

# Gender-specific risk factors for suicidal ideation among adolescents in urban Paraguay during the COVID-19 pandemic: A baseline survey

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**Objectives:** This study aims to investigate the factors contributing to suicidal ideation among Paraguayan adolescents during the COVID-19 pandemic, focusing on sex differences. The study seeks to provide valuable insights for targeted suicide prevention education interventions tailored to adolescents' needs. **Methods:** The study utilized stratified random sampling involving 12,146 adolescents aged 13-16 from 21 health promotion schools in Limpio, Paraguay. A total of 567 participants completed a survey through face-to-face interviews. Data analysis was conducted using binary logistic regression, with suicidal ideation in the past 12 months as the dependent variable, and socio-demographic, psychological, health behavior, violence, and supportive factors independent variables. **Results:** Overall, 17.6% of boys and 32.2% of girls reported experiencing suicidal ideation in the last 12 months. Factors such as depression and loneliness were significant factors of suicidal ideation among boys, while girls were significantly affected by their BMI, depression, loneliness, alcohol and drug use, bullying experiences, and parental understanding. **Conclusion:** While school health policies have traditionally focused on physical health, the COVID-19 pandemic underscores the importance of a comprehensive approach that addresses mental health as well. Developing intervention programs that encompass both mental and physical health and take into account cultural considerations can promote equity and prevent adolescent suicide.

**Key words:** suicidal ideation, suicide prevention education, adolescent, COVID-19, Paraguay

## I. Introduction

Adolescent suicide is a complex and multifaceted public health issue (Evans, Hawton, Rodham, & Deeks, 2005). While suicidal thoughts may not always lead to suicide, they are still a concerning sign that requires thorough management. Approximately one-third of adolescent worldwide report having experienced

suicidal thoughts at least once in their lives, and one-tenth attempt suicide (Nock et al., 2013). Mental health problems such as depression, bipolar disorder, and panic disorder are identified as the primary causes of youth suicide in both developed and developing countries (Institute of Medicine, 2002). Furthermore, gender differences in suicidal behavior are known to exist, with female adolescents exhibiting suicide rates

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that are two to three times higher than those of male adolescents (Garrison, McKeown, Valois, & Vincent, 1993; Hawton, Sutton, Haw, Sinclair, & Harriss, 1992; Lewinsohn, Rohde, & Seeley, 1996). These factors include the lethality of suicide attempt methods, the accuracy of reporting past suicidal behavior, the prevalence of depression, and gender differences in substance use disorders (Lewinsohn, Rohde, Seeley, & Baldwin, 2001). One possible explanation for the increase in suicide attempts among young women is the rising rate of depression (Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993). Suicidal behavior, which can be divided into thoughts and attempts, is one of the most significant symptoms of Major Depressive Disorder (MDD) according to the DSM-IV (Harrington, Fudge, Rutter, Pickles, & Hill, 1990). Previous research has consistently found a link between depression and suicidal behavior in adolescents (Brent et al., 1993; Garrison, Jackson, Addy, McKeown, & Waller, 1991). As a result of these findings, many countries have emphasized the development of gender-specific suicide prevention programs for adolescents. However, interventions in low-income countries have often either overlooked gender differences or been unfriendly to effective suicide prevention efforts (Hamilton & Klimes-Dougan, 2015).

The prevalence of mental health problems among adolescents in low-income countries is similar to that in high-income countries, but the majority of adolescents in low-income countries are more likely to lack access to mental health care than in high-income countries (Patel et al., 2007). This creates a significant imbalance between their mental health care needs and available resources (Belfer, 2008; Kieling et al., 2011). To address this issue, the United Nations [UN] has proposed further research on the role of public health policy in adolescent mental health to promote awareness of youth's mental health status and enhance their life, interpersonal, and emotional skills (UN, 2014).

Paraguay, on the other hand, is a landlocked country in South America and is classified as a lower-middle income country (Central Intelligence Agency, 2014). The Ministry of Health and Social Welfare is responsible for Paraguay's universal healthcare system, which is delivered primarily by health center (World Health Organization [WHO], 2017a). Mental health services in Paraguay account for only 1.84% of the total health budget. This is lower than the global average of 2.5% and the WHO Americas Region's 11.8% (Jaeschke et al., 2021). In addition, the lack of community-based services for young people creates geographic barriers to timely mental health care and access to treatment (Aboaja, Wahab, Cao, O'Higgins, & Torales, 2022). Research on the mental health of youth in Paraguay shows that one of the biggest problems is the lack of specific mental health plans or strategies for children and adolescents. The mental health activities for adolescents in Paraguay are carried out in WHO/PAHO-designated health promotion schools, and approximately 20% of primary and secondary schools have school-based health promotion activities to promote mental health and prevent mental disorders (WHO, 2017a).

The present study aims to identify factors affecting suicidal ideation among male and female adolescents in Paraguay's Health Promotion Schools, as a part of future Official Development Assistance (ODA) projects. While existing international studies have examined family and friend factors affecting adolescent mental health little is known about these factors in Paraguay, and further research is needed to understand how they may differ by country (Hourri, Nam, Choe, Min, & Matsumoto, 2012). It is important to note that suicidal thoughts do not always lead to suicide, and this study does not assume a direct causal relationship between the two. However, it is still crucial to identify the factors that contribute to suicidal ideation among adolescents in order to develop effective suicide

prevention interventions. Moreover, COVID-19 has raised concerns about adolescent mental health, as studies show that adolescents are at higher risk of depression due to social isolation and fear (Gladstone et al., 2021; Rehman et al., 2021; Shader, 2020). Depression is a leading cause of suicidal ideation, which may lead to actual suicide, requiring thorough management (McIntyre & Lee, 2020).

While previous research has identified various factors that contribute to adolescent suicidal ideation, there are still gaps in our understanding of the specific factors that may be most relevant to adolescents in Paraguay (Chin, Lee, & So, 2011). By identifying these factors, this study aims to inform the development of targeted suicide prevention education interventions as part of ODA projects, with the ultimate goal of reducing the incidence of adolescent suicide in Paraguay.

## II. Methods

### 1. Study population

This was a cross-sectional study based on basic survey data from students at 21 health promotion schools in Limpio, Paraguay, which is a target area of the KOICA (Korea International Cooperation Agency) health project. Limpio is located about 40 minutes' drive from Asuncion, the capital of Paraguay, and is an urban and rural complex consisting of 12 districts. The total population is 103,834, where 52,986 (51.03%) are male and 50,848 (48.7%) are female. A total of 21 health promotion schools registered in Limpio City Council were selected to take part in the study, and participants were adolescent aged 13-16 at the health promotion schools.

### 2. Materials

The questionnaire used was based on the WHO

Global School-based Student Health Survey and validated by experts from the Health Promotion Bureau (Dirección General de Promoción de la Salud in the Paraguayan Ministry of Health and Welfare) and WHO Pan American Health Organization.

The questionnaire included respondents' demographic characteristics, health status, awareness of health, health knowledge and behavior, health risk factors, and lifestyle. The language of the questionnaire was Spanish and English, while only the Spanish version was used in the survey.

#### 1) Study variables

Suicidal ideation, the dependent variable of this study, was assessed with the item "I have seriously considered suicide within the last 12 months" (Gijzen et al., 2021) answered as a dichotomous variable: (1) I have seriously considered suicide within the last 12 months, or (2) I have not seriously considered suicide within the last 12 months (Valois, Zullig, & Hunter, 2015).

The choice of variables in this study was guided by the literature on factors associated with adolescent suicidal ideation, as well as the WHO Global School-based Student Health Survey questionnaire. The study aimed to investigate the relationship between various socio-demographic, psychological, health behavioral, violence, and supportive factors and suicidal ideation among adolescents.

According to a previous meta-analysis on factors of adolescent suicidal ideation, the independent variables in this study were classified into socio-demographic, psychological, health behavioral, violence, and supportive factors. Socio-demographic factors were age, grade, number of close friends, BMI (WHO, n.d.). Psychological factors were experience of depression, experience of loneliness, and subjective perception of weight, all within the last 30 days. Health behavioral factors included drinking, sex, drug use, and physical

activities, all within the last 12 months. Violence factors were physical fighting, bullying, and being subjected to physical/sexual harassment, both within the last 30 days. Supportive factors were degree of parental understanding, school attendance, and participation in community activities.

### 3. Research design

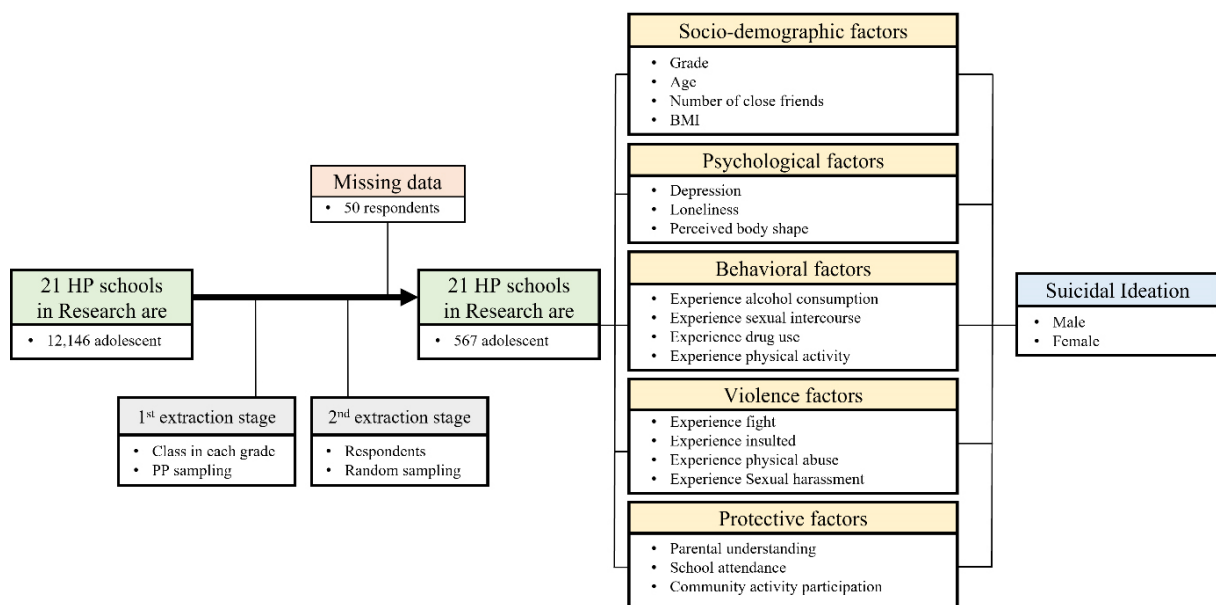
This research is a cross-sectional survey, and the research design is based on a primary survey of students in Limpio, Paraguay. In order to understand the impact of these factors on suicidal ideation among male and female adolescents in rural area, we set up a research model as follows [Figure 1].

### 4. Data collection

Stratified random sampling was performed on a total of 12,146 adolescent from 21 health promotion schools in Limpio, Paraguay. The school was the stratification unit, and classes were selected by simple randomization considering sex at each school. In the first extraction stage, classes in each grade were

selected by proportionate probability sampling. In the second extraction stage, participants were selected by simple random sampling proportional to sex. While there were no dropouts or missing values in the data, 50 respondents who did not satisfy the subject criteria were excluded, and a total of 567 respondents were selected as the study subjects. Subject Criteria was a case of failing to complete the questionnaire or quitting during the survey. In this situation, we no longer forced the survey.

The survey was organized by the Paraguayan Ministry of Health and received parental consent and student consent from all youth students. Afterwards, teachers at the target school were educated to explain the survey to students, and survey operators conducted survey education, place rental, and response to unexpected situations. Twenty survey operators were selected and trained on the survey for about 5 days. A pilot survey was conducted from October 17 to 20, 2021, to identify any potential issues with the survey. The main survey period was from November 1 to 22, 2021, and individual face-to-face interviews were conducted at each health promotion school by the assigned survey staff.



[Figure 1] Research design

## 5. Data analysis

Statistical analysis was conducted using SPSS 26.0, and GraphPad was used to graph the analysis. Regarding the univariate analysis, it was conducted to identify the significant variables associated with suicidal ideation in each category of variables (socio-demographic, psychological, health behavioral, violence, and supportive). This approach helps to understand the contribution of each variable to the outcome variable before including them in the multivariable model. It also helps to identify the potential confounders that may need to be controlled for in the multivariable analysis.

First, a frequency analysis was conducted to understand the differences in participants' general characteristics by sex. Second,  $\chi^2$ -test was used to analyze the relationship between suicidal ideation and socio-demographic, psychological, behavioral, violence, and supportive factors. Third, binary logistic regression was performed using as independent variables those significant variables in the univariate analysis to identify the factors influencing suicidal ideation according to sex differences. The significance level was .05.

## 6. Ethics Approval

This study was approved by Yonsei University's Mirae Campus Bioethics Review Committee (Management No. 1041849-202104-SB-060-01) and the Paraguayan Ministry of Health and Welfare (MINISTERIO DE SALUD PUBLICA Y BIENESTAR SOCIAL) (Management No. SIMESE 131.239/2021).

## III. Results

### 1. General characteristics

General characteristics of male and female

adolescent participants are shown in (Table 1). As per socio-demographic characteristics, out of 567 participants, 42.0% (238) were male, and 58.0% (329) were female. The mean age was 15.96 ( $\pm 0.784$ ) for boys and 15.95 ( $\pm 0.793$ ) for girls. Most respondents reported having more than four close friends, namely 176 (73.9%) boys and 168 (51.1%) girls. In terms of body mass index (BMI) of students, the most boys, 189 boys had normal weight, (79.4%), followed by 35 overweight (14.7%) and 14 obese (5.9%). As for girls, 200 (60.8%) were normal weight, followed by 68 (20.7%) obese and 61 (18.5%) overweight.

As per psychological factors, 125 boys (52.5%) and 233 (70.8%) girls reported feeling depressed. There were 127 boys (53.4%) and 242 girls (73.6%) felt lonely. A total of 140 boys (58.8%) reported having normal weight, and 98 boys (41.2%) recognized them as overweight or obese. There were 173 girls (52.6%) reported having normal weight, and 156 girls (47.4%) perceived themselves as overweight or obese.

Among the behavioral characteristics, 60 (25.2%) boys and 111 (33.7%) girls said they had drinking experience. Additionally, 29 (12.2%) boys and 21 (6.4%) girls reported having sex. In terms of drug use, 42 (17.6%) boys and 27 (8.2%) girls said they had experience using drugs. As per physical activities, 113 boys (47.5%) reported physical activity 1-5 days a week, 93 boys (39.1%) said they everyday do it, and 32 boys (13.4%) reported zero days of physical activity a week. Meanwhile, 178 girls (54.1%) reported physical activity 1-5 days a week, 77 girls (23.4%) reported zero days of physical activity a week, and 74 girls (22.5%) said they everyday do physical activities.

As per violence factors, 18 boys (7.6%) and 30 girls (9.1%) reported having fought. Moreover, 34 boys (14.3%) and 67 girls (20.4%) reported being bullied; additionally, 41 boys (17.2%) and 40 girls (12.2%) reported being physically harassed, while 7 boys (2.9%) and 8 girls (2.4%) reported being sexually harassed.

In terms of supportive factors, 117 boys (49.2%) and 129 girls (39.2%) reported they always or almost always understand the concerns of parents or guardians, 191 boys (80.3%) and 252 girls (76.6%) reported always attending school. Moreover, 110 boys (46.2%) and 168 girls (51.1%) reported participating in community activities.

In terms of suicidal ideation, the result showed that 17.6% of boys and 32.2% of girls reported having experienced suicidal thoughts within the last 12 months, more girls than boys may have engaged in

suicidal ideation. Among those who reported experiencing suicidal ideation, the result suggested that 33.3% of boys and 22.6% of girls reported having attempted suicide, boys may have a higher tendency for suicidal ideation to develop into suicide attempts.

## 2. Relationship between characteristics and suicidal ideation by sex

We analyzed how the relationship of socio-demographic, psychological, behavioral,

〈Table 1〉 General characteristics of respondents

unit: n(%)

Variables		Boys (n=238)	Girls (n=329)
Socio-demographic factors	Grade		
	7th	78 (32.8)	110 (33.4)
	8th	92 (38.7)	122 (37.1)
	9th	68 (28.6)	97 (29.5)
	Age (M±SD)	15.96 ± 0.784	15.95 ± 0.793
	Number of close friends		
	0	12 ( 5.0)	13 ( 4.0)
	1-3	50 (21.0)	148 (45.0)
	≥ 4	176 (73.9)	168 ( 5.1)
	BMI		
Normal (18.5 - 24.9)	189 (79.4)	200 (60.8)	
Overweight (25.0 - 29.9)	35 (14.7)	61 (18.5)	
Obesity (≥ 30)	14 ( 5.9)	68 (20.7)	
Psychological factors	Depression (in the past 30 days)		
	No	113 (47.5)	96 (29.2)
	Yes	125 (52.5)	233 (70.8)
	Loneliness (in the past 30 days)		
	No	111 (46.6)	87 (26.4)
	Yes	127 (53.4)	242 (73.6)
Perceived body shape (in the past 30 days)	Normal	140 (58.8)	173 (52.6)
	Overweight, obesity	98 (41.2)	156 (47.4)
Behavioral factors	Experience alcohol consumption (in the past 12 month)		
	No	178 (74.8)	218 (66.3)
	Yes	60 (25.2)	111 (33.7)
	Experience sexual intercourse (in the past 12 month)		
	No	209 (87.8)	308 (93.6)
	Yes	29 (12.2)	21 ( 6.4)
	Experience drug use (in the past 12 month)		
	No	196 (82.4)	302 (91.8)
	Yes	42 (17.6)	27 ( 8.2)
	Experience physical activity		
0 day	32 (13.4)	77 (23.4)	
1-5 days	113 (47.5)	178 (54.1)	
Always	93 (39.1)	74 (22.5)	

	Variables	Boys (n=238)	Girls (n=329)
Violence factors	Experience fight (in the past 30 days)		
	No	220 (92.4)	299 (90.9)
	Yes	18 ( 7.6)	30 ( 9.1)
	Experience insulted (in the past 30 days)		
	No	204 (85.7)	262 (79.6)
	Yes	34 (14.3)	67 (20.4)
	Experience physical abuse (in the past 30 days)		
	No	197 (82.8)	289 (87.8)
	Yes	41 (17.2)	40 (12.2)
	Experience sexual harassment (in the past 12 month)		
No	231 (97.1)	321 (97.6)	
Yes	7 ( 2.9)	8 ( 2.4)	
Protective factors	Parental understanding (in the past 30 days)		
	Never	33 (13.9)	47 (14.3)
	Sometimes	88 (37.0)	153 (46.5)
	Always	117 (49.2)	129 (39.2)
	School attendance (in the past 30 days)		
	0-1 per a week	2 ( 0.8)	5 ( 1.5)
	2-4 per a week	45 (18.9)	72 (21.9)
Always	191 (80.3)	252 (76.6)	
Community activity participation (in the past 30 days)			
No	128 (53.8)	161 (48.9)	
Yes	110 (46.2)	168 (51.1)	
Mental health related factors	Suicidal ideation (in the past 12 month)		
	No	196 (82.4)	223 (67.8)
	Yes	42 (17.6)	106 (32.2)
	Suicide attempt* (in the past 12 month)		
	No	28 (66.7)	82 (77.4)
Yes	14 (33.3)	24 (22.6)	

**Notes.** \* Only those students who experienced suicidal ideation responded

violence, and supportive factors with suicidal ideation differed by sex (Table 2). Looking at suicidal ideation and socio-demographic characteristics, 42 boys (17.6%) and 106 girls (32.2%) had suicidal ideation. Higher rates of suicidal ideation were shown in girls than boys, and a significant difference was observed ( $p < .001$ ). For boys, there was no significant difference in suicidal ideation by grade, number of close friends, or BMI, while for girls, there was a significant difference in suicidal ideation by BMI. It was found that 46.2% of girls with BMI indicating normal weight, 38.7% of girls with BMI indicating being obesity, and 15.1% of girls with BMI indicating overweight reported suicidal ideation, showing significant differences in suicidal ideation rate by BMI ( $p < .001$ ).

Regarding suicidal ideation according to

psychological factors, boys showed significant differences in suicidal ideation according to depression and loneliness, while girls' suicidal ideation significantly differed based on depression, loneliness, and subjective weight perception. A total of 83.3% of boys ( $p < .001$ ) and 90.6% of girls with suicidal ideation had experienced depression ( $p < .001$ ). Moreover, 78.6% of boys ( $p < .001$ ) and 61.3% of girls with suicidal ideation felt lonely ( $p < .01$ ). Additionally, 58.5% of girls with suicidal ideation perceived themselves as overweight or obese ( $p < .01$ ).

Regarding suicidal ideation in connection with health-related behavioral factors, there were significant differences by drinking and drug experience for both male and girls, but there was no significant difference by sexual or physical activity.

73.3% of male students who said they had suicidal thoughts said they had drunk alcohol ( $p < .05$ ), 56.6% of female students who said they had suicidal thoughts answered that they had drunk alcohol ( $p < .001$ ). 38.9% of male students who said they had thought about suicide had experience using drugs ( $p < .05$ ), 19.8% of female students who said they had thought of suicide said they had used drugs ( $p < .001$ ).

In terms of violence factors, there was a significant difference in suicidal ideation by fight experience and bullying experience in both male and girls, but there was no statistically significant difference by physical or sexual harassment experience. A total of 16.7% of boys ( $p < .05$ ) and 17.0% of girls with suicidal ideation experienced fighting ( $p < .01$ ). Moreover, 31.0% of boys ( $p < .01$ ) and 34.9% of girls with suicidal ideation

(Table 2) Related variables by suicide ideation among adolescents boys and girls

unit: n(%)

Variables	Suicide ideation						
	Boys (n=238)		$\chi^2(p)$	Girls (n=329)		$\chi^2(p)$	
	No	Yes		No	Yes		
Sex	196(82.4)	42(17.6)		223(67.8)	106(32.2)	15.202 (<.001)	
Grade							
7th	69(35.2)	9(21.4)	3.146 (.207)	76(34.1)	34(32.1)	.197 (.906)	
8th	74(37.8)	18(42.9)		81(36.3)	41(38.7)		
9th	53(27.0)	15(35.7)		66(29.6)	31(29.2)		
Socio-demographic factors	Number of close friends						
0	10( 5.1)	2( 4.8)	.242 (.886)	7( 3.1)	6( 5.7)	6.091 (<.05)	
1-3	40(20.4)	10(23.8)		92(41.3)	56(52.8)		
≥ 4	146(74.5)	30(71.4)		124(55.6)	44(41.5)		
BMI	Normal(18.5 - 24.9)		3.678 (.298)	151(67.7)	49(46.2)	31.002 (<.001)	
Overweight(25.0 - 29.9)	31(16.0)	4( 9.1)		45(20.2)	16(15.1)		
Obesity(≥ 30)	8( 4.1)	6(13.6)		27(12.1)	41(38.7)		
Psychological factors	Depression (in the past 30 days)						
	No	106(54.1)	7(16.7)	19.417 (<.001)	86(38.6)	10( 9.4)	29.505 (<.001)
	Yes	90(45.9)	35(83.3)		137(61.4)	96(90.6)	
	Loneliness (in the past 30 days)						
	No	102(52.0)	9(21.4)	13.024 (<.001)	46(20.6)	41(38.7)	12.036 (<.01)
	Yes	94(48.0)	33(78.6)		177(79.4)	65(61.3)	
Perceived body shape (in the past 30 days)							
Normal	118(60.2)	22(52.4)	.874 (.390)	129(57.8)	44(41.5)	7.692 (<.01)	
Overweight, obesity	78(39.8)	20(47.6)		94(42.2)	62(58.5)		
Behavioral factors	Experience alcohol consumption (in the past 12 month)						
	No	152(85.4)	44(73.3)	4.491 (<.05)	172(77.1)	46(43.4)	36.573 (<.001)
	Yes	26(14.6)	16(26.7)		51(22.9)	60(56.6)	
	Experience sexual intercourse (in the past 12 month)						
	No	175(83.7)	21(72.4)	2.245 (.190)	212(95.1)	96(90.6)	2.436 (.147)
	Yes	34(16.3)	8(27.6)		11( 4.9)	10( 9.4)	
	Experience drug use (in the past 12 month)						
	No	185(84.1)	11(61.1)	6.046 (<.05)	217(97.3)	85(80.2)	27.956 (<.001)
	Yes	35(15.9)	7(38.9)		6( 2.7)	21(19.8)	
	Experience physical activity						
0 day	22(11.2)	10(23.8)	4.749 (.123)	48(21.5)	29(27.4)	2.506 (.286)	
1-5 days	96(49.0)	17(40.5)		120(53.8)	58(54.7)		
Always	78(39.8)	15(35.7)		55(24.7)	19(17.9)		



Variables	Suicide ideation						
	Boys (n=238)		$\chi^2(p)$	Girls (n=329)		$\chi^2(p)$	
	No	Yes		No	Yes		
Violence factors	Experience fight (in the past 30 days)		6.046 (.05)	211(94.6)	88(83.0)	11.666 (.01)	
	No	185(94.4)					35(83.3)
	Yes	11( 5.6)	7(16.7)				
	Experience insulted (in the past 30 days)		11.569 (.01)	193(86.5)	69(65.1)	20.389 (.001)	
	No	175(89.3)					29(69.0)
	Yes	21(10.7)	13(31.0)				
	Experience physical abuse (in the past 30 days)		.631 (.499)	200(89.7)	89(84.0)	2.204 (.151)	
	No	164(83.7)					33(78.6)
	Yes	32(16.3)	9(21.4)				
	Experience sexual harassment (in the past 12 month)		.592 (.358)	220(98.7)	101(95.3)	3.443 (.117)	
No	191(97.4)	40(95.2)					
Yes	5( 2.6)	2( 4.8)					
Protective factors	Parental understanding (in the past 30 days)		1.495 (.480)	23(10.3)	24(22.6)	45.081 (.001)	
	Never	28(14.3)					5(11.9)
	Sometimes	69(35.2)					19(45.2)
	Always	99(50.5)	18(42.9)				
	School attendance (in the past 30 days)		.432 (.677)	179(80.3)	73(68.9)	6.489 (.05)	
	0-1 per a week	157(80.1)					34(81.0)
	2-4 per a week	37(18.9)					8(19.0)
	Always	2( 1.0)	0( 0.0)				
	Community activity participation (in the past 30 days)		.232 (.734)	108(48.4)	53(50.0)	.071 (.814)	
	No	104(53.1)					24(57.1)
Yes	92(46.9)	18(42.9)					

reported being bullied ( $p < .001$ ).

In terms of supportive characteristics, for boys, parental understanding, school attendance, and community activity participation were not significantly associated with suicidal ideation. However, for girls, significant differences in suicidal ideation were found based on parental understanding and school attendance. Specifically, 64.2% of girls with suicidal ideation reported that their parents did not always understand them, and 22.6% reported that their parents did not understand them at all ( $p < .001$ ). Regarding school attendance, 68.9% of girls with suicidal ideation attended school 0 or 1 time a week within the last 30 days ( $p < .05$ ).

### 3. Factors influencing suicidal ideation by sex

We conducted logistic regression analysis to identify the factors affecting suicidal ideation among boys and girls and verify the relative influence of each variable

(Table 3). For boys, depression, loneliness, drinking, drug experience, fighting, and bullying experience were entered as independent variables, and depression and loneliness were found to be significant factors [Figure 1]. Boys who reported being depressive feeling within the last 30 days had 4.006 times higher suicidal ideation rate than those who reported not being depressive feeling ( $p < .01$ ); additionally, boys who experienced loneliness within the last 30 days had 2.154 times higher suicidal ideation rate than those who reported they did not feel lonely ( $p < .05$ ).

For girls, BMI, depression, loneliness, weight perception, drinking, drug experience, fighting, bullying experience, and parental understanding were used as independent variables, and BMI, depression, loneliness, drinking, drug experience, bullying experience, and parental understanding were found to be significant factors [Figure 2]. Girls with an overweight BMI were 2.312 times more likely to

experience suicidal ideation than those with an average BMI ( $p < .05$ ), and girls with a BMI measured as obese had a suicidal ideation rate 4.115 times higher than girls with an average weight BMI ( $p < .001$ ). To clarify, being overweight or obese is not better than having an average BMI. These results were presented incorrectly in the previous version.

Girls who reported being depressed within the last 30 days were 2.738 times more likely to think of suicide than girls who reported not being depressed ( $p < .01$ ), and girls who felt lonely within the last 30 days were 2.210 times more likely to think of suicide than those who did not feel lonely ( $p < .05$ ). Among the

behavioral factors, girls who reported drinking within the last 12 months had a rate of suicidal ideation 3.418 times higher than those who had no drinking experience ( $p < .001$ ). It was found that girls with drug experience within the last 12 months had a suicidal ideation rate 5.014 times higher than girls without drug experience ( $p < .01$ ). Girls who had been bullied had a rate of suicidal ideation 2.083 times higher than girls who had not been bullied ( $p < .05$ ). Finally, girls who felt their parents did not understand them at all had a rate of suicidal ideation 2.481 times higher than girls who thought their parents understood them always or most of the time ( $p < .001$ ).

<Table 3> Influencing factors for suicide ideation among boys and girls based on multiple logistic regression

Variables	Suicide ideation						
	Boys (n=238)			Girls (n=329)			
	OR	95% CI	P	OR	95% CI	P	
Socio-demographic factors	BMI						
	Normal (18.5 - 24.9)			1			
	Overweight (25.0 - 29.9)	-	-	2.312	1.019-5.247	<.05	
	Obesity ( $\geq 30$ )			4.115	1.573-10.763	<.001	
Psychological factors	Depression (in the past 30 days)						
	No	1		1			
	Yes	4.006	1.628-9.855	<.01	2.738	1.184-6.331	<.01
	Loneliness (in the past 30 days)						
	No	1		1			
	Yes	2.154	0.912-5.090	<.05	2.210	1.023-4.774	<.05
Behavioral factors	Perceived body shape (in the past 30 days)						
	Normal	-	-	1			
	Overweight, obesity			.693	0.702-2.390	.408	
Behavioral factors	Experience alcohol consumption (in the past 12 month)						
	No	1		1			
	Yes	0.692	0.319-1.501	.352	3.418	1.849-6.317	<.001
	Experience drug use (in the past 12 month)						
No	1		1				
Yes	1.575	0.259-9.588	.622	5.014	2.515-9.814	<.01	
Violence factors	Experience fight (in the past 30 days)						
	No	1		1			
	Yes	1.178	0.196-7.062	.858	4.997	0.874-8.562	.070
	Experience insulted (in the past 30 days)						
No	1		1				
Yes	1.949	0.814-4.667	.134	2.083	1.056-4.108	<.05	
Protective factors	Parental understanding (in the past 30 days)						
	Always/ most	-	-	1			
	Never/ sometimes			2.481	1.567-3.929	<.001	
	Nagelkerke R <sup>2</sup>		.336		.414		
	Hosmer and Lemeshow Test		.357		.186		

## IV. Discussion

In Latin America, adolescent suicide began to be recognized as a social problem later than in other continents, and related studies mainly attempted to analyze the determinants and risk factors of juvenile suicides (Im, Oh, & Suk, 2017; Price & Khubchandani, 2017; Teti, Rebok, Rojas, Grendas, & Daray, 2014). Looking at the main risk factors of adolescent suicide, psychological factors related to “relationships” (e.g., relationships with family members, peers, and other acquaintances), drinking, and drug taking are factors influencing suicidal thoughts and suicide attempts (Borges, Benjet, Medina-Mora, Orozco, & Nock, 2008; De Luca, Wyman, & Warren, 2012).

According to the results presented in <Table 2>, the rate of suicidal ideation was higher among female than male adolescents, which is in line with previous studies that showed that girls think more about suicide on average than boys (Salway et al., 2019; Simons & Murphy, 1985). In addition, it was found that BMI, drinking, drug experience, peer bullying experience, and parental understanding had a significant influence on girls’ suicidal ideation <Table 3>. This shows that adolescent girls are more vulnerable to high-risk behaviors such as drinking and drug taking and to physical appearance than adolescent boys, and that forming positive and supportive relationships with parents is more important for girls than boys (Lee et al., 2019).

In Latin America, underage drinking and drug use are important social problems, which have increased during COVID-19 (Lustig & Tommasi, 2020; Mejía et al., 2020). The average age for starting illegal drug use in Paraguay was 12.2 years, which is lower than in other countries (Substance Abuse and Mental Health Services Administration, 2016). This means that adolescent students are more likely to be adversely affected by drug use younger age, as reflected by the

finding of this study that girls with drug experience had a higher suicidal ideation rate. Paraguay’s school health education programs do not include prevention and management of alcohol and drugs, and programs that include effective interventions for adolescent by sex are lacking. Considering the results of this study and previous research, it is necessary to add educational content to the prohibition of drug use when developing school health education programs, and efforts should be made to increase effectiveness by using different approaches by sex. There is a strong need for alternatives to prevent poor health behavior from worsening over generations.

The main cause of suicide or suicide attempts in the youth age group is psychological factors such as depression and loneliness (Ge, Lorenz, Conger, Elder, & Simons, 1994; Ge, Natsuaki, & Conger, 2006). In particular, the participants in this study were adolescents aged between 13 and 16 years, which is in the later part of adolescence. Studies have shown that adolescents entering adulthood are more vulnerable to suicide, and the main cause was mental health issues due to environmental reasons (Arnett, 2001).

In this study, students who experienced suicidal ideation were likely to feel depressed and lonely <Table 3>, which are considered major factors of Paraguayan male and girls’ suicidal ideation (Zavala, 2022). The COVID-19 pandemic may also be a cause of depression and loneliness (Palgi et al., 2020). Adolescents who experienced the 2 years of COVID-19 pandemic were more depressed and lonely during this period, and suicidal ideation and suicide attempts of adolescents have rapidly increased in many countries (Bera, Souchon, Ladsous, Colin, & Lopez-Castroman, 2022; Ravens-Sieberer et al., 2022; Schleider et al., 2022). The number of individuals suffering from anxiety and depression in Paraguay during COVID-19 has also increased (de la Rosa et al., 2022), and although there have been no studies with adolescents,

research has shown that depression among Paraguayan college students and government officials has increased during COVID-19 (Kim, Lee, Kang et al., 2021; Torales et al., 2022).

Many countries around the world are introducing mental health intervention programs to support people suffering from “Corona Blues” (depression caused by COVID-19), targeting vulnerable groups including adolescent, elderly persons, and those living with disabilities. However, Paraguay’s mental health services are only 1.84% of Paraguay’s total healthcare budget (Aboaja et al., 2022), which is lower than the WHO’s Latin America average of 2.5%. In particular, Paraguay lacks mental health services for adolescent as well as national strategies and plans for the mental health of this age group compared to other countries in the region. Paraguay’s public health system is less developed than private healthcare and lacks infrastructure such as manpower and equipment. Under these circumstances, “social prescribing” used in the UK, Canada, Australia, and Korea may be an alternative to preventing and managing the mental health issues of young people in Paraguay (Drinkwater, Wildman, & Moffatt, 2019, Morse et al., 2022). Social prescribing enhances non-medical interventions and can be performed even in countries with insufficient medical resources. Also, it can be used to develop intervention programs to improve the psychological status of socially vulnerable groups such as adolescents and elderly persons (Kim, Lee, Chung et al., 2021). For adolescent who feel a high level of depression and loneliness, a “targeted intervention”-type program is required, and a way to activate the “Psychiatric Quarantine” program using social prescribing for sustainable management is also needed.

School health policies and practices in the field of international development have primarily focused on physical health, including disease prevention and management, and nutrition. However, the COVID-19

pandemic has highlighted the need for a more holistic approach to school health that considers psychological factors such as mental health. With the release of the Global Accelerated Action for the Health of Adolescents (AA-HA!) guidance, the WHO advocates for integrated management of adolescent health (WHO, 2017b). In particular, it promotes a strategic means to engage not only the health sector but also the education sector by certifying schools where adolescents spend the most time as Health Promoting Schools. In Latin America, including Paraguay, WHO/PAHO certifies schools that meet certain criteria as Health Promoting Schools. WHO/PAHO-accredited health promotion schools follow guidelines for managing adolescent substance use, obesity, nutrition, and mental health. In particular, WHO/PAHO and previous research have highlighted the risks to adolescent mental health following the COVID-19 pandemic, with increases in depression, anxiety, and other emotions among adolescents since 2020 (Gallegos et al., 2021; Volpi, Triantafilo, Ramírez, & Knight, 2021). In particular, studies have shown a sharp increase in suicide attempts due to depression and anxiety among adolescents in Latin American and Caribbean countries (Tausch et al., 2022). These findings highlight the need to develop a range of interventions for adolescent mental health when developing programmes for Latin American adolescents. They also suggest the need to diversify approaches when developing interventions for schools. When Korea conducts school health projects in countries in Latin America, it is important to make good use of WHO’s Health Promoting School certification criteria. Korea has a well-developed system for promoting and supporting health-promoting schools, which has been instrumental in positively impacting not only students’ health behaviors but also their entire health experience (Kim & Kim, 2018). In particular, we educated students to live healthy lives through an integrated approach to student health (Kim

& Kim, 2021; Lee, Lee, & Baik, 2022). Based on these experiences, it is necessary to develop an integrated approach that includes mental health care when implementing health education in schools, a growing area of international development cooperation since the COVID-19 pandemic. In addition, as the results of this study show, mental health risks are different for adolescents by gender, so a more sensitive approach should be taken when applying mental health intervention programs to adolescents.

This study had several limitations, with implications for future related research. First, the cross-sectional design precluded accurately identifying causal relationship between variables. Second, since the study was conducted only with residents of Limpio, it cannot be generalized to other regions or countries. Third, since variables related to psychological factors such as depression and loneliness were cross-sectional questions, more sophisticated tools to measure the psychological status of adolescents should be used for in-depth research in the future.

## V. Conclusion

This study aimed to identify the factors influencing suicidal ideation by sex among Paraguayan adolescents during COVID-19. Schools are places where adolescent spend substantial time, and health education in schools has a greater impact on adolescent than other campaigns. This study is part of the efforts to explore the direction of school health in the field of international development during the post-COVID-19 period, with the aim of obtaining data to develop the suicide prevention curriculum.

First, female adolescents were found to have a high rate of suicidal ideation, and BMI, drinking, drug experiences, peer bullying experiences, and parental understanding significantly influenced suicidal

ideation. In particular, it is urgent to prevent and manage drinking and drug use, which are problematic in Paraguay, and alternatives are needed to prevent poor health behaviors from worsening through generations. Second, psychological factors in both male and female adolescents had a significant influence on suicidal ideation. For adolescent who feel a high level of depression and loneliness, targeted intervention-type programs as well as activation of the "Psychiatric Quarantine" program using social prescribing for sustainable management are needed. Third, an integrated approach program based on the results of this study is required to prevent and intervene in juvenile suicide. This study provides evidence that, along with the existing physical health promotion programs, school health during the post-COVID-19 period should incorporate interventions targeting psychological factors of suicidal ideation such as students' mental health.

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