HEALTH PROMOTION

The methodology of the Italian Health Behaviour in School-aged Children (HBSC) 2018 study and its development for the next round

GIACOMO LAZZERI[1], ALESSIO VIENO[2], LORENA CHARRIER[3], ANGELA SPINELLI[4], SILVIA CIARDULLO[4], DANIELA PIERANNUNZIO[4], DANIELA GALEONE[5], PAOLA NARDONE[4]

[1] Dipartimento di Medicina Molecolare e dello Sviluppo, Università degli studi di Siena, Siena, Italy; [2] Dipartimento di Psicologia dello Sviluppo e della Socializzazione, Università degli Studi di Padova, Padua, Italy; [3] Dipartimento di Scienze della Sanità Pubblica e Pediatriche, Università degli Studi di Torino, Turin, Italy; [4] Centro Nazionale per la Prevenzione delle Malattie e la Promozione della Salute, Istituto Superiore di Sanità, Rome, Italy; [5] Ministero della Salute, Direzione generale della prevenzione sanitaria, Rome, Italy

Keywords

Healthy behavior • Epidemiological surveillance • Adolescents • Italy

Summary

Introduction. *The Italian "Health Behaviour in School-aged Children" (HBSC) is a national surveillance system that collects data on health and well-being among adolescents aged 11, 13 and 15 years attending school. It is part of the HBSC Research Network, an international alliance of researchers from 45 European and North American countries and regions started in 1982.*

Methods. *All countries and regions participating in HBSC must adhere to a common international standard protocol developed and systematically updated by the entire HBSC Network. Data collection occurs every four years. Italy joined the international Network in 2000 and, to date, five waves (in 2002, 2006, 2010, 2014 and 2018) have been carried out. From 2010 the Italian HBSC is representative at regional level and in 2017 the base of the "Surveillance system for risk behaviours in 11-17 year-olds" became part of the Prime Ministerial Decree "Identification of surveillance systems and registries of mortality, tumours and other diseases". Cluster sampling is used, with school class as primary sampling unit, and two validated questionnaires are used to collect the information.*

Results. *In 2018, the Italian HBSC involved 3,608 classes and 58,976 students. The average response rates were 86% of sampled classes and 97% of students achieving a national and regional representative sample for youths of all age groups (19,504 eleven-year-old, 20,554 thirteen-year-old and 18,918 fifteen-year-old). The national coordination group prepared a standardized format for disseminating the results locally and indicating areas for intervention A national report and some articles have been published. The next round, which will take place in the 2021-2022 school year, will also involve a representative sample of students of grade four of secondary schools (adolescents aged 17 years) and use on line questionnaires.*

Conclusions. *Over 3 decades at international and 2 decades at national level 35 years have demonstrated that HBSC methodology and its results are useful for monitoring and deepening the knowledge on the most critical issues of adolescents' well-being.*

Introduction

All over the world there are about 1.2 billion adolescents (10-19 years), who represent the 16% of the world's population [1]. Investing in children's health and well-being is a priority public health strategy; adolescence is a formative phase of life during which models of growth, development and behavior lay the foundation for health in the adult stage and in subsequent generations [2]. Adolescents experience rapid physical, cognitive and psychosocial growth. This affects how they feel, think, make decisions, and interact with the world around them. At this age, children also gradually acquire decision-making autonomy about important behaviours and lifestyles that may affect their present and future health, such as eating habits, physical activity, alcohol and tobacco consumption, and use of drugs [3-7]. Several studies have used national health surveys and multicenter studies to estimate children's and adolescents' behaviour trends worldwide and in specific regions, or to carry out cross-country comparative analyses [8-10]. In addition, cross-country analyses enable to observe disparities between the states with the lowest and highest rates of health inequalities and to detect policy differences [11], to assess the effectiveness of interventions that have already been implemented, and to plan priorities for health care resource allocation. In order to investigate and monitor the behaviour and health choices of teenagers aged 11, 13 and 15 years and to provide information to support education and health promotion policies, researchers from England, Finland and Norway launched the Health Behaviour in School-aged Children (HBSC) study in 1982 [12, 13]. The HBSC was among the first international surveys on adolescent health.

Since then, the study participation has grown and in 2018, 50 countries and regions took part. At first, producing valid and reliable data was challenging, due to the range of structural and practical factors such as different school systems in which fieldwork was conducted, the compliance with a common research protocol, the

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issues around language and translation, and the different research capabilities of the participating countries. In the last 35 years, these challenges have been faced and overcome.

The increased focus on the HBSC study has resulted in greater methodological scrutiny and the need for a sharper focus on continuous improvement.

Italy joined the HBSC international network in 2000 and five data collections have been carried out since then (2002, 2006, 2010, 2014, 2018). The first two surveys were coordinated by the Universities of Turin, Padua and Siena, with the support of the Ministry of Education, and carried out on a sample of about 5000 children, with a national representativeness [14, 15].

From 2010, the HBSC survey was promoted and funded by the Ministry of Health and the Istituto Superiore di Sanità (ISS) (Italian National Institute of Health) which joined the three Universities (Padua, Siena and Turin) in its coordination in the 2010 and 2018 waves. HBSC became the first Italian population-based, national and regional representative surveillance system with the aim to acquire knowledge of well-being, health behaviours and social environments in early adolescence through the involvement of more than 65,000 students aged 11, 13 and 15 years [16-18].

The Prime Ministerial Decree (DPCM) of 3 March 2017, "Identification of surveillance systems and registries of mortality, tumours and other diseases, implementing Decree-Law n. 179 of 2012", included the "Surveillance system for risk behaviours in 11-17 year-olds" among those of national and regional significance, and identified the Italian National Institute of Health as its national reference body. This paper provides an overview of the methods employed in 2018 and the developments for the next data collection which will be carried out in 2022.

Materials and methods

The Italian 2018 HBSC survey mostly followed the international HBSC protocol 2017-2018 [19-21]. The main differences lay in the representativeness and the sample size involved in the Italian surveillance. In fact, as all the 20 Italian Regions demanded a representativeness for their territory, the sample size was much larger than the one requested by HBSC protocol. The target population consisted of boys and girls aged 11, 13 and 15 years enrolled in the first and third grades of lower secondary school and the second grade of upper secondary school.

The Italian HBSC 2018 survey represents a success of the collaboration between school and health systems. Many professionals were involved in the HBSC national network and contributed to its activities. School head teachers, class teachers and other school staff together with health workers were involved. Regional and Local Health Unit (LHU) coordinators were nominated for each Region in order to carry out and support activities at regional level. The national coordination HBSC 2018 Group, consisting of the National Institute of Health and the Universities of Turin, Siena and Padua, coordinated the activities and performed training sessions on 2018 survey methods for the health workers. In addition, the school's personnel involved in HBSC 2018 survey was informed on data collection procedures by the Provincial School Offices.

Sampling

The sampling procedures adopted in 2018 in Italy followed the rules agreed internationally. Cluster sampling was used, with school class as primary sampling unit [21]. More details about this type of sampling method and the main disadvantages are described elsewhere [22]. From the complete list of public and private schools and classes of each Region, provided by the Ministry of Education, the team of the Italian National Institute of Health extracted a representative sample of classes at national and regional level for each age group (11, 13 and 15 years-old). As in the last 2 surveys, the sample size for each Region was about 1,200 children for each age group. This sample size was corrected for the general population of students, in order to achieve a precision of ± 3.5% (95% confidence interval, 7% between the minimum and maximum limits for a binomial proportion 50%). Over-sampling of 5% for third grade of lower secondary school and of 15% for the second grade of upper secondary school was applied in order to compensate for students that repeated the class; additional over-sampling of 10% was considered for those expected to refuse to participate. From the Italian national sample, a sub-sample of 1,500 students of each age group (proportional to the Italian regional populations) was randomly extracted to be the Italian contribution to the international HBSC study [19].

The Ethics Committee of the Italian National Institute of Health approved the 2018 protocol, including the use of an opt-out consent form, in which parents deny the consent for the participation of their son and the lack of a returned form was considered to imply consent to adolescents' participation. For the protection of privacy, as indicated by the international protocol, procedures have been adopted to avoid the possible identification of single individuals according to the European laws [23].

Instruments used for data collection, procedures and analysis

Data were collected using two questionnaires prepared by the international and national HBSC networks: one aimed at adolescents aged 11, 13 and 15 years and the other at school head teachers (which was optional but was adopted by all Italian Regions). Both questionnaires contained a "core" section of common questions (mandatory); "optional" packages concerning questions on specific topic areas which countries could choose either to include or not in their questionnaires; "country-specific" questions related to issues of national importance.

Survey questions covered a range of health indicators and health-related behaviours as well as the life circumstances of adolescents. Questions are subjected to validation studies and piloting at national and

international levels and the outcomes of these studies are often published [17, 19, 20]. Questions about the use of drugs (cannabis), gambling and sexual behaviour were addressed only to 15 year olds.

In the 2018 round, the Italian national coordination group decided to add some questions about sexual behaviour, social media and nutrients intake, and to modify some questions on smoking and alcohol in the adolescent questionnaire. For dietary habits, the weekly consumption of cereals (e.g. cornflakes, muesli, bread, pasta and rice), legumes (e.g. peas, beans and chickpeas) and savoury snacks was added to mandatory information on fruit, vegetables, sweets and soft drinks containing sugar; furthermore, a question on the frequency of family meals was included in the questionnaire. Additionally, given the growing importance of the phenomenon, students were asked if they had participated in or suffered cyberbullying actions in the last 2 months. A focus on social media regarding contacts and online communications with friends, parents, brothers/sisters, classmates and teachers was introduced. Through a set of 9 questions on the use of social networks (for example Facebook, Twitter, Instagram, Ask and You-tube) and instant messages (for example, WhatsApp, Facebook Messenger), an internationally validated scale with a synthetic indicator that identifies the "problematic" use of these social tools was also created.

The topics of mandatory and optional sections, and the packages included in the questionnaire specifically addressed to Italian adolescents are reported in Table I. The questionnaires were self-completed, anonymous and administered in the classroom during school hours. As per protocol, questionnaires, once completed, were collected and immediately placed in an envelope sealed by health workers. Demographic information collected (gender, year and month of birth, class frequency,

Tab. I. List of sections in the 2017-2018 international HBSC protocol, for the adolescents' questionnaire; main section (mandatory) and "optional" section.

Sections	Mandatory Packages [a]
Social context	School, peers, family, social inequality, migration, electronic media communication (special topic)
Health outcomes,	Body image, body mass index, injuries, positive health
Health behaviours	Eating habits (breakfast consumption, food frequency consumption, family meals), toothbrushing, MVPA/VPA
Risk behaviours	Alcohol use, tobacco use, cannabis use, sexual health, bullying, fighting
Sections	**Optional Packages** [b]
Chronic conditions	Disability and chronic conditions
Eating and dieting	**Food frequency questionnaire** [b], **weight reduction behaviour** [b], food related lifestyle aspects, body image
Electronic media mommunication	Fear of missing out, **Internet gaming disorder** [b]
Family culture	Current family situation, quality of family communication, school related parental support, young carers, parental monitoring, family activities
Gender	Gender norms
Health literacy	Health literacy for school aged children
Leisure	Leisure activities (organised and unstructured)
Migration	Attitudes to migrants, feelings toward immigrants, perception of unequal treatment
Neighbourhood	Neighbourhood social features, neighbourhood structural features
Peer culture	Generalized trust and empathy
Physical activity	**Screen time related sitting** [b], active travel to school, environmental factors, motivations
Positive health	Short depression scale (Center for Epidemiologic Studies Short Depression Scale (CES-D-R 10)), sleep and chronotype, sleep quality, medicine use, Strengths and Difficulties Questionnaire (SDQ), Cohen Perceived Stress Scale, WHO (Five) Well-Being Index, positive youth development, positive mental health through active engagement, Positive mental health through sense of unity, positive mental health through social self-efficacy
Puberty	**Pubertal status and timing** [b]
Risk behaviour	Smoking at present, number of cigarettes smoked in last 30 days, **beverage-specific frequency of alcohol use,** drinking motives, use of electronic cigarettes, use of waterpipe, frequency of substance use in last 12 months, **illicit drug use in lifetime, peer substance use, adolescent gambling** [b]
School	School related competence/autonomy, school related reward, **participation/theory of organised participation** [b]
Sexual health	Romantic experiences, **first sexual intercourse** [b]
Social inequalities	**Parental education** [b], perceived family wealth
Spiritual health	Spiritual health measure
Violence & injuries	**Serious injuries (past 12 months)** [b], **specific forms of bullying perpetration and victimisation** [b], suicidal ideation and behaviour, violence (physical fighting and weapon carrying), child abuse and maltreatment

[a] The sections dealing with cannabis use and sexual habits are present only in the questionnaires addressed to 15-year-olds; [b] In bold the optional topics included in the 2017-2018 questionnaire administered in Italy.

nationality, nationality of parents) can never be traced back to the individual student.
The main aspects investigated by the questionnaire were detailed in a previous publication [22].
A single alpha-numeric code was adopted to link the students' questionnaires of a specific class with that compiled by the head teacher so as to obtain detailed analyses of young people habits possibly depending on school environment and policies.
A "class form" to be filled during the day of the survey was also prepared. It provided more detailed information on present or absent students on the day in which the survey was performed.
In total, 70,000 copies of the questionnaires for the adolescents were printed on special paper suitable for optical data reading. Similarly to the last two Italian HBSC surveys, in 2018 the lists of selected classes and schools, together with the questionnaires, were sent to the regional coordinators. They shared all the materials with the health workers involved in the data collection in each LHU.
The LHU informed teachers of the objectives and the methods of the survey and described the teachers' responsibilities.
The teachers were provided with:

- a descriptive presentation of the project;
- a letter/guide including all procedures;
- a letter from the head teacher to the parents containing a form to be returned in case the parents refused the consent for their child's participation.

The questionnaire for head teachers was transmitted to the LHU personnel on the day the questionnaire was administered to adolescents. On the day of data collection, teachers gave the health workers information on adolescents not participating in the survey and the questionnaire which had been completed by the head teachers. After the teachers and the health workers had distributed the questionnaires to the students and given them all the instructions, they filled out the class form.
The regional coordinators were responsible for gathering all questionnaires in their Regions and delivering them to the company which had been contracted to create a data-file by optical data reading. The data-file of each Region was sent to the Italian National Institute of Health which was responsible for checking the data, creating a national database and analyzing the data. According to the international protocol, data on young people outside the target age groups were removed. Stata software version 16.1 was used for all statistical analyses.

Results

Data collection began in late March 2018 and lasted until the end of June 2018. Overall, the Italian HBSC 2018 survey consisted in 65,358 questionnaires addressed to adolescents. The records were cleaned and compiled following the study protocol. The final sample included 3,608 classes and 58,976 students: 19,504 11 year-olds, 20,554 13 year-olds and 18,918 15 year-olds. All Italian Regions (N = 21) were involved. In 2018, the response rate was 86.3% among the sampled classes (in comparison to 90% in 2014, 96% in 2010, 66% in 2006 and 77% in 2002). Table II shows the percentages of classes' participation in the Italian Regions: in 14 (66.7%) the participation was above 94%, in 3 (14.3%) between 81 and 83%, in 2 (9.5%) between 50 and 60% and in 2 (9.5%) below 50%.
The national coordination group prepared a standardized format for reporting the obtained results, and regional coordinators were able to download it from a reserved area of the website of the national survey. The format of the regional report complied with the technical report prepared by the international coordination group. The regional reports enabled health workers to locally disseminate the results and indicate areas for intervention [24].
In October 2018, a national congress was organized to disseminate the 2018 Italian HBSC results. Representatives from all Italian Regions took part in this event. The main results were relaunched by the national and local press. In October 2020, the national report was published, focusing on regional and gender differences in adolescents' health behaviours [18]. In addition, the results of the Italian HBSC 2018 survey on adolescents' eating habits [25], sexual behaviours [26], alcohol use [27] and problematic social media use (PSMU) [28] were published in a monographic section of the "Annali dell'Istituto Superiore di Sanità". A comparison between Italian and international HBSC results was also reported in the same issue [29].

Discussion and conclusions

Adolescence is a window of opportunity, given its critical developmental timing in terms of identity, age, and vulnerability. During adolescence, an individual acquires the physical, cognitive, emotional, social, and economic resources that are the foundation for health and wellbeing in later life [2]. Adolescence is an ideal time for health promotion on nutrition, exercise, mental health, relationships, drug use – such as smoking, vaping, and alcohol consumption – domestic and gang violence, positive sexuality, and active political citizenship [30 32].
For all these reasons, there is a need for public health surveillance systems to monitor countries and regional variations and temporal trends of health behaviours and health outcomes among adolescents. The HBSC study is an efficient way to collect data on adolescents' health and health-related behaviours. In the last 3 decades, the use of a common protocol has enabled the collection of comparative cross-national data in the HBSC participating countries, providing a platform for systematic data collection at the country level.
Since 2010, the methodology of both national and international HBSC study protocols was adopted by all the Italian Regions making it possible to collect information on well-being and health-related behaviours

Tab. II. Classes' participation in the 20 Italian regions in the 2017-2018 HBSC.

	First grade of middle school		Third grade of middle school		Second grade of secondary school		Total N. sampled classes	Total N. enrolled classes	% of classes' participation
	N. sampled classes	N. enrolled classes	N. sampled classes	N. enrolled classes	N. sampled classes	N. enrolled classes			
Piemonte	58	58	62	62	66	65	186	185	99.5
Valle d'Aosta	60	34	60	34	61	23	181	91	50.3
Lombardia	60	58	65	63	68	67	193	188	97.4
Provincia autonoma Bolzano	61	51	64	56	76	56	201	163	81.1
Provincia autonoma Trento	55	53	60	55	71	67	186	175	94.1
Veneto	134	111	132	110	133	110	399	331	83.0
Friuli V.G.	58	58	63	62	73	72	194	192	99.0
Liguria	58	56	60	57	65	59	183	172	94.0
Emilia Romagna	54	53	56	55	64	62	174	170	97.7
Toscana	58	58	60	60	68	67	186	185	99.5
Umbria	58	22	65	27	65	35	188	84	44.7
Marche	54	54	58	58	64	63	176	175	99.4
Lazio	58	57	62	62	68	68	188	187	99.5
Abruzzo	59	58	60	57	67	67	186	182	97.8
Molise	62	49	69	56	68	57	199	162	81.4
Campania	60	60	61	61	67	64	188	185	98.4
Puglia	55	55	58	56	64	61	177	172	97.2
Basilicata	64	34	65	35	71	28	200	97	48.5
Calabria	65	65	69	69	69	69	203	203	100.0
Sicilia	58	58	61	59	71	71	190	188	98.9
Sardegna	64	39	69	40	72	42	205	121	59.0
Tot	1313	1141	1379	1194	1491	1273	4183	3608	86.3

on representative samples of 11, 13 and 15 year-olds in each Region. This allowed researchers to monitor trends in the following 8 years, to compare regional data and provide a guidance to policy-makers to define strategies and interventions aimed at improving adolescent's health and decreasing inequalities. The results of the 2018 survey show a high level of participation of schools and students, proving the feasibility of the survey and its methodology. The success of the survey has been achieved thanks to the contribution, participation and professionalism of the network of health workers and teachers.

One limitation of the HBSC study is that the information collected is self-reported rather than measured or observed. For example, it is well-known that Body Mass Index calculations based on self-reported height and weight are underestimates, but they are widely used in cross-sectional studies [33-35]. However, in order to improve the quality of collected data, the international Research Protocol was updated based on the scientific evidence at each survey [19, 20, 30].

The cross-sectional design of the surveillance has another limitation: if it is well suited for estimating prevalence and studying trends, it doesn't allow researchers to infer causalities. Nevertheless, cross-sectional studies enable the investigation of several age groups and are less time-consuming and costly than longitudinal studies [36]. In these studies, analyses of variables in participant groups are performed for the same moment in time and causal associations among variables cannot be assessed [37]. The limitation of cross-sectional studies is called a 'cohort issue' [36]. The absence of a time dimension (as opposed to longitudinal studies) hinders the interpretation of the findings [38]. Moreover, the results obtained by cross-sectional studies are prone to selection bias [36] and might erroneously report on changes in a given variable depending on the respondents' age, while it might be caused by differences between cohorts. Longitudinal studies, on the other hand, might incorrectly observe changes in a given variable as depending on the respondents' age, while actually the changes are rather attributable to the specific or historical period in which the repeated measurements were conducted [39]. Moreover, studies observing trends are essential for monitoring the variables investigated, checking the efficiency of interventions, both during an intervention itself and in the follow-up after its end, and providing data for future studies or interventions.

As such, these trend studies have an essential role in research and in putting research findings into practice.

Moreover, the strength of the HBSC study lies in its long history (over 30 years for the international study and about 20 in Italy), continual development, and ability to compare data at international and national level, as well as analyzing the changes in various areas of adolescents' lives in relation to their health and well-being. This enables the monitoring of trends in, for instance, physical activity, sedentary behaviour, and overweight/obesity [40-42], but also in other health indicators in school-aged children [36-39].
The next round of HBSC will take place in the 2021-2022 school year. The Italian national coordinating group, in agreement with the Ministry of Health, the Ministry of Education and the Regions, decided to include also a representative sample of students of grade four of the upper secondary school (adolescents aged 17 years). The adolescents and head teachers will fill in the questionnaires on line and, only in case of particular need (e.g. unavailability of digital devices, lack of Internet access), a paper version will be used. An optional package of questions about COVID-19 will be introduced in Italy, as well as in the majority of the participating countries.
In conclusion, the results over 35 years have demonstrated that the HBSC methodology and its findings are useful for both monitoring and for research on the most critical issues currently characterizing adolescents' lives, their health and health behaviours.

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Members of the 2018 HBSC-Italia Group

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Conflicts of interest

None declared.

Ethics approval

The Italian HBSC study protocol and questionnaire were formally approved by the Ethics Committee of the Italian National Institute of Health (PROT-PRE876/17, 20 November 2017).

Authors' Contributions

GL, PN: conceptualized and drafted the manuscript, contributed to interpretation of data and wrote the paper.
AS, PD, SC: contributed to the analysis and interpretation of data for the manuscript execution; wrote the paper.
LC, AV, DG: critically reviewed the manuscript
All Authors revised the manuscript and gave their contributions to improve the paper. All authors read and approved the final manuscript.

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Correspondence: Giacomo Lazzeri, Dipartimento di Medicina Molecolare e dello Sviluppo, Università degli Studi di Siena, Siena, Italy

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