

School survey with adolescents: design, operationalization, and participant profile

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Graphical Abstract

Highlights

- Representative school-based survey with adolescents aged 10 to 15 years.
- Broad collection of biopsychosocial health indicators in the school setting.
- Detailed design and operationalization of the study's data collection.
- Innovative strategies ensured an adherence rate of 43.32%, above the area average.

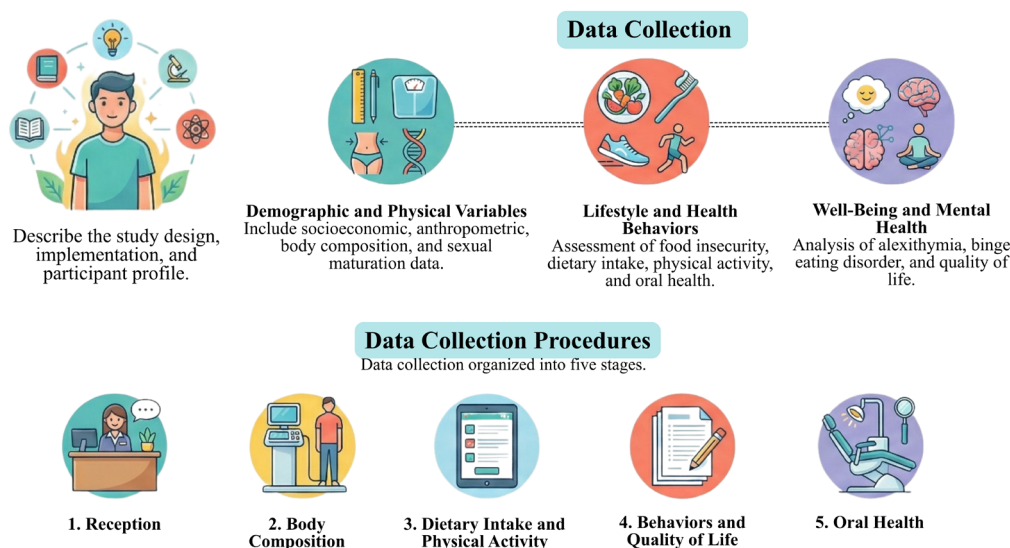


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Abstract

This study aimed to describe the design, operationalization, and general characteristics of participants of a school-based survey entitled the 'Adolescent Health' study, conducted in 2023 with a representative sample of adolescents aged 10 to 15 years enrolled in public schools of a municipality with high human development in southern Brazil. The sample was randomly selected by double cluster (schools and classes). All students from the selected classes were invited to participate. Demographic data were extracted from school records; socioeconomic and food insecurity data were answered by parents or guardians. Anthropometric and body composition measurements, sexual maturation, dietary intake, physical activity, sedentary behavior, oral health indicators, and scales for alexithymia, binge eating disorder, and quality of life perception were collected from the adolescents. A total of 675 students participated in the study. The adherence rate was 43.32%, ranging from 37.13% to 47.27% depending on the school. There was a predominance of female sex, age group of 10 to 12 years, self-reported White race/ethnicity, fifth-grade students, and morning shift. Most families had up to five residents per household and a *per capita* income between half and one minimum wage. This is the first school-based survey to assess multiple indicators in a representative sample of adolescents from the municipal education system of a city in the interior of southern Brazil, providing subsidies for conducting future school-based surveys on adolescent health.

Keywords: Health Surveys. Health Indicators. Methods. Adolescent Health. Students.

Associate Editor: Edison Barbieri

Reviewer: João Mário Cubas 

Mundo Saúde. 2026;50:e19462025

O Mundo da Saúde, São Paulo, SP, Brasil.

<https://revistamundodasaude.emnuvens.com.br>

Received: 21 december 2025.

Accepted: 06 july 2026.

Published: 23 july 2026.

INTRODUCTION

Adolescence encompasses the period between childhood and adulthood, spanning the age range from 10 to 19 years¹. This period is characterized by changes in the social, biological, cognitive, and emotional spheres, as well as by greater autonomy in decision-making, which may lead to risk behaviors or health-protective behaviors². Habits established during this period – such as physical activity practice, dietary habits, alcohol consumption, and smoking – influence adolescents' current and future health, making adolescence a window of opportunity for health promotion interventions³.

Surveillance actions are fundamental for monitoring, as well as for early identification of risk factors related to health problems, with the purpose of planning health promotion and disease prevention actions⁴. In Brazil, the School Health Program (PSE) is a policy integrating health and education that aims to monitor and assess the health of public education students in order to propose measures to address vulnerabilities that compromise the growth and development of children and adolescents.

Through the PSE, it is possible to formulate pub-

lic health policies aimed at comprehensive health care for children and adolescents, as well as to qualify them⁵. Therefore, the school environment is an important data source for research related to monitoring adolescent health and behavior – data that aid in the creation of protective measures.

Population- and school-based studies may be useful for identifying health-related risks, behaviors, and outcomes. Such studies require structured protocols, infrastructure, trained teams, time, intersectoral coordination, and financial resources⁶. Therefore, technical and methodological details of these studies, as well as adversities encountered, deserve to be documented in the scientific literature to contribute to the construction of other school-based surveys on adolescent health.

Given this, this article aims to describe the design, operationalization, and general characteristics of participants of the 'Adolescent Health' study, which proposes to analyze the health conditions of students aged 10 to 15 years in the municipal public school system of Blumenau, Santa Catarina, Brazil.

METHODOLOGY

The 'Adolescent Health' study is a school-based survey conducted with adolescents aged 10 to 15 years enrolled in elementary school in municipal public schools of Blumenau in 2023. Blumenau is a municipality located in the Médio Vale do Itajaí region, Santa Catarina, with an estimated population of 361,261 thousand inhabitants in 2022 and a municipal human development index of 0.806⁷. In 2023, 46 elementary schools and 21,915 enrolled students were registered with the Municipal Education Department (SEMED).

Participants

The 'Adolescent Health' study assessed a representative sample of students aged 10 to 15 years enrolled from the 5th to the 9th grade. A population of 11,865 students was considered for sample size calculation. A prevalence of overweight and obesity of 32.3% – based on data investigated in

the Brazilian adolescent population by the National Brazilian Survey⁸ – a type I error margin of 5%, a 95% confidence level, and a design effect of 1.5 for the chosen sampling unit were considered in the sample calculation. The final sample was 590 students, considering the addition of 20% to compensate for possible losses. The statistical tool OpenEpi[®] was used in the sample size calculation process, and the prevalence of overweight and obesity was adopted as it represents one of the main health risks during adolescence³.

Blumenau is subdivided into six regions: Central, Velha/Vila Nova, Garcia, Fortaleza, Itoupavas/Badenfurt, and Vila Itoupava. For the study, five regions were considered following the unification of the Itoupavas/Badenfurt and Vila Itoupava regions. The number of students to be assessed per region was determined in accordance with the representativeness percentage (Table 1).

Table 1 - Representative number of adolescent students aged 10 to 15 years in municipal education by region. Adolescent Health Study, 2023. Blumenau, Santa Catarina, Brazil.

Municipality Region	No. of adolescent students*	% of total	Sample size
Itoupavas/Badenfurt e Vila Itoupava	6,407	54.0	319
Velha/Vila Nova	2,778	23.4	138
Fortaleza	911	7.7	45
Garcia	918	7.7	45
Central	851	7.2	43
Total	11,865	100	590

Legend: No. = number; % = percentage; (*) Source: Municipal Education Department of Blumenau, 2023.

Schools were stratified by size (large: ≥ 500 students; medium: 200 to 499 students; and small: < 200 students)⁹. Thirty-four medium- or large-sized schools with at least one class per grade, a minimum of 15 students per class¹⁰, and availability of two rooms for data collection – a computer lab with internet access and a minimum capacity of 30 computers, and a classroom or auditorium – participated in the selection. Passthrough schools, which serve students residing in other neighborhoods, were excluded from the selection because they do not represent the local population of the regions.

In the first stage, primary sampling units (schools in each region) were selected by cluster sampling. If a school declined to participate, a new selection was conducted. In the second stage, secondary sampling units (classes) were randomly selected by cluster. All students in the selected classes were invited to participate in the study; only those who returned the Informed Consent Form (ICF) signed by their parents or guardians and who signed the Informed Assent Form (IAF) before data collection were included. Students with physical or mental disabilities identified by parents/guardians or school professionals participated in the study; their identities were recorded in the field diary.

To maximize participant adherence and ensure the study's capillarity, a multichannel communication and community mobilization strategy was implemented. Structured interviews were conducted on local conventional media (radio and television), in which the researchers detailed the study's objectives, inclusion criteria, collection procedures, and assessment locations, conferring credibility and institutional visibility to the research. Simultaneously, an official study profile was created on the Instagram social network. This platform served as an information repository, using language accessible to education partners and the target audience, reinforcing the importance of adolescent participation for the advancement of science.

Study variables

Demographic and socioeconomic, anthropometric, food and nutritional insecurity, body composition, sexual maturation, dietary intake, physical activity practice, sedentary behavior, oral health, alexithymia, binge eating disorder, and quality of life variables were collected. Figure 1 presents the instruments and variables collected.

Demographic and socioeconomic and food insecurity variables

Demographic and socioeconomic variables were collected through the class report generated by the SEMED system and a questionnaire developed by the researchers. Income was categorized in multiples of the official Brazilian minimum wage in force in January 2023 (R\$ 1,320.00): ≤ 0.5 minimum wages *per capita*; > 0.5 to ≤ 1.0 minimum wages *per capita*; > 1.0 to ≤ 2.0 minimum wages *per capita*; and > 2.0 minimum wages *per capita*. Parental education was categorized as: no schooling, elementary education, secondary education, and higher education. The household food insecurity situation was assessed using the short version of the Brazilian Food Insecurity Scale (EBIA)¹¹. This is a five-question instrument that screens for the presence of food insecurity from at least one positive response. The instruments were answered by the adolescent's parents/guardians at home in a physical document sent by the student.

Anthropometric and body composition variables

Methodological procedures for weight and height measurement followed SISVAN recommendations¹²; for neck and abdominal circumference measurement, the Brazilian Society of Pediatrics¹³ and the National Health and Nutrition Examination Survey¹⁴, respectively.

Bioelectrical impedance was performed with the student in an orthostatic position, barefoot, without accessories, with lower limbs extended and

apart and upper limbs stretched, holding the metal bar of the equipment without contact with the trunk. The InBody120 software (Ottonoboni®) of the equipment is fed with date of birth, sex, and height for the calculation and adjustment of body composition variables. The procedure takes approximately 17 seconds.

Sexual maturation

Sexual maturation assessment followed Tanner's criteria¹⁵. Adolescents performed a self-assessment of pubertal stage based on a printed document containing figures of Tanner stages for male and female sexes. In a reserved physical space, adolescents were individually instructed about the assessment, with the right to refusal and confidentiality guaranteed. The age of menarche was asked of female students.

Dietary intake

Adolescent dietary intake was assessed through the previous day recall. Data collection was conducted using a validated self-reported web-based questionnaire (Web-CAAFE, Consumo Alimentar e Atividade Física de Escolares – Dietary Intake and Physical Activity of Schoolchildren)¹⁶, an instrument that has been validated and undergone reproducibility testing^{16,17}. This questionnaire collects information on consumption at six daily eating occasions (breakfast, morning snack, lunch, afternoon snack, dinner, and evening snack). For each occasion, there is a closed list of 32 images of foods, beverages, or food groups (healthy and unhealthy)¹⁸. The student accesses the questionnaire through a school-specific login and password, using headphones, and has an animated avatar to guide questionnaire completion. School meal acceptance is also assessed by the instrument¹⁷.

Physical activity and sedentary behavior

Physical activity practice and sedentary behavior were assessed using the Web-CAAFE^{16,17}, collecting information from three periods of the previous day based on a list of 32 images of leisure activities, sports, and household chores. Activities performed during physical education classes and the mode of transportation used to travel to school were also assessed¹⁶.

Oral health

Oral health conditions were assessed through the oral clinical examination. Procedures followed the guidelines of the 4th edition of the Oral Health Surveys – Basic Methods of the World Health Organization (WHO)¹⁹. The prevalence of dental caries was assessed through calculation of the permanent teeth decayed, missing, and filled index (DMFT)²⁰ and the primary teeth decayed, extracted or indicated for extraction, and filled index (dft)²¹, using the diagnostic criteria proposed by the WHO for epidemiological surveys in oral health¹⁹. Variables related to dental care were collected using a questionnaire adapted from the National School Health Survey (PeNSE)¹⁰.

Alexithymia, binge eating disorder, and quality of life

Alexithymia was assessed using the Toronto Alexithymia Scale (TAS-20)²², comprising 20 statements that describe feelings, emotions, and/or mood states. The degree of agreement with each statement is assessed using a five-point Likert scale. The total score is the sum of the points assigned to each statement, with a total score ≥ 61 indicating alexithymia, between 52 and 60, possible alexithymia, and ≤ 51 , absence of alexithymia.

Binge eating disorder was assessed using the Binge Eating Scale (BES)²³, comprising 16 groups of statements. Each statement generates a score that is summed at the end. A final score ≤ 17 indicates absence of binge eating, between 18 and 26, presence of moderate binge eating, and ≥ 27 , presence of severe binge eating.

Quality of life was assessed using the Pediatric Quality of Life Inventory (PedsQL) 4.0²⁴, a validated instrument for this age group that contains 23 items distributed across four domains: physical, emotional, social, and school. Each item uses a five-level response scale: 0 = never a problem; 1 = almost never a problem; 2 = sometimes a problem; 3 = often a problem; 4 = almost always a problem. Items are inversely scored and transposed to a scale from 0 to 100. The higher the score, the better the quality of life.

The three questionnaires were completed by the students under the supervision of the assessors.

Indicator	Instrument	Variables
Demographic and socioeconomic	Class report	Student's name, mother's name, sex, age, date of birth, school, grade, school shift
	Parents/guardians questionnaire	Race/ethnicity* of the adolescent, relationship of the guardian, home address, number of residents in the household, monthly family income, date of birth of parents, weight and height of parents, parental education, parents' alcohol consumption and smoking habits
Food and nutritional insecurity	Brazilian Food Insecurity Scale (EBIA) ¹¹	Level of food and nutritional insecurity
Anthropometry	Scale attached to the InBody120 device (Otto-boni®)	Weight
	Digital stadiometer InLab S50 (Otto-boni®)	Height
	Non-elastic measuring tape	Neck circumference, abdominal circumference
Body composition	Bioelectrical impedance InBody120 (Otto-boni®)	Total body water, protein, minerals, fat mass, skeletal muscle mass, BMI, body fat percentage, lean mass and segmental fat, waist-to-hip ratio, and visceral fat
Sexual maturation	Tanner Scale ¹⁵	Tanner stages
	Interview	Age of menarche
Dietary intake	Web-CAAFE ¹⁷	Six meals: breakfast; morning snack; lunch; afternoon snack; dinner; evening snack.
		32 food items: Rice; vegetables (e.g., carrots, squash, eggplant, tomato, string beans...); leafy greens (all greens and leaves); soup (vegetable soup) – vegetable only; beans; farofa (toasted cassava flour mixture); pasta and lasagna; instant noodles; French fries; chicken and meat (any type and form, minced meat, chicken, giblets...); egg (boiled, fried, omelet); seafood (fish, mussels, oysters, shrimp...); corn, potato, and mashed potato; sausage/hot dog (processed meats in general: salami, ham, turkey breast...); fruits (banana, apple, orange, grape, pear, all types of fruit; fruit salad); bread and crackers without filling; cheese bread; cake (simple cake without topping or filling, e.g., orange, chocolate, carrot, egg); cheese; coffee with milk – not black coffee; milk; yogurt; chocolate milk (homemade or boxed, Nescau); breakfast cereal; natural fruit juice; artificial juice (boxed, powdered); filled cookies – only filled; soft drinks; sweets (candy, chocolate, lollipop, gelatin, pudding, ice cream, sweets in general); snacks (e.g., chips, packaged snacks); water (tap, fountain, bottled); snacks (pizza, coxinha, hamburger, hot dog, calzone...).
		School meal consumption: previous day; school meal adherence; school meal acceptance.
Physical activity and sedentary behavior	Web-CAAFE ¹⁷	Three periods of the day: morning; afternoon; evening.
		32 physical activities and sedentary behaviors: Balls (all ball-related activities except soccer: volleyball, basketball, handball); tag games; soccer; running; martial arts (judo, jiu-jitsu, capoeira); tennis; dancing (ballet, jazz, hip-hop, all types of dance); ping-pong; marbles; hopscotch; jump rope (or elastic); gymnastics (stretching); playground (playing in the playground); aquatic activities (swimming, playing in the water and at the beach); bicycle; scooter, skateboard, roller skates; surfing; flying kites; dodgeball; hide-and-seek; playing with the dog (dogs only); studying (homework, writing, drawing, painting, reading); board games (checkers, chess, ludo, cards, dominoes); dolls/action figures; playing with toy cars; watching television; listening to music; playing or gaming on a cell phone (or tablet/iPad); computer; video games (any video game); washing dishes (drying dishes); sweeping the house or other household chores.
		School physical education: activities organized by the teacher; frequency of physical education classes; acceptance of physical education classes.
Oral health	Oral cavity clinical examination ^{20,21}	Shape of upper and lower dental arch, occlusion, position of the lingual frenulum, temporomandibular joint (TMJ) alterations on the right and left sides, and dental caries indices (dft and DMFT)
	Dental care questionnaire	Frequency and timing of tooth brushing, brushing at school, use of dental floss and mouthwash, frequency and reason for dentist visits, responsible for oral hygiene instruction, and childhood habits
Alexithymia	Toronto Alexithymia Scale (TAS-20) ²²	Risk of alexithymia
Binge eating disorder	Binge Eating Scale (BES) ²³	Risk of binge eating disorder
Quality of life	Pediatric Quality of Life Inventory (PedsQL) ²⁴	Perception of quality of life in the domains: health and activities, feelings, social interaction, and school

Legend: BMI: body mass index; Web-CAAFE: dietary intake and physical activity of schoolchildren; TMJ: temporomandibular joint; dft: index of primary teeth decayed, extracted or indicated for extraction, and filled; DMFT: index of permanent teeth decayed, missing, and filled. *Race/Ethnicity: reported by parents/guardians.

Figure 1 - Description of indicators, instruments, and variables collected in the Adolescent Health Study, 2023. Blumenau, Santa Catarina, Brazil.

Data collection preparation

Four actions were carried out before data collection: 1) development of Standard Operating Procedures (SOPs); 2) theoretical training; 3) practical training: pilot project; and 4) SOP adjustments. SOPs were developed and revised by the research team. Theoretical training took place on university premises and included a lecture with explanation and sharing of the SOPs. The pilot project was conducted in February 2023 with 26 adolescents of both sexes (54% female, 46% male) from two classes (5th and 8th grade) of a school selected by SEMED. After analysis of the pilot project, the SOPs were adjusted to their final version and made available in the university library at the following link: https://bu.furb.br/docs/LD/2023/369783_1_1.pdf.

Data collection

The details of the data collection actions of the

'Adolescent Health' study are presented in Figure 2. After the selection of secondary sampling units, class reports were collected to gather students' demographic variables and to organize the envelope with the invitation, ICF, and parents/guardians questionnaire to be sent home. The envelopes were distributed to students during school hours at a time previously scheduled with the school. On that day, the study's objectives, characteristics, and logistics were presented. During a second school visit, envelopes were collected and a data collection schedule was established. Students who returned the documents (ICF and questionnaire) completed and signed by their parents/guardians were registered with an identification code. This code was used to identify all data collection instruments, including data obtained from the class report and the parents/guardians questionnaire.

	DATA COLLECTION STAGES
BEFORE	STAGE 1 – Presentation of the 'Adolescent Health' Study
	• Meeting via video call with principals and coordinators of the selected schools to present the study. • Scheduling of a reconnaissance visit to the schools.
	STAGE 2 – Reconnaissance visit and data collection planning
	• Reconnaissance of the physical space and operational dynamics of the school. • Determination of the data collection space. • Scheduling of the ICF delivery date. • Agreement on the data collection schedule. • Reservation of the computer lab. • Random selection of secondary sampling units (classes).
	STAGE 3 – Study dissemination
	• Creation of study social media profiles (Instagram®, YouTube®, email). • Radio and television interviews. • Distribution of graphic materials at schools.
	STAGE 4 – ICF delivery to students
	• Presentation of the study and video screening in the classroom. • Delivery of ICFs to students. • Scheduling of the deadline for receiving signed ICFs.
	STAGE 5 – ICF collection and collection of class reports
	• Collection of signed ICFs. • Collection of reports from selected classes. • Confirmation of space reservations for data collection. • Reinforcement of the invitation to students who had not yet returned the signed ICF.
DURING	STAGE 6 – Data collection
	• Collection of IAF signatures. • Distribution of passports. • Data collection.

to be continued...

	DATA COLLECTION STAGES
AFTER	STAGE 7 – Database construction
	• Creation of data entry forms (Epi Info version 7.2.5.0®). • Training of the data entry team. • Double data entry. • Database validation (Epi Info version 3.3.2®).
	STAGE 8 – Production of technical reports
	• Preparation and delivery of technical reports with the research results to each school and to the Municipal Education Department of Blumenau/SC.

Figure 2 - Steps performed before, during, and after data collection. ‘Adolescent Health Study, 2023’. Blumenau, Santa Catarina, Brazil.

Data collection was organized into five stations: reception, body composition, Web-CAAFE, questionnaires, and oral health. Classes with a maximum of 35 students were conducted from the classroom to the data collection location. At the ‘reception station’, the student signed the IAF and received a passport with their identification code and an explanation of the collection flow and Web-CAAFE completion process. At the ‘body composition station’, anthropometry, bioelectrical impedance, and sexual maturation self-assessment were conducted. At the ‘Web-CAAFE station’, the student completed the web-based instrument, and at the ‘questionnaires station’, the physical questionnaires. At the ‘oral health station’, the oral clinical examination was conducted and the dental care questionnaire was applied. The body composition and oral health stations were located in reserved spaces to ensure privacy.

After handing in their passports at the reception

station, students were distributed into three groups designated A, B, and C. ‘Group A’ started the collection at the body composition station, ‘Group B’ at the oral health station, and ‘Group C’ at the questionnaires station. The student’s passport was stamped after passing through each station.

Data analysis

Data were tabulated using SPSS software, version 22.0®. Descriptive analysis was performed with categorical variables presented as absolute (n) and relative (%) frequencies.

Ethical aspects

This study followed guidelines and regulatory standards for research involving human subjects (CAAE: 37003820.2.0000.5370/Opinion No. 4,574,897). Guardians and participants signed the ICF and the Informed Assent Form (IAF), respectively, before data collection.

RESULTS

In the first stage of sample selection, six schools were drawn. As two could not participate due to renovations in their physical spaces, two others were drawn to ensure representativeness by region. In the second stage, 56 classes were selected, totaling 1,558 students. All received the invitation to participate in the study. There was full collaboration from the participating schools. All contributed by providing adequate physical space, consecutive days, and full-day periods for data collection, as well as releasing students during class time regardless of the subject, which encouraged student adherence and facilitated collection logistics. During this period, multichannel communication and community mobilization strategies were simultaneously implemented.

Data collection took place over 18 school days – 16 in the morning and afternoon shifts and two in the morning shift only – totaling 170 hours of collection (approximately 5 hours per shift). The data collection

flow described in the methodology was followed at all schools, despite the need for adaptations in station layout according to the physical space dimensions of each school.

A total of 675 students participated in this study, meeting the total and regional sample sizes. The adherence rate was 43.32%, ranging from 37.13% to 47.27% depending on the school. Demographic and socioeconomic characteristics of participants are presented in Table 2. A higher representation of female sex, the 10–12 age group, self-reported White race/ethnicity by parents/guardians, and students enrolled in the morning shift and fifth grade was observed.

There was a predominance of mothers and fathers with secondary education, families with five or fewer residents per household, and *per capita* income between half and one minimum wage. Information on maternal and paternal education was obtained in 94.4% and 71.3% of cases, respectively.

Table 2 - Description of participants of the Adolescent Health Study, Blumenau, 2023. Blumenau, Santa Catarina, Brazil.

Variables	Total		Female sex		Male sex	
	n	%	n	%	n	%
Age group (years)						
10-12	390	57.8	227	59.3	163	55.8
13-15	285	42.2	156	40.7	129	44.2
Race/Ethnicity						
White	442	65.5	260	67.9	182	62.3
Other	233	34.5	123	32.1	110	37.7
School year						
5 th grade	180	26.7	96	25.1	84	28.8
6 th grade	145	21.5	87	22.7	58	19.9
7 th grade	98	14.5	57	14.9	41	14.0
8 th grade	129	19.1	69	18.0	60	20.5
9 th grade	123	18.2	74	19.3	49	16.8
School shift						
Morning	386	57.2	221	57.7	165	56.5
Afternoon	289	42.8	162	42.3	127	43.5
Maternal education						
No schooling	1	0.2	0	0	1	0.4
Elementary education*	163	25.6	96	26.5	67	24.4
Secondary education*	283	44.4	144	39.8	139	50.5
Higher education*	190	29.8	122	33.7	68	24.7
Paternal education						
No schooling	1	0.2	1	0.4	0	0
Elementary education*	141	29.3	74	26.4	67	33.3
Secondary education*	233	48.5	135	48.2	98	48.8
Higher education*	106	22.0	70	25.0	36	17.9
Per capita income (MW)						
≤ 0.5 MW	171	32.2	88	29.2	83	36.3
> 0.5 to ≤ 1.0 MW	213	40.2	123	40.9	90	39.3
> 1.0 to ≤ 2.0 MW	127	24.0	80	26.6	47	20.5
> 2.0 MW	19	3.6	10	3.3	9	3.9
Number of household residents						
≤ 5 residents	570	89.3	324	89.3	246	89.5
> 5 residents	68	10.7	39	10.7	29	10.5
School region						
Itoupavas/Badenfurt and Vila Itoupava	363	53.8	204	53.3	159	54.4
Velha/Vila Nova	143	21.2	93	24.3	50	17.1
Fortaleza	62	9.2	32	8.3	30	10.3
Garcia	56	8.3	28	7.3	28	9.6
Central	51	7.5	26	6.8	25	8.6

Legend: (*) complete and incomplete; MW = minimum wage.

DISCUSSION

This manuscript describes the design, operationalization, and general characteristics of participants of the 'Adolescent Health' study conducted in 2023. It was the first school-based survey to assess a representative sample of adolescents aged 10 to 15 years from the municipal public school

system of a city in southern Brazil classified in the high human development category⁷.

The study undertook a broad approach to adolescents' health conditions. Data collection addressed demographic and socioeconomic, anthropometric, body composition, sexual maturation, dietary intake

and eating behavior, risk of food and nutritional insecurity, physical activity practice, sedentary behavior, oral health, and quality of life aspects.

The bibliographic review identified only one survey conducted with adolescents enrolled in the municipal school system of Blumenau. That study included a representative sample of adolescents aged 12 to 16 years, was conducted in 2011, and assessed a smaller number of variables²⁵. Other methodological articles described data collection in adolescents but did not include variables described in this study – such as body composition by tetrapolar bioelectrical impedance, identification of alexithymia and binge eating disorder risk, quality of life perception, oral cavity clinical examination with assessment of lingual frenulum position and temporomandibular joint (TMJ) alterations, and dental care questionnaire^{6,26,27,28}. Additionally, a study based on PeNSE data (2015) assessed aspects of oral health in adolescents aged 13 to 15 years, converging with the present study only regarding brushing frequency and dentist visit frequency²⁹.

Our study achieved a participant adherence rate (43.32%) higher than that described in another study with a similar age group (7 to 14 years; 27.2%)⁶, which may be attributed to the consolidated partnership between the University and the Municipal Education Department and to the dissemination strategies adopted before and during data collection. Interinstitutional partnerships are fundamental for enabling school-based surveys. In this study, data collection was facilitated by the support researchers received in the schools, from the moment of study presentation to the adolescents through to the release of students during school hours for participation in data collection. Similarly, it is believed that dissemination strategies involving a variety of media platforms – such as social networks and traditional media outlets (radio and television) – enabled engagement of the target audience. The integration of social media in scientific

research reflects the need to keep pace with social and technological changes, while also enabling dialogue with study participants³⁰. Such strategies may not have been used in other studies, as they were not described by the authors^{6,26,27}.

Other highlights include the physical space available in the schools and the use of different data collection instruments during the study. The use of a validated web-based questionnaire enabled the direct entry of information into the digital database, while also being an interactive and engaging instrument for adolescents¹⁷. The use of innovative technologies for dietary intake assessment reduces costs and makes data collection more efficient, especially when the tool is validated for the target audience. This application is relevant for epidemiological studies, in which the accuracy of collected data is fundamental for precise analyses³¹. Conducting data collection in the morning and afternoon shifts and on different days of the week helped reduce interference from typical lifestyle patterns related to shift and day of the week, minimizing the possibility of selection bias. Furthermore, this data collection strategy strengthened the representativeness of the study population and the quality and reliability of the collected data.

As study limitations, the possibility of recall bias and interpretation difficulties with the questionnaires may be cited. The use of instruments validated for the age group^{22,23,24} and the reading of questionnaires by a trained assessor were strategies adopted to minimize these biases. Additionally, other limitations deserve mention, such as the adherence rate below 50% – despite the study having presented a higher adherence percentage than others conducted with the same age group. There is also the possibility of selection bias, given that two selected schools had to be replaced due to infeasibility of data collection. Finally, data collection in the school setting imposes its own challenges – such as interruptions and noise – that may have influenced responses.

CONCLUSION

The assessment of adolescents' health conditions provides information that enables the development and implementation of health care strategies that consider the specific needs of this life cycle phase. Furthermore, they serve as a basis for reviewing cur-

rent public policies.

It is hoped that the description of the design and operationalization presented in this article may contribute as a reference source and assist in the planning of other school-based surveys on adolescent health.

CRediT author statement

Methodology: Ludwig, AFK; Silva, LS; Andreghetoni, BD; Azevedo, LC. Validation: Vargas, DM; Oliveira, MF; Azevedo, LC; Statistical Analysis: Not reported. Formal Analysis: Vargas, DM; Oliveira, MF; Azevedo, LC. Investigation: Ludwig, AFK; Silva, LS; Andreghetoni, BD; Azevedo, LC. Resources: Vargas, DM; Oliveira, MF. Writing – Original Draft Preparation: Ludwig, AFK; Silva, LS; Andreghetoni, BD. Writing – Review & Editing: Ludwig, AFK; Silva, LS; Vargas, DM; Oliveira, MF; Andreghetoni, BD; Azevedo, LC.

All authors have read and agreed to the published version of the manuscript.

Funding

This study received financial support from the Higher Education Extension Program for Graduate Studies (PROEXT-PG Capes), the Coordination for the Improvement of Higher Education Personnel (CAPES), and the Secretariat of Higher Education (SESu) of the Ministry of Education (MEC), through the project “Extension Practices: Schools as Centers of Transformation”; the Fritz Müller Foundation, through Public Notice No. 1/2022 – Call for Projects Supporting Education as an Agent of Transformation; the Research and Innovation Support Foundation of the State of Santa Catarina (Process No. 48/2021); UNIEDU/Fund for the Support of Higher Education Maintenance and Development (Process No. 261/SED/2022); and CNPq, through PROPEX Public Notice No. 03/2023 – PIBIC/CNPq.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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How to cite this article: Ludwig, A.F.K., Silva, L.S., Vargas, D.M., Oliveira, M.F., Andreghe-toni, B.D., Azevedo, L.C. (2026). School survey with adolescents: design, operationalization, and participant profile. *O Mundo Da Saúde*, 50. <https://doi.org/10.15343/0104-7809.202650e19462025>. *Mundo Saúde*. 2026;50:e19462025.