# Original Article

# Effectiveness of a school-based mental health education program in an impoverished urban area of Peru

Ha Yun Kim[1,2] (iD), Eun Woo Nam[1,2], Ki Nam Jin[2] and Ae Young So[3]

**Abstract:** This study aimed to evaluate the effectiveness of a school-based mental health education program in preventing adolescent suicide attempts in an impoverished urban area in Peru, as part of an Official Development Assistance project by the Korea International Cooperation Agency. The PRECEDE-PROCEED model informed the effectiveness study. In this intervention, the participants were first to fifth grade students in public secondary schools. The pre-post intervention survey was conducted with a stratified random sampling method. A sample of 768 and 738 students in experimental and control groups was analyzed comparatively, using chi-squared tests and logistic regression. This study found that the program had a positive effect on adolescent mental health-related risk behaviors and suicide attempts in the experimental group compared to the control group. Thus, the intervention may have helped prevent the increase in mental health-related risk behaviors and suicide attempts. Further, parental affection, when included in the intervention, had a significant effect on suicide attempts. As such, the involvement of parental affection in the intervention might be effective in preventing suicide attempts. To enhance the effectiveness of interventions aiming to prevent adolescent suicide, the participation and attention of parents, as well as adolescents, must be encouraged. Further, to maintain the effectiveness of the intervention and expand coverage to other schools in the neighborhood, a strategy for project sustainability is needed, particularly with regards to capacity-building in schools and communities.

**Keywords:** health education, Korea International Cooperation Agency (KOICA), mental health, Official Development Assistance, Peru, PRECEDE-PROCEED, school health, suicide

## Introduction

Adolescents experience significant physical and mental transformations at both individual and social levels. These changes are especially important among low- and middle-income countries, as 90% of children and adolescents live in these countries (1,2). Adolescent suicide and mental health issues, including depression, bipolar disorder, and panic disorder, are cited as major causes of ill health among adolescents in both low- and middle-income countries, as well as in high-income countries (3). The prevalence of mental health problems among adolescents in low- and middle-income countries is 10–20%, which is similar to that of high-income countries (2,4,5). Further, the risk factors for mental disorders identified in low- and middle-income countries are similar to those found in high-income countries (2). Despite such high rates, most adolescents in low-income countries do not receive adequate mental health services, adding to the

1. Yonsei Global Health Center, Yonsei University, Wonju, Republic of Korea.
2. Department of Health Administration, College of Health Sciences, Yonsei University, Wonju, Republic of Korea.
3. Department of Nursing, Gangneung-Wonju National University, Wonju, Republic of Korea.

Correspondence to: Eun Woo Nam, Yonsei Global Health Center, Yonsei University, 1 Yonseidae-gil, Wonju-City, Gangwon-Do, 26493, Republic of Korea.  Email: ewnam@yonsei.ac.kr Tel.: +82-33-760-2413; Fax: +82-33-760-2519

broadening gap between the needs and availability of resources for such services (2,6). Peru has seen a high prevalence of suicide attempts and suicidal ideation, particularly in its impoverished urban areas (7). In a pre-intervention survey in 2014, Peru's impoverished areas showed a prevalence of 6.3% in suicide attempts, which is higher than the national average of 5.9%. Similarly, these impoverished areas have a prevalence of suicidal ideation of 25.7%, which is higher compared to the national average of 20.5% (7,8). Many existing studies (9–12) have sought to identify the factors related to adolescent suicidal behavior. However, most have been conducted in high-income countries. Intervention programs in low- and middle-income countries therefore merit further investigation.

The government of the Republic of Korea received an ODA (Official Development Assistance) request from the government of the Republic of Peru for a health promotion program in an impoverished urban area. The project locations are adjacent to the capital Lima, but the Korea–Peru health center was built in an impoverished area at the request of the Peruvian government in order to improve health care. This area was found to have an urgent need for a medical facility to improve its poor medical services, particularly since it continues to see a rapid growth in population (13). Accordingly, the Korea International Cooperation Agency (KOICA), the Ministry of Health of Peru and the regional government of Callao of Peru collaborated on the development of a health promotion program in North Lima and Callao (2013–2017). The Yonsei University, as a project management consultant, received funds from KOICA and dispatched experts to Peru to implement the program. The health promotion program includes a school health promotion program particularly focused on mental health (14).

One advantage of the familiar setting of school for the provision of mental health services is that students and families avoid the stigma and intimidation they may feel when they go to unfamiliar, and perhaps less culturally compatible mental health settings:

> Moreover, schools have a wealth of opportunities to acquire information on how children deal with physical and social stresses and challenges and on how they perform in the academic setting, on community-related roles in which children engage, and on the nature and extent of many sorts of interpersonal relationships (15).

KOICA's health promotion program remains significant as it serves as a guide and tool for the prevention of adolescent mental health problems based on the school environment. This program was designed to be evaluated and to report progress annually during the implementation period (14). It was carried out with the main goal of preventing adolescent suicidal behavior. The current study assessed the data on suicide attempts as well as the effectiveness of this particular program and its influential components.

This study aimed to evaluate the effectiveness of a school-based mental health education program in impoverished urban areas in Peru. First, the study assessed social, epidemiological, behavioral, environmental, educational, ecological, administrative and policy components to gauge the mental health status of adolescents. Second, through process, impact and outcome evaluations, it aimed to analyze the effectiveness of the intervention on adolescent suicide attempts.

## Methods

### Research design

The PRECEDE-PROCEED model informed the intervention(16) as shown in Figure 1 (supplementary material). This study was designed based on the guidelines set by the Transparent Reporting of Evaluations with Non-randomized Designs (TREND) group. The TREND guidelines were developed to increase transparency in reporting non-randomized trials through systematization (17).

### Intervention

The project team of KOICA–Yonsei conducted a pre-intervention survey and identified mental health needs. The results of the pre-intervention assessment in adolescents show that suicide attempts, suicidal ideation, and health risk behaviors such as drug use, high-risk sexual behavior, and physical abuse, and feelings of intimidation and humiliation, were more common. There was also a lack of closeness between parents and children. The project team then developed the school-based mental health education intervention based on the findings. Therefore, this intervention was carried out with the main goal of preventing adolescent suicidal behavior and reduce its risk factors.

Accordingly, this intervention consisted of mental health, smoking, drinking and drug use prevention and sexual education for students. Moreover, parents play an important role in the health behavior of their children, so health education sessions for parents and family workshops were conducted. This intervention was openly explained to all parents and/or guardians.

The final version of the intervention was assessed by the technical committee, which consisted of stakeholders at KOICA, Yonsei University, the Pan American Health Organization, the Ministry of Health of Peru and the Ministry of Education of Peru. The main roles of the technical committee were to develop and monitor the program and make decisions about further actions during meetings. Finally, the intervention was implemented across public secondary schools between March and November 2015. The proportion of parents participating was about 50%. All parents were welcome to participate.

### Participants

In this intervention, the target participants were all grade 1–5 students in public secondary school. The project team of KOICA–Yonsei visited 17 public secondary schools in the areas of Comas and Callao for the selection of schools. Schools were excluded if they already had mental health education programs or if they did not want to participate in such a program. In the end, four schools were assigned to the experimental group and two other schools were selected to be part of the control group. The sample size of the experimental group was 2144 students, distributed amongst 64 classrooms. The sample size of the control group was 2078 students, distributed amongst 84 classrooms. However, because a census was not conducted due to time and financial constraints, a stratified random sampling with replacement was carried out for 4222 students (six schools). The stratified units (classrooms) were set by the school. Students in each stratification (classroom) were selected through a simple random sampling for gender and random stratification was used to select the study sample. The sample was probabilistic, two-stage, and independent in each school area. In the first-stage sampling (classroom selection), a systematic sampling, with a probability proportional to the size of students, was used. In the second stage (student selection), a simple random sampling was carried out. To calculate the sample size, the formula used by the National Commission for Development and Life without Drugs in 'The 4th National Survey: Drug Use and Prevention of Students in Secondary School (2012)' was adopted and validated by the National Institute of Statistics and Informatics of Peru.

There was sample loss during the survey period, so the number of samples for the pre-assessment in 2014 and post-assessment in 2015 surveys is not the same. Finally, a sample of 768 students in 2014 (381 in the experimental group and 387 in the control group) and 738 students in 2015 (379 in the experimental group and 359 in the control group) was analyzed (Table 1-supplementary material). The sample calculation program, G*Power 3.1 (18), was used to confirm the appropriate sample size for the analyses of this study, following the sample calculation formula, and then Cohen's Priori Power Analysis method (19) was applied. Under the conditions of probability = 0.05, power = 0.95, and odds ratio = 1.5, the optimal sample size calculated was 417; therefore, our sample of 738 participants was deemed suitable for testing the logistic regression model.

### Scales of measurement

*Questionnaire.* A self-administered structured questionnaire was developed based on the 2010 Global School-based Student Health Survey in Peru and the World Health Organization (WHO) Global School-based Student Health Survey Questionnaire Modules (3,20). The Global School-based Student Health Survey questionnaire is a self-administered questionnaire that assesses risk factors and protective factors related to adolescents' behavior. The questionnaire was adopted after being reviewed by the Ministry of Health of Peru, the Pan American Health Organization and the KOICA Peru office from July to September 2014. Both questionnaires have been adopted by the WHO and have been used in many countries globally. The questionnaire was modified and translated into Spanish so that the information could be collected from the students in their native language. The questionnaire comprised 180 questions.

### Variables

A total of 35 variables were measured in the analysis. The independent variables included general

characteristics, health knowledge, program satis-faction, predisposing, reinforcing and enabling factors, behavioral and environmental factors, and psychological factors. In the reinforcing factors of the independent variable, the operational definition of parental affection refers to how often parents expressed their love for their child during the last 30 days. The scale was divided into 'always', 'almost always', 'sometimes', 'rarely', and 'never'. The dependent variable was a reported suicide attempt. Participants were asked about suicide attempts during the past year, to which they responded with either 'yes (0)' or 'no (1)'.

### Data collection

The pre-intervention survey was conducted from the 27th to the 31st of October, 2014, and the post-intervention survey was conducted after the completion of the intervention from the 25th to the 30th of November, 2015. The pre- and post-intervention surveys were conducted after obtaining an informed consent from the students and their parents or guardians. The students filled out the self-administered questionnaires. All data were treated as anonymous.

### Analytical method

The data analysis was carried out using the statistical package SPSS WIN 21.0, in which a $p$-value of less than 0.05 was considered statistically significant. A chi-squared test was conducted to test homogeneity between the experimental and control groups. The differences in predisposing, reinforcing and enabling factors, behavioral and environmental factors, mental health status, and suicide attempts between the experimental and control groups were compared using the chi-squared test. A logistic regression was performed for two purposes. The first was to compare the size of the change in suicidal behavior across the experimental and control schools, according to the 'participation in the program' variable, with the experimental group coded as '1' and the control group as '0'. The second was to assess whether psychological, environmental, behavioral, reinforcing, and enabling factors in the PROCEED model influenced suicide attempts. The fit of the model was tested using the Hosmer and Lemeshow test. The logistic regression model in this study was proven to be a good fit, as the $p$-values were above 0.05.

### Test of homogeneity

To check for significant differences between the experimental and control groups before the intervention of the school-based mental health education program, a test of homogeneity was conducted. The results of the analysis showed that there was no significant difference in general characteristics, predisposing, reinforcing, enabling, behavioral, environmental, psychological factors, and suicide attempt factors between the experimental and control groups. Thus, the groups were judged as homogenous (Table 2-supplementary material).

### Ethical considerations

This study was reviewed and approved by the Institutional Review Board (IRB) of Yonsei University (1041849-201410-BM-048-02). It was approved by the IRB (2014.10.17) of the Regional Health Directorate of Callao State Government in Peru. The IRB review and approval was also renewed annually from Yonsei University and the Direcciones Regionales de Salud Callao state government. Prior consent was obtained from each school administration and parents or guardians. Informed consent was obtained from individual participants. An anonymous questionnaire was used.

## Results

### Effectiveness of program on predisposing, reinforcing, and enabling factors

Predisposing factors were compared among those who participated in the program and those who did not participate. There was a significant difference in the stage of behavior change in terms of smoking ($\chi^2$ = 24.92, $p$ = <0.001), alcohol consumption ($\chi^2$ = 20.62, $p$ = <0.001), and contraception ($\chi^2$ = 8.52, $p$ = 0.036). There were significant differences in the reinforcing factors, including the number of close friends ($\chi^2$ = 10.26, $p$ = 0.006) and the level at which parents are understanding ($\chi^2$ = 8.56, $p$ = 0.014). Among the enabling factors, significant differences were found in the experience of acquiring information regarding smoking ($\chi^2$ = 5.06, $p$ = 0.024), drug use ($\chi^2$ = 13.26, $p$ = <0.001), and sexual behavior ($\chi^2$ = 5.63, $p$ = 0.060) (Table 3-supplementary material).

## Effect of program on behavioral and environmental factors

The behavioral factors of participants and non-participants of the school-based mental health education program were compared, and significant differences were found in terms of history of smoking ($\chi^2$ = 11.54, $p$ = 0.001), current smoking ($\chi^2$ = 10.32, $p$ = 0.001), history of drug use ($\chi^2$ = 7.45, $p$ = 0.006), and history of high-risk sexual behavior ($\chi^2$ = 8.53, $p$ = 0.003). Among the environmental factors, significant differences were found in the experience of feeling intimidated or humiliated ($\chi^2$ = 9.63, $p$ = 0.008) (Table 3-supplementary material).

## Effect of program on psychological factors

The Psychological factors of participants and non-participants in the school-based mental health education program were compared. There were significant differences in terms of depression ($\chi^2$ = 4.44, $p$ = 0.035), self-rated health ($\chi^2$ = 11.68, $p$ = 0.003) and subjective happiness ($\chi^2$ = 9.36, $p$ = 0.009) (Table 3-supplementary material).

## Effect of program on suicide attempts

In order to analyze the factors affecting suicide attempts, the related variables were classified. In Model 1, the effects of the program experimental group and the control group on suicide attempts were examined. In Model 2, psychological factors (depression, self-rated health, and subjective happiness) were added to the group classification presented in Model 1 to see the effect on suicide attempts. In the case of Model 3, in addition to the variables identified as influential factors in Model 2, environmental factors (physical abuse, feelings of intimidation or humiliation physical violence between parents), which are considered to affect suicide attempts were added. In the case of Model 4, we analyzed further by adding behavioral factors (smoking history, alcohol consumption history, illicit drug use history, high-risk sexual behavior, involvement in fights). In Model 5, we analyzed the extent to which suicide attempts were affected, including reinforcing factors (number of close friends, parents are understanding, time spent with parents, parental affection) and enabling factors

(information acquisition, academic performance). Table 1 shows that in model 1, students who did not participate in the intervention experienced more suicide attempts (odds ratio (OR) = 1.77, 95% confidence interval (CI) = 1.18–2.68, $p$ = 0.006). Participation in the program did not have a significant effect in model 4, but when parental affection (OR = 3.21, 95% CI = 1.54–6.68, $p$ = 0.002) and gender (OR = 3.02, 95% CI = 1.58–5.77, $p$ = 0.001) were added to model 5, it again had a significant effect on suicide attempts (OR = 1.86, 95% CI = 1.06–3.27, $p$ = 0.031). Moreover, Table 1 shows that psychological, environmental, behavioral, reinforcing, and enabling factors influence suicide attempts. In model 5, the results showed that the experience of depression (OR = 2.30, 95% CI = 1.25–4.23, $p$ = 0.007), subjective happiness (OR = 3.36, 95% CI = 1.50–7.51, $p$ = 0.003), history of smoking (OR = 3.25, 95% CI = 1.65–6.40, $p$ = 0.001), history of high-risk sexual behavior (OR = 2.40, 95% CI = 1.22–4.71, $p$ = 0.011), involvement in fights (OR = 1.47, 95% CI = 1.26–1.85, $p$ = 0.014), parental affection (OR = 3.21, 95% CI = 1.54–6.68, $p$ = 0.002), and gender (male) (OR = 3.02, 95% CI = 1.58–5.77, $p$ = 0.001) had a significant impact on suicide attempts.

## Discussion

This study examined the effectiveness of the school-based mental health education program implemented through KOICA's ODA program in an impoverished area of Peru. It found that the program had a positive effect on adolescent mental health-related risk behaviors and suicide attempts in the experimental group compared to the control group. This indicates that the intervention may have helped prevent an increase in mental health-related risk behaviors and suicide attempts in adolescents. According to the outcome evaluation, the intervention program was effective in decreasing suicide attempts. The proportion of students with a reported suicide attempt was 11.6% among the experimental group and 18.9% in the control group. Participants were sorted into groups according to their suicide risk based on the number of suicide attempts made. The results showed that 6.3% of those in the experimental group were sorted into the high-risk group, and 8.1% of those in the control group were sorted into the high-risk group. This is similar to the results of a

**Table 1.** Influencing factors of suicide attempt after the program.

| Category | | | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) | Model 4 OR (95% CI) | Model 5 OR (95% CI) |
|---|---|---|---|---|---|---|---|
| Participation in the program | | Experimental group | 1 | 1 | 1 | 1 | 1 |
| | | Control group | 1.77 (1.18–2.68)** | 0.65 (0.42–1.01) | 0.62 (0.40–0.98)* | 0.74 (0.45–1.19) | 1.86 (1.06–3.27)* |
| Psychological factors | Depression | No | | 1 | 1 | 1 | 1 |
| | | Yes | | 4.51 (2.66–7.66)*** | 3.31 (1.91–5.73)*** | 2.81(1.59–4.96)*** | 2.30 (1.25–4.23)** |
| | Self-rated health | Good | | 1 | 1 | 1 | 1 |
| | | Normal | | 1.11 (0.53–2.32) | 0.91 (0.41–2.00) | 0.84(0.36–1.95) | 0.76 (0.30–1.92) |
| | | Poor | | 1.51 (0.62–3.65) | 1.21 (0.48–3.04) | 1.14(0.43–3.02) | 0.89 (0.29–2.65) |
| | Subjective happiness | Happy | | 1 | 1 | 1 | 1 |
| | | Normal | | 3.21 (1.71–5.99)*** | 2.64 (1.37–5.12)** | 3.27(1.62–6.61)** | 2.81 (1.30–6.09)** |
| | | Unhappy | | 4.12 (2.13–7.97)*** | 3.17 (1.59–6.29)** | 3.54(1.70–7.35)** | 3.36 (1.50–7.51)** |
| Environmental factors | Physical abuse | No | | | 1 | 1 | 1 |
| | | Yes | | | 1.43 (0.89–2.28) | 1.14 (0.69–1.90) | 1.06 (0.61–1.84) |
| | Feel intimidated or humiliated | Never | | | 1 | 1 | 1 |
| | | 1–2 times | | | 1.20 (0.59–2.45) | 1.25 (0.59–2.64) | 1.00 (0.44–2.26) |
| | | More times | | | 1.55 (0.82–2.90) | 1.56 (0.79–3.05) | 1.27 (0.61–2.64). |
| | Physical violence between parents | No | | | 1 | 1 | 1 |
| | | Yes | | | 2.10 (1.22–3.64)** | 2.10 (1.20–3.69)** | 1.72 (0.94–3.14) |
| | Verbal violence between parents | No | | | 1 | 1 | 1 |
| | | Yes | | | 1.23 (0.70–2.15) | 1.10 (0.62–1.95) | 1.16 (0.63–2.13) |
| Behavioral factors | Smoking history | No | | | | 1 | 1 |
| | | Yes | | | | 2.56 (1.40–4.67)** | 3.25 (1.65–6.40)** |
| | Alcohol consumption history | No | | | | 1 | 1 |
| | | Yes | | | | 0.99 (0.55–1.77) | 0.85 (0.44–1.62) |
| | Illicit drug use history | No | | | | 1 | 1 |
| | | Yes | | | | 1.17(0.55–2.45) | 1.41(0.62–3.23) |
| | High-risk sexual behavior history | No | | | | 1 | 1 |
| | | Yes | | | | 1.68 (0.93–3.02) | 2.40 (1.22–4.71)* |
| | Involvement in fights | Never | | | | 1 | 1 |
| | | 1–3 times | | | | 1.65 (0.71–3.82) | 1.63 (0.65–4.10) |
| | | ≥4 times | | | | 1.54 (1.32–1.91)* | 1.47 (1.26–1.85)* |

**Table 1.** (Continued)

| Category | | | Model 1 OR (95% CI) | Model 2 OR (95% CI) | Model 3 OR (95% CI) | Model 4 OR (95% CI) | Model 5 OR (95% CI) |
|---|---|---|---|---|---|---|---|
| Reinforcing factors | Number of close friends | ≥1 | | | | | 1 |
| | | 1–3 | | | | | 1.19 (0.47–3.00) |
| | | None | | | | | 1.37 (0.58–3.23) |
| | Parents are understanding | Always/most of the time | | | | | 1 |
| | | Sometimes | | | | | 1.68 (0.88–3.23) |
| | | Rarely/never | | | | | 1.66 (0.77–3.59) |
| | Time spent with parents | Always/most of the time | | | | | 1 |
| | | Sometimes | | | | | 0.68 (0.35–1.32) |
| | | Rarely/never | | | | | 0.77 (0.36–1.64) |
| | Parental affection | Always/most of the time | | | | | 1 |
| | | Sometimes | | | | | 1.84 (0.91–3.68) |
| | | Rarely/never | | | | | 3.21 (1.54–6.68)** |
| Enabling factors | Information acquisition | No | | | | | 1 |
| | | Yes | | | | | 1.34 (0.60–2.96) |
| | Academic performance | Upper | | | | | 1 |
| | | Normal | | | | | 0.65 (0.343–1.232) |
| | | Below | | | | | 0.62 (0.297–1.309) |
| General characteristics | Gender | Female | | | | | 1 |
| | | Male | | | | | 3.02 (1.58–5.77)** |
| | Age range | 12–14 years | | | | | 1 |
| | | 15–18 years | | | | | 1.59 (0.88–2.88) |
| | Type of living arrangement | Both parents | | | | | 1 |
| | | Single parent | | | | | 0.71 (0.18–2.85) |
| | | Separation | | | | | 0.79 (0.26–2.35) |
| Nagelkerke $R^2$ | | | 0.018 | 0.182 | 0.230 | 0.307 | 0.393 |
| p-value[a] | | | — | 0.950 | 0.178 | 0.720 | 0.530 |

$N = 738$.
OR: odds ratio; CI: confidence interval.
[a]Hosmer and Lemeshow Test.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

previous study, which confirmed the positive effect of a school-based suicide prevention education program on the students' attitudes toward suicide and in decreasing suicide risk (21).

The program's effectiveness in decreasing suicide attempts was analyzed. The results showed that students who did not participate in the intervention had more suicide attempts. In addition, when parental affection was part of the intervention, it had a significant effect on suicide attempts (OR = 3.21, 95% CI = 1.54–6.68, $p = 0.002$) in model 5. This indicates that the intervention might have prevented an increase in suicide attempts, and the involvement of parental affection in the intervention might be effective in preventing suicide attempts. Previous studies have also demonstrated similar findings wherein there was a decrease in suicidal ideation and related behavior when adolescents felt understood by members of their family and had effective communication with their family members (22). Parent-child disagreements, negative parental attitude, and lack of open communication were found to be risk factors for suicidal behavior (23).

The variables that had a significant effect on suicide attempts included depression, subjective happiness, smoking experience, history of high-risk sexual behavior, involvement in fights, parental affection, and gender (male). Previous studies have shown the effects of various risk factors, protective factors, psychological and behavioral problems, and social adaptation skills on the mental health of adolescents (24,25). The results of the current study show that adolescent suicide does not simply depend on a couple of factors, but arises from situations in which individual, home, school and social factors influence one another. Therefore, adolescent suicide must be prevented and addressed through a multi-dimensional and integrated approach.

Once the program has run its course it is likely to stop because of the challenges associated with bringing in external staff and limited financial resources. Therefore, to not only maintain the effectiveness of the intervention but also scale it up it to other schools in the neighborhood, a strategy for project sustainability is needed. For the government of Peru to operate these programs autonomously after they are terminated, a strategy that involves the implementation of a health education training program, such as the 'WHO Urban School Health Kit (USHK)' might be useful. The USHK was developed with a school health education approach, by the WHO Western Pacific Regional Office, and aims to train school teachers on how to provide health education (26). The advantage of the USHK is that by educating teachers, they can develop the capacity to conduct health promotion activities in schools and communities. Therefore, it can be a useful tool for school health education if it is adapted according to the circumstances of each country.

## Limitations

There are certain limitations to this study. First, there is a possibility that the measures of adolescent health risk behaviors and domestic violence were underestimated because the survey was self-administered. Second, although the school-based mental health education program included health education and family workshops targeting parents of the participating students, a quantitative evaluation of the effectiveness of the program for parents was not carried out. Third, the study was carried out at an impoverished region with a lower than average household income. Therefore, generalization of the effectiveness of the school-based mental health education program must be conducted with caution.

It is suggested that intervention programs for the prevention of adolescent suicide must encourage the active engagement, participation and attention of parents and their children for it to be more effective. This intervention program targeting impoverished areas of Peru was school-based and targeted adolescents currently attending school. Therefore, adolescents outside of school were not included. These adolescents must be supported so that they can return to school or be integrated safely into society through education and empowerment. There is thus a need for a health promotion intervention that includes adolescents who are outside of the school system and who otherwise remain invisible in the community, as they have a higher risk of suicide attempt, drug use, smoking, alcohol consumption, sexual violence, and abuse.

## Conclusion

The school-based mental health education program in Peru improved the intent to change behavior, the ability to acquire health information, family bonding through increased parental affection,

and subjective happiness. Moreover, the program was effective in diminishing adolescent smoking, drug use, and high-risk sexual behavior. Among the environmental factors, significant differences were found in the experience of feeling intimidated or humiliated, depression, and suicide attempts. In addition, this intervention had a significant effect on decreasing adolescent suicide. This indicates that the intervention may have helped prevent an increase in mental health-related risk behaviors and suicide attempts in adolescents.

Specifically, fostering parental affection in interventions might be effective in preventing suicide attempts. This sheds light on the substantial influence that parents, the main source of social support, have on the suicidal behavior of adolescents, and suggests possible adverse effects of fighting, emotional differences, and lack of open communication with parents on the suicidal behavior of adolescents. Therefore, intervention programs aiming to prevent adolescent suicide must encourage the active engagement of parents and their children, to be more effective. Moreover, to maintain the effectiveness of the intervention and expand the intervention to other schools in the neighborhood, a strategy for project sustainability is needed so that schools and communities have the capacity to carry on the project.

*Conflict of interest*

The authors declare that there is no conflict of interest.

*ORCID iD*

Ha Yun Kim  iD https://orcid.org/0000-0001-8022-8686

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