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Territorial and social inequalities in mental distress and self-perceived health among schooled adolescents: a cross-sectional study in central Catalonia and Barcelona

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Abstract

Background Despite being generally considered healthy, adolescence is a crucial period where health behaviours are established, which can impact future well-being. Factors such as social determinants, psychosocial variables, and risk behaviours play significant roles in determining general and mental health, with important gender differences. This article aims to study social inequalities in the prevalence of mental distress and poor self-perceived health of 14 to 18-year-old students schooled in Central Catalonia and Barcelona in the 2021–2022 academic year, separately for boys and girls.

Methods Cross-sectional study using data from two surveys that monitor health and health behaviours in Central Catalonia (DESKcohort) and in Barcelona (FRESC survey) during the year 2021–2022. The final sample included 7,309 adolescents (51.8% were girls). Prevalence of mental distress and poor self-perceived health status were estimated stratifying by sex and according to different social determinants of health (independent variables): axes of inequality, psychosocial variables, and health behaviours. Poisson regression models with robust variance were calculated to analyse potential associations with independent variables.

Results Sex differences were observed, with girls having more than twice as much mental distress (42.0% vs. 18.7%, $p < 0.001$) and poorer self-perceived health status (15.6% vs. 6%, $p < 0.001$), compared to boys. Behavioural factors were more strongly linked to self-perceived health status than to mental distress. Axes of inequality, bullying victimization and problematic internet use were associated to both mental distress and poor self-perceived health status for boys and girls.

Conclusions Adolescents' overall health is associated to factors such as gender, sexual orientation, migration status, socioeconomic position, bullying victimization, and problematic internet use. This study underscores the importance

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of taking a holistic approach when developing preventive and promotion strategies for adolescent health, addressing different levels of intervention while focusing on the most vulnerable populations.

Keywords Adolescents, Mental distress, Self-perceived health status, Social determinants of health

Introduction

Health is defined as a “state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”, understanding the word *complete* as a holistic interpretation of the concept health [1]. Although adolescents (aged 10-to-19-years-old) are considered to be healthy, it has been seen that most mortality in adulthood has its origins in this period [2]. This is caused mainly because in adolescence different health behaviours are adopted, such a substance use, not exercising enough, dietary patterns, etc., which can contribute to future health problems. Furthermore, mental health issues often begin in childhood and adolescence, accounting for 13% of the global burden of disease among people aged 10 to 19, with affective disorders being among the most prevalent [3].

To assess overall health status in adolescence, self-perceived health is a widely utilized indicator. Adolescents generally report better health compared to other age groups, aligning with epidemiological data indicating the lowest morbidity and mortality rates in this population [4]. However, data indicates that only 37% of adolescents rate their health as “excellent,” with girls consistently reporting worse health than boys [5]. Given that adolescence is typically characterized by low rates of physical morbidity and mortality, such a low percentage of adolescents perceiving their health as excellent may signal underlying health concerns. This discrepancy suggests that factors beyond physical health, such as psychosocial stressors, mental health issues, or societal pressures, may be influencing adolescents’ health perceptions. Notably, girls may be more susceptible to these factors, contributing to the observed gender differences in self-rated health [6, 7, 8]. Therefore, understanding these underlying influences on self-perceived health is essential to address health inequalities and improve adolescent wellbeing. To better understand how all these factors interact and influence adolescent perceptions of their health status, the conceptual framework of the determinants of social inequalities in health is essential [9].

Adolescent health is influenced by structural inequalities related to social class, gender, ethnicity, sexual orientation, age, and territory [9]. Rural youth show higher rates of alcohol and tobacco use, while urban adolescents report greater use of illegal substances and better mental health outcomes, highlighting access disparities [10, 11]. Moreover, lower social class and ethnic minority status are linked to poorer health, mediated by discrimination and acculturation [12, 13]. Furthermore,

sexual minorities face more mental health issues and risky behaviours due to stigma and minority stress [14]. Finally, gender differences in health status have been widely identified: for instance, adolescent girls are almost two times more likely to experience low mood than boys and report a lower life satisfaction and quality of life [7, 15]. Since gender differences are particularly pronounced during adolescence, it will be necessary to study the health of boys and girls separately to detect gender-differentiated factors.

Social and psychosocial factors such as interpersonal relationships (such as experiences of bullying or sexual violence) can condition overall mental health and wellbeing [16], causing low mood, low self-esteem, and suicidal ideation [17, 18]. Moreover, suffering these types of violence are also associated with higher prevalences of substance use and risky sexual behaviours [19, 20].

The impact of these social determinants significantly influence adolescents’ decision-making processes, leading to the initiation of risky behaviours such as tobacco, alcohol, and cannabis use during this critical developmental period. A study conducted among adolescents in Central Catalonia found that polydrug use of tobacco and cannabis was associated with poorer self-perceived health and mood states, particularly among students in higher academic courses and vocational training programs [21]. Moreover, bad dietary patterns have been associated with mental health problems (such as depression and anxiety) [22], as well as problematic use of the internet, especially for girls [23].

Despite these well-known established relationships [24], the COVID-19 pandemic profoundly affected the social and health conditions of families worldwide [25]. It particularly influenced certain behaviours and consumption patterns that can impact health [26], often in unequal ways depending on individuals’ social positions. Consequently, in the aftermath of the pandemic, it is crucial to estimate and understand how these changes have affected different territories. Thus, the aim of this article is to study social inequalities in the prevalence of mental distress and poor self-perceived health of 14 to 18-year-old students schooled in Central Catalonia and Barcelona in the 2021–2022 academic year, separately for boys and girls.

Methods

Cross-sectional study of adolescents aged 14 to 18 years who were studying 4th year of compulsory secondary education (CSE), 2nd year of post compulsory

secondary education (PCSE) and Intermediate Level Training Cycles (ILTC) during the 2021–2022 academic year. The study was carried out in Central Catalonia and the city of Barcelona to encompass a range of territorial contexts, including metropolitan areas, large cities, and small towns. Central Catalonia, located in the north-east of Spain, comprises 6 counties: Anoia, Bages, Berguedà, Moianès, Osona and Solsonès. Data were drawn from two sources: the DESKcohort project (conducted in Central Catalonia) [27] and the Secondary School Risk Factors Survey (FRESC) in Barcelona. Both DESKcohort and FRESC aim to study adolescent health and its determinants through ad-hoc, territory-specific questionnaires administered in secondary schools.

For the DESKcohort project, a convenience sample was used. All high schools of the region (92) were invited to participate in the study, and 78 of them accepted (84.8% of the total) [27]. The survey was completed by 6,378 adolescents attending schools in Central Catalonia, corresponding to 71.7% of the 8,900 students enrolled across the participating centres. For the FRESC survey, a stratified random sample was used, with the classroom as the sampling unit. For each of the three levels of secondary education studied, the classrooms were selected taking into account the socio-economic level of the neighbourhood where the school was located, its ownership and the district [28]. A total of 2,170 adolescents were surveyed in Barcelona. In both studies, the inclusion criterion was that adolescents had to be students residing in a village or town within Central Catalonia or in the city of Barcelona, respectively. As a result, 706 students were excluded because they lived outside these areas.

The initial combined sample included 7,842 adolescents. Of these, 420 participants (5.36% of the total sample) were excluded due to missing data on one or more variables (the highest percentage of missing data for a single variable was 2.70%, observed in the variable of experienced sexual violence). Thus, the final sample consisted of 7,422 adolescents, of whom 51.8% were girls. From our final sample, 78.3% of the adolescents were from the DESKcohort project and 21.7% from the FRESC survey. A descriptive table was made to compare the characteristics of the sample according to both territories to assess any major differences (Table 1).

The data collection was carried out using the DESKcohort and FRESC questionnaires (both available at each project's websites). Both surveys were created using validated questionnaires or instruments with a well-established track record in public health diagnostics in adolescents, such as the ESTUDES survey (a national school-based survey on drug use conducted by the Spanish Government Delegation for the National Plan on Drugs) [29] which include the Compulsive Internet Use Scale (CIUS) for assessing problematic internet use [30]

and the CAST test to assess risky cannabis consumption [31]. Although alcohol use and physical activity are important health behaviours in adolescence, since we did not have any comparable measures between surveys they were not included in the study.

The data collection process was identical for both samples studied. Both surveys were digitalized and auto administered in the high-school classrooms, and all the data was anonymized, confidential and private. For data collection, the DESKcohort survey was computerised using the Redcap Software [32]. For the DESKcohort project, the parents and the participants signed an informed consent form accepting to participate and the study was approved by the Research and Ethics Committee of the Universitat de Vic-Universitat Central de Catalunya (UVic-UCC) (96/2019). The FRESC survey is part of the Annual Statistical Action Program of the Government of Catalonia and is not subject to an ethics committee evaluation.

The first objective was to estimate the prevalence of mental distress and poor self-perceived health status, for boys and girls. Thus, two dependent variables were created: **mental distress** and **poor self-perceived health status**. Mental distress was reported through the validated questionnaire Warwick Edinburg Mental Well-Being Scale (WEMWBS) [33]. It consists of 14 items measuring positive aspects of mental well-being in the last two weeks, with a 5-point Likert scale answers going from “Never” to “Always” and punctuation ranging from 14 (mental distress) to 70 (mental well-being).

According to the authors [34], the WEMWBS has been benchmarked against well-validated measures of depression and there are scores equivalent to cut points for possible clinical problems; thus, in our study we used ≤ 44 scores as a cut-off point to assess mental distress. To assess the validity of the dependent variables a structural equation model with Satorra-Bentler estimation was fitted obtaining a RSMEA (Root Mean Square Error of Approximation) of 0.08, CFI (Goodness of Fit Index) of 0.90, TLI (Tucker-Lewis Index) of 0.89 and SRMR (Standardized Root Mean Squares Residual) of 0.05. To assess the internal consistency we estimated Cronbach's Alfa, obtaining a coefficient of 0.90 (95% CI: 0.89–0.90). For the poor self-perceived health status, the following question was used “How would you say your general health is like?”. Adolescents who answered “regular” or “bad” were considered to have a poor self-perceived health status, compared to the ones who had a “good, very good or excellent” self-perceived health status [35].

The second objective was to analyse social inequalities in mental distress and poor self-perceived health status considering other related factors, for boys and girls separately. For this reason, we considered the following independent variables, according to the conceptual

Table 1 Characteristics of adolescents schooled in central Catalonia and Barcelona in the 2021–2022 academic year, according to territory

	Central Catalonia	Barcelona	P value ^d
	N (%)	N (%)	
Total	5,815 (78.3%)	1,607 (21.7%)	
<u>Main study variables</u>			
Mental distress (cut-off 44)			
Mental wellbeing	3,993 (68.7%)	1,117 (69.5%)	0.519
Mental distress	1,822 (31.3%)	490 (30.5%)	
Self-perceived health status			
Excellent, very good and good	5,148 (88.5%)	1,438 (89.5%)	0.284
Regular or bad	667 (11.5%)	169 (10.5%)	
<u>Axes of inequality</u>			
Sex			
Male	2,826 (48.6%)	755 (47.0%)	0.251
Female	2,989 (51.4%)	852 (53.0%)	
Course			
4th course of CSE ^a	3,231 (55.6%)	885 (55.1%)	0.393
2nd course of PCSE ^b	1,969 (33.9%)	533 (33.2%)	
2nd course of ILTC ^c	615 (10.6%)	189 (11.8%)	
Sexual orientation			
Heterosexual	4,607 (79.2%)	1,012 (63.0%)	< 0.001
Homosexual	135 (2.3%)	145 (9.0%)	
Bisexual	654 (11.2%)	361 (22.5%)	
Doesn't know/Questioning it/Others	419 (7.2%)	89 (5.5%)	
Migration status			
Spain	4,461 (76.7%)	1,068 (66.5%)	< 0.001
2nd generation	1,007 (17.3%)	345 (21.5%)	
1st generation	347 (6.0%)	194 (12.1%)	
Maximum level of parental education			
University	2,383 (41.0%)	1,000 (62.2%)	< 0.001
Secondary education	1,888 (32.5%)	435 (27.1%)	
Primary education or less	1,052 (18.1%)	140 (8.7%)	
Doesn't know / No answer	492 (8.5%)	32 (2.0%)	
<u>Psychosocial factors</u>			
Victim of bullying			
No	5,073 (87.2%)	1,500 (93.3%)	< 0.001
Yes	742 (12.8%)	107 (6.7%)	
Aggressor of bullying			
No	5,425 (93.3%)	1,520 (94.6%)	0.061
Yes	390 (6.7%)	87 (5.4%)	
Having suffered sexual violence			
No	3,631 (62.4%)	790 (49.2%)	< 0.001
Yes	2,184 (37.6%)	817 (50.8%)	
<u>Behavioural factors</u>			
Dieting to lose weight			
No	5,609 (96.5%)	1,421 (88.4%)	< 0.001
Yes	206 (3.5%)	186 (11.6%)	
Daily tobacco consumption			
No	5,284 (90.9%)	1,436 (89.4%)	0.067
Yes	531 (9.1%)	171 (10.6%)	
Risky cannabis use			
No	5,610 (96.5%)	1,522 (94.7%)	0.001
Yes	205 (3.5%)	85 (5.3%)	
Problematic use of internet (cut-off 28)			

Table 1 (continued)

	Central Catalonia	Barcelona	P value ^d
	N (%)	N (%)	
Total	5,815 (78.3%)	1,607 (21.7%)	
No	4,382 (75.4%)	1,303 (81.1%)	< 0.001
Yes	1,433 (24.6%)	304 (18.9%)	

^a CSE = Compulsory secondary education; ^b PCSE = Post-compulsory secondary education; ^c ILTC = Intermediate Level Training Cycles

^d Test used: Chi squared test

framework of the social determinants of health [9]. As axes of inequality, we considered municipality size, academic course (used as a proxy for age), sexual orientation, migration status and socioeconomic position.

Academic course was categorized into three groups: 4th year of Compulsory Secondary Education (CSE; ages 14–16), 2nd year of Post-Compulsory Secondary Education (PCSE; ages 16–18), and 2nd year of Intermediate-Level Vocational Training (ILVT; ages 16–18).

Municipality size was classified into five categories: very small municipalities (<= 5,000 inhabitants), small municipalities (> 5,001 and <= 10,000 inhabitants), medium municipalities (> 10,001 and <= 30,000 inhabitants), intermediate cities (≥ 30,000 inhabitants) in Central Catalonia, and the metropolis of Barcelona (1.6 million inhabitants). **Sexual orientation** was classified with the following options: (1) Heterosexual (you are regularly attracted to people of a different sex than yourself), (2) Homosexual (you are regularly attracted to people of the same sex), (3) Bisexual (you are attracted to people of different sex as well as people of the same sex as yourself), (4) I am questioning it/ I don't know, (5) I prefer not to answer, (6) Others. **Migration status** was categorized as: native, 2nd and 1st generation immigrant. **Socioeconomic position** was assessed through the highest level of parental education, grouped into: university, secondary education, primary education or less and does not know/ no answer.

As psychosocial factors, we considered having **experienced or exercised bullying** (no/yes) in the last year and having experienced any type of **sexual violence** (verbal or physical) in their lifetime (no/yes). Finally, several health behaviours were considered: **dieting to lose weight** (no/yes), **daily tobacco consumption** (no/yes), **risky cannabis consumption** (no/yes) and **problematic use of internet** (no/yes). Risky cannabis use was assessed through the CAST test, with adolescents with scores ≥ 7 being considered as risky users [31], while problematic internet use was assessed through the CIUS scale, with scores < 28 indicating a problematic use [36].

For the statistical analysis, we first performed a descriptive analysis to compare the FRESC and DESK samples, followed by an examination of the distribution of study variables by sex using the Chi-squared test (Tables 1 and 2). Then, we estimated the prevalence of

mental distress and poor self-perceived health status and its 95% confidence intervals (95%CI) for each category of the independent variables (Table 3). To analyse the factors associated with emotional distress and poor self-perceived health status, univariate and multivariate Poisson regression models with robust variance were performed obtaining crude and adjusted prevalence ratios (PR) with their 95%CI. We used Poisson regression models with robust variance to obtain prevalence ratios, as these provide a more direct and interpretable estimate of risk when the prevalence of the dependent variable is high, whereas odds ratios tend to overestimate the association when prevalence exceeds 20% [37, 38, 39, 40]. Independent variables that showed significance in the univariate analysis were included for multivariate analysis (Table 4). Moreover, all the analyses were replicated for those adolescents who reported experiencing both mental distress and poor self-perceived health status, to establish any possible differences in the associated factors (the results can be found in Additional file 2, supplementary Table 2). All analyses were stratified for boys and girls. This approach allows for the identification of sex-specific patterns and ensures that potential inequalities are not masked in aggregated data [41]. Analyses were performed using STATA.18 statistical software.

Results

Table 2 shows the characteristics of the study sample according to sex. There were sex differences in the prevalence of mental distress (42.4% for girls and 19.1% for boys, $p < 0.001$) and of poor self-perceived health status (16.1% for girls and 6.1% for boys, $p < 0.001$). These differences were also observed for adolescents with both mental distress and a poor self-perceived health status, with 12.1% of girls and 3.2% of boys ($p < 0.001$) reporting both conditions (Additional file 2, supplementary Table 2). Moreover, a higher percentage of boys attended ILTC courses compared to girls (12.9% vs. 8.9%, $p < 0.001$). In our sample, girls were four times more likely than boys to report being bisexual (21.6% and 5.2%, $p < 0.001$) and reported being a 2nd generation immigrant more often (19.5% vs. 16.9%, $p = 0.013$). More girls reported being a bullying victim (12.8% vs. 10.0%, $p < 0.001$) whilst more boys reported being a bully aggressor (8.5% vs. 4.5%, $p < 0.001$). There was a higher prevalence of lifetime

Table 2 Characteristics of adolescents schooled in central Catalonia and Barcelona in the 2021–2022 academic year, according to sex

	Boys	Girls	P value ^d
	N (%)	N (%)	
Total	3,581 (48.2%)	3,841 (51.8%)	
<i>Main study variables</i>			
Mental distress (cut-off 44)			
Mental wellbeing	2,898 (80.9%)	2,212 (57.6%)	< 0.001
Mental distress	683 (19.1%)	1,629 (42.4%)	
Self-perceived health status			
Excellent, very good and good	3,364 (93.9%)	3,222 (83.9%)	< 0.001
Regular or bad	217 (6.1%)	619 (16.1%)	
<i>Axes of inequality</i>			
Size of municipality of residence			
<=5,000 inhabit.	833 (23.3%)	802 (20.9%)	0.016
> 5,0001-<=10,000 inhabit.	700 (19.5%)	846 (22.0%)	
10,001hab-<=30,000 inhabit.	398 (11.1%)	401 (10.4%)	
> 30,000 inhabit.	895 (25.0%)	940 (24.5%)	
Barcelona	755 (21.1%)	852 (22.2%)	
Course			
4th course of CSE ^a	2,062 (57.6%)	2,054 (53.5%)	< 0.001
2nd course of PCSE ^b	1,057 (29.5%)	1,445 (37.6%)	
2nd course of ILTC ^c	462 (12.9%)	342 (8.9%)	
Sexual orientation			
Heterosexual	3,157 (88.2%)	2,462 (64.1%)	< 0.001
Homosexual	134 (3.7%)	146 (3.8%)	
Bisexual	185 (5.2%)	830 (21.6%)	
Doesn't know/Questioning it/Others	105 (2.9%)	403 (10.5%)	
Migration status			
Spain	2,717 (75.9%)	2,812 (73.2%)	0.013
2nd generation	604 (16.9%)	748 (19.5%)	
1st generation	260 (7.3%)	281 (7.3%)	
Maximum level of parental education			
University	1,657 (46.3%)	1,726 (44.9%)	< 0.001
Secondary education	1,071 (29.9%)	1,252 (32.6%)	
Primary education or less	530 (14.8%)	662 (17.2%)	
Doesn't know / No answer	323 (9.0%)	201 (5.2%)	
<i>Psychosocial factors</i>			
Victim of bullying			
No	3,223 (90.0%)	3,350 (87.2%)	< 0.001
Yes	358 (10.0%)	491 (12.8%)	
Aggressor of bullying			
No	3,275 (91.5%)	3,670 (95.5%)	< 0.001
Yes	306 (8.5%)	171 (4.5%)	
Having suffered sexual violence			
No	3,008 (84.0%)	1,413 (36.8%)	< 0.001
Yes	573 (16.0%)	2,428 (63.2%)	
<i>Behavioural factors</i>			
Dieting to lose weight			
No	3,441 (96.1%)	3,589 (93.4%)	< 0.001
Yes	140 (3.9%)	252 (6.6%)	
Daily tobacco consumption			
No	3,313 (92.5%)	3,407 (88.7%)	< 0.001
Yes	268 (7.5%)	434 (11.3%)	
Risky cannabis use			
No	3,433 (95.9%)	3,699 (96.3%)	0.333

Table 2 (continued)

	Boys	Girls	P value ^d
	N (%)	N (%)	
Total	3,581 (48.2%)	3,841 (51.8%)	
Yes	148 (4.1%)	142 (3.7%)	
Problematic use of internet (cut-off 28)			
No	2,960 (82.7%)	2,725 (70.9%)	< 0.001
Yes	621 (17.3%)	1,116 (29.1%)	

^a CSE = Compulsory secondary education; ^b PCSE = Post-compulsory secondary education; ^c ILTC = Intermediate Level Training Cycles

^d Test used: Chi squared test

experienced sexual violence for girls compared to boys (63.2% vs. 16.0%, $p < 0.001$). Girls reported smoking daily more frequently than boys (11.3% vs. 7.5%, $p < 0.001$), whilst there were no statistically significant differences between sexes for risky cannabis use. Finally, girls reported higher prevalences of problematic internet use than boys (29.1% vs. 17.3%, $p < 0.001$).

Table 3 shows the prevalence of mental distress and poor self-perceived health status according to the different independent variables, for boys and girls. Regarding the axes of inequality, boys who lived in bigger cities reported a higher prevalence of mental distress than the ones living in small cities. Moreover, boys attending 2nd course of PCSE had a higher prevalence of mental distress than the ones coursing 4th of CSE. Similar differences were observed for girls attending 2nd course of ILTC and 4th of CSE regarding poor self-perceived health status.

Adolescents with a minority sexual orientation or who were questioning their sexual orientation had a higher prevalence of mental distress than their heterosexual peers, differently for boys and girls: while homosexual and bisexual boys had more mental distress than heterosexual boys, this difference is only observed between bisexual and heterosexual girls. Similar patterns were observed for poor self-perceived health status. For migration status, 1st generation immigrant boys and 2nd generation immigrant girls reported more mental distress than their native peers. Migrant adolescents also reported a higher prevalence of poor self-perceived health status compared to natives, but only in girls. Regarding the maximum level of parental education, we found differences in both the prevalence of mental distress and poor self-perceived health status for boys and girls, where adolescents with parents with a lower education reported higher prevalences.

Regarding psychosocial determinants, adolescents who reported being a victim of bullying exhibited higher mental distress and poorer self-perceived health status. We observed the same patterns for adolescents who were aggressors of bullying, and for those who had suffered sexual violence (except for poor self-perceived health status in boys).

Regarding behavioural factors, we observed that girls who were dieting to lose weight report higher prevalences of both dependent variables compared to girls who were not dieting. Adolescents who smoke tobacco daily reported a higher prevalence of poor self-perceived health status compared to those who do not smoke daily. Furthermore, adolescents who were risky cannabis users had a poorer self-perceived health status than the ones who were not risky users. Finally, higher prevalences of both mental distress and poor self-perceived health status were found in adolescents with problematic use of the internet compared to their counterparts.

Table 4 shows adjusted regression models for mental distress and poor self-perceived health status, for boys and girls. For the different axes of inequality, having a minority sexual orientation and being immigrant were associated with both dependent variables, for both boys and girls. Living in a big city, attending a higher academic course, and having parents with less than university studies was associated with higher mental distress among boys. Among girls, having parents with lower educational attainment was associated with both higher mental distress and poorer self-perceived health, while attending 2nd year of ILTC was associated to poorer self-perceived health. Being a victim of bullying was associated to mental distress (aPR = 1.88, 95% CI: 1.60–2.23 for boys and for girls aPR = 1.32, 95% CI: 1.21–1.44) and to having poor self-perceived health status (aPR = 2.39, 95% CI: 1.78–3.22 for boys and aPR = 1.58, 95% CI: 1.33–1.87 for girls). On the other hand, being an aggressor of bullying was only associated to poor self-perceived health status in girls (aPR = 1.42, 95% CI: 1.11–1.81). Moreover, experiencing sexual violence was associated with a higher prevalence of mental distress in both girls (aPR = 1.18, 95% CI: 1.09–1.28) and boys (aPR = 1.22, 95% CI: 1.03–1.44).

Regarding behavioural factors, dieting to lose weight was associated to both dependent variables only for girls. Poor self-perceived health status was associated to daily tobacco smoking (aPR = 12.07, 95% CI: 1.41–3.03 for boys and aPR = 1.73, 95% CI: 1.43–2.09 for girls) and risky cannabis use (aPR = 1.62, 95% CI: 1.03–2.54 for boys and aPR = 1.57, 95% CI: 1.24–1.99 for girls). Finally, problematic use of internet was associated to both mental distress

Table 3 Prevalence of mental distress and poor self-perceived health according to independent variables, in adolescents schooled in central Catalonia and Barcelona in the 2021–2022 academic year, by sex

	MENTAL DISTRESS				POOR SELF-PERCEIVED HEALTH STATUS			
	Boys		Girls		Boys		Girls	
	N	% [95%CI]	N	% [95%CI]	N	% [95%CI]	N	% [95%CI]
<i>Axes of inequality</i>								
Size of municipality of residence								
≤5,000 inhabit.	833	15.6 [13.3–18.2]	802	43.3 [39.9–46.7]	833	6 [4.6–7.8]	802	15.8 [13.5–18.5]
> 5,0001–≤10,000 inhabit.	700	21 [18.1–24.2]	846	42.4 [39.1–45.8]	700	6.3 [4.7–8.3]	846	16.5 [14.2–19.2]
10,001hab–≤30,000 inhabit.	398	16.6 [13.2–20.6]	401	41.9 [37.2–46.8]	398	5 [3.3–7.7]	401	15 [11.8–18.8]
> 30,000 inhabit.	895	21.1 [18.6–23.9]	940	44.3 [41.1–47.5]	895	6.4 [4.9–8.2]	940	18 [15.7–20.6]
Barcelona	755	20 [17.3–23]	852	39.8 [36.6–43.1]	755	6.1 [4.6–8]	852	14.4 [12.2–17]
Course								
4th course of CSE ^a	2062	17.4 [15.8–19.1]	2054	42.7 [40.6–44.9]	2062	6 [5.1–7.1]	2054	15.3 [13.8–17]
2nd course of PCSE ^b	1057	21.8 [19.4–24.4]	1445	42.6 [40.1–45.2]	1057	5 [3.9–6.5]	1445	15.7 [13.9–17.7]
2nd course of ILTC ^c	462	20.6 [17.1–24.5]	342	39.5 [34.4–44.8]	462	8.7 [6.4–11.6]	342	22.5 [18.4–27.2]
Sexual orientation								
Heterosexual	3157	16.9 [15.6–18.3]	2462	37.9 [36–39.8]	3157	5.4 [4.6–6.2]	2462	12.6 [11.4–14]
Homosexual	134	29.1 [22–37.3]	146	41.1 [33.4–49.2]	134	9.7 [5.7–16]	146	21.9 [15.9–29.4]
Bisexual	185	37.8 [31.1–45]	830	50.7 [47.3–54.1]	185	13 [8.8–18.6]	830	22.5 [19.8–25.5]
Doesn't know/Questioning it/Others	105	38.1 [29.3–47.7]	403	53.6 [48.7–58.4]	105	9.5 [5.2–16.8]	403	22.1 [18.3–26.4]
Migration status								
Spain	2717	17.9 [16.5–19.3]	2812	39.8 [38–41.7]	2717	5.4 [4.6–6.3]	2812	14 [12.8–15.4]
2nd generation	604	20.7 [17.6–24.1]	748	50.1 [46.6–53.7]	604	8.1 [6.2–10.6]	748	21.1 [18.3–24.2]
1st generation	260	28.1 [22.9–33.8]	281	47.7 [41.9–53.5]	260	8.1 [5.3–12.1]	281	23.5 [18.9–28.8]
Maximum level of parental education								
University	1657	16.4 [14.7–18.2]	1726	38.5 [36.2–40.8]	1657	5.3 [4.3–6.4]	1726	12.3 [10.9–14]
Secondary education	1071	19.5 [17.2–22]	1252	44 [41.3–46.8]	1071	5.9 [4.6–7.5]	1252	18.5 [16.4–20.7]
Primary education or less	530	22.8 [19.5–26.6]	662	47 [43.2–50.8]	530	8.7 [6.6–11.4]	662	19.6 [16.8–22.8]
Doesn't know / No answer	323	25.4 [20.9–30.4]	201	51.2 [44.4–58.1]	323	6.5 [4.3–9.8]	201	22.4 [17.2–28.7]
<i>Psychosocial factors</i>								
Victim of bullying								
No	3223	17 [15.8–18.4]	3350	39.9 [38.3–41.6]	3223	5.1 [4.4–5.9]	3350	14.4 [13.3–15.7]
Yes	358	37.4 [32.6–42.6]	491	59.3 [54.9–63.5]	358	14.5 [11.2–18.6]	491	27.5 [23.7–31.6]
Aggressor of bullying								
No	3275	18.4 [17.1–19.7]	3670	42 [40.4–43.6]	3275	5.6 [4.9–6.5]	3670	15.4 [14.3–16.6]
Yes	306	26.5 [21.8–31.7]	171	52 [44.6–59.4]	306	10.5 [7.5–14.4]	171	31.6 [25.1–38.9]
Having suffered sexual violence								
No	3008	17.6 [16.3–19]	1413	36 [33.5–38.5]	3008	5.6 [4.8–6.5]	1413	13 [11.3–14.8]
Yes	573	26.7 [23.2–30.5]	2428	46.2 [44.2–48.2]	573	8.4 [6.4–10.9]	2428	18 [16.5–19.5]
<i>Behavioural factors</i>								
Dieting to lose weight								
No	3441	19.2 [17.9–20.5]	3589	41.6 [40–43.2]	3441	5.9 [5.2–6.8]	3589	15.7 [14.5–16.9]
Yes	140	17.1 [11.8–24.3]	252	54.4 [48.2–60.4]	140	9.3 [5.5–15.3]	252	22.2 [17.5–27.8]
Daily tobacco consumption								
No	3313	18.7 [17.5–20.1]	3407	42.2 [40.6–43.9]	3313	5.5 [4.8–6.3]	3407	14.4 [13.3–15.6]
Yes	268	23.1 [18.5–28.6]	434	44 [39.4–48.7]	268	13.1 [9.5–17.6]	434	29.5 [25.4–34]
Risky cannabis use								
No	3433	18.8 [17.5–20.1]	3699	42 [40.4–43.6]	3433	5.7 [4.9–6.5]	3699	15.2 [14–16.4]
Yes	148	26.4 [19.9–34]	142	52.8 [44.6–60.9]	148	15.5 [10.5–22.3]	142	40.8 [33.1–49.1]
Problematic use of internet (cut-off 28)								
No	2960	16.9 [15.6–18.3]	2725	36.9 [35.1–38.7]	2960	5.2 [4.4–6]	2725	13 [11.7–14.3]
Yes	621	29.6 [26.2–33.3]	1116	55.9 [53–58.8]	621	10.3 [8.1–13]	1116	23.8 [21.4–26.4]

^a CSE = Compulsory secondary education; ^b PCSE = Post-compulsory secondary education; ^c ILTC = Intermediate Level Training Cycles

Table 4 Adjusted models with adjusted prevalence ratios (aPR) and 95%CI of mental distress and poor self-perceived health status according to independent variables in adolescents schooled in central Catalonia and Barcelona in the 2021–2022 academic year, by sex

	MENTAL DISTRESS				POOR SELF-PERCEIVED HEALTH STATUS			
	Boys		Girls		Boys		Girls	
	aPR	95%CI	aPR	95%CI	aPR	95%CI	aPR	95%CI
<i>Axes of inequality</i>								
Size of municipality of residence								
<=5,000 inhabit.	1.00		1.00		1.00		1.00	
> 5,0001-<=10,000 inhabit.	1.29	[1.05–1.59]	0.95	[0.86–1.06]	1.06	[0.72–1.56]	1.00	[0.81–1.23]
10,001hab-<=30,000 inhabit.	1.03	[0.79–1.34]	0.93	[0.81–1.07]	0.87	[0.53–1.44]	0.87	[0.66–1.14]
> 30,000 inhabit.	1.26	[1.03–1.53]	0.98	[0.88–1.08]	0.99	[0.69–1.43]	1.06	[0.86–1.30]
Barcelona	1.22	[0.98–1.53]	0.91	[0.81–1.02]	0.94	[0.63–1.41]	0.82	[0.65–1.03]
Course								
4th course of CSE ^a	1.00						1.00	
2nd course of PCSE ^b	1.39	[1.20–1.62]					1.14	[0.98–1.34]
2nd course of ILTC ^c	1.21	[0.99–1.49]					1.29	[1.03–1.62]
Sexual orientation								
Heterosexual	1.00		1.00		1.00		1.00	
Homosexual	1.51	[1.15–1.99]*	1.10	[0.91–1.33]*	1.36	[0.80–2.31]	1.85	[1.35–2.53]
Bisexual	1.90	[1.53–2.36]*	1.32	[1.21–1.43]*	1.92	[1.27–2.90]	1.72	[1.46–2.03]
Doesn't know/Questioning it/Others	1.95	[1.50–2.53]*	1.38	[1.24–1.52]*	1.53	[0.82–2.88]	1.80	[1.47–2.20]
Migration status								
Spain	1.00		1.00		1.00		1.00	
2nd generation	1.08	[0.90–1.29]	1.21	[1.12–1.32]	1.54	[1.13–2.10]	1.49	[1.26–1.77]
1st generation	1.38	[1.12–1.70]*	1.16	[1.02–1.33]*	1.57	[1.01–2.44]	1.61	[1.27–2.04]
Maximum level of parental education								
University	1.00		1.00				1.00	
Secondary education	1.21	[1.03–1.42]	1.14	[1.04–1.24]			1.41	[1.19–1.67]*
Primary education or less	1.37	[1.13–1.66]	1.19	[1.07–1.31]			1.44	[1.17–1.76]
Doesn't know / No answer	1.61	[1.29–2.01]	1.27	[1.09–1.48]			1.47	[1.09–1.99]
<i>Psychosocial factors</i>								
Victim of bullying								
No	1.00		1.00		1.00		1.00	
Yes	1.88	[1.60–2.23]*	1.32	[1.21–1.44]*	2.39	[1.78–3.22]*	1.58	[1.33–1.87]*
Aggressor of bullying								
No							1.00	
Yes							1.42	[1.11–1.81]
Having suffered sexual violence								
No	1.00		1.00					
Yes	1.22	[1.03–1.44]	1.18	[1.09–1.28]				
<i>Behavioural factors</i>								
Dieting to lose weight								
No			1.00				1.00	
Yes			1.28	[1.13–1.44]			1.39	[1.08–1.78]
Daily tobacco consumption								
No					1.00		1.00	
Yes					2.07	[1.41–3.03]	1.73	[1.43–2.09]
Risky cannabis use								
No					1.00		1.00	
Yes					1.62	[1.03–2.54]	1.57	[1.24–1.99]
Problematic use of internet (cut-off 28)								

Table 4 (continued)

	MENTAL DISTRESS				POOR SELF-PERCEIVED HEALTH STATUS			
	Boys		Girls		Boys		Girls	
	aPR	95%CI	aPR	95%CI	aPR	95%CI	aPR	95%CI
No	1.00		1.00		1.00		1.00	
Yes	1.51	[1.31–1.75]	1.43	[1.33–1.53]	1.71	[1.29–2.26]	1.65	[1.43–1.90]

^a CSE = Compulsory secondary education; ^b PCSE = Post-compulsory secondary education; ^c ILTC = Intermediate Level Training Cycles

Note: Only variables that were statistically significant in the crude models were included in the multivariate analyses

* Categories marked with an asterisk are those in which there is an interaction with sex

and poor self-perceived health status for both sexes. There were no significant differences between the associated factors in the models fitted with the two dependent variables separately (Table 4) compared to the model that considered both mental distress and self-perceived poor health status (Additional file 2, supplementary Table 2).

Discussion

The aim of this article was to study social inequalities in the prevalence of mental distress and poor self-perceived health status of 14-to-18-year-old adolescents schooled in Central Catalonia and in Barcelona. We found significant differences by sex, with girls presenting higher prevalences of mental distress and poorer self-perceived health status than boys. Moreover, behavioural factors were associated more frequently with self-perceived health status, in comparison to mental distress; on the other hand, sexual orientation, migration status and socioeconomic position were associated to worse values of mental distress and self-perceived health status for both sexes.

While interpreting the results, it is important to consider the broader social context in which the data were collected—specifically, the lingering effects of the COVID-19 pandemic during the 2021–2022 academic year. Although most formal restrictions had been lifted by then, the pandemic likely had lasting impacts on adolescents' everyday experiences, potentially shaping the patterns observed in this study. Previous literature has shown that adolescents were particularly vulnerable to the psychosocial consequences of prolonged isolation, disruptions in schooling, and changes in family dynamics and socioeconomic conditions [42, 43]. These factors may have influenced not only health-related behaviours, but also how these behaviours are socially distributed.

Notably, the social distancing measures and school closures interrupted peer interactions—a key component of adolescent development—which may have disproportionately affected girls, given gendered differences in socialization processes and emotional coping strategies [44]. This could have exacerbated pre-existing gender inequalities in mental health and wellbeing [15]. Additionally, increased reliance on digital platforms and social media during the pandemic introduced new forms

of exposure to appearance-related content and social comparison, which have been associated with lower self-esteem, body dissatisfaction and drive for thinness [45], which can in turn cause changes in eating and physical activity patterns. These mechanisms may partly explain some of the gendered and behavioural patterns found in our data. Ongoing monitoring is therefore essential to determine whether these post-pandemic shifts are transient or indicative of longer-term transformations in adolescent health behaviours and inequalities.

Gender differences in mental health and well-being in adolescence have been found in the literature, with girls showing a higher risk than boys [46]. There are several possible explanations for these differences. One is the *Gender Intensification Hypothesis*, which describes the impact of gender roles on adolescent health, mainly that social pressure to conform to female gender roles places girls in a vulnerable position, which has a direct impact on their health, generating gender-based inequalities [46, 47]. Moreover, linked to gender roles are attitudes such as sexism and machismo, which help explain violent attitudes and behaviours, especially in boys [48]. These attitudes cause experiences of sexual violence, which are more frequent among girls (for instance, more than 60% of girls in our sample reported having experienced sexual violence in comparison to 16% of the boys). This could also explain gender differences in mental distress, as a previous study showed that experiencing sexual violence accounted for 36% of the difference in low mood between adolescent girls and boys [15]. On the other hand, some hypothesise that biological factors are to blame, such as early maturity in girls [46, 49]; moreover, premenstrual syndrome and the hormonal change linked to menarche may cause some of the mental distress and poor perception of health in girls [50].

As to the axes of inequality, we observed that sexual orientation, migration status and parental education were associated with both mental distress and poor self-perceived health status, showing a relevant impact on adolescents' overall health status. Adolescents with a minority sexual orientation have worse health than their heterosexual peers due to structural, interpersonal and individual stigma and minority stress [14]. This association is present for both sexes and both dependent

variables, nevertheless for poor self-perceived health status it was only observed for bisexual boys. One possible explanation is that bisexual youth represent a subpopulation of adolescents within sexual minorities, who exhibit specific risk behaviours that, in turn, increase the risk of mental health problems such as depression and suicidal behaviour [51].

The relationship between migration status and mental distress and poor self-perceived health status may vary depending on the ethnic origin, social and cultural norms of the country of origin and country of residence, and level of acculturation. For example, some studies show that children from ethnic minority groups have better mental health than natives [46], while in our study immigrant adolescents reported higher values of mental distress and poor self-perceived health status. One hypothesis is that low acculturation in impoverished settings or settings that endorse risk behaviours may be protective [52], whereas marginalization and poor social adaptation can also cause poor mental health values, especially during adolescence where belonging to a social group gains importance [53]. Further studies are needed to determine whether these variables (ethnicity, cultural and social norms, level of acculturation, etc.) act as possible mediators of the relationship between migration status and overall health.

In our study, parent's level of education was associated to both dependent variables for girls and to mental distress for boys. Still, the association was weak, and we did not observe a pattern of worse health as the educational level lowered, as we expected. The relationship between parental level of education and overall health has been studied, and has been found to be specially strong on childhood; nevertheless, during adolescence other contextual factors start to influence health, such as peer's relationships or neighbourhood of residence, and parental control and influence diminish [54]. The appearance of these other factors may weaken the association of our dependent variables and parental education. Thus, for future studies is important to consider other SES indicators to better measure the impact of socioeconomic status in adolescence, such as subjective social status [55].

We did not find a clear association between mental distress and self-perceived health and municipality size. Municipality size was associated only for boys and mental distress, with boys living in urban areas showing higher prevalence. Some studies found that rural adolescents report unhealthier behaviours, such as higher use of legal substances (alcohol and tobacco), while illegal substances were more prevalent among adolescents on urban settings [11]. On the other hand, other authors found that adolescents living in rural settings have worse general health and lifestyle behaviours [56]. A possible explanation for rural teenagers presenting worse health is

the lack of supporting organizations directed at youth or more difficulty accessing health services in rural settings [57]. Nevertheless, it is difficult to establish comparisons, since the classifications for rural and urban settings differ greatly between studies [11], which is a possible explanation for the lack of association in our study.

Psychosocial determinants of health play a very important role in adolescents' health status. It has been studied that interpersonal relationships (family relations, such as parental support, or relationship with peers) can act as a protective or risk factor for mental health or wellbeing outcomes [46]. For instance, in our study we found associations with being bullied and mental distress and poor self-perceived health status for both sexes. A causal relation has been found between bullying victimization and mental health problems, such as depression, anxiety and suicidal ideation and attempts [58]. Moreover, experiencing sexual violence is associated with several health risky behaviours, such as substance use or risky sexual behaviour and with experiences of sadness or hopelessness [59], which can account for the associations that we found between experiencing sexual violence and mental distress.

Several health behaviours were also associated to mental distress and poor self-perceived health status. Dieting to lose weight was associated to both dependent variables, only for girls. As mentioned previously, gender roles and social beauty standards can explain this relationship: girls are expected to be thin and slender, causing low body satisfaction and self-esteem, which leads to low mood and depressive symptoms [60]. These social and cultural norms are often spread through the internet; in fact a study found a positive association between media use, depressive symptoms, body dissatisfaction and disordered eating [61]. A possible explanation why dieting was associated to health outcomes only for girls is that we specifically asked for dieting to lose weight, whereas boys beauty standards usually revolve around being muscular [62]. For future studies, it is important to consider other reasons for dieting (for example, to gain weight or muscle), since it might be associated with health status for boys as well, considering also maturation factors associated with age.

Problematic use of the internet was also associated with both dependent variables, for both sexes. As has been mentioned previously, social media use impacts negatively on mental health, body image and self-esteem, which consequently encourages unhealthy behaviours, such as reduced motivation to exercise and unhealthy dietary intakes [61]. Moreover, some authors established that adolescents who start using internet pathologically can develop depression as a consequence [63]. Thus, including behavioural addictions is essential when studying adolescents' overall wellbeing.

This study has several limitations. One of the limitations is the source of the data. Since we combined samples from two different projects (and thus, we have two instruments), some of the independent variables were not completely comparable. Nevertheless, before data analysis a process of data harmonization between the two samples was conducted, minimizing this limitation. In this line, the only SES measure available that was common between the two samples were parental educational level, which is known is not the best SES indicator for adolescents. Also, the timeframe for the psychosocial variables differs (bullying was asked during the last year, whereas sexual violence was asked throughout their lifetime), causing comparability limitations. Information on these variables and how were harmonized can be found in Additional file 1 (supplementary Table 1). Moreover, a small proportion of missing data was present in the dataset, with 5.36% of cases excluded due to missing values in key variables. Nevertheless, the variable with the highest rate of missing values was sexual violence (2.70%), while other variables had minimal or no missing data. Thus, since missing values were not concentrated on any single variable, and given their low prevalence, we consider the impact on our study findings to be limited. Another limitation of this study is the use of academic course as a proxy for age. While this approach is largely valid within the Catalan education system—where age-grade correspondence is tightly regulated and grade retention is rare—it may introduce some bias at the post-compulsory level. This is because in post-compulsory levels some adolescents are no longer enrolled in the educational system, either because they have entered the labour market or are pursuing other non-formal pathways. As a result, this study may underrepresent certain subgroups of older adolescents who have disengaged from formal schooling.

Nonetheless, a key strength of the study is its large, population-based sample, which ensures sufficient statistical power to explore multiple dimensions of social inequality and their intersection with gender. Another strength is its preventive approach. Addressing mental health and self-perceived health prior to an actual diagnosis will allow policy makers to identify key elements to design promotion and prevention interventions and thus reduce the incidence of adolescent health problems and improve their quality of life.

Conclusions

There are significant gender inequalities in adolescent health, with girls having more than twice the prevalence of emotional distress and self-perceived health status than boys. Adolescents' overall health is determined by several axes of inequality, psychosocial determinants, and health behaviours: gender, sexual orientation, migration status, socioeconomic position, being a bullying

victim and problematic use of the internet are associated to higher values of mental distress and poor self-perceived health status. It is essential to have a holistic perspective when designing preventive and promotion strategies targeted at adolescents' health, with different levels of intervention. Moreover, it is crucial to target the most vulnerable populations and identify their specific needs to adapt the strategies and heighten its impact and effectiveness. Addressing general health at an early and vulnerable developmental stage such as adolescence is crucial to reduce the deterioration and impact of both physical and mental health in the adult population.

Abbreviations

CSE	Compulsory Secondary Education
PCSE	Post-compulsory Secondary Education
ILTC	Intermediate Level Training Cycles
FRESC	Secondary School Risk Factors Survey
UVic-UCC	Universitat de Vic– Universitat Central de Catalunya
WEMWBS	Warwick-Edinburgh Mental Wellbeing Scale
RSMEA	Root Mean Square Error of Approximation
CFI	Comparative Fit Index
TLI	Tucker-Lewis Index
SRMR	Standardized Root Mean Squares Residual

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-025-23515-4>.

Supplementary Material 1

Supplementary Material 2

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Author contributions

H.G-C: cured, analysed and interpreted the data and wrote the original draft manuscript; C.V-C: Review & editing and validation; M.J.L: Review & editing, and validation; B.S-B: Review & editing, and validation; K.P: Review & editing, and validation; G.P: Review & editing, and validation; M.C-A: Review & editing, and validation; G.S: Review & editing, and validation; M.A.B: Review & editing, and validation; I.R-P: Review & editing, and validation; I.M-R: Review & editing, and validation; A.C-L: Review & editing, and validation; M.B-P: supervision, conceptualization, data curation, review & editing, and validation; C.F: Review & editing, and validation; A.E: supervision, conceptualization, review & editing, and validation. All authors approved the final manuscript.

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Data availability

The study data are publicly available for other researchers via the respective project websites: <https://deskcohort.cat/en/databases/> and <https://www.aspb.cat/es/contacto/>.

Declarations

Ethics approval and consent to participate

For the DESKcohort project, the parents and the participants signed an informed consent form accepting to participate and the study was approved by the Research and Ethics Committee of the Universitat de Vic-Universitat Central de Catalunya (UVic-UCC) (96/2019). The FRES survey is part of the Annual Statistical Action Program of the Government of Catalonia and is not subject to an ethics committee evaluation.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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