A School-Based Multilevel Study of Adolescent Suicide Ideation in California High Schools

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Objectives To assess the between-school variation in suicide ideation and to estimate the contribution of school-level attributes, student-level characteristics, and 2 cross-level interactions (school by student) to student suicide ideation.

Study design A secondary analysis of the California Healthy Kids Survey in 2 large and representative samples of California high schools and students: 2009-2011 and 2011-2013. This is a population sample of all public high school students (grades 9 and 11) in California. Analyses were first conducted on surveys administered in the 2011-2013 academic years to 790 schools with 345 203 students and replicated on surveys administered in 2009-2011 to 860 schools with 406 313 students.

Results School-level suicide ideation rates ranged between 4% and 67%, with a median of 19.3% and mean of 20.0% (SD, 5.7%). Student suicide ideation was explained by student-level characteristics ($R^2 = .20$) and to a larger extent by school-level attributes ($R^2 = .55$). Student-level characteristics predictive of suicide ideation included, sex, ethnic and racial affiliation, victimization, and perceptions of school climate. In both samples, school size and average level of academic achievement were not associated with rates of school suicide ideation. Schools with a larger number of girls and higher levels of victimization had higher rates of suicide ideation in both samples. The hypotheses regarding cross-level interactions were not confirmed.

Conclusions Differences among schools in student suicide ideation are meaningful. The findings suggest an emphasis on the role of schools in prevention programs, public health campaigns to reduce suicide, multilevel research, and theory development. (J Pediatr 2018;■■:■:■:■■)
variance in student suicide ideation: school-level attributes, student-level characteristics, and cross-level interactions (school by student). Specifically, we examined cross-level interactions between school-level victimization and student-level victimization, such that when students who are victimized in schools with lower levels of victimization tend to have more suicide ideation compared with students who are victimized in schools that have higher levels of victimization. Students in the former schools may feel more isolated compared with students who are victimized in school, but so are many of their peers. The second hypothesis was that student-level victimization is associated with suicide ideation more in schools with low levels of teacher support compared with students in other schools in which staff are perceived as providing more support, thus, moderating the effects of student victimization.

**Methods**

The data for this study came from 2 sources: the California Healthy Kids Survey (CHKS), conducted by WestEd\(^{20}\) for the California Department of Education, and publicly available school-level data from the California Department of Education, mainly the California Basic Educational Data System (available at: http://www.cde.ca.gov/ds/sd/ch/index.cfm) and the Academic Performance Index Base (available at: http://www.cde.ca.gov/ta/ac/api/).

The CHKS is a survey administered biannually by WestEd to 5th-, 7th-, 9th-, and 11th-grade students, conducted as a census among all public school districts, schools, and students in the relevant grades. A 2-year wave provides a representative sample of the state of California. Prior studies using this database reported that approximately 85% of school districts in California participate.\(^{21}\) A study using CHKS data from a consortium of several school districts in the Southern California region reported an 87% student-level response rate.\(^{22}\)

The present analyses focused on high school students (grades 9 and 11). Analyses were first conducted on surveys administered in the 2011-2013 academic years to 790 schools with 179 457 ninth-grade students (52.0%) and 165 746 eleventh-grade students (48.0%), then replicated with surveys administered in the 2011-2013 academic years to 860 schools with 216 587 ninth-grade students (46.7%) and 189 726 eleventh-grade students (53.3%). These are 2 separate population samples with separate groups of students in each sample.

This secondary data analysis was reviewed by the institutional review board of the second author’s university and deemed exempt.

**Dependent Variable**

Similar to other studies (eg, the Youth Risk Behavior Surveillance [YRBS]), students were asked: “During the past 12 months, did you ever seriously consider suicide?”

**Student-Level Independent Variables**

We used student-level variables that were present in the CHKS surveys. The selection of these predictors was based on previous studies on the effects of school context on student mental health and risk behaviors.\(^{12,14,15}\) Internal consistencies are reported per the 2011-2013 wave, because they are almost identical in the 2 waves.

Demographics included sex, grade, and race and ethnicity coded with 3 dummy variables (1 = African American or Black; Asian; Hispanic; and Other, with the value “White” serving as the reference, and therefore not showing in tables).

School climate was assessed with 2 constructs. School belongingness was computed as the mean of 5 items, such as “I feel close to people at this school” (alpha = 0.83). Adult support in school was computed as the mean of 6 items, each starting with “At my school, there is a teacher or some other adult who...” and continuing, for example, with “really cares about me” (alpha = 0.89). All items used a 5-point response scale (from 1 [strongly disagree] to 5 [strongly agree]).

Victimization and involvement in violence was assessed by the following five indexes: (a) moderate victimization (eg, frequency during the prior 12 months, at school, of having been “pushed, shoved, slapped, hit or kicked by someone who wasn’t just kidding around” [alpha = 0.78]; these 8 items were measured on a scale of 1 [0 times] to 4 [4 or more times]); (b) severe victimization as measured with 3 items (eg, “participated in a physical fight”) using the same scale (alpha = 0.59); (c) discrimination-based bullying as measured with 5 items accompanied by the same scale (eg, “harassed or bullied because of your race, ethnicity, or national origin”; alpha = 0.75); (d) weapon involvement as assessed by 4 items with the same scale (eg, “threatened or injured with a weapon such as a gun, knife, or club”; alpha = 0.75); and (e) gang membership as assessed by a yes-or-no answer to the question, “Do you consider yourself a member of a gang?”

**School-Level Independent Variables**

Some school-level attributes were aggregated from student-level data gathered as part of the survey. In addition, school-level ethnicity (defined as the proportion of each ethnic and racial group in the school), school enrollment, proportion of students eligible for free or reduced price lunch, and Academic Performance Index were extracted from California Department of Education school-level databases.

**Statistical Analyses**

We conducted multilevel analyses with students nested within schools. For the student-level, the dependent variable was binary (yes/no suicide ideation); we, therefore, fitted models with a logit link, assuming a binomial distribution (ie, multiple logistic regression). To determine whether a school-level analysis is justified, we examined the interschool variation. Because our average school size was unusually large, with more than 400 students per school, and we had a very large sample of schools, we followed Bliese’s recommendation and measured between-school variability with the coefficient ICC(2),\(^{23}\) the index of reliability of group means, which indicates whether group means can be used to reliably differentiate between groups (in this case, schools) in terms of the dependent variable. The ICC(2) is customarily interpreted in a way similar to Cronbach alpha, with 0.60 being the lower boundary of...
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