

# Health behaviours of school-aged children in Luxembourg

Report on the Luxembourg HBSC Survey 2022

**HEALTH BEHAVIOUR IN SCHOOL-AGED CHILDREN:**  
WORLD HEALTH ORGANIZATION COLLABORATIVE  
CROSS-NATIONAL STUDY (HBSC)



LE GOUVERNEMENT  
DU GRAND-DUCHÉ DE LUXEMBOURG  
Ministère de l'Éducation nationale,  
de l'Enfance et de la Jeunesse



LE GOUVERNEMENT  
DU GRAND-DUCHÉ DE LUXEMBOURG  
Ministère de la Santé  
et de la Sécurité sociale

Direction de la santé



FACULTY OF HUMANITIES,  
EDUCATION AND  
SOCIAL SCIENCES



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Felipe G Mendes  
Joana Lopes Ferreira  
Caroline Residori  
Carolina Catunda

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# Contributors

## Authors

Dr Felipe G Mendes

Postdoctoral researcher, University of Luxembourg

Joana Lopes Ferreira, M.Sc.

Research and development specialist, University of Luxembourg

Dr Caroline Residori

Research and development specialist, University of Luxembourg

Dr Carolina Catunda

Research scientist, University of Luxembourg

## HBSC Luxembourg Team

Dr Romain Brisson

University of Luxembourg

Dr Carolina Catunda

Co-Principal Investigator, University of Luxembourg

Dr Senad Karavdic

*Service de Coordination de la Recherche et de l'Innovation pédagogiques et technologiques (SCRIPT)*

Joana Lopes Ferreira, M.Sc.

University of Luxembourg

Dr Felipe G Mendes

University of Luxembourg

Dr Maud Moinard

Co-Principal Investigator, Ministry of Health and Social Security/Health Directorate

Dr Josepha Nell

Ministry of Education, Children and Youth

Dr Katharina K Pucher

Ministry of Health and Social Security/Health Directorate

Dr Caroline Residori

University of Luxembourg

Prof Dr Robin Samuel

University of Luxembourg

Aurélien Ventujol, M.Sc

*Service de Coordination de la Recherche et de l'Innovation pédagogiques et technologiques (SCRIPT)*

Raoul Wirion, M.A.

Ministry of Education, Children and Youth



# Acknowledgement

The Health Behaviour in School-aged Children (HBSC) study was initiated in 1982 and has been conducted every four years to understand and promote the health and well-being of children and adolescents. Currently, more than 50 countries participate in the international study, Luxembourg being one of them since 2006. By comparing data over many years and across countries, policy makers, teachers, pupils, parents, as well as anyone interested in the health of the growing generation can make informed decisions.

This report on the HBSC 2022 survey was only possible because many people contributed to data collection and processing. We would like to take this opportunity to thank them.

HBSC is an international survey conducted in collaboration with the World Health Organization - Regional Office for Europe. We would like to thank the international coordinator of the 2021/22 survey, Dr Joanna Inchley from the University of Glasgow. Our thanks also go to the database manager, Professor Oddrun Samdal from the University of Bergen, and to Joe Hancock from the International Coordinating Centre in Glasgow, who developed the artwork for this report.

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Finally, we would like to express our appreciation and gratitude to all the children and young people who have consented to and participated in the HBSC Luxembourg study over the years, as well as to their parents. In addition, we would like to thank all the school headmasters and teachers whose cooperation made this study possible.

For the HBSC Luxembourg team:

Dr Carolina Catunda and Dr Maud Moinard (Co-Principal Investigators)



# Summary

## About this report

The present report focusses on the health behaviours results of the HBSC (Health Behaviour in School-aged Children) Luxembourg 2022 survey and includes a total of 7 893 pupils aged 11 to 18. This report provides information about the following health behaviours: breakfast habits, dental care, nutrition, and physical activity, as well as some health outcomes like weight status and body image. It also explores the association between physical activity and health outcomes.

## Breakfast habits

Breakfast is considered one of the most important meals of the day. 45.6% of the adolescents in Luxembourg reported to eat breakfast on all five weekdays and 32.7% reported never eating breakfast during weekdays. Girls skipped breakfast more often than boys. Moreover, the proportion of girls who ate breakfast all weekdays decreased importantly at 13-14 years old, as for boys this marked decrease happens at 15-16 years old. Additionally, adolescents with low family affluence were more likely to skip breakfast on weekdays and less likely to eat breakfast daily.

## Dental care habits

Toothbrushing is an important behaviour for maintaining oral hygiene and it is recommended to toothbrush twice a day. Girls were more likely than boys to brush their teeth at least twice a day (77.8% vs 64.1%, respectively). Moreover, adolescents from high affluence families reported more often to toothbrush at least twice a day than adolescents from low and medium family affluence.

## Nutrition

Healthy eating behaviours are associated with several positive health outcomes during adolescence. 11.5% of the adolescents in Luxembourg reported the consumption of fruits and/or vegetables at most weekly, and by contrast, 24.5% consumed both these aliments at least daily. The consumption of fruits and vegetables did not vary with gender, but it was associated to age. Younger adolescents reported higher prevalence on the consumption of these aliments (11-12 years old: 34.0% vs 13-14 years old: 22.9%; 15-16 years old: 20.2%; 17-18 years old: 20.3%). Moreover, the consumption of fruits and vegetables was associated with family affluence, with those from high family affluence reporting more frequently the consumption of these aliments at least daily.

Regarding sweet consumption, 27.7% of the adolescents in Luxembourg declared a daily consumption of these aliments. Girls were more likely to report its daily consumption than boys (31.1% vs 24.5%, respectively). Younger adolescents presented a higher prevalence of daily sweet consumption (31.9% 11-12 years old vs 23.5% 17-18 years old). Regarding the daily consumption of soft drinks, boys reported it more frequently than girls (25.9% vs 21.4%, respectively). Moreover, this consumption was more prevalent in older boys, with a steep increase between 11-12 years old (19.5%) and 13-14 years old (27.5%). Additionally, the daily consumption of soft drinks was negatively associated with family affluence: the higher the family affluence, the less likely a daily consumption was reported.

## Physical activity

Regular physical activity is a key protective factor for health promotion. This report focusses on two components of physical activity: moderate to vigorous physical activity (MVPA) and vigorous physical activity (VPA). Regarding

MVPA, 15.6% of the adolescents in Luxembourg achieved the WHO recommendation to be physically active daily. However, 5.5% of the adolescents reported that they did not practice MVPA at all on a regular week. Boys were twice more prone to declare a daily MVPA practice. Adolescents aged 11-12 and those from high affluence families were more prevalent to report practicing MVPA in comparison to their older and less affluent peers, respectively. Considering VPA, 57.8% of the pupils reported to have practiced it at least 3 times in a week. Boys were more likely to practice VPA at least 3 times a week than girls (69.6% vs 45.7%, respectively). Moreover, the 11-12 years old were more prevalent to report practicing VPA at least 3 times a week than their counterparts, and girls presented a more pronounced age difference. The prevalence of those practicing VPA at least 3 times a week increased with family affluence (low affluence: 47.4%; medium affluence: 56.6%; high affluence: 68.9%).

### **Weight status and body image**

An unhealthy weight status during childhood and adolescence is associated with adverse health consequences during life. In Luxembourg, the prevalence of adolescents considered to have a normal weight was 67.4%, while 20.8% were considered to be on overweight/obesity and 11.8% as thin. The overweight/obesity prevalence was higher within boys, adolescents from low affluence families and increased with age. Focusing on obesity, 5.7% of the adolescents were considered to be obese. Independently of gender, there was a steep increase in the prevalence of obesity between 13-14 years old (4.2%) and 15-16 years old (6.9%).

Regarding body image, 45.9% of the adolescents in Luxembourg perceived their body as having the right size, while 34.7% thought they were too fat. Body image was related to gender and age. Girls were more likely to report themselves as too fat (girls: 41.7% vs boys: 27.9%), contrasting with boys that felt more often too thin (boys: 22.7% vs girls: 16.0%). In addition, younger boys considered themselves less frequently as too thin, whilst younger girls considered themselves less frequently as too fat.

Concerning the correspondence between weight status and body image, 21.9% of the adolescents in Luxembourg overestimated their weight and 16.7% underestimated it. Girls were around two times more prone to overestimate their weight than boys (30.5% vs 14.3%, respectively), whereas boys underestimated it more frequently (boys: 21.7% vs girls: 11.2%). The prevalence of the overestimation decreased with age, especially for girls, whilst its underestimation increased with age for boys only. Additionally, adolescents from low family affluence overestimated less often their weight.

### **Physical activity and health outcomes**

Physical activity is an important behaviour to adolescents' health and the lack of its practice is often associated with lower well-being and increased weight status. To investigate this association in Luxembourg, four physical activity levels were created based on MVPA and VPA questions: "physically inactive", "low active", "active" and "highly active". These levels were then analysed in relation to adolescents' well-being and weight status. Highly active adolescents presented the highest levels of well-being in all age groups. Additionally, and independently of age, adolescent's well-being decreased with the decrease of the physical activity level. Considering overweight and obesity, there was a negative association between physical activity levels and weight status, after controlling for dietary intake (consumption of fruits, vegetables, soft drinks, and sweets). The less physically active an adolescent is, the higher the chances of being overweight or obese.



## Conclusions et perspectives

The health behaviours, weight status and body image of adolescents in Luxembourg in 2022 were mainly associated with gender, age and family affluence. For instance, girls reported toothbrushing more often, and soft drink consumption less often, whilst boys more frequently ate breakfast regularly and followed the WHO recommendation of physical activity, and less frequently consumed sweets. Concerning weight status, boys presented higher prevalence of overweight/obesity, perceived themselves more frequently as too thin and underestimated their weight status. Girls, on the other hand, presented higher prevalence of thinness, perceived themselves more frequently as too fat and overestimated their actual weight status. Regarding age and family affluence, a clearer pattern emerged. Younger adolescents reported healthier behaviours and better weight status in comparison to their older peers. Adolescents from a low family affluence were more like to report poorer eating behaviours, lower levels of physical activity, less regular breakfast consumption, as well as more frequently being overweight/obese. Moreover, physical activity had an exponential association with higher well-being and lower chances of overweight and obesity. Different initiatives already exist in Luxembourg to promote a general healthier lifestyle. Future strategies should focus on developing or reinforcing programmes targeting the specific subgroups presenting unhealthy profiles.



Health behaviours



## Health behaviours

Physical inactivity, dietary risk and increased body mass index were among the most important risk factors associated to death between 1990 and 2019, when considering all causes worldwide (GBD 2019 Risk Factors Collaborators, 2020). The World Obesity Atlas predicted that the prevalence of obesity among children and adolescents (aged 5–19) in the European Region will increase by 8 percentage points for boys and by 6 percentage points for girls by 2035 (World Obesity Federation, 2022). In Luxembourg, more specifically, the expectation is that between 2020 and 2035 there will be a 2.4% annual increase in the prevalence of children and adolescents' obesity, according to the same publication.

Having healthy behaviours in youth, confers benefits for multiple health outcomes, such as physical fitness, cardiometabolic health, bone health, cognitive and mental health, and reduced adiposity (Bull et al., 2020; World Health Organization, 2022). However, the prevalence of insufficient physical activity decreased for boys and it was stable for girls between 2001 to 2016 (Guthold et al., 2020). This global decrease was also documented in Luxembourg, where over the period 2006–2018, a decrease in the prevalence of youth that exercise at least four times per week (40% to 35%) and an increase in the proportion of adolescents in overweight (14 to 19%) have been observed (Heinz, van Duin, et al., 2020).

It is also noteworthy that health behaviours can have an impact on economic indicators, such as health costs from non-communicable diseases (Forster et al., 2011). Investing in adolescent health and well-being generates benefits now, and it is more likely that these benefits remain during the adult life (Patton et al., 2016).

In 2022, 9432 pupils from 688 classes and 152 schools attending Luxembourg schools responded to an anonymized paper-pencil questionnaire in class, during school hours. The present report includes a total of 7893 pupils aged 11 to 18, attending Luxembourg public and private schools whose teaching is based on the national curriculum<sup>1</sup>. The purpose of this report is to present an overview of the health behaviours and some of their health outcomes of adolescents in Luxembourg in the year 2022. More specifically, this publication focusses on physical activity, eating behaviours, dental care, weight status and body image. This report is part of a series, exploring the HBSC Luxembourg 2022 survey. Other reports explored mental health, the perceived impact of the COVID-19 pandemic and trends between 2006–2022, risk behaviours and the social context. This collection of reports is intended to present an overview of health and health behaviours of adolescents in Luxembourg in the year 2022.

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<sup>1</sup> For more information on the population, please refer to Catunda, Mendes, and Lopes Ferreira (2023).

## Breakfast habits

Breakfast is considered one of the most important meals of the day (Rampersaud et al., 2005). A regular breakfast consumption can have benefits on BMI (Albertson et al., 2007), academic performance (Adolphus et al., 2016; Cohen et al., 2021), dietary quality (Nicklas et al., 2000; Rampersaud et al., 2005), and mental health (Zahedi et al., 2022). Moreover, adolescents that skip breakfast are also more likely to present other unhealthy behaviours (Vereecken et al., 2009).

Adolescents answered to the following question: "How often do you usually have breakfast .... (More than just a glass of milk or fruit juice)?" for both weekdays and weekend, as breakfast habits differ depending on the day. In Table 1 it is possible to observe that 45.6% of the pupils ate breakfast on all five days of the week and 32.7% never ate breakfast during weekdays. In addition, two thirds of the adolescents ate breakfast both days of the weekend and 16.4% never have breakfast during the weekend.

In Luxembourg, the prevalence of adolescents eating breakfast during weekdays is lower in comparison to some of the other countries participating in the HBSC 2022 survey. In Estonia and Scotland, prevalences were above 50% and in Portugal above 60% (Gaspar et al., 2022; Inchley et al., 2023; Paksööt & Oja, 2023). Although it is worth noticing that the age range is smaller in those countries (11 to 16 years old), the Luxembourg prevalence is still smaller when using the same age range (47.3%).

In addition, the prevalence of those eating breakfast on weekdays and weekend was lower when compared to the 2018 HBSC survey (Heinz, Kern, et al., 2020) and is in decline since 2006 (Heinz, van Duin, et al., 2020). This decline, however, is not a Luxembourgish specific phenomenon, in fact it has been reported all over Europe (Lazzeri et al., 2023). Unfortunately this behaviour can persist into adulthood (Pearson et al., 2009).

**Table 1: Breakfast habits response distribution**

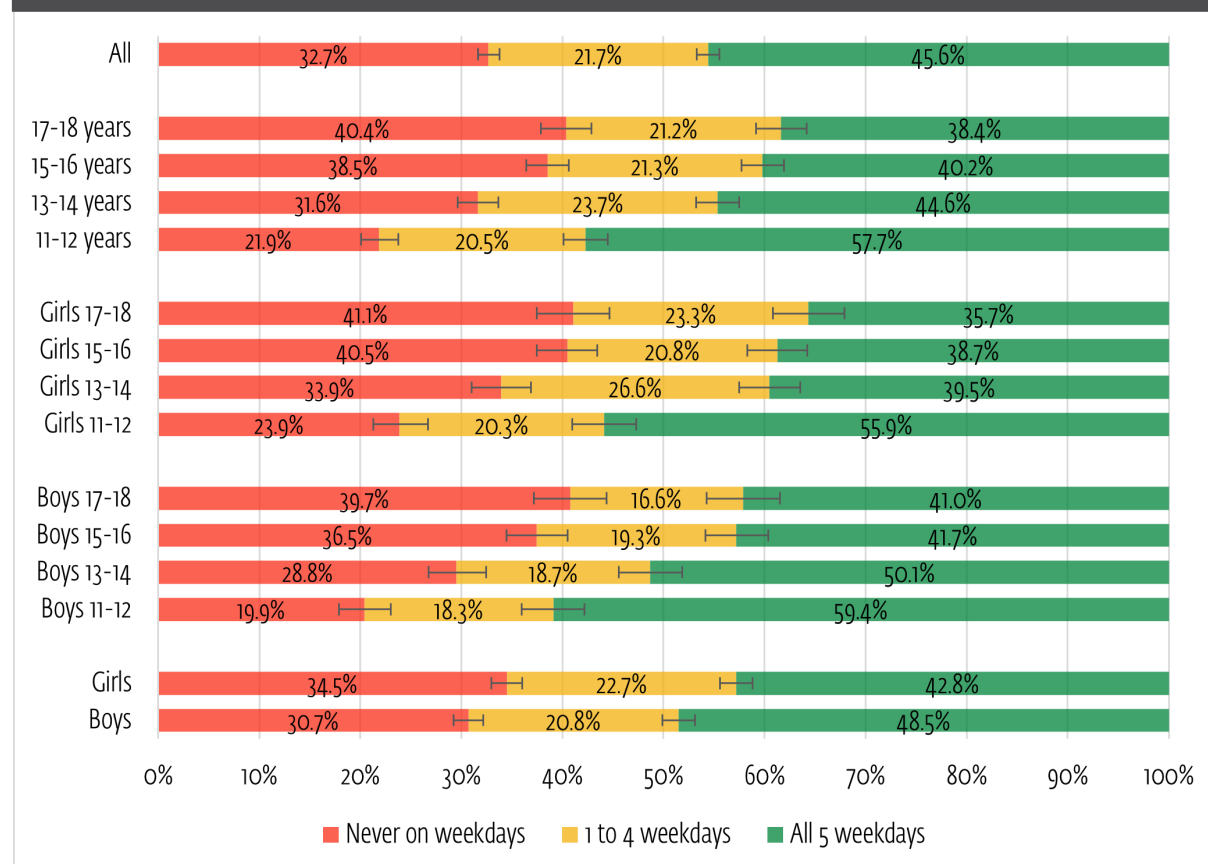
How often do you usually have breakfast...?			
Weekdays		Weekend	
32.7%	I never have breakfast during the week	16.4%	I never have breakfast during the weekend
5.2%	One day	17.1%	Only one day of the weekend
5.6%	Two days	66.5%	On both weekend days
6.2%	Three days		
4.7%	Four days		
45.6%	Five days		

In the following, only breakfast habits on weekdays are analysed, as this indicator better reflects the regularity of breakfast intake, when compared to weekends. The responses, ranging from 1 ("I never have breakfast during the week") to 6 ("five days"), were categorized into: "never on weekdays", "1 to 4 weekdays" and "all 5 weekdays".

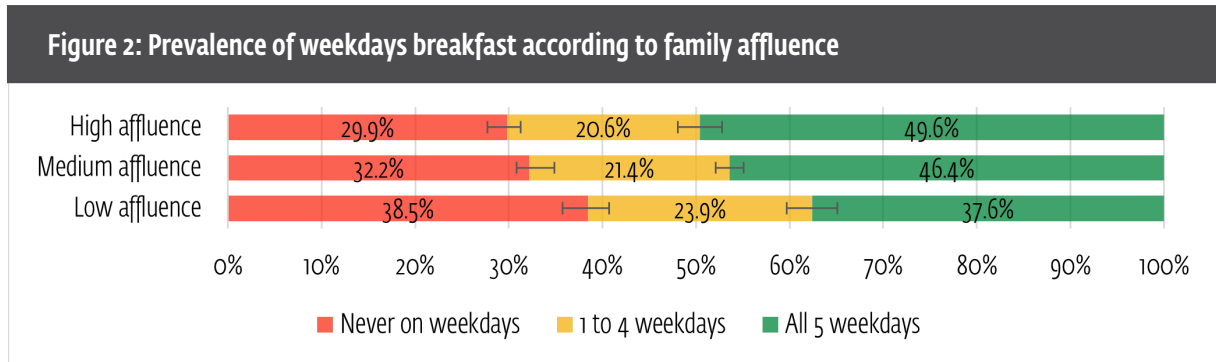
Girls skipped breakfast more often on weekdays than boys (57.2% vs 51.5%, respectively; Figure 1). At an international level, Scotland, Portugal, Austria, and Italy, observed a similar gender pattern (Felder-Puig et al., 2023; Gaspar et al., 2022; Gruppo HBSC-Italia 2022, 2023; Inchley et al., 2023; Page et al., 2023).

In addition, while 57.7% of adolescents aged 11-12 ate breakfast every weekday, they were 44.6% within the 13-14-year-old adolescents, 40.2% within the 15-16-year-old and 38.4% within the 17-18-year-old. This age pattern, however, is slightly different by gender. The proportion of boys having breakfast on all weekdays decreases linearly until 16 years old. For girls, a steep decrease happens between 11-12 and 13-14 and then remains stable as they grow old. Luxembourg follows a similar pattern to Scotland and Italy (Gruppo HBSC-Italia 2022, 2023; Inchley et al., 2023; Page et al., 2023), where younger adolescents ate breakfast more frequently in weekdays, but contrasts to Portugal where older pupils ate breakfast more frequently on weekdays (Gaspar et al., 2022).

Figure 1: Prevalence of weekdays breakfast according to age and gender



Pupils from low family affluence reported less frequently to eat breakfast on every weekday than adolescents from medium or high family affluence. In addition, they also reported never eating breakfast on weekdays more frequently than their peers (Figure 2). This association between breakfast habits and family affluence is similar to other countries in Europe (Lazzeri et al., 2023).



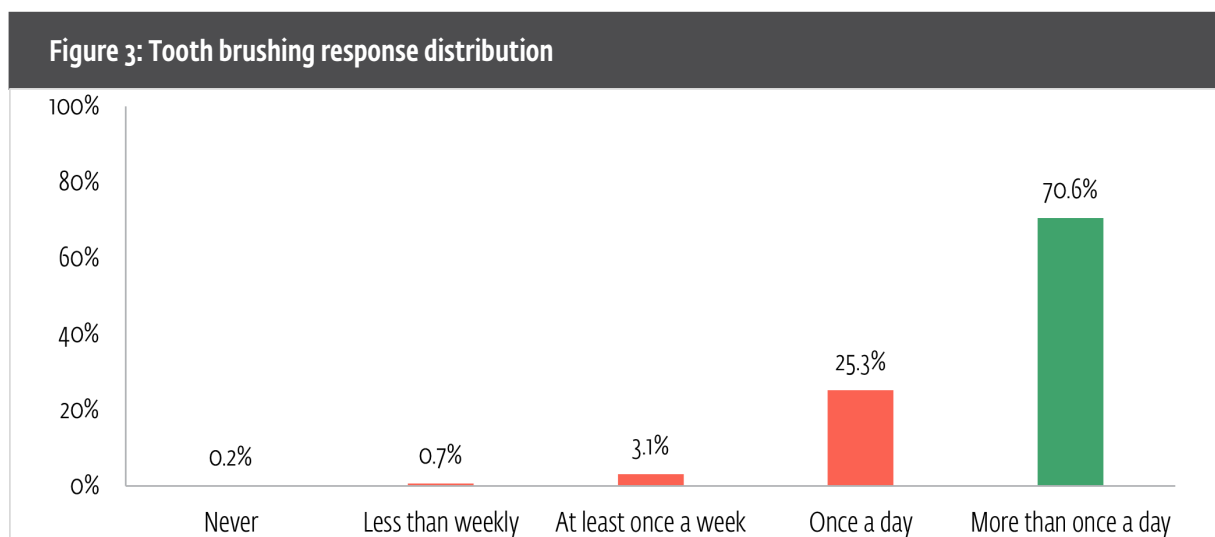
The prevalence of breakfast on weekdays according to migration background, family structure and type of school can be seen in the appendix (Figure 29 and Table 6). Adolescents with no migration background were more likely to eat breakfast on all weekdays, compared with their counterparts. Additionally, those who live with both parents were also more prone to report that they ate breakfast on all weekdays and less likely to report never eating breakfast on weekdays. Considering type of school, adolescents from EF, ESC - *classes inférieures* and ESC - *classes supérieures* were more prone to report eating breakfast all weekdays and, consistently, they reported lower prevalence on never eating breakfast on weekdays. These results may, however, reflect the heterogeneity in school types in terms of age and family affluence (Catunda, Mendes, & Lopes Ferreira, 2023).



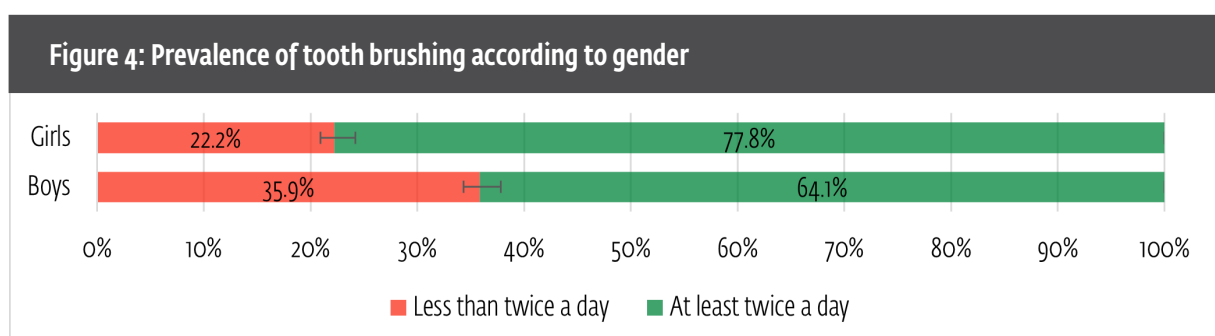
## Dental care habits

Toothbrushing is an important behaviour for maintaining oral hygiene. This behaviour prevent non-communicable diseases, periodontal disease, and dental caries (Löe, 2000; Oliveira et al., 2010) and it can contribute to a better quality of life (Locker et al., 2002). Thus, it is recommended toothbrushing twice a day (Kumar et al., 2016) to maintain dental health.

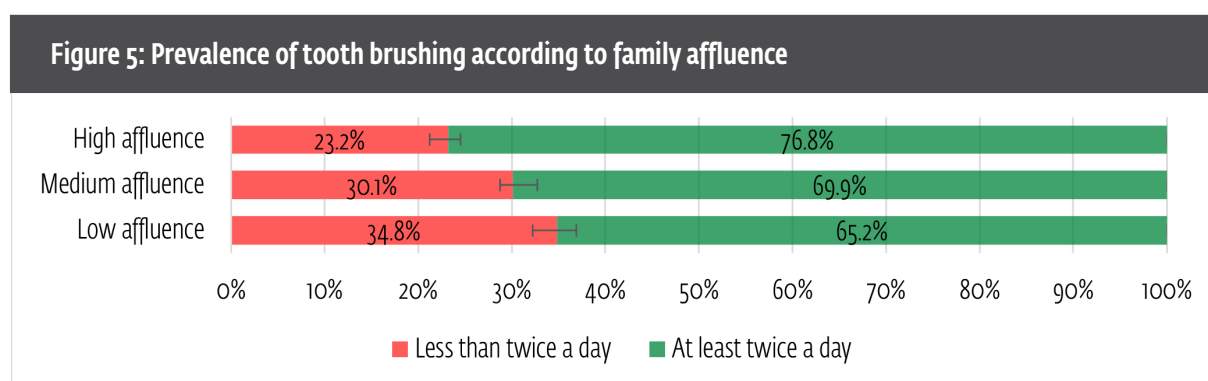
In the HBSC study 2022, adolescents answered the question "How often do you brush your teeth?" on a scale ranging from 1 ("more than once a day") to 5 ("never"). Figure 3 shows that 70.6% of adolescents in Luxembourg brushed their teeth "more than once a day", and one quarter of the participants reported to brush their teeth only once a day.



For further analysis, the answers are combined into two groups: "at least twice a day" versus "less than twice a day". The prevalence of tooth brushing by gender can be found on Figure 4. Results indicate that girls brushed their teeth at least twice a day more frequently than boys (77.8% vs 64.1%, respectively). These results are similar to those found in the 2018 survey: in total, 70% of the adolescents brushed their teeth at least twice a day; 78.0% of the girls and 62.5% of the boys (Heinz, Kern, et al., 2020). A similar gender pattern was also found in Scotland (Inchley et al., 2023).



Dental hygiene is associated with family affluence, as shown in Figure 5, distinguishing adolescents from high family affluence, on one hand, and those from low and medium affluence, on the other hand (i.e., high family affluence: 76.8% vs low family affluence: 65.2% and medium family affluence: 69.9%). This association is similar to the one found in 2018 (Heinz, Kern, et al., 2020).



Age was weakly associated with adolescents' toothbrushing, and this association was observed only among boys. The frequency of boys who brushed their teeth at least twice a day decreased with age. Family structure was only weakly associated with this behaviour, while migration background did not present any significant association with it. The frequency of toothbrushing varied as a function of type of school following the pattern previously presented: adolescents from EF, ESC - *classes inférieures* and ESC - *classes supérieures* were more prone to report this habit at least twice a day (see appendix Figure 30 and in Table 7), although that might be mirroring the results related to family affluence and age (Catunda, Mendes, & Lopes Ferreira, 2023).

## Nutrition

Healthy eating behaviours are related with several positive health outcomes for youth (Wang et al., 2014) and need particular attention, as the behaviours established during that period of life tend to be carried over into adulthood (Craigie et al., 2011). As such, it is recommended that adolescents increase the consumption of fruits and vegetables and decrease the consumption of sweets and soft drinks (World Health Organization, 2015; World Health Organization & FAO of the United Nations, 2005). Accordingly, the WHO suggests a daily consumption of at least 400 grams or five portions of fruits and vegetables (WHO & FAO of the United Nations, 2005). Regarding sweets and soft drinks, the WHO strongly recommends that the energy intake from free sugars should not exceed 10% of the daily energy needs of children and adolescents and, if possible, that this amount should be reduced below 5% (World Health Organization, 2015). Nevertheless, in 2018 almost half of adolescents in Europe did not consume neither fruit nor vegetables daily, and one out of six consumed soft drinks at least once a day, according to the HBSC International Report, including 45 countries and regions (Inchley et al., 2020).

The HBSC study includes items related to the consumption of fruits, vegetables, soft drinks, and sweets. In each case, adolescents were asked to indicate how often they consumed these products on a scale ranging from 1 "never" to 7 "more than once daily". In Luxembourg in 2022, 12.0% of the adolescents didn't eat fruits or vegetables weekly (categories "less than once a week" and "never"; Table 2). These results are similar to the HBSC 2018 survey (Heinz, Kern, et al., 2020), in which 11.7% didn't eat fruits and 12.4% didn't eat vegetables weekly.

**Table 2: Eating behaviours response distribution**

How often do you eat or drink...?	Never	Less than once a week	Once a week	2-4 days a week	5-6 days a week	Once daily	More than once daily
Fruits	3.0%	9.0%	12.0%	28.0%	13.0%	18.0%	17.0%
Vegetables	4.3%	7.7%	9.5%	23.0%	18.6%	20.5%	16.5%
Sweets	2.8%	12.5%	16.5%	27.6%	12.9%	16.9%	10.8%
Soft drinks	9.8%	18.6%	15.2%	21.9%	10.8%	12.3%	11.4%

Regarding the consumption of sweets and soft drinks, the prevalence of those never consuming it or consuming it less than once a week is lower when compared to the previous HBSC survey (Heinz, Kern, et al., 2020). Regarding sweets, they were 18.9% in 2018 and 15.3% in 2022 to have consumed sweets less than once a week or never. Similarly, the prevalence of adolescents who drank soft drinks less than once a week or never was 31.6% in 2018 and 28.4% in 2022 (Heinz, Kern, et al., 2020).

### Fruits and Vegetables

In the following, the items related to the consumption of fruits and vegetables were combined into one variable, distinguishing three categories: "at most weekly", "not daily", and "at least daily" (Table 3). The category "at most weekly" (highlighted in red) corresponds to the adolescents that consumed fruits and/or vegetables at the most once

a week. The category “not daily” (highlighted in yellow) includes those who consumed fruits and vegetables during the week, but not daily. At last, the category “at least daily” (highlighted in green) includes the adolescents who ate both fruits and vegetables at least once or more daily.

Table 3 presents the response distribution of the consumption of fruits and vegetables. The majority of the adolescents (64.0%) reported eating fruits and vegetables during the week, but not daily. The consumption of fruits and vegetables at most weekly was reported by 11.5% adolescents, and by contrast, 24.4% of the adolescents reported to consume it at least daily. The results are thus similar to the ones found in 2018 (63.3%, 11.5% and 25.5%, respectively; Heinz, Kern, et al., 2020).

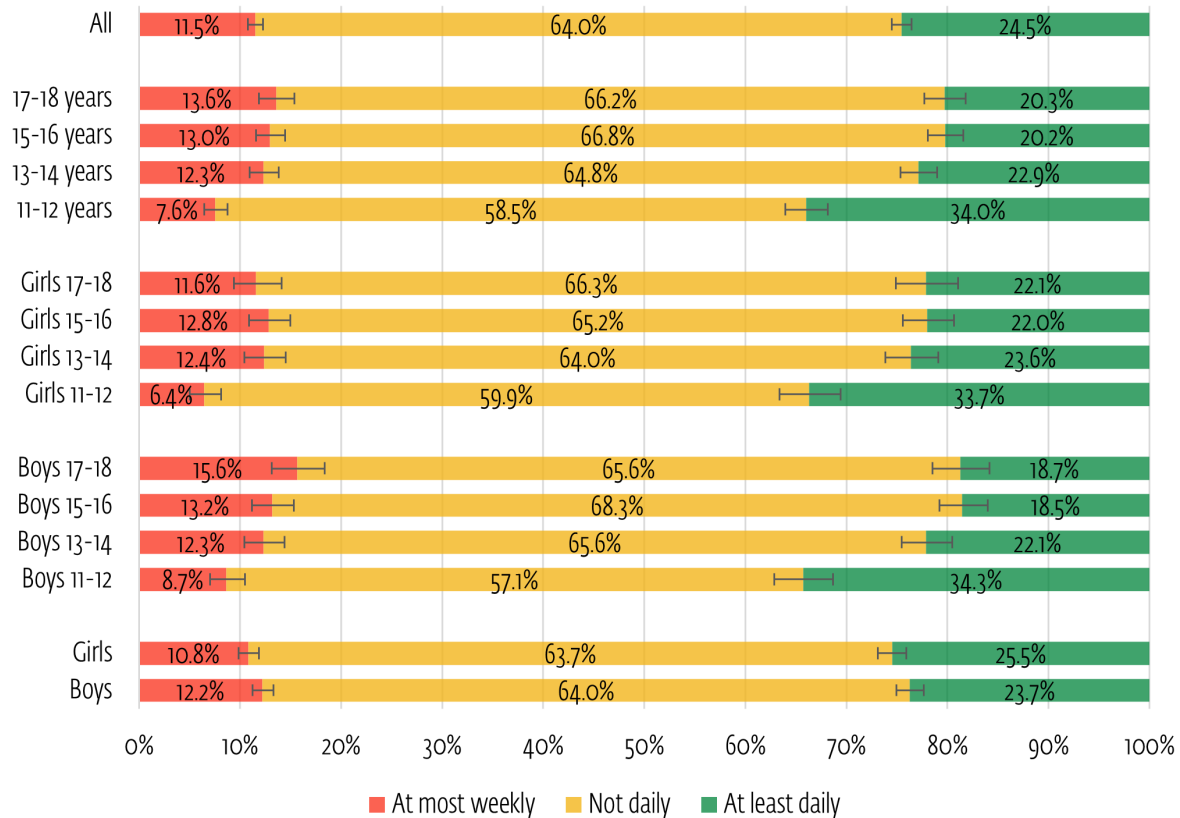
**Table 3: Response distribution of fruits and vegetables consumption**

		Fruits						
		Never	Less than once a week	Once a week	2-4 days a week	5-6 days a week	Once daily	More than once daily
Vegetables	Never	1.2%	1.1%	0.6%	0.6%	0.2%	0.3%	0.3%
	Less than once a week	0.4%	2.1%	1.9%	1.9%	0.4%	0.4%	0.4%
	Once a week	0.3%	1.5%	2.4%	3.5%	0.7%	0.7%	0.5%
	2-4 days a week	0.3%	2.2%	3.7%	9.8%	3.4%	2.2%	1.5%
	5-6 days a week	0.3%	0.9%	1.9%	6.7%	4.7%	2.7%	1.5%
	Once daily	0.2%	0.7%	1.1%	3.4%	2.8%	8.1%	4.2%
	More than once daily	0.2%	0.5%	0.7%	1.9%	1.0%	3.6%	8.5%

Overall and in contrast to the 2018 survey (Heinz, Kern, et al., 2020), the consumption of fruits and vegetables was unrelated to gender. In 2022, 10.8% of the girls reported eating fruits and vegetables at most weekly, compared to 12.2% of boys. With a small increase for girls (10.2% in 2018) and a small decrease for boys (12.5% in 2018), the gender difference is no longer significant.

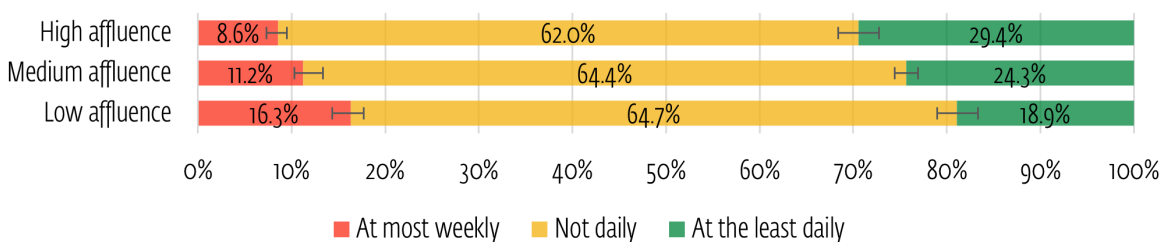
Moreover, the results showed that this consumption was associated with age: the younger the more frequent the consumption of fruits and vegetables (i.e.: 34.0% of 11-12 years old vs 22.9% of 13-14 years old; 20.2% of 15-16 years old; 20.3% of 17-18 years old; Figure 6). Moreover, the prevalence of those who never consumed fruits and vegetables or at most consumed it weekly almost doubled from the 11-12 years old to the other age categories, and that independently of gender. Among other HBSC countries, a similar age pattern in the individual consumption of fruits and vegetables can be observed, as younger adolescents systematically reported a higher consumption of fruits and vegetables (Felder-Puig et al., 2023; Gaspar et al., 2022).

Figure 6: Combination of fruits and vegetables consumption according to age and gender



In Figure 7, the results show that the consumption of fruits and vegetables was also associated to family affluence: the higher the affluence, the most frequent is the consumption of fruits and vegetables (low family affluence: 18.9%; medium family affluence: 24.3%; high family affluence: 29.4%). A similar pattern was found in 2018 (Heinz, Kern, et al., 2020), although from 2018 to 2022, there was a slightly increase in the prevalence of adolescents from low family affluence that reported to never consume fruits and vegetables or to consume it at most weekly (15.6 in 2018 vs 16.3 in 2022; Heinz, Kern, et al., 2020).

Figure 7: Combination of fruits and vegetables consumption according to family affluence



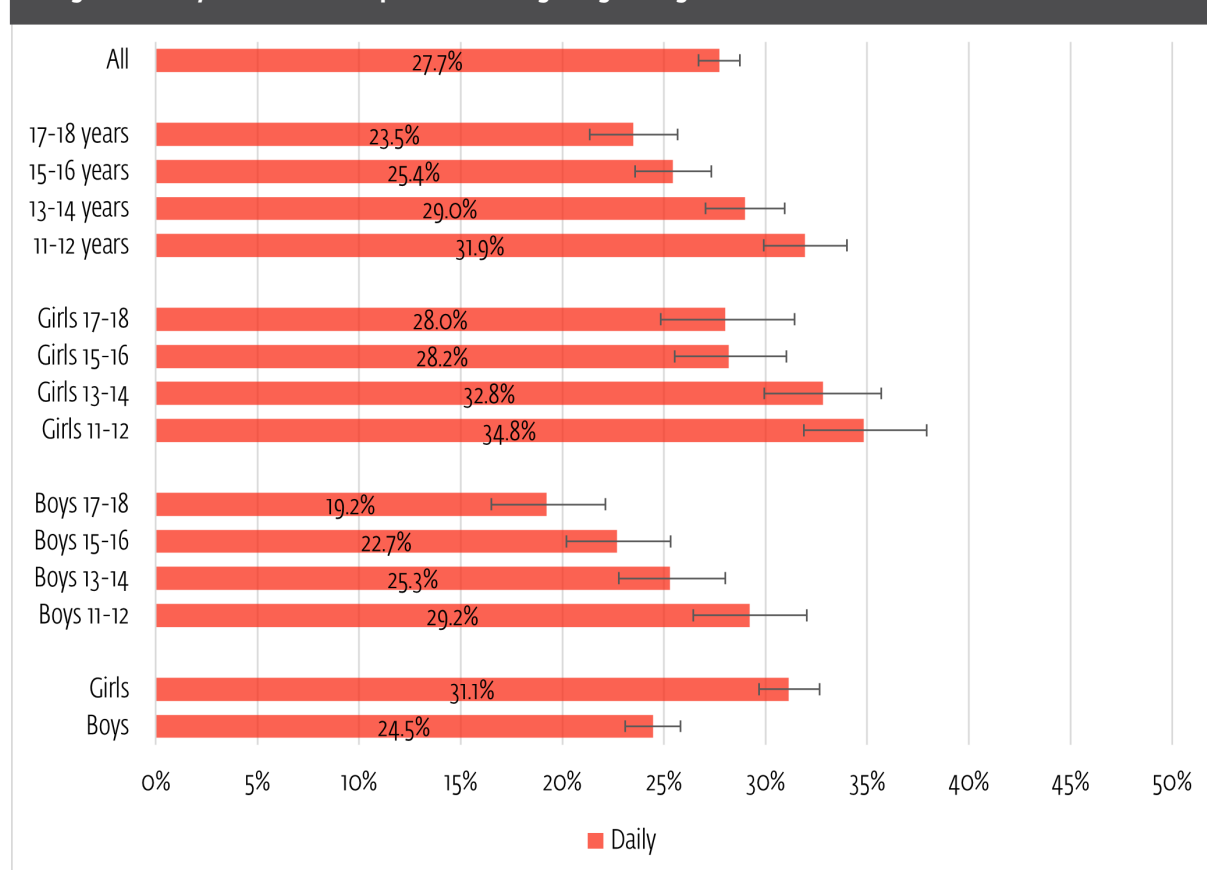
As seen in other health behaviours reported previously, family structure is only weakly associated with the consumption of fruits and vegetables, and migration status was not associated with its consumption. In the same way, pupils from EF, ESC - *classes inférieures* and ESC - *classes supérieures* declared more frequently to eat fruits and vegetables at least daily. In addition, pupils from *Formation Professionnelle* were the ones who reported the least consumption of these products at least daily (see appendix Figure 31 and Table 8).

## Sweets

In what follows, the consumption of sweets was analysed based on three categories: "daily", "one to six days a week", "less than once a week". In general, 27.7% of the adolescents in Luxembourg reported eating sweets daily (Figure 8). Compared to 2018 survey, the number of adolescents that consume sweets daily increased by 2.6 percentage points (27.7% in 2022 vs 25.1% in 2018).

Girls consumed sweets daily to a larger extent than boys (31.1% vs 24.5%, respectively; Figure 8). This association between daily consumption of sweets and gender is similar to other HBSC countries (Felder-Puig et al., 2023; Gaspar et al., 2022; Gruppo HBSC-Italia 2022, 2023), where girls presented higher prevalence of this consumption than boys. Compared to the 2018 survey, the sweet consumption increased by 2 percentage points for boys and by 3 percentage points for girls (in 2018: 22% boys vs 28% girls; Heinz, Kern, et al., 2020). As such, the gender gap continued to increase: from 3 percentage points in 2006 and in 2014 to 6 percentage points in 2018 and 7 percentage points in 2022 (Health Behaviour in School-aged Children Luxembourg Study, 2023).

**Figure 8: Daily sweets consumption according to age and gender**

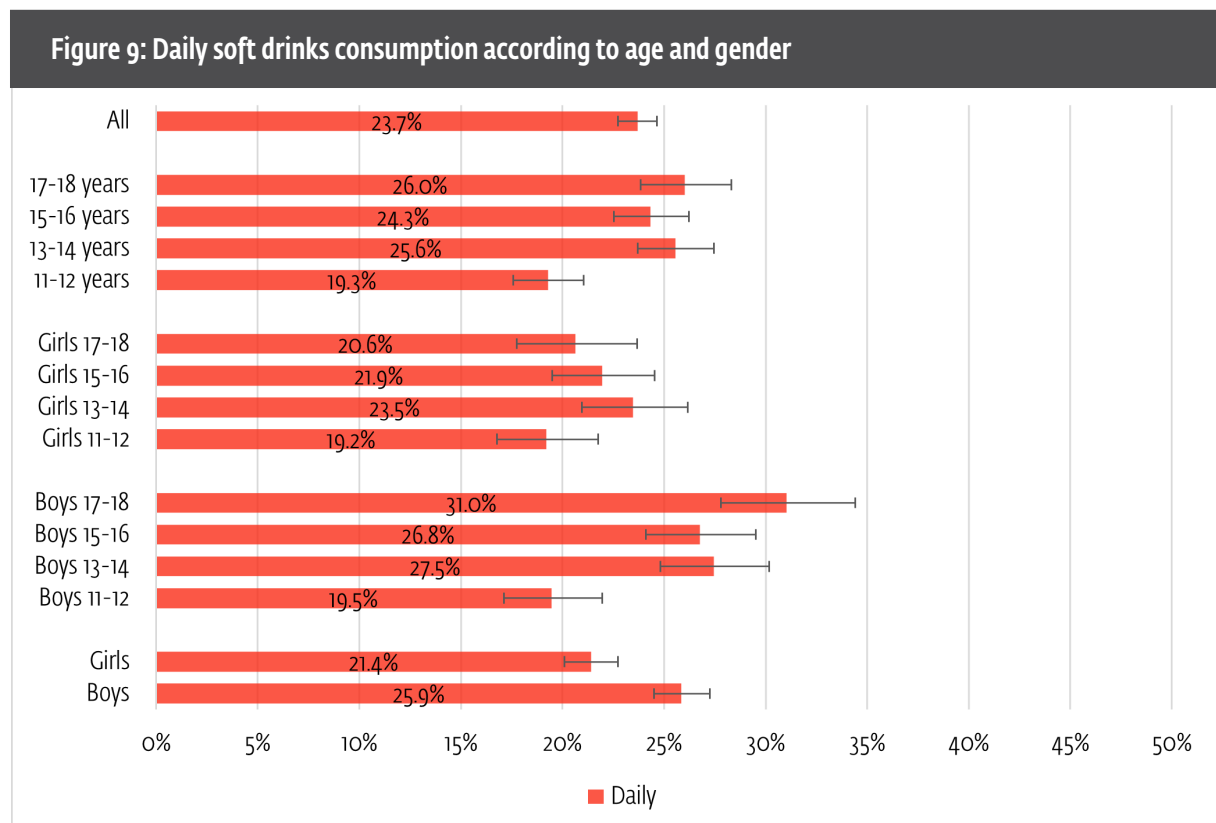


The consumption of sweets was also age-associated: younger adolescents ate more sweets than older adolescents, independently of their gender (31.9% of 11-12 years old vs 23.5% of 17-18 years old; Figure 8). This decrease in the sweets consumption with age was also found in Austria (Felder-Puig et al., 2023), but contrasted with adolescents in Scotland, where no age pattern emerged. Between 2018 and 2022, the increase in the percentage of pupils who consumed sweets daily is more pronounced within the younger groups. In fact, in 2018 at 11-12 years old, 25% of boys and 28% girls consumed sweets daily, compared to 29% and 35%, respectively in 2022 (Health Behaviour in School-aged Children Luxembourg Study, 2023).

Adolescents with no migration background reported more often daily sweet consumption compared with their counterparts (no migration: 32.7%, second generation: 25.4%, first generation: 26.1%). Family affluence was also associated with daily sweet consumption, while family structure was only weakly associated. Considering type of school, daily sweet consumption was more prevalent among the EF, ESG - *voie de préparation*, ESC - *classes inférieures* and ESC - *classes supérieures* (see appendix Figure 32 and Table 9), although the results are mirroring an age effect.

## Soft drinks

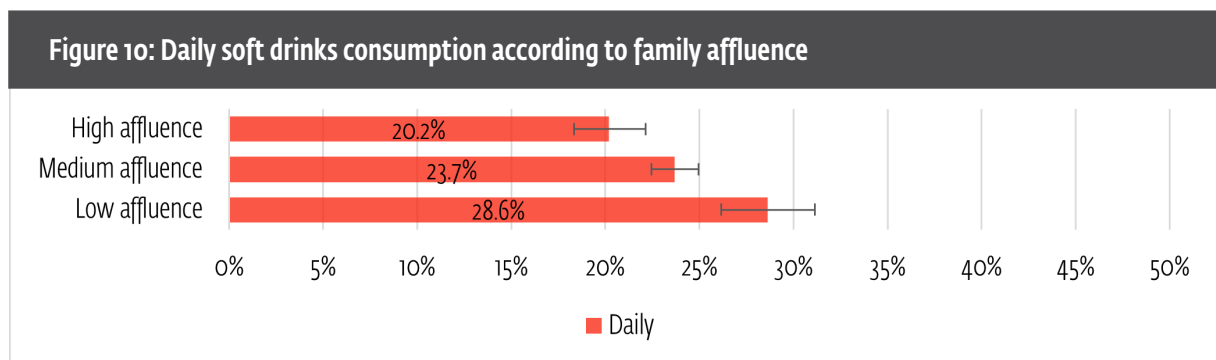
Similarly to sweet consumption, the consumption of soft drinks was also analysed based on three categories: "daily", "one to six days a week", and "less than once a week". In 2022, 23.7% of adolescents in Luxembourg reported a daily consumption of soft drinks (Figure 9). This consumption remained stable compared to the 2018 HBSC Luxembourg data (Heinz, Kern, et al., 2020). The prevalence of soft drink consumption in Luxembourg (23.1% of the adolescents aged 11 to 16) is higher in comparison to peers the same age in Portugal (12.2%) and Scotland (21%; Gaspar et al., 2022; Inchley et al., 2023).



This behaviour was more prevalent in boys (25.9%) than girls (21.4%) and younger pupils were less likely to consume these drinks (19.3% of 11-12 years old vs 25.6% of 13-14 years old; 24.3% of 15-16 years old and 26.0% of 17-18 years old; Figure 9). The same pattern is found in other countries, such as Portugal, Scotland, Italy, and Austria (Felder-Puig et al., 2023; Gaspar et al., 2022; Gruppo HBSC-Italia 2022, 2023; Inchley et al., 2023; Page et al., 2023). It is worth noting, however, that in Luxembourg this increase with age is rather a reflection of boys' consumption, as the consumption of soft drinks is similar for girls in all age groups.

The daily consumption of soft drinks is associated with family affluence (Figure 10). 28.6% of the adolescents of low family affluence reported to drink such beverages daily, against 20.2% of the adolescents of high family affluence. A similar finding was found in Scotland in 2022 (Inchley et al., 2023; Page et al., 2023).

Adolescents living with both parents and frequenting EF and ESC - *classes supérieures* were less prevalent to consume soft drinks less than once a week. By contrast, pupils from ESG - *voie de préparation* and *Formation Professionnelle* were the ones that more frequently consumed soft drinks on a daily basis. Finally, the consumption of soft drinks was not associated to migration background (see appendix Figure 33 and Table 10).





## Physical activity

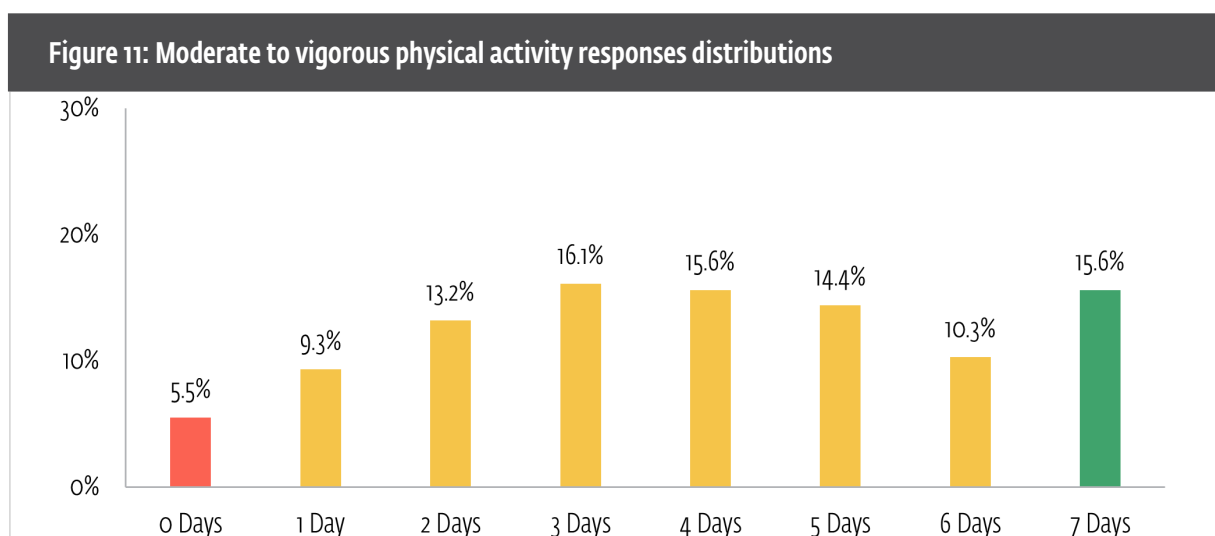
Regular physical activity is a key protective factor for health promotion (World Health Organization, 2018). The benefits for children and adolescents are associated with higher physical fitness and vitality, self-confidence, and a reduced risk of obesity and related diseases (Bull et al., 2020). Physical activity also benefits mental health, including the prevention of symptoms of depression and anxiety, and improves children and adolescents' educational attainment (Ian Janssen & LeBlanc, 2010). Furthermore, patterns of physical activity in adulthood are often established during adolescence, making this stage of life a crucial period for promoting it.

The WHO recognizes the promotion of physical activity as a public health priority and, in 2018, developed the Global Action Plan on Physical Activity 2018–2030 (GAPPA; World Health Organization, 2019). The GAPPA aims to promote physical activity and increase the physically active population globally by 15 percentage points by 2030. The WHO recommends that adolescents (a) do at least an average of 60 minutes per day of moderate-to-vigorous physical activity, mostly aerobic, across the week and (b) incorporate vigorous-intensity aerobic activities that strengthen muscle and bone, at least 3 days a week (Bull et al., 2020).

In the HBSC study, pupils were asked to answer two questions about physical activity. The first question refers to all moderate to vigorous physical activity (MVPA); the second question, to vigorous physical activity done during leisure time (VPA).

### Moderate to vigorous Physical Activity

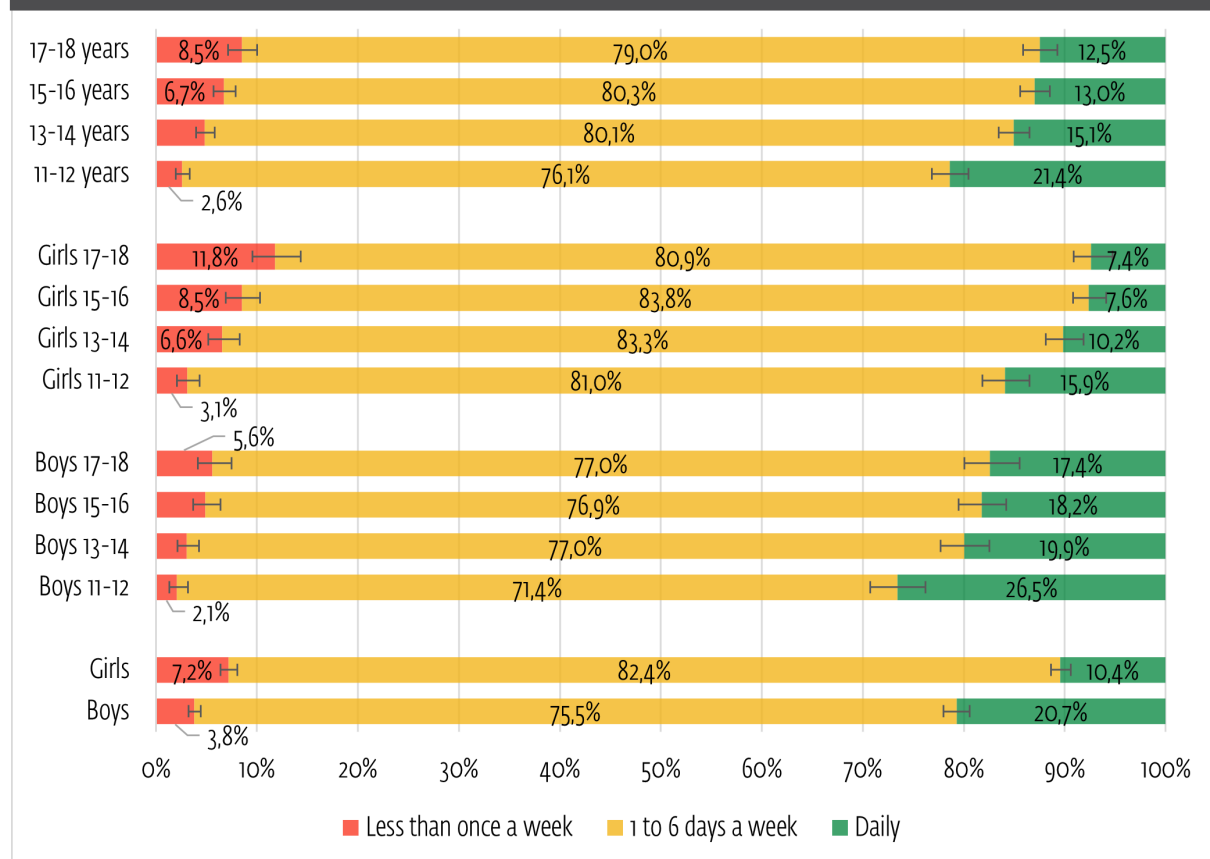
Moderate to Vigorous Physical Activity (MVPA) was measured based on the following item: "over the past seven days, on how many days were you physically active for a total of at least 60 minutes per day." The response options ranged from "0" to "seven days" and were then categorized to distinguish between the adolescents practicing MVPA (a) less than once a week, (b) one to six days a week, and (c) daily (7 days a week, Figure 11).



In total, 5.5% of the pupils did not practice any MVPA during the week and 15.6% complied with the WHO recommendation to be physically active at least 60 minutes per day. Although that marks an increase from 13% in 2018, the prevalence in 2022 is similar to the results found in 2006, in which they were 15% (Heinz, van Duin, et al., 2020). When compared to other HBSC countries and using the same age range (11-to-15 years old), the prevalence of adolescents in Luxembourg meeting the WHO MVPA recommendation is lower than Scotland (23%), but similar to Estonia (16%; Inchley et al., 2023; Paksööt & Oja, 2023).

MVPA was found to be gender-related (Figure 12), as the prevalence of daily MVPA was indeed two times higher in boys than in girls (20.7% vs 10.4%, respectively). Reversely, the prevalence of adolescents practicing MVPA less than once a week was almost two times higher in girls than in boys (7.2% vs 3.8%, respectively). This gender difference is well reported in the literature (Guthold et al., 2020) and similar to other HBSC participating countries in 2022, such as Scotland, Estonia and Sweden (Folkhälsomyndigheten, 2023; Inchley et al., 2023; Paksööt & Oja, 2023). In addition, a Luxembourgish study using an accelerometer also found this gender difference, as they observed that 12.7% of girls and 41.7% of boys met the MVPA guidelines (Melanie Eckelt et al., 2020).

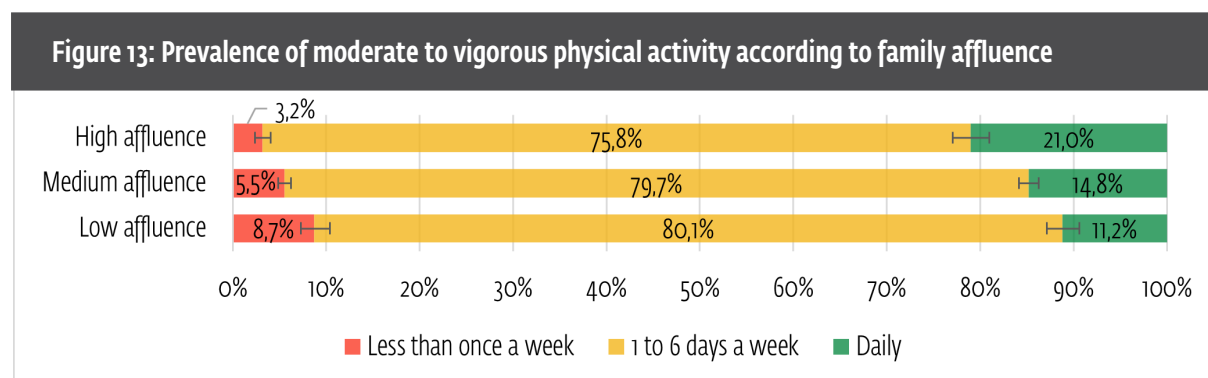
**Figure 12: Prevalence of moderate to vigorous physical activity according to age and gender**



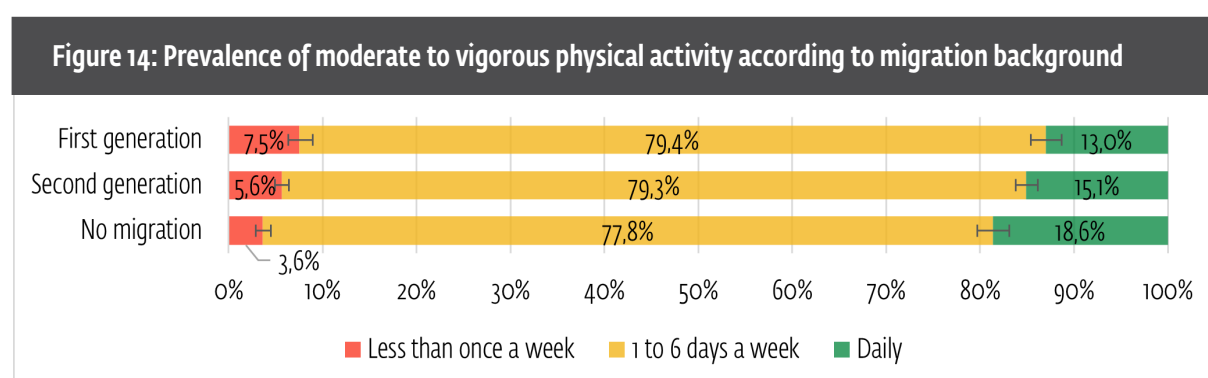
MVPA was also associated with age, with adolescents aged 11-12 more often practicing MVPA (21.4%) than their counterparts (15.1% of 13-14 years old; 13% of 15-16 years old and 12.5% of 17-18 years old). This contrast was larger in

boys than in girls (Figure 12). This association between physical activity, age and gender is consistent worldwide (Guthold et al., 2020).

In Figure 13, MVPA was also associated to family affluence: the higher the affluence, the higher the prevalence of daily practice of MVPA (low affluence: 11.2%; medium affluence: 14.8%; high affluence: 21.0%). This finding is not new and was already reported internationally in 2018 (Inchley et al., 2020).



MVPA was also associated with migration background: although being a first- or a second-generation migrant was not associated with MVPA, we observed differences between adolescents with no migration background (18.6%) and the others (first generation: 15.1%; second generation: 13.0%; Figure 14), although this could also be related to a higher family affluence within those with no migration background (Catunda, Mendes, & Lopes Ferreira, 2023).



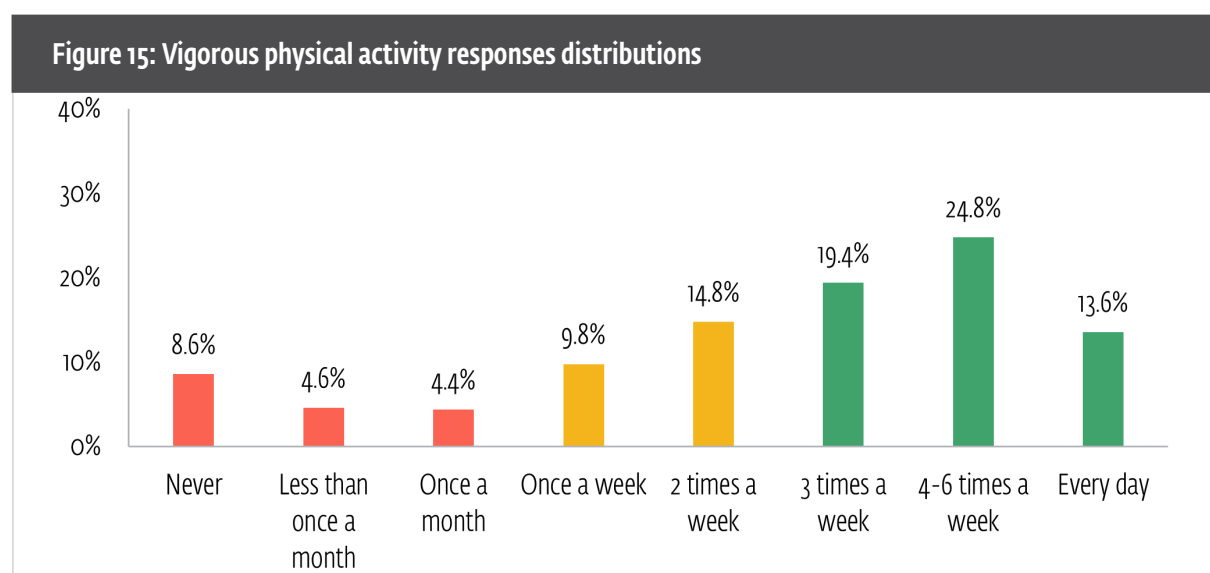
MVPA varied with family structure and type of school, although this association was considered weak (see appendix Figure 34 and Table 11). Adolescents who live with both parents were less likely to only practice MVPA less than once a week. Moreover, pupils in EF reported more often to practice MVPA 7 times per week than their counterparts, although that is likely related to age (them being younger).

## Vigorous physical activity

Vigorous physical activity (VPA) was measured based on the following question: "Outside school hours: how often do you usually exercise in your free time so much that you get out of breath or sweat?" The response options ranged from 1 ("every day") to 8 ("never"). Three categories were then created, distinguishing between the adolescents practicing VPA (a) never to once a month, (b) once a week or 2 times a week, and (c) at least three times a week.

It is worth mentioning that until 2018 this item involved a 1-to-7 rating scale and in 2022 a 1-to-8 rating scale. In both cases, the scale ranged from "every day" to "never", however the 2022 version split the response option "2-3 times a week" into two distinct response options: "3 times a week" and "2 times a week", in order to identify those fulfilling the WHO recommendation for VPA (i.e. to incorporate vigorous-intensity aerobic activities at least 3 days a week; Bull et al., 2020).

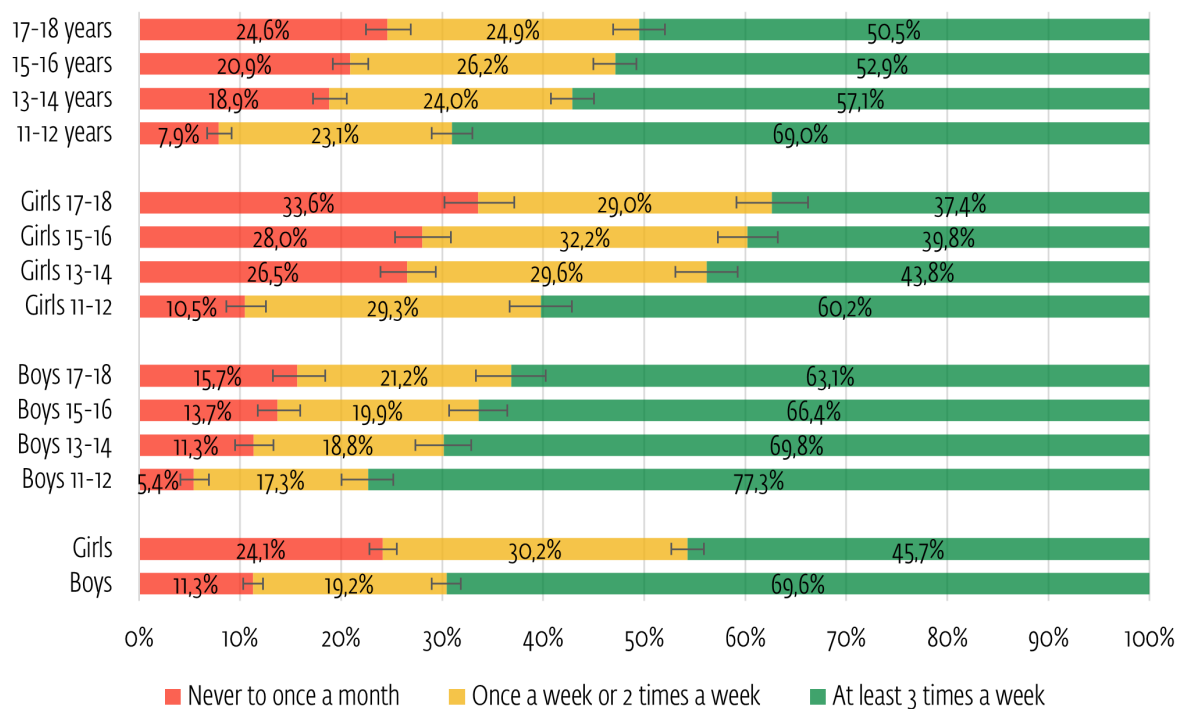
Figure 15 presents the response distribution of VPA. The results showed that 57.8% of the adolescents followed the WHO recommendation and practiced VPA 3 times or more per week. When compared to data from 2018 (Heinz, Kern, et al., 2020), the prevalence of pupils who practiced VPA at least 4 times per week increased. In 2018 they were 31.6% to have practiced it 2 to 3 times a week (compared to 34.2% in 2022), 22.4% to practice it 4 to 6 times a week (compared to 24.8% in 2022) and 12.8% to practice it daily (compared to 13.6% in 2022). Moreover, 17.6% of adolescent did not practice VPA regularly (categories "Never" to "Once a month"), a slight decrease when compared to the 18.1% in 2018 (Heinz, Kern, et al., 2020).



Similarly, to MVPA, boys practiced VPA to a far larger extent than girls (Figure 16). Boys were 69.6% to have practiced VPA at least three times a week, against 45.7% of the girls. This association with gender was also found in other HBSC countries, like Scotland and Italy (Gruppo HBSC-Italia 2022, 2023; Inchley et al., 2023).

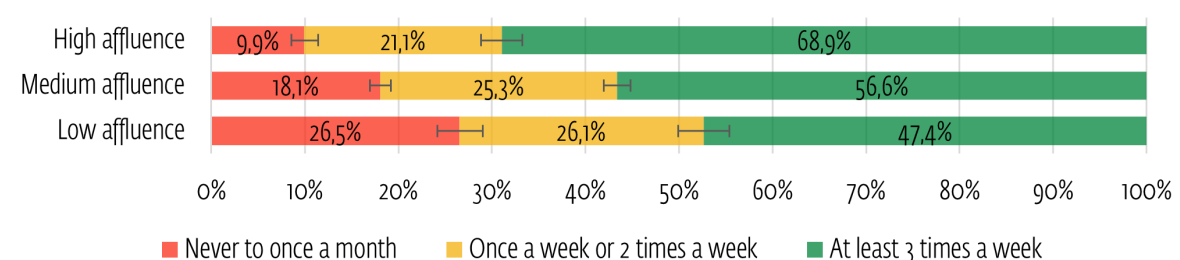
VPA was also associated with age: adolescents aged 11-12 were more prevalent to report practicing VPA 3 times or more than their older counterparts (Figure 16). This pattern was similar in Italy and Scotland (Gruppo HBSC-Italia 2022, 2023; Inchley et al., 2023). In Luxembourg, this age differences are more pronounced for girls than for boys.

**Figure 16: Prevalence of vigorous physical activity according to age and gender**



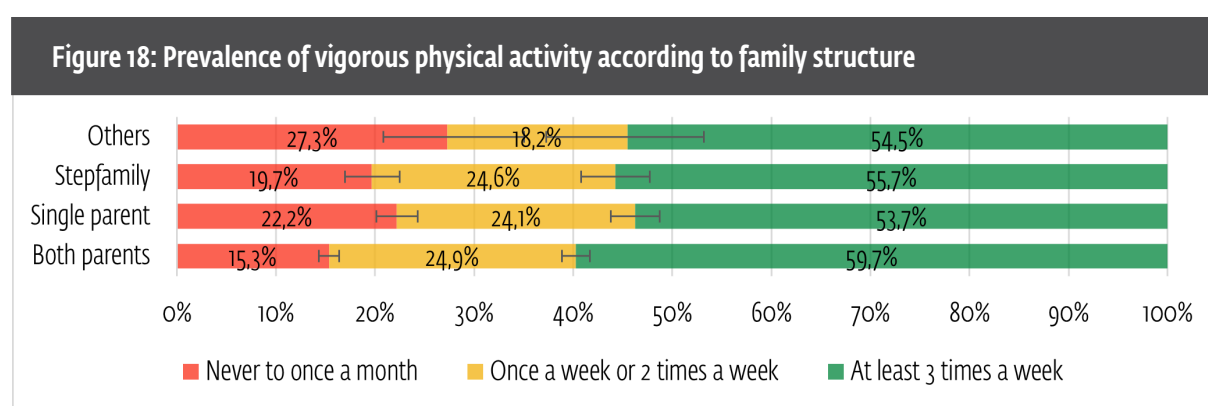
VPA was also highly associated with family affluence: the higher the affluence, the higher the prevalence of adolescents who practiced VPA at least three times a week (i.e., low affluence: 47.4%; medium affluence: 56.6%; high affluence: 68.9%). This pattern is inverted for the prevalence of adolescents who reported practicing VPA never to once a month (Figure 17).

**Figure 17: Prevalence of vigorous physical activity according to family affluence**



VPA was also associated with migration background. For instance, 23.1% of first-generation migrant adolescents reported to practice VPA never to once a month, against 11.3% of adolescents with no migration background (Figure 35 and Table 12 in the appendix). This pattern, however, might be related to its association to family affluence (Catunda, Mendes, & Lopes Ferreira, 2023).

Family structure also played a role in VPA. Results showed that living with both parents was associated with a more frequent VPA than other types of family structure. Living with a single or within a stepfamily was unrelated to the periodicity of VPA (Figure 18).



VPA varied with type of school (Figure 35 and Table 12 in the appendix). As in previous results, pupils from EF, ESC - *classes inférieures* and ESC *classes supérieures* reported more frequently to practice VPA 3 times or more per week and, conversely, they presented lower prevalence on the category "never to once a month". These results, however, may reflect the influence of age and family affluence.

## Weight status and body image

For children and adolescents, an unhealthy weight status, such as underweight, overweight, or obesity is associated with adverse health consequences during life (GBD 2019 Risk Factors Collaborators, 2020; World Health Organization, 2023). Obesity is currently considered as an increasing worldwide public health crisis (Abarca-Gómez et al., 2017; World Health Organization, 2022, 2023) affecting low-, middle- and high-income countries (Ayala-Marín et al., 2020; World Obesity Federation, 2022). In Luxembourg, 37% of adults could be obese by 2035, with an annual increase of 2.4% in child and adolescent obesity between 2020 and 2035. However, Luxembourg is well ranked in terms of its relative preparedness to tackle obesity among all countries, being in the 23<sup>rd</sup> position globally (World Obesity Federation, 2022).

Body image is how individuals perceive and think about their body. The perception of body weight can explain the association between mental well-being and overweight/obesity (Fisman et al., 2022). Due to adolescence being a crucial transitional period of life, body image can be associated with obesity, eating disorders and physical activity (Fisman et al., 2022; Gaddad et al., 2018).

### Weight status

Weight status was based on the Body Mass Index (BMI) of the adolescents. To determine BMI, pupils were asked two questions: "How much do you weigh without clothes?" and "How tall are you without shoes?" With this information, the BMI was calculated and divided into 7 categories (Thinness Grade 3; Thinness Grade 2; Thinness Grade 1; Normal Weight; Overweight; Obesity and Morbid Obesity) based on the cut-off values of the International Obesity Task Force (IOTF), according to age and gender (Cole & Lobstein, 2012).

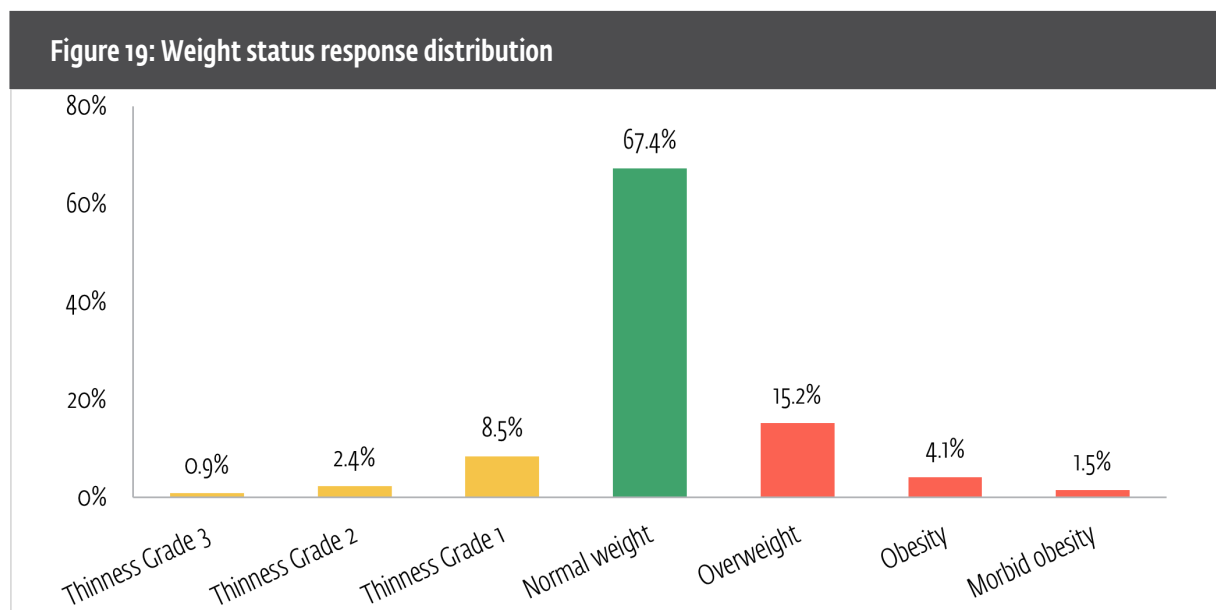


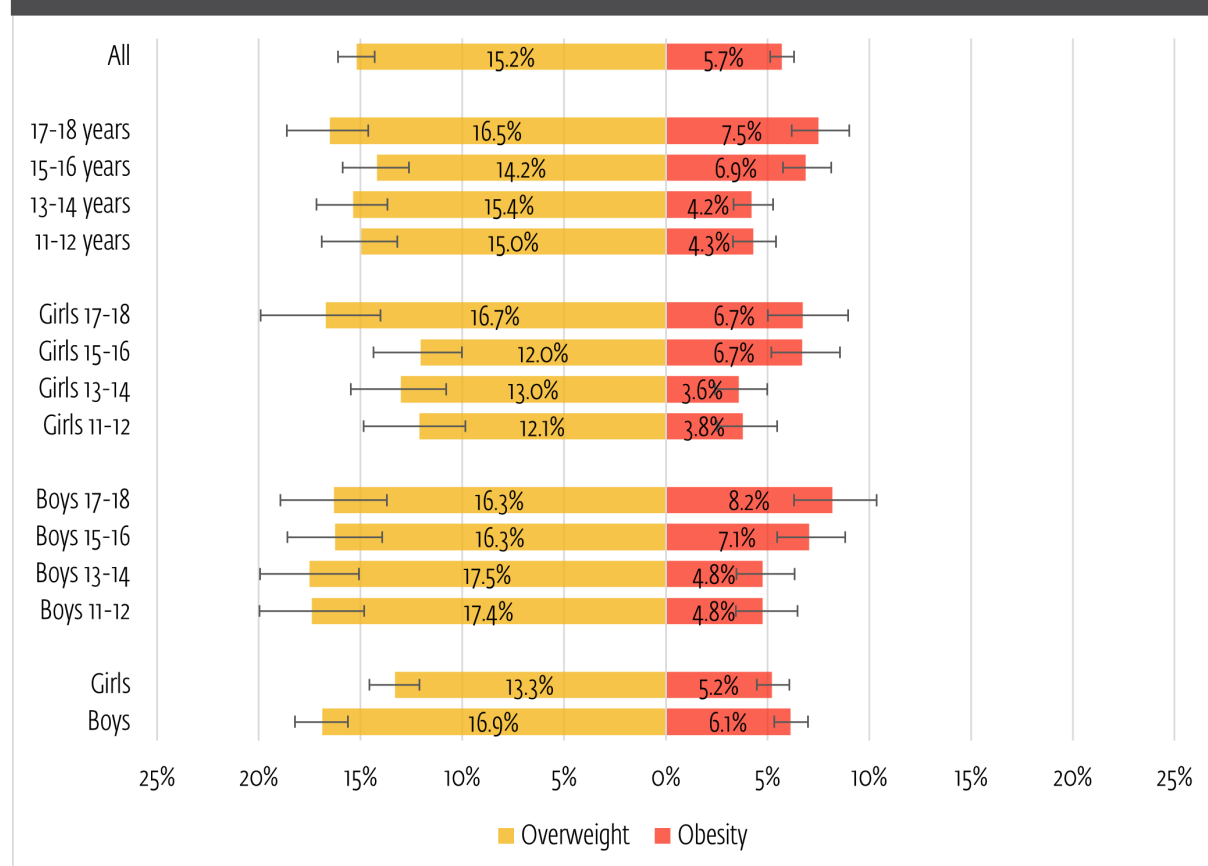
Figure 19 presents the prevalence of weight status in Luxembourg. Most adolescents (67.4%) were considered to have normal weight, while 20.8% were in overweight/obesity/morbid obesity and 11.8% thinness (grades 1, 2 or 3). In 2018,

they were 69% with a normal weight (Heinz, Kern, et al., 2020). Besides, the prevalence of overweight (14.8% in 2018 vs 15.2% in 2022), obesity (3.4% in 2018 vs 4.1% in 2022) and morbid obesity (0.7% in 2018 vs 1.5% in 2022) increased, a pattern present in other countries around the globe (World Obesity Federation, 2022).

In what follows, for the analyses by sociodemographic characteristics, adolescents were categorized into three groups: "thinness" (including "Thinness Grades 1 to 3"), "normal weight" and "overweight/obese" (including "overweight, obesity, morbid obesity").

Figure 20 shows that the prevalence of overweight/obesity is higher among boys than girls (23.0% vs 18.5%, respectively). Regarding age and gender, the prevalence of thinness decreases with age for both boys and girls, with a steeper decrease between 11-12 years old and 13-14 years old, especially for girls (19.5% of 11-12 years old vs 12.1% of 13-14 years old; Figure 36 in the appendix). In contrast, the increase of overweight/obesity for girls was more pronounced after 13-14 years old (16.6% vs 18.7% of 15-16 years old and 23.4% of 17-18 years old; Figure 37 in the appendix). Similarly in Italy, boys also presented higher prevalence in overweight/obesity than girls (Gruppo HBSC-Italia 2022, 2023).

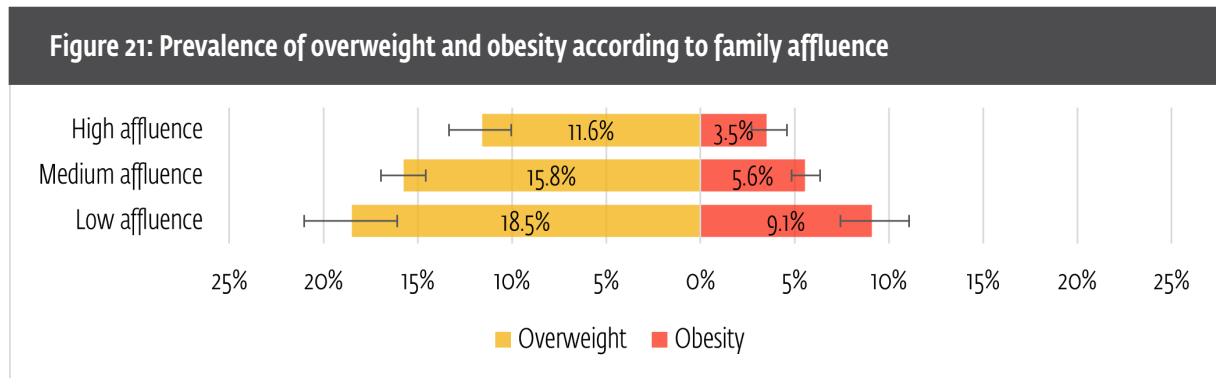
**Figure 20: Prevalence of overweight and obesity according to age and gender**



Overweight/obesity was associated with family affluence (Figure 21). Adolescents from families with low affluence (27.6%) were almost twice more in overweight/obesity than those from high affluence (15.1%). It is worth noting that



this family affluence gap already existed in 2018, but increased 3 percentage points since then (9.2% vs 12.5%, respectively; Heinz, Kern, et al., 2020), due to an increase in the proportion of overweight/obese adolescents from a low family affluence (2018: 24.3% vs 2022: 27.6%). The association between family affluence and overweight or obesity was also found in other HBSC countries in 2018 (Inchley et al., 2020).



Weight status varied with type of school, migration background and family structure (Figure 36 and Table 13 in the appendix). These results, however, may reflect the influence of other sociodemographic indicators, such as age and family affluence (Catunda, Mendes, & Lopes Ferreira, 2023).

### Body image

In the 2022 HBSC survey, adolescents were asked about their body image with the following question "Do you think you are...?". The response categories were "much too thin", "a little too thin", "about the right size", "a little too fat" and "much too fat". Figure 22 shows that 45.9% of the adolescents thought that they were about right, 34.7% thought that they were too fat, and 19.4% considered themselves to be too thin. Compared to 2018 (Heinz, Kern, et al., 2020), the prevalence of those who think they are "a bit too thin" and "much too fat" increased in 2022 (respectively 13.2% and 5.1% in 2018 vs 15.6% and 6.8% in 2022).

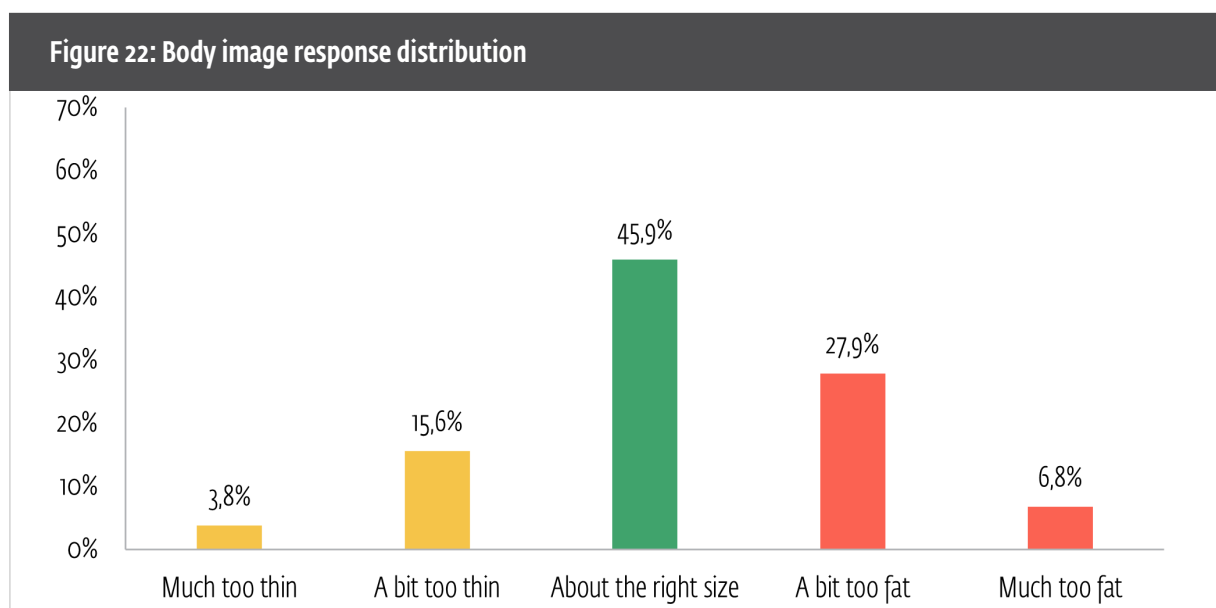
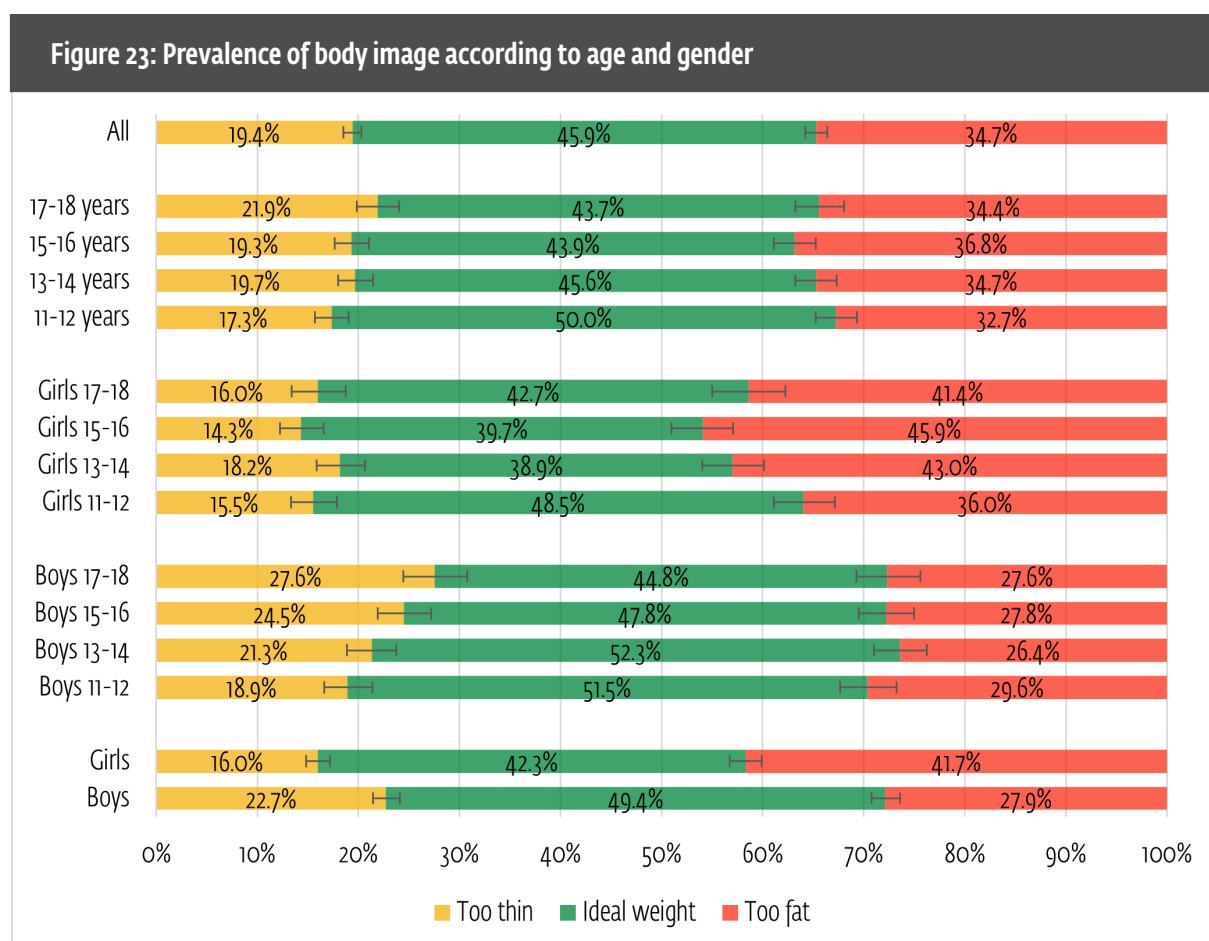


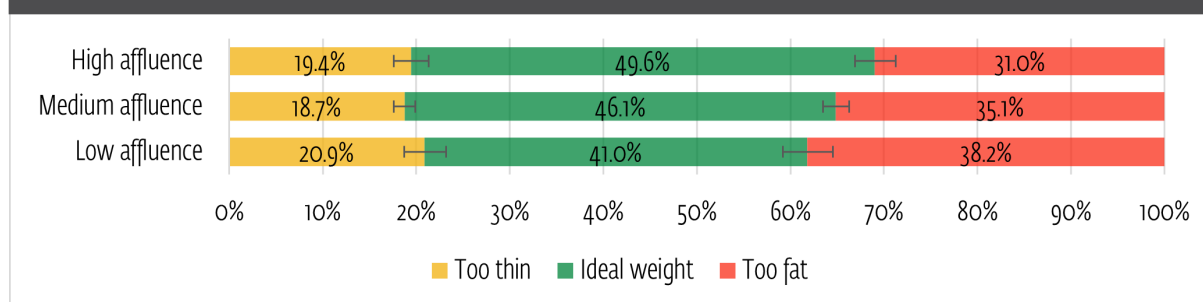
Figure 23 presents the prevalence of body image according to age and gender, using three categories "too thin" (including "much too thin" and "a bit too thin"), "ideal weight" (about the right size), "too fat" (including "a bit too fat" and "much too fat").



Body image was related to gender. Girls were more likely to report themselves as too fat (41.7% vs 27.9%), while boys thought about themselves more often as too thin (22.7% vs 16.0%, Figure 23). Additionally, results showed an increase with age in the prevalence of girls who thought they were too fat (36.0% of 11-12 years old vs 41.4% of 17-18 years old), while for boys the increase is related to being too thin (18.9% of 11-12 years old vs 27.6% of 17-18 years old). For both boys and girls aged 17-18, however, the proportion of those who thought they were too thin increased compared to the 2018 survey (20.6% of boys and 9.8% of girls in 2018; Heinz, Kern, et al., 2020).

The results also presented an association between body image and family affluence (Figure 24). Adolescents with low affluence were more likely to consider themselves as too fat, compared to their peers from high family affluence (38.2% low affluence vs 31.0% high affluence). In 2018, there was no association between family affluence and body weight's perception (Heinz, Kern, et al., 2020).

**Figure 24: Prevalence of body image according to family affluence**



Body image varied with type of school, migration background and family structure (Figure 38 and Table 14 in the appendix). First generation migrant adolescents considered themselves more frequently as too thin, while second generation migrants were more likely to feel too fat. Considering family structure and type of school, the results may be a consequence of other sociodemographic factors, such as age and family affluence.

### Correspondence between weight status and body image

The following results reflect the correspondence between weight status and body image, with three categories: "underestimated", "correct estimated" and "overestimated" their weight status. More precisely, the category "underestimated" includes adolescents who perceived themselves as thinner than their actual weight status; the category "correct estimated" includes those who correctly estimated their weight status and; "overestimated" includes those who considered themselves heavier than their actual weight status (Table 4). Most of the adolescents in Luxembourg correctly assessed their weight status (61.3%), while 21.9% overestimated it and 16.7% underestimated it. Since 2018, the percentage of adolescents underestimating their weight has increased from 13.9% to 16.7%, while the percentage of adolescents who correctly estimated and overestimated their weight decreased (from 63.6% to 61.3%, and from 22.5% to 21.9%, respectively; Heinz, Kern, et al., 2020). These results follow the trends pattern found in 41 European countries between 2002 and 2018 (Geraets et al., 2023), in which an increase of underestimation and a decrease of overestimation was also found.

**Table 4: Correspondence between weight status and body image (total percentage)**

		Actual weight status according to BMI classification		
		Overweight	Normal weight	Underweight
Body image	Too thin	0.2%	12.2%	6.9%
	Ideal weight	4.3%	38.0%	4.2%
	Too fat	16.4%	17.1%	0.6%

Figure 25 presents the prevalence of the weight status and body image correspondence according to age and gender. Girls were two times more prone to overestimate their weight compared to boys (30.5% vs 14.3%, respectively). Boys, in contrast, more often underestimated their weight status (21.7% vs 11.2% girls). This assessment was also age dependent. The prevalence of an overestimation decreased with the age for both boys and girls (e.g.: 32.4% 11-12

years old vs 24.8% 17-18 years old girls). The underestimation, however, increased with age more markedly for boys (15.4% 11-12 years old vs 25.1% 17-18 years old). These results are, in general, similar to the ones found in 2018 (Heinz, Kern, et al., 2020).

**Figure 25: Prevalence of the correspondence between weight status and body image according to age and gender**

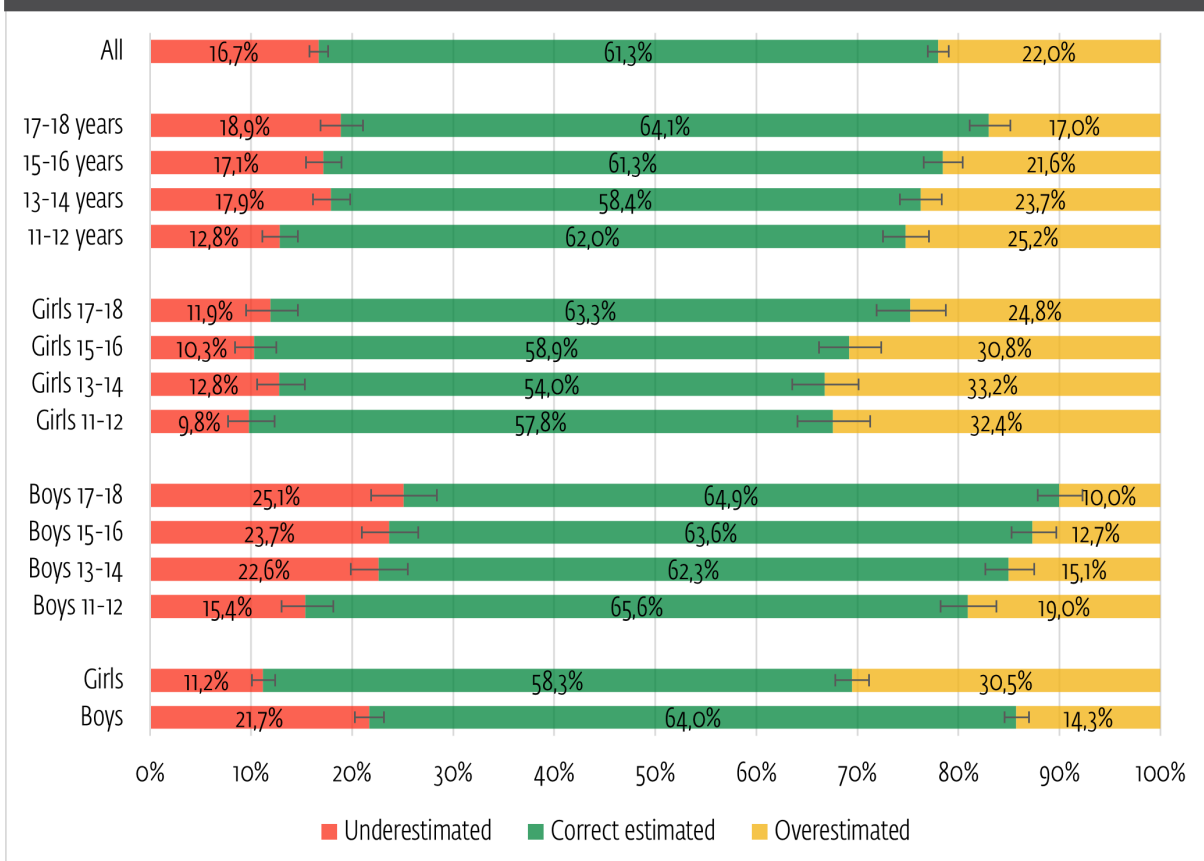
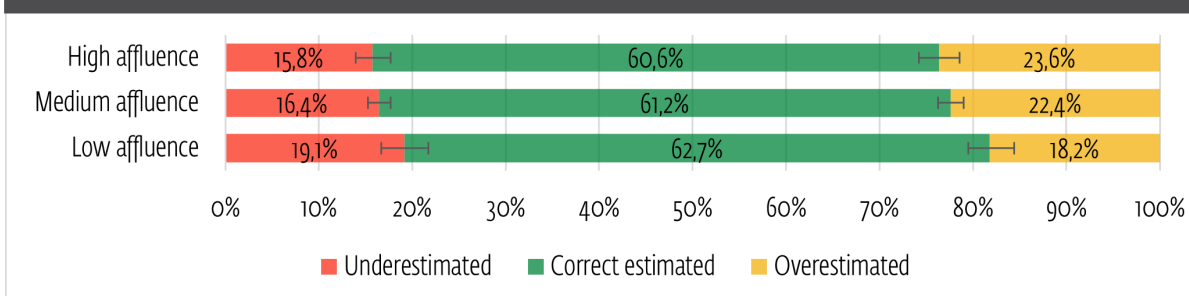


Figure 26 presents the association between family affluence and body perception's correspondence. Adolescents from low affluence families overestimated their weight status to a lesser extent than their counterparts (18.2% low family affluence vs 23.6% high family affluence). In 2018, a similar association between family affluence and body perception's correspondence was found in many European countries (Inchley et al., 2020).

**Figure 26: Prevalence of the correspondence between weight status and body image according to family affluence**



The correspondence between weight status and body image was also associated with migration background. Adolescents with no migration background overestimated more frequently their body weight status, while an underestimation was more frequently reported by adolescents with first migration background. Moreover, the correspondence between weight status and body image varied with type of school. However, this association may reflect the influence of age and family affluence. Finally, no significant pattern was found in relation to family structure (see appendix Figure 39 and Table 15).

# Physical activity and health outcomes

## Introduction

Physical activity is a key behaviour of youth health (World Health Organization, 2019), and the lack of physical activity is more likely to cluster with other unhealthy behaviours (Uddin et al., 2020). In addition, a physically active lifestyle during adolescence is important for health and wellbeing throughout the lifespan (van Sluijs et al., 2021).

Nevertheless, the prevalence of obesity (World Health Organization, 2022) and the presence of mental health problems (Castelpietra et al., 2022) affecting young people continues to increase. When boosted by physical inactivity, their impact on morbidity and mortality is even higher (van Sluijs et al., 2021). Sociodemographic disparities are also an important component of this pathway (Castelpietra et al., 2022; World Health Organization, 2022), and as such subgroup analysis are needed to improve interventions to the target population.

In the present section, we aim to analyse the relationship between physical activity and health outcomes in adolescents in Luxembourg. More specifically, we aim to: a) compare the mean well-being by physical activity levels and age groups and; b) better understand the relation between physical activity levels and overweight/obesity, controlling for dietary intake.

## Method

### *Dependent variables*

**Well-being.** The WHO-5 Well-Being Index is a five-item measure of subjective well-being. Each item relies on a 0-to-5 rating scale. Here, we used a sum score ranging from 0 to 25.

**Weight status.** Overweight and obese individuals were identified based on the thresholds developed by the International Obesity Task Force (Cole & Lobstein, 2012).

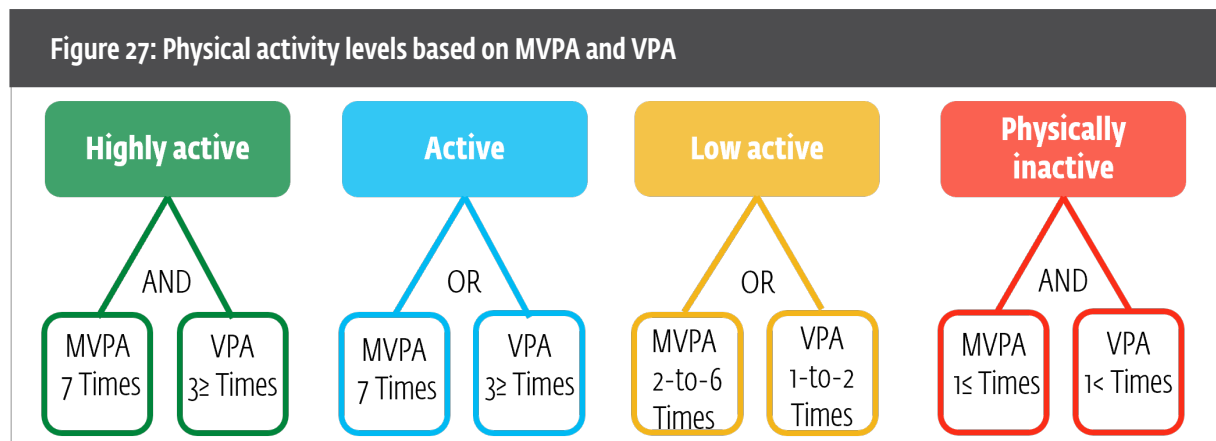
### *Independent variables*

**Age.** Four age groups were created: 11-12, 13-14, 15-16, and 17-18 years old.

**Physical activity.** Four levels of physical activity were created based on two items measuring moderate-to-vigorous physical activity (MVPA) and vigorous physical activity (VPA). As it is shown in Figure 27:

- the category "physically inactive" includes adolescents practicing (a) MVPA less than two days a week and (b) VPA less than once a week;
- the category "low active" includes adolescents practicing (a) MVPA between two to six days a week and (b) VPA once or twice a week;

- the category “active” includes adolescents practicing (a) MVPA every day or (b) VPA at least three times a week and;
- the category “highly active” includes adolescents practicing (a) MVPA every day and (b) VPA at least three times a week.



The category “highly active”, including both VPA and MVPA, is the closest possible to the WHO recommendation of physical activity for youth that includes both (a) an average of 60 minutes per day of moderate-to-vigorous intensity physical activity and; (b) vigorous-intensity aerobic activities, at least 3 days a week (Bull et al., 2020).

Consumption of fruits, vegetables, soft drinks, and sweets were used as control variables, as weight gain is related to energy unbalanced diet (Jebeile et al., 2022). For each variable, we distinguished between adolescents consuming the corresponding product less than daily (coded 0) and at least daily (coded 1).

#### Statistical analyses

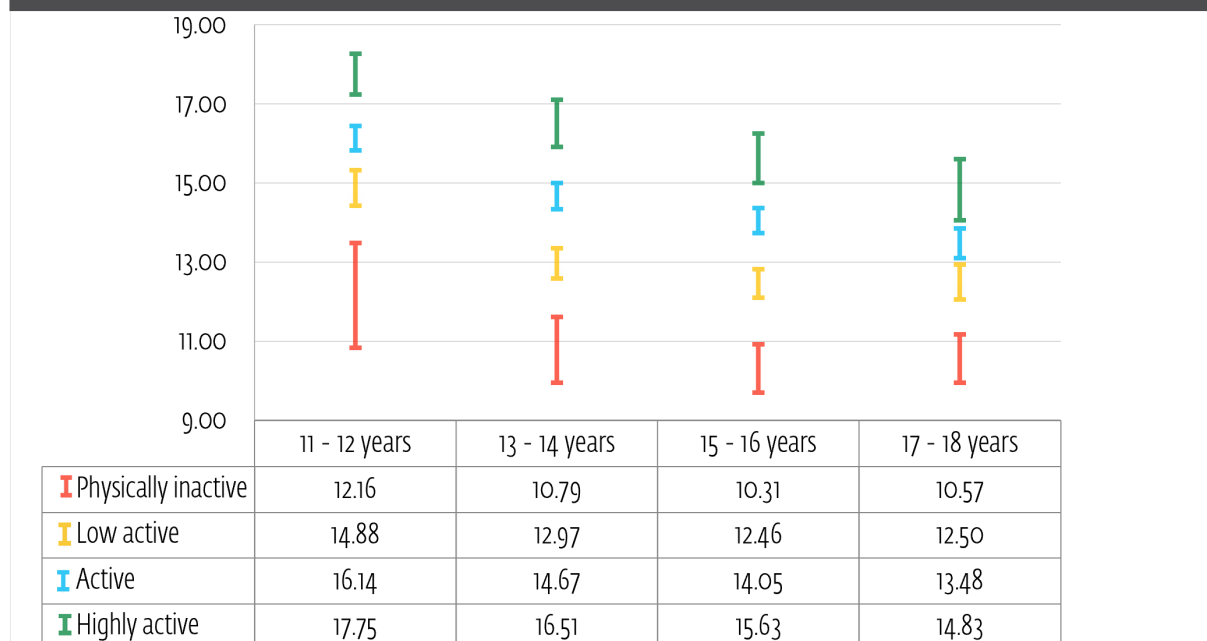
A two-way analysis of variance (ANOVA) with pairwise comparisons was performed to assess the differences between the mean values of well-being by physical activity levels and age groups. Binary logistic regressions were performed to estimate the predictive power of physical activity on overweight and obesity adjusting by the daily consumption of the fruits, vegetables, soft drinks, and sweets. The level of statistical significance for all the tests was .05.

#### Results and discussion

Figure 28 presents the means and confidence intervals of well-being by physical activity levels and age groups. The higher the level of physical activity, the higher the level of well-being and that irrespective of age ( $p \leq .05$ ). Highly active adolescents presented the highest levels of well-being ( $M_{11-12y0} = 17.75$ , 95% CI [17.24-18.27];  $M_{13-14y0} = 16.51$ , 95% CI [15.92-17.10];  $M_{15-16y0} = 15.63$ , 95% CI [15.00-16.25];  $M_{17-18y0} = 14.83$ , 95% CI [14.06-15.60]; appendix Table 16). Followed by the active adolescents, then those considered as low active and finally the physically inactive adolescents. It is worth noting that despite the fact that well-being decreases with age (Catunda, Mendes, Lopes Ferreira, & Residori,

2023), 17-18 years old adolescents who were highly active had better well-being than their 11-12 years old peers who were physically inactive.

**Figure 28: Well-being mean score according to levels of physical activity and age groups**



For adolescents, the positive consequences of physical activity in maintaining a good health and well-being are well established in the literature (van Sluijs et al., 2021). The benefits of physical activity on health outcomes can be attributed to the improvement on metabolic (i.e., fitness, healthy body weight) and human development aspects (i.e., coordination and movement control; van Sluijs et al., 2021). Our results corroborate the literature, highlighting the importance of incorporating physical activity behaviour at all ages.

Furthermore, physical activity begins to be understood from a holistic perspective. The voluntary act of moving happens within a specific space and context, influenced by the local culture and reflective of individual's interests, emotions, and relationships (Piggin, 2020). With this perspective in mind, and in light of our results, it is important to engage in physical activity, independently of the time spent on it. Subsequently, being present in a healthy environment, where others practice such activities, might naturally motivate one's to gradually increase their level of physical activity (Bull et al., 2020).

In addition to comparing the levels of well-being by physical activity, we also aimed to better understand the relation between physical activity levels and overweight/obesity, controlling for dietary intake. As shown in Table 5, the less physically active an adolescent is, the higher the odds of being overweight or obese. In fact, the odds of being overweight and obese are respectively 2.2 and 6.8 times higher in adolescents who are physically inactive, compared to those who are highly active.



**Table 5: Associations between levels of physical activity and weight status (overweight and obesity), controlling for dietary intake**

	Overweight		Obesity	
	OR (95% CI)	<i>p</i>	OR (95% CI)	<i>p</i>
Level of physical activity				
Active	1.51 (1.21-1.89)	< .001	2.73 (1.55-4.81)	< .001
Low active	2.07 (1.64-2.61)	< .001	5.19 (2.95-9.16)	< .001
Physically inactive	2.19 (1.64-2.93)	< .001	6.81 (3.68-12.59)	< .001

Notes. The reported results are adjusted for fruit, vegetable, soft drink, and sweet (daily) consumption<sup>2</sup>. "Highly active" was the reference group. "OR" means "Odds Ratio".

This association between physical activity and weight status have already been observed in Europe (World Health Organization. Regional Office for Europe, 2016) and in countries with different income classifications around the world (Mahumud et al., 2021). The results from this report are important to establish the magnitude of the association between physical activity and overweight/obesity in Luxembourg.

Similar to other European countries, where a longitudinal association between weight status and MVPA levels during 6 years of follow-up was observed (Sprengeler et al., 2021), the lower the levels of physical activity practiced by adolescents in Luxembourg, the highest the probability to be overweight/obese. Indeed, the pathway to obesity includes unhealthy behaviours, such as physical inactivity (World Health Organization, 2022), and as importantly the persistence of those unhealthy behaviours. Furthermore, it is important to mention that obesity is not only related to eating behaviours and physical activity, but also with other factors, such as genetics, sedentary behaviour, social context and physical environment (World Health Organization, 2022). Accordingly, in order to better understand this problem, more comprehensive research should be encouraged in the country.

<sup>2</sup> In Table 17 (see appendix) detailed information about dietary intake is presented. However, the interpretation of the association between dietary intake and overweight/obesity needs caution, as overweight individuals can under-report unhealthy food intake, especially sweets consumption (Garaulet et al., 2000; Janssen et al., 2005). This negative association between sweets daily consumption and overweight/obesity was found in previous studies in Luxembourg (Residori 2019), in other European countries, and in Canada (Janssen et al., 2005).



## Conclusions and perspectives

This report on the Luxembourg HBSC survey 2022 presented an overview of the health behaviours and health outcomes of school-aged children in Luxembourg. It explored breakfast habits, dental care, nutrition, physical activity, weight status and body image. First, we examined the association between each health behaviour and sociodemographic characteristics. In addition, the relationship between physical activity and well-being, as well as obesity/overweight was analysed.

In general, health behaviours varied according to family affluence, age, and gender. All the health behaviours had an association with family affluence, mostly in favour of those from a higher family affluence. Adolescents from low family affluence had lower prevalence of healthy eating behaviours, such as daily consumption of breakfast, fruits and vegetables, in addition to having a higher consumption of soft drinks and being more often physically inactive. The prevalence of overweight/obese adolescents is also higher within those from a lower affluence family background. Adolescents from a high family affluence, however, consume more often sweets. In relation to age, data indicated that younger adolescents reported healthier behaviours, with the exception of daily sweet consumption, which decreases with age.

Gender also presented associations with health behaviours, but they were not systematic, and its direction varied. Girls presented healthier behaviours in dental care and soft drink consumption. In contrast, boys had a higher frequency of eating breakfast, practicing physical activities, and lower frequency of sweet consumption. Girls also reported more frequently to brush their teeth at least twice a day and were less often overweight/obese. Despite this, girls were more likely than boys to perceive themselves as overweight, revealing a gender-associated trend in body image, with girls often considering themselves too fat while boys tended to feel too thin.

One in five adolescents in Luxembourg was considered to have an unhealthy weight status and this problem increased since 2018 (Heinz, Kern, et al., 2020). Obesity is a public health problem worldwide (World Health Organization, 2023), related to a complex interaction between individual, social, and environmental factors (World Health Organization, 2022).

Physical activity presented a relationship with well-being and obesity/overweight. Adolescents reporting any physical activity level presented higher well-being and lower probability to be obese/overweight than the physically inactive in Luxembourg. Moreover, the more adolescents practiced physical activity, the higher were their levels of well-being and lower were the chances of them being overweight and obese. These results reinforce that some physical activity is better than none, and that its benefit increase according with the time/frequency/intensity of physical activity. Thus, physically inactive adolescents should start practicing physical activity in a lower level and gradually increase it afterwards.

In order to reduce levels of physical inactivity and sedentary behaviour, the Global Action Plan on Physical Activity 2018–2030 (GAPPA, WHO, 2019) suggests that countries need to propose a combination of recommended policy solutions to promote physical activity based on:

- Active societies (raise awareness for the health, social, economic and environmental co-benefits of regular physical activity; promote mass events in public spaces in order to make available experiences of physical activities that can reach vulnerable groups).
- Active environments (reinforce travelling by foot, cycling and other forms of mobility including wheels, as well as safe places to do it).
- Active people (reinforce good-quality physical education in all the educational settings with the purpose of creating more positive experiences of physical activity; promote physical activities outside school hours through various contexts, such as, in nature, community centres, recreation and sport facilities).
- Active systems (multisectoral engagement and leadership to support physical activity implementations; monitoring policy and programmes with national data and reporting on policy implementation; strengthen the national and institutional research for effective policy solutions; develop innovative finance mechanisms).

More recently, in order to decrease obesity in the world, World health Organization created the “WHO acceleration plan to stop obesity” (World Health Organization, 2023). A document that aims to guide and to development country-level actions to decrease the obesity in the world based on five workstreams: evidence-based, impactful and cost-effective actions; delivery for impact; global advocacy; engaging partners and; accountability.

In Luxembourg, some initiatives to reduce levels of physical inactivity in adolescents, to promote better eating behaviours and decrease obesity already exist.

In the [Spliffest](#), organized by *Comité Olympique et Sportif Luxembourgeois* (COSL), children and adolescents have the chance to try out a range of sports.

The [Nuit du Sport](#), organized by the *Service National de la Jeunesse* and the Ministry of Sport, aims to promote the practice of new sports as well as healthier behaviours among children and adolescents in their community.

The [Gesond iessen, Mëi beweegen](#) exists since 2006. This pioneer program aims to promote regular physical activity and balanced diet and to demote obesity and sedentary lifestyle in Luxembourg, especially for children and adolescents. In 2018, the program was renewed until 2025 by the Ministry of Sport, the Ministry of Education, Children and Youth and the Ministry of Health and Social Security.

In this perspective, our results contribute with information that could guide future actions. More specifically, either by developing or reinforcing programmes targeting specific subgroups presenting different unhealthy profiles.

For instance, existing programmes aiming to enhance the consumption of a healthy balanced diet should be reinforced targeting adolescents from a low affluent background, who systematically presented unhealthier behaviours. The evaluation of existing programmes, and more specifically, of the effectiveness of actions aimed at disadvantaged groups, should be a priority. Such evaluations would permit the reinforcement of those that reached its goals and understand its points of weakness and strength, in order to orient future interventions (Pettman et al., 2012).

Furthermore, alongside programmes that aim to promote physical activity, the development of interventions to specifically demote physical inactivity are also necessary. Girls, more frequently than boys, reported never practising any kind of physical activity. Girls also presented a systematically worse mental health and well-being when compared to their peers (Catunda, Mendes, Lopes Ferreira, & Residori, 2023). Knowing that physical inactivity was shown to be associated with unfavourable consequences, such as obesity/overweight and worse well-being in this report, interventions aiming specifically at reducing physical inactivity could also have a positive impact in enhancing their mental health. For instance, the Physical Activity 4 Everyone (PA4E1) programme, implemented and evaluated in ten Australian secondary schools, included, among others, a component targeting the engagement of pupils with low activity levels, by modifying school policies (van Sluijs et al., 2021). After 2 years, in schools participating in this very comprehensive school-based physical activity programme, pupils were still engaging in an additional 7 min of physical activity per day, showing its efficacy in both changing and maintaining a positive behaviour. In addition to modifying schools' policies, this program also implemented strategies to enhance physical education lessons, after school community sport and fitness programmes, and parental engagement, between others.

When bringing attention to boys, our results show that although they reported more frequently to practise physical activity, and have somewhat similar eating behaviour than girls, they were also more frequently overweight and obese. Unfortunately, the HBSC 2022 study has not measured sedentary behaviour, that could be part of an explanation. It is important to note that physical activity and sedentary behaviours are not the opposite of each other (Thivel et al., 2018). Individuals can attain the physical activity levels recommended and still devote a significant amount of their time to sedentary activities. A systematic review has shown that the balance between physical activity, sleep quality and sedentary behaviour is fundamental for the health and mental health of adolescents (Ekelund et al., 2016; Sampasa-Kanyinga et al., 2020). More specifically, high levels of physical activity only attenuate the increased risk sedentary behaviours had in depressive symptoms and other mental health problems. Therefore, in addition to stimulating physical activity, breaking sedentary behaviours seems as important to enhance the health of adolescents.

In sum, in order to improve positive health behaviours during adolescence, it is necessary to engage not only the concerned individuals, but also the social environment, communities, and policy makers. This engagement will contribute for adolescents to adopt healthier behaviours and consequently become healthy adults in the future.



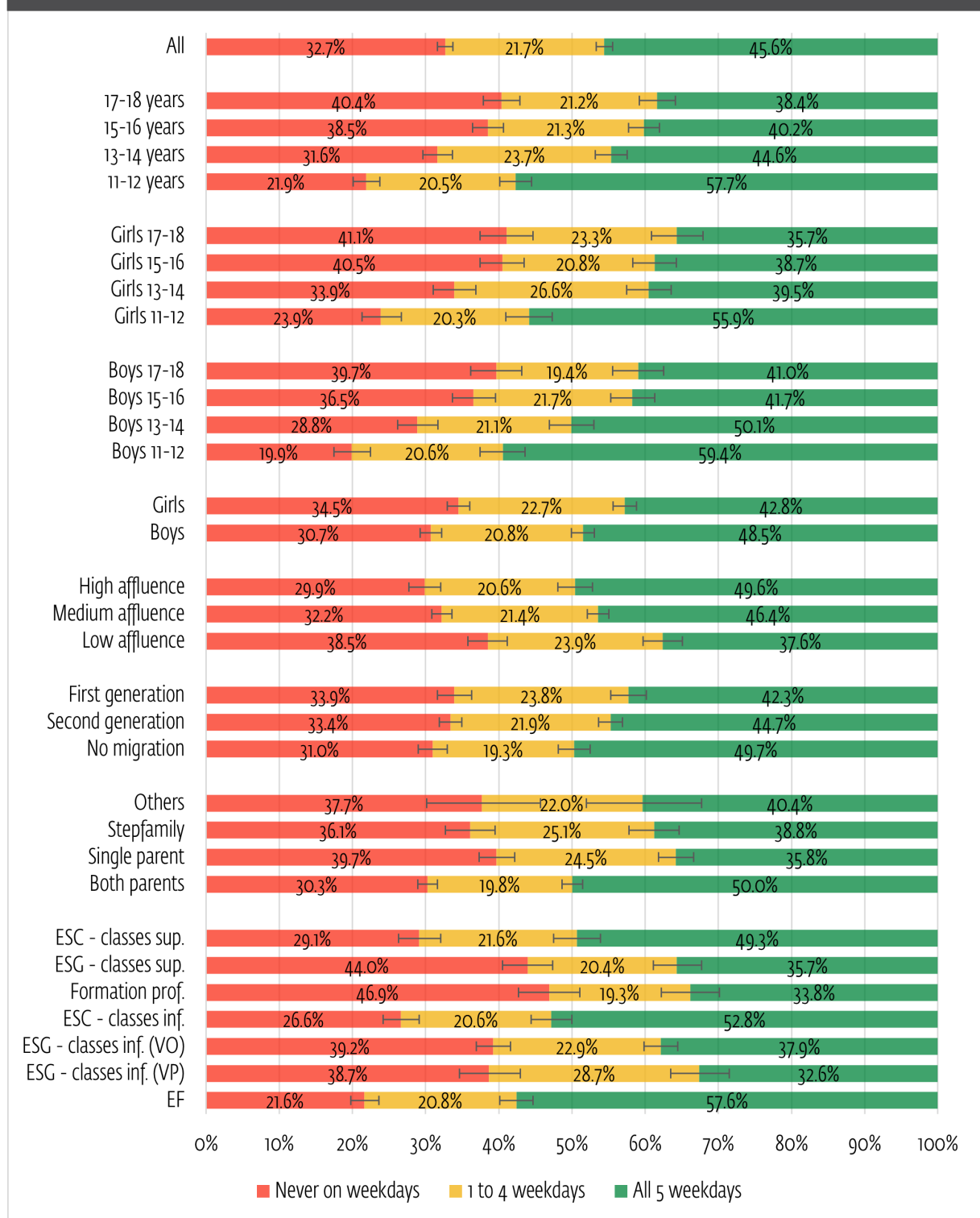
# Appendix





## Breakfast habits

Figure 29: Prevalence of breakfast habits according to sociodemographic groups



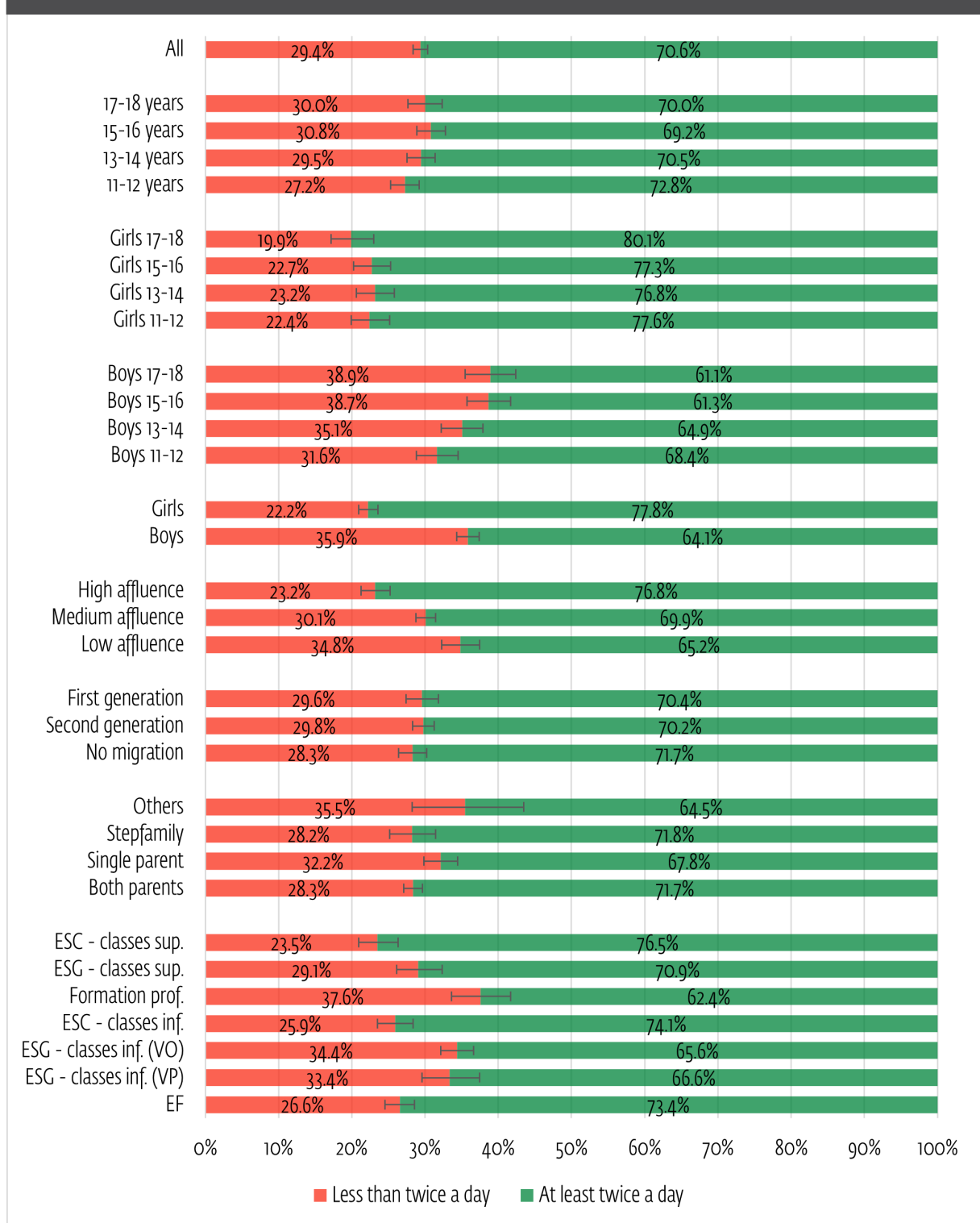
**Table 6: Prevalence of breakfast habits according to sociodemographic groups**

	Never on weekdays (1)	1 to 4 weekdays (2-5)	All 5 weekdays (6)	Chi square test
<b>All</b>				<b>N = 7 533</b>
	32.7 (31.6-33.8)	21.7 (20.8-22.7)	45.6 (44.5-46.7)	
<b>Age</b>				<b>N = 7 533</b>
11-12 years	21.9 (20.1-23.7)	20.5 (18.7-22.3)	57.7 (55.5-59.9)	
13-14 years	31.6 (29.6-33.7)	23.7 (21.9-25.6)	44.6 (42.5-46.8)	$p < .001$
15-16 years	38.5 (36.4-40.6)	21.3 (19.6-23.1)	40.2 (38.1-42.3)	$\chi^2 = -.199$
17-18 years	40.4 (37.9-42.9)	21.2 (19.2-23.4)	38.4 (35.9-40.9)	
<b>Age x Gender</b>				<b>N = 3 684</b>
Girls 11-12	23.9 (21.3-26.7)	20.3 (17.8-22.9)	55.9 (52.7-59.0)	
Girls 13-14	33.9 (31.0-36.9)	26.6 (23.9-29.4)	39.5 (36.5-42.6)	$p < .001$
Girls 15-16	40.5 (37.5-43.5)	20.8 (18.4-23.4)	38.7 (35.7-41.7)	$\chi^2 = -.190$
Girls 17-18	41.1 (37.4-44.7)	23.3 (20.3-26.6)	35.7 (32.2-39.2)	
				<b>N = 3 799</b>
Boys 11-12	19.9 (17.5-22.4)	20.6 (18.3-23.3)	59.4 (56.4-62.5)	
Boys 13-14	28.8 (26.1-31.7)	21.1 (18.7-23.7)	50.1 (47.1-53.2)	$p < .001$
Boys 15-16	36.5 (33.7-39.6)	21.7 (19.3-24.4)	41.7 (38.8-44.8)	$\chi^2 = -.209$
Boys 17-18	39.7 (36.1-43.1)	19.4 (16.6-22.3)	41.0 (37.5-44.5)	
<b>Gender</b>				<b>N = 7 483</b>
Girls	34.5 (33.0-36.0)	22.7 (21.4-24.1)	42.8 (41.2-44.4)	$p < .001$
Boys	30.7 (29.2-32.2)	20.8 (19.5-22.1)	48.5 (46.9-50.1)	Cramér's V. = .057
<b>Family affluence</b>				<b>N = 7 336</b>
High	29.9 (27.7-32.1)	20.6 (18.7-22.5)	49.6 (47.2-52.0)	$p < .001$
Medium	32.2 (30.8-33.6)	21.4 (20.2-22.6)	46.4 (44.9-47.9)	$\chi^2 = .107$
Low	38.5 (35.8-41.2)	23.9 (21.6-26.3)	37.6 (34.9-40.3)	
<b>Migration background</b>				<b>N = 7 264</b>
First generation	33.9 (31.6-36.3)	23.8 (21.7-25.9)	42.3 (39.9-44.7)	$p < .001$
Second generation	33.4 (31.9-35.0)	21.9 (20.5-23.2)	44.7 (43.1-46.3)	Cramér's V. = .040
No migration	31.0 (29.0-33.0)	19.3 (17.7-21.1)	49.7 (47.5-51.9)	
<b>Family structure</b>				<b>N = 7 109</b>
Others	37.7 (30.1-45.7)	22.0 (15.8-29.1)	40.4 (32.7-48.5)	
Stepfamily	36.1 (32.7-39.5)	25.1 (22.1-28.2)	38.8 (35.4-42.2)	$p < .001$
Single parent	39.7 (37.3-42.2)	24.5 (22.4-26.7)	35.8 (33.5-38.3)	Cramér's V. = .089
Both parents	30.3 (29.0-31.6)	19.8 (18.7-20.9)	50.0 (48.5-51.4)	
<b>Type of school</b>				<b>N = 7 533</b>
ESC-classes sup.	29.1 (26.3-32.1)	21.6 (19.0-24.3)	49.3 (46.1-52.5)	
ESG-classes sup.	44.0 (40.5-47.4)	20.4 (17.7-23.2)	35.7 (32.5-39.0)	
Formation prof.	46.9 (42.7-51.1)	19.3 (16.1-22.7)	33.8 (29.8-37.8)	
ESC-classes inf.	26.6 (24.2-29.1)	20.6 (18.4-22.9)	52.8 (50.0-55.6)	$p < .001$
ESG-classes inf. (VO)	39.2 (36.9-41.6)	22.9 (20.9-24.9)	37.9 (35.6-40.2)	Cramér's V. = .151
ESG-classes inf. (VP)	38.7 (34.6-43.0)	28.7 (25.1-32.8)	32.6 (28.7-36.7)	
EF	21.6 (19.8-23.6)	20.8 (19.0-22.7)	57.6 (55.3-59.9)	

Respondents were asked to indicate how often they usually had breakfast during weekdays on a scale ranging from 1 ("I never have breakfast during the week") to 6 ("five days"). Breakfast habits were categorized in: "never on weekdays" (category 1), "1 to 4 weekdays" (categories 2-to-5) and "all 5 weekdays" (category 6). The results are in % (95% Confidence Interval).

## Dental care habits

Figure 30: Prevalence of tooth brushing according to sociodemographic groups



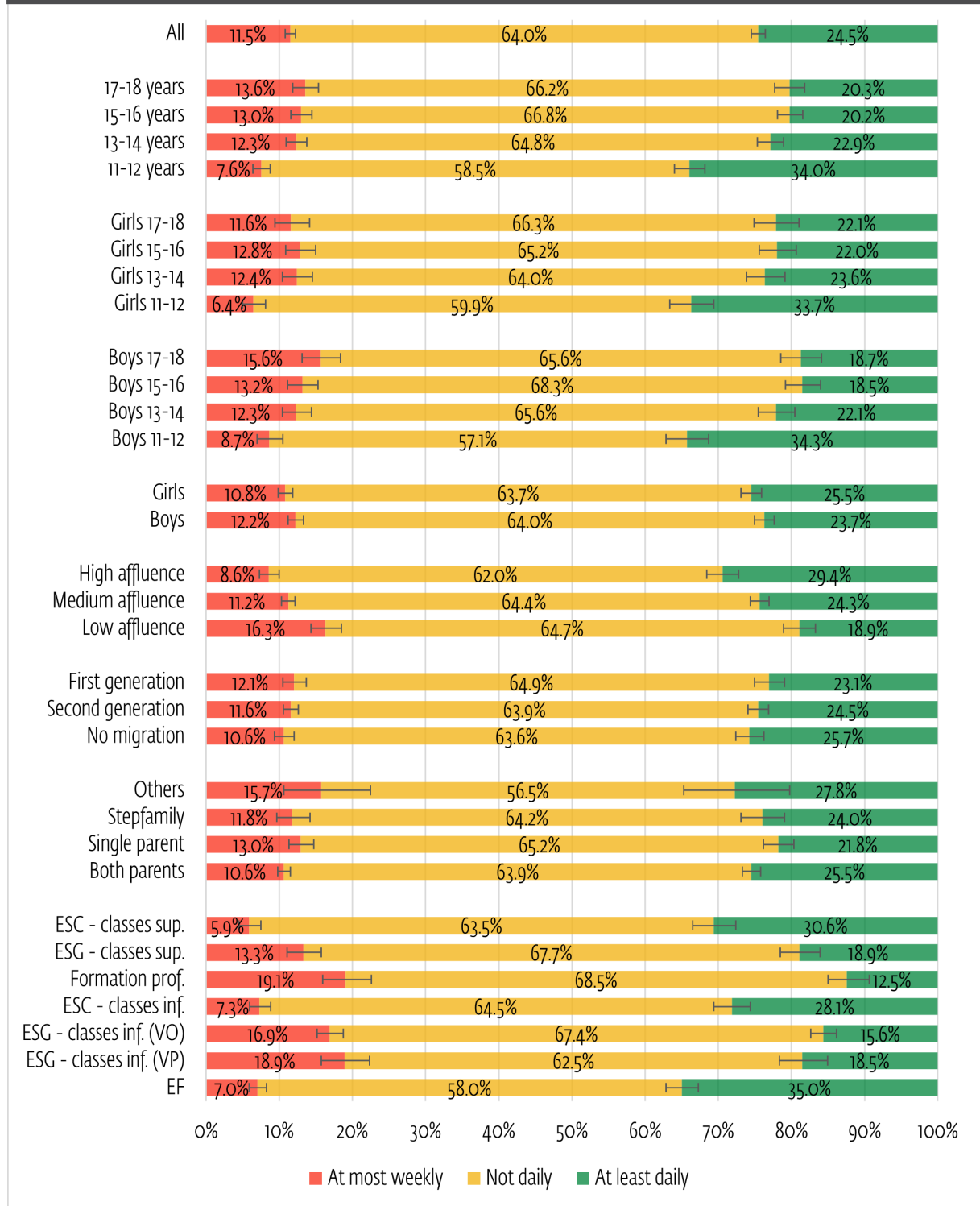
**Table 7: Prevalence of tooth brushing according to sociodemographic groups**

	Less than twice a day (2-5)	At least twice a day (1)	Chi square test
<b>All</b>			<b>N = 7 696</b>
	29.4 (28.4-30.4)	70.6 (69.6-71.6)	
<b>Age</b>			<b>N = 7 696</b>
11-12 years	27.2 (25.3-29.2)	72.8 (70.8-74.7)	
13-14 years	29.5 (27.5-31.4)	70.5 (68.6-72.5)	$p = .026$
15-16 years	30.8 (28.9-32.8)	69.2 (67.2-71.1)	$\gamma = -.042$
17-18 years	30.0 (27.7-32.4)	70.0 (67.6-72.2)	
<b>Age x Gender</b>			<b>N = 3 751</b>
Girls 11-12	22.4 (19.9-25.2)	77.6 (75.0-80.2)	
Girls 13-14	23.2 (20.7-25.8)	76.8 (74.2-79.3)	$p = .282$
Girls 15-16	22.7 (20.2-25.3)	77.3 (74.7-79.8)	$\gamma = .031$
Girls 17-18	19.9 (17.2-23.0)	80.1 (77.1-83.0)	
			<b>N = 3 893</b>
Boys 11-12	31.6 (28.8-34.5)	68.4 (65.5-71.2)	
Boys 13-14	35.1 (32.2-37.9)	64.9 (62.1-67.8)	$p < .001$
Boys 15-16	38.7 (35.8-41.7)	61.3 (58.3-64.2)	$\gamma = -.093$
Boys 17-18	38.9 (35.5-42.4)	61.1 (57.6-64.5)	
<b>Gender</b>			<b>N = 7 644</b>
Girls	22.2 (20.9-23.6)	77.8 (76.4-79.1)	$p < .001$
Boys	35.9 (34.4-37.4)	64.1 (62.6-65.6)	Cramér's V. = .150
<b>Family affluence</b>			<b>N = 7 473</b>
High	23.2 (21.2-25.2)	76.8 (74.8-78.8)	
Medium	30.1 (28.7-31.4)	69.9 (68.5-71.2)	$p < .001$
Low	34.8 (32.3-37.5)	65.2 (62.5-67.7)	$\gamma = .163$
<b>Migration background</b>			<b>N = 7 415</b>
First generation	29.6 (27.4-31.8)	70.4 (68.2-72.6)	
Second generation	29.8 (28.3-31.3)	70.2 (68.7-71.7)	$p = .464$
No migration	28.3 (26.4-30.3)	71.7 (69.7-73.6)	Cramér's V. = .014
<b>Family structure</b>			<b>N = 7 256</b>
Others	35.5 (28.2-43.5)	64.5 (56.5-71.8)	
Stepfamily	28.2 (25.2-31.4)	71.8 (68.6-74.8)	$p = .010$
Single parent	32.2 (29.9-34.5)	67.8 (65.5-70.1)	Cramér's V. = .040
Both parents	28.3 (27.1-29.6)	71.7 (70.4-72.9)	
<b>Type of school</b>			<b>N = 7 696</b>
ESC-classes sup.	23.5 (20.9-26.3)	76.5 (73.7-79.1)	
ESG-classes sup.	29.1 (26.1-32.3)	70.9 (67.8-74.0)	
Formation prof.	37.6 (33.6-41.7)	62.4 (58.3-66.4)	
ESC-classes inf.	25.9 (23.5-28.4)	74.1 (71.5-76.4)	$p < .001$
ESG-classes inf. (VO)	34.4 (32.2-36.7)	65.6 (63.4-67.9)	Cramér's V. = .097
ESG-classes inf. (VP)	33.4 (29.6-37.5)	66.6 (62.5-70.4)	
EF	26.6 (24.6-28.6)	73.4 (71.4-75.4)	

Respondents were asked to indicate how often they brush their teeth on a scale ranging from 1 ("more than once a day") to 5 ("never"). Tooth brushing was categorized in: "less than twice a day" (categories 2-to-5) and "at least twice a day" (category 1). The results are in % (95% Confidence Interval).

## Fruits and vegetables consumption

**Figure 31: Prevalence of combination of fruits and vegetables consumption according to sociodemographic groups**



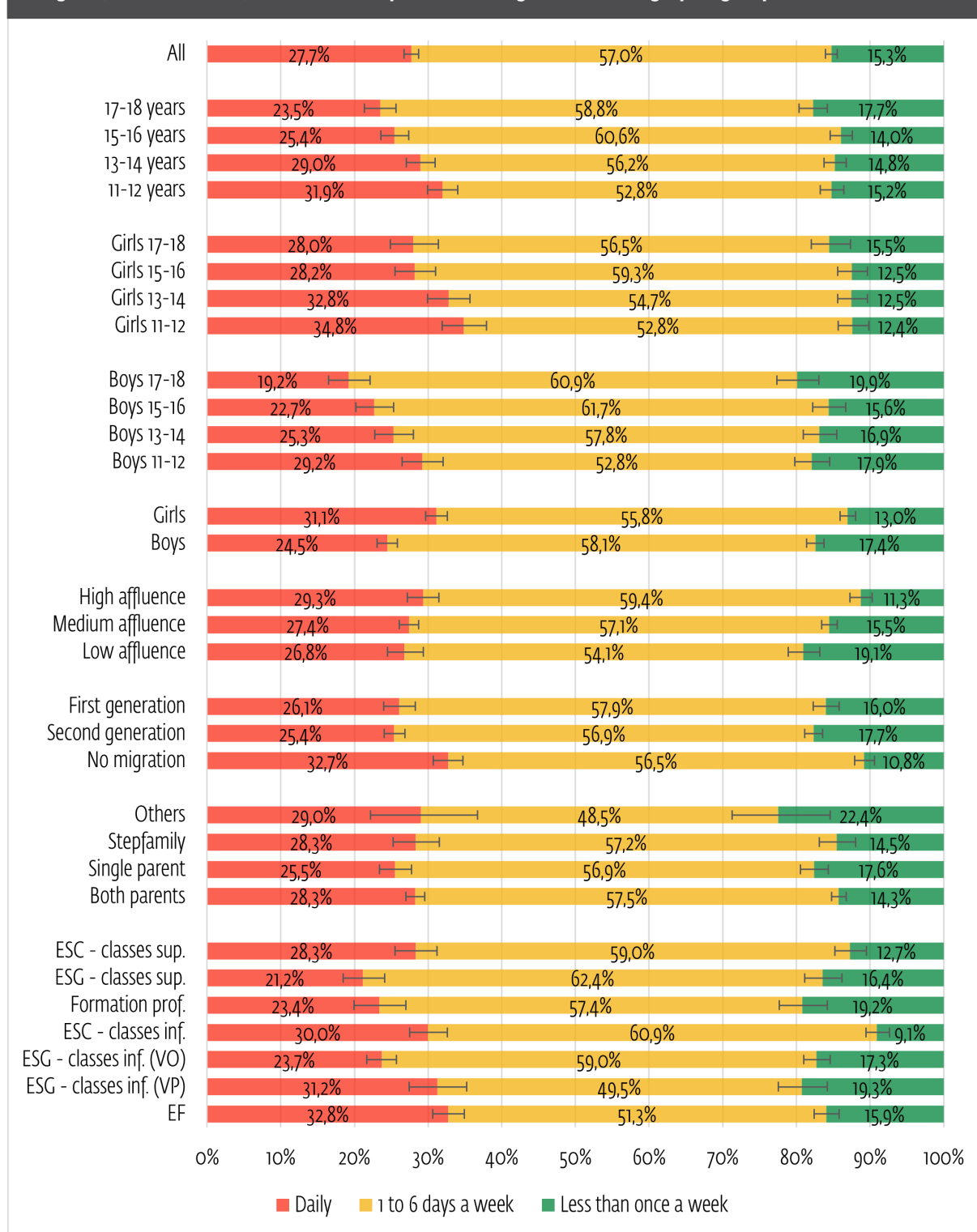
**Table 8: Prevalence of combination of fruits and vegetables consumption according to sociodemographic groups**

	At most weekly	Not daily	At least daily	Chi square test
<b>All</b>				<b>N = 7 551</b>
	11.5 (10.8-12.2)	64.0 (62.9-65.0)	24.5 (23.6-25.5)	
<b>Age</b>				<b>N = 7 551</b>
11-12 years	7.6 (6.4-8.8)	58.5 (56.3-60.6)	34.0 (31.9-36.1)	
13-14 years	12.3 (11.0-13.8)	64.8 (62.7-66.8)	22.9 (21.1-24.7)	$p < .001$
15-16 years	13.0 (11.6-14.5)	66.8 (64.7-68.8)	20.2 (18.6-22.0)	$\chi^2 = -.173$
17-18 years	13.6 (11.9-15.4)	66.2 (63.7-68.5)	20.3 (18.2-22.4)	
<b>Age x Gender</b>				<b>N = 3 687</b>
Girls 11-12	6.4 (5.0-8.1)	59.9 (56.7-62.9)	33.7 (30.8-36.8)	
Girls 13-14	12.4 (10.5-14.5)	64.0 (61.0-66.9)	23.6 (21.1-26.4)	$p < .001$
Girls 15-16	12.8 (10.9-15.0)	65.2 (62.2-68.0)	22.0 (19.6-24.6)	$\chi^2 = -.147$
Girls 17-18	11.6 (9.4-14.1)	66.3 (62.8-69.8)	22.1 (19.1-25.3)	
				<b>N = 3 812</b>
Boys 11-12	8.7 (7.0-10.5)	57.1 (54.0-60.1)	34.3 (31.4-37.3)	
Boys 13-14	12.3 (10.4-14.4)	65.6 (62.6-68.4)	22.1 (19.7-24.7)	$p < .001$
Boys 15-16	13.2 (11.2-15.3)	68.3 (65.4-71.1)	18.5 (16.3-21.1)	$\chi^2 = -.198$
Boys 17-18	15.6 (13.1-18.4)	65.6 (62.1-68.9)	18.7 (16.0-21.6)	
<b>Gender</b>				<b>N = 7 498</b>
Girls	10.8 (9.8-11.9)	63.7 (62.1-65.2)	25.5 (24.1-26.9)	$p = .063$
Boys	12.2 (11.2-13.3)	64.0 (62.5-65.5)	23.7 (22.4-25.1)	Cramér's V. = .027
<b>Family affluence</b>				<b>N = 7 350</b>
High	8.6 (7.3-10.0)	62.0 (59.7-64.3)	29.4 (27.3-31.6)	
Medium	11.2 (10.3-12.2)	64.4 (63.0-65.8)	24.3 (23.1-25.6)	$p < .001$
Low	16.3 (14.4-18.5)	64.7 (62.0-67.4)	18.9 (16.8-21.2)	$\chi^2 = .163$
<b>Migration background</b>				<b>N = 7 286</b>
First generation	12.1 (10.5-13.7)	64.9 (62.5-67.2)	23.1 (21.1-25.2)	
Second generation	11.6 (10.6-12.6)	63.9 (62.3-65.4)	24.5 (23.1-25.9)	$p = .336$
No migration	10.6 (9.3-12.0)	63.6 (61.5-65.7)	25.7 (23.9-27.7)	Cramér's V. = .018
<b>Family structure</b>				<b>N = 7 124</b>
Others	15.7 (10.6-22.5)	56.5 (48.4-64.4)	27.8 (20.8-35.3)	
Stepfamily	11.8 (9.7-14.2)	64.2 (60.8-67.5)	24.0 (21.1-27.1)	$p = .010$
Single parent	13.0 (11.4-14.7)	65.2 (62.9-67.6)	21.8 (19.8-23.9)	Cramér's V. = .034
Both parents	10.6 (9.8-11.5)	63.9 (62.5-65.2)	25.5 (24.2-26.7)	
<b>Type of school</b>				<b>N = 7 551</b>
ESC-classes sup.	5.9 (4.5-7.5)	63.5 (60.4-66.6)	30.6 (27.7-33.6)	
ESG-classes sup.	13.3 (11.1-15.8)	67.7 (64.5-70.9)	18.9 (16.4-21.8)	
Formation prof.	19.1 (15.9-22.6)	68.5 (64.5-72.4)	12.5 (9.9-15.6)	
ESC-classes inf.	7.3 (6.0-8.9)	64.5 (61.8-67.2)	28.1 (25.6-30.6)	$p < .001$
ESG-classes inf. (VO)	16.9 (15.2-18.8)	67.4 (65.2-69.7)	15.6 (13.9-17.4)	Cramér's V. = .162
ESG-classes inf. (VP)	18.9 (15.7-22.4)	62.5 (58.3-66.5)	18.5 (15.4-22.0)	
EF	7.0 (5.9-8.3)	58.0 (55.7-60.2)	35.0 (32.8-37.2)	

Respondents were asked to indicate how often they consumed fruits and vegetables on a scale ranging from 1 for "never" to 7 for "more than once daily". The individual consumption of fruits and vegetables was combined in one variable and categorized in: "at most weekly", "not daily", and "at least daily". The category "at most weekly" represents the adolescents that consumed fruits and vegetables at the most once a week (categories 1-to-3); "not daily" represents the adolescents that consumed fruits and vegetables during the week, but they do not eat it daily (categories 4 and 5); "at least daily" represents the adolescents that ate both fruits and vegetables once (or more) a day (categories 6 and 7). The results are in % (95% Confidence Interval).

## Sweets consumption

Figure 32: Prevalence of sweets consumption according to sociodemographic groups



**Table 9: Prevalence of sweets consumption according to sociodemographic groups**

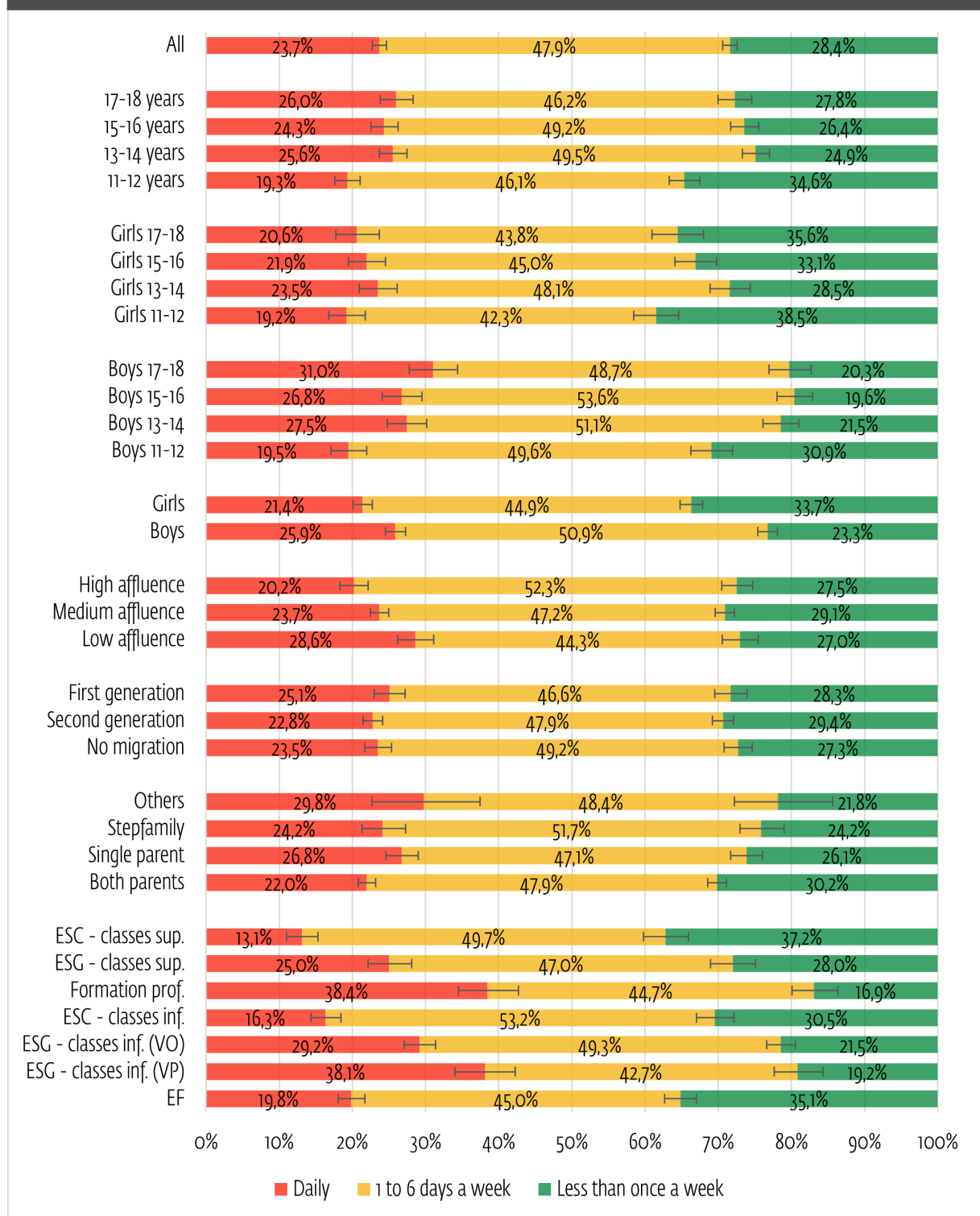
	Daily (6-7)	1 to 6 days a week (3-5)	Less than once a week (1-2)	Chi square test
<b>All</b>				<b>N = 7 636</b>
	27.7 (26.7-28.7)	57.0 (55.9-58.1)	15.3 (14.5-16.1)	
<b>Age</b>				<b>N = 7 636</b>
11-12 years	31.9 (29.9-34.0)	52.8 (50.6-55.0)	15.2 (13.7-16.9)	
13-14 years	29.0 (27.1-30.9)	56.2 (54.1-58.3)	14.8 (13.3-16.4)	$p < .001$
15-16 years	25.4 (23.6-27.3)	60.6 (58.5-62.7)	14.0 (12.5-15.5)	$\chi^2 = .080$
17-18 years	23.5 (21.4-25.7)	58.8 (56.2-61.2)	17.7 (15.8-19.7)	
<b>Age x Gender</b>				<b>N = 3 728</b>
Girls 11-12	34.8 (31.9-37.9)	52.8 (49.6-55.9)	12.4 (10.4-14.6)	
Girls 13-14	32.8 (29.9-35.7)	54.7 (51.6-57.7)	12.5 (10.6-14.7)	$p < .001$
Girls 15-16	28.2 (25.5-31.0)	59.3 (56.3-62.3)	12.5 (10.6-14.6)	$\chi^2 = .079$
Girls 17-18	28.0 (24.8-31.4)	56.5 (52.7-60.0)	15.5 (13.0-18.4)	
				<b>N = 3 858</b>
Boys 11-12	29.2 (26.4-32.0)	52.8 (49.8-55.9)	17.9 (15.7-20.4)	
Boys 13-14	25.3 (22.8-28.0)	57.8 (54.8-60.8)	16.9 (14.8-19.3)	$p < .001$
Boys 15-16	22.7 (20.2-25.3)	61.7 (58.7-64.6)	15.6 (13.5-18.0)	$\chi^2 = .081$
Boys 17-18	19.2 (16.5-22.1)	60.9 (57.4-64.4)	19.9 (17.1-22.8)	
<b>Gender</b>				<b>N = 7 586</b>
Girls	31.1 (29.7-32.6)	55.8 (54.2-57.4)	13.0 (12.0-14.1)	$p < .001$
Boys	24.5 (23.1-25.8)	58.1 (56.6-59.7)	17.4 (16.2-18.6)	Cramér's V. = 0.086
<b>Family affluence</b>				<b>N = 7 432</b>
High	29.3 (27.2-31.5)	59.4 (57.0-61.7)	11.3 (9.8-12.8)	
Medium	27.4 (26.1-28.7)	57.1 (55.6-58.5)	15.5 (14.5-16.6)	$p < .001$
Low	26.8 (24.5-29.3)	54.1 (51.4-56.9)	19.1 (17.0-21.3)	$\chi^2 = -.079$
<b>Migration background</b>				<b>N = 7 362</b>
First generation	26.1 (24.0-28.3)	57.9 (55.5-60.3)	16.0 (14.3-17.8)	
Second generation	25.4 (24.0-26.8)	56.9 (55.3-58.5)	17.7 (16.5-18.9)	$p < .001$
No migration	32.7 (30.7-34.8)	56.5 (54.3-58.6)	10.8 (9.5-12.2)	Cramér's V. = .068
<b>Family structure</b>				<b>N = 7 208</b>
Others	29.0 (22.2-36.7)	48.5 (40.7-56.7)	22.4 (16.2-29.5)	
Stepfamily	28.3 (25.2-31.5)	57.2 (53.7-60.6)	14.5 (12.2-17.1)	$p = .004$
Single parent	25.5 (23.4-27.7)	56.9 (54.4-59.3)	17.6 (15.8-19.5)	Cramér's V. = .037
Both parents	28.3 (27.0-29.6)	57.5 (56.1-58.9)	14.3 (13.3-15.3)	
<b>Type of school</b>				<b>N = 7 636</b>
ESC-classes sup.	28.3 (25.5-31.2)	59.0 (55.8-62.1)	12.7 (10.7-15.0)	
ESG-classes sup.	21.2 (18.5-24.1)	62.4 (59.0-65.6)	16.4 (14.0-19.1)	
Formation prof.	23.4 (19.9-27.0)	57.4 (53.2-61.5)	19.2 (16.0-22.6)	
ESC-classes inf.	30.0 (27.5-32.6)	60.9 (58.2-63.6)	9.1 (7.6-10.8)	$p < .001$
ESG-classes inf. (VO)	23.7 (21.7-25.7)	59.0 (56.7-61.4)	17.3 (15.6-19.2)	Cramér's V. = .091
ESG-classes inf. (VP)	31.2 (27.4-35.2)	49.5 (45.3-53.7)	19.3 (16.1-22.7)	
EF	32.8 (30.6-34.9)	51.3 (49.0-53.6)	15.9 (14.3-17.7)	

Respondents were asked to indicate how often they consumed sweets on a scale ranging from 1 ("never") to 7 ("more than once daily"). Sweets consumption was categorized in: daily (categories 6 and 7), 1-to-6 days a week (categories 3-to-5) and less than once a week (categories 1 and 2). The results are in % (95% Confidence Interval).



## Soft drinks consumption

Figure 33: Prevalence of soft drinks consumption according to sociodemographic groups



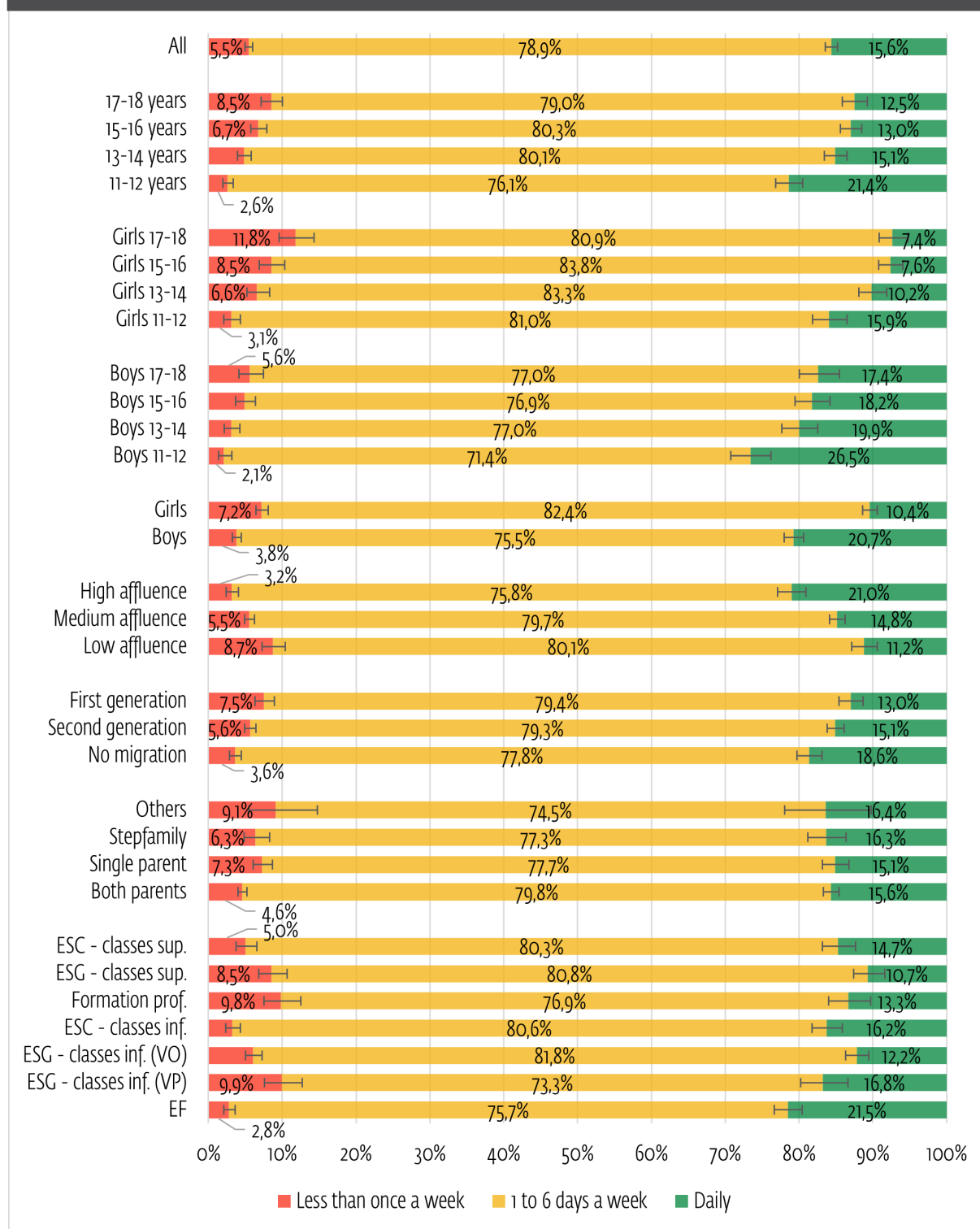
**Table 10: Prevalence of soft drinks consumption according to sociodemographic groups**

	Daily (6-7)	1 to 6 days a week (3-5)	Less than once a week (1-2)	Chi square test
<b>All</b>				<b>N = 7 621</b>
	23.7 (22.7-24.6)	47.9 (46.8-49.0)	28.4 (27.4-29.4)	
<b>Age</b>				<b>N = 7 621</b>
11-12 years	19.3 (17.6-21.1)	46.1 (43.9-48.3)	34.6 (32.5-36.7)	
13-14 years	25.6 (23.7-27.5)	49.5 (47.4-51.7)	24.9 (23.1-26.8)	$p < .001$
15-16 years	24.3 (22.5-26.2)	49.2 (47.1-51.4)	26.4 (24.6-28.4)	$\chi^2 = -.077$
17-18 years	26.0 (23.8-28.3)	46.2 (43.7-48.8)	27.8 (25.5-30.1)	
<b>Age x Gender</b>				<b>N = 3 721</b>
Girls 11-12	19.2 (16.8-21.7)	42.3 (39.2-45.4)	38.5 (35.4-41.5)	
Girls 13-14	23.5 (21.0-26.2)	48.1 (45.0-51.1)	28.5 (25.8-31.3)	$p = .358$
Girls 15-16	21.9 (19.5-24.5)	45.0 (41.9-48.0)	33.1 (30.2-36.0)	$\chi^2 = -.019$
Girls 17-18	20.6 (17.7-23.7)	43.8 (40.1-47.4)	35.6 (32.1-39.1)	
				<b>N = 3 851</b>
Boys 11-12	19.5 (17.1-22.0)	49.6 (46.5-52.7)	30.9 (28.2-33.8)	
Boys 13-14	27.5 (24.8-30.2)	51.1 (48.1-54.1)	21.5 (19.1-24.0)	$p < .001$
Boys 15-16	26.8 (24.1-29.5)	53.6 (50.6-56.7)	19.6 (17.2-22.1)	$\chi^2 = -.138$
Boys 17-18	31.0 (27.8-34.4)	48.7 (45.0-52.2)	20.3 (17.6-23.4)	
<b>Gender</b>				<b>N = 7 572</b>
Girls	21.4 (20.1-22.7)	44.9 (43.3-46.5)	33.7 (32.2-35.2)	$p < .001$
Boys	25.9 (24.5-27.3)	50.9 (49.3-52.5)	23.3 (22.0-24.6)	Cramér's V. = .116
<b>Family affluence</b>				<b>N = 7 410</b>
High	20.2 (18.3-22.1)	52.3 (50.0-54.7)	27.5 (25.4-29.6)	
Medium	23.7 (22.4-24.9)	47.2 (45.7-48.7)	29.1 (27.8-30.5)	$p = .002$
Low	28.6 (26.2-31.1)	44.3 (41.6-47.1)	27.0 (24.6-29.5)	$\chi^2 = .053$
<b>Migration background</b>				<b>N = 7 352</b>
First generation	25.1 (23.0-27.2)	46.6 (44.2-49.0)	28.3 (26.2-30.6)	
Second generation	22.8 (21.4-24.1)	47.9 (46.2-49.5)	29.4 (27.9-30.8)	$p = .204$
No migration	23.5 (21.7-25.4)	49.2 (47.1-51.4)	27.3 (25.4-29.2)	Cramér's V. = .020
<b>Family structure</b>				<b>N = 7 196</b>
Others	29.8 (22.7-37.4)	48.4 (40.2-56.4)	21.8 (15.9-29.3)	
Stepfamily	24.2 (21.3-27.3)	51.7 (48.2-55.2)	24.2 (21.3-27.3)	$p < .001$
Single parent	26.8 (24.6-29.0)	47.1 (44.6-49.5)	26.1 (24.0-28.3)	Cramér's V. = .047
Both parents	22.0 (20.8-23.2)	47.9 (46.4-49.3)	30.2 (28.9-31.5)	
<b>Type of school</b>				<b>N = 7 621</b>
ESC-classes sup.	13.1 (11.0-15.3)	49.7 (46.5-52.9)	37.2 (34.1-40.3)	
ESG-classes sup.	25.0 (22.2-28.1)	47.0 (43.5-50.4)	28.0 (25.0-31.1)	
Formation prof.	38.4 (34.5-42.7)	44.7 (40.6-49.0)	16.9 (13.9-20.2)	
ESC-classes inf.	16.3 (14.3-18.4)	53.2 (50.4-56.0)	30.5 (28.0-33.1)	$p < .001$
ESG-classes inf. (VO)	29.2 (27.1-31.4)	49.3 (46.9-51.7)	21.5 (19.6-23.5)	Cramér's V. = .151
ESG-classes inf. (VP)	38.1 (34.0-42.2)	42.7 (38.6-46.9)	19.2 (16.1-22.7)	
EF	19.8 (18.1-21.7)	45.0 (42.7-47.3)	35.1 (33.0-37.3)	

Respondents were asked to indicate how often they consumed soft drinks on a scale ranging from 1 ("never") to 7 ("more than once daily"). Soft drink consumption was categorized in: daily (categories 6-to-7), 1-to-6 days a week (categories 3-to-5) and less than once a week (categories 1 and 2). The results are in % (95% Confidence Interval).

## Moderate to vigorous physical activity

Figure 34: Prevalence of moderate to vigorous physical activity according to sociodemographic groups



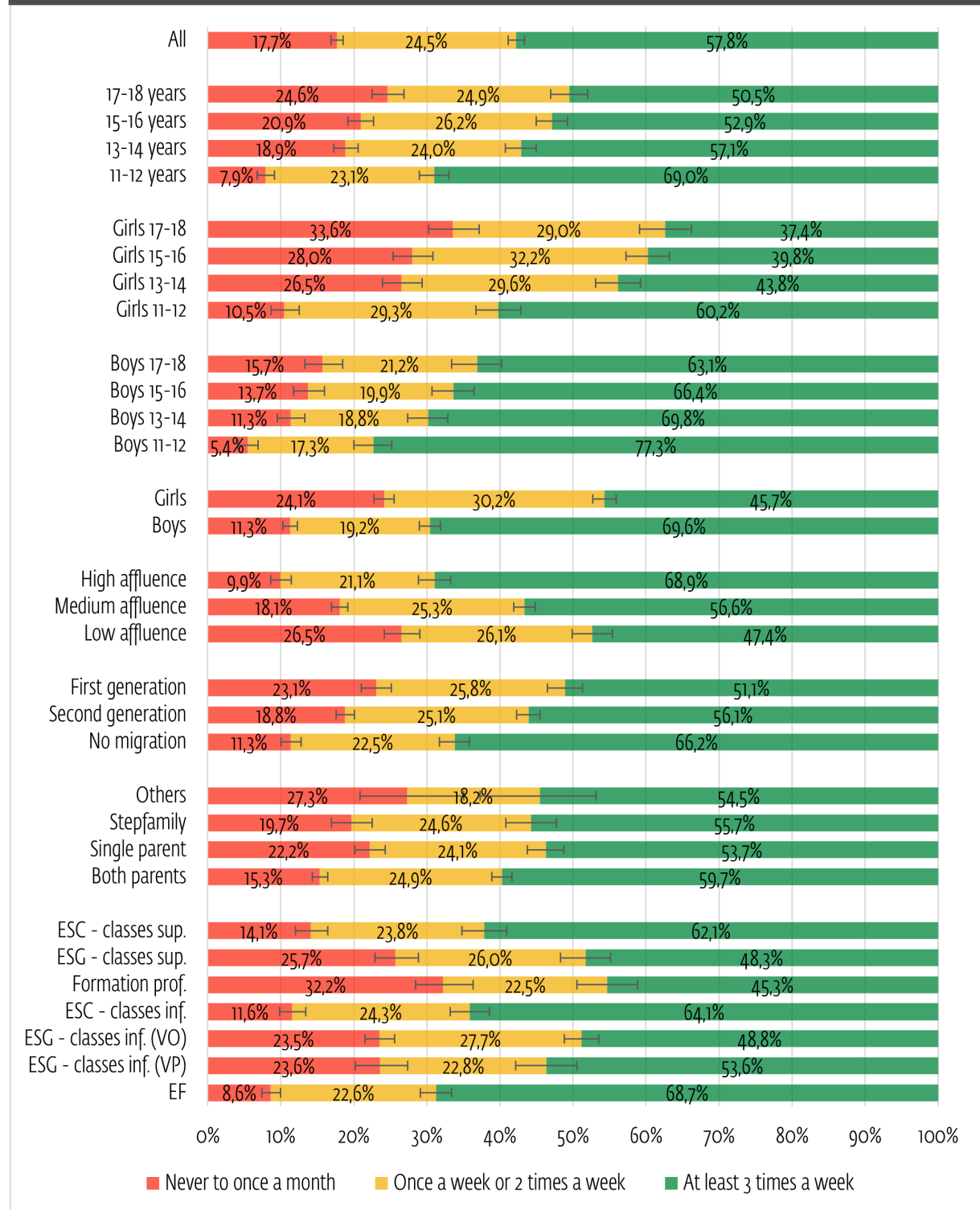
**Table 11: Prevalence of moderate to vigorous physical activity according to sociodemographic groups**

	Less than once a week (0)	1 to 6 days a week (1-6)	Daily (7)	Chi square test
<b>All</b>				<b>N = 7 506</b>
	5.5 (5.0-6.0)	78.9 (77.9-79.8)	15.6 (14.8-16.5)	
<b>Age</b>				<b>N = 7 506</b>
11-12 years	2.6 (1.9-3.3)	76.1 (74.1-77.9)	21.4 (19.6-23.2)	
13-14 years	4.8 (4.0-5.8)	80.1 (78.3-81.8)	15.1 (13.6-16.7)	$p < .001$
15-16 years	6.7 (5.7-7.9)	80.3 (78.5-81.9)	13.0 (11.6-14.5)	$\chi^2 = -.207$
17-18 years	8.5 (7.1-10.0)	79.0 (76.8-81.0)	12.5 (10.8-14.2)	
<b>Age x Gender</b>				<b>N = 3 663</b>
Girls 11-12	3.1 (2.1-4.3)	81.0 (78.3-83.3)	15.9 (13.7-18.3)	
Girls 13-14	6.6 (5.2-8.3)	83.3 (80.9-85.5)	10.2 (8.4-12.2)	$p < .001$
Girls 15-16	8.5 (6.9-10.3)	83.8 (81.4-86.0)	7.6 (6.1-9.4)	$\chi^2 = -.275$
Girls 17-18	11.8 (9.6-14.3)	80.9 (77.8-83.6)	7.4 (5.6-9.5)	
				<b>N = 3 793</b>
Boys 11-12	2.1 (1.4-3.2)	71.4 (68.4-74.0)	26.5 (23.8-29.3)	
Boys 13-14	3.1 (2.2-4.3)	77.0 (74.3-79.5)	19.9 (17.6-22.5)	$p < .001$
Boys 15-16	4.9 (3.7-6.4)	76.9 (74.2-79.4)	18.2 (15.9-20.7)	$\chi^2 = -.164$
Boys 17-18	5.6 (4.2-7.5)	77.0 (73.9-80.0)	17.4 (14.9-20.3)	
<b>Gender</b>				<b>N = 7 456</b>
Girls	7.2 (6.4-8.1)	82.4 (81.1-83.6)	10.4 (9.5-11.4)	$p < .001$
Boys	3.8 (3.2-4.4)	75.5 (74.1-76.9)	20.7 (19.4-22.0)	Cramér's V. = .154
<b>Family affluence</b>				<b>N = 7 305</b>
High	3.2 (2.4-4.1)	75.8 (73.7-77.8)	21.0 (19.1-23.0)	$p < .001$
Medium	5.5 (4.9-6.2)	79.7 (78.4-80.8)	14.8 (13.8-15.9)	$\chi^2 = .227$
Low	8.7 (7.3-10.4)	80.1 (77.8-82.2)	11.2 (9.5-13.0)	
<b>Migration background</b>				<b>N = 7 229</b>
First generation	7.5 (6.3-8.9)	79.4 (77.4-81.4)	13.0 (11.4-14.7)	$p < .001$
Second generation	5.6 (4.9-6.4)	79.3 (77.9-80.6)	15.1 (14.0-16.3)	Cramér's V. = .056
No migration	3.6 (2.9-4.5)	77.8 (75.9-79.5)	18.6 (17.0-20.4)	
<b>Family structure</b>				<b>N = 7 089</b>
Others	9.1 (5.5-14.8)	74.5 (66.6-80.5)	16.4 (10.8-22.5)	
Stepfamily	6.3 (4.8-8.3)	77.3 (74.3-80.2)	16.3 (13.8-19.0)	$p = .001$
Single parent	7.3 (6.1-8.7)	77.7 (75.5-79.7)	15.1 (13.4-17.0)	Cramér's V. = .040
Both parents	4.6 (4.0-5.2)	79.8 (78.6-80.9)	15.6 (14.6-16.7)	
<b>Type of school</b>				<b>N = 7 506</b>
ESC-classes sup.	5.0 (3.7-6.5)	80.3 (77.7-82.8)	14.7 (12.5-17.1)	
ESG-classes sup.	8.5 (6.8-10.7)	80.8 (78.0-83.5)	10.7 (8.7-13.0)	
Formation prof.	9.8 (7.5-12.5)	76.9 (73.3-80.3)	13.3 (10.6-16.3)	
ESC-classes inf.	3.2 (2.3-4.3)	80.6 (78.3-82.7)	16.2 (14.2-18.4)	$p < .001$
ESG-classes inf. (VO)	6.0 (5.0-7.3)	81.8 (79.9-83.6)	12.2 (10.7-13.8)	Cramér's V. = .105
ESG-classes inf. (VP)	9.9 (7.6-12.7)	73.3 (69.4-76.9)	16.8 (13.8-20.2)	
EF	2.8 (2.1-3.6)	75.7 (73.7-77.7)	21.5 (19.6-23.4)	

Respondents were asked to indicate how many days they were physically active for a total of at least 60 minutes per day, in the past 7 days. The response options ranged from 0 ("0 days") to 7 ("seven days"). MVPA was categorized in: less than once a week (category 0), 1 to 6 days a week (categories 1-to-6) and daily (category 7). The results are in % (95% Confidence Interval).

## Vigorous physical activity

Figure 35: Prevalence of vigorous physical activity according to sociodemographic groups



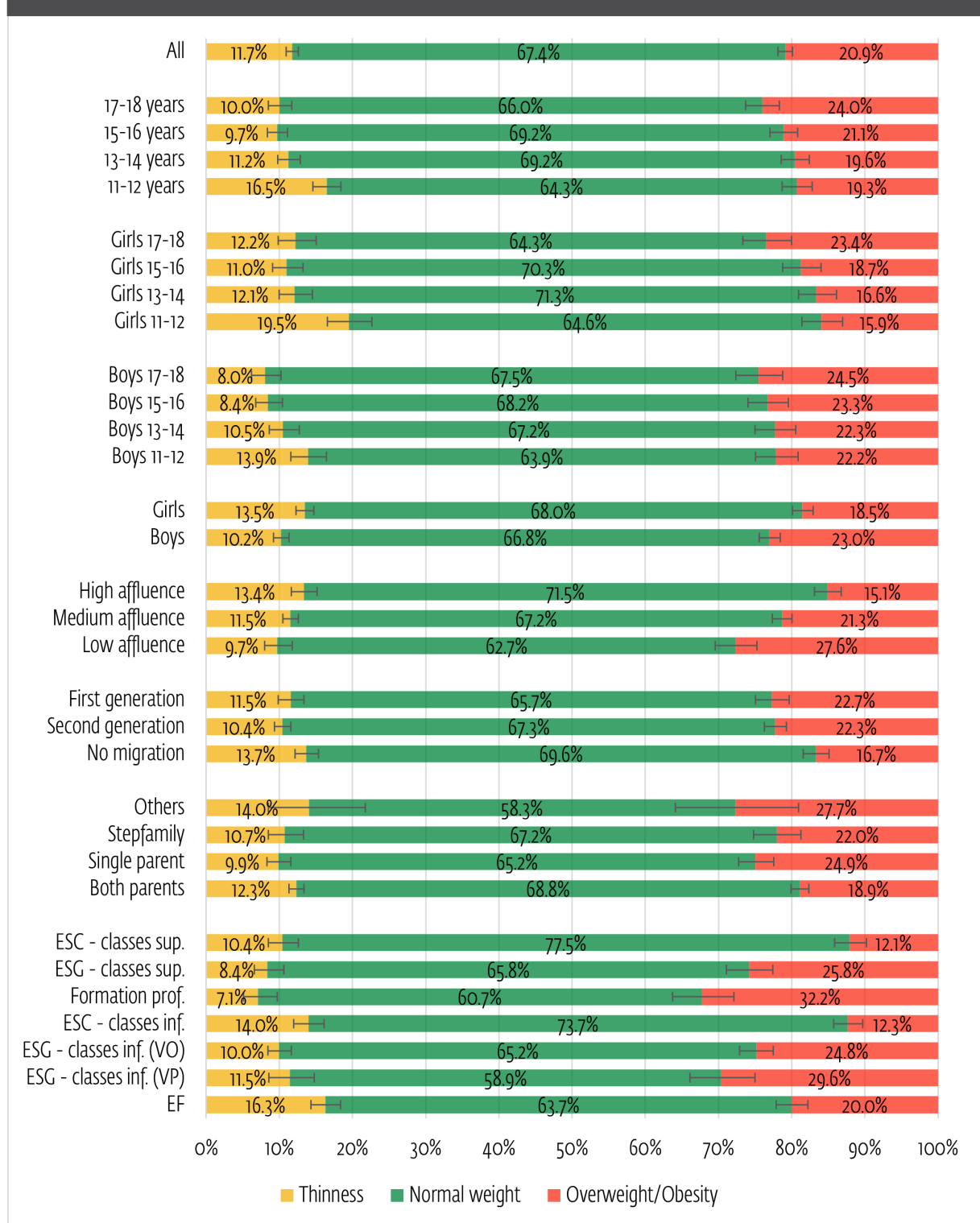
**Table 12: Prevalence of vigorous physical activity according to sociodemographic groups**

	Never to once a month (6-8)	Once a week or 2 times a week (4-5)	At least 3 times a week (1-3)	Chi square test
<b>All</b>				<b>N = 7 641</b>
	17.7 (16.9-18.6)	24.5 (23.6-25.5)	57.8 (56.6-58.9)	
<b>Age</b>				<b>N = 7 641</b>
11-12 years	7.9 (6.8-9.2)	23.1 (21.2-25.0)	69.0 (67.0-71.0)	
13-14 years	18.9 (17.2-20.6)	24.0 (22.2-25.9)	57.1 (55.0-59.2)	$p < .001$
15-16 years	20.9 (19.2-22.7)	26.2 (24.3-28.1)	52.9 (50.7-55)	$\chi^2 = .204$
17-18 years	24.6 (22.5-26.9)	24.9 (22.7-27.1)	50.5 (47.9-53)	
<b>Age x Gender</b>				<b>N = 3 720</b>
Girls 11-12	10.5 (8.7-12.5)	29.3 (26.5-32.2)	60.2 (57.1-63.3)	
Girls 13-14	26.5 (23.9-29.4)	29.6 (26.9-32.5)	43.8 (40.8-46.9)	$p < .001$
Girls 15-16	28 (25.4-30.8)	32.2 (29.4-35.1)	39.8 (36.8-42.8)	$\chi^2 = .240$
Girls 17-18	33.6 (30.2-37.1)	29.0 (25.8-32.4)	37.4 (33.9-41.0)	
				<b>N = 3 871</b>
Boys 11-12	5.4 (4.1-6.9)	17.3 (15.0-19.7)	77.3 (74.6-79.7)	
Boys 13-14	11.3 (9.5-13.3)	18.8 (16.6-21.3)	69.8 (67.1-72.6)	$p < .001$
Boys 15-16	13.7 (11.7-15.9)	19.9 (17.5-22.4)	66.4 (63.5-69.2)	$\chi^2 = .178$
Boys 17-18	15.7 (13.3-18.5)	21.2 (18.4-24.2)	63.1 (59.6-66.5)	
<b>Gender</b>				<b>N = 7 591</b>
Girls	24.1 (22.8-25.5)	30.2 (28.7-31.7)	45.7 (44.1-47.3)	$p < .001$
Boys	11.3 (10.3-12.3)	19.2 (17.9-20.4)	69.6 (68.1-71.0)	Cramér's V. = .246
<b>Family affluence</b>				<b>N = 7 435</b>
High	9.9 (8.6-11.4)	21.1 (19.3-23.2)	68.9 (66.7-71.1)	$p < .001$
Medium	18.1 (16.9-19.2)	25.3 (24.1-26.6)	56.6 (55.2-58.1)	$\chi^2 = -.249$
Low	26.5 (24.2-29)	26.1 (23.7-28.6)	47.4 (44.6-50.1)	
<b>Migration background</b>				<b>N = 7 359</b>
First generation	23.1 (21.0-25.1)	25.8 (23.7-28.0)	51.1 (48.6-53.5)	$p < .001$
Second generation	18.8 (17.6-20.1)	25.1 (23.7-26.5)	56.1 (54.5-57.7)	Cramér's V. = .091
No migration	11.3 (10.0-12.8)	22.5 (20.7-24.3)	66.2 (64.1-68.2)	
<b>Family structure</b>				<b>N = 7 211</b>
Others	27.3 (20.8-35.1)	18.2 (12.6-24.9)	54.5 (46.3-62.2)	
Stepfamily	19.7 (17.0-22.5)	24.6 (21.7-27.7)	55.7 (52.3-59.2)	$p < .001$
Single parent	22.2 (20.2-24.3)	24.1 (22.0-26.3)	53.7 (51.2-56.2)	Cramér's V. = .061
Both parents	15.3 (14.3-16.4)	24.9 (23.7-26.2)	59.7 (58.3-61.1)	
<b>Type of school</b>				<b>N = 7 641</b>
ESC-classes sup.	14.1 (12.0-16.4)	23.8 (21.1-26.5)	62.1 (59.1-65.2)	
ESG-classes sup.	25.7 (22.9-28.8)	26.0 (23.1-29.1)	48.3 (44.8-51.7)	
Formation prof.	32.2 (28.5-36.3)	22.5 (19.1-26.1)	45.3 (41.1-49.4)	$p < .001$
ESC-classes inf.	11.6 (9.8-13.4)	24.3 (22.0-26.8)	64.1 (61.4-66.8)	Cramér's V. = .156
ESG-classes inf. (VO)	23.5 (21.5-25.5)	27.7 (25.6-29.9)	48.8 (46.4-51.2)	
ESG-classes inf. (VP)	23.6 (20.2-27.4)	22.8 (19.4-26.4)	53.6 (49.4-57.8)	
EF	8.6 (7.4-10.0)	22.6 (20.8-24.6)	68.7 (66.6-70.8)	

Respondents were asked to indicate how often do they usually exercise in their free time (outside of school) so much that they get out of breath or sweat. The response options ranged from 1 ("every day") to 8 ("never"). VPA was categorized in: never to once a month (categories 6-to-8), once a week or 2 times a week (categories 4 and 5) and at least 3 times a week (categories 1-to-3). The results are in % (95% Confidence Interval).

## Weight status

Figure 36: Prevalence of weight status according to sociodemographic groups



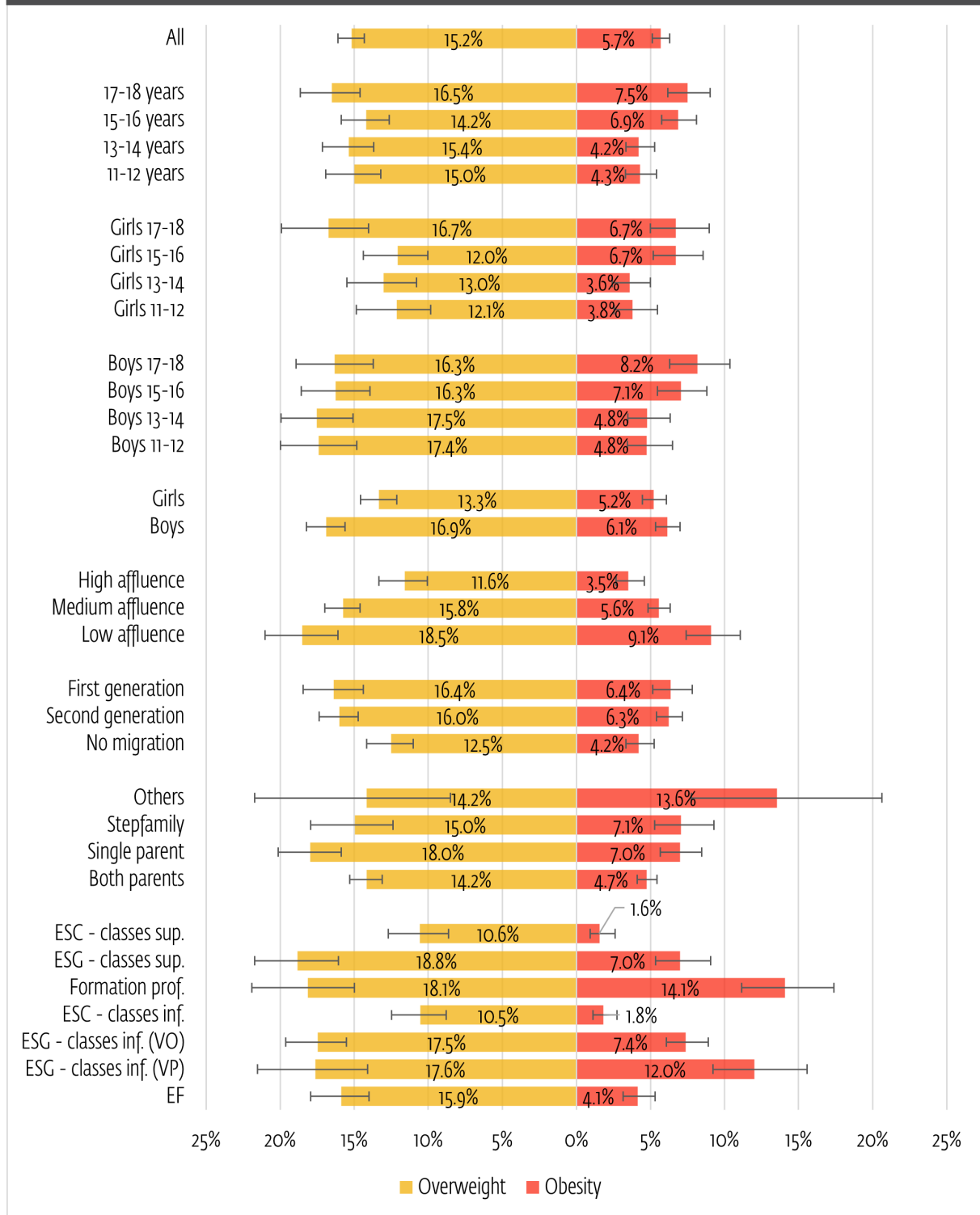
**Table 13: Prevalence of weight status according to sociodemographic groups**

	Thinness	Normal weight	Overweight/ Obesity	Chi square test
<b>All</b>				<b>N = 6 163</b>
	11.7 (11.0-12.6)	67.4 (66.2-68.5)	20.9 (19.9-21.9)	
<b>Age</b>				<b>N = 6 163</b>
11-12 years	16.5 (14.6-18.4)	64.3 (61.7-66.7)	19.3 (17.3-21.4)	
13-14 years	11.2 (9.8-12.8)	69.2 (67.0-71.4)	19.6 (17.7-21.6)	$p < .001$
15-16 years	9.7 (8.4-11.2)	69.2 (67.1-71.4)	21.1 (19.2-23.0)	$\chi^2 = .100$
17-18 years	10.0 (8.5-11.7)	66.0 (63.4-68.5)	24.0 (21.7-26.3)	
<b>Age x Gender</b>				<b>N = 2 930</b>
Girls 11-12	19.5 (16.6-22.6)	64.6 (61.0-68.3)	15.9 (13.2-18.8)	
Girls 13-14	12.1 (10.0-14.5)	71.3 (68.1-74.4)	16.6 (14.2-19.4)	$p < .001$
Girls 15-16	11.0 (9.1-13.2)	70.3 (67.2-73.3)	18.7 (16.3-21.5)	$\chi^2 = .130$
Girls 17-18	12.2 (9.9-15.0)	64.3 (60.5-68.0)	23.4 (20.2-26.9)	
				<b>N = 3 233</b>
Boys 11-12	13.9 (11.6-16.5)	63.9 (60.5-67.3)	22.2 (19.4-25.2)	
Boys 13-14	10.5 (8.6-12.7)	67.2 (64.0-70.3)	22.3 (19.6-25.1)	$p = .004$
Boys 15-16	8.4 (6.8-10.4)	68.2 (65.1-71.2)	23.3 (20.7-26.2)	$\chi^2 = .074$
Boys 17-18	8.0 (6.2-10.2)	67.5 (64.0-70.9)	24.5 (21.4-27.8)	
<b>Gender</b>				<b>N = 6 163</b>
Girls	13.5 (12.2-14.7)	68.0 (66.3-69.7)	18.5 (17.2-20.0)	$p < .001$
Boys	10.2 (9.2-11.3)	66.8 (65.1-68.4)	23.0 (21.6-24.5)	Cramér's V. = .069
<b>Family affluence</b>				<b>N = 6 017</b>
High	13.4 (11.7-15.1)	71.5 (69.2-73.8)	15.1 (13.3-17.0)	
Medium	11.5 (10.5-12.6)	67.2 (65.6-68.7)	21.3 (20.0-22.7)	$p < .001$
Low	9.7 (8.0-11.8)	62.7 (59.5-65.7)	27.6 (24.8-30.5)	$\chi^2 = -.162$
<b>Migration background</b>				<b>N = 5 967</b>
First generation	11.5 (9.9-13.4)	65.7 (63.1-68.3)	22.7 (20.5-25.1)	
Second generation	10.4 (9.4-11.6)	67.3 (65.6-69.0)	22.3 (20.8-23.8)	$p < .001$
No migration	13.7 (12.1-15.4)	69.6 (67.4-71.7)	16.7 (15.0-18.5)	Cramér's V. = .051
<b>Family structure</b>				<b>N = 5 856</b>
Others	14 (8.5-21.7)	58.3 (49.0-67.5)	27.7 (19.6-36.4)	
Stepfamily	10.7 (8.5-13.3)	67.2 (63.5-70.8)	22.0 (18.8-25.3)	$p < .001$
Single parent	9.9 (8.3-11.6)	65.2 (62.5-67.8)	24.9 (22.6-27.4)	Cramér's V. = .050
Both parents	12.3 (11.3-13.4)	68.8 (67.3-70.2)	18.9 (17.7-20.2)	
<b>Type of school</b>				<b>N = 6 163</b>
ESC-classes sup.	10.4 (8.5-12.6)	77.5 (74.6-80.1)	12.1 (10.1-14.4)	
ESG-classes sup.	8.4 (6.6-10.6)	65.8 (62.3-69.2)	25.8 (22.7-29.1)	
Formation prof.	7.1 (5.1-9.7)	60.7 (56.4-65.1)	32.2 (28.2-36.6)	
ESC-classes inf.	14.0 (11.9-16.1)	73.7 (70.9-76.2)	12.3 (10.4-14.4)	$p < .001$
ESG-classes inf. (VO)	10.0 (8.4-11.7)	65.2 (62.6-67.7)	24.8 (22.5-27.2)	Cramér's V. = .131
ESG-classes inf. (VP)	11.5 (8.6-14.8)	58.9 (54.1-63.6)	29.6 (25.4-34.3)	
EF	16.3 (14.3-18.3)	63.7 (61.1-66.3)	20.0 (17.9-22.3)	

Respondents were asked about their height and weight. Based on this information it was calculated their BMI (Body Mass Index) score. According to the International Obesity Task Force cut-offs (Cole & Lobstein, 2012), the weight status was categorized in: thinness, normal weight and overweight/obesity. The results are in % (95% Confidence Interval).

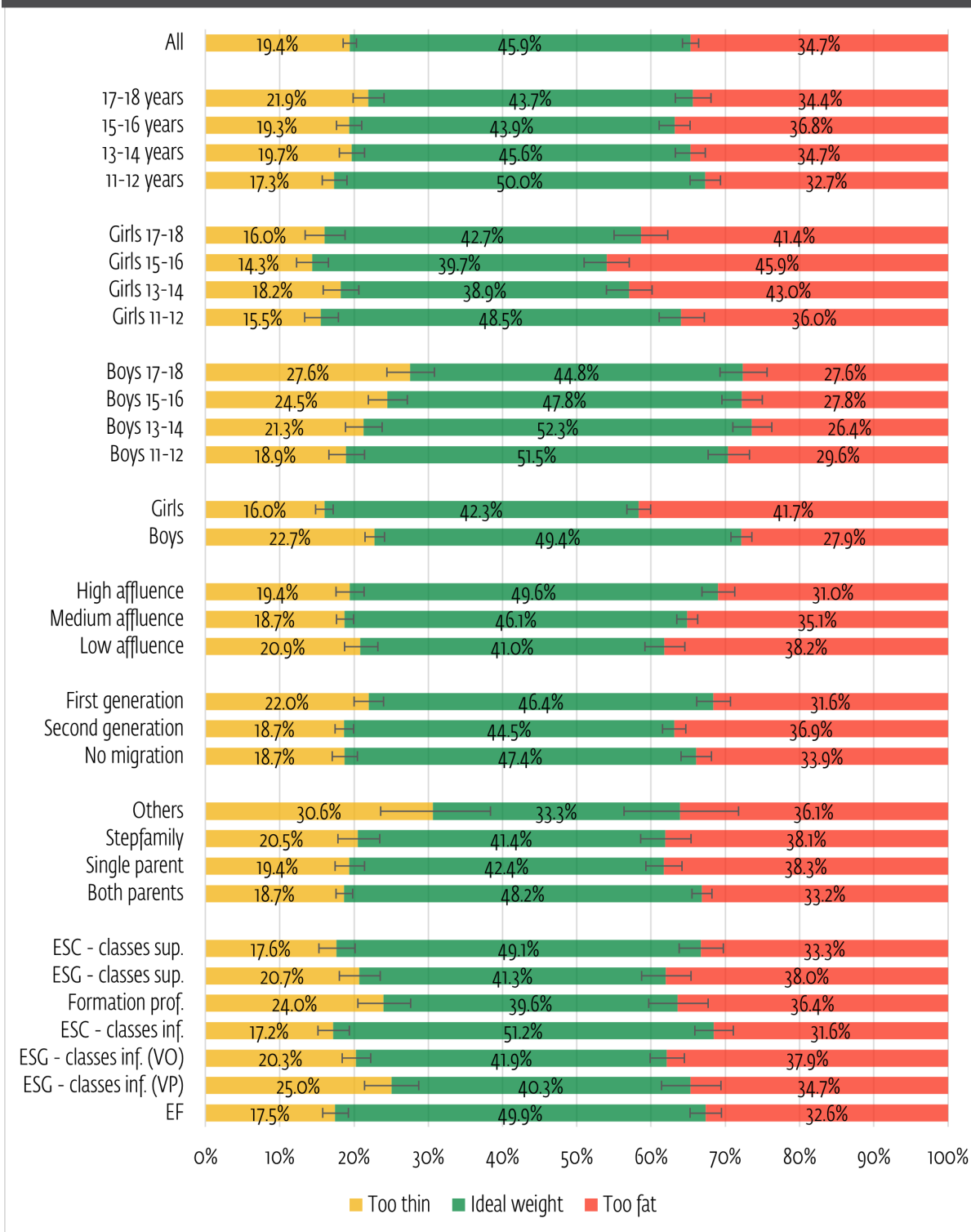


Figure 37: Prevalence of overweight and obesity according to sociodemographic groups



## Body image

Figure 38: Prevalence of body image according to sociodemographic groups



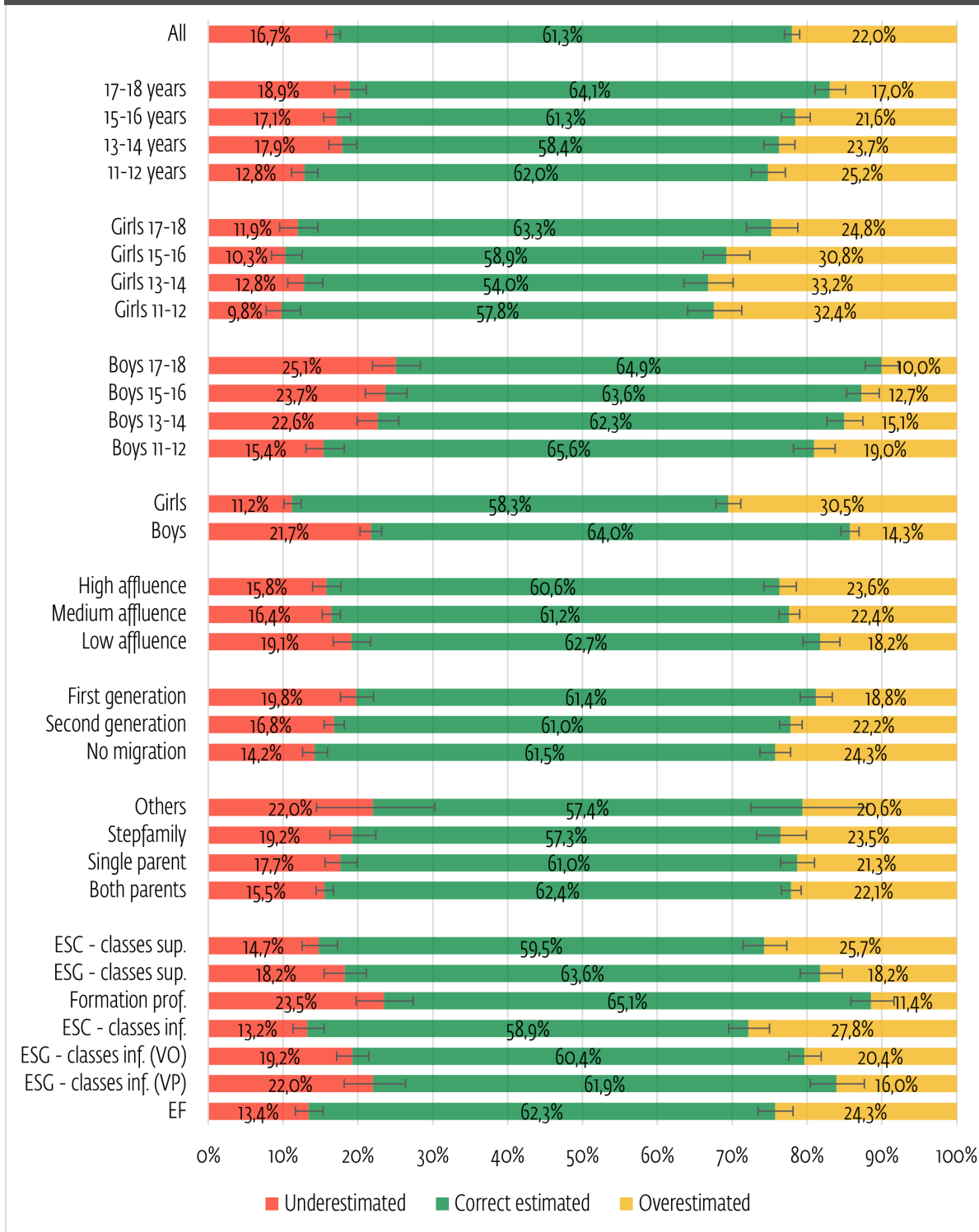
**Table 14: Prevalence of body image according to sociodemographic groups**

	Too thin (1-2)	Ideal weight (3)	Too fat (4-5)	Chi square test
<b>All</b>				<b>N = 7 633</b>
	19.4 (18.5-20.3)	45.9 (44.8-47.0)	34.7 (33.6-35.8)	
<b>Age</b>				<b>N = 7 633</b>
11-12 years	17.3 (15.7-19.0)	50.0 (47.7-52.1)	32.7 (30.7-34.8)	$p = .829$ $\chi^2 = -.003$
13-14 years	19.7 (18.0-21.4)	45.6 (43.5-47.7)	34.7 (32.7-36.8)	
15-16 years	19.3 (17.7-21.1)	43.9 (41.7-46.0)	36.8 (34.7-38.9)	
17-18 years	21.9 (19.9-24.1)	43.7 (41.2-46.3)	34.4 (32.0-36.9)	
<b>Age x Gender</b>				<b>N = 3 707</b>
Girls 11-12	15.5 (13.3-17.9)	48.5 (45.3-51.7)	36.0 (33.0-39.1)	$p = .008$ $\chi^2 = .054$
Girls 13-14	18.2 (15.9-20.6)	38.9 (35.9-41.9)	43.0 (39.9-46.0)	
Girls 15-16	14.3 (12.3-16.5)	39.7 (36.8-42.8)	45.9 (42.9-49.0)	
Girls 17-18	16.0 (13.4-18.8)	42.7 (39.0-46.3)	41.4 (37.7-45.0)	
				<b>N = 3 877</b>
Boys 11-12	18.9 (16.6-21.4)	51.5 (48.4-54.5)	29.6 (26.9-32.5)	$p = .002$ $\chi^2 = -.064$
Boys 13-14	21.3 (18.9-23.8)	52.3 (49.2-55.2)	26.4 (23.8-29.1)	
Boys 15-16	24.5 (21.9-27.2)	47.8 (44.8-50.9)	27.8 (25.0-30.5)	
Boys 17-18	27.6 (24.4-30.8)	44.8 (41.3-48.3)	27.6 (24.6-30.9)	
<b>Gender</b>				<b>N = 7 584</b>
Girls	16.0 (14.8-17.2)	42.3 (40.7-43.9)	41.7 (40.1-43.2)	$p < .001$ Cramér's V. = .149
Boys	22.7 (21.5-24.1)	49.4 (47.8-51.0)	27.9 (26.5-29.3)	
<b>Family affluence</b>				<b>N = 7 420</b>
High	19.4 (17.6-21.3)	49.6 (47.2-52.0)	31.0 (28.8-33.2)	$p = .009$ $\chi^2 = -.047$
Medium	18.7 (17.6-19.9)	46.1 (44.7-47.6)	35.1 (33.7-36.5)	
Low	20.9 (18.7-23.2)	41.0 (38.3-43.7)	38.2 (35.6-40.9)	
<b>Migration background</b>				<b>N = 7 346</b>
First generation	22.0 (20.0-24.0)	46.4 (44.0-48.8)	31.6 (29.4-33.9)	$p < .001$ Cramér's V. = .036
Second generation	18.7 (17.4-20.0)	44.5 (42.9-46.1)	36.9 (35.3-38.4)	
No migration	18.7 (17.1-20.5)	47.4 (45.2-49.5)	33.9 (31.9-36.0)	
<b>Family structure</b>				<b>N = 7 193</b>
Others	30.6 (23.6-38.4)	33.3 (26.1-41.2)	36.1 (28.6-44.0)	$p < .001$ Cramér's V. = .053
Stepfamily	20.5 (17.8-23.5)	41.4 (38.0-44.9)	38.1 (34.8-41.6)	
Single parent	19.4 (17.5-21.4)	42.4 (39.9-44.8)	38.3 (35.9-40.7)	
Both parents	18.7 (17.6-19.8)	48.2 (46.7-49.6)	33.2 (31.8-34.5)	
<b>Type of school</b>				<b>N = 7 633</b>
ESC-classes sup.	17.6 (15.3-20.2)	49.1 (46.0-52.3)	33.3 (30.3-36.3)	$p < .001$ Cramér's V. = .069
ESG-classes sup.	20.7 (18.0-23.5)	41.3 (38.0-44.7)	38.0 (34.7-41.4)	
Formation prof.	24.0 (20.5-27.7)	39.6 (35.5-43.7)	36.4 (32.5-40.6)	
ESC-classes inf.	17.2 (15.1-19.3)	51.2 (48.4-54.0)	31.6 (29.0-34.2)	
ESG-classes inf. (VO)	20.3 (18.4-22.2)	41.9 (39.5-44.2)	37.9 (35.6-40.2)	
ESG-classes inf. (VP)	25.0 (21.4-28.7)	40.3 (36.2-44.5)	34.7 (30.8-38.8)	
EF	17.5 (15.8-19.2)	49.9 (47.6-52.2)	32.6 (30.5-34.8)	

Respondents were asked to indicate how they perceive their bodies, completing the following sentence: "Do you think your body is ...". The responses ranged from 1 ("much too thin") to 5 ("much too fat"). Body image was categorized in: too thin (categories 1 and 2), ideal weight (category 3) and too fat (categories 4 and 5). The results are in % (95% Confidence Interval).

## Correspondence between weight status and body image

**Figure 39: Prevalence of correspondence between weight status and body image according to sociodemographic groups**



**Table 15: Prevalence of correspondence between weight status and body image according to sociodemographic groups**

	Underestimated	Correct estimated	Overestimated	Chi square test
<b>All</b>				<b>N = 6 088</b>
	16.7 (15.8-17.7)	61.3 (60.1-62.5)	22.0 (21.0-23.1)	
<b>Age</b>				<b>N = 6 088</b>
11-12 years	12.8 (11.1-14.6)	62.0 (59.4-64.5)	25.2 (23.0-27.5)	
13-14 years	17.9 (16.1-19.8)	58.4 (56.0-60.8)	23.7 (21.7-25.9)	$p < .001$
15-16 years	17.1 (15.4-19.0)	61.3 (59.0-63.5)	21.6 (19.7-23.6)	$\gamma = -.103$
17-18 years	18.9 (16.9-21.1)	64.1 (61.5-66.7)	17.0 (15.0-19.1)	
<b>Age x Gender</b>				<b>N = 2 895</b>
Girls 11-12	9.8 (7.7-12.3)	57.8 (54.0-61.6)	32.4 (28.9-36.1)	
Girls 13-14	12.8 (10.6-15.3)	54.0 (50.6-57.6)	33.2 (30.0-36.6)	$p = .005$
Girls 15-16	10.3 (8.4-12.5)	58.9 (55.6-62.2)	30.8 (27.8-34.0)	$\gamma = -.069$
Girls 17-18	11.9 (9.5-14.6)	63.3 (59.5-67.1)	24.8 (21.5-28.3)	
				<b>N = 3 193</b>
Boys 11-12	15.4 (13.0-18.1)	65.6 (62.2-68.9)	19.0 (16.3-21.9)	
Boys 13-14	22.6 (19.9-25.5)	62.3 (59.1-65.6)	15.1 (12.8-17.6)	$p < .001$
Boys 15-16	23.7 (21.0-26.6)	63.6 (60.5-66.8)	12.7 (10.7-15.1)	$\gamma = -.150$
Boys 17-18	25.1 (21.9-28.4)	64.9 (61.2-68.3)	10.0 (7.9-12.4)	
<b>Gender</b>				<b>N = 6 088</b>
Girls	11.2 (10.1-12.4)	58.3 (56.5-60.1)	30.5 (28.9-32.2)	$p < .001$
Boys	21.7 (20.3-23.2)	64.0 (62.3-65.7)	14.3 (13.1-15.5)	Cramér's V. = .219
<b>Family affluence</b>				<b>N = 5 952</b>
High	15.8 (13.9-17.7)	60.6 (58.0-63.1)	23.6 (21.5-25.9)	
Medium	16.4 (15.2-17.7)	61.2 (59.6-62.8)	22.4 (21.0-23.7)	$p = .002$
Low	19.1 (16.7-21.7)	62.7 (59.5-65.7)	18.2 (15.9-20.8)	$\gamma = .068$
<b>Migration background</b>				<b>N = 5 895</b>
First generation	19.8 (17.6-22.0)	61.4 (58.6-64.0)	18.8 (16.7-21.0)	
Second generation	16.8 (15.5-18.2)	61.0 (59.3-62.8)	22.2 (20.7-23.7)	$p < .001$
No migration	14.2 (12.6-15.9)	61.5 (59.2-63.8)	24.3 (22.3-26.3)	Cramér's V. = .044
<b>Family structure</b>				<b>N = 5 790</b>
Others	22.0 (14.4-30.3)	57.4 (48.2-67.1)	20.6 (13.6-29.2)	
Stepfamily	19.2 (16.2-22.4)	57.3 (53.4-61.2)	23.5 (20.3-26.9)	$p = .074$
Single parent	17.7 (15.6-19.9)	61.0 (58.3-63.7)	21.3 (19.1-23.7)	Cramér's V. = .032
Both parents	15.5 (14.4-16.7)	62.4 (60.8-63.9)	22.1 (20.8-23.4)	
<b>Type of school</b>				<b>N = 6 088</b>
ESC-classes sup.	14.7 (12.5-17.3)	59.5 (56.3-62.8)	25.7 (22.9-28.7)	
ESG-classes sup.	18.2 (15.5-21.1)	63.6 (60.1-67.1)	18.2 (15.5-21.1)	
Formation prof.	23.5 (19.8-27.4)	65.1 (60.8-69.4)	11.4 (8.8-14.5)	$p < .001$
ESC-classes inf.	13.2 (11.3-15.4)	58.9 (56.0-61.9)	27.8 (25.2-30.6)	Cramér's V. = .094
ESG-classes inf. (VO)	19.2 (17.1-21.4)	60.4 (57.8-63.1)	20.4 (18.2-22.6)	
ESG-classes inf. (VP)	22.0 (18.2-26.4)	61.9 (56.9-66.5)	16.0 (12.5-19.8)	
EF	13.4 (11.6-15.4)	62.3 (59.7-64.9)	24.3 (22.0-26.7)	

Based on the weight status and body image, it was computed the correspondence between these two variables. The correspondence of the weight status with body image was categorized in underestimated, correct estimated and overestimated. The "underestimated" represents the adolescents that perceive themselves thinner than their actual weight status; "correct estimated" represents the adolescents that perceive themselves with the correct weight status" and "overestimated" the adolescents that perceive themselves heavier than their actual weight status. The results are in % (95% Confidence Interval).

**Table 16: WHO-5 Index mean score according to levels of physical activity and age groups**

		Physically inactive	Low active	Active	Highly active
Age	11-12 years	12.16 (10.84-13.49)	14.88 (14.43-15.33)	16.14 (15.83-16.45)	17.75 (17.24-18.27)
	13-14 years	10.79 (9.96-11.61)	12.97 (12.59-13.36)	14.67 (14.34-15.00)	16.51 (15.92-17.10)
	15-16 years	10.31 (9.70-10.92)	12.46 (12.10-12.83)	14.05 (13.73-14.38)	15.63 (15.00-16.25)
	17-18 years	10.57 (9.95-11.18)	12.5 (12.07-12.94)	13.48 (13.11-13.85)	14.83 (14.06-15.60)

**Table 17: Associations between levels of physical activity and weight status (overweight and obesity), controlling for dietary intake**

	Overweight		Obesity	
	OR (95% CI)	p	OR (95% CI)	p
Level of physical activity				
Active	1.51 (1.21-1.89)	< .001	2.73 (1.55-4.81)	< .001
Low active	2.07 (1.64-2.61)	< .001	5.19 (2.95-9.16)	< .001
Physically inactive	2.19 (1.64-2.93)	< .001	6.81 (3.68-12.59)	< .001
Fruit consumption	0.96 (0.81-1.13)	.608	1.08 (0.81-1.44)	.598
Vegetable consumption	0.92 (0.78-1.07)	.279	0.78 (0.59-1.04)	.088
Soft drink consumption	1.22 (1.04-1.43)	.014	1.37 (1.05-1.77)	.019
Sweet consumption	0.60 (0.51-0.70)	< .001	0.55 (0.41-0.74)	< .001

Notes. "Highly active" was the reference group. "OR" means "Odds Ratio". The reported results are adjusted for fruit, vegetable, soft drink, and sweet consumption.

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# Abbreviations

BMI	Body Mass Index
COVID-19	Coronavirus disease 2019
EF	<i>Enseignement Fondamental</i>
ESC	<i>Enseignement Secondaire Classique</i>
ESG	<i>Enseignement Secondaire Général</i>
FAS	Family Affluence Scale
FP	<i>Formation Professionnelle</i>
GAPPA	Global Action Plan on Physical Activity
HBSC	Health Behaviour in School-aged Children (study/survey)
MVPA	Moderate-to-vigorous Physical Activity
SCRIPT	<i>Service de Coordination de la Recherche et de l'Innovation pédagogiques et technologiques</i>
VO	<i>Voie d'orientation</i>
VP	<i>Voie de préparation</i>
VPA	Vigorous Physical Activity
WHO	World Health Organization



# Reports on the Luxembourg HBSC Survey 2022

This report is part of a series of 5 thematic reports based on the HBSC survey 2022:

- Mental health and well-being of school-aged children in Luxembourg
- Health behaviours of school-aged children in Luxembourg
- Risk behaviours of school-aged children in Luxembourg
- Social context of school-aged children in Luxembourg
- COVID-19 impact and trends in health of school-aged children from 2006-2022 in Luxembourg

The reports are available in English, French and German and can be downloaded from the website [www.hbsc.lu](http://www.hbsc.lu). A methodological report and an interactive data visualization between 2006 and 2022 are also available in the website.



## **Report on the Luxembourg HBSC Survey 2022**

### **HEALTH BEHAVIOUR IN SCHOOL-AGED CHILDREN (HBSC) STUDY**

This report provides information on the health behaviours and health outcomes of adolescents aged 11 to 18 years old attending Luxembourg public and private schools whose teaching is based on the national curriculum in 2022.

Family affluence showed an association with all health behaviours. Adolescents from a low family affluence background reported less often to: have breakfast every day, brush their teeth at least twice a day, eat fruits and vegetables daily and practise physical activity; in addition, they reported more often to consume soft drinks daily and a higher prevalence of overweight/obesity is observed, when compared to their peers with a high affluence family background. Age and gender also presented associations with health behaviours, but they were not systematic, and its direction varied.

Moreover, this report analyses the relationship between physical activity, on the one hand, and overweight/obesity and well-being, on the other hand. Independently of the consumption of fruits, vegetables, soft drinks and sweets, the higher the frequency of physical activity, the lower the chances of being overweight and obese. In addition, higher levels of physical activity were associated with higher levels of well-being.

**University of Luxembourg**

Campus Belval

Maison de Sciences Humaines

11, Porte des Sciences

L-4366 Esch-sur-Alzette

[www.hbsc.lu](http://www.hbsc.lu)