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ASSESSMENT OF CHILDHOOD OBESITY

Impact of the COVID-19 pandemic on the daily routine and behaviours of school-agechildren in Albania

This report presents the findings of the 2021- 23 Childhood Obesity Surveillance Initiative (COSI) Survey, which was conducted by the Institute of Public Health (IPH). World Health Organization (WHO) Country Office Albania, and United Nations Children's Fund (UNICEF) in Albania provided technical and financial support for the realization of this survey.

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REPORT

ASSESSMENT OF CHILDHOOD OBESITY

Impact of the COVID-19 pandemic on the daily routine and behaviours of school-age children in Albania

Institute of Public Health
Tirana, March 2023

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ABBREVIATIONS

A	age
BMI	body mass index
CI	confidence interval
COSI	Childhood Obesity Surveillance Initiative
COV-EAT	Study on Lifestyle Changes and Determinants of Children's and Adolescents' Body Weight Increase during the First COVID-19 Lockdown in Greece
COVID-19	Corona virus disease
HFSS	High in Fat, Salt and Sugar
NA	not available
NCD	Noncommunicable disease
PSU	primary sampling unit
SSU	secondary sampling unit
SU	sampling unit
UNICEF	United Nations Children's Fund
WHO	World Health Organization

EXECUTIVE SUMMARY

The intention of this study is to serve as an instrument for policy information to better understand the problem and trend of obesity in children at both national and European levels, as well as to design effective nutrition interventions for children in order to stop or reverse the growing trend of obesity and keep this global epidemic under control.

As the worldwide spread of COVID-19 has had profound impacts on individuals, health systems, and the obesogenic environment, this study also aims to provide valuable information about how children's daily routines respond to unforeseen circumstances. The results can provide insight for the academic community and policymakers on which healthy lifestyle habits are essential for children's daily routines in potentially similar social circumstances.

The use of a standard COSI & COVID-19 data collection protocol to assess childhood obesity and children's daily routines and behaviours enables the comparison of the outcome data compiled by our country with the data from other countries participating in the same WHO initiative.

This report presents the main results of the third round of COSI for Albania (and WHO_ COSI sixth round of data collection), which took place between 2021 and 2023. For the first time this report also includes data on the impact of the COVID-19 pandemic on the daily routine and behaviours of primary school-age children in Albania, following the COSI approach.

The analysis of study data according to the WHO BMI limit values shows that, overall, 30.2% of children aged 8-9 years are overweight, of which 14.2% are obese. The prevalence was higher among boys (33.1%) than girls (27.4%), among urban (32.9%) than rural children (25.8%) and children whose parents had a medium and high education level (35.3% and 33.8%, respectively) compared to children with a low parental education level (27.8%). The prevalence of obesity increases as gestational age increases, and it is higher among never breastfed children (20.4%) compared to <6 months breastfed children (15.1%), with the lowest being among >6 months breastfed children (13.8%).

The prevalence of overweight (30.2%) among Albanian children aged 8–9 years based on WHO limit values is very close to the average of European children aged 7–9 years (29%) based on the latest data from the WHO-Report COSI round 5_ 2018-2020 (19). However, for the age group of 8-9 years (which corresponds to our study population) in this round of data collection, the European average of overweight and obesity is higher. Large differences are noticed across countries, with overweight prevalence ranging from 21.1% to 41.7%, and obesity from 7.1% to 19.2%.

The prevalence of overweight and obesity based on the latest data from the WHO-Report COSI round 5_ 2018-2020 is clearly higher in children aged 8–9 years than in any other age group; it is higher in urban than in rural areas and higher in males than in females. The prevalence of obesity in Albanian children aged 8–9 years by gender (17.7% in males and 10.7% in females) is in the midrange of the indicator in European countries for the same age group (from 9.6% to 25.4 in males and from 4.6% to 17.2% in females). In the 16 countries where data were collected for more than one age group, there was a tendency for the prevalence of overweight to increase with age among boys and girls and the prevalence of obesity to increase with age for boys.

However, it is worth noting that the latest data from the WHO-Report COSI round do not pertain to the period of lockdown due to the COVID-19 pandemic. The upcoming WHO-Report COSI 6th 2021-2023 round of data collection will enable the assessment of the impact of the COVID pandemic on childhood obesity rates at both country and European levels. The worldwide spread of COVID-19 has had profound impacts on individuals, health systems, and the obesogenic environment. Children were a unique population

affected by the COVID-19 pandemic. School closures disrupted learning and changed the lifestyles of children. Different studies from a number of countries in the European Region indicate that the prevalence of overweight and obesity and/or mean body mass index in children and adolescents increased during the COVID-19 pandemic. In one study conducted in the USA, which compared the obesity prevalence between the pre-pandemic and pandemic period, the overall obesity prevalence increased from 13.7% to 15.4% in 2020. (56) In particular, children with overweight and obesity appeared to be at risk for accelerated weight gain during the COVID-19 pandemic.

COV-EAT, a study on children and adolescent lifestyles during lockdown in Greece indicated that 35% of parents reported an increase in body weight among their children. These results correspond to our findings as the proportion of parents thinking that their child is extremely overweight during the pandemic increases significantly with the increase in perceived weight prior to the pandemic (0%, 0.2%, 10.2%, and 53.8% among parents thinking their child is underweight, normal weight, overweight, or extremely overweight before the pandemic, respectively). This relation has a highly significant linear trend. These studies suggest that pre-existing paediatric obesity was aggravated during the COVID-19 pandemic era.

Given the importance of diet and physical activity as determinants of overweight and obesity, COSI collects data on the frequency of consumption of breakfast, fresh fruit and vegetables – all considered to be important elements of a healthy diet – as well as frequency of soft drinks consumption.

On the measurement day, two out of five children (42.3%) stated that they had not had breakfast. A significant correlation is observed: the prevalence of breakfast skipping monotonically increasing with the increase in BMI - from 35% of thin children skipping breakfast, to 40.5%, 44.1% and 50.3% of normal, overweight and obese children skipping breakfast, respectively. The prevalence of breakfast consumption on that day was highest among children in rural (60.3%) than urban (56.1%) areas. The data also show that the proportion of children having breakfast increases significantly with the increase in parental education level.

About four out of five parents (79%) report that their children have breakfast at home every day (70.4%) or almost every day (8.5%). The rates of daily breakfast consumption in European countries ranged from 94% in Portugal and Denmark to only 44% in Armenia and 49% in Greece. Significantly higher percentages of urban children (72.1%) compared to rural children (67.7%) consumed breakfast daily and the prevalence of daily breakfast consumption increases with the increase in parental education level. The proportion of children never having breakfast was 5.1%.

Overall, two thirds of children (67.1%) consume fresh fruit daily. Our results are higher compared to other European countries where the highest daily fruit consumers were found in Portugal (63%), Ireland (61%), and Denmark (60%). Daily fruit consumption is slightly more common among girls, similarly to the trend in European countries, and urban children. Fruit was never consumed, or was consumed less than once a week by 4.5% of children. The highest percentages of children never consuming fresh fruit, or doing so less than once a week, were found in Malta, Tajikistan, and Georgia (14%, 12%, and 10%, respectively). The prevalence of rarely consuming fruits (never or less than once a week) decreases monotonically with the increase in parental education level.

Conversely, less than one thirds of children (29.9%) consume vegetables daily. The prevalence of rare (never or less than once a week) vegetable consumption is significantly higher among boys, rural area children and it is negatively associated with parental education level. The percentage of European children eating vegetables every day varied widely between countries, ranging from 57% in Portugal and Denmark to only 13% of children in Georgia and Spain.

Most of the Albanian children (83.2%) consume fruit and vegetables on a daily basis. Eating 1-2 portions of fruit and vegetables a day tended to be more common in the children of parents with a high level of education than in the children of parents with a low level of education.

Overall, 8.8% of children consumed soft drinks containing sugar on more than three days a week, much lower than the average of European countries, where 22% of children aged 6–9 consumed soft drinks more than three days a week. The frequent consumption of soft drinks containing sugar was higher among rural children (11%) than urban children (7.4%) and it was higher in the children of parents with a low level of education than in the children of parents with a high level of education, similarly to the European trend. Almost three-fourths of children (74.2%) never consumed soft drinks containing sugar or did so less than once a week compared to half of European children (49%) doing the same. The prevalence of rare (never or once a week) soft drinks consumption is significantly higher among urban area children and positively associated with parental education level.

Physical activity has many health benefits and, as a key determinant of energy expenditure, is important for maintaining a healthy weight. European children have become less active as environments and opportunities for safe active play, recreation, and transport have decreased. COSI round 6 collected data on travel to and from school and on time spent practicing sports/dancing, playing actively/ vigorously, watching television, and using electronic devices.

About six in ten children (59.1%) travelled to and from school actively (on foot, by bicycle, skating or by non-motorized scooter) compared to only 41% of 6–9-year-old children in European countries. The proportion of children using motorized vehicles to and from school increases with the increase in parental education level, similarly to the trend found in the majority of European countries that participated in COSI ROUND 5th. The prevalence of overweight and obesity is significantly higher among children using less healthy means of transportation to and from school compared to children using healthy transportation means.

More than two-thirds of children (68.1%) spend at least two hours a week practicing sports/dancing, 21.5% of them practice sports for less than two hours, and 10.3% never engage in sports/dancing clubs. The percentage of boys (71.3%) practicing sports/dancing for at least two hours a week was significantly higher than that of girls (65%), and the children of parents with a high level of education were more likely to spend at least two hours a week doing sports or dancing than those whose parents had a low level of education. A comparable trend was present in all countries participating in COSI ROUND 5.

Almost all children spent at least one hour a day on average engaging in active or vigorous play. The figure was slightly lower on weekdays (94.2%) compared to weekends (97.8%), but higher than the average of European children (86% on weekdays vs. 96% on weekends).

About four in ten children (39.6%) spend at least two hours a day watching TV or using electronic devices on weekdays, while this rate almost doubled (76.6%) on weekends. Boys, as in almost all European countries (with the exception of Austria and the Russian Federation), were more likely than girls to have at least two hours a day of screen time. There was no significant association between the time spent watching TV or using electronic devices during both weekdays and weekends and the BMI of children, with no clear trends being observed.

About one in ten children (9.4%) sleeps fewer than 9 hours per day, whereas the remaining 90.6% sleep 9 or more hours per day. A significantly higher proportion of rural (92.6%) than urban children (89.4%) sleep for 9 hours or more each day. Also, the proportion of children sleeping for 9 or more hours daily decreases significantly with the increase in parental education level. No significant association was found between the daily number of sleeping hours and the BMI of children, and no clear trends are observed.

About one out five people among the family members of the children included in this study were ever diagnosed with high cholesterol level (21.8%), high blood pressure (19.8%), or diabetes (19%).

School plays a key role in the battle against obesity in children and adolescents through the implementation of specific policies that promote healthy nutritional habits and physical activity, which are conscious choices for healthy behaviour among young people. WHO emphasizes that

policy and educational measures within the school environment represent a good opportunity to positively influence the health of young people.

COSI collected data on some characteristics, such as the frequency of physical education classes, the availability of school playgrounds, the availability of a number of listed food items and beverages on school premises, and current school initiatives organized to promote a healthy lifestyle, etc.

There has been an improvement in the availability of the outdoor (95.1%) and indoor playground areas (55.6%) in schools, which are spaces where children can usually play during breaks between classes, compared to the data from the latest Albania COSI 2015-16 round (respectively 87.2% and 48%).

Additionally, the number of schools that organize sports/physical activity events at least once a week for primary school children outside school hours for all grade levels is slightly higher (55.6%) compared to the data from the latest COSI 2015-16 round (53.8%). However, the number of schools that did not organize any sports/physical activity events is still significant (37.5%). The same increasing trend was observed in the number of physical education classes for the children. All schools reported the realization of 135 minutes/week for all grade levels (3 hours of physical education). While the data from the latest COSI 2015-16 round showed that the teaching program included 2 hours of physical education - 45 minutes each- for a total of 90 minutes per week.

However, the partial lack of playgrounds (especially indoor ones) and sports /physical activity events outside school hours indicates the difficulty of children to be sufficiently physically active in the school environment as school teachers did not organize any activities or sports in addition to the mandatory 135 minutes per week of physical education for each class, which was more prevalent in rural schools.

Nutrition education was included in the curricular activities in all schools. About half of the schools provided all three nutrition education types ("*healthy eating information*", "*tasting of fresh fruit and vegetables*" and "*learning food preparation skills*") meanwhile, the latter type of education was not delivered in 42 % of schools. A rising trend is reported by the school staff regarding the use of initiatives to promote a healthy lifestyle in schools this round, compared to the last COSI round (respectively 73.6% of schools reported having had initiatives/projects organized (or that will be organized) compared to 63.5% in COSI 2015-16).

All schools were free from advertising and marketing of any energy-dense and nutrient-poor foods and beverages that could undermine the promotion of a healthy, balanced diet. A significant decreasing trend is also observed in children's exposure to unhealthy foods (potato chips, croissants, drinks with added sugar, hamburgers, sandwiches, etc.), as a result of the implementation of two regulations drawn up and approved by the Ministry of Health and Social Protection, the Ministry of Education and Sports and the Ministry of Agriculture and Rural Development, on " banning the advertising of unhealthy foods in the premises of pre-university educational institutions" and on "food standards in the premises of pre-university educational institutions" in 2021.

In the meantime, the lack of access to water and healthy foods (fresh fruits, fruit juice with no sugar, etc.) found in the school environment, as well as the small number of schools (14 schools or 9.7% of the total) that have a canteen (available only in non-public schools) may contribute to children developing poor nutritional habits at an early age.

The routes to and from school for most pupils to walk or ride a bicycle are considered much safer by the school staff in this COSI round (40.2%) compared to COSI round 2015-16 (20%). Road safety is rated higher in urban areas than in rural ones.

The COVID-19 pandemic has been described as a "unique multidimensional and potentially toxic stress factor for mental health," which has had a particularly strong influence on children and adolescents due to the interruption of social contacts—which are crucial to psychosocial development.

In order to understand the effect of the COVID-19 pandemic situation on children´s daily routines, wellbeing, eating habits, behaviours, physical activity, and perception of the nutritional status of school-age children, a voluntary family questionnaire was distributed to the parents of all school children aged 7–10 years. They were invited to share with us their opinions about the perceived frequency of their children engaging in the above-mentioned activities prior to and during the COVID-19 pandemic.

Parents perceived their children's weight during the COVID-19 pandemic as higher than before the pandemic, regardless of nutritional status (underweight, slightly normal overweight, and very overweight). The proportion of parents thinking that their child is a little overweight or extremely overweight during the pandemic increases significantly with the perceived weight prior to the pandemic.

A review of 15 international studies about the weight changes of children and adolescents during the COVID-19 pandemic predominantly showed an increase in weight mostly due to a change in eating habits and decreased physical activity. Often, a reduction in movement is accompanied by an increase in smartphone use. Our data also show that the behaviours that increased more during the pandemic (in terms of the percentage of children engaging in them) included time spent watching TV or using electronic devices both on weekdays and weekends (respectively +21 percentage points). On the other hand, the behaviours that decreased more during the pandemic include the time spent actively playing outside on weekdays and weekends (-21.7 and -18.9 percentage points, respectively).

Problematic smartphone use can be accompanied by symptoms of anxiety and depression. (66) During the pandemic, higher proportions of children felt lonely and sad compared to the pre-pandemic period; lower proportions of children were attentive, had fun with their friends, or did things children want to do in their free time, and lower proportions made progress at school as well, compared to the pre-pandemic period.

Our data are consistent with the findings of several studies suggesting that the pre-existing paediatric obesity was aggravated during the COVID-19 pandemic period, which means that childhood overweight and obesity will still remain a major public health challenge in the WHO European Region (including Albania) for the foreseen future.

This report will contribute to the efforts to tackle childhood overweight and obesity, both by tracking progress and by informing and driving policy action on nutrition and physical activity. In addition, for the first time, this report has collected information on how Albanian children's daily routines respond to unforeseen circumstances, thus providing important insights for the academic community and policymakers about healthy life habits that are essential for children's daily routine in potentially similar social circumstances.

CONTEXT/INTRODUCTION

Childhood obesity is an important public health concern in the WHO European Region: for this reason, it is considered to be the greatest challenge of the 21st century. Childhood obesity significantly compromises the person's future development. The health consequences of overweight for children during childhood strongly are associated with risk factors for cardiovascular disease, type-2 diabetes, orthopaedic and musculoskeletal problems and mental disorders. (1) Childhood overweight and obesity might represent a social burden in terms of lower school attendance, poorer school performance, and an increased probability of having a low-income job. The most alarming aspect of childhood obesity is that these children remain obese even in adulthood, thus developing a serious pathology that leads to reduced quality and length of life.

The most recent WHO European Obesity Report (1) was compiled in response to the problem of obesity and overweight within the WHO European Region, where an estimated 59% of adults and one in three children (29% of boys and 27% of girls) are living with overweight or obesity, and no country is currently on track to meet global targets to halt the rise in obesity by 2025. This is why childhood obesity is one of the priority topics in the WHO European Programme of Work, 2020–2025 (EPW).

The World Health Organization European Childhood Obesity Surveillance Initiative (COSI/WHO Europe) is a continuous and systematic process of collecting, analysing, interpreting, and disseminating descriptive information for monitoring excess body weight in the WHO European Region. The aim of the system is to routinely measure trends in overweight and obesity in primary school children, in order to gain an accurate understanding of the epidemic in this population group and to enable intercountry comparisons within the European Region. (2, 3)

Tackling obesity – including childhood obesity – is vital for the achievement of Sustainable Development Goals and for the implementation of the WHO European Programme of Work 2020–2025 – "United Action for Better Health".

Physical distancing restrictions through mandatory lockdown period (s) during the COVID-19 PANDEMIC, led to a constraint on people's mobility, forcing families to stay home for a long period of time. Particularly in children, the lockdown completely modified their lifestyle due to homeschooling, the stress of coping with the situation, and lack of structured activities and social interactions. (4)
In addition to the WHO/Europe COSI and within its system and network, the WHO European Office for the Prevention and Control of NCDs aims to conduct the study *"Impact of the COVID-19 pandemic on the daily routine and behaviours of school-age children in Europe"* during the 2021/2023 school year.

In Albania, overweight and obesity are an important risk factor for health, especially for non-communicable diseases. This risk factor is present since childhood. (5, 25)

Albania joined the WHO/COSI initiative for the first time during the third round of data collection, which took place during the 2012/2013 school year, followed by the next, fourth round, which took place during the 2015/2016 school year.

The National Action Plan on Food and Nutrition 2013-2020, Health Promotion Action Plan 2017-2021 & 2022-2030, and Non-Communicable Disease Prevention and Control Program 2016-2020 & 2021-2030 have dedicated special attention to the control and reduction of overweight and obesity in the Albanian population in general, and especially in young children, including the "Monitoring of obesity every 3 years in children aged 6-9.9 years as part of the *European Childhood Obesity Surveillance Initiative"* as an important *systematic instrument for policy information.*

This study is part of the implementation of the Childhood Obesity Surveillance System in Albania, the 2-year Cooperation Agreement between the Ministry of Health and Social Protection and the World Health Organization (WHO) 2022-2024, the 2-year Cooperation Agreement between the Ministry of Health and Social Protection and the United Nations Agencies and the Sixth Round 2021-2023 of data collection on the tendency of overweight and obesity in children aged 6.00-8.99 years old among European member countries of the WHO, which our country is also part of. (COSI 2021-2023)

1. AIM AND MAIN OBJECTIVES

The implementation of this study aims to measure trends in overweight and obesity among primary school-age children in Albania.

This study comprises two main objectives:

- Firstly, as part of the childhood obesity surveillance system in Albania, to collect, analyse, interpret and disseminate information to help monitor overweight among young children and use this information to understand the progress of the epidemic, as well as to plan and take actions accordingly.

- Secondly, to collect comparable, valid, and reliable data on the impact of the COVID-19 pandemic on the daily routine and behaviours of primary school-age children in Albania, following the COSI approach.

For the third time, this study will be part of the surveillance system of routine data, in order to provide information to more accurately understand the problem of obesity in children at both national and European levels (COSI-Childhood Obesity Surveillance Initiative_ 6th round).

2. METHODS

Data are collected according to a common protocol devised by the WHO Regional Office for Europe and Member States. (6)

Primary schools were the setting of enrolment: these schools were the settings through which children have been selected to participate in the study and the place where children have been measured and data has been collected.All measurements were performed between 8 October and 2 December 2022.

2.1 Study population and subjects

The study population consisted of children who attended the second and third grades in the 9-year school system. This age group was chosen because it is linked to a higher risk of obesity (7-9*)*; it acknowledges the growing impact of puberty and recognizes the ability of children of this age to answer a few simple questions (10). Moreover, COSI requires data collection for children aged 6–9 years (2).

Another reason for selecting the same age group relates to the need for assessing the trends of obesity and overweight in children in this age group in Albania (because this age group was also targeted in the previous COSI round in Albania). From this point of view, the comparison of overweight and obesity rates in children in the same age group (8-9 years old) would provide valuable information for evidence-based policymaking and effective design and implementation of intervention programs.

2.2 Sampling strategy

A one-stage stratified cluster sampling technique was used, with primary schools serving as main clusters or primary sampling units.

The schools in the sampling framework were stratified by region, and then a simple random sample of primary schools was drawn with probability proportional to size. In every selected school, a 2nd and a 3rd grade has been randomly selected.

2.3 Sample size and participation in the study

The sample size is driven by the survey's requirements of reaching a minimum of ≈2800 children (≈1400 boys and ≈1400 girls), the effective number of measured children in order to have 80% power to detect a minimum difference of 0.10 Z-score in mean body mass index (BMI) per year at a two-sided 5% significance level, after adjusting for design effect of 1.2 (2, 4,19). Assuming a response rate of 90%, the required sample size should be set at ≈3100 children to obtain the minimum target sample size of ≈2800 children). (2, 4)

Since the target cohort of pupils (children aged 8-9 years) is divided into 2nd and 3rd grades, and all pupils in a class have to be included, then this doubled the number of pupils included, in order to ensure the minimum number of target pupils (children aged 8-9 years). Therefore, in order to reach the entire target cohort, we collected data about approximately ≈3100x2=6200 pupils (about 3100 2nd graders and about 3100 3rd graders).

Furthermore, assuming an average of ≈20 pupils per class, ≈140/155 classes were required to achieve the final recommended sample size of ≈2800 pupils per targeted age group.

Based on these conservative assumptions, it was decided to include 144 classes in the final sample. Then the final list of schools to be included in the study was selected and drawn up. As indicated by the WHO COSI protocol, only the data of children who were exactly 8.00-8.99 years old (from second grade and third grade) were used for the cross-sectional analysis.

2.4 Recruitment approach

The study included every pupil in the second and third grades selected during the sampling process who was present on the day the anthropometric measurements were performed, regardless of their age. Only students whose parents gave consent were asked to be measured. No pupils who were absent or didn't agree to being measured on the measurement day were measured. Even children with severe physical handicaps were measured, but the results were not included in the database for further analysis. During data collection, children who were outside the sample group were measured either by the teacher's or the child's request. These data were not included in this analysis.

2.5 Data Collection

COSI &COVID-19 data were collected using three record forms: the child record form (including anthropometric measurements) filled in by a trained examiner; the school record form completed by the school principal (head teacher), the teachers of the participating classes or other staff; and the voluntary family record form completed by the parents or guardians/caregivers as a self-administered paper questionnaire. (6)

The COSI &COVID-19 voluntary family record form, proposed by WHO in the Data Collection Manual for this round (WHO_R6 2021-2023) was previously revised and finalized by the national coordination team regarding the inclusion of optional questions, in view of the context and benefits at the national level.

Anthropometric measurements of the children were performed using portable scales and stadiometers. Weight measurements were performed using scales with a ± 100 g degree of accuracy and a measuring capacity of 200 kg. Height measurements were performed using portable stadiometers with an accuracy of ± 1 mm and a measuring range of 20–205 cm. Ten sets of weighing scales (SECA 874) and portable height boards (SECA 213) were provided by the Institute of Public Health for the field work.

2.6 Data cleaning and analysis

All data were entered into SPSS (Statistical Package for Social Sciences), version 17.0. The data analysis consisted in the description of the variables (univariate analysis: calculation of mean values and standard deviations for numerical variables and frequency distributions [absolute values and corresponding percentages] for categorical variables), as well as in the application of statistical tests (bivariate analysis) for comparing the prevalence of underweight, overweight and obesity in children in different sub-groups.

Specifically, the statistical tests used in the current analysis consisted of the following procedures:

- Chi-square test and Fisher's exact test (in cases where the expected value of at least one cell was <5) for comparing the prevalence of overweight and obesity in children according to gender (male vs. female), place of residence (rural vs. urban), or the parental education level.
- Pearson and Spearman correlation coefficients were used to evaluate linear associations between numerical variables.
- For all applied statistical procedures, values of $P \leq 0.05$ were considered statistically significant (significant).

During data analysis, body weight was adjusted for the weight of the clothes worn by the children when measured.

Children for whom a biologically implausible (or extreme) BMI-for-age value was estimated were excluded from the analysis.

3.DEFINITIONS EMPLOYED

1. **BODY MASS INDEX**: The classification of children's weight status was based on the BMI and WHO recommended growth reference for school-aged children and adolescents. BMI is calculated using the following formula: weight (kg) divided by height squared (m^2). (12, 13)

2. **THE CHILD'S AGE-** The child's age (in years) was calculated using the formula: date of measurement minus date of birth (expressed in days)/365.25

3. **CHILDREN'S NUTRITIONAL STATUS** - The body mass index (BMI) was calculated, and the WHO BMI-for-age (BMI/A) distributions for children (>5 years old) were used to compute BMI/A z-scores (12,13).
   - Thinness was defined as a BMI/A value below a z-score of –2,
   - normal weight as a z-score between –2 and +1;
   - overweight was defined as a BMI/A value above a z-score of +1.
   - obesity was defined as a BMI/A value above a z-score of +2,

4. **BIRTH**
   1. Preterm birth was defined as below 37 gestational weeks, and
   2. full-term birth as at 37 gestational weeks or above (14).

5. BIRTH WEIGHT

1. Low birth weight was defined as lower than 2,500 g,
2. normal birth weight as between 2,501 and 4,000 g,
3. high birth weight as 4,001 g and above (14, 15).

6. GENERAL BREASTFEEDING

1. "no," - "never breastfed."
2. range between less than 1 month and 5 months - breastfed for less than 6 months."
3. breastfeeding for 6 months or more- "breastfed for at least 6 months

7. PHYSICAL ACTIVITY AND SCREEN TIME

The answer options were categorized into "healthy" and "less healthy" behaviours in order to enable the comparisons between different socioeconomic population groups. (16)

The "less healthy" behaviours included:

1. taking a motorized vehicle to and from school,
2. participating in sports or dancing club fewer than 2 h per week,
3. playing actively or vigorously for less than 1 h a day,
4. watching TV or using electronic devices for 2 h a day or more,
5. and sleeping fewer than 9 h a day.

8. PARENTS' PERCEPTIONS OF THEIR CHILDREN'S WEIGHT STATUS

The perceived and actual classification of children's weight status was considered consistent in the following cases (17):

(i) children with thinness were correctly classified as "underweight";
(ii) normal weight children as "normal weight";
(iii) children with overweight (excluding obesity) as "a little overweight"; and
(iv) children with obesity as "extremely overweight".

9. PARENTAL EDUCATION LEVEL

Three categories of parental education were created:

(i) low parental education (both parents with low education);
(ii) medium parental education (one parent with low education, one parent with higher education); and
(iii) high parental education (both parents with higher education).

Parents were considered as having low education if they reported their educational attainment as "primary school or less", "lower secondary education" or "upper secondary and post-secondary non-tertiary education". Parents were considered as having higher education if they reported their educational attainment as "short-cycle tertiary education or bachelor's or equivalent level" and "master's or doctoral or equivalent level". In the case of single-parent families, parental education was based only on the education level declared by the responding parent (19)

4. ETHICAL ASPECTS

WHO COSI study protocol conforms to the International Ethical Guidelines for Biomedical Research Involving Human Subjects. (18) For this national survey, ethical permission was also provided by the Ethics Committee at the Ministry of Health and Social Protection (Annex: 1 Ethical permission provided by the Ethics Committee at the Ministry of Health and Social Protection).

Parents were fully informed about the study procedures and data handling and their informed consent was obtained on a voluntary basis. This was done either through a letter or through a school information meeting. Furthermore, the child's verbal assent was always obtained before measurements were taken. Examiners took steps to ensure the basic principles of confidentiality, privacy, and objectivity were observed throughout the process.

The confidentiality of all collected and archived data was ensured. The children's names are included neither in the hardcopy child form, nor in the electronic data files.

5. THE FINANCIAL SUPPORT

The financial support of this study was provided by the World Health Organization (WHO). United Nations Children's Fund (UNICEF) and the Institute of Public Health.

6. FIELD WORK

Field work consisted in the collection of the data on anthropometric measurements, mandatory child & school forms and voluntary family form.

There were six groups of examiners involved in the collection of data during the field work. Field work was carried out during the October 7 - December 2, 2022 period (about 8 weeks of field work).

- The data were collected in the 144 sampled schools according to the sampling plan (Annex 2: List of schools included in this study)

- The study population was children aged 8 years, but this targeted age group is spread across two grades, i.e. the measurements included the 2nd and 3rd grade, where children from this age group were present (the age of starting school in Albania is different).

- At the end of the fieldwork, a total of 5888 children from 144 primary schools were measured across the country. Only 158 parents refused to include their child in the study. All the children were interviewed and measured in similar conditions in all the schools included in the survey. But our analysis has included only 3159 children aged 8 to 8.99 years old.

- An additional 5298 forms completed by the children's parents or guardian/caregiver (who undertook the anthropometric measurements) were also collected, which will provide information on children's behaviours regarding physical activity/inactivity, eating habits, behaviours and daily routines, wellbeing, and family background during the COVID-19 pandemic periods.

- Generally, the school record forms were completed by the headmasters, but sometimes by the teachers of the participating classes or school managing staff, in the presence of the examiner, in 144 schools around the country. The school form will provide data on some characteristics, such as the frequency of physical education classes, the availability of school playgrounds, the possibility to purchase a number of listed food items and beverages on the school premises, and current school initiatives organized to promote a healthy lifestyle.

7. RESULTS

7.1 Overweight and obesity

Analyses of data from around the world show that the prevalence of obesity and overweight in children and adolescents has risen, although they have stabilized or have started to decrease in some European countries in recent years.1,2 The predictions for the future are not encouraging, with some estimates suggesting that 254 million children aged 5–19 years will be obese by 2030. (20)

WHO European Regional Obesity Report 2022 highlights how vulnerability to unhealthy body weight in early life can affect a person's tendency to develop obesity.

In the WHO European Region, obesity poses an increasing challenge, with one in three school-aged children, one in four adolescents and almost 60% of the adult population now living with overweight or obesity. A high body mass index is a major risk factor for noncommunicable diseases, including cancers and cardiovascular diseases. (1) The data on 3159 children aged 8-8.99 years were analysed and used in this report. More than six in ten children (62.3%) were attending schools in urban areas and 37.7% were attending rural area schools (Table 1).

Table 1. Distribution of children by geographic location

Geographic location of the school	Absolute number	Percentage (%)
Urban	1968	62.3
Rural	1191	37.7
Total	**3159**	**100.0**

There was an almost equal sex distribution among participating children, with 50.5% boys and 49.5% girls (Table 2).

Table 2. Distribution of children by sex

Gender of the child	Absolute number	Percentage (%)
Boy	1595	50.5
Girl	1564	49.5
Total	**3159**	**100.0**

The distribution of children by level of parental education is shown in Table 3. More than two thirds of children have parents with a low education level, 13.9% have parents with a medium education level and 18.3% have parents with a higher education level.

Table 3. Distribution of children by level of parental education

Parental education level	Absolute number	Percentage	Valid %	Cumulative %
Low	1881	59.5	67.9	67.9
Medium	385	12.2	13.9	81.7
High	506	16.0	18.3	100.0
Subtotal	*2772*	*87.7*	*100.0*	
Missing	387	12.3		
Total	**3159**	**100.0**		

In order to determine the nutritional status of the children, we relied on the Body Mass Index (BMI) using the WHO limit values (presented in detail in the methodology section of this report). Table 4 presents a summary of the anthropometric characteristics of the sample of children selected for the study. Only one child (a boy) refused to be measured.

Table 4. Anthropometric characteristics of a representative sample of children aged 8.0-8.99 years, 2016

Anthropometric indicator	Boys (n=1594)		Girls (n=1564)		Total (n=3158)	
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)
Weight (kg)	30.4±7.7	28.3 (25.0-33.9)	29.0±7.2	27.4 (23.9-32.5)	29.7±7.5	27.8 (24.5-33.1)
Height (cm)	132.5±6.5	132.4 (128.0-136.5)	130.8±6.2	130.6 (126.7-135.5)	131.7±6.4	131.5 (127.3-135.8)
BMI (kg/m²)	17.1±3.2	16.3 (14.9-18.6)	16.8±3.1	16.0 (14.5-18.3)	16.9±3.2	16.1 (14.7-18.4)

Table 5 shows the distribution of children's body mass (BMI) according to WHO limit values. The prevalence of overweight (including obesity) among children is 30.2%, of whom 14.2% are obese. Only 3.2% of children are thin.

Table 5. Distribution of nutritional status of children based on BMI according to WHO criteria (N=3158)

Nutritional status	Absolute number	Percentage	Valid %	Cumulative %
Thin	100	3.2	3.2	3.2
Normal	2103	66.6	66.6	69.8
Overweight*	506	16.0	16.0	85.8
Obese	449	14.2	14.2	100.0
Subtotal	*3158*	*100.0*	*100.0*	
Missing data	1	.0	3.2	
Total	**3159**	**100.0**		

*Overweight excluding obesity

Table 6 shows the distribution of children's BMI by gender and geographic location of the school. Referring to the obtained results, there is a significant difference (P<0.001) in the prevalence of obesity by gender. The proportion of obese boys (17.7%) is 1.65 times higher than the proportion of obese girls (10.7%), while the prevalence of overweight shows a much smaller difference and a reversed gender trend, i.e. higher among girls (16.7%) than among boys (15.4%). The prevalence of obesity is 1.33 times higher among urban than rural children (15.7% vs. 11.8%, respectively) and the same trend and pattern is observed with regard to the prevalence of overweight being 1.24 higher among urban than rural children (17.3% vs. 13.9%, respectively) [Table 6].

Table 6. BMI distribution according to children's demographic characteristics (N=3158)

Variable		BMI category				P-value**
		Thin (n=100)	Normal (n=2103)	Overweight (n=506)	Obese (n=449)	
Gender						
Boys	Number	57	1010	245	282	**<0.001**
	%	3.6 %	63.4 %	15.4 %	17.7 %	
Girls	Number	43	1093	261	167	
	%	2.7 %	69.9 %	16.7 %	10.7 %	
Geographic position of the school						
Urban	Number	54	1265	340	308	**<0.001**
	%	2.7 %	64.3 %	17.3 %	15.7 %	
Rural	Number	46	838	166	141	
	%	3.9 %	70.4 %	13.9 %	11.7 %	

* Row percentage.

** P-value according to the chi-square test.

Table 7 shows the distribution of children's BMI by level of parental education. There is a significant difference in the distribution of overweight by level of parental education with the prevalence of overweight being significantly lower among parents with a low level of education (15.1%) compared to those with a medium (17.4%) and high education level (17.8%). The prevalence of obesity varies similarly by parental education level: 12.7%, 17.9%, and 16% among low, medium and high parental education level.

Table 7. BMI distribution according to children's parental education level

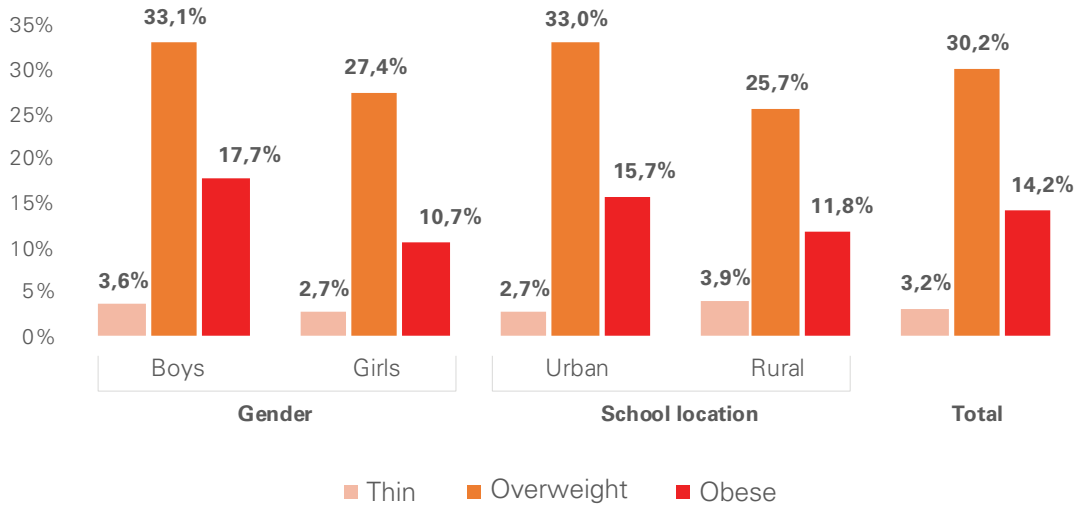
Variable		BMI category				P-value**
		Thin (n=91)	Normal (n=1851)	Overweight (440)	Obese (389)	
Parental education level						
Low	Number	63	1295	283	239	**0.025**
	%	3.4 %	68.9 %	15.1 %	12.7 %	
Medium	Number	11	238	67	69	
	%	2.9 %	61.8 %	17.4 %	17.9 %	
High	Number	17	318	90	81	
	%	3.4 %	62.8 %	17.8 %	16.0 %	

* Row percentage.

** P-value according to the chi-square test.

The prevalence of overweight (including obesity) is higher among boys and urban children (Figure 1).

Figure 1. Distribution of overweight* and obesity in children based on gender and place of residence according to WHO criteria (in %)



* Overweight including obesity.

Table 8 shows the prevalence of overweight (overweight + obesity) by gender, urban-rural and parental education level. The prevalence of overweight is significantly higher among boys than girls (33.1% vs. 27.4%, respectively), among urban (32.9%) than rural children (25.8%) and children with medium and higher parental education level (35.3% and 33.8%, respectively) compared to children with a lower parental education level (27.8%).

Table 8. BMI distribution by child demographic characteristic

Variable		BMI category			P-value**
		Thin (n=100)	Normal (n=2103)	Overweight including obesity (n=955)	
Gender					
Boys	Number	57	1010	527	**<0.001**
	% *	3.6 %	63.4 %	33.1 %	
Girls	Number	43	1093	428	
	%	2.7 %	69.9 %	27.4 %	
Geographic position of the school					
Urban	Number	54	1265	648	**<0.001**
	%	2.7 %	64.3 %	32.9 %	
Rural	Number	46	838	307	
	%	3.9 %	70.4 %	25.8 %	
Parental education level					
Low	Number	63	1295	522	**0.010**
	%	3.4 %	68.9 %	27.8 %	
Medium	Number	11	238	136	
	%	2.9 %	61.8 %	35.3 %	
High	Number	17	318	171	
	%	3.4 %	62.8 %	33.8 %	

* Row percentage.

** P-value according to the chi-square test.

7.2 Association with early-life factors

Breastfeeding has been described as a protective factor, and the more exclusively and the longer children are breastfed, the greater their protection from obesity. Birth weight has been shown to have a positive correlation with later risk for obesity. Different studies also confirmed that a higher birth weight (>4,000 g) is associated with an increased risk of obesity and contributes to childhood obesity and to increased body fat mass (14).

The WHO recommends exclusive breastfeeding until 6 months, with continued breastfeeding and appropriate complementary foods up to 2 years of age or beyond (21). It has been consistently shown that human milk, due to its bioactive compounds, has immunological, endocrinological, neuronal, and psychological benefits for the child (22, 23, 24).

Despite the strong policy commitments and robust evidence on its benefits, the prevalence of breastfeeding remains low in the WHO European Region (26).

Besides the mandatory measurements of the children's weight and height, the COSI protocol also includes the option to gather information about simple indicators of the first year of life, such as children's birth weight and breastfeeding practice and duration.

BIRTH WEIGHT

Table 9 shows the distribution of birthweight based on parental/guardian/caregiver reporting. The prevalence of self-reported low birth weight (<2500 gr) was 6.3%, whereas 7.6% of children had a birthweight of >4000 gr.

Table 9. Birth weight distribution of children according to parental/guardian/caregiver reporting

Reported birth-weigh	Absolute number	Percentage (%)
<2500 gr	167	6.3
2500-4000 gr	2282	86.1
>4000 gr	200	7.6
Total	**2649**	**100.0**

Obese children had the highest percentage (14.9%) of being born over 4000 g, followed by overweight ones (8.1% of whom had a birth weight of >4000 gr). While among thin children, 8% of them had a lower birth weight than 2500 gr (Table 10).

Table 10. Distribution of children by BMI and birthweight

BMI category	Birthweight			Total
	<2500 gr	2500-4000 gr	>4000 gr	
Thin	8.0 %	89.7 %	2.3 %	100.0%
Normal	7.4 %	86.5 %	6.1 %	100.0%
Overweight	3.0 %	88.8 %	8.1 %	100.0%
Obese	4.3 %	80.7 %	14.9 %	100.0%
Total	**6.3 %**	**86.1 %**	**7.6 %**	**100.0%**

There is a statistically significant difference in the prevalence of obesity depending on children's birth weight (P<0.001). Thus, children born weighing <2500 grams had a lower prevalence of obesity (9.6%) compared to children born weighing 2500-4000 grams (13.0%), who in turn had a much lower prevalence of obesity compared to children born weighing >4000 grams (27.5%). There is a similar situation for the prevalence of overweight: 7.8%, 16.7%, and 17.5%, respectively. (Table 11)

Table 11. Distribution of children by BMI and birthweight

Variable		Birthweight <2500 gr	2500-4000 gr	>4000 gr	P-value**
BMI category					
Thin	Number	7	78	2	**<0.001**
	% *	4.2 %	3.4 %	1.0 %	
Normal	Number	131	1525	108	
	%	78.4 %	66.8 %	54.0 %	
Overweight	Number	13	382	35	
	%	7.8 %	16.7 %	17.5 %	
Obese	Number	16	297	55	
	%	9.6 %	13.0 %	27.5 %	
Total	**Number**	**167**	**2282**	**200**	
	%	**100.0 %**	**100.0 %**	**100.0 %**	

* Column percentage.

** P-value according to the chi-square test.

BIRTH

About 87.2% of the children are reported as having been born full term, with 6.3% of them being born preterm and 5.3% considered as late-term birth. In 1.2% of cases, parents do not remember this information. The prevalence of prematurity among thin, overweight and obese children is 7.6%, 7.7%, and 5.0%, respectively (Table 12).

Table 12. Distribution of children by BMI and time of birth

BMI category	Term				Total
	Preterm (<37 weeks)	Full term (37-41 weeks)	Late term (≥42 weeks)	I do not know	
Thin	7.6 %	88.0 %	2.2 %	2.2 %	100.0%
Normal	6.2 %	87.8 %	4.7 %	1.3 %	100.0%
Overweight	7.7 %	86.7 %	4.6 %	0.9 %	100.0%
Obese	5.0 %	85.0 %	9.5 %	0.5 %	100.0%
Total	**6.3 %**	**87.2 %**	**5.3 %**	**1.2 %**	**100.0%**

There are statistically significant differences in the distribution of overweight and obesity by term of birth (Table 13). For example, the prevalence of obesity increases with the increase in gestational age (from 11.2% among preterm babies, to 13.8% among full-term birth and 25.3% among late-term birth babies), whereas reversed trends are noted with regard to the prevalence of overweight and thin babies. In this light, late-term birth is a risk factor for obesity in later life.

Table 13. Distribution of children by BMI and time of birth

BMI		Time of birth				P-value**
		Preterm (<37 weeks)	Full term (37-41 weeks)	Late term (≥42 weeks)	I do not know	
Thin	Number	7	81	2	2	**0.007**
	%	3.9	3.3	1.3	6.1	
Normal	Number	117	1659	89	25	
	%	65.4	67.1	59.3	75.8	
Overweight	Number	35	392	21	4	
	%	19.6	15.9	14.0	12.1	
Obese	Number	20	340	38	2	
	%	11.2	13.8	25.3	6.1	
Total	**Number**	**179**	**2472**	**150**	**33**	
	%	**100.0**	**100.0**	**100.0**	**100.0**	

* Column percentage.

** P-value according to the chi-square test.

BREASTFEEDING

Table 14 shows the distribution of children by their breastfeeding status. Among the respondents, 96.0% declared having had breastfed their baby "sometimes" and 3.5% declared never having had breastfed their baby.

Table 14. Distribution of children by breastfeeding status

Breastfeeding status	Absolute number	Percentage	Valid %	Cumulative %
Never	98	3.1	3.5	3.5
Yes, <6 months	403	12.8	14.4	18.0
Yes, ≥6 months	2278	72.1	81.6	99.6
I don't know	11	0.3	0.4	100.0
Sub-total	*2779*	*88.3*	*100.0*	
Missing	380	11.7		
Total	**3159**	**100.0**		

Table 15 shows the distribution of BMI by children breastfeeding status. The differences are not statistically significant (P>0.05). However, the prevalence of obesity is higher among never breastfed children (20.4%) compared to <6 months breastfed children (15.1%) being lowest among >6 months breastfed children (13.8%) [Table 15 and Figure 2]. The association with being thin and overweight does not show a consistent trend by breastfeeding status.

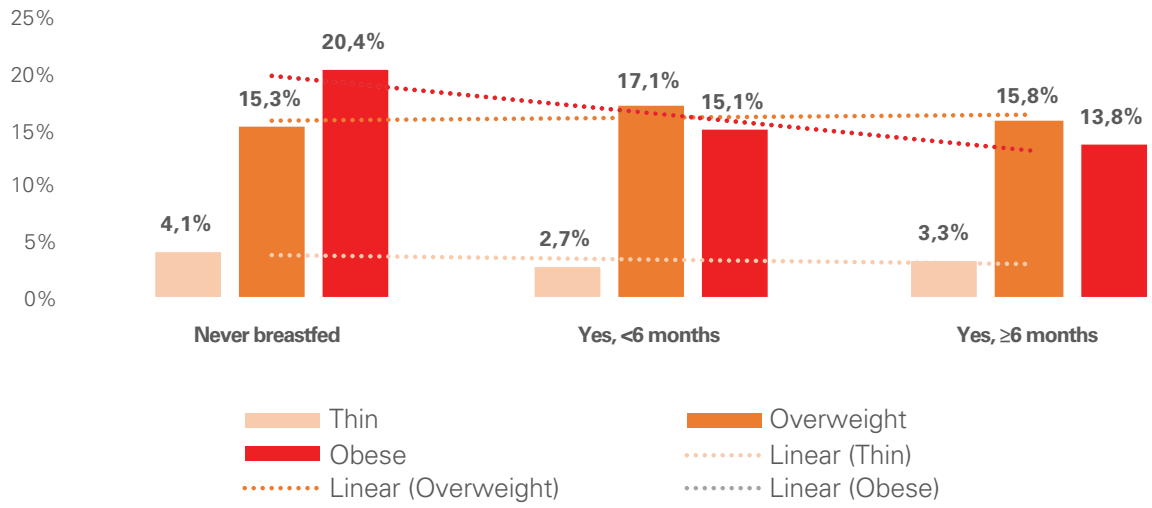
Table 15. Distribution of children by BMI and their breastfeeding status

Breastfeeding status		BMI category				P-value**
		Thin	Normal	Overweight	Obese	
Never	Number	4	59	15	20	0.546
	%	4.1 %	60.2 %	15.3 %	20.4 %	
Yes, <6 months	Number	11	262	69	61	
	%	2.7 %	65.0 %	17.1 %	15.1 %	
Yes, ≥6 months	Number	76	1527	360	314	
	%	3.3 %	67.1 %	15.8 %	13.8 %	
Total	**Number**	**91**	**1848**	**444**	**395**	
	%	**3.3 %**	**66.5 %**	**16.0 %**	**14.2 %**	

* Row percentage.

** P-value according to the chi-square test.

Figure 2. Distribution of BMI by children's breastfeeding status



There were no significant differences in the distribution of breastfeeding status by gender of the child, geographic location of the school (urban/rural) and parental education level.

7.3 Eating habits

It is important for a child to eat a healthy diet in order to prevent malnutrition (stunting, wasting, micronutrient deficiencies, obesity) and noncommunicable diseases (NCDs) (27, 28, 29). Low-quality diets are now believed to be the single biggest risk factor for the global burden of the disease (27, 30). In recent decades, changes in dietary patterns and physical activity behaviours have been identified as likely contributors to a rise in childhood obesity. A healthy diet includes adequate quantities and appropriate proportions of fruits, vegetables, legumes (e.g., lentils and beans), nuts, and whole grains (31), and limits the intake of free sugars (27, 32,33), salt (27,34), saturated fats, and highly processed foods. A healthy diet eliminates trans fats of all kinds. Consumption of sugar-sweetened beverages should be limited, as it has been associated with increased body weight (27,35), and dental caries (27, 36)

BREAKFAST CONSUMPTION

At the time of the measurement, 42.3% of children declared not having had breakfast, 52.7% had had breakfast, and 4.9% had consumed just a beverage for breakfast (Table 16).

Table 15. Status of breakfast consumption among children

Breakfast consumption	Absolute number	Percentage (%)
No	1337	42.3
Yes	1666	52.7
Yes, but just a beverage	156	4.9
Total	**3159**	**100.0**

There was no gender difference with regard to the percentages of children consuming breakfast (including just a beverage) [Table 17]. However, significantly higher proportions of rural children consumed breakfast (60.3%) compared to urban children (56.1%). Also, the proportion of children having breakfast increases significantly with the increase in parental education level from 57% among parents with low education level, to 59.5% among parents with medium education level and 63.6% among parents with high education level.

Table 17. Status of breakfast consumption among children

Variable	Breakfast consumption		P-value**
	No	Yes	
Geographic position			
Urban	864 (43.9)	1104 (56.1)	0.021
Rural	473 (39.7)	718 (60.3)	
Gender			
Male	685 (42.9)	910 (57.1)	0.494
Female	652 (41.7)	912 (58.3)	
Parental education level			
Low	809 (43.0)	1072 (57.0)	0.025
Medium	156 (40.5)	229 (59.5)	
High	184 (36.4)	322 (63.6)	

* Absolute number and row percentage (in parenthesis).

** P-value according to the chi-square test (Fisher's Exact Test for 2x2 tables).

The trend of breakfast consumption among children in relation to their nutritional status is shown in Table 18 and Figure 3. A significant linear relationship is noted, with the prevalence of no breakfast consumption monotonically increasing with the increase in the BMI category: from 35% of thin children skipping breakfast, to 40.5% of normal children, 44.1% of overweight children, and 50.3 % of obese children skipping breakfast; obviously, the opposite trend is true with regard to the proportion of children having breakfast by BMI category; these differences are highly significant (P=0.001) and the linear trend of this relationship is highly significant as well (P<0.001).

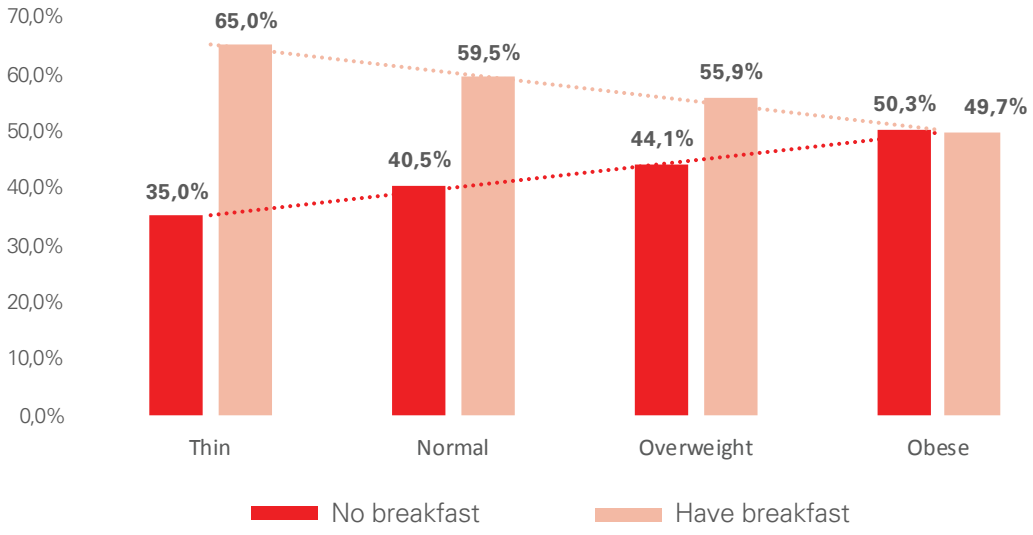
Table 18. Distribution of children (%) based on BMI and breakfast consumption status

Variable	Breakfast consumption		P-value**
	No	Yes	
Nutritional status			
Thin	35 (35.0) *	65 (65.0)	
Normal	852 (40.5)	1251 (59.5)	0.001
Overweight	223 (44.1)	283 (55.9)	
Obese	226 (50.3)	223 (49.7)	
Total	1336 (42.3)	1822 (57.7)	

* Absolute number and row percentage (in parenthesis).

** P-value according to the chi-square test.

Figure 3. Distribution of children (%) by BMI and breakfast consumption status



FREQUENCY OF BREAKFAST CONSUMPTION ACCORDING TO PARENTS' REPORT

About one in twenty children aged 8-8.99 years old never consume breakfast compared with 70.4% of children who have breakfast every day (Table 19).

Table 19. Frequency of breakfast consumption

Frequency of breakfast consumption	Absolute number	Percentage	Valid %	Cumulative %
Never	144	4.6	5.1	5.1
1-3 days/week	451	14.3	16.0	21.1
4-6 days/week	241	7.6	8.5	29.6
Every day	1984	62.8	70.4	100.
Subtotal	*2820*	*89.3*	*100.0*	
Missing	339	10.7		
Total	**3159**	**100.0**		

There were no significant differences regarding the prevalence of daily breakfast consumption by gender (Table 20). However, significantly higher percentages of urban children (72.1%) compared to rural children (67.7%) consumed breakfast daily. The prevalence of daily breakfast consumption increases with the increase in parental education level (69.2%, 70.4%, and 75.8% among children of parents with a low, medium and high education level, respectively) and these differences are almost statistically significant (P=0.077).

Table 20. Frequency of breakfast consumption by gender, location and parental education level

Variable		Frequency of breakfast consumption			P-value**
		Never	1-6 days/week	Daily	
Gender					
Boys	Number	73	355	988	0.788
	%	5.2 %	25.1 %	69.8 %	
Girls	Number	71	337	996	
	%	5.1 %	24.0 %	70.9 %	
Geographic position of the school					
Urban	Number	95	385	1239	0.003
	%	5.5 %	22.4 %	72.1 %	
Rural	Number	49	307	745	
	%	4.5 %	27.9 %	67.7 %	

Parental education level					
Low	Number	93	477	1283	0.077
	%	5.0 %	25.7 %	69.2 %	
Medium	Number	20	93	269	
	%	5.2 %	24.3 %	70.4 %	
High	Number	20	101	1932	
	%	4.0 %	20.2 %	75.8 %	

* Row percentage ** P-value according to chi square test.

FREQUENCY OF FRUIT CONSUMPTION

About one in twenty children aged 8-8.99 years old never consume fruits or consume them less than once a week (4.5%); half of them (49.9%) consume fruits once a day, and 17.2% consume fruits more than once a day (Table 21).

Table 21. Frequency of fresh fruit consumption

Frequency of fresh fruit consumption	Absolute number	Percentage	Valid %	Cumulative %
Never	33	1.0	1.2	1.2
< once a week	94	3.0	3.3	4.5
1-3 days/week	394	12.5	13.9	18.4
4-6 days/week	409	12.9	14.5	32.9
Once every day	1413	44.7	49.9	82.8
> once a day	486	15.4	17.2	100.0
Subtotal	*2829*	*89.6*	*100.0*	
Missing	330	10.4		
Total	**3159**	**100.0**		

Table 22 shows the frequency of fruit consumption by basic characteristics of the children. There are no significant differences in the prevalence of daily consumption by gender, urban/rural location or parental education level. Nevertheless, daily fruit consumption is slightly higher among girls, urban children and it varies without a clear trend in terms of parental education level. The prevalence of rarely consuming fruits (never or less than once a week) decreases monotonically with the increase in parental education level (4.5%, 4.2%, and 3.2% among children of parents with a low, medium and high education level, respectively).

Table 22. Frequency of fruit consumption by basic child characteristic

Variable		Frequency of fruit consumption				P-value**
		Never or <1x a week	1-3 days a week	4-6 days a week	At least once daily	
Gender						
Boys	Number	68	198	213	937	0.641
	%	4.8 %	14.0 %	15.0 %	66.2 %	
Girls	Number	59	196	196	962	
	%	4.2 %	13.9	13.9 %	67.1 %	
Geographic position of the school						
Urban	Number	72	233	241	1179	0.355
	%	4.2 %	13.5 %	14.0 %	68.3 %	
Rural	Number	55	161	168	720	
	%	5.0 %	14.6 %	15.2 %	65.2 %	
Parental education level						
Low	Number	83	268	270	1238	0.314
	%	4.5 %	14.4 %	14.5 %	66.6 %	
Medium	Number	16	49	46	273	
	%	4.2 %	12.8 %	12.0 %	71.1 %	
High	Number	16	64	84	338	
	%	3.2 %	12.7 %	16.7 %	67.3 %	

* Row percentage.

** P-value according to the chi-square test.

FREQUENCY OF VEGETABLE CONSUMPTION

More than one in ten children aged 8-8.99 years never consume vegetables or consume them less than once a week (12.2%); one in four children (24.9%) consume vegetables once every day and 5% consume vegetables more than once a day (Table 23).

Table 23. Frequency of vegetable consumption

Frequency of vegetable consumption	Absolute number	Percentage	Valid %	Cumulative %
Never	77	2.4	2.7	2.7
< once a week	266	8.4	9.5	12.2
1-3 days/week	1032	32.7	36.8	49.1
4-6 days/week	589	18.6	21.0	70.1
Once every day	697	22.1	24.9	95.0
> once a day	140	4.4	5.0	100.0
Subtotal	*2801*	*88.7*	*100.0*	
Missing	358	11.3		
Total	**3159**	**100.0**		

Table 24 shows the frequency of vegetable consumption by basic child characteristic. There are significant differences in the prevalence of daily consumption by gender, urban/rural, or parental education level. The prevalence of rare (never or less than once a week) vegetable consumption is significantly higher among boys and rural area children, while being negatively associated with parental education level (13.8%, 11.5%, and 6.6% among children of parents with a low, medium and high education level, respectively). Conversely, the prevalence of frequent (4-6 times a week) and daily vegetable consumption is higher among girls and urban area children, and it is positively associated with parental education level.

Table 24. Frequency of vegetable consumption by basic child characteristic

Variable		Frequency of vegetable consumption				P-value**
		Never or <1x a week	1-3 days a week	4-6 days a week	At least once daily	
Gender						
Boys	Number	193	517	302	396	0.044
	%	13.7 %	36.7 %	21.4 %	28.1 %	
Girls	Number	150	515	287	441	
	%	10.8 %	37.0 %	20.6 %	31.7 %	
Geographic position of the school						
Urban	Number	179	624	371	530	0.003
	%	10.5 %	36.6 %	21.8 %	31.1 %	
Rural	Number	164	408	218	307	
	%	14.9 %	37.2 %	19.9 %	28.0 %	
Parental education level						
Low	Number	253	697	355	531	<0.001
	%	13.8	38.0	19.3	28.9	
Medium	Number	44	150	78	112	
	%	11.5	39.1	20.3	29.2	
High	Number	33	170	141	157	
	%	6.6	33.9	28.1	31.3	

* Row percentage.

** P-value according to chi square test.

FREQUENCY OF SOFT DRINKS CONSUMPTION

More than one in five children aged 8-8.99 years old never consume soft drinks containing sugar, more than half of them consume soft drinks containing sugar less than once a week (51.3%); 17% consume soft drinks containing sugar 1-3 days a week, and the remaining have soft drinks more days per week (Table 25).

Table 25. Frequency of sugary soft drink consumption

Frequency of sugary soft drink consumption	Absolute number	Percentage	Valid %	Cumulative %
Never	633	20.0	22.9	22.9
< once a week	1421	45.0	51.3	74.2
1-3 days/week	471	14.9	17.0	91.2
4-6 days/week	114	3.6	4.1	95.3
Once every day	81	2.6	2.9	98.2
> once a day	49	1.6	1.8	100.0
Sub-total	*2769*	*87.7*	*100.0*	
Missing	390	12.3		
Total	**3159**	**100.0**		

Table 26 shows the frequency of sugary soft drink consumption by basic child characteristic. Overall, 8.8% of children consumed soft drinks containing sugar on more than three days a week. There are no significant gender differences in the prevalence of frequent (>3 days a week) consumption of soft drinks. However, the prevalence of frequent soft drink consumption is higher among rural children (11%) than among urban children (7.4%) and it is negatively associated with parental education level (10.6%, 6.1%, and 3.4% among children of parents with a low, medium and high education level, respectively). Conversely, the prevalence of rare (never or once a week) sugary soft drink consumption is significantly higher among urban area children and positively associated with parental education level.

Table 26. Frequency of sugary soft drink consumption by basic child characteristic

Variable		Frequency of soft drink consumption			P-value**
		Never or <1x a week	1-3 days a week	>3 days a week	
Gender					
Boys	Number	1023	245	126	0.628
	%	73.4%	17.6%	9.0%	
Girls	Number	1031	226	118	
	%	75.0%	16.4%	8.6%	

Geographic position of the school					
Urban	Number	1287	277	125	0.001
	%	76.2%	16.4%	7.4%	
Rural	Number	767	194	119	
	%	71.0%	18.0%	11.0%	
Parental education level					
Low	Number	1287	334	193	<0.001
	%	70.9%	18.4%	10.6%	
Medium	Number	294	63	23	
	%	77.4%	16.6%	6.1%	
High	Number	420	63	17	
	%	84.0%	12.6%	3.4%	
Total	Number	2054	471	244	
	%	74.2%	17.0%	8.8%	

* Row percentage.

** P-value according to the chi square test.

CONSUMPTION OF FRESH FRUITS AND/OR VEGETABLE PORTIONS

About one in six children aged 8-8.99 years (16.8%) never consume or consume less than 1 portion of fresh fruits and/or vegetables, about six in ten children consume 1-2 portions a day, and about one in four children consume 3 or more portions a day (Table 27).

Table 27. Frequency of fresh fruits and/or vegetable portions

Frequency of fresh fruits and/or vegetable portions	Absolute number	Percentage	Valid %	Cumulative %
None	27	0.9	1.0	1.0
<1 portion a day	445	14.1	15.8	16.8
1-2 portions a day	1660	52.5	59.0	75.8
3-4 portions a day	571	18.1	20.3	96.1
≥5 portions a day	111	3.5	3.9	100.0
Subtotal	*2814*	*89.1*	*100.0*	
Missing	345	10.9		
Total	**3159**	**100.0**		

Table 28 shows the frequency of fresh fruit and/or vegetable portion consumption by basic child characteristic. There are no significant differences in the frequency of fruit/vegetable portion consumption by gender, urban/rural location or parental education level. The only trend worth mentioning was the negative association of rare consumption of fruit/vegetable portions (none or <1 portion a day) with parental education level (17.9%, 15.2%, and 13.9% among children of parents with a low, medium and high education level, respectively) and the positive association of 1-2 portions per day with parental education level (58.2%, 59.9%, and 62.6% among children of parents with a low, medium and high education level, respectively).

Table 28. Frequency of fresh fruit and/or vegetable portion consumption by basic child characteristic

Variable		Frequency of fresh fruit and/or vegetable consumption			P-value**
		None or <1 portion a day	1-2 portions a day	≥3 portions a day	
Gender					
Boys	Number	247	823	337	0.539
	%	17.6 %	58.5 %	24.0 %	
Girls	Number	225	837	345	
	%	16.0 %	59.5 %	24.5 %	
Geographic position of the school					
Urban	Number	296	1011	416	0.768
	%	17.2 %	58.7 %	24.1 %	
Rural	Number	176	649	266	
	%	16.1 %	59.5 %	24.4 %	
Parental education level					
Low	Number	331	1076	442	0.203
	%	17.9 %	58.2 %	23.9 %	
Medium	Number	58	229	95	
	%	15.2 %	59.9 %	24.9 %	
High	Number	70	315	118	
	%	13.9 %	62.6 %	23.5 %	

* Row percentage.

** P-value according to the chi square test.

7.4 Parental perceptions of children's weight status

For this analysis, only the reporting from children's parents were used, excluding the opinions given by other relative or caregivers/guardians.

Overall, 65.7% of parents categorized their child's weight status accurately relative to the WHO growth charts. There were differences found in the accuracy of parents' perceptions of their child's weight status as compared with the actual WHO weight status categories.

About one in sixteen parents (6.4%) of children aged 8-8.99 years old think that their child is underweight, 80% think that their child's weight is normal, 12.2% think that their child is slightly overweight and 1.5% say their child is extremely overweight (Table 29).

Table 29. Parental Perceptions of Children's Weight Status

Parental perceptions of children's weight status	Absolute number	Percentage	Valid %	Cumulative %
Underweight	179	6.3	6.4	6.4
Normal weight	2241	79.2	80.0	86.4
Slightly overweight	341	12.1	12.2	98.5
Extremely overweight	41	1.4	1.5	100.0
Subtotal	*2802*	*99.0*	*100.0*	
Missing	27	1.0		
Total	**2829**	**100.0**		

There is a strong correlation between parental perceptions of their child's weight with the actual BMI of the child (Table 30). The Spearman's rho correlation coefficient (0.546, $P<0.001$) shows a significant and moderate relation between them.

From Table 29, it can be noted that the prevalence of actual obesity increases significantly and positively with the increase in parents' opinion about the child's perceived weight (2.2, 5.3%, 68.6%, and 87.8% among children perceived to be underweight, normal weight, slightly overweight, and extremely overweight, respectively). The reverse trend is noted with regard to the prevalence of actually being thin based on the parental opinion about the child's weight.

However, parents were more likely to overestimate their child's weight if the child in fact was thin (82.1%) or slightly overweight (68.6%).

Table 30. Distribution of children by BMI according to parental perceptions

Parental Perceptions of Children's Weight Status		BMI category				P-value**
		Thin	Normal	Overweight	Obese	
Underweight	Number	24	147	4	4	<0.001
	%	13.4 %	82.1 %	2.2 %	2.2 %	
Normal weight	Number	62	1699	360	119	
	%	2.8 %	75.8 %	16.1 %	5.3 %	
Slightly overweight	Number	8	19	80	234	
	%	2.3 %	5.6 %	23.5 %	68.6 %	
Extremely overweight	Number	0	3	2	36	
	%	0.0 %	7.3 %	4.9 %	87.8 %	
Total	**Number**	**94**	**1868**	**446**	**393**	
	%	**3.4 %**	**66.7 %**	**15.9 %**	**14.0 %**	

* Row percentage.

** P-value according to the chi square test.

PARENTAL PERCEPTIONS ACCORDING TO PARENTAL EDUCATION VS CHILDREN'S BMI STATUS

Table 31 shows the cross-tabulation of parental perceptions of children's weight with the actual BMI of children, by parental education level. By parental education level, these two parameters are significantly and moderately associated (Spearman's rho correlation coefficient 0.518, 0.595, and 0.591 among parents with a low, medium and high education level, respectively). However, the association between parental perceptions of children's weight with the actual BMI of children is stronger among medium and parents with a high education level than among those with a low education level.

Table 31. Distribution of children by BMI and parental perception according to their education level

Parental education level	Parental Perceptions of Children's Weight Status	BMI category				P-value**
		Thin	Normal	Overweight	Obese	
Low	Underweight	14 (12.5)	94 (83.9)	1 (0.9)	3 (2.7)	<0.001
	Normal weight	47 (3.1)	1156 (76.2)	236 (15.5)	79 (5.2)	
	Slightly overweight	2 (1.1)	12 (6.5)	41 (22.2)	130 (70.3)	
	Extremely overweight	0 (0.0)	3 (11.5)	1 (3.8)	22 (84.6)	
Medium	Underweight	5 (21.7)	16 (69.6)	1 (4.3)	1 (4.3)	<0.001
	Normal weight	5 (1.7)	215 (75.2)	46 (16.1)	20 (7.0)	
	Slightly overweight	1 (1.5)	5 (7.5)	19 (28.4)	42 (62.7)	
	Extremely overweight	0 (0.0)	0 (0.0)	0 (0.0)	5 (100.0)	

High	Underweight	4 (10.0)	34 (85.0)	2 (5.0)	0 (0.0)	<0.001
	Normal weight	8 (2.2)	280 (75.9)	66 (17.9)	15 (4.1)	
	Slightly overweight	5 (6.1)	2 (2.4)	19 (23.2)	56 (68.3)	
	Extremely overweight	0 (0.0)	0 (0.0)	1 (10.0)	9 (90.0)	

* Absolute number and row percentage (in parenthesis).

** P-value according to the chi square test.

MATERNAL AND PATERNAL PERCEPTION, VS CHILDREN BMI STATUS

Table 32 shows the cross-tabulation of parental perceptions of children's weight with the actual BMI of children, by the opinion of the mother or father responding. Again, the association between parental perceptions of children's weight with the actual BMI of children is highly significant for mothers and fathers alike. However, this association appears considerably stronger among mothers (Spearman's rho correlation coefficient 0.556) than among fathers (Spearman's rho correlation coefficient 0.451).

Table 32. Distribution of children by BMI and maternal and paternal perception

Parent responding	Parental Perceptions of Children's Weight Status	BMI category				P-value**
		Thin	Normal	Overweight	Obese	
Mother	Underweight	22 (13.6)	133 (82.1)	4 (2.5)	3 (1.9)	<0.001
	Normal weight	49 (2.4)	1528 (76.1)	326 (16.2)	106 (5.3)	
	Slightly overweight	7 (2.2)	17 (5.4)	72 (23.0)	217 (69.3)	
	Extremely overweight	0 (0.0)	3 (7.7)	2 (5.1)	34 (87.2)	
Father	Underweight	2 (11.8)	14 (82.4)	0 (0.0)	1 (5.9)	<0.001
	Normal weight	13 (5.6)	171 (74.0)	34 (14.7)	13 (5.6)	
	Slightly overweight	1 (3.6)	2 (7.1)	8 (28.6)	17 (60.7)	
	Extremely overweight	0 (0.0)	0 (0.0)	0 (0.0)	2 (100.0)	

* Absolute number and row percentage (in parenthesis).

** P-value according to the chi square test.

7.5 Physical activity and screen time

The physical environment, both built and natural, can influence opportunities for participation in physical activity (1, 37). The built environment refers to all objects, spaces and buildings that have been created for and modified by people, including schools, workplaces, transport systems, neighbourhoods, houses and sports grounds; and natural environments are those that provide opportunities for people to be physically active outdoors, including greenspace, lakes, oceans and mountains (1, 37).

Physical activity, sedentary behaviour, and sleep are important predictors of children's health. Early school years are a time during which children have the opportunity to develop healthy habits that persist through adolescence and into adult life. WHO recommends that children aged 5–17 years do at least an average of 60 min per day of moderate- to vigorous-intensity, mostly aerobic, physical activity during the week and vigorous-intensity aerobic activities at least 3 days a week, along with activities that strengthen muscle and bone, should be incorporated. (38, 39) It is also recommended that children have no more than 2 h a day of recreational screen time and limit sitting for extended periods. (38-41)

TRAVELLING ACTIVELY TO AND FROM SCHOOL

The percentage of children actively travelling to school is 53.8% compared to 57.8% of children actively travelling from school. More than four in ten children (40.9%) use a motorized vehicle both to and from school, thus engaging in a less healthy behaviour, whereas the remaining 59.1% travel either on foot/cycling/skating (healthy behaviour) at least when going to or returning from school [Table 33].

Table 33. Status of healthy behaviour of children when traveling to and from school

Transport to and from school	Absolute number	Percentage	Valid %	Cumulative %
Healthy	1656	52.4	59.1	59.1
Less healthy	1147	36.3	40.9	100.0
Subtotal	*2803*	*88.7*	*100.0*	
Missing	356	11.3		
Total	**3159**	**100.0**		

There are no significant gender and urban/rural differences with regard to the engagement in healthy forms of transport to and from school as similar proportions of boys/girls and urban/rural children engage in either healthy or less healthy ways of transportation to and from school (Table 34).

However, as expected, there is a positive significant association between the form of transportation to and from school with parental education level, with the proportion of children using motorized vehicles both ways to and from school (less healthy behaviour) increasing with the increase in parental education level (38.6%, 41.1%, and 50.9% among children of parents with a low, medium and high education level, respectively).

Table 34. Transport to and from school by gender, location and parental education level

Variable		Transport to and from school		P-value**
		Healthy	Less healthy	
Gender				
Boys	Number	833	582	0.848
	%	58.9 %	41.1 %	
Girls	Number	823	565	
	%	59.3 %	40.7 %	
Geographic position of the school				
Urban	Number	1023	682	0.223
	%	60.0 %	40.0 %	
Rural	Number	633	465	
	%	57.7 %	42.3 %	
Parental education level				
Low	Number	1133	712	<0.001
	%	61.4 %	38.6 %	
Medium	Number	224	156	
	%	58.9 %	41.1 %	
High	Number	246	255	
	%	49.1 %	50.9 %	

* Row percentage.

** P-value according to the chi square test (Fisher's Exact Test for 2x2 tables).

There is a significant association between the use of healthy forms of transportation to and from school with the BMI of children (Table 35). The prevalence of overweight is significantly higher among children using less healthy forms of transportation to and from school (16.7%) compared to children using healthy transportation forms (15.1%). A similar pattern is observed for the prevalence of obesity but with a wider gap between children engaging in less healthy forms of transportation (16.7% vs. 12.3%, respectively).

Table 35. Transport to and from school by BMI category

Transport to and from school		BMI category					P-value***
		Thin	Normal	Overweight	Obese	*Total*	
Healthy	Number	58	1144	250	203	1655	0.003
	%	3.5%*	69.1%	15.1%	12.3%	*100.0*	
	%	61.7**	61.1	56.7	51.5	59.1	
Less healthy	Number	36	729	191	191	1147	
	%	3.1%	63.6%	16.7%	16.7%	*100.0*	
	%	38.3	38.9	43.3	48.5	40.9	
Total	**Number**	**94**	**1873**	**441**	**394**	**2802**	
	%	**3.4%**	**66.8%**	**15.7%**	**14.1%**	**100.0**	
	%	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	

* Row percentage

** Column percentage.

*** P-value according to the chi square test.

PARTICIPATING IN A SPORTS OR DANCING CLUB

More than two-thirds of children (68.1%) spend at least two hours a week practicing sports/dancing, 21.5% practice sport for less than two hours, and 10.3% never engage in sports/dancing clubs (Table 36).

Table 36. Distribution of children by time spent in a sport/dancing club during the week

Participation in a sport or dancing club	Absolute number	Percentage	Valid %	Cumulative %
Never (0 hours, 0 minutes)	234	7.4	10.3	10.3
>0 minutes but <2 hours	488	15.4	21.5	31.9
Healthy (>=2 hours)	1543	48.8	68.1	100.0
Subtotal	*2265*	*71.7*	*100.0*	
Missing	894	28.3		
Total	**3159**	**100.0**		

Significantly higher rates of boys (71.3%) than girls (65%) engage in sports for at least two hours a week and the opposite is noted for boys and girls never engaging actively in sports during a typical week (8.6% vs. 12%, respectively) [Table 37].

There are no significant urban-rural differences with regard to this indicator, but higher percentages of urban children (69%) than rural ones (66.8%) engage for at least two hours in sports during a typical week.

The association with parental education level is highly significant and positive: the proportion of children engaging in at least two hours of sports/dancing clubs during a typical week increases with the increase in parental education level (65.7%, 68.5%, and 77.5% among children of parents with a low, medium and high education level, respectively). On the contrary, never engaging in sports during a typical week is significantly and negatively associated with parental education level (11.2%, 9.6%, and 7.3% among children of parents with a low, medium and high education level, respectively).

Table 37. Time spent in a sports/dancing club during the week by basic child characteristic

Variable		Time spent engaging in a sport/dancing club			P-value**
		Never (0 hours, 0 minutes)	>0 minutes but <2 hours	Healthy (>=2 hours)	
Gender					
Boys	Number	98	228	808	0.003
	%	8.6 %	20.1 %	71.3 %	
Girls	Number	136	260	735	
	%	12.0 %	23.0 %	65.0 %	
Geographic position of the school					
Urban	Number	148	278	942	0.112
	%	10.8 %	20.1 %	69.0 %	
Rural	Number	86	213	601	
	%	9.6 %	23.7 %	66.8 %	
Parental education level					
Low	Number	165	342	970	<0.001
	%	11.2 %	23.2 %	65.7 %	
Medium	Number	30	68	213	
	%	9.6 %	21.9 %	68.5 %	
High	Number	30	62	317	
	%	7.3 %	15.2 %	77.5 %	

* Row percentage.

** P-value according to the chi square test.

7.6 Time spent playing actively/vigorously

WEEKDAYS

Almost all children (94.2%) play actively during the weekdays for at least one hour, whereas 4.9% play for less than one hour and 0.9% are completely sedentary (Table 38).

Table 38. Distribution of children by time spent playing actively/vigorously during the weekdays

Time spent playing actively/ vigorously	Absolute number	Percentage	Valid %	Cumulative %
Never (0 hours, 0 minutes)	25	0.8	0.9	0.9
>0 minutes but <1 hour	134	4.2	4.9	5.8
Healthy (≥1 hour)	2593	82.1	94.2	100.0
Subtotal	*2752*	*87.1*	*100.0*	
Missing	407	12.9		
Total	**3159**	**100.0**		

Significantly higher rates of boys (95.6%) than girls (92.9%) play actively/vigorously for at least 1 hour during the weekdays, and significantly higher proportions of rural (95.7%) than urban children (93.3%) do the same (Table 39). Surprisingly, there is a significant negative association between the time spent playing vigorously during the weekdays with parental education level, with the proportion of children playing vigorously decreasing with the increase in parental education level (95.1%, 94.1%, and 91.9% among children of parents with a low, medium and high education level, respectively).

Table 39. Time spent playing actively/vigorously during the weekdays by gender, location and parental education level

Variable		Time playing actively/vigorously during the weekdays		P-value**
		<1 hour	≥1 hour	
Gender				
Boys	Number	61	1318	0.002
	%	4.4 %	95.6 %	
Girls	Number	98	1275	
	%	7.1 %	92.9 %	
Geographic position of the school				
Urban	Number	112	1554	0.009
	%	6.7 %	93.3 %	
Rural	Number	47	1039	
	%	4.3 %	95.7 %	
Parental education level				
Low	Number	88	1722	0.023
	%	4.9 %	95.1 %	
Medium	Number	22	352	
	%	5.9 %	94.1 %	
High	Number	39	444	
	%	8.1 %	91.9 %	

* Row percentage.

** P-value according to the chi square test (Fisher's Exact Test for 2x2 tables).

There is a significant association between the time spent playing vigorously during weekdays with the BMI of children (Table 40). The prevalence of overweight is significantly higher among children engaging in vigorous/active play for <1 hour during weekdays (24.5%) compared to children playing actively for a longer time (15.4%). A similar pattern is observed for the prevalence of obesity but with a smaller gap between children actively playing for <1 hour ≥1 hour during weekdays (16.4% vs. 13.6%, respectively).

Table 40. Time spent playing actively/vigorously during the weekdays by BMI category

Time spent playing actively/vigorously during the weekdays		BMI category				P-value**
		Thin	Normal	Overweight	Obese	
<1 hour	Number	3	91	39	26	0.007
	%	1.9	57.2	24.5	16.4	
≥1 hour	Number	88	1754	398	352	
	%	3.4	67.7	15.4	13.6	
Total	**Number**	**91**	**1845**	**437**	**378**	
	%	**3.3**	**67.1**	**15.9**	**13.7**	

* Row percentage.

** P-value according to the chi square test.

WEEKENDS

Almost all children (97.8%) play actively during the weekends for at least one hour, whereas 1.2% play for less than one hour and 1.0% are completely sedentary (Table 41).

Table 41. Distribution of children by time spent playing actively/vigorously during the weekends

Time spent playing actively/vigorously	Absolute number	Percentage	Valid %	Cumulative %
Never (0 hours, 0 minutes)	26	0.8	1.0	1.0
>0 minutes but <1 hour	31	1.0	1.2	2.2
Healthy (≥1 hour)	2578	81.6	97.8	100.0
Subtotal	*2635*	*83.4*	*100.0*	
Missing	524	16.6		
Total	**3159**	**100.0**		

There are no significant differences in the proportion of children playing vigorously for at least 1 hour during the weekends by gender, urban-rural categorization and parental education level (Table 42).

Table 42. Time spent playing actively/vigorously during the weekends by gender, location and parental education level

Variable		Time spent playing actively/vigorously during the weekends		P-value**
		<1 hour	≥1 hour	
Gender				
Boys	Number	23	1280	0.182
	%	1.8 %	98.2 %	
Girls	Number	34	1298	
	%	2.6 %	97.4 %	
Geographic position of the school				
Urban	Number	34	1565	0.891
	%	2.1 %	97.9 %	
Rural	Number	23	1013	
	%	2.2 %	97.8 %	
Parental education level				
Low	Number	40	1682	0.448
	%	2.3 %	97.7 %	
Medium	Number	6	355	
	%	1.7 %	98.3 %	
High	Number	7	462	
	%	1.5 %	98.5 %	

* Row percentage.

** P-value according to the chi square test (Fisher's Exact Test for 2x2 tables).

There is no significant association between the time spent playing vigorously during weekends with the BMI of children (Table 43) either.

Table 43. Time spent playing actively/vigorously during the weekends by BMI category

Time spent playing actively/vigorously during the weekends		BMI category				P-value**
		Thin	Normal	Overweight	Obese	
<1 hour	Number	3	41	6	7	0.568
	%	5.3	71.9	10.5	12.3	
≥1 hour	Number	85	1724	415	353	
	%	3.3	66.9	16.1	13.7	
Total	**Number**	**88**	**1765**	**421**	**360**	
	%	**3.3**	**67.0**	**16.0**	**13.7**	

* Row percentage.

** P-value according to the chi square test.

7.7 Time spent watching television or using electronic devices (screen time)

WEEKDAYS

About four in ten children (39.6%) spend at least two hours a day watching TV or using electronic devices during weekdays, whereas 60.4% spend less than two hours in these activities (Table 44).

Table 44. Distribution of children by time spent watching television or using electronic devices per day during the weekdays

Time spent watching television or using electronic devices per day	Absolute number	Percentage	Valid %	Cumulative %
<2 hours	1661	52.6	60.4	60.4
≥2 hours	1087	34.4	39.6	100.0
Sub-total	2748	87.0	100.0	
Missing	411	13.0		
Total	**3159**	**100.0**		

Significantly higher proportions of boys (42.6%) than girls (36.4%) spend at least two hours a day watching TV or using electronic devices during the weekdays, whereas no significant differences were noticed regarding this indicator by urban-rural categorization and parental education level (Table 45). However, a pattern was spotted with regard to parental education level: the percentage of children spending at least 2 hours a day watching TV or using electronic devices during weekdays decreases with the increase in parental education level (40.7%, 40.4%, and 36.5% among children of parents with a low, medium and high education level, respectively).

Table 45. Time spent watching television or using electronic devices per day during the weekdays by gender, location and parental education level

Variable		Time spent watching television or using electronic devices per day during the weekdays		P-value**
		<2 hours	≥2 hours	
Gender				
Boys	Number	797	592	0.001
	%	57.4 %	42.6 %	
Girls	Number	864	495	
	%	63.6 %	36.4 %	
Geographic position of the school				
Urban	Number	1016	654	0.604
	%	60.8 %	39.2 %	
Rural	Number	645	433	
	%	59.8 %	40.2 %	

Parental education level				
Low	Number	1063	731	0.231
	%	59.3 %	40.7 %	
Medium	Number	226	153	
	%	59.6 %	40.4 %	
High	Number	313	180	
	%	63.5 %	36.5 %	

* Row percentage.

** P-value according to the chi square test (Fisher's Exact Test for 2x2 tables).

There is no significant association between the time spent watching TV or using electronic devices during weekdays with the BMI of children and no clear trends are observed (Table 46).

Table 46. Time spent watching television or using electronic devices per day during the weekdays by BMI category

Time spent watching television or using electronic devices per day during the weekdays		BMI category				P-value**
		Thin	Normal	Overweight	Obese	
<2 hours	Number	57	1105	273	225	0.707
	%	3.4	66.6	16.4	13.6	
≥2 hours	Number	35	732	163	157	
	%	3.2	67.3	15.0	14.4	
Total	**Number**	**92**	**1837**	**436**	**382**	
	%	**3.3**	**66.9**	**15.9**	**13.9**	

* Row percentage.

** P-value according to the chi square test.

WEEKENDS

About eight in ten children (76.6%) spend at least two hours a day watching TV or using electronic devices during weekends, implying a strong considerable increase compared to the respective percentage engaging in these activities during the weekdays, whereas 23.4% spent less than two hours in these activities (Table 47).

Table 47. Distribution of children by time spent watching television or using electronic devices per day during the weekends

Time spent watching television or using electronic devices per day	Absolute number	Percentage	Valid %	Cumulative %
<2 hours	612	19.4	23.4	23.4
≥2 hours	2003	63.4	76.6	100.0
Sub-total	*2615*	*82.8*	*100.0*	
Missing	544	17.2		
Total	**3159**	**100.0**		

Significantly higher rates of boys (78.4%) than girls (74.8%) spend at least two hours a day watching TV or using electronic devices during the weekends (Table 48). Also, significant differences were noticed regarding this indicator by urban-rural categorization; surprisingly, higher proportions of rural children (79.1%) than urban ones (75%) spend at least two hours a day watching TV or using electronic devices during the weekends. No significant differences were noticed with regard to this indicator by parental education level and there is no clear trend either.

Table 48. Time spent watching television or using electronic devices per day during the weekends by gender, location and parental education level

Variable		Time spent watching television or using electronic devices per day during the weekends		P-value**
		<2 hours	≥2 hours	
Gender				
Boys	Number	285	1033	0.034
	%	21.6 %	78.4 %	
Girls	Number	327	970	
	%	25.2 %	74.8 %	
Geographic position of the school				
Urban	Number	395	1184	0.016
	%	25.0 %	75.0 %	
Rural	Number	217	819	
	%	20.9 %	79.1 %	
Parental education level				
Low	Number	390	1309	0.095
	%	23.0 %	77.0 %	
Medium	Number	70	297	
	%	19.1 %	80.9 %	
High	Number	122	359	
	%	25.4 %	74.6 %	

* Row percentage. ** P-value according to the chi square test (Fisher's Exact Test for 2x2 tables).

There is no significant association between the time spent watching TV or using electronic devices during weekends with the BMI of children and no clear trends are observed (Table 49).

Table 49. Time spent watching television or using electronic devices per day during the weekends by BMI category

Time spent watching television or using electronic devices per day during the weekends		BMI category				P-value**
		Thin	Normal	Overweight	Obese	
<2 hours	Number	19	406	111	76	0.297
	%	3.1	66.3	18.1	12.4	
≥2 hours	Number	68	1335	309	290	
	%	3.4	66.7	15.4	14.5	
Total	**Number**	**87**	**1741**	**420**	**366**	
	%	**3.3**	**66.6**	**16.1**	**14.0**	

* Row percentage.

** P-value according to the chi square test.

SLEEPING

About one in ten children (9.4%) sleep fewer than 9 hours daily whereas the remaining 90.6% sleep 9 or more hours daily (Table 50).

Table 50. Distribution of children by sleeping time

Daily sleeping time	Absolute number	Percentage	Valid %	Cumulative %
<9 hours (unhealthy)	267	8.5	9.4	9.4
≥9 hours (healthy)	2582	81.7	90.6	100.0
Sub-total	*2849*	*90.2*	*100.0*	
Missing	310	9.8		
Total	**3159**	**100.0**		

There are no gender differences with regard to the rate of children sleeping <9 or ≥9 hours daily (Table 51). However, significantly higher rates of rural (92.6%) than urban children (89.4%) sleep for 9 hours or more each day. Also, the proportion of children sleeping for ≥9 hours daily decreases significantly with the increase in parental education level: 92.3%, 88.0%, and 86.7% among children of parents with a low, medium and high education level, respectively, thus showing a negative significant linear trend.

Table 51. Sleeping time by gender, location and parental education level

Variable		Daily sleeping hours <9 hours	Daily sleeping hours ≥9 hours	P-value**
Gender				
Boys	Number	139	1291	0.563
	%	9.7	90.3	
Girls	Number	128	1291	
	%	9.0	91.0	
Geographic position of the school				
Urban	Number	185	1553	0.004
	%	10.6	89.4	
Rural	Number	82	1029	
	%	7.4	92.6	
Parental education level				
Low	Number	145	1727	<0.001
	%	7.7	92.3	
Medium	Number	46.	338	
	%	12.0	88.0	
High	Number	67	437	
	%	13.3	86.7	

* Row percentage.

** P-value according to the chi square test (Fisher's Exact Test for 2x2 tables).

There is no significant association between the daily sleeping hours with the BMI of children and no clear trends are observed (Table 52).

Table 52. Daily sleeping hours by BMI category

Daily sleeping hours		BMI category Thin	Normal	Overweight	Obese	P-value**
<9 hours	Number	5	172	42	48	0.150
	%	1.9	64.4	15.7	18.0	
≥9 hours	Number	88	1731	411	351	
	%	3.4	67.1	15.9	13.6	
Total	**Number**	**93**	**1903**	**453**	**399**	
	%	**3.3**	**66.8**	**15.9**	**14.0**	

* Row percentage.

** P-value according to the chi square test.

7.8 Household health characteristics

Obesity is complex, with multifaceted determinants (including social determinants) and health consequences. Obesity is both a disease in its own right and a risk factor for many other diseases that affect multiple body systems. Adverse effects of obesity on health include those due to the mechanical effects of increased body weight, such as some musculoskeletal complications and increased cardiovascular risk, as well as effects on mental health and metabolic effects; for example, type-2 diabetes mellitus. (1)

Prevalence of the family members having ever been diagnosed or treated for high blood pressure (hypertension), diabetes or high cholesterol by a doctor or other health worker

The prevalence of high blood pressure ever diagnosed among a family member was 19.8% (Table 53). However, about one in ten respondents didn't answer this question.

Table 53. Prevalence of the family members having ever been diagnosed or treated for high blood pressure (hypertension) by a doctor or other health worker

Prevalence of hypertension among family members	Absolute number	Percentage	Valid %	Cumulative %
Yes	561	17.8	19.8	19.8
No	2108	66.7	74.5	94.4
I don't know	159	5.0	5.6	100.0
Subtotal	*2828*	*89.5*	*100.0*	
Missing	331	10.5		
Total	**3159**	**100.0**		

The prevalence of diabetes having ever been diagnosed among a family member was 19% (Table 54). However, about one in ten respondents didn't answer this question.

Table 54. Prevalence of the family members having ever been diagnosed or treated for diabetes by a doctor or other health worker

Prevalence of diabetes among family members	Absolute number	Percentage	Valid %	Cumulative %
Yes	538	17.0	19.0	19.0
No	2210	70.0	78.1	97.1
I don't know	81	2.6	2.9	100.0
Sub-total	*2829*	*89.6*	*100.0*	
Missing	330	10.4		
Total	**3159**	**100.0**		

The prevalence of high cholesterol level having ever been diagnosed among a family member was 21.8% (Table 55). However, about one in ten respondents didn't answer this question.

Table 55. Prevalence of the family members having ever been diagnosed or treated for high cholesterol by a doctor or other health worker

Prevalence of high cholesterol among family members	Absolute number	Percentage	Valid %	Cumulative %
Yes	615	19.5	21.8	21.8
No	2054	65.0	72.9	94.7
I don't know	149	4.7	5.3	100.0
Sub-total	*2818*	*89.2*	*100.0*	
Missing	341	10.8		
Total	**3159**	**100.0**		

7.9 School environment

The School environment is a combination of physical, social, and learning environments. It refers to the set of facilities that the school provides. It plays a significant role in students' success and plays a crucial role in the lifestyle of the students. The abilities and potential of the students keep enhancing in a positive and learning environment. (53)

The school food facilities refer to all the spaces, infrastructure and conditions inside and around the school premises where food is available, obtained, purchased and/or consumed (for example tuck shops, kiosks, canteens, food vendors, vending machines); also taking into account the nutritional content of these foods. (54) The environment also includes all of the information available, promotion (marketing, advertisements, branding, food labels, packages, promotions, etc.) and the pricing of foods and food products.

Data on the school environment characteristics were collected from 144 schools across the country, 77 of them located in the city and 48 in the countryside.
The school record forms were generally completed by the headmasters (80.6%), by the teachers of the participating classes (16%), and sometimes by the school managing staff (3.5%), in the presence of the examiner.

- Only a few schools (4.9 %) reported a lack of outdoor playground areas in their schools, compared to a significant number of schools (44.4%) reporting a lack of indoor areas where children can usually play during breaks between classes, especially higher in schools located in rural areas (64.9%). There is an improvement in the availability of these environments compared to the data from the latest COSI 2015-16 round, where it was found that 12.8% of schools reported a lack of playgrounds outside the school and 52% of schools reported a lack of indoor spaces where children can usually play during breaks between lessons.

- The physical education lessons of the children were another issue of the study. The teaching program approved by the Ministry of Education plans for the elementary classes, under the mandatory curriculum for each grade, 3 hours (45 minutes each) of physical education, for a total of 135 minutes each week.

All schools reported the realization of 135 minutes/week for all grade levels. While the data from the latest COSI 2015-16 round showed that the teaching program included 2 hours of physical education 45 minutes each, for a total of 90 minutes a week.

Table 56 shows the distribution of sport/physical activities at least once a week for primary school children outside school hours by location.

Table 56. Sports/physical activities at least once a week for primary school children outside chool hours

School location	Yes, to all grade levels	Only to some grade levels	No	Total
Urban	53 (60.9%)	6 (6.9%)	28 (32.2%)	87 (100.0%)
Rural	27 (47.4%)	4 (7.0%)	26 (45.6%)	57 (100.0%)
Total	**80 (55.6%)**	**10(6.9%)**	**54(37.5%)**	**144(100.0%)**

The number of schools that organize sports/physical activities at least once a week for primary school children outside school hours to all grade levels is slightly higher (55.6%) compared to the data from the latest COSI 2015-16 round (53.8%). However, the number of schools that did not organize any sports/physical activities is still significant (37.5%).

Table 57 shows the distribution of availability of school bus transport to/from school or provided by the schools by residence.

Table 57. School bus transport available to/from school or provided by the schools by residence

School location	Yes, to all grade levels	Only to some grade levels	Only to pupils from rural areas	Only to pupils living far away	No	Total
Urban	12 (13.8%)	0 (.0%)	9 (10.3%)	5 (5.7%)	61 (70.1%)	87 (100.0%)
Rural	13 (22.8%)	2 (3.5%)	2 (3.5%)	10 (17.5%)	30 (52.6%)	57 (100.0%)
Total	**25 (17.4%)**	**2 (1.4%)**	**11 (7.6%)**	**14 (10.4%)**	**91 (63.2%)**	**144 (100.0%)**

Figure 4 shows the distribution of availability of school bus transport to/from school or provided by the schools according to the latest COSI rounds. The data from this COSI round shows an increased number of schools with availability of school bus transport for all children, regardless of their residence.

Figure 4. Availability of school bus transport to/from school or provided by the schools according to the latest COSI rounds

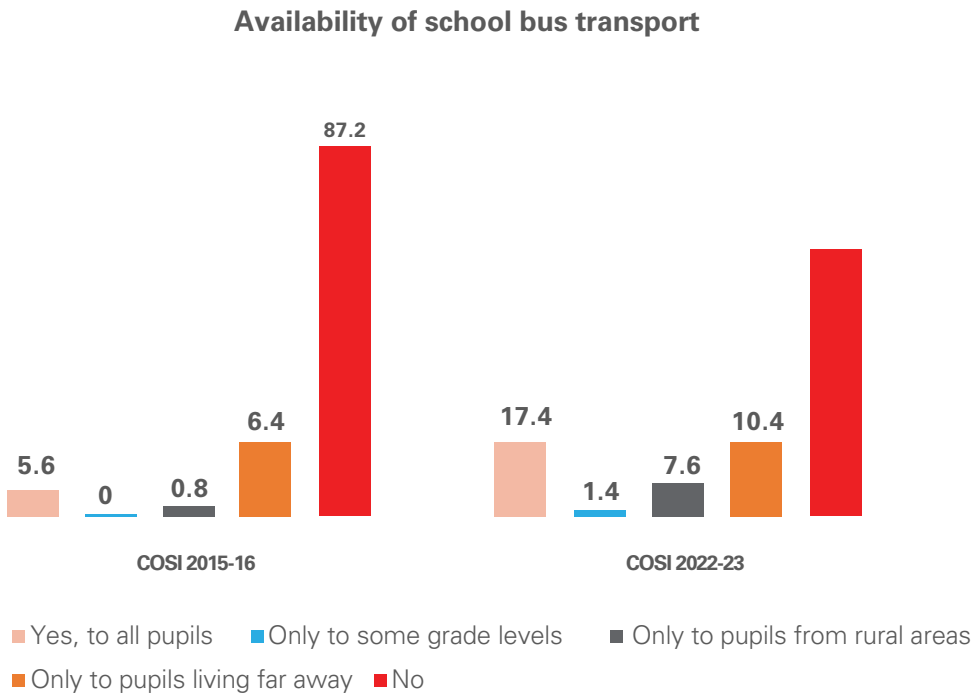


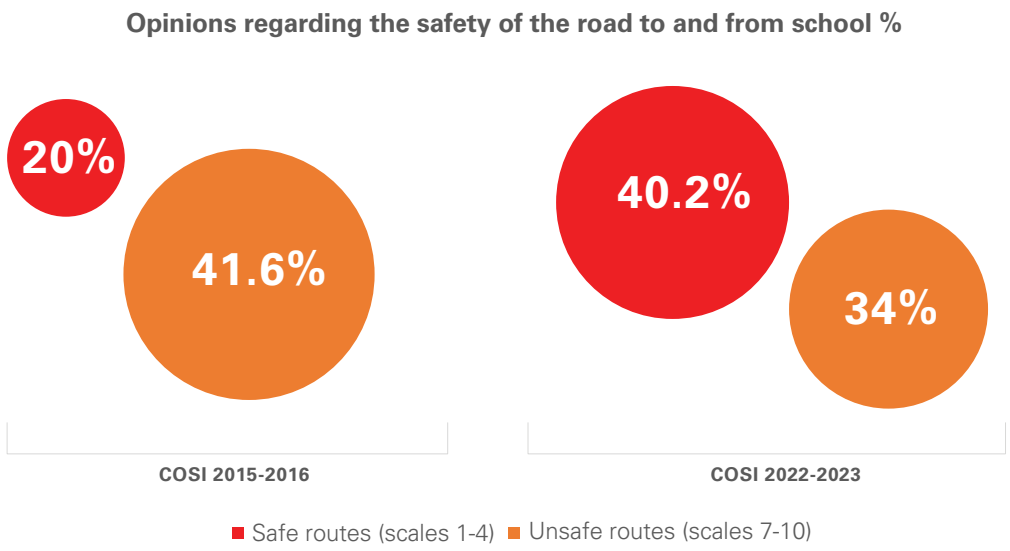
Table 58 shows the distribution of school staff opinion regarding the safety of routes to and from school for most of their pupils to walk or ride a bicycle. About 40% of school staff report a very safe route level (rating scale 1-4) whereas 34% of them report an unsafe route level (rating scale 7-10). Safety level is slightly higher among school staff in urban areas (41.2%) than in rural areas. (38.6%)

Table 58. Safety of route to and from school for most pupils to walk or ride a bicycle, by school location

Safety of routes to and from school	Urban	Rural	Total
1 Extremely safe	1.1%	1.8%	1.4%
2	8.0%	10.5%	9.0%
3	21.8%	17.5%	20.1%
4	10.3%	8.8%	9.7%
5	18.4%	12.3%	16.0%
6	10.3%	8.8%	9.7%
7	9.2%	3.5%	6.9%
8	10.3%	22.8%	15.3%
9	.0%	7.0%	2.8%
10 Extremely unsafe	10.3%	7.0%	9.0%
Total	**100.0%**	**100.0%**	**100.0%**

The routes are considered much safer by the school staff involved in this COSI round (40.2%) compared to COSI round 2015-16 (20%) (Figure 5)

Figure 5. The distribution of opinions regarding route safety according to the to the latest COSI rounds



Nutrition education was included in the school curricular activities in all schools providing also "*healthy eating information*" education. Meanwhile "*tasting of fresh fruit and vegetables*" education was provided by 78% of schools and "*learning food preparation skills*" was provided by 58 % of schools. About half of schools provided all three nutrition education types.

In this current school year, 106 schools (73.6%) reported having organized (or will organize) initiatives/ projects in both grades part of the study, to promote a healthy lifestyle. Only one school reported having organized such initiative only for the second grade class.

Table 59 lists the types of foods and beverages that children can find on their school premises. There was a notable lack of access to fresh fruits, vegetables, fruit juices with no sugar, milk or yogurt. About one out of three schools had access to drinking water (both free or paid). Almost all schools that declared access to drinks and food with payment belong to non-public schools.

Table 59. Distribution of foods/drinks accessible to the children at school (%)

Beverages	Free	Paid	Not available	Foods	Free	Paid	Not available
Without added sugar							
Water	25	5.6	69.4	Fresh fruit	2.8	2.8	94.4
Tea	3.5	6.9	89.6	Vegetables	2.1	2.8	94.4
100% fruit juices	0.7	5.6	93.8	Sweet snacks (e.g. chocolate, sugar confectionery, cakes, breakfast and/or cereal bars, sweet biscuits and/or pastries)	0.7	2.8	96.5
With added sugar							
Fruit juices or other non-carbonated drinks	0	6.2	93.8	**Ice-cream**	**0.7**	**0.7**	**98.6**
Carbonated (soft) drinks	0	4.9	95.1	Savoury snacks (e.g. potato crisps, salted popcorn, salted nuts, savoury biscuits and/or pretzels)	0	2.1	97.9
Flavoured milk	0	2.1	97.9				
Hot drinks (cocoa, tea, coffee with milk)	1.4	3.5	95.1				
Dairy							
Milk, yoghurt, ayran	2.1	2.8	95.1				

Only 14 schools (9.7%) had a canteen in their premises. All of them were non-public schools. Only five schools (3.5%) had vending machines, where children are allowed to purchase foods or beverages All schools were free from advertising and marketing of any energy-dense and nutrient-poor foods and beverages that could undermine the promotion of a healthy, balanced diet.

7.10 Covid-19 pandemic impact on the daily routine and behaviours

The worldwide spread of COVID-19 has had profound impacts on individuals, health systems, and the obesogenic environment. (1) Different studies from a number of countries in the Region indicate that the prevalence of overweight and obesity and/or mean body mass index has increased in children and adolescents during the COVID-19 pandemic (42-45, 55), followed by a decrease in physical activity and

increase in the consumption of High in Fat, Salt and Sugar (HFSS) foods (43, 46, 47). The use of food delivery services and apps has become an increasingly important area of focus during the COVID-19 pandemic. (48) Particularly, the food and drink industry has increased the impact of its marketing by using different approaches to promote their unhealthy products. Social media also became an influential platform that was increasingly used during the pandemic. (49)

The reasons for childhood overweight and obesity are complex and multifactorial (4,50): the child's personal characteristics and individual risk factors are nested within the family context, incorporating parenting style and other family characteristics but also within the community and the wider social context (4, 51,52)

In order to understand the effect of the COVID-19 pandemic situation on children´s daily routines, wellbeing, eating habits, behaviours, physical activity and perception of the nutritional status of school-aged children, a voluntary family questionnaire has been distributed to the parents of all school children (5888 children aged 7–10 years) involved in this study. They were invited to share with us their opinions about the perceived frequency of their children engaging in the above mentioned parameters before and during the COVID-19 pandemic. In total, the form was completed and returned by 5289 parents (response rate 89%). The children in Albania stayed home from school because of COVID-19 between March 2020 and June 2022.

Table 1 presents the distribution of family members according to COVID- 19 status. The COVID-19 incidence is lowest among children (11.3%) compared to respondent parents (27.2%), spouse/partners (25.1%) or other household members (23.2%).

Table 60. COVID-19 (Coronavirus) confirmed by a doctor and/or a positive COVID-19 test (in number and percentage)

COVID-19	You n (%)	Your Child n (%)	Your Spouse/Partner n (%)	Other Household Member(s) n (%)
No	3475 (72.8)	4112 (88.7)	3512 (74.9)	3239 (76.8)
Yes	1296 (27.2)	526 (11.3)	1179 (25.1)	974 (23.2)
Yes, at home isolation	1260 (26.4)	510 (11.0)	1127 (24.0)	898 (21.3)
Yes, admitted to the hospital	36 (0.8)	16 (0.3)	52 (1.1)	82 (1.9)
Total	**4771 (100.0)**	**4638 (100.0)**	**4691 (100.0)**	**4219 (100.0)**

For approximately two-thirds of families, the consumption of various food products didn't change before and during the pandemic (i.e. it stayed the same). The highest increase was noticed for fruits (22.4%), dairy products (19%) and vegetables (18.1%) whereas the highest decrease was noticed with regard to soft drinks, sweets and savoury snacks with 26.1%, 15.5% and 15.2% of parents declaring that their children consumed less of these foods during the pandemic (Table 2).

Table 62. Children's food consumption during the period of the COVID-19 pandemic compared to the period before COVID-19 according to parents' opinion

Situation	Decreased in comparison topre-COVID Period n (%)	Stayed the same in comparison to pre-COVID period n (%)	Increased in comparison to pre-COVID period n (%)	I don´t know n (%)
Amount of fresh fruits your child ate	292 (5.8)	3379 (66.5)	1137 (22.4)	270 (5.3)
Amount of vegetables (including vegetable soup,excluding potatoes) your child ate	360 (7.2)	3539 (70.6)	906 (18.1)	210 (4.2)
Amount of meat your child ate	551 (11.2)	3421 (69.5)	746 (15.2)	206 (4.2)
Amount of fish your child ate	620 (12.7)	3213 (65.9)	764 (15.7)	278 (5.7)
Amount of dairy product (e.g. milk, cheese and eggs) your child ate	358 (7.1)	3529 (70.1)	954 (19.0)	192 (3.8)
Amounts of savoury snacks(e.g. potato chips, corn chips, popcorn, peanuts) your child ate	763 (15.2)	3247 (64.7)	804 (16.0)	201 (4.0)
Amount of sweets (e.g. cakes, biscuits, candy desserts, pastry, ice-cream) your child ate	777 (15.5)	3340 (66.5)	710 (14.1)	198 (3.9)
Amount of soft drinks containing sugar your childdrank	1263 (26.1)	2885 (59.7)	338 (7.0)	347 (7.2)
Amount of breakfast cerealsyour child ate	562 (11.4)	3515 (71.0)	530 (10.7)	343 (6.9)

The frequency of ordering food through applications and/or online delivery services was reduced during the pandemic, with about two-thirds of parents (66.5%) declaring to have never done so during the pandemic compared to about half (51.1%) before the pandemic. It can be noted that such decrease affected mainly those who rarely ordered food online (less than once a month up to once per week) who further disengaged in this behaviour, compared to those who usually order online food (more than once per week) where only a 0.3% percentage points decrease was noticed compared to before the pandemic situation (Table 3).

Table 63. Frequency of food ordered through applications and/or other online delivery services according to parents' opinion

Food consumption frequency	Pre-COVID period n (%)	COVID pandemic period n (%)
Never	2574 (51.1)	3367 (66.5)
Less than once a month	785 (15.6)	642 (12.7)
Once a month	654 (13.0)	419 (8.3)
2-3 times per month	462 (9.2)	276 (5.5)
Once per week	446 (8.9)	256 (5.1)
More than once per week	116 (2.3)	101 (2.0)
Total	5037 (100.0)	5061 (100.0)

The weekly routine behaviours with regard to food consumption varied more extensively during the pandemic compared to the pre-pandemic period. Behaviours that increased most during the pandemic include eating home-cooked meals (35.3%), eating together as a family (29%), cooking meals together with your child (25.5%) and buying foods in large quantities (21.6%). On the other hand, the behaviours that showed the largest decrease (in terms of the rates of parents declared to engage in these less during the pandemic) are eating meals prepared outside of home (51.1 percentage points drop), eating ready-to-eat meals (47.3 percentage points drop) and buying online groceries (41.3 percentage points drop) [Table 4].

Table 64. Changes in the following parental behaviours in weekly routine during COVID period compared to the pre- COVID period (in number and percentage)

Behaviours	Lower/less than pre-COVID period n (%)	The same than pre-COVID period n (%)	Higher/more than pre-COVID period n (%)	I don´t know n (%)	Total n (%)
Buying regional/local food at nearby businesses	1036 (20.9)	2969 (59.9)	708 (14.3)	243 (4.9)	4956 (100.0)
Buying food in super orhyper-markets	871 (17.4)	3151(63.0)	858 (17.1)	124 (2.5)	5004 (100.0)
Online grocery shopping	1721 (41.3)	1252 (30.1)	249 (6.0)	942(22.6)	4164 (100.0)
Buying food in large quantities (for periods of time longer than 1 week)	1068 (22.1)	2419 (50.0)	1043 (21.6)	307 (6.3)	4837 (100.0)

Eating home-cooked meals	205 (4.1)	2905 (58.2)	1763 (35.3)	117(2.3)	4990(100.0)
Eating ready-to-eat meals	2177 (47.3)	1764 (38.3)	223 (4.8)	443 (9.6)	4607(100.0)
Eating meals prepared out-side of home (e.g. take away/ online delivery services)	2354 (51.1)	1478 (32.1)	170 (3.7)	604 (13.1)	4606(100.0)
Eating together as a family	224 (4.4)	3246 (64.4)	1464 (29.0)	108 (2.1)	5042 (100.0)
Eating breakfast	364 (7.3)	3522 (70.8)	966 (19.4)	124 (2.5)	4976 (100.0)
Cooking meals to-gether with your child	315 (6.3)	3268 (65.3)	1275 (25.5)	149 (3.0)	5007(100.0)
Reusing leftovers for another meal	1381 (29.5)	2403 (51.3)	382 (8.1)	522 (11.1)	4688(100.0)
Planning pur-chases and meals in ad-vance (making a meal plan)	675 (14.0)	2915 (60.4)	755 (15.7)	479 (9.9)	4824 (100.0)

In general, more than half of the parents declared that the engagement of their children in the behaviours included in Table 5 did not change during the COVID-19 pandemic compared to the pre-pandemic period, and more than three-quarters of parents declared that their children slept the same amount during the pandemic on both weekdays and weekends. The behaviours that increased more during the pandemic (in terms of percentage of children engaging in them) include time spent learning in the house (+26.9 percentage points), and time spent watching TV or using electronic devices on weekdays (+21 percentage points) and on weekends (+21 percentage points). On the other hand, the behaviours that decreased more during the pandemic include time spent actively playing outside on weekdays and weekends (-21.7 and -18.9 percentage points, respectively) and time spent watching TV or using electronic devices on weekdays (-21.8 and -20.5 percentage points, respectively) [Table 5].

Table 65. Children engaging in different behaviours before and during the COVID-19 pandemic, according to the parents' opinion

Situation	Decreased in comparison to pre-COVID period n (%)	Stayed the same in comparison to pre-COVID Period n (%)	Increased in comparison to pre-COVID period n (%)	I don´t know n (%)
Amount your child slept on weekdays	453 (9.0)	3963 (78.5)	506 (10.0)	126 (2.5)
Amount your child slept on weekends	340 (6.8)	3775 (76.0)	703 (14.2)	150 (3.0)
Time your child spent learning in the house (including home schooling), if more than 3h/day	364 (7.3)	3150 (62.8)	1351 (26.9)	150 (3.0)
Time your child spent outside school hours, playing actively/vigorously (e.g. running,jumping outside or moving and fitness games inside) on weekdays	1091 (21.7)	2841 (56.6)	887 (17.7)	199 (4.0)
Time your child spent outside school hours, playing actively/vigorously (e.g. running,jumping outside or moving and fitness games inside) on weekends	947 (18.9)	2938 (58.7)	919 (18.4)	199 (4.0)
Spending time watching TV, playing video/computer games,or using social media for non-educational purposes on weekdays	1094 (21.8)	2733 (54.4)	1058 (21.1)	139 (2.8)
Spending time watching TV, playing video/computer games,or using social media for non-educational purposes on weekends	1027 (20.5)	2737 (54.7)	1049 (21.0)	187 (3.7)

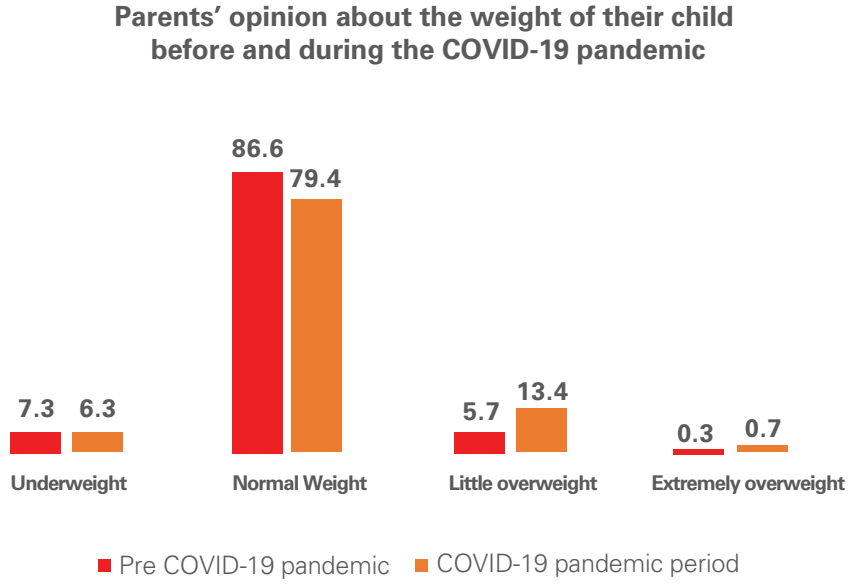
WEIGHT OPINION BEFORE AND DURING THE COVID-19 PANDEMIC

Parents' opinion on their child's weight shows a higher perception of weight during COVID compared to the pre-COVID period for all conditions except normal weight where the perception is lower **(Table 6, Figure 1)**

Table 66. Parents' opinion about the weight of their child before and during the COVID-19 pandemic

Condition	Pre COVID-19 pandemic	COVID-19 pandemic Period
Underweight	355 (7.3)	292 (6.3)
Normal weight	4192 (86.6)	3666 (79.4)
Little overweight	278 (5.7)	619 (13.4)
Extremely overweight	13 (0.3)	43 (0.7)

Figure 6. Parents' opinion about the weight of their child before and during the COVID-19 pandemic



Parents' opinion about their child weight before and during the COVID-19 pandemic are significantly correlated (Spearman's rho correlation coefficient 0.470, P<0.001): the proportion of parents thinking that their child is extremely overweight during the pandemic increases significantly with the increase in perceived weight prior to the pandemic (0%, 0.2%, 10.2% and 53.8% among parents' thinking their child is underweight, normal weight, overweight or extremely overweight before the pandemic, respectively). This relationship has a highly significant linear trend.

Table 67. Parents' opinion about the weight of their child before and during the COVID-19 pandemic

Weight opinion – before the COVID-19 pandemic		Weight opinion – during the COVID-19 pandemic				P-value**
		Underweight	Normal weight	Little overweight	Extremely overweight	
Underweight	Number	132	142	23	0	<0.001
	%	44.4	47.8	7.7	0.0	
Normal weight	Number	126	3379	379	8	
	%	3.2	86.8	9.7	0.2	
Little over-weight	Number	7	28	184	25	
	%	2.9	11.5	75.4	10.2	
Extremely overweight	Number	1	1	4	7	
	%	7.7	7.7	30.8	53.8	
Total	**Number**	**266**	**3550**	**590**	**40**	
	%	**6.0**	**79.8**	**13.3**	**0.9**	

* Row percentage.

** P-value according to the chi square test.

Parents also expressed their opinion about their CHILD'S behaviours and feelings during the pre-COVID period (Table 8) and during the COVID-19 pandemic (Table 9).

Table 68. Parents' perceptions on CHILD'S behaviours and feelings during the pre-COVID period

Has your child felt fitand well?	Not at all 142 (2.8)	Slightly 263 (5.2)	Moderately 1742 (34.7)	Very 2015 (40.1)	Extremely 864 (17.2)
Has your child felt full of energy?	Never 50 (1.0)	Seldom 419 (8.3)	Quite often 1452 (28.8)	Very often 1205 (23.9)	Always 1911 (37.9)
Has your child felt sad?	Never 1371 (27.2)	Seldom 3041 (60.3)	Quite often 470 (9.3)	Very often 129 (2.6)	Always 36 (0.7)
Has your child feltlonely?	Never 3203 (63.4)	Seldom 1464 (29.0)	Quite often 280 (5.5)	Very often 76 (1.5)	Always 27 (0.5)
Has your child had enough time for him/ herself?	Never 27 (0.5)	Seldom 124 (2.5)	Quite often 974 (19.3)	Very often 922 (18.3)	Always 2995 (59.4)
Has your child been able to do the things that he/ she wants to doin his/her free time?	Never 34 (0.7)	Seldom 405 (8.0)	Quite often 1246 (24.7)	Very often 1056 (20.9)	Always 2310 (45.7)

Has your child felt that his/her parent(s) treated him/her fairly?	Never 99 (2.0)	Seldom 139 (2.8)	Quite often 746 (14.9)	Very often 884 (17.6)	Always 3154 (62.8)
Has your child had fun with his/her friends?	Never 59 (1.2)	Seldom 616 (12.2)	Quite often 1069 (21.2)	Very often 1101 (21.9)	Always 2187 (43.5)
Has your child got onwell at school?	Not at all 31 (0.6)	Slightly 156 (3.1)	Moderately 1631 (32.4)	Very 1978 (39.3)	Extremely 1241 (24.6)
Has your child been able to pay attention?	Never 22 (0.4)	Seldom 204 (4.0)	Quite often 1239 (24.5)	Very often 1181 (23.4)	Always 2411 (47.7)

Table 69. Parents perceptions on about the behaviours and feelings during the COVID-19 Pandemic period

Has your child felt fitand well?	Not at all 115 (2.3)	Slightly 337 (6.7)	Moderately 1662 (33.0)	Very 1959 (38.9)	Extremely 963 (19.1)
Has your child felt full of energy?	Never 50 (1.0)	Seldom 531 (10.6)	Quite often 1489 (29.8)	Very often 1172 (23.4)	Always 1761 (35.2)
Has your child felt sad?	Never 1657 (33.1)	Seldom 2515 (50.2)	Quite often 655 (13.1)	Very often 141 (2.8)	Always 39 (0.8)
Has your child felt lonely?	Never 2885 (57.4)	Seldom 1564 (31.1)	Quite often 408 (8.1)	Very often 127 (2.5)	Always 38 (0.8)
Has your child had enough time for him/herself?	Never 30 (0.6)	Seldom 175 (3.5)	Quite often 1067 (21.3)	Very often 977 (19.5)	Always 2763 (55.1)
Has your child been able to do the things that he/she wants to doin his/her free time?	Never 60 (1.2)	Seldom 693 (13.8)	Quite often 1229 (24.5)	Very often 921 (18.4)	Always 2105 (42.0)
Has your child felt that his/her parent(s) treated him/her fairly?	Never 104 (2.1)	Seldom 153 (3.1)	Quite often 826 (16.6)	Very often 829 (16.7)	Always 3063 (61.6)
Has your child had fun with his/her friends?	Never 217 (4.3)	Seldom 1401 (27.9)	Quite often 938 (18.7)	Very often 769 (15.3)	Always 1694 (33.8)

Has your child got onwell at school?	Not at all 70 (1.4)	Slightly 223 (4.5)	Moderately 1830 (36.5)	Very 1768 (35.3)	Extremely 1116 (22.3)
Has your child been able to pay attention?	Never 30 (0.6)	Seldom 326 (6.5)	Quite often 1371 (27.3)	Very often 1087 (21.6)	Always 2216 (44.1)

Figure 2 shows that during the pandemic higher proportions of children have felt lonely and sad quite often, very often or always, compared to the pre-pandemic period, but lower proportions of children had enough time for themselves, felt full of energy or fit and well. (Tables above 8, 9 and Figure 2)

OPINION ON FITNESS BEFORE AND DURING THE COVID-19 PANDEMIC

The proportion of parents perceiving that their child is fit and well during the pandemic in general shows a positive, strong correlation with the perceptions of fitness before the pandemic (Spearman's rho correlation coefficient 0.470, P<0.001), [Table 10].

Figure 7. Parents' opinion about the behaviours and feelings of their child before and during the COVID-19 pandemic

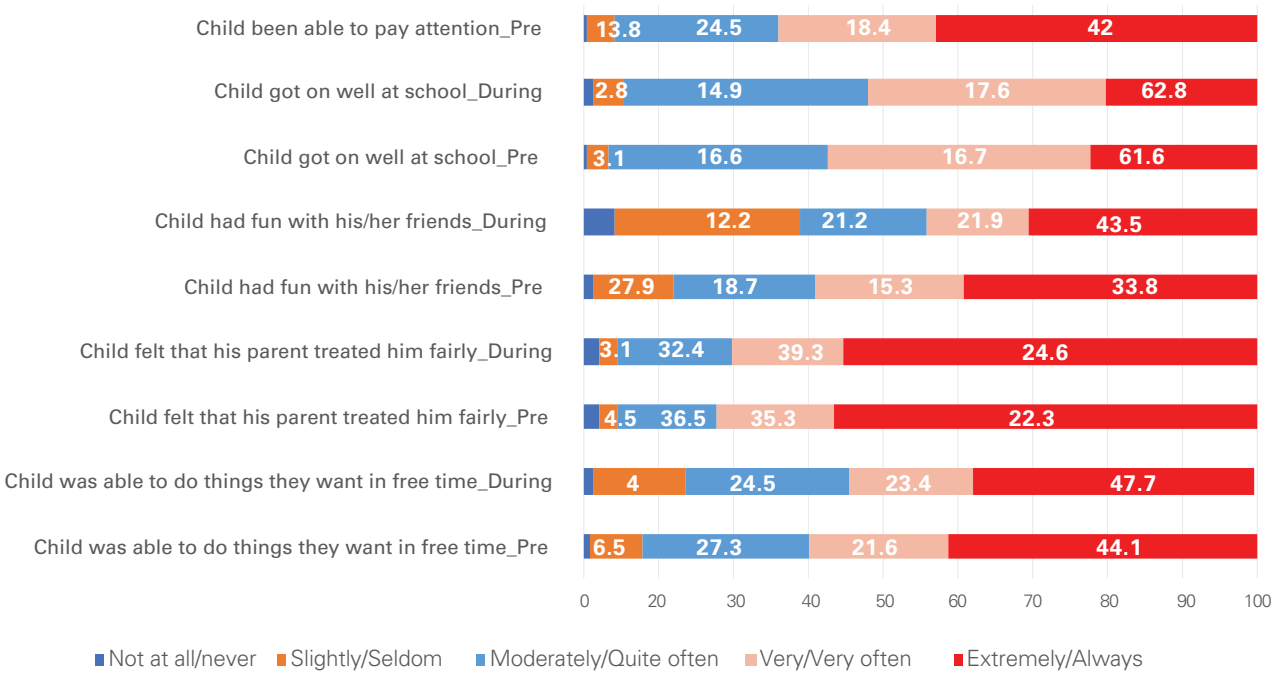


Table 70. Parents' opinion on the fitness status of their child before and during the COVID-19 pandemic

Opinion on fitness – before the COVID-19 pandemic		Opinion on fitness – during the COVID-19 pandemic					P-value**
		Not at all	Slightly	Moderately	Very	Extremely	
Not at all	Number	35	32	35	23	14	<0.001
	%	25.2	23.0	25.2	16.5	10.1	
Slightly	Number	17	94	101	36	14	
	%	6.5	35.9	38.5	13.7	5.3	
Moderately	Number	16	112	996	486	104	
	%	0.9	6.5	58.1	28.4	6.1	
Very	Number	35	73	422	1175	288	
	%	1.8	3.7	21.2	59.0	14.5	
Extremely	Number	11	22	89	214	521	
	%	1.3	2.6	10.4	25.0	60.8	
Total	**Number**	**114**	**333**	**1643**	**1934**	**941**	
	%	**2.3**	**6.7**	**33.1**	**39.0**	**19.0**	

* Row percentage.

** P-value according to the chi square test.

OPINION ON ENERGY BEFORE AND DURING THE COVID-19 PANDEMIC

Likewise, the proportion of parents perceiving that their child is full of energy during the pandemic in general shows a positive, strong correlation with the perceptions of their child's energy before the pandemic (Spearman's rho correlation coefficient 0.535, P<0.001) [Table 11].

Table 71. Parents' opinion about the energy status of their child before and during the COVID-19 pandemic

Opinion on energy – before the COVID-19 pandemic		Opinion on energy – during the COVID-19 pandemic					P-value**
		Never	Seldom	Quite often	Very often	Always	
Never	Number	17	16	3	3	7	<0.001
	%	37.0	34.8	6.5	6.5	15.2	
Seldom	Number	9	207	121	38	38	
	%	2.2	50.1	29.3	9.2	9.2	
Quite often	Number	6	132	804	289	196	
	%	0.4	9.3	56.3	20.3	13.7	
Very often	Number	7	82	321	520	257	
	%	0.6	6.9	27.0	43.8	21.7	
Always	Number	11	86	221	313	1238	
	%	0.6	4.6	11.8	16.7	66.2	
Total	**Number**	**50**	**523**	**1470**	**1163**	**1736**	
	%	**1.0**	**10.6**	**29.7**	**23.5**	**35.1**	

* Row percentage. ** P-value according to the chi square test.

OPINION ON SADNESS BEFORE AND DURING THE COVID-19 PANDEMIC

The proportion of parents perceiving that their child is sad during the pandemic in general shows a positive, strong correlation with the perceptions of their child's sadness before the pandemic (Spearman's rho correlation coefficient 0.541, P<0.001) [Table 12].

Table 72. Parents' opinion on their child feeling sad before and during the COVID-19 pandemic

Opinion on sadness – before the COVID-19 pandemic		Opinion on sadness – during the COVID-19 pandemic					P-value**
		Never	Seldom	Quite often	Very often	Always	
Never	Number	1021	235	66	14	12	<0.001
	%	75.7	17.4	4.9	1.0	0.9	
Seldom	Number	573	2017	317	62	14	
	%	19.2	67.6	10.6	2.1	0.5	
Quite often	Number	30	182	221	26	4	
	%	6.5	39.3	47.7	5.6	0.9	
Very often	Number	6	45	40	33	2	
	%	4.8	35.7	31.7	26.2	1.6	
Always	Number	7	10	8	4.	7	
	%	19.4	27.8	22.2	11.1	19.4	
Total	**Number**	**1637**	**2489**	**652**	**139**	**39**	
	%	**33.0**	**50.2**	**13.2**	**2.8**	**0.8**	

OPINION ON LONELINESS BEFORE AND DURING THE COVID-19 PANDEMIC

The proportion of parents perceiving that their child is lonely during the pandemic in general shows a positive, strong correlation with the perceptions of their child's loneliness before the pandemic (Spearman's rho correlation coefficient 0.658, P<0.001) [Table 13].

Table 73. Parents' opinion about their child feeling lonely before and during the COVID-19 pandemic

Opinion on loneliness – before the COVID-19 pandemic		Opinion on loneliness – during the COVID-19 pandemic					P-value**
		Never	Seldom	Quite often	Very often	Always	
Never	Number	2603	418	93	30	19	<0.001
	%	82.3	13.2	2.9	0.9	0.6	
Seldom	Number	222	1015	163	35	6	
	%	15.4	70.4	11.3	2.4	0.4	
Quite often	Number	16	98	128	26	4	
	%	5.9	36.0	47.1	9.6	1.5	
Very often	Number	9	14	16	32	3	
	%	12.2	18.9	21.6	43.2	4.1	
Always	Number	6	8	5	2	5	
	%	23.1	30.8	19.2	7.7	19.2	
Total	**Number**	**2856**	**1553**	**405**	**125**	**37**	
	%	**57.4**	**31.2**	**8.1**	**2.5**	**0.7**	

PRE AND DURING COVID-19 PANDEMIC PARENTS' OPINION ABOUT CHILDREN HAVING ENOUGH TIME FOR THEMSELVES

The proportion of parents perceiving that their child has had enough time for him/herself during the pandemic in general shows a positive, strong correlation with the perception of their child's time sufficiency before the pandemic (Spearman's rho correlation coefficient 0.594, P<0.001) [Table 14].

Table 74. Parents' opinion about their child having enough time for him/herself before and during the COVID-19 pandemic

Opinion about the child having enough time for him/herself – before the COVID-19 pandemic		Opinion about the child having enough time for him/herself– during the COVID-19 pandemic					P-value**
		Never	Seldom	Quite often	Very often	Always	
Never	Number	8	3	5	1	10	<0.001
	%	29.6	11.1	18.5	3.7	37.0	
Seldom	Number	3	57	29	15	17	
	%	2.5	47.1	24.0	12.4	14.0	
Quite often	Number	6	46	581	171	152	
	%	0.6	4.8	60.8	17.9	15.9	
Very often	Number	2	17	230	417	235	
	%	0.2	1.9	25.5	46.3	26.1	
Always	Number	10	51	210	363	2318	
	%	0.3	1.7	7.1	12.3	78.5	
Total	**Number**	**29**	**174**	**1055**	**967**	**2732**	
	%	**0.6**	**3.5**	**21.3**	**19.5**	**55.1**	

* Row percentage.

** P-value according to the chi square test.

Parents reported that during the period of the COVID pandemic, lower proportions of children were quite often, very often or always attentive, had fun with their friends, or did things children want to do in their free time, and lower proportions made moderate or high progress at school as well compared to the pre-pandemic period (Tables 8, 9 and Figure 3).

PARENTS' OPINION BEFORE AND DURING THE COVID-19 PANDEMIC ABOUT THEIR CHILDREN BEING ABLE TO DO THE THINGS THEY WANT IN THEIR FREE TIME.

The proportion of parents perceiving that their child has been able to do the things they wanted to do in their free time during the pandemic in general shows a positive, strong correlation with the same perceptions as before the pandemic (Spearman's rho correlation coefficient 0.546, P<0.001) [Table 15].

Table 75. Parents' opinion about children doing the things they want in their free time before and during the COVID-19 pandemic

Opinion about children doing the things they want to do in their free time- before the COVID-19 pandemic		Opinion about children doing the things they want to do in their free time– during the COVID-19 pandemic					P-value**
		Never	Seldom	Quite often	Very often	Always	
Never	Number	13	9	3	3	4	<0.001
	%	40.6	28.1	9.4	9.4	12.5	
Seldom	Number	12	221	93	28	41	
	%	3.0	55.9	23.5	7.1	10.4	
Quite often	Number	7	169	658	211	173	
	%	0.6	13.9	54.0	17.3	14.2	
Very often	Number	12	125	231	449	223	
	%	1.2	12.0	22.2	43.2	21.4	
Always	Number	16	167	231	222	1641	
	%	0.7	7.3	10.1	9.7	72.1	
Total	**Number**	**60**	**691**	**1216**	**913**	**2082**	
	%	**1.2**	**13.9**	**24.5**	**18.4**	**42.0**	

PARENTS' OPINION BEFORE AND DURING THE COVID-19 PANDEMIC ABOUT CHILDREN FEELING THAT THEIR PARENT(S) TREATED THEM FAIRLY

The proportion of parents perceiving that their children were feeling fairly treated by their parents during the pandemic in general shows a positive, very strong correlation with the same perceptions as before the pandemic (Spearman's rho correlation coefficient 0.703, P<0.001) [Table 16].

Table 76. Parents' opinion about children feeling fairly treated by their parents before and during the COVID-19 pandemic

Opinion about children feeling fairly treated by their parents - before the COVID-19 pandemic		Opinion about children feeling fairly treated by their parents– during the COVID-19 pandemic					P-value**
		Never	Seldom	Quite often	Very often	Always	
Never	Number	58	4	10	3	22	<0.001
	%	59.8	4.1	10.3	3.1	22.7	
Seldom	Number	7	61	38	14	12	
	%	5.3	46.2	28.8	10.6	9.1	
Quite often	Number	4	39	492	109	85	
	%	0.5	5.3	67.5	15.0	11.7	
Very often	Number	3	17	150	491	201	
	%	0.3	2.0	17.4	57.0	23.3	
Always	Number	30	31	125	204	2704	
	%	1.0	1.0	4.0	6.6	87.4	
Total	**Number**	**102**	**152**	**815**	**821**	**3024**	
	%	**2.1**	**3.1**	**16.6**	**16.7**	**61.5**	

PARENTS' OPINION BEFORE AND DURING THE COVID-19 PANDEMIC ABOUT THEIR CHILDREN HAVING FUN WITH THEIR FRIENDS

The proportion of parents perceiving that their children were having fun with their friends during the pandemic in general shows a positive, strong correlation with the same perceptions as before the pandemic (Spearman's rho correlation coefficient 0.565, P<0.001) [Table 17].

Table 77. Parents' opinion about their children having fun with their friends before and during the COVID-19 pandemic

Opinion about children having fun with their friends - before the COVID-19 pandemic		Opinion about children having fun with their friends– during the COVID-19 pandemic					P-value**
		Never	Seldom	Quite often	Very often	Always	
Never	Number	42	12	3	1	1	
	%	71.2	20.3	5.1	1.7	1.7	
Seldom	Number	37	467	56	21	21	
	%	6.1	77.6	9.3	3.5	3.5	
Quite often	Number	40	294	549	107	61	
	%	3.8	28.0	52.2	10.2	5.8	<0.001
Very often	Number	42	267	185	434	153	
	%	3.9	24.7	17.1	40.1	14.2	
Always	Number	54	343	138	197	1425	
	%	2.5	15.9	6.4	9.1	66.1	
Total	**Number**	**215**	**1383**	**931**	**760**	**1661**	
	%	**4.3**	**27.9**	**18.8**	**15.4**	**33.6**	

* Row percentage.
** P-value according to the chi square test.

OPINION ABOUT CHILD SCHOOL PERFORMANCE BEFORE AND DURING THE COVID-19 PANDEMIC

The proportion of parents perceiving that their child has got on well during the pandemic in general shows a positive, very strong correlation with the same perceptions as before the pandemic (Spearman's rho correlation coefficient 0.776, P<0.001) [Table 18].

Table78. Parents' opinion about their child's school performance before and during the COVID-19 pandemic

Opinion about child school performance - before the COVID-19 pandemic		Opinion about child school performance– during the COVID-19 pandemic					P-value**
		Not at all	Slightly	Moderately	Very	Extremely	
Not at all	Number	24	5	1	0	1	<0.001
	%	77.4	16.1	3.2	0.0	3.2	
Slightly	Number	10	98	38	5	2	
	%	6.5	64.1	24.8	3.3	1.3	
Moderately	Number	20	84	1354	121	23	
	%	1.2	5.2	84.5	7.6	1.4	
Very	Number	7	30	343	1397	168	
	%	0.4	1.5	17.6	71.8	8.6	
Extremely	Number	8	6	76	225	910	
	%	0.7	0.5	6.2	18.4	74.3	
Total	**Number**	**69**	**223**	**1812**	**1748**	**1104**	
	%	**1.4**	**4.5**	**36.6**	**35.3**	**22.3**	

OPINION ABOUT THE CHILD BEING ABLE TO PAY ATTENTION BEFORE AND DURING THE COVID-19 PANDEMIC

The proportion of parents perceiving that their child has been able to pay attention during the pandemic in general shows a positive, very strong correlation with the same perceptions as before the pandemic (Spearman's rho correlation coefficient 0.746, P<0.001) [Table 19].

Table 79. Parents' opinion about their child being able to pay attention, before and during the COVID-19 pandemic

Opinion about the child being able to pay attention - before the COVID-19 pandemic		Opinion about the child being able to pay attention– during the COVID-19 pandemic					P-value**
		Never	Seldom	Quite often	Very often	Always	
Never	Number	15	4	0	0	2	<0.001
	%	71.4	19.0	0.0	0.0	9.5	
Seldom	Number	5	140	39	7	9	
	%	2.5	70.0	19.5	3.5	4.5	
Quite often	Number	3	107	919	115	77	
	%	0.2	8.8	75.3	9.4	6.3	
Very often	Number	3	34	265	688	180	
	%	0.3	2.9	22.6	58.8	15.4	
Always	Number	4	38	142	270	1932	
	%	0.2	1.6	6.0	11.3	81.0	
Total	**Number**	**30**	**323**	**1365**	**1080**	**2200**	
	%	**0.6**	**6.5**	**27.3**	**21.6**	**44.0**	

* Row percentage.
** P-value according to the chi square test.

8. CONCLUSION

Data collected in this round of COSI, conducted between 2022 and 2023 and encompassing 3158 children, indicate that, overall, 30.2% of children aged 8–9 years are living with overweight (including obesity) and 14.2% are affected by obesity. Both overweight and obesity tended to be more common in boys than in girls, among urban than rural children and children of parents with a medium and high education level. The prevalence of obesity increases with the increase in gestational age, and it is higher among never breastfed children compared to <6 months breastfed children, with the lowest being among >6 months breastfed children. The psychosocial well-being of children during the COVID-19 pandemic has been negatively affected compared to the pre-pandemic period as higher proportions of children felt lonely and sad, while fewer were attentive, had fun with their friends, or did things children want to do in their free time, and made good progress at school compared to the pre-pandemic period. The pandemic – along with its lockdown and school closure – has also increased unhealthy dietary habits (breakfast skipping, lower daily vegetable consumption) and reduced physical activity levels. Our data are consistent with the findings of several studies suggesting that the pre-existing paediatric obesity was aggravated during the COVID-19 pandemic period (1,5,42-45, 55,56,57), which means that childhood overweight and obesity will still remain a major public health challenge in the WHO European Region (including Albania) for the near future. This report will contribute to the efforts to tackle childhood overweight and obesity, both by tracking progress and by informing and driving policy action on nutrition and physical activity. In addition, for the first time, this report has collected information on how Albanian children's daily routines respond to unforeseen circumstances, thus providing important insights for the academic community and policymakers about healthy lifestyle habits that are essential for children's daily routines in potentially similar social circumstances.

9. RECOMMENDATIONS

Based on the above findings, further steps for future interventions emphasize the need to focus on:

- A more in-depth analysis of the findings of COSI _COVID 22-23 and addressing the factors that influenced and encouraged unhealthy habits in children and further exacerbation of obesity and overweight among children in this age group.
- Evaluating the consumers' use of food delivery services as a new growing phenomenon in Albania and the nutritional quality of the foods offered by them in order to minimize obesogenic digital food environments.
- Limiting children's exposure to unhealthy food and beverage advertising including alcohol.
- Improving physical and digital environments for promoting healthy eating and being active and preventing access to unhealthy foods.
- Improving school environments, including food facilities, with increased access to healthy foods and physical spaces that enable children to be active in and outside school hours.
- Improving natural environments and road infrastructure to promote active transportation (walking and cycling) combined with an increased access to being active through programs focused on physical activity and reduction of recreational sedentary screen time.
- Increasing and strengthening the capacities of health workers for the assessment and management of childhood obesity.
- Increasing public awareness of obesity as a risk factor and a complex multifactorial disorder by organizing promotional campaigns on good lifestyle habits and maintaining a healthy weight.

10. STRENGTHS AND LIMITATIONS

The major strength of this study is its large study population, employing a nationally representative sample. Furthermore, the standardized method of data collection and processing allowed inter-country comparisons, as well as enhanced the generalizability of our results. There are, however, some limitations. Firstly, most of the presented data were self-reported, thus the information bias cannot be ruled out. However, there are no reasons to believe that the parents have consistently misreported (voluntarily or unwillingly) on various survey items. On the other hand, given the cross-sectional nature of the survey, the temporality of events cannot be determined and any association should be interpreted with caution, thus not implying causality.

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Annex 1 Ethical permission provided by the ethics committee at the ministry of health and social protection

Annex 2 List of schools included in this study

Lista e shkollave te perzgjedhura per studimin "Vlerësimi i obezitetit në moshën fëminore, COSI 2022-2023"									
Nr.	Emri_shkolles	Nr.	Emri_shkolles	Nr.	Emri_shkolles	Nr.	Emri_shkolles	Nr.	Emri_shkolles
1	Dohoshisht	31	Servete Maçi	61	Lekaj	92	Ajet Xhindole	122	Sejdi Dida
2	Kastriot	32	Sabahudin Gabrani	62	Xhonxh Soros	93	Mehmet Vrioni	123	Ali Podrimja
3	Maqellarë	33	E Kuqe	63	Qamil Gjuzi	94	Ylli mengjesit	124	B. e Malesise
4	Xhevdet Doda	34	Murat Toptani	65	Naun Kacaku Portez	95	Drenovice	125	Kolec Mekshi Tale
5	Gjoricë	35	Isa Boletini	66	Mesonjetorja Dertliu	96	Goriçan	126	Llesh Nik Deka
6	Bajram Curri	36	Ibrahim Brahja	67	Koli Dimo Frasher	97	Z. Veleshnja	127	Zejmen
7	Eftali Koçi	37	Gustav Mayer	68	Muhamet Shehu	98	Ali Agjahu	128	Academic Center
8	Hajdar Dushi	38	Kongresi I Manastirit	69	Meleq Gosnishti	99	Bardhyl Popa	129	Rubik
9	Hasan Koçi	39	Pal Engjelli	70	Alush Grepcka	100	Sulë Domi	130	Mark Trokthi
10	Vasil Ziu	40	Jordan Misja	71	Goja E Arte	101	Luigj Gurakuqi	131	Gjin Pjetri
11	Armath	41	Fenix	72	Lek Prevezi	102	Naim Frashëri	132	Ismail Dema
12	Kuçok	42	Turgut Ozal	73	Riza Ibraliu	103	P. Xhuvani	133	Prekë Gjoni
13	Vadardh	43	Willson	74	Feridum Xhindoli	104	A. Lleshanaku	134	Salo Halili
14	Iliria	44	Qatar College	75	Allkaj	105	Seit Pepa	135	Skenderbej
15	Turgut Ozal	45	New York Basic	76	Koli Sako	106	Milizë	136	Dësh. e Prishtinës
16	Rilindja	46	Lunder	77	Gërmenj	107	Halit Uruçi	137	Hot i Ri
17	Udhja e Prizrenit	47	Bedri Llagami Vaqarr	78	Beselidhja	108	Gjocaj	138	Bardhaj
18	Petrit Llaftiu	48	Sarina	79	Ismail Klosi	109	Rrahman Ã‡ota	139	Seit Can Tagani
19	Xhafzotaj Fshat	49	100-Vjetori	80	Avni Rustemi	110	Dilaver Nezha	140	Adem Haxhija
20	Hajdar Hoxha Larushk	50	Ahmet Zogu Bathore	81	7-Marsi	111	Asdreni	141	Maria Ndihmëtare
21	Arbëria Halil	51	A. Hajdari Paskuqan	82	Meleq Gosnishti	112	Demokracia	142	Miqësia
22	Shaqir Lleja Bushnesh	52	Halit Coka Bathore	83	28 Nëntori	113	Tafil Rexhepi	143	Hajmel
23	Selman Daci Bubq	53	Udhja E Prizrenit	84	Avni Rustemi	114	Nevrus Vila	144	Pjetër Arbnori
24	Avni Rustemi	54	Nene Tereza Laknas	85	Ibrahim Kushta	115	Shegeras		
25	Dora D 'Istria	55	Niko Hoxha Valias	86	Musa Ã‡akërri	116	Kolë Koci		
26	Lasgush Poradeci	56	Elina	87	Bali Pelari Orikum	117	Servet Agolli		
27	Misto Mame	57	Benxull	88	Internacional	118	Shefki Muçllari		
28	Niket Dardani	58	Vore	89	Shefqet Sulejmani	119	Nehemia		
29	Osman Myderizi	59	Herbert Qerret	90	5 Dëshmorët Ksamil	120	Rilindja		
30	Skender Caci	60	Fiqiri Kurti	91	Uznove	121	Lidh. Prizerenit		