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Adolescents' self-reported health status, behaviours and health issues addressed during routine school doctor consultations in Switzerland: an observational study

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Summary

BACKGROUND: We aimed to investigate the self-reported health status and behaviours of 7th-grade adolescents, associations with gender and educational track, as well as health issues addressed during routine school doctor consultations in Switzerland.

METHODS: Data on health status and behaviours, specifically general well-being, stimulant and addictive substance use, bullying/violence, exercise, nutrition and health protection, and puberty/sexuality, were drawn from routinely collected self-assessment questionnaires from 1076 (of a total of 1126) students from 14 schools in the Swiss canton of Zug in 2020. Data on health issues addressed in school doctor consultations were collected by nine school doctors (for 595 individual consultations). Multilevel logistic regression analyses were used to investigate the association of gender and educational track with unfavourable health status or behaviours.

RESULTS: Although 92% (n = 989) of the students reported being happy or satisfied overall, 21% (n = 215) often or almost always felt sad, and 5-10% had repeatedly been seriously physically hurt (n = 67), sexually harassed with words (n = 88) or experienced uncomfortable physical contact (n = 60). Female gender and a lower educational track were associated with unfavourable health status. In 90% (n = 533) of the school doctor consultations, at least one topic of disease prevention or health promotion was addressed, whereby the topics addressed depended strongly on the individual school doctors.

CONCLUSIONS: Our findings revealed that unfavourable health status and behaviours were prevalent among adolescents but the health topics addressed in school doctor consultations were not tailored to students' self-reported health issues. A school-based approach that strengthens adolescents' health literacy and provides opportunities for patient-centred counselling has the potential to improve the current and future health of adolescents and, ultimately, adults. To realise this potential, it is essential for school doctors to be sensitised and trained to address students' health concerns. Emphasis should be placed on the importance of patient-centred counselling, the high prevalence of bullying, and gender and educational differences.

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Introduction

Adolescence is an important time for the detection and prevention of health concerns [1–3]. Adolescents are faced with multiple challenges caused by physiological and social role changes [3]. Unfavourable health behaviours such as substance use and high-risk sexual behaviour are often initiated during adolescence [3], and 10–20% of adolescents are estimated to suffer from mental disorders, both globally and in Switzerland [4, 5]. Such health problems of adolescents are often not sufficiently recognised [6–8], which is particularly concerning given the high impact of health in childhood and adolescence on health in adulthood [1, 2, 9].

School health services provide an opportunity to prevent potential health issues in later life by identifying and treating young people who have health problems or are at risk of developing them [2, 9, 10]. In this regard, for example, it has been shown that students at schools offering comprehensive psychosocial assessments report lower levels of depressive symptoms [11]. Importantly, even when the beneficial effects are small, they may be meaningful at a population level [9].

In Switzerland, school health services are federally regulated and organised, that is, by each canton (region) [12]. In the case of the canton of Zug, in preparation for the mandatory routine school doctor consultation in the 7th grade, students fill out a self-assessment questionnaire to reflect on their health status and health behaviours regarding different health topics under health prevention and promotion (including well-being, addictive substance use and bullying). This information is brought along to the school doctor consultation to serve as a basis for discussion. Through this process, students are encouraged to reflect on their health status and behaviours and are reminded of health issues they want to discuss with the school

doctor. Moreover, school doctors can identify the health issues of high priority to the students.

Knowledge of adolescents' health status and behaviours as well as health issues addressed during school doctor consultations is crucial to improve school health services and other preventive and health-promoting programs. In particular, gender- and education-specific analyses could promote an understanding of the health differences between girls and boys as well as adolescents with different socioeconomic backgrounds and thus may enable the development of specific health prevention and promotion strategies that ultimately could benefit society as a whole [13].

Therefore, with this study, we aimed to investigate the self-reported health status and behaviours of 7th-grade adolescents, associations with gender and educational track, and health issues addressed during school doctor consultations in the Swiss canton of Zug.

Methods

Design and setting

This study was part of an evaluation of the school health service in the 7th grade in the Swiss canton of Zug, conducted in the school year 2020/2021 (August 2020–July 2021). The school doctor consultation in the 7th grade (International Standard Classification of Education (ISCED) 2 = lower secondary education [14]) is the last of three mandatory routine school doctor consultations in the canton of Zug, with the first taking place in kindergarten (ISCED 0 = early childhood education [14]) and the second in 5th grade (ISCED 1 = primary education [14]). The school doctor consultations are organised by the municipalities and carried out by family doctors or paediatricians.

The school health service in the 7th grade includes an in-school "preparation lesson" with cantonal prevention specialists preceding the school doctor consultation. The 45-minute preparation lesson includes a brief introduction to health prevention and promotion topics, as well as a discussion of case studies to show the students when, how and where they can get help. Furthermore, an explanation of what happens at the school doctor consultation is provided. Finally, the students are given 20 minutes to individually complete a self-assessment questionnaire on several health topics and to transfer results in terms of topic-specific "scores" onto a separate evaluation sheet (for categorisation, see below). The self-assessment questionnaire is anonymous, and students are informed about the confidentiality of both their responses and the school doctor consultation. The evaluation sheet is meant to serve as a basis for the discussion with the school doctor (see figure 1 for an illustration of the process). The school doctor consultation takes place during school hours without the presence of parents. Besides the conversation on health topics, the school doctors are advised to assess height and weight, vision, blood pressure and pulse, and posture and skeleton and check the students' vaccination status. As board-certified specialists for primary care/paediatrics, school doctors are allowed to take measures or refer students to specialists according to usual care.

The local ethics committee ("Ethikkommission Nordwest- und Zentralschweiz") waived the need for ethics approval because the study was part of a quality improvement project (reference number: Req-2020-00539). The data from students were collected anonymously by the Department of Child and Adolescent Health of the canton of Zug as part of a yearly routine assessment. Since the Federal Act on Research Involving Human Beings does not apply to anonymised health data (Human Research Act, Art. 2), it was not necessary to obtain the students' informed consent. No study protocol has been published.

Data collection

Two data sources were used:

- the *self-assessment questionnaire*, which was part of the routine preparation for the school doctor consultation;
- a *consultation report* specifically designed to evaluate the school health service.

The self-assessment questionnaire contained 39 questions about the students' health status and behaviours under five overarching health topics:

- well-being;
- stimulant and addictive substance use;
- exclusion, bullying and violence;
- exercise, nutrition and health protection;
- puberty and sexuality.

The questionnaire was anonymous (i.e., no student names) but contained information on the students' gender (female, male or diverse) and their class, including educational track and school. In the canton of Zug, lower secondary education comprises three educational tracks: level A (German: "Kantonsschule"), the highest level, preparing students for tertiary education; the intermediate level B (German: "Sekundarschule"), and the lowest level C (German: "Realschule"), which prepares students for vocational training.

The consultation report was designed specifically for evaluation purposes to assess the topics addressed in the school doctor consultation. It was a student-specific sheet where school doctors ticked off all addressed topics (regarding the overarching topics mentioned above, plus subtopics). Like the self-assessment questionnaire, it contained no identifying student information (i.e., names) but carried information on students' gender and their class (including educational track and school).

Both types of data were originally collected on paper (see supplementary files A and B available for download at https://doi.org/10.57187/smw.2023.40078) and subsequently digitalised (to Excel) by a member of the study team (SEN, consultation report) and by personnel of the Department of Child and Adolescent Health of the canton of Zug (self-assessment questionnaire).

Categorisation of health status and behaviours

Each answer to the (mostly Likert-type) questions on the self-assessment questionnaire was assigned a pre-determined score, with more unfavourable answers translating to higher scores. In the preparation lesson, students were asked to calculate the overall score of each overarching health topic by summing up the individual scores. These overall scores translated into one of three categories indi-

cating the degree to which they were unfavourable ("high", "middle"' and "low") and were transferred by the students to the evaluation sheet, which then served as the basis for discussion in the school doctor consultation (figure 1).

For this study, the students' health status and behaviours were categorised as "unfavourable" (i.e., concerning or problematic) vs. "favourable" at both the level of *the individual question* (35 of the 39 questions were analysed) and the level of *the overarching health topic* (five topics overall). For individual questions, this required dichotomizing answers that were on a 4-point Likert scale, whereas, for overarching health topics, it entailed combining the categories "middle" and "low".

Participants

All 7th grade students in the canton of Zug (n = 1126) and their school doctors (n = 13) were eligible. Of all 1126 approached students, 1085 (96.4%) filled out the self-assessment questionnaire. Nine students were excluded due to missing information on class level (n = 7) or gender (n = 2), leaving 1076 (95.8% of the total number of students) for analysis. Of the 13 approached school doctors, nine filled out the consultation reports (69.2%). Due to time constraints, one school doctor filled out the tool for a random sample of 50% of the students only. For each filled-out tool, school doctors received a reimbursement in the amount of 3 Swiss francs.

Data analysis

Data were described using counts (*n*) and proportions (%) or means and standard deviations (SDs). Missing rates were reported. For the calculation of students' (topic-specific) overall scores, missing answers to single questions were replaced with the mean value (across all students).

To investigate the association of gender and educational track with health status and behaviours, for the overarching health topics (overall scores) and all individual questions combined, multilevel logistic regression analyses were used, adjusted for the school (random intercept) and with interaction terms between the fixed effects male/female gender and educational track A/B/C. Significance was assumed for $p < 0.05$. The correlation between responses to individual questions was analysed by means of Spearman's correlation and presented graphically; significance was assessed with the Spearman rank correlation test.

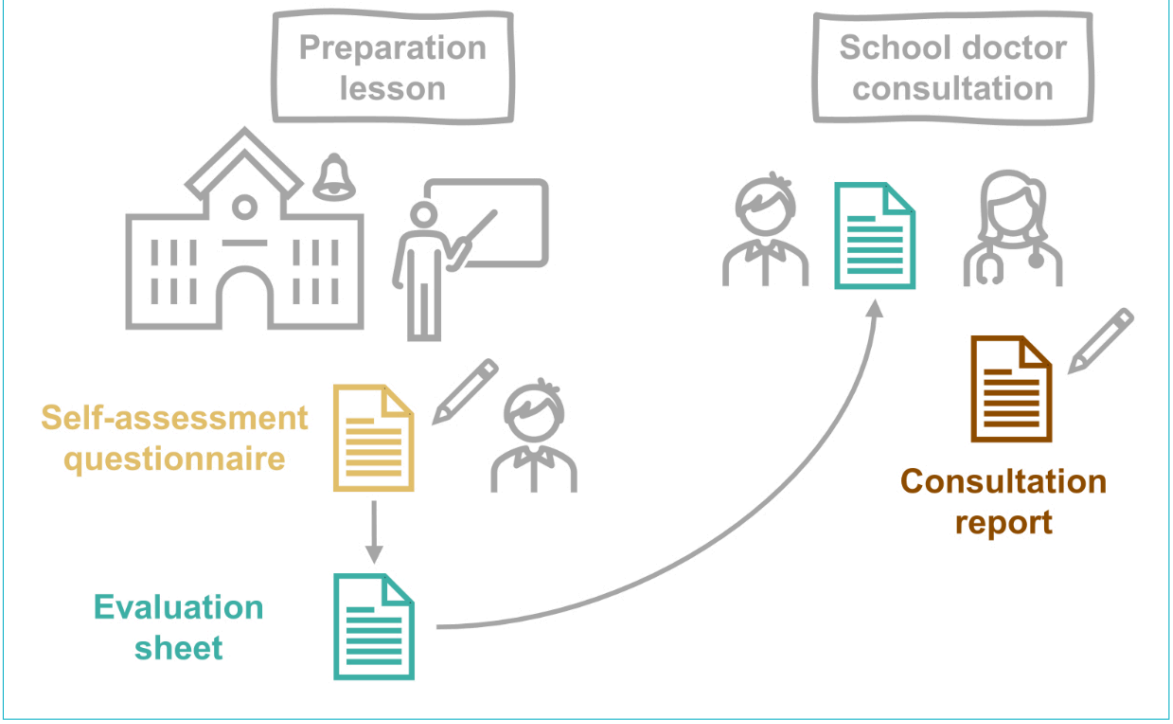
Data were analysed using R software version 4.2.0 [15]. The R package lme4 was used to fit multilevel logistic regression models [16]. To translate calculated effect sizes from regression analyses with interaction effects into odds ratios (ORs) with 95% confidence intervals (CIs) and *p* values, the glht() function from the R package multcomp was used [17].

Results

Study population

We analysed data on 1076 students from 64 classes in 14 different schools. Of all students, 52.0% identified as female, 47.3% as male and 0.7% as non-binary gender. The educational track level A contained 29.7% of the students, level B had 46.8% and level C had 23.4%. The consultation reports covered data from 595 students (49.9% female, level A: 28.1%, level B: 41.4%, level C: 22.2%, mixed/unassignable educational track: 8.4%) from 43 classes in 10 different schools. The majority of the students were 14 years old in the year 2020 (63.5%; 24.0% were 13 years old and 9.4% were 15 years old), and the mean student age was 13.8 years (SD 0.6; with a mean student age of 13.6

Figure 1: Overview of the process. During the preparation lesson, the students fill out a "self-assessment questionnaire". The answers are transferred to an "evaluation sheet" which is brought to the school doctor consultation and serves as a basis for the conversation. Afterwards, the school doctors tick off the health topics addressed on the "consultation report".



years in educational track level A, 13.8 years in level B and 14.0 years in level C). The characteristics of the school doctors are presented in table S1 in the appendix.

Self-reported health status and behaviours

The proportion of students with unfavourable health status or behaviours according to the individual questions, overall as well as by educational track and gender, is displayed in table 1. The overall score per health topic is shown in figure 2. Generally, female students and students in educational track levels B and particularly C had more unfavourable self-reported health status and behaviours than male students and those in level A (see figure 3 and table S2 in the appendix for the regression results). The main results within each health topic are presented in the following paragraphs.

Well-being

Overall, the majority of the 1076 students reported feeling quite or very happy and satisfied. Still, every fifth student reported feeling sad often or almost always. In just under a third, pain was experienced often or almost always. Every fifth student was quite or very unhappy with their appearance, and almost half of the students reported that they would like to change something about their appearance if they could. Female students in educational track levels B and C had higher proportions of unfavourable "well-being" scores compared to male students (figure 3).

Stimulants and addictive substances

The vast majority of students reported that they had never consumed cigarettes, e-cigarettes or e-shisha, snus or shisha, or marijuana and that they felt quite well or even very well-informed about the effects and risks of addictive substances. Alcohol was consumed more often, with more than every third student having tried it at least once, but less than every tenth student reported consuming it from time to time or even regularly. When asked about the behaviour of others, over a third of the students reported that other adolescents whom they met regularly consumed addictive substances. Female students in educational track A had lower proportions of unfavourable scores compared to those in level C and compared to their male counterparts (figure 3).

Exclusion, bullying and violence

Most of the students reported feeling accepted by others for who they were always or most of the time. Conversely, around one in 20 students seldom or never felt accepted by others or often or very often felt excluded from others. Half of the students had been seriously offended, hurt or threatened at least once, and almost one-fifth had been seriously physically hurt, sexually harassed with words or experienced uncomfortable physical contact. Students in educational track level C more often had unfavourable "exclusion, bullying and violence" scores than those in level A, particularly females (figure 3).

Exercise, nutrition and health protection

Nearly three-quarters of the students reported doing sports more than once per week in their spare time. Most students also reported eating healthy often or always, but almost half of the students often or very often spent more time online than they intended, and roughly one-quarter did not use sunscreen in strong sun.

Puberty and sexuality

Almost all students reported feeling well-informed about sexuality. Most felt well-informed about contraception, but one-third felt quite or very badly informed about sexually transmitted diseases (STDs). Almost one-third of the students were worried about issues concerning their physical development. Students in educational track level C had more unfavourable "puberty and sexuality" scores, and females in educational track levels B and C had more unfavourable scores than their male counterparts (figure 3).

Correlation

There was a clear correlation between different questions within the same overarching health topic (figure S1 in the appendix). Apart from that, the highest correlation was observed between feeling sad/unhappy or unhealthy/unsatisfied and not feeling accepted, having been seriously offended/hurt/threatened, having been sexually harassed with words, or worrying about one's physical development, as well as between worrying about one's physical development and being unhappy about or wanting to change something about one's appearance. There was hardly any negative correlation, that is, an unfavourable response to one question correlating with a favourable response to another question.

Health issues addressed in the school doctor consultation

According to the 595 filled-out consultation reports, at least one of the five overarching health topics was addressed in 89.6% of the consultations. In over half of the consultations, all five health topics from the evaluation sheet were addressed. The most frequently addressed topics were "exercise, nutrition and health protection" (in 86.7%), "stimulants and addictive substances" (in 86.4%), and "well-being" (in 72.9%).

Whether and which health issues were addressed varied highly by school doctor. Seven of the nine school doctors addressed at least one health issue in all consultations, whereas one school doctor did so in only 60.0% (of n = 20) and another in none (of n = 54). The variation by health topic is shown in figure 4A (overarching health topics) and figure 4B (subtopics).

Discussion

In this study, we set out to describe the self-reported health status and behaviours of over 1000 Swiss adolescents aged 13–15 years and the health issues that were addressed in their routine school doctor consultations. We found that although the vast majority of students reported being happy and satisfied overall, around 20% often felt sad and 5–10% had repeatedly been seriously physically hurt, sexually ha-

Table 1:
Proportion of students with unfavourable health status or behaviours, overall and by educational track and gender.

Variable		Overall	Level A		Level B		Level C		MD
		(n = 1076)	Female students (n = 172)	Male students (n = 144)	Female students (n = 279)	Male students (n = 223)	Female students (n = 109)	Male students (n = 142)	
Well-being									
Feels not very or not at all healthy or satisfied		7.6 (81)	7.6 (13)	2.1 (3)	9.4 (26)	5.8 (13)	15.9 (17)	5.6 (8)	0.6
Is often or almost always sad or unhappy		20.5 (215)	24.1 (41)	13.2 (19)	27.9 (75)	12.3 (27)	37.9 (39)	9.4 (13)	2.5
Is often or almost always in pain		30.9 (317)	29.6 (47)	23.0 (32)	36.5 (97)	27.2 (59)	46.6 (48)	24.3 (33)	4.7
Can rarely or never fall asleep easily and sleep through the night		15.8 (168)	15.6 (26)	12.7 (18)	17.1 (47)	13.5 (30)	25.9 (28)	11.3 (16)	1.3
Can rarely or never motivate themselves for school and studying		21.5 (226)	14.2 (24)	23.6 (33)	17.8 (49)	23.3 (51)	31.1 (33)	25.4 (35)	2.2
Is not very or not at all satisfied with their appearance		20.3 (210)	26.3 (44)	9.4 (13)	30.4 (80)	11.4 (25)	32.7 (33)	10.6 (15)	3.8
Would change something about their appearance if it were possible		46.5 (496)	54.7 (93)	37.3 (53)	60.2 (165)	35.4 (79)	54.6 (59)	30.3 (43)	0.9
Stimulants and addictive substances									
Has consumed (from time to time or regularly):	… cigarettes	2.2 (24)	0.0 (0)	0.7 (1)	2.2 (6)	1.8 (4)	4.6 (5)	5.7 (8)	0.5
	… e-cigarettes/e-shisha	3.3 (35)	0.0 (0)	4.2 (6)	2.5 (7)	2.3 (5)	6.5 (7)	7.1 (10)	0.6
	… snus or shisha	3.0 (32)	0.0 (0)	2.8 (4)	2.2 (6)	1.8 (4)	9.3 (10)	5.9 (8)	1.6
	… marijuana	0.8 (9)	0.6 (1)	2.1 (3)	0.4 (1)	1.4 (3)	0.9 (1)	0.0 (0)	0.5
	… alcohol	8.8 (94)	4.1 (7)	9.2 (13)	10.6 (29)	8.1 (18)	9.2 (10)	12.0 (17)	1.0
	… other drugs	0.9 (10)	0.6 (1)	0.0 (0)	0.4 (1)	0.5 (1)	0.9 (1)	4.3 (6)	0.7
Has contact with adolescents who regularly use stimulants and addictive substances		36.4 (388)	25.7 (44)	33.1 (47)	39.4 (109)	39.9 (89)	36.1 (39)	42.4 (59)	0.8
Feels not very well or not at all well-informed about the effects and risks of addictive substances		8.0 (83)	4.7 (8)	4.9 (7)	8.5 (23)	7.9 (17)	12.5 (13)	10.3 (14)	3.0
Exclusion, bullying and violence									
Seldom or never feels accepted by others		6.1 (66)	3.5 (6)	4.2 (6)	7.2 (20)	6.3 (14)	9.2 (10)	6.3 (9)	0
Feels often or very often excluded by others		4.5 (48)	3.5 (6)	3.5 (5)	5.8 (16)	4.0 (9)	6.4 (7)	2.8 (4)	0.3
Has been (a few times or repeatedly)	… seriously offended / hurt / threatened	22.5 (242)	19.8 (34)	16.0 (23)	23.3 (65)	20.7 (46)	39.8 (43)	19.7 (28)	0.2
	…seriously physically hurt	6.2 (67)	2.3 (4)	4.9 (7)	6.5 (18)	7.6 (17)	9.2 (10)	5.6 (8)	0.1
	… sexually harassed with words	8.2 (88)	11.0 (19)	2.1 (3)	10.0 (28)	4.1 (9)	19.3 (21)	4.9 (7)	0.1
	… experienced harassment / uncomfortable physical contact	5.6 (60)	7.0 (12)	2.1 (3)	7.2 (20)	0.9 (2)	11.9 (13)	4.2 (6)	0.1
	Has (a few times or repeatedly)								
	… seriously offended / hurt / threatened others	10.1 (109)	2.9 (5)	12.5 (18)	4.3 (12)	13.5 (30)	12.0 (13)	21.1 (30)	0.1
	… seriously physically hurt others	3.1 (33)	1.2 (2)	4.9 (7)	1.8 (5)	2.7 (6)	1.8 (2)	7.0 (10)	0.1
Exercise, nutrition and health protection									
Exercises only once a month or less often		8.7 (93)	9.9 (17)	5.6 (8)	7.9 (22)	5.0 (11)	16.7 (18)	10.6 (15)	0.3
Rarely or never eats breakfast		28.5 (306)	15.1 (26)	19.4 (28)	33.6 (93)	25.1 (56)	51.4 (56)	32.1 (45)	0.4
Seldom or never eats healthy		14.6 (157)	9.9 (17)	15.3 (22)	12.6 (35)	15.2 (34)	20.4 (22)	19.0 (27)	0.2
Is often or very often bored		18.3 (197)	16.9 (29)	14.6 (21)	20.4 (57)	14.3 (32)	27.5 (30)	19.0 (27)	0
Is often or very often online longer than intended		46.5 (499)	53.5 (92)	37.5 (54)	51.6 (144)	38.7 (86)	52.8 (57)	44.4 (63)	0.2
Seldom or never protects the skin from strong sunlight		24.1 (259)	12.2 (21)	29.2 (42)	20.1 (56)	30.6 (68)	22.9 (25)	31.7 (45)	0.1
Seldom or never protects the ears from loud music		43.1 (462)	40.9 (70)	36.1 (52)	44.1 (123)	44.8 (99)	46.8 (51)	45.8 (65)	0.3
Seldom or never wears a helmet when cycling		47.1 (505)	34.9 (60)	30.8 (44)	50.7 (141)	45.5 (101)	63.3 (69)	62.7 (89)	0.3
Puberty and sexuality									
Is worried about something concerning their physical development		31.5 (336)	33.1 (57)	21.5 (31)	40.2 (111)	19.9 (44)	50.9 (54)	26.4 (37)	0.9
Feels not very well or not at all well-informed about contraception		7.7 (82)	6.4 (11)	2.1 (3)	5.0 (14)	7.2 (16)	16.7 (18)	13.6 (19)	0.5
Feels not very well or not at all well-informed about protection against STDs		34.4 (369)	31.6 (54)	20.8 (30)	37.1 (103)	28.7 (64)	46.3 (50)	46.1 (65)	0.4
Feels not well educated about sexuality		5.3 (56)	3.0 (5)	1.4 (2)	4.4 (12)	4.5 (10)	14.2 (15)	8.0 (11)	1.8

Answers were dichotomized and uniformly presented to show unfavourable answers as "% (*n*) agree/applies". The numbers in the gender-educational track strata do not add up to the overall numbers because seven students reported their gender as "diverse" (we refrained from reporting separate results for these seven students due to privacy/anonymisation concerns). Educational tracks: A (highest), B (intermediate) and C (lowest).

Abbreviations: MD, missing data (in %); STD, sexually transmitted disease

rassed with words or experienced uncomfortable physical contact. Female gender and lower educational track were associated with more unfavourable health status, with females in the lowest educational track having the least favourable health status. Furthermore, we found that in 90% of the analysed school doctor consultations, at least one health prevention or promotion topic was addressed, with the most frequently addressed topics being "exercise, nutrition and health protection", "stimulants and addictive

substances", and "well-being". The topics discussed depended strongly on the individual school doctors.

Our descriptive results with regard to well-being and bullying are well in line with the literature, for example, the Swiss results from the Health Behaviour in School-aged Children (HBSC) survey conducted in 2018 [18] and the Swiss results from the Programme for International Student Assessment (PISA) [19, 20]. The high proportion of bullying is concerning, given its many negative effects on overall health later in life [21, 22]. Some studies have shown that the adverse effects of negative peer relationships on mental health can be even worse than childhood maltreatment, suggesting that bullying should be addressed as a major public health concern [23].

Figure 2: Proportion of students with unfavourable scores, for all questions and within the five overarching health topics, by educational track and gender. Educational tracks: A (highest), B (intermediate) and C (lowest). Number of students: n = 1069.

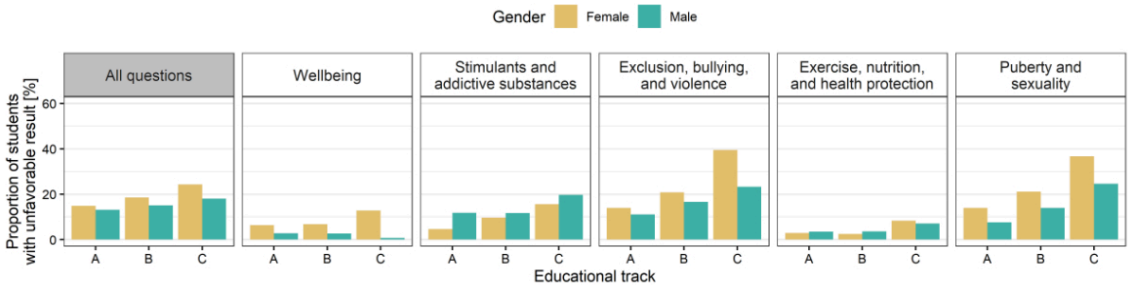


Figure 3: Associations of gender and educational track with unfavourable scores, for all questions and within the five overarching health topics. Odds ratios (ORs) with 95% confidence intervals (CIs) are presented on a logarithmic scale. ORs >1 indicate a positive association with unfavourable scores. For "Exclusion, bullying and violence" and "Exercise, nutrition and health protection", we used simple logistic regression without random effects to ensure well-defined models. Number of students: n = 1069.

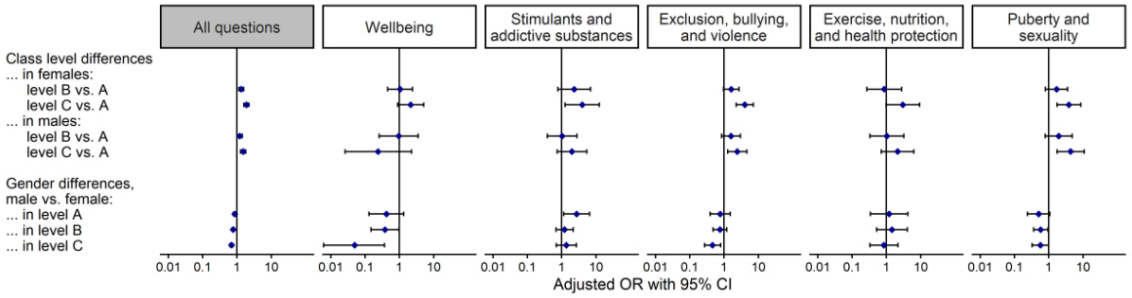
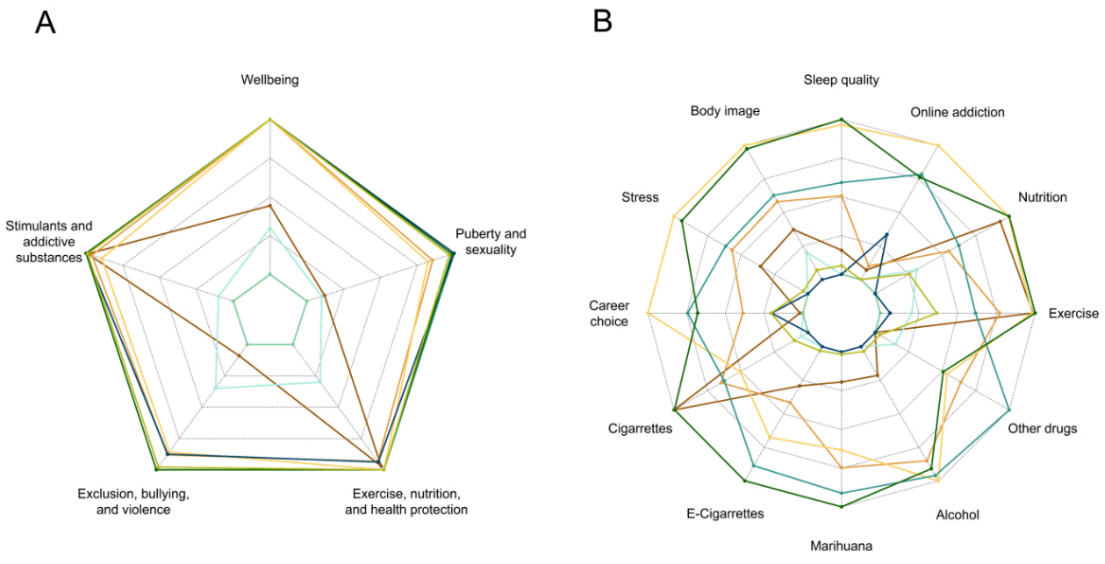


Figure 4: Health issues addressed, stratified by school doctor. Proportion of consultations in which A) overarching health topics or B) specific subtopics were addressed (information on specific subtopics was only available for "well-being", "exercise, nutrition and health prevention", and "stimulants and addictive substances"). The innermost polygon represents 0% (addressed in zero consultations); the outmost polygon represents 100% (addressed in every consultation). The different colours represent different school doctors. Number of school doctors: n = 9.



Our inferential results are also well in line with the literature: the association of both lower socioeconomic status [24–26] and female gender [6, 24, 27, 28] with unfavourable self-reported health status is well documented. For instance, the HBSC survey found that adolescents from less wealthy families and female adolescents reported lower levels of life satisfaction and health [18, 24]. Interestingly, we observed that females in the lowest educational track had the most unfavourable health status. The literature paints a heterogeneous picture of the relationship of socioeconomic status and gender with health, which seems to depend on both the definition of socioeconomic status and the studied outcomes [29, 30]. Regardless, our findings suggest that health promotion and prevention should focus on promoting equal opportunities for students of different socioeconomic backgrounds, especially for female adolescents. This is particularly relevant because health in adolescence impacts health in adulthood, during which the negative associations of socioeconomic status and gender with health are still present [25, 27]. Despite the generally better health reported by males compared to females, it should be noted that males are also at risk of being undertreated: compared to females, males have higher suicide rates, lower health care utilisation, higher unmet needs and lower life expectancy [31]. For adolescents specifically, it has previously been shown that females are more likely than males to seek social support, plan and vent their emotions in early adolescence, whereas males increase their use of these strategies only as they hit late adolescence [32]. Gender-specific health prevention and promotion strategies may thus be indicated [33, 34].

Regarding the discussion of health issues, we found that the health topics from the evaluation sheet were frequently addressed. This is encouraging, given that studies have shown that adolescents find it important to have the opportunity to talk with their doctor about these health topics [35–37] and these health issues are often not sufficiently recognised [6, 7]. However, in our study, the health issues discussed depended heavily on the school doctor, suggesting that the discussion was not always patient-centred. This is consistent with the findings of a recent Swiss study of young adults (aged 17–26 years), which showed that the likelihood of risk behaviours being addressed by primary care physicians was largely independent of the risk factors and wishes of the youth [26]. Moreover, consistent with previous studies [37], the most frequently addressed health topics were "exercise, nutrition and health protection" and "stimulants and addictive substances". Yet, adolescents' self-reported health status and behaviours were more favourable regarding these health topics than others. It is plausible that school doctors felt most responsible for – and familiar with – these "classical" health topics in the sense of having the appropriate education and skills to handle these topics [38]. This should be placed in the broader context: despite repeated legislative efforts, Switzerland has no federal law on health prevention and promotion [39]. However, in recognition of the importance of health prevention, a national strategy to prevent non-communicable diseases during the period 2017-2024 was introduced to strengthen preventive measures and improve the integration of prevention into acute and long-term care policies [40]. This includes strengthening the training of health professionals to carry out preventive measures [39]. Whether this will be effective remains to be seen.

Importantly, a systematic school-based approach, that is a doctor consultation with a preparation lesson, constitutes a unique, low-threshold and equal opportunity to improve the health literacy of adolescents. Health literacy is an important health determinant and includes the motivation, knowledge and skills to acquire, understand and assess health information, communicate on health issues, and make informed decisions to maintain and promote one's health [41, 42]. Reflecting on one's health status and behaviours as well as having easy access to a health professional promotes the development of adolescents' autonomy, their self-management skills and their ability to make informed decisions and take responsibility for their own health [43]. The same can be argued for the preparation lesson on health prevention and promotion topics as well as the completion of a self-assessment questionnaire included in the school setting. Low-threshold and equal access is especially important because, as with unfavourable health status and behaviours, there is an association between lower health literacy and lower socioeconomic status [44]. Another advantage of the school-based approach is that adolescents have private time with the doctor, that is, without parents present. This is important to adolescents and has been shown to increase discussion about risky behaviours but is often not granted in the context of regular adolescent-physician encounters [35, 37]. However, it is important for the success of the school-based approach that the students are not only encouraged to reflect on their health status but also to actively address health issues as needed rather than relying solely on the school doctor, who cannot know what is most important to the student (even if an "assessment sheet" is available). In general, further research is needed to identify the needs and preferences of both students and school doctors. Ultimately, different types of school health services may be compared to determine which is most beneficial.

Strengths and limitations

Our study offers detailed insights into the self-reported health status and behaviours of adolescents and the addressing of these health issues. There was a very high coverage of virtually all 7th-grade students in the canton of Zug, as well as high completeness rates, with <5% missing data for all variables. Moreover, the increased correlation of responses within health topics speaks to the validity of the self-assessment questionnaire. A major limitation of this study was that due to anonymised data collection, the matching of the self-assessment questionnaires and consultation reports at the student level was not possible. The limitations of the consultation report were that i) only nine out of 13 school doctors participated, and this may not be a random sample (participation bias) and ii) we could not discriminate whether a health issue was only addressed briefly or discussed in detail. Moreover, the study was restricted to the school doctor consultation, without any follow-up of the subsequent clinical pathways. The limitations of the self-assessment questionnaire were as follows: first, there was a possible social desirability bias in the reporting of health status and behaviours, especially for the topic "stimulants and addictive substances", which cov-

ers illicit activities [45]. Second, the COVID-19 pandemic might have impacted the responses in our study, considering that many studies have raised concerns regarding the negative impact of the pandemic on mental health among children and adolescents [46]. Finally, the canton of Zug is not fully representative of the whole country of Switzerland (above average economy and education) [47]. Nevertheless, our results were in line with previous data from Switzerland.

Conclusions

Our findings point to the importance of health prevention and promotion in adolescence. A school-based approach that strengthens adolescents' health literacy and provides opportunities for patient-centred counselling has the potential to improve the current and future health of adolescents and, ultimately, adults. To realise this potential, it is essential for school doctors to be sensitised and trained to address students' health concerns. Emphasis should be placed on the importance of patient-centred counselling, the high prevalence of bullying, and gender and educational differences.

Data sharing

The datasets generated and/or analysed during the current study are not publicly available due to the ethics approval waiver only applying to the specific project but are available from the corresponding author on reasonable request and with the permission of the local ethics committee ("Ethikkommission Nordwest- und Zentralschweiz").

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Potential competing interests
All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflict of interest was disclosed.

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Appendix

Table S1:
Characteristics of school doctors.

Variable		**School doctors (n = 9*)**
Gender	% female	33%
	% male	66%
Medical speciality	% General internal medicine	89%
	% Paediatrics	11%
Mean number of years of working experience (SD)		28 (9)
Median number of years of experience as a school doctor for the 7th grade (SD)		21 (8)

Information collected from school doctors via an anonymous web survey.

* Out of a total of 13 school doctors. These nine school doctors are not necessarily the same nine school doctors who filled out the consultation reports. Percentages are rounded and thus may not always add up to 100%.

Abbreviations: SD, standard deviation

Table S2:
Association of student gender and class level with unfavourable results, and random effects (school).*

		OR	95% CI	p
All questions (random intercept: SD = 0.09, 95% CI = 0.05 to 0.15)				
Female students	Class level B (vs. A)	1.33	1.14 to 1.56	<0.001
	Class level C (vs. A)	1.89	1.59 to 2.23	<0.001
Male students	Class level B (vs. A)	1.20	1.01 to 1.42	0.036
	Class level C (vs. A)	1.51	1.01 to 1.79	<0.001
Class level A	Male gender (vs. female)	0.86	0.77 to 0.96	0.006
Class level B	Male gender (vs. female)	0.77	0.71 to 0.84	<0.001
Class level C	Male gender (vs. female)	0.69	0.62 to 0.76	<0.001
Well-being (random intercept: SD = 0.16, 95% CI = 0.00 to 0.73)				
Female students	Class level B (vs. A)	1.05	0.46 to 2.41	0.908
	Class level C (vs. A)	2.14	0.89 to 5.14	0.089
Male students	Class level B (vs. A)	0.96	0.26 to 3.57	0.946
	Class level C (vs. A)	0.24	0.03 to 2.26	0.214
Class level A	Male gender (vs. female)	0.42	0.13 to 1.34	0.143
Class level B	Male gender (vs. female)	0.38	0.15 to 0.97	0.043
Class level C	Male gender (vs. female)	0.05	0.01 to 0.37	0.004
Stimulants and addictive substances (random intercept: SD = 0.46, 95% CI = 0.21 to 0.84)				
Female students	Class level B (vs. A)	2.31	0.77 to 6.88	0.134
	Class level C (vs. A)	3.97	1.26 to 12.51	0.019
Male students	Class level B (vs. A)	1.03	0.38 to 2.75	0.960
	Class level C (vs. A)	1.98	0.73 to 5.36	0.177
Class level A	Male gender (vs. female)	2.72	1.14 to 6.49	0.024
Class level B	Male gender (vs. female)	1.21	0.68 to 2.15	0.515
Class level C	Male gender (vs. female)	1.36	0.69 to 2.67	0.368
Exclusion, bullying and violence*				
Female students	Class level B (vs. A)	1.62	0.96 to 2.72	0.069
	Class level C (vs. A)	4.02	2.26 to 7.16	<0.001
Male students	Class level B (vs. A)	1.59	0.85 to 2.98	0.147
	Class level C (vs. A)	2.42	1.27 to 4.64	0.008
Class level A	Male gender (vs. female)	0.77	0.39 to 1.51	0.450
Class level B	Male gender (vs. female)	0.76	0.48 to 1.20	0.234
Class level C	Male gender (vs. female)	0.46	0.27 to 0.80	0.006
Exercise, nutrition and health protection*				
Female students	Class level B (vs. A)	0.86	0.27 to 2.75	0.799
	Class level C (vs. A)	3.01	0.98 to 9.22	0.054
Male students	Class level B (vs. A)	1.03	0.33 to 3.23	0.954
	Class level C (vs. A)	2.11	0.70 to 6.32	0.184
Class level A	Male gender (vs. female)	1.20	0.34 to 4.23	0.775
Class level B:	Male gender (vs. female)	1.45	0.52 to 4.05	0.483
Class level C	Male gender (vs. female)	0.84	0.33 to 2.15	0.719
Puberty and sexuality (random intercept: SD = 0.34, 95% CI = 0.15 to 0.63)				
Female students	Class level B (vs. A)	1.69	0.80 to 3.58	0.173
	Class level C (vs. A)	3.86	1.73 to 8.62	<0.001
Male students	Class level B (vs. A)	1.95	0.79 to 4.85	0.150
	Class level C (vs. A)	4.33	1.74 to 10.80	0.002
Class level A	Male gender (vs. female)	0.51	0.24 to 1.07	0.074
Class level B	Male gender (vs. female)	0.58	0.36 to 0.95	0.029
Class level C	Male gender (vs. female)	0.57	0.33 to 0.99	0.045

* For “Exclusion, bullying and violence” and “Exercise, nutrition and health protection”, we had to use simple logistic regression without random effects to ensure well-defined models.

Abbreviations: OR, odds ratio; CI, confidence interval; SD, standard deviation; STD, sexually transmitted disease

Figure S1: Correlation of responses to individual questions. Grey rectangles outline questions belonging to the same overarching health topic. The colour indicates the direction and strength of the correlation.