ninth grade (age of 15–16 years), supervised by teachers. Participation was voluntary. Students were instructed that they could withdraw from the survey at any time. Parents were informed by letters. In two of 14 municipalities, local authorities required parental consent. All schools did not want to participate in the surveys or did not distribute the questionnaire to all classes. Approximately 10% of students are known to be absent each day, some did not want to participate or parents had denied participation.

In 2011, 8946 students from 128 schools answered the questionnaire for whom the Joint Application Registry was available. In 2014, the corresponding numbers were 7629 and 127. Of those who participated in 2011, 3244 did not answer in 2014 while 1927 new students responded. Students participating in either survey formed a dynamic sample (total  $n = 10\ 873$ ; 50.0% female).

### Joint application registry

For students who participated in either survey, the timing of the start of upper secondary education was searched from the national Joint Application Registry, held by the Finnish National Agency for Education. Participants were followed from Spring 2014 to 2017. In practice, all students apply to upper secondary education via that system when completing the ninth grade. Seventy-one students could not be found in the registry and were excluded from the analyses.

The study protocol was approved by the Ethical Committee of the Finnish Institute of Health and Welfare.

### Measures

#### Late starter

We compared students who continued studies directly from the ninth grade in 2014 ( $n = 10\ 159$ , 93.4%) to those whose start was postponed ( $n = 714$ , 6.6%) e.g. not being accepted for any

institution, did not accept the offered place, interrupted and applied again later or went to preparatory education.

### Health-compromising behaviours

Eight behaviours were measured. The cut-off points for dichotomized variables were based on international and national recommendations or previous research: bedtime on school days 11 pm or later indicating < 8-h sleep;<sup>22</sup> tooth brushing less than twice-a-day;<sup>23</sup> not having breakfast every school day;<sup>24</sup> alcohol consumption monthly or more often;<sup>10</sup> smoking weekly or more often;<sup>15</sup> energy drinks daily;<sup>25</sup> vigorous physical activity < 6 days/week;<sup>15</sup> daily screen time 6 h or more (leaving not enough time for sleep, school work and physical exercise), which at the time of the survey was considered excessive.<sup>26</sup> When these individual health-compromising behaviours are adopted together, they are further understood as indicators of an unhealthy lifestyle.

### Academic achievement and sociodemographic background

Grade point averages (GPAs) were calculated based on self-reported academic achievement at school in mother tongue, foreign language, and mathematics in 2011 and 2014. GPA, ranging from 4 = fail to 10 excellent, was rounded to the fraction of 0.5 and recoded to three categories: 'High' (9–10 points; 27.8% in 2011/26.6% in 2014), 'Medium' (7.5–8.5 points; 58.8/51.1%) and 'Low' (4–7 points; 13.4/22.3%). We further included self-reported immigrant background (7.7/8.6%) (vs. native), foreign language spoken at home (6.8/11.1%) (vs. only Finnish/Swedish) and parents with secondary education or lower (64.5/63.1%) (vs. tertiary education) as control variables. Missing values in the socio-demographic variables in one of the surveys were filled using the respective measurement in the other survey.

### Statistical analyses

First, we computed intra-class correlations to estimate how much of the variance in the timing of the transition into upper secondary education was explained by students being nested in schools.<sup>27</sup> Second, we conducted a series of separate multilevel logistic regressions to estimate the odds ratio (OR) for academic achievement, sociodemographic variables and health-compromising behaviours separately, controlling only for gender and school. Third, multivariate associations were presented additionally adjusting for academic achievement, immigrant status, language spoken at home and parental education.

Fourth, the health-compromising behaviours correlated which is why we ran a set of latent class analyses to identify those behaviours that fall together and differentiate best between health-related lifestyles. Because we expected to find age-dependent clusters of health-compromising behaviours we used latent class analysis with full information maximum likelihood instead of alternative approaches which assume identical clusters across developmental stages such as latent transition analysis.<sup>28</sup> Fifth, crude and multivariate associations of these health behaviour clusters with the late start were presented to examine whether these groups of behaviours were stronger associated with the outcome than any of the single unhealthy behaviour. The above analyses are performed separately for data from grade 7 (2011) and grade 9 (2014).

For all models, we computed  $R^2$  for fixed and random effects.<sup>29</sup> Latent class analyses were conducted in Mplus Version 7.11. All other analyses were performed in Stata Version 15.1.

### Attrition analysis

Those 5702 students who participated in both surveys were compared with those who answered the 2011 survey only. The first mentioned group was in 2011 more likely Finnish/Swedish

speakers ( $P < 0.01$ ) and had better GPA or were less likely late starters ( $P < 0.001$  for both) compared with the latter group. Attrition was further associated with tooth brushing less than twice-a-day ( $P < 0.01$ ), as well as late bedtime, breakfast not every school day, monthly alcohol consumption, smoking, and daily energy drinks ( $P < 0.001$  for all).

## Results

Gender and school adjusted associations for the separately entered predictors are presented in table 1. School explained 2.9% of the variance in the seventh and 5.8% in the ninth grade. For the seventh graders, academic achievement and all sociodemographic background variables were significantly associated with the late start of upper secondary education. In the ninth grade, the associations were corresponding. The strongest predictor in both grades was academic achievement which explained 11% of the variance in the seventh and 17% in the ninth. The second largest part of the variance was explained by parental education accounting for 3 and 4%, respectively.

In the seventh grade, all health-compromising behaviours, except infrequent vigorous physical activity, were associated with the late start. The strongest association was observed for weekly smoking, OR = 2.96 (CI = 2.25–3.89). None of the health-compromising behaviours explained >3% of the total variance. In the ninth grade, the associations weakened or disappeared. The strongest association was observed for daily energy drinks, OR = 1.80 (CI = 1.36–2.39), while indicators of physical activity, bedtime and alcohol consumption became non-significant. The  $R^2$  for the health-compromising behaviours varied between 0.03 and 0.04.

Table 2 presents the separate models for each of the health-compromising behaviours after controlling for academic achievement and sociodemographic background. In the seventh grade, the

associations of a late start with all health-compromising behaviours attenuated and ORs became non-significant for alcohol consumption and screen time (table 2). All multivariate models explained around 12% of the total variance. None of the individual behaviours explained >1% of the total variance. In the ninth grade, only screen time remained independently associated with the late start, OR = 1.33 (CI = 1.04–1.71). The adjusted models explained between 18 and 19% of the total variance.

The results of the latent class analyses are presented in figure 1, conducted separately for grades 7 and 9. Three cluster solutions fitted the data acceptable well (entropy = 0.574/0.556, respectively) and the obtained clusters were better interpretable in terms of age-related development in adolescence than for the two or four cluster solutions. Screen time and physical activity did not differentiate between the clusters and they were thus not included in the analyses.

In the seventh grade (figure 1), the most common cluster indicated a healthy lifestyle (60.2% of the adolescents). It was defined by probabilities of adopting the health-compromising behaviours of <20%. The only exception was brushing teeth less than twice-a-day with a probability of 37.8%. An unhealthy lifestyle cluster (7.5% of the adolescents) was indicated by probabilities of adopting these health-compromising behaviours varying between 31.1% for daily energy drinks and 76.4% for monthly alcohol use. In this age group, a mixed lifestyle (32.3% of the adolescents) was indicative of similar levels of irregular tooth brushing and breakfast pattern as for the unhealthy lifestyle but this cluster differed by lower probabilities of the other four health-compromising behaviours.

When regressing the late start of upper secondary education on the health behaviour clusters, these groupings of behaviours explained 5% of the total variance (table 3). When compared with belonging to the healthy cluster, adolescents in the mixed (OR = 1.87, CI = 1.55–2.27) or unhealthy (OR = 3.39, CI = 2.55–4.51)

**Table 1** Associations of the late start of upper secondary education with academic achievement, sociodemographic background and health-compromising behaviours in the seventh and ninth grades

Sociodemographic background and health behaviours		Seventh grade			Ninth grade		
		OR (95% CI)	<i>n</i>	$R^2$	OR (95% CI)	<i>n</i>	$R^2$
Gender <sup>a</sup>	Girl	1	8946	0.01	1	7629	0.01
	Boy	0.98 (0.83–1.17)			1.09 (0.89–1.32)		
Immigrant status	Native	1	8935	0.01	1	7616	0.02
	Immigrant	<b>1.50 (1.13–1.99)</b>			<b>2.10 (1.59–2.78)</b>		
Language at home	Finnish/Swedish	1	8934	0.01	1	7528	0.04
	Other	<b>1.66 (1.24–2.22)</b>			<b>2.23 (1.73–2.87)</b>		
Academic achievement	High	1	8824	0.11	1	7589	0.17
	Medium	<b>2.63 (1.97–3.49)</b>			<b>2.89 (1.99–4.18)</b>		
	Low	<b>7.74 (5.69–10.55)</b>			<b>9.19 (6.32–13.37)</b>		
Parental education	Tertiary education	1	8759	0.03	1	7531	0.04
	Secondary education or lower	<b>1.50 (1.23–1.83)</b>			<b>1.65 (1.32–2.06)</b>		
Bedtime	Early	1	8772	0.03	1	7273	0.03
	11 pm or later	<b>1.79 (1.48–2.16)</b>			1.11 (0.90–1.37)		
Tooth brushing	Twice or more daily	1	8749	0.02	1	7264	0.03
	Less often	<b>1.42 (1.18–1.70)</b>			<b>1.24 (1.01–1.53)</b>		
Breakfast	Daily	1	8688	0.03	1	7231	0.04
	Not every school day	<b>1.68 (1.40–2.01)</b>			<b>1.53 (1.25–1.87)</b>		
Monthly alcohol use	No	1	8732	0.02	1	7227	0.03
	Yes	<b>1.56 (1.22–1.99)</b>			0.92 (0.75–1.12)		
Weekly smoking	No	1	8774	0.03	1	7277	0.03
	Yes	<b>2.96 (2.25–3.89)</b>			<b>1.52 (1.21–1.91)</b>		
Energy drinks	Not daily	1	8730	0.02	1	7240	0.03
	Daily	<b>2.53 (1.86–3.43)</b>			<b>1.80 (1.36–2.39)</b>		
Vigorous physical activity	On 6 days or more	1	8758	0.01	1	7274	0.03
	Less	1.03 (0.85–1.24)			1.19 (0.96–1.46)		
Screen time	<6 h a day	1	8789	0.01	1	7297	0.03
	Excessive	<b>1.36 (1.09–1.70)</b>			<b>1.51 (1.19–1.91)</b>		

Notes: Adjusted for school and gender. Each predictor in a separate model. Statistically significant associations are marked in bold.

<sup>a</sup>Adjusted for school only.

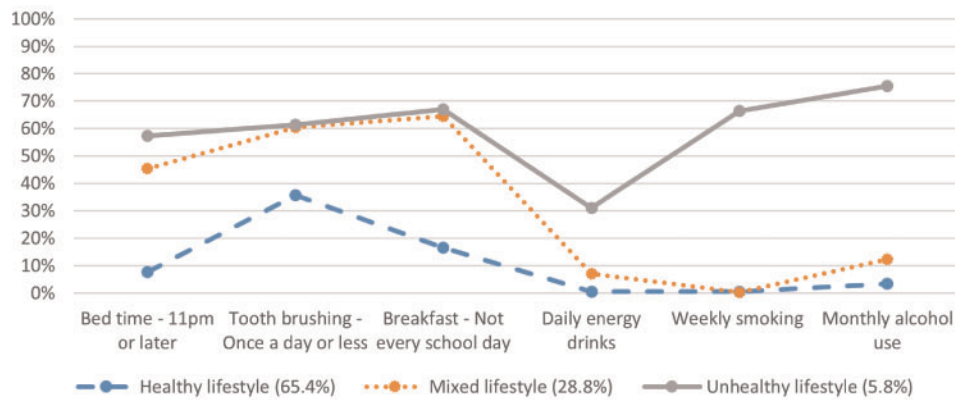
**Table 2** Adjusted<sup>a</sup> associations for health-compromising behaviour with the late start of upper secondary education in the seventh and ninth grades

Health behaviour	Seventh grade			Ninth grade		
	OR (95% CI)	n	R <sup>2</sup>	OR (95% CI)	n	R <sup>2</sup>
Bedtime						
Early	1	8480	0.12	1	7117	0.19
11pm or later	<b>1.44 (1.17–1.75)</b>			1.21 (0.97–1.51)		
Tooth brushing						
Twice or more daily	1	8459	0.12	1	7108	0.19
Less often	<b>1.26 (1.04–1.53)</b>			0.98 (0.79–1.22)		
Breakfast						
Daily	1	8397	0.12	1	7080	0.18
Not every school day	<b>1.27 (1.05–1.54)</b>			1.05 (0.85–1.30)		
Monthly alcohol use						
No	1	8548	0.12	1	7073	0.18
Yes	1.17 (0.90–1.52)			1.07 (0.86–1.32)		
Weekly smoking						
No	1	8480	0.12	1	7119	0.19
Yes	<b>2.05 (1.52–2.76)</b>			1.01 (0.79–1.28)		
Energy drinks						
Not daily	1	8437	0.12	1	7086	0.19
Daily	<b>1.86 (1.34–2.58)</b>			1.21 (0.90–1.62)		
Vigorous physical activity						
On 6 days or more	1	8468	0.12	1	7115	0.19
Less often	0.97 (0.79–1.18)			1.02(0.82–1.27)		
Screen time						
<6 h a day	1	8494	0.12	1	7141	0.19
Excessive	1.22 (0.89–1.42)			<b>1.33 (1.04–1.71)</b>		

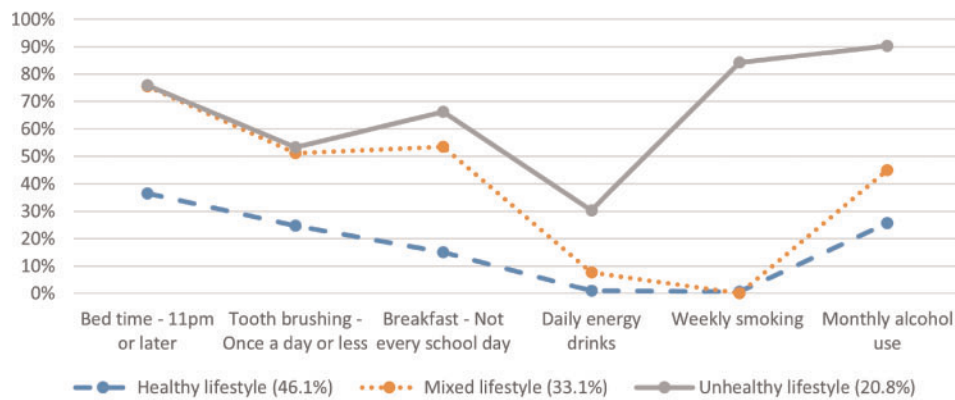
Notes: Each predictor in a separate model. Statistically significant associations are marked in bold.

<sup>a</sup>Adjusted for gender, school, academic achievement and socio-demographics.

Seventh grade, age of 12–13 years



Ninth grade, age of 15–16 years



**Figure 1** Three health behaviour clusters solution for the seventh graders (age of 12–13 years) and ninth graders (15–16 years). Proportions of the most likely membership on the left

**Table 3** Associations of health behaviour clusters with the late start of upper secondary education in the seventh and ninth grades in Model 1 (adjusted for gender and school) and in Model 2 (+ academic achievement and sociodemographic background)

Health cluster	Seventh grade		Ninth grade	
	Model 1 (n = 8807) OR (95% CI)	Model 2 (n = 8662) OR (95% CI)	Model 1 (n = 7216) OR (95% CI)	Model 2 (n = 6809) OR (95% CI)
Healthy	1	1	1	1
Mixed	<b>1.87 (1.55–2.27)</b>	<b>1.49 (1.22–1.82)</b>	1.26 (0.98–1.61)	0.92 (0.70–1.20)
Unhealthy	<b>3.39 (2.55–4.51)</b>	<b>2.26 (1.67–3.08)</b>	<b>1.76 (1.33–2.31)</b>	0.96 (0.71–1.30)

Notes: Statistically significant associations are marked in bold.

cluster were significantly more likely to postpone their start of upper secondary education. The associations attenuated but remained significant after controlling for academic achievement and sociodemographic background.

In the ninth grade, late bedtime and monthly alcohol use were higher in all clusters than at the younger age, while regular tooth brushing became more common (figure 1). Mixed and unhealthy clusters did not any longer differentiate in bedtime, while the relative difference in not having breakfast every school day and weekly smoking increased. A healthy lifestyle was less common in this age group (32.8% of the adolescents), whereas an unhealthy lifestyle was more prevalent (24.6%). The most common behaviour cluster was the mixed lifestyle (43.7%).

Health behaviour clusters explained 4% of the variance (table 3). ORs were 1.26 (0.98–1.61) for the mixed cluster and 1.76 (1.33–2.31) for the unhealthy cluster; however, the latter association was not robust to include academic achievement and sociodemographic background into the model.

## Discussion

Health-compromising behaviours predicted strongly the late start of upper secondary education at the age of 12–13 years, thus showing a process of health-related selection operating at early adolescence. By the age of 15–16 years just before applying for the continuation of education, the associations attenuated and monthly alcohol use and late bedtime lost the statistical significance, which may reflect that these behaviours are more normative at this age. When controlling for academic achievement and sociodemographic background, which as such were strong predictors of the late start, the associations attenuated. Alcohol use as well as screen time lost the statistical significance in the seventh grade, and only screen time predicted the late start in the ninth grade any longer. Similar patterns were found for the lifestyles so that compared with the healthy behaviour cluster, belonging to the unhealthy cluster predicted the late start in both grades but in adjusted models only in the seventh grade.

In earlier research, health-compromising behaviours have been shown to be part of a selection process through which individuals became divided into segments of populations, which differ in pathways leading to educational and socioeconomic positions later in life.<sup>8,9</sup> In this process, health-compromising behaviours may signalize, e.g. difficulties in or poor commitment to schoolwork,<sup>30</sup> less parental supervision<sup>31</sup> or lack of some psychological resources, such as coping, planning<sup>32</sup> or self-efficacy.<sup>33</sup> These may lower academic achievement and thus reduce the possibilities to be selected directly to the desired school or field of studies. If this is true, students demonstrating health-compromising behaviours earlier than what according to our results is more age-typical development will have a higher risk of having lower grades in the joint application registry as some of the final grades are given already before the last year of compulsory education. Thus, academic

achievement and health-compromising behaviours may become so intertwined that it becomes difficult to separate their effects when studying the transition to upper secondary education and educational trajectories in general. Altogether, health-compromising behaviours open a scene for detecting risks for a discontinuous or fragmentary educational trajectory, which in the long run may lead to difficulties in entering the labour market and in attaining a stable work career without spells of unemployment.<sup>4,34</sup> The observation that health-compromising behaviours are adopted together and conjointly influencing educational trajectories suggests that interventions, to be maximally efficient, may target several risk factors simultaneously.<sup>18</sup>

Sociodemographic background both forms a starting point for fragmentary educational trajectories and work careers and operates during the entire pathway.<sup>35</sup> It is well known that parents' low education is closely related to students' poorer academic achievement.<sup>5</sup> Also in this study, secondary education or lower of the family increased the probability of not starting upper secondary school directly. Adolescents' behaviours are often closely knit with their sociodemographic context.<sup>36</sup> The intertwining of health-compromising behaviours, academic achievement, and sociodemographic background in the analyses brings out the complexity of mechanisms influencing the educational selection processes. In line with other studies,<sup>3,9</sup> our results suggest that even in the Finnish welfare society that emphasizes equality of opportunities, social background continuously plays a role in educational pathways.

## Strengths and limitations of the study

This study design gave an opportunity to follow a large cohort of students from early adolescence to middle adolescence during an important phase of educational and health-related transition processes. The set of health-related behaviours is versatile and the educational follow-up data were based on objective measurements obtained from the national registry. This reduced measurement error and the amount of missing data due to nonresponse. However, we cannot exclude biases due to the selective attrition, because those adolescents, who participated the surveys, were less likely to be a late starter, and more often natives and Finnish/Swedish speakers and had better school achievement in average. Without the attrition, the observed associations might have been even stronger. Changes of the place of study after 2014 were not investigated in this study, even though they usually result in a prolonged study period and later entrance into working life.

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Conflicts of interest: None declared.

## Key points

- Students with health-compromising behaviours, particularly at the age of 12–13 years are more likely to have a delay in transition to upper secondary education.
- Students with the health-compromising behaviours have a higher risk for fragmentary education careers as well as late graduation and transition to work life.
- Interventions tackling several health-compromising behaviours simultaneously at early adolescence may contribute to reducing educational health inequalities.

## References

- Biddle SJH, Pearson N, Ross GM, Braithwaite R. Tracking of sedentary behaviours of young people: a systematic review. *Prev Med* 2010;51:345–51.
- Kalalahti M, Varjo J, Jahnukainen M. Immigrant-origin youth and the indecisiveness of choice for upper secondary education in Finland. *J Youth Stud* 2017;20:1242–62.
- Kilpi-Jakonen E. Continuation to upper secondary education in Finland: children of immigrants and the majority compared. *Acta Sociol* 2011;54:77–106.
- Lorentzen T, Bäckman O, Ilmakunnas I, Kauppinen T. Pathways to adulthood: sequences in the school-to-work transition in Finland, Norway and Sweden. *Soc Indic Res* 2019;141:1285–305.
- OECD. *PISA 2015 Results (Volume I): Excellence and Equity in Education*. 2016, doi:10.1787/9789264266490-en.
- Koivusilta L, Honkala S, Honkala E, Rimpelä A. Toothbrushing as part of the adolescent lifestyle predicts education level. *J Dent Res* 2003;82:361–6.
- Koivusilta L, Nupponen H, Rimpelä A. Adolescent physical activity predicts high education and socio-economic position in adulthood. *Eur J Public Health* 2012;22:203–9.
- Acacio-Claro P, Doku D, Koivusilta L, Rimpelä A. How socioeconomic circumstances, school achievement and reserve capacity in adolescence predict adult education level: a three-generation study in Finland. *Int J Adolesc Youth* 2018;23:382–97.
- Koivusilta L, West P, Saaristo V, et al. From childhood socio-economic position to adult educational level - do health behaviours in adolescence matter? A longitudinal study. *BMC Public Health* 2013;13:711.
- Koivusilta L, Rimpelä A, Rimpelä M, Vikat A. Health behavior-based selection into educational tracks starts in early adolescence. *Health Educ Res* 2001;16:201–14.
- Cutler DM, Lleras-Muney A. Understanding differences in health behaviors by education. *J Health Econ* 2010;29:1–28.
- Skalamera J, Hummer RA. Educational attainment and the clustering of health-related behavior among U.S. young adults. *Prev Med* 2016;84:83–9.
- Conti G, Heckman J, Urzua S. The education-health gradient. *Am Econ Rev* 2010;100:234–8.
- Kinnunen JM, Lindfors P, Rimpelä A, et al. Academic well-being and smoking among 14- to 17-year-old schoolchildren in six European cities. *J Adolesc* 2016;50:56–64.
- Inchley J, Currie D, Dorothy B, et al. *Growing up Unequal: Gender and Socioeconomic Differences in Young People's Health and Well-Being: Health Behaviour in School-Aged Children (HBSC) Study: International Report from the 2013/2014 Survey*. Copenhagen: World Health Organization, 2016.
- Rodwell L, Romaniuk H, Nilsen W, et al. Adolescent mental health and behavioural predictors of being NEET: a prospective study of young adults not in employment, education, or training. *Psychol Med* 2018;48:861–71.
- Leech RM, McNaughton SA, Timperio A. The clustering of diet, physical activity and sedentary behavior in children and adolescents: a review. *Int J Behav Nutr Phys Act* 2014;11:4–9.
- Prochaska JJ, Spring B, Nigg CR. Multiple health behavior change research: an introduction and overview. *Prev Med* 2008;46:181–8.
- Sweeting H, Green M, Benzeval M, West P. The emergence of health inequalities in early adulthood: evidence on timing and mechanisms from a West of Scotland cohort. *BMC Public Health* 2015;16:41.
- West P. Rethinking the health selection explanation for health inequalities. *Soc Sci Med* 1991;32:373–84.
- Elovainio M, Rosenström T, Hakulinen C, et al. Educational attainment and health transitions over the life course: testing the potential mechanisms. *J Public Health* 2016;38:e254–62.
- Paruthi S, Brooks LJ, D'Ambrosio C, et al. Recommended amount of sleep for pediatric populations: a consensus statement of the American Academy of Sleep Medicine. *J Clin Sleep Med* 2016;12:785–6.
- Finnish Dental Association. Recommendations of the Finnish Dental Association. Available at: <https://www.hammaslaakariliitto.fi/en/home/recommendations-finnish-dental-association#.XRXK7zegZPZ> (26 June 2019, date last accessed).
- Finnish Food Authority. Suomalaiset ravitsemussuosituksset (Finnish recommendations for healthy nutrition 2014). Available at: <https://www.ruokavirasto.fi/vrn/ravitsemussuosituksset> (26 June 2019, date last accessed).
- Koivusilta L, Kuoppamäki H, Rimpelä A. Energy drink consumption, health complaints and late bedtime among young adolescents. *Int J Public Health* 2016;61:299–306.
- Ferguson CJ. Everything in moderation: moderate use of screens unassociated with child behavior problems. *Psychiatr Q* 2017;88:797–805.
- Rabe-Hesketh S, Skrondal A. *Multilevel and Longitudinal Modeling Using Stata - Volume II: Categorical Responses, Counts Survival*. College Station, Texas: Stata Press Publication, 2012.
- Lanza ST, Flaherty BP, Collins LM. Latent class and latent transition analysis. In: *Handbook of Psychology*. Hoboken, New Jersey: John Wiley & Sons, Inc., 2003: 663–85.
- McKelvey RD, Zavoina W. A statistical model for the analysis of ordinal level dependent variables. *J Math Sociol* 1975;4:103–20.
- Minkkinen J, Kinnunen JM, Karvonen S, et al. Low schoolwork engagement and schoolwork difficulties predict smoking in adolescence? *Eur J Public Health* 2019;29:44–9.
- Lindfors P, Minkkinen J, Katainen A, Rimpelä A. Do maternal knowledge and paternal knowledge of children's whereabouts buffer differently against alcohol use? A longitudinal study among Finnish boys and girls. *Drug Alcohol Depend* 2019;194:351–7.
- Pakpour AH, Sniehotta FF. Perceived behavioural control and coping planning predict dental brushing behaviour among Iranian adolescents. *J Clin Periodontol* 2012;39:132–7.
- Schwarzer R, Luszczynska A. Self-efficacy, adolescents' risk-taking behaviors, and health. In: Urdañ T, Pajares F, editors. *Self-Efficacy Beliefs of Adolescents*. Greenwich, Connecticut: Information Age Publishing, 2005: 139–59.
- Abbott-Chapman J. Improving the participation of disadvantaged students in post-compulsory education and training: a continuing challenge. In: *Learning and Teaching for the Twenty-First Century: Festschrift for Professor Phillip Hughes*. Heidelberg: Springer, 2007:275–92.
- Ditton H, Bayer M, Wohlking F. Structural and motivational mechanisms of academic achievement: a mediation model of social-background effects on academic achievement. *Br J Sociol* 2018;70:1276–96.
- Moor I, Rathmann K, Lenzi M, et al. Socioeconomic inequalities in adolescent smoking across 35 countries: a multilevel analysis of the role of family, school and peers. *Eur J Public Health* 2015;25:457–63.