

Adolescent loneliness in the COVID-19 era. The perspective of health behavior in a study on school-aged children in Poland

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Summary Background. This study examines the prevalence and underlying factors of loneliness among Polish adolescents in schools during the COVID-19 pandemic.

Objectives. The aim of this study is to assess the frequency of loneliness experienced by Polish students depending on the perceived impact of the COVID-19 pandemic on various aspects of life.

Material and methods. Utilizing data from a representative sample of over 6,200 students aged 11 to 17, as part of the global Health Behavior in School-aged Children (HBSC) survey for the 2021/2022 school year, the study investigates how the pandemic has affected the lives of young people, particularly in fostering feelings of loneliness.

Results. The findings indicate that almost one-third of Polish school students report feeling lonely “often” or “always”. Key factors contributing to this loneliness include gender, age, the level of support from family and peers, as well as the amount of time spent on social media. Notably, the study uncovers that girls are more likely to feel lonely – especially those in secondary school and living in larger cities. There is also a noticeable link between heavy social media usage and heightened loneliness.

Conclusions. The pandemic’s toll on mental health, family dynamics, and academic life has emerged as a significant concern. This paper underscores the urgent need for dedicated programs and support mechanisms to counteract the adverse effects of the pandemic on the mental health and overall well-being of young people.

Key words: adolescent, loneliness, COVID-19, Poland.

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Background

Loneliness, a universal and timeless emotion, is an experience that manifests uniquely in each individual [1]. Its prevalence among teenagers and young adults is particularly noteworthy and concerning. Adolescence – traditionally a time rich in socialization, forming deep friendships, experiencing first loves, and integrating into close-knit peer groups as a source of identity and a sense of belonging [2] – now seems to be undergoing a transformative phase.

In recent years, an increasing number of young people have voiced feelings of loneliness, a situation further aggravated by the COVID-19 pandemic [3]. The pandemic brought with it a necessity for social distancing [4] and restricted interpersonal contact, challenging the very core of social bonding – a fundamental human need. According to the Evolutionary Theory of Loneliness (ETS), a lack of social connectivity can lead to significant long-term mental and physical health repercussions [5]. The pandemic’s impact on young individuals has touched many facets of their daily lives, particularly degrading the quality of their social

interactions. While staying indoors with parents and siblings entailed certain positive benefits [6], the overall negative effects, especially on the mental health of children and adolescents, have been more profound and lasting compared to adults [7].

Parallel to these challenges is the steady increase in social media usage among teenagers. Traditional face-to-face interactions have increasingly been replaced by digital conversations and real gatherings by “Insta stories” [8]. Unfortunately, this heightened online engagement, peaking during the pandemic, has not alleviated the sense of isolation among the youth. A literature-review study by Jamil et al. has highlighted a strong correlation between loneliness, social distancing, and Internet use, leading to escalated stress, anxiety, and depression in teenagers during the pandemic [9]. This raises the crucial question: How might we effectively address and reverse these troubling trends? The absence of clear-cut answers underscores the need for ongoing research and analysis into the factors contributing to loneliness in school-aged youth, aiming to devise and implement effective strategies to enhance their well-being.



Objectives

The aim of this study is to assess the frequency of loneliness experienced by Polish students depending on the perceived impact of the COVID-19 pandemic on various aspects of life. The following research questions have been formulated: To what degree does the negative impact of the COVID-19 pandemic on different areas of adolescent life elevate their frequency of feeling lonely? Does this impact retain its significance when the analysis is adjusted for demographic factors, family and peer support, and social media engagement?

Material and methods

The research presented in this paper is part of the latest round of the international Health Behavior in School-aged Children (HBSC) research. The HBSC study is a collaborative cross-national study conducted in 51 countries and regions across Europe and North America in collaboration with the WHO Regional Office for Europe¹. All participating countries used a standardized mandatory and optional questionnaire collecting information about health behaviors and health outcomes together with social contextual factors of children and adolescents aged 11, 13 and 15 and optionally 17 years old. Each country gathers a representative random cluster sample, with units of clustering being schools and classes. In the last round, the data was collected in 44 countries and regions. Poland has carried out the ninth round of this international research, which has been conducted in our country every four years since 1990. The comprehensive nature of its questionnaire, coupled with its timing during the 2021/22 school year – the last year of the pandemic – provides a unique perspective. Notably, this study found that Polish youth rank among the highest in terms of frequently feeling lonely when compared to their counterparts in 44 other surveyed countries [10].

Participants

This study was conducted online as a school-based survey during the 2021/22 school year. We focused on school students across four age groups – 11, 13, 15, and 17 years old – corresponding to grades 5 and 7 of primary school, and grades 1 and 3 of secondary school. The sample included 6,219 students, representing 394 school classes from 168 schools across all 16 provinces. The school response rate was 64.7%. The demographic breakdown of the sample was 54.1% girls and 45.9% boys, with an average age of 14.62 years (SD = 2.00). Our sample was nationally representative in terms of both gender and place of residence, with 40% of participants living in rural areas.

Survey tools

The survey encompassed several key components. The participants answered a question about loneliness: “During the past 12 months, how often have you felt lonely?” The possible responses ranged from “never”, “rarely”, “sometimes”, “most of the time”, to “always”. This question was sourced from the Global School-based Student Health Survey [11].

Additionally, participants were asked about the impact of the COVID-19 pandemic on ten various aspects of their lives. This began with an introduction: “Since the start of the COVID-19 pandemic, the lives of many people have been affected (i.e. lockdowns, school closures, distance learning, and social distancing)”. Then they were asked: “What impact did these measures have on the following aspects of your life (A negative

impact means it made things worse, a positive impact means it made things better): 1. Your life as a whole; 2. Your health; 3. Relationships with your family; 4. Relationships with your friends; 5. Your mental health (e.g. dealing with your emotions, stress, etc.); 6. Your school performance; 7. Physical activity (e.g. sports, cycling, walks, etc.); 8. What you ate or drank; 9. Your future expectations (e.g. exams, jobs, etc.); 10. Your family financial situation. Participants assessed this impact on a five-point scale: very negative, quite negative, neither positive nor negative, quite positive, very positive. Responses were coded into three categories of impact: negative, neutral, and positive. The overall impact on participants’ lives over nine specific areas of functioning was evaluated.

Support from family and peers was measured using the Multidimensional Scale of Perceived Social Support (MSPP), developed by Zimet et al. [12]. The surveyed adolescents were asked to describe the support they perceive from family and peers. Concerning family, they were asked to assess whether: 1. My family makes a great effort to help me; 2. My family provides the emotional help and support I need; 3. I can talk to my family about my problems; 4. My family willingly assists me in making my own decisions. Concerning peer support, the questions included the following statements: 1. My friends really make an effort to help me; 2. I can rely on my male and female friends when things go wrong; 3. I have male and female friends with whom I can share my joys and concerns; 4. I can talk to my male and female friends about my problems. On a seven-point scale, only the extreme responses were labeled: “very strongly disagree” and “very strongly agree”. The answers were then recorded from 0 to 6. Scales ranging from 0–24 points were constructed, which were divided into 3 intervals, taking the average level of support from each source to be the median 50–60% of responses. The overall support indices demonstrated good reliability, with Cronbach’s alpha values of 0.939 and 0.929 for the family and peer support scales, respectively.

The study also investigated time spent on social media. Students were asked, “In your free time: how many hours a day do you spend using computers and other electronic devices for social networks, such as Instagram, Facebook, Twitter, Snapchat, etc.?” Nine response categories were distinguished, from “none at all” to “about 7 or more hours a day”. This question structure on sedentary behaviors has been used since the beginning of the HBSC studies, adjusting the forms of sedentary activities to the lifestyle of contemporary youth.

Analyses were adjusted for the gender and age of the respondents, as well as for family wealth and place of residence. The analyses have been corrected for family wealth as measured using the FAS (Family Affluence Scale), a standard tool employed for investigating material status in HBSC research. In 2014, this scale was extended from 4 to 6 questions. To facilitate comparing the results, only 4 common questions were used: the number of cars in the family, whether the student has their own room, the number of computers in the household, and family journeys away from home for holidays or vacations. In 2018, the latter question was replaced with a question about going on vacation abroad. FAS values range from 0 to 9 in this configuration, with high values indicating that the student comes from a more affluent family [13]. The FAS is typically categorized into three ranges based on country-specific cutoff points, aiming for about 20% of cases in each extreme category.

The scope of the questionnaire and the procedure for organizing the studies and obtaining consent from parents and students to participate in the survey were reviewed and approved by the Bioethics Committee of the Institute of Mother and Child in Warsaw (opinion no. 51/2021 of 24.06.2021).

¹ The study is led by an International Coordinator. The current International Coordinator is Dr Jo Inchley, University of Glasgow, UK. HBSC research in Poland is coordinated by two centers: The Institute of Mother and Child in Warsaw – Dr Anna Dzielska and the Faculty of Pedagogy of the University of Warsaw – Dr Agnieszka Małkowska-Szcutnik.

Statistical analysis

Descriptive statistics were used to summarize the data – presenting frequencies for nominal and ordinal variables and calculating means and standard deviations (SD) for continuous variables. To explore the relationship between loneliness and other factors, both univariate and multivariate analyses were employed. The univariate analysis utilized the chi-square test to differentiate between three levels of loneliness. In contrast, the multivariate analysis involved logistic regression, coding frequent feelings of loneliness as “1” (feeling lonely most of the time or always) and infrequent feelings as “0”. The outcomes of the final model were represented through the beta coefficient of the regression equation, its standard error (SE), significance according to the Wald test, and the odds ratio (OR) with a 95% confidence interval (CI). Additionally, the fit of the model was evaluated using the Hosmer-Lemeshow chi-square test and Nagelkerke’s R-squared coefficient. All statistical analyses were carried out using IBM SPSS v. 29 software (IBM Corp., Armonk, NY, USA).

Results

Frequency of feeling lonely

Among the 6,219 school students surveyed, 26.9% reported feeling lonely most of the time or always during the past 12 months. This included 6.2% who indicated they “always” felt lonely. The distribution of these responses, broken down by demographic and social characteristics, is detailed in Table 1.

The data reveal that girls experienced loneliness more frequently than boys, and this trend was more pronounced among high school students compared to those in primary school (30.3% vs 22.7%, $p < 0.001$). The place of residence did not significantly influence the frequency of loneliness, although a gender-based analysis showed the results for girls as being on the verge of statistical significance. Frequent loneliness was experienced by 37.8% of girls from cities with over 100,000 inhabitants, compared to 31.6% among girls living in rural areas. The correlation with family wealth level was relatively weak.

Table 2 summarizes the results related to the frequency of feeling lonely among groups of school students, categorized by

Variable	n (%)	Feeling lonely (%)			p
		rarely or never	sometimes	most of the time or always	
Total	6,219 (100.0)	39.6	33.5	26.9	
Gender					< 0.001
boy	2,807 (45.1)	52.5	28.8	18.7	
girl	3,412 (54.9)	29.0	37.4	33.6	
Grade					< 0.001
V primary school	1,437 (23.1)	53.0	28.9	18.2	
VII primary school	1,403 (22.6)	41.6	31.0	27.4	
I secondary school	1,870 (30.0)	33.7	35.1	31.2	
III secondary school	1,509 (24.3)	32.5	38.3	29.2	
Place of living					0.206
big cities	1,078 (17.4)	38.3	32.1	29.6	
average cities	785 (12.7)	38.6	33.1	28.3	
small towns	1,837 (29.7)	39.2	34.3	26.5	
rural areas	2,489 (40.2)	40.9	33.5	25.6	
Family Affluence Scale ¹					0.157
low	1,210 (19.9)	37.9	33.1	29.1	
average	3,739 (61.3)	39.6	33.4	27.0	
high	1,145 (18.8)	41.0	34.4	24.6	

¹Assumed relative distribution.

Variable	n (%)	Feeling lonely (%)			p
		rarely or never	sometimes	most of the time or always	
Family support*					< 0.001
low	1,093 (18.1)	22.0	27.7	50.3	
average	3,615 (60.1)	35.8	38.1	26.1	
high	1,309 (21.8)	63.4	26.5	10.1	
Peer support*					< 0.001
low	1,194 (20.0)	28.1	28.9	43.0	
average	3,470 (58.2)	39.8	35.8	24.4	
high	1,297 (21.8)	48.3	32.5	19.2	
Time on social media (a day)					< 0.001
not at all	445 (8.2)	57.8	25.3	16.9	
2 hours or less	2,466 (45.1)	44.7	34.3	21.0	
3–4 hours	1,332 (24.4)	32.4	35.8	31.8	
5 hours or more	1,216 (22.3)	28.5	32.2	39.3	

*Assumed cut-off points.

social factors and time spent on social media. The findings indicate that strong support from family and peers acts as a significant buffer against loneliness. Conversely, spending substantial time on social media emerged as a risk factor. In the group abstaining from media use, 16.9% of respondents often felt lonely, compared to 39.3% among those who engaged with media for more than 4 hours a day.

Impact of the pandemic on different spheres of life and the threat of loneliness

The school students surveyed in the 2021/22 school year reported highly varied perceptions of the pandemic’s impact on

their lives overall (as shown in Figure 1). Those highlighting the negative aspects outnumbered those pointing to positive effects by around two to one (36.0% vs 16.1%). A negative impact was most frequently reported in relation to mental health (38.3%) and physical activity (38.1%), while it was less commonly associated with family relationships (18.3%) and the family’s financial situation (19.1%).

Analyzing these results further, it was evident that students more often felt lonely when they perceived the pandemic as having a negative impact on their lives overall and on specific spheres of life. Depending on the area of functioning being assessed, the proportion of students frequently feeling lonely varied from 32.3% to 40% (Table 3).

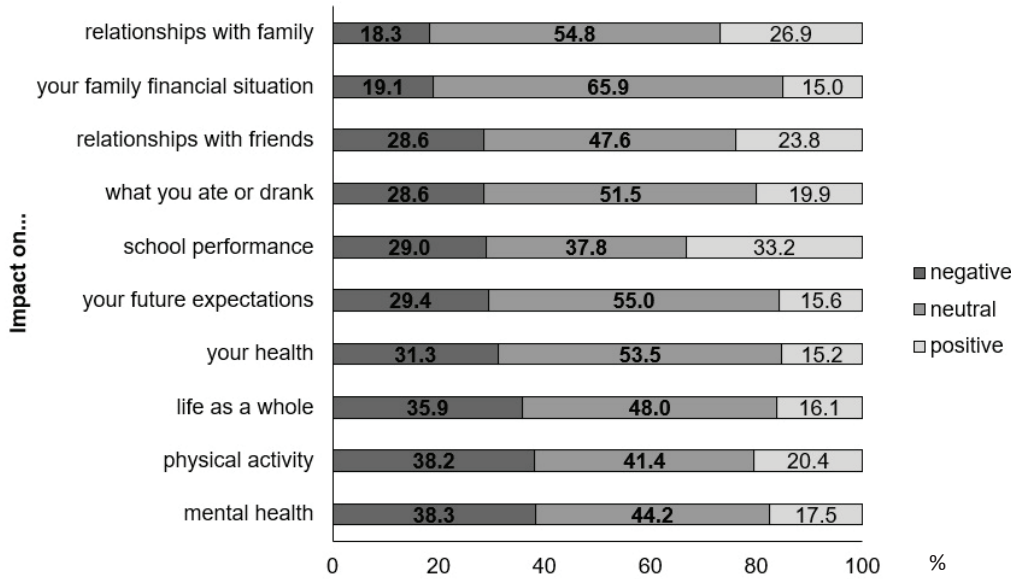


Figure 1. The pandemic’s impact on adolescents’ lives

Impact of COVID-19 pandemic on...	n (%)	Feeling lonely (%)			p
		rarely or never	sometimes	most of the time or always	
Your life as a whole					< 0.001
negative	2,084 (35.9)	30.9	34.2	34.9	
neutral	2,781 (48.0)	42.6	35.1	22.3	
positive	9,34 (16.1)	47.1	28.5	24.4	
Your health					< 0.001
negative	1,807 (31.3)	30.5	33.9	35.6	
neutral	3,094 (53.5)	40.6	35.1	24.3	
positive	878 (15.2)	51.1	29.2	19.7	
Relationships with your family					< 0.001
negative	1,056 (18.3)	30.6	31.8	37.6	
neutral	3,160 (54.8)	38.5	35.0	26.5	
positive	1,550 (26.9)	46.2	32.5	21.3	
Relationships with your friends					< 0.001
negative	1,647 (28.6)	31.0	33.6	35.4	
neutral	2,743 (47.6)	41.6	34.6	23.8	
positive	1,368 (23.8)	43.5	32.7	23.8	
Your mental health (e.g. dealing with your emotions, stress, etc.)					< 0.001
negative	2,211 (38.3)	25.4	34.3	40.3	
neutral	2,550 (44.2)	47.5	34.4	18.1	
positive	1,013 (17.5)	48.2	31.0	20.8	
Your school performance					< 0.001
negative	1,668 (29.0)	29.6	34.2	36.2	
neutral	2,179 (37.8)	42.7	33.0	23.3	
positive	1,913 (33.2)	42.9	33.3	23.8	

Table 3. Frequency of experiencing loneliness by the impact of pandemic on different areas

Impact of COVID-19 pandemic on...	n (%)	Feeling lonely (%)			p
		rarely or never	sometimes	most of the time or always	
Physical activity (e.g. sports, cycling, walks, etc.)					< 0.001
negative	2,201 (38.2)	33.4	34.3	32.3	
neutral	2,386 (41.4)	42.5	33.5	24.0	
positive	1,178 (20.4)	43.2	33.2	23.6	
What you ate or drank					< 0.001
negative	1,643 (28.6)	28.4	35.6	36.0	
neutral	2,964 (51.5)	42.7	33.5	23.8	
positive	1,148 (19.9)	44.9	32.3	22.8	
Your future expectations (e.g. exams, jobs, etc.)					< 0.001
negative	1,697 (29.4)	31.6	34.0	34.4	
neutral	3,166 (55.0)	41.4	34.1	24.5	
positive	901 (15.6)	45.0	32.1	22.9	
Your family financial situation					< 0.001
negative	1,098 (19.1)	33.9	31.9	34.2	
neutral	3,791 (65.9)	38.8	35.0	26.2	
positive	862 (15.0)	46.5	31.5	22.0	

Table 4. Estimation* of final logistic regression model for frequent loneliness

Independent variable	B	SE	p	OR	95% CI
Impact of COVID-19 pandemic on mental health					
positive (ref.)				1.00	
neutral	-0.162	0.106	0.127	0.85	0.69–1.05
negative	0.648	0.102	0.000	1.91	1.57–2.34
Gender					
boy (ref.)				1.00	
girl	0.527	0.079	0.000	1.69	1.45–1.98
Grade					
V primary school (ref.)				1.00	
VIII primary school	0.451	0.156	0.004	1.57	1.16–2.13
I secondary school	0.631	0.155	0.000	1.88	1.39–2.54
III secondary school	0.535	0.158	0.001	1.71	1.25–2.33
Family support					
high (ref.)				1.00	
average	0.763	0.113	0.000	2.15	1.72–2.68
low	1.573	0.126	0.000	4.82	3.76–6.18
Peer support					
high (ref.)				1.00	
average	0.334	0.095	0.000	1.40	1.16–1.68
low	1.030	0.113	0.000	2.80	2.24–3.50
Time on social media					
not at all (ref.)				1.00	
2 hours or less	0.070	0.155	0.653	1.07	0.79–1.45
3–4 hours	0.441	0.163	0.007	1.55	1.13–2.14
5 hours or more	0.678	0.164	0.000	1.97	1.43–2.72
Constant	-3.533	0.225	0.000		

*B – regression parameter, SE – standard error, OR – odds ratio, 95%CI – 95% confidence interval for OR.

Multifactorial analysis

The multifactorial analysis aimed to pinpoint factors that independently affect the likelihood of frequently feeling lonely among the school students aged 11–17 surveyed in the 2021/22 school year. Initially, the study's preliminary phase (unpublished data) concentrated solely on assessing how the pandemic impacted nine different aspects of life. The analysis identified three key independent predictors of loneliness: the impact on family relationships, mental health, and school functioning. Table 4 presents the estimation results of the final model, with six conditioning factors taken into account. In this analysis, all variables were qualitative, with a specific emphasis on the reference category. The odds ratio (OR) served as the primary measure for assessing the strength of these relationships, adjusted for various

other factors. Notably, the most significant contributors to loneliness were found to be a lack of family support (OR = 4.82) and inadequate peer support (OR = 2.80). Additionally, the amount of time spent on social media emerged as a crucial factor. The data showed that students spending more than 4 hours daily on social media platforms were nearly twice as likely to experience loneliness (OR = 1.97), with a significant risk also noted for those spending 3–4 hours daily on social media (OR = 1.55).

Within the scope of the pandemic's perceived impact, which ranked fourth in the final model, only its effect on health was deemed significant. A negative impact on health correlated with an OR of 1.91, whereas a neutral impact did not show an increased risk compared to a positive impact. Furthermore, the analysis revealed gender disparities, with girls being more prone to loneliness (OR = 1.69), as well as age differences, with

third-grade secondary school students facing a higher risk (OR = 1.71). Compared to the reference group of fifth-grade primary school students, the older the student cohort, the greater the risk of frequent loneliness. The robustness of the final model is evidenced by its good fit in the Hosmer-Lemeshow test ($p = 0.116$) and a Nagelkerke's R -squared value of 0.224.

Discussion

The primary goal of this study was to analyze the impact of the COVID-19 pandemic on the lives of young people, particularly in the context of loneliness felt by Polish teenagers. This topic contributes to the global discussion on the consequences of the pandemic and its associated social isolation on the mental health of adolescents [14, 15]. We sought to address two main questions: To what degree does the negative impact of the COVID-19 pandemic on different areas of adolescent life elevate their frequency of feeling lonely? Does this impact retain its significance when the analysis is adjusted for demographic factors, family and peer support, and social media engagement?

Pandemic's impact on the prevalence of loneliness

In our nationally representative sample of over 6,200 school students, nearly a third reported frequent or constant feelings of loneliness. This trend is consistent with other studies in literature, which often link loneliness to mental health disturbances and challenges in social relationships [16, 17]. In an analysis of 41 selected studies about children and adolescents' loneliness during the pandemic, Farrell et al. [18] found that loneliness rates typically ranged between 20–40%, though sometimes the problem affected more than half of the study group. When discussing such reviews, it is essential to remember that these studies can vary in terms of age groups, respondent profiles, loneliness measurement tools, and criteria for judging the intensity of these feelings. Assessments of the pandemic's effects also differ, with longitudinal or comparable cross-sectional studies before and during the pandemic being relatively scarce. One distinctive aspect of our study is how it correlates the sense of loneliness with teenagers' subjective views on how the pandemic has impacted various aspects of their lives. Fogarty et al. found that 38.7% of youth reported moderate to extreme loneliness, and a study in the United States showed 53.4% of adolescents felt lonely [19].

Demographic factors

Our study revealed that girls experienced loneliness more often than boys, a finding that aligns with Peterle et al.'s study involving 479 participants, with an average age of 16.03 years (SD = 1.01). A significant 61.17% of the surveyed adolescents exhibited emotional and behavioral problems, with girls more frequently reporting increased loneliness, anxiety, and sadness during the pandemic [20]. Secondary school students more often felt lonely than those in primary school. Girls from cities with over 100,000 inhabitants experienced loneliness more often than their rural counterparts [21]. A study by Hou et al. explored the connection between loneliness and adolescent well-being during the pandemic, finding a 77.6% rate of depressive symptoms among rural youth in China during COVID-19, with girls exhibiting more depressive symptoms than boys (all $p < 0.05$). Loneliness played a mediating role between perceived social support and depressive symptoms, with the indirect effect being stronger among unsupervised youth compared to those not in this group during the pandemic [22].

Family and peer support

Support from family and friends is crucial. In our study, low support from family and peers was indeed identified as a sig-

nificant burden, whereas significant support from family and friends mitigated feelings of loneliness. Similar analyses were conducted in the United Kingdom right after the end of the pandemic, where youth aged 11 to 16 years ($n = 894$) were studied in terms of loneliness, social contacts, relationships with parents, and mental health difficulties during the first 11 weeks of lockdown and a month later ($n = 443$). It was confirmed that youth maintaining closer relationships with parents reported significantly fewer serious mental health problems and a lower level of loneliness [23].

Social media engagement

Spending a significant amount of time on social media does not protect youth from loneliness; in fact, it has quite the opposite effect. Teenagers using social media for more than 4 hours a day reported feeling lonely over twice as often as those less active on social media (39.3% vs 16.9%). Such a dependency has been confirmed in multiple studies on young people's Internet use [24–26]. However, the causal relationship might actually be the inverse. As Cauberghe et al. argue, it may be the case that lonelier young people turn to social media more often to seek and establish social contacts [27]. In the virtual world, young people can form real relationships and engage in positive interactions, such as developing their passions or finding others with similar interests. The COVID-19 pandemic has heightened both the challenges and opportunities associated with social media use [28]. During periods of social distancing, these platforms were an irreplaceable and sometimes the only possible way to keep in touch with peers [29], school, and extended family over many weeks [30]. Moreover, having positive and entertaining experiences online, like viewing humorous content, helped mitigated feelings of loneliness and stress.

Study limitations and strengths

We are aware of a number of potential limitations of our study. Firstly, loneliness was measured using only a single question (although some evidence suggests that this approach is as effective as more complex measurement scales) [31]. Secondly, it is difficult to establish causal relationships based on such subjective data from cross-sectional studies – however, as we have mentioned, our method of questioning about the pandemic's impact on various aspects of life maintained a sequential order in the relationships studied.

A major strength of our study, on the other hand, is the large, uniform research sample that is representative of the country in terms of gender and place of residence. The fact that the study was conducted as part of the latest round of the international HBSC research network guarantees high-quality data obtained using a consistent protocol across all participating countries [32]. This facilitates future international comparisons considering cultural, geographical, and economic differences. The use of online survey methods was another strength, promoting anonymity and encouraging more candid responses to sensitive questions, especially regarding mental health. The statistical methods, including logistic regression, enabled a thorough examination of factors relating to the pandemic's impact on youth well-being. It is also noteworthy that literature includes few such comprehensive studies on youth loneliness in Poland. The results obtained provided answers to all the research questions posed, thereby setting clear directions for the development of interventions and programs aimed at mitigating the negative effects of the pandemic on this group.

Conclusions

The findings of this study provide critical insights into the effects of the COVID-19 pandemic on adolescent loneliness in

Poland, responding to two fundamental questions. Firstly, the degree to which the pandemic's negative impacts on various life areas heighten feelings of loneliness among adolescents is substantial: our analysis indicates that disruptions caused by the pandemic in areas such as family dynamics, mental health, and school life significantly elevate the frequency of loneliness. These findings are corroborated by the data showing nearly one-third of the surveyed students reporting frequent feelings of loneliness, a figure resonating with global studies.

Secondly, when adjusting for demographic factors, family and peer support, and social media engagement, the significance of the pandemic's impact remains robust. This study underlines the disproportionate effect on specific demographics,

particularly girls and older adolescents, and the amplifying role of excessive social media use.

In light of these observations, it is clear that the COVID-19 era has posed unique challenges for adolescents, necessitating targeted interventions. Programs aimed at bolstering mental health and emotional well-being must consider the nuanced needs of different age groups and genders. There is an urgent need for educational initiatives that foster healthy social media habits, recognizing its double-edged influence on adolescent loneliness. Moreover, enhancing family and peer support networks emerges as a key strategy in mitigating loneliness. Interventions should focus on strengthening these relationships, providing tools and resources for families and peer groups to support their adolescents effectively.

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