



Suicidal behaviour in adolescents: Educational interventions in Mexico

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Abstract

Suicide in adolescents constitutes a public health problem throughout the world. The objective of this study was to identify the prevalence of suicidal behaviour in a public middle school in Mexico and to implement appropriate educational interventions in the school and community contexts. Our work took place from September 2017 to July 2018. We conducted a quasi-experimental, mixed-methodology study with 12-year-old students in first year of middle school ($n = 29$), using an educational intervention approach within the frame of the Life Skills Education methodology. We included family members and academic staff in the study with the view of sensitising them to suicidal behaviour. At the community level, we worked with the adolescent and adult populations to form 'gatekeepers' (guardians). We administered a questionnaire on psychosocial indicators of depression and suicide risk to 383 students in their first-to-third years of middle school. Other questionnaires were applied, and life skills focus groups (FGs) were organised with the educational intervention participants. The questionnaires addressed suicidal behaviour in adolescents, alcohol consumption, life skills and prosociality. Prevalence of attempted suicide cases came to 14.1% (95 CI% 10.7-17.9), the average age of those who reported having hurt themselves with the purpose of taking their lives was 12.9 years, 75% of those who had attempted suicide were female and 64.8% had consumed alcohol. The educational intervention with students achieved a statistically significant increase in the life skills of participants, specifically as regards self-awareness and overall scores. The family members in the FGs developed greater awareness of suicidal behaviour, and the adolescents engaged at the community level significantly broadened ($p < .05$) their knowledge of depression. In developing countries such as Mexico, it is essential not only to increase the number of interventions for preventing suicidal behaviour in adolescents, but also to improve instruments for measuring the extent of the problem.

KEYWORDS

adolescents, gatekeepers, intervention, Mexico, suicidal behaviour

1 | INTRODUCTION

Suicidal behaviour and death by suicide are considered a public health problem (World Health Organization, 2010) afflicting increasingly younger people and requiring a comprehensive response from diverse disciplines (Center for Disease Control & Prevention, 2011). According to global estimates for 2016, injuries caused 42.21% of deaths worldwide in the population aged 10 to 24 years. Suicide, the second leading cause of death, accounted for 7.8% of mortality in the same age group, surpassed only by motor vehicle accidents, which represented 13.82% of mortality (Institute for Health Metrics & Evaluation, 2017).

In Latin America, suicide is the third leading cause of death, accountable for 6.74% of overall mortality. In Mexico specifically, self-inflicted injuries cause 8.89% of total mortality among young people of both sexes within the 10–24 age bracket; the figure drops to 7.07% in the State of Morelos (Institute for Health Metrics & Evaluation, 2017). According to Borges et al., suicide deaths spiralled by 275% from 1970 to 2007, particularly among those in the 15–29 age bracket (Borges et al., 2010).

The major risk and predictive factors of suicidal behaviour among Mexican adolescents are psychiatric, psychological, biological, social and contextual (Borges & Cota, 2009; Espinoza-Gómez et al., 2010; Pérez-Amezcuca et al., 2010). Understanding these factors is essential for generating effective and targeted interventions that take into account the characteristics of the vulnerable populations and the contexts in which they develop.

Educational interventions for suicide prevention among students within the school context have focussed on enhancing knowledge of the problem, helping families and academic staff identify the risk factors in adolescents, promoting protective factors and developing strategies that support adolescents in coping with stress. Training students, families and academic staff as guardians (gatekeepers) is another type of intervention that aims to identify people at risk for suicide in a timely fashion, promote seeking help and facilitate access to mental health services, among others (Bustamante & Florenzano, 2013; Mann et al., 2005; Pérez Reina et al., 2008; Piedrahita et al., 2012).

The twofold objective of our study was to identify the prevalence of suicidal behaviour among students in a public middle school and to implement educational interventions in the school and community contexts.

2 | METHODS

We conducted a quasi-experimental study using mixed methods and educational interventions with adolescents and adults. Our work formed part of a broader study on suicidal behaviour among Mexican adolescents in five states: Aguascalientes, Baja California Sur, Campeche, Morelos and Tabasco. Work in Morelos, the only state where educational interventions have been used, was in response to a request from municipal authorities. The interventions were carried out at the municipal seat within the contexts of the

What is known about this topic:

- Suicidal behaviour and suicide are increasing in youth populations.
- Suicide is the second cause of death in adolescents worldwide.
- Educational interventions have been developed with school communities to prevent suicide.

What this paper adds:

- Evidence on educational interventions with schoolchildren to strengthen life skills
- Evidence on educational interventions involving family and teachers in the school context to train gatekeepers
- Evidence on community experience in forming gatekeepers among adolescents and adults

community and a school where educational and local authorities had identified suicidal risk situations in the adolescent population. Our study, which took place from September 2017 to July 2018, was evaluated by means of pre–post measurements. The educational interventions were designed for adolescents 10–19 years old and for adults 20 years and older.

2.1 | At the community level

We selected the participants through convenience sampling among the following actors:

- Adolescents: members of the Youth Patrol (*Patrulla Juvenil*) government program ($n = 20$)
- Adults: the municipal coordinator of the Youth Patrol program and psychologists working in municipal institutions ($n = 3$)

2.2 | At the school level

Selection criteria:

- Students enrolled in the selected school for the 2017–2018 school year
- The parents or guardians of the students ($n = 17$)
- School authorities and academic staff ($n = 18$)

Data collection instruments and techniques:

1. A questionnaire on psychosocial indicators of depression and suicide risk (*CIP-DERS*) composed of 86 questions divided into six sections: (1) parasuicidal data, (2) suicidal ideation, (3) relationships with mom and dad, (4) depressive symptomatology,

- (5) impulsiveness and (6) substance use (González-Forteza & Jiménez-Tapia,) (Table S1).
2. A skills for life questionnaire composed of 43 questions divided into five sections: (1) sociodemographic characteristics, (2) self-awareness, (3) effective communication, (4) empathy and (5) coping with emotions (Fe & Alegría. Bravo A, personal communication, 2015) (Table S2).
 3. A prosocial behaviour questionnaire composed of 21 questions divided into four sections: (1) defence and help, (2) social support, (3) environmental protection and (4) donations (e.g. of blood for non-profit purposes, working time in social organisations, involvement in volunteer programs and money for those in need, among others). This questionnaire was constructed and validated with Mexicans by Garcidueñas-Gallegos (Garcidueñas-Gallegos, 2015) (Table S3).
 4. A questionnaire regarding knowledge of depressive symptomatology and harmful use of alcohol based on the indicators listed in the Mental Health Gap Action Program (mhGAP) of the World Health Organization (WHO/PAHO). This questionnaire was composed of 28 questions divided into two sections: (1) substance use and (2) depressive symptomatology (Organización Mundial de la Salud, 2011) (Table S4).
 5. An informed-guardian questionnaire for families and academic staff, divided into three sections: (1) sociodemographic characteristics, (2) knowledge concerning suicide (seven questions) and (3) suicide risk factors (13 questions) (Barrueto et al., 2017; Bean & Baber, 2011) (Table S5).
 6. Focus groups (FGs) held separately with students and family members prior and subsequent to the interventions

2.3 | Study stages

2.3.1 | Stage 1

At the community level, we presented the project to members of the local Youth Patrol program and reached agreements on the execution of a community intervention. We invited the Youth Patrol participants to join the community intervention. At the school level, we presented the intervention to the school community and initiated work by administering the *CIP-DERS* questionnaire to all the students ($n = 383$) enrolled in the middle school of interest. This instrument explored population characteristics such as age, sex, school year, family structure and other traits of interest including depressive symptomatology and substance use. We measured attempted suicide and suicidal ideation.

2.3.2 | Stage 2

We designed three educational interventions: one at the community level (the Youth Patrol group) and two at the school level (students, family and academic staff). The sessions were coordinated by the research team.

2.4 | At the community level

The Youth Patrol group. Educational actions for this group were designed and implemented according to the Intervention Mapping method (Bartholomew et al., 2016). We identified the harmful use of alcohol and the presence of depressive symptoms as risk factors for suicidal behaviour.

The objective of this intervention was to create a group of adolescent guardians (gatekeepers) capable of identifying peers who exhibited the following risk factors: harmful use of alcohol and moderate-to-severe depressive symptoms.

The research team carried out a selection process among the Youth Patrol members with the view of forming a self-managing group. The final group was made up of adolescents from the municipal seat and a nearby rural community within the municipality where the study was conducted ($n = 20$).

The research team conducted 11 educational sessions with support from the coordinator of the Youth Patrol program. The sessions had a duration of 2 hr each and were held in the afternoons, from Monday to Friday, at the town-hall auditorium (Table 1).

2.5 | At the school level

2.5.1 | Students

We invited the first-year students (12 years of age) to participate in the educational sessions on life skills and obtained the informed consent of their parents. We conducted 12 educational sessions with students ($n = 35$) from one of the first-year classes in the middle school analysed, as recommended by Life Skills Education experts from the *Fe y Alegría* (Faith and Joy) civil association in Colombia. Centred on four specific life skills—self-awareness, empathy, coping with emotions and effective communication—the sessions were conducted on the school premises once a week, with a duration of 50–60 min each (Table 1).

2.5.2 | Student family members

We invited the family members of the first-year students to participate in the educational initiative on protective factors against suicidal behaviour in adolescents. We also carried out six educational sessions with the students' immediate family members ($n = 17$). The sessions were designed according to the Precede/Proceed method (Gielen & Eileen, 2008) (Table 1).

2.5.3 | Academic staff

We invited the school authorities and teaching staff to participate in the educational initiative on protective factors against suicidal behaviour in adolescents. We conducted three educational

TABLE 1 Educational sessions of the initiatives at the school and community levels

School setting: Students	
Sessions	Theme
1–3	Self-awareness
4–6	Empathy
7–9	Coping with emotions
10–12	Effective communication
School setting: Family and academic staff	
1	The family as a protective factor
2	Adolescence within the family structure and cycle
3	Communication within the family
4 ^a	Suicidal behaviour and the identification of risk factors
5 ^a	Identification of warning signs in the adolescent
6 ^a	Community support resources
Community setting: Adolescent gatekeepers	
1	What is suicidal behaviour?
2–3	Depression: mhGAP indicators of depression
4–5	Indicators of harmful use of alcohol
6–8	Prosocial behaviour
9	Communication strategies for the adolescent gatekeepers with adult guardians
10	Support resources for channelling at-risk adolescents
11	End of sessions

^aSessions conducted with academic staff.

sessions with academic staff from the school under study ($n = 18$) (Table 1).

The educational sessions with the students' family members and academic staff were held at the school library, on the dates and schedules when participants were available. Each session lasted 60 min.

2.5.4 | Stage 3

Upon conclusion of the educational sessions, we administered post-intervention questionnaires to participants at the community and school levels. We also organised FGs with students and families at the school level.

2.6 | Statistical Method

The quantitative component analysis was performed using Stata 14.1 software. Based on the data derived from the questionnaires (*CIP-DERS*; skills for life; informed guardians; prosocial behaviours; and knowledge concerning depressive symptomatology and the harmful use of alcohol), we prepared a general description of our study variables (distribution, outliers and missing values) and characterised the population under study. We determined proportions by category (prevalence of attempted suicide and suicidal ideation) with

a 95% confidence interval, and estimated the measures of central tendency and dispersion for the quantitative variables (age, age at first attempt and average number of attempts).

To assess the effects of the interventions, we compared the results of the pre-post measurements. At the community level, we compared the medians of the scores obtained in each of the five attitudes of participants towards adolescent suicidal behaviour and the general score for all five. For life skills, we compared the medians of the scores obtained in each of the four skills and the general score for the four. To this end, we used the Wilcoxon test for comparing medians of dependent samples.

2.7 | Qualitative component

The FGs were audio recorded and transcribed using the Office Word computer program. Coding was based on ATLAS.ti v8 software. We created matrices to identify regularities and differences in the data.

2.8 | Ethical considerations

Our research was evaluated and approved through a blind review process by the Research Ethics Committee of the National Institute of Public Health in Mexico. Mechanisms were anticipated for referring those adolescents exhibiting suicidal risk factors to the municipal or state-level mental health services.

Our research was also approved by the municipal and academic authorities of the municipality where the study was conducted. Informed assent was obtained from the students and consent letters were signed by their families and academic staff prior to their participation in the study.

3 | RESULTS

This section initially describes the suicidal behaviour component of the study (the *CIP-DERS* questionnaire), and then presents the results of each educational intervention in the community and school contexts.

By means of the *CIP-DERS* questionnaire, we obtained information on 383 students (86% of total enrolment at the middle school analysed for the 2017–2018 school year). Of these, 53% were female. The average age of the students was 13 years: 12.9 for females and 13.2 for males. 80.1% of the students reported that they were living with both parents and 16.7% with only one parent. We identified an average of 5.6 members per family.

3.1 | Description of suicidal behaviour

The overall prevalence of suicide attempts was 14.1% (95% CI 10.7–17.9). The average age of those who reported having injured

themselves with the intention of taking their lives was 12.9 years; 37% were in their first year of middle school and 75.9% were female, a statistically significant proportion compared to males ($p = .000$). The prevalence of attempted suicide by sex was 20.2% (95% CI 14.9–26.3) for females and 7.2% (95% CI 3.9–12.0) for males, with an average of 3.4 attempts reported. The average age at first attempt was 11.4 years and 12 years at last attempt. We found that 62.9% had used a sharp object, and 18.5% of those who had attempted suicide were considering making another attempt.

3.2 | Suicidal ideation

The prevalence of suicidal ideation was 10.44% (95% CI 7.7–13.9). The specific prevalence among males was 7.2% (95% CI 4.2 – 12), while among females it was 13.3%. The average age of those exhibiting suicidal ideation was 12.7; 50% were in the first year of middle school and 50% had already made at least one attempt.

3.3 | Depressive symptomatology

The overall prevalence of severe depressive symptomatology was 13.3%. We observed no statistically significant differences by sex, with a prevalence among females of 15.2% and 11.1% among males ($p = .254$).

With respect to lifetime substance use, 43.8% reported having used alcohol, with an average age at initiation of 11.7 among males and 12.1 among females. Up to 20.6% reported having used tobacco, 11.7% inhalants and 10.4% marijuana.

We found that 64.8% of the students who had attempted suicide had consumed alcohol ($p = .001$); 38.2% in the month prior to the study ($p = .000$). Among those exhibiting suicidal ideation, 52.5% had consumed alcohol ($p = .283$); 22.5% during the last month ($p = .002$).

According to our results, 25.6% of the young people who had consumed tobacco on at least one occasion had attempted suicide ($p = .001$); 28.3% of those who had done so in the previous 30 days had also attempted to take their own lives ($p = .000$). As many as 50% of students exhibiting suicidal ideation had consumed tobacco on at least one occasion ($p = .000$) and 45% had smoked in the last month ($p = .000$).

As regards marijuana, 47% of those who had attempted suicide had tried it on at least one occasion ($p = .000$), and 13.2% had consumed marijuana in the last month ($p = .005$). Among those exhibiting suicidal ideation, 27.5% had consumed marijuana at least once ($p = .000$).

We found that 33.3% of the students who had attempted suicide ($p = .000$) and 35% of those exhibiting suicidal ideation had used inhalable drugs ($p = .000$). The prevalence of the use of inhalants during the month of the study was 11.1% among those attempting suicide ($p = .015$) and 15% among those presenting suicidal ideation ($p = .001$). No differences were found in marijuana use in the previous month according to the presence or absence of suicidal ideation ($p = .519$).

3.4 | Educational intervention with students

All the sessions were attended by 29 students in the first year of middle school: 16 were females and 13 were males, with an average age of 12 years. We found a statistically significant increase in self-awareness ($p < .01$) and overall scores among the students who attended the life skills educational intervention ($p < .01$). In comparing by sex, females achieved a statistically significant increase in their capacity for self-awareness ($p < .01$), coping with emotions ($p < .05$) and overall scores ($p < .01$); males, meanwhile, registered an increase only as regards self-awareness ($p < .01$).

During the post-intervention FGs, all participants indicated positive changes in all skill areas. They believed that they were better able to manage their emotions and stated that group dynamics in the classroom had improved (Table S6).

3.5 | Educational intervention with families and academic staff

Families. A total of 17 individuals (14 females and three males) participated with an average age of 41.5 years; 88.2% had an intimate partner, 70.5% had a basic level of education and 64.7% were homemakers, while 11.8% were engaged in agricultural work.

Based on the informed-guardian questionnaire, we identified changes in the attitudes of participants towards adolescent suicidal behaviour. A statistically significant change was observed as regards the overall average of these attitudes ($p = .007$) and specifically in the attitudes of devoting attention to the student ($p = .017$) and preparedness ($p = .003$). These results were consistent with the family reports during the FGs (Table S5).

Academic staff. A total of 12 men and six women participated with an average age of 43.4; 72.2% reported having an intimate partner and 83.3% had a university education.

Results from the informed-guardian questionnaire for teachers showed positive but not statistically significant changes in attitudes towards prevention, mental healthcare and devoting attention to the student. Only the attitudes concerning preparedness and the overall percentage of attitudes demonstrated statistically significant changes ($p = .006$ and $p = .017$ respectively).

3.6 | Community intervention

A total of 20 adolescents with an average age of 14 years ranging from 12 to 18 attended the sessions. Among the participants, 75% were males, 50% were students and 38% both studied and worked. As regards prosocial behaviour, we found increases in all four of its components (defence and help, social support, environmental protection and donations), with environmental protection ($p < .05$) and the confluence of the four behaviours registering statistically significant improvement ($p < .05$).

The questionnaire concerning knowledge of depression and the harmful use of alcohol (WHO/PAHO MhGAP version 1.0) administered after the intervention showed a significant increase in the understanding of depression ($p < .05$).

Moreover, following the intervention, the adolescent gatekeepers began to identify other adolescents displaying depression and alcoholic consumption risk factors. They channelled them to the adult gatekeeper and, subsequently, to the team of psychologists working in municipal institutions.

4 | DISCUSSION

Our study adopted the approach of previous authors who had viewed suicidal behaviour as a continuous spectrum with three fundamental components: ideation, planning and attempt (Borges & Cota, 2009). For the purposes of prevention, it is insufficient to detect the presence of these elements; it is necessary to investigate and analyse the factors associated with suicide as a precondition for generating appropriate proposals and interventions based on available resources (Nock et al., 2008). Our study focussed on the investigation of suicidal ideation and attempted suicide, as well as on factors related to the design of interventions at the school and community levels.

According to the WHO series of World Mental Health Surveys on the prevalence of attempted suicide in a 12-month period reported by countries providing information to the World Bank, the annual global prevalence amounts to four per thousand adults (of both sexes) in low-income countries and six per thousand women in middle-income countries (WHO, 2014).

A study in Latin America revealed a 12% prevalence of lifetime suicide attempts among university students in the city of Medellin, in Colombia (Blandon-Cuesta et al., 2015). Another study in the United States indicated an 8.2% prevalence of suicide attempts among students in the eighth, 10th and 12th grades (Zwald et al., 2018). Data from these studies indicate lower rates than those found in our study.

The prevalence of attempted suicide found in our study was higher than the rates reported in Mexico nationwide and at the state level (Valdez-Santiago et al., 2017). On high school campuses, Perez-Amezcuca et al. (2010) reported a prevalence of suicide attempts at the national level lower than that of our study (9%: 95% CI 8–58 10), although the rates reported by both studies for Morelos were similar (14%: 95% CI 9–21). With regard to northern Mexico, Monge et al reported an 11.4% rate of suicide attempts among 15- to 19-year-olds in public and private high schools (Monge et al., 2007).

Consistent with other studies, we found that females constitute an at-risk population for attempted suicide (Blandon-Cuesta et al., 2015; Borges et al., 2010; Perez-Amezcuca et al., 2010). The prevalence of attempts among female students in our study was higher than that reported by other authors (Borges & Cota, 2009; Valdez-Santiago et al., 2017), although Gonzalez-Forteza et al. (2003) noted similar figures in their study of public high school students in Mexico (7% for males and 17% for females) (González-Forteza et al., 2003).

Previous research efforts have reported a considerable difference in the suicide rate between males and females. Although women show a higher prevalence of ideation and attempts, men tend to carry them through more often, suggesting that they choose more lethal methods (WHO, 2017).

Our study revealed that adolescents had been exposed at an early age to alcohol and marijuana, with consumption beginning around the age of 12. Such early exposure was found to be significantly associated with attempted suicide, in line with previous studies (Borges et al., 2005; Pérez-Amezcuca et al., 2010; Valdez-Santiago et al., 2017). The 2012 National Survey on Health and Nutrition (ENSANUT by its Spanish initials), cited by Valdez-Santiago et al. (2017), reported a higher rate of suicide attempts among adolescents who had initiated the consumption of tobacco (OR 10.1; 95% CI 7.1–14.2) or alcohol (OR 5.3; 95% CI 4.1–6.8) before the age of 13; a higher probability of attempts was also found among those who had used tobacco (OR 3.26; 95% CI 2.49–4.27) or alcohol at any age (Valdez-Santiago et al., 2017). Although Perez-Amezcuca et al. found no association between drug use and suicide attempts, they did encounter an association between drug use and suicidal ideation (Pérez-Amezcuca et al., 2010). Borges et al. found an increased probability of attempts among those who had abused alcohol (OR 19.18; 95% CI 8.84–41.64) or illicit drugs (OR 17.21; 95% CI 7.81–37.94) (Borges et al., 2008).

Marijuana is the most consumed illicit drug in the world (Naji et al., 2018). Although other studies have found an association between marijuana consumption and both suicidal ideation and attempted suicide, these studies have not been fully conclusive (Chabrol et al., 2014; Naji et al., 2018; Price et al., 2009).

In the three interventions conducted during our study, we found an increase in knowledge and skills and an improved attitude concerning suicidal behaviour, as well as a greater level of sensitivity to the problem.

Our study indicated an improvement in attitudes as a result of the training of 'gatekeepers' among family and academic staff. These results are similar to those reported by Torok et al. (2019) regarding attitudes among both population groups (Torok et al., 2019). Several studies have demonstrated that training gatekeepers in suicide prevention enhances knowledge and improves attitudes concerning suicide; however, no data exist to suggest that this training modifies behaviour for identifying adolescent patterns indicating a heightened risk of suicide (Hashimoto, et al., 2016; Isaac et al., 2009; Phoenix et al., 2018; Terpstra et al., 2018). This represents an opportunity for improving measuring instruments and the training of gatekeepers.

The results in life skills obtained among students are consistent with those of other studies conducted in school settings where it was possible to enhance the life skills of the students. In Peru, an educational program to enhance life skills redounded to a significant increase in assertiveness and improved communication skills, but these advances were not noted in the areas of self-esteem and decision-making (Choque-Larrauri & Chirinos-Caceres, 2009). These results are in contrast to those of our study, in which self-awareness proved to be one of the highest-rated skills. This may be attributable to differences between the populations studied (Moreira & Murillo, 2016). In Mexico, a study of adolescents reported an

improvement in basic social skills and those related to the emotions (Morales et al., 2013).

As regards prosocial behaviour, our study found statistically significant improvement in environmental protection, different from what was reported by Garcidueñas, who found statistically significant improvement in social support and donations (Garcidueñas-Gallegos, 2015). Adolescents exhibiting prosocial behaviour were found to demonstrate empathy as a result of vicariously experiencing feelings of need in people faced with a critical situation (Calvo et al., 2001). The interpersonal bonds among adolescents are of vital importance for sharing their experiences and providing emotional support through basic strategies.

Conclusions. We began this study by measuring suicidal behaviour among adolescents in socially disadvantaged communities, which served as a basis for designing specific initiatives in community and school contexts. To exert an impact on public health in communities, it is essential not only to describe the problem of interest, but also to develop proposals geared towards modifying or preventing the event being analysed, in our case, suicidal behaviour.

The participation of adolescents in community health interventions such as those of adolescent gatekeepers is crucial for identifying young people at risk of suicidal behaviour, as well as for crafting support strategies.

In developing countries such as Mexico, it is of primary importance to increase the number of interventions aimed at preventing suicidal behaviour among adolescents, but also to improve instruments for measuring the extent of the problem and the design of educational initiatives with diverse population groups.

Limitations. The suicidal behaviour component of the study centred on a population of adolescents attending a school within the public basic education system in a socially disadvantaged community. Therefore, our results can only be interpreted with respect to such populations. Additionally, the sample size of our educational initiatives can be considered a constraint on generalisability.

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CONFLICT OF INTEREST

All authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

The data sets generated and analysed during this study are not publicly available to protect participant anonymity. However, they are available from the corresponding author on reasonable request.

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REFERENCES

- Barrueto, C., Gaete, J., Bustamante, F., & Pizarro, M. (2017). Self-perceived knowledge and skills of teachers for prevention of suicidal behavior in adolescents pre and post-intervention. *Revista Chilena De neuro-psiquiatría*, 55(3), 170–178.
- Bartholomew, L. K., Markham, C. M., Ruitter, R. A. C., Fernández, M. E., Kok, G., & Parcel, G. S. (2016). *Planning health promotion programs. An intervention mapping approach* (4th ed). San Francisco, CA: Jossey Bass.
- Bean, G., & Baber, K. M. (2011). Connect: An effective community-based youthsucidepreventionprogram. *SuicideandLife-ThreateningBehavior*, 41, 87–97. <https://doi.org/10.1111/j.1943-278X.2010.00006.x>
- Blandón-Cuesta, O. M., Carmona-Parra, J. A., Mendoza-Orozco, M. Z., & Medina-Pérez, O. A. (2015). Ideación suicida y factores asociados en jóvenes universitarios de la ciudad de Medellín. *Archivo Medico De Camagüey*. <http://scielo.sld.cu/pdf/amc/v19n5/amc060510.pdf>
- Borges, G., Benjet, C., Medina-Mora, M. E., Orozco, R., & Nock, M. (2008). Suicide Ideation, Plan, and Attempt in the Mexican Adolescent Mental Health Survey. *Journal of the American Academy of Child and Adolescent Psychiatry*. 47(1), 41–52. <http://linkinghub.elsevier.com/retrieve/pii/S0890856709620839>
- Borges, G., & Cota, M. (2009). Estudios sobre conducta suicida en México: 1998–2008. *Jovenes*, 32, 12–45.
- Borges, G., Orozco, R., Benjet, C., & Medina-Mora, M. E. (2010). Suicidio y conductas suicidas en México: Retrospectiva y situación actual. *Salud Publica De Mexico*, <http://www.scielo.org.mx/pdf/spm/v52n4/v52n4a05.pdf>
- Borges, G., Wilcox, H. C., Medina-Mora, M. E., Zambrano, J., Blanco, J., & Walters, E. (2005). Suicidal behavior in the Mexican national comorbidity survey (m-ncs): Lifetime and 12- month prevalence, psychiatric factors and service utilization. *Salud Ment*. <http://www.medigraphic.com/pdfs/salmen/sam-2005/sam052d.pdf>
- Bustamante, F., & Florenzano, R. (2013). Programas de prevención del suicidio adolescente en establecimientos escolares: Una revisión de la literatura. *Revista Chilena De neuro-psiquiatría*, 51, 126–136. <https://doi.org/10.4067/S0717-92272013000200006>
- Calvo, A. J., González, R., & Martorell, M. C. (2001). Variables relacionadas con la conducta prosocial en la infancia y adolescencia: Personalidad, autoconcepto y género. *Infancia Y Aprendizaje*, 24(1), 95–111. <http://www.tandfonline.com/doi/full/10.1174/021037001316899947>
- CDC. ASAP. (2011) Suicide Prevention: A Public Health Issue. https://www.cdc.gov/violenceprevention/pdf/asap_suicide_issue2-a.pdf
- Chabrol, H., Melioli, T., & Goutaudier, N. (2014). Cannabis use and suicidal ideations in high-school students. *Addictive Behaviors*, 39(12), 1766–1768. <https://doi.org/10.1016/j.addbeh.2014.06.008>. <http://linkinghub.elsevier.com/retrieve/pii/S0306460314001956>
- Choque-Larrauri, R., & Chirinos-Cáceres, J. L. (2009). Eficacia del Programa de Habilidades para la Vida en Adolescentes Escolares de Huanavelica, Perú. *Revista De Salud Pública*, 11, 169–181. <https://doi.org/10.1590/S0124-00642009000200002>
- Espinoza-Gómez, F., Zepeda-Pamplona, V., Bautista-Hernández, V., Hernández-Suárez, M. C., Newton-Sánchez, O. A., & Plasencia-García, G. R. (2010). Violencia doméstica y riesgo de conducta suicida en universitarios adolescentes. *Salud Publica De Mexico*, 52(3), 213–219. <http://www.scielo.org.mx/pdf/spm/v52n3/05.pdf>
- Garcidueñas-Gallegos, D. (2015). Variables asociadas a la conducta prosocial y su prevalencia en adolescentes de educación secundaria (tesis de pregrado).. Universidad Michoacana De San Nicolás De Hidalgo. Michoacán, México.
- Gielen, A. C., & Eileen, M. M. (2008). The precede-proceed planning model. In K. Glanz, F. Lewis, & K. B. Rimer (Ed), *Health Behavior and Health Education* (509-516). : Jossey-Bass.

- González-Forteza, C., Ramos-Lira, L., Caballero-Gutiérrez, M. Á., & Wagner-Echeagarray, F. A. (2003). Correlatos psicosociales de depresión, ideación e intento suicida en adolescentes mexicanos. *Psicothema*, <http://www.psicothema.es/pdf/1102.pdf>
- Hashimoto, N., Suzuki, Y., Kato, T. A., Fujisawa, D., Sato, R., Aoyama-Uehara, K., Fukasawa, M., Asakura, S., Kusumi, I., & Otsuka, K. (2016). Effectiveness of suicide prevention gatekeeper-training for university administrative staff in Japan. *Psychiatry and Clinical Neurosciences*, *70*, 62–70. <https://doi.org/10.1111/pcn.12358>
- Institute for Health Metrics and Evaluation. (2017) GBD Compare | IHME Viz Hub. University of Washington, <https://vizhub.healthdata.org/gbd-compare/>
- Isaac, M., Elias, B., Katz, L. Y., Belik, S.-L., Deane, F. P., Enns, M. W., & Sareen, J. (2009). Gatekeeper Training as a Preventative Intervention for Suicide: A Systematic Review. *Canadian Journal of Psychiatry*, *54*, 260–268. <https://doi.org/10.1177/070674370905400407>
- Mann, J., Apter, A., Bertolote, J., Beautrais, A., Currier, D., Haas, A. et al (2005). Suicide Prevention Strategies: A Systematic Review. *JAMA*, *294*, 2064–2074. <https://doi.org/10.1001/jama.294.16.2064>
- Mo, P. K., Ko, T. T., & Xin, M. Q. (2018) School-based gatekeeper training programmes in enhancing gatekeepers' cognitions and behaviours for adolescent suicide prevention: a systematic review. *Child and Adolescent Psychiatry and Mental Health*.
- Monge, H. J. A., Cubillas, R. M. J., Román, P. R., & Abril, V. E. (2007). Intentos de suicidio en adolescentes de educación media superior y su relación con la familia. *Psicol Y Salud*. <http://www.redalyc.org/pdf/291/29117105.pdf>
- Morales, M., Benítez, M., & Agustín, D. (2013). Habilidades para la vida (cognitivas y sociales) en adolescentes de zona rural. *REDIE*, *15*, 98–113.
- Moreira, A., & Murillo, P. (2016). Habilidades para la vida como estrategia de promoción de la salud en niños y niñas en riesgo social: Programa educativo de enfermería. *Rev. Enfermería Actual De Costa Rica*, *30*, 1–17.
- Naji, L., Rosic, T., Dennis, B., Bhatt, M., Sanger, N., Hudson, J., Mouravska, N., Thabane, L., & Samaan, Z. (2018). The association between cannabis use and suicidal behavior in patients with psychiatric disorders: An analysis of sex differences. *Biol Sex Differ*, *9*(1). <https://bsd.biomedcentral.com/articles/10.1186/s13293-018-0182-x>
- Nock, M. K., Borges, G., Bromet, E. J., Cha, C. B., Kessler, R. C., & Lee, S. (2008). Suicide and suicidal behavior. *Epidemiologic Reviews*, *30*, 133–154. <https://doi.org/10.1093/epirev/mxn002>
- Organización Mundial de la Salud. (2011) Guía de Intervención mhGAP para los trastornos mentales, neurológicos y por uso de sustancias en el nivel de atención de la salud no especializada, PAHO, versión 1.0. OPS. https://www.who.int/publications/guidelines/mhGAP_intervention_guide/es/
- Pérez-Amezcuca, B., Rivera-Rivera, L., Atienzo, E. E., De Castro, F., Leyva-López, A., & Chávez-Ayala, R. (2010). Prevalencia y factores asociados a la ideación e intento suicida en adolescentes de educación media superior de la República mexicana. *Salud Publica De Mexico*, <http://www.scielosp.org/pdf/spm/v52n4/v52n4a08.pdf>
- Pérez-Reyna, E., Hernández-Trujillo, A., Pérez-Reyna, M., Cardero-Montoya, D., & Beatón-Lobaina, Y. B. (2008). Modificación de conocimientos en profesores de la escuela de instructores de Arte Pepito Tey sobre la prevención del intento suicida en adolescentes. *Medisan*, <http://www.redalyc.org/articulo.oa?id=368445249002>
- Piedrahita, L. E., Mayerling-Paz, K., & Romero, A. M. (2012). Estrategia de intervención para la prevención del suicidio en adolescentes: La escuela como contexto. *Revista Hacia La Promoción De La Salud*, *17*, 136–148.
- Price, C., Hemmingsson, T., Lewis, G., Zammit, S., & Allebeck, P. (2009). Cannabis and suicide: Longitudinal study. *British Journal of Psychiatry*, *195*(6), 492–497. <https://doi.org/10.1192/bjp.bp.109.065227>. https://www.cambridge.org/core/product/identifier/S000712500251209/type/journal_article
- Terpstra, S., Beekman, A., Abbing, J., Jaken, S., Steendam, M., & Gilissen, R. (2018). Suicide prevention gatekeeper training in the Netherlands improves gatekeepers' knowledge of suicide prevention and their confidence to discuss suicidality, an observational study. *BMC Public Health*, *18*, 637. <https://doi.org/10.1186/s12889-018-5512-8>
- Torok, M., Caezar, A. L., Smart, A., Nicolopoulos, A., & Wong, Q. (2019). Preventing adolescent suicide: A systematic review of the effectiveness and change mechanisms of suicide prevention gatekeeping training programs for teachers and parents. *Journal of Adolescence*, *73*, 100–112. <https://doi.org/10.1016/j.adolescence.2019.04.005>
- Valdez-Santiago, R., Solórzano, H. E., Iñiguez, M. M., Burgos, Á. L., Gómez-Hernández, H., & Martínez-González, Á. (2017). Attempted suicide among adolescents in Mexico: Prevalence and associated factors at the national level. *Injury Prevention*, <http://injuryprevention.bmj.com/lookup/doi/10.1136/injuryprev-2016-042197>
- WHO (2010). *Suicide huge but preventable public health problem, says WHO*. World Health Organization. <http://www.who.int/mediacentre/news/releases/2004/pr61/en/>
- WHO (2014). *Preventing suicide: A global imperative*. World Health Organization. http://apps.who.int/iris/bitstream/10665/131056/1/9789241564779_eng.pdf?ua=1
- WHO (2017). *Suicide data*. World Health Organization. http://www.who.int/mental_health/prevention/suicide/suicideprevent/en/
- Zwald, M. L., Annor, F. B., Wilkinson, A., Friedrichs, M., Fondario, A., Dunn, A. C., Nakashima, A., Gilbert, L. K., & Ivey-Stephenson, A. (2018). Suicidal Ideation and Attempts Among Students in Grades 8, 10, and 12 – Utah, 2015. *MMWR. Morbidity and Mortality Weekly Report*, *67*(15), 451–454. http://www.cdc.gov/mmwr/volumes/67/wr/mm6715a4.htm?s_cid=mm6715a4_w

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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