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Developmental Differences in Risk Factors for Suicide Attempts between Ninth and Eleventh Graders

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In order to identify differences in risk factors for suicide attempts throughout adolescence, this study utilized a school-based survey of ninth (n = 1,192) and eleventh graders (N = 1,055). Suicide attempts were associated with cigarette and alcohol use, family violence, and depression for ninth graders and with illicit drug use, school violence, and sexual abuse for eleventh graders, while having friends was protective for both groups. Additionally, having more than one risk factor imparted an exponential risk for suicide attempts (ninth > eleventh graders). The differences detected are consistent with developmental changes of adolescence and represent important information for identification of at-risk youth.

Adolescent suicide and suicidal behaviors have caused great concern within the medical and public health community. Although the incidence of youth suicide has declined over the last decade, suicide remains one of the leading causes of adolescent mortality in the United States (Gould, Greenberg, Velting, & Shaffer, 2003). While current annual rates for suicide are low (1.5 per 100,000 for 10–14 year olds and 8.2 per 100,000 for 15–19 year olds), rates of suicidal behaviors in community samples are much higher (De Man & Leduc, 1994; Lewinsohn, Rohde, & Seeley, 1996; Reynolds, 1999). The 2001 Youth Risk Behavior Surveillance Survey (YRBS) conducted by the Centers for Disease Control and Prevention (CDC) found that 8.8% of youth attempted suicide in the last 12 months (CDC, 2003). Other epidemiological studies suggest that the lifetime rate of suicide attempts ranges from 3% to 15% (Lewinsohn, Rohde, Seeley, & Baldwin, 2001).

Numerous risk factors for adolescent suicidal attempts have been reported in the literature, including female gender, psychopathology, family discord, substance abuse, health problems, negative life events, academic problems, and sexual abuse (Borowsky, Ireland & Resnick, 2001; Gould et al., 1998; Lewinsohn, Rohde & Seeley, 1993; McKeown et al.,1998; Reifman & Windle, 1995; Reinherz et al., 1995). While much is known about the precursors of suicide attempts in adolescents, developmental differences are not well understood. It is known that older adoles-

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cents have a higher risk of suicide and that risk factors for suicide differ by age (Brent, Baugher, Bridge, Chen, & Chiappetta, 1999; Lewinsohn et al., 1996). Suicidal behaviors have been associated with other problem behaviors that increase with age, including gun-carrying, tobacco use, lack of seatbelt use, and condom nonuse (Brent et al. 1999; Brooks, Harris, Thrall, & Woods, 2002; Orpinas, Basen-Engquist, Grunbaum, & Parcel, 1995; Woods et al., 1997). The relative contribution of risk factors throughout the adolescent period, however, has yet to be examined thoroughly.

In order to explore the developmental differences in risk factors for suicide attempts, we analyzed data from the Teen Health Surveys collected at Cambridge Rindge and Latin High School (CRLS) in Cambridge, MA, from 1996–2002. Our hypothesis was that the risks associated with suicide attempts would be different for ninth and eleventh graders reflecting their developmental changes. The study was approved by the Cambridge Health Alliance Institutional Review Board in March 2004.

METHOD

Context and Participants

Cambridge is an urban community of approximately 100,000 people located just outside of Boston. The high school, CRLS, has a racially and economically diverse population ($N = 1{,}900$); in 2001–2002, the demographic breakdown was 51% male, 40% Black, 37% White, 15% Hispanic, and 7% Asian (Cambridge Public Schools [CPS], 2004). The school population and racial and gender makeup during the time of the study (1996–2002) remained fairly stable.

Since 1990, the Teen Health Survey, based on the YRBS, has been administered to all consenting students in attendance at CRLS every other year during the spring semester. A passive parent consent form is sent home prior to conducting the surveys. Families are told of their teen's pending participation and asked to exclude them if they have any concerns. Students are also informed that participation is voluntary and anonymous.

Student attendance rates for CRLS were 95% for 1999/2000 and 2001/2002. Survey refusal rates were less than 2%. Exclusion of some special education students decreased participation rates slightly (Handricken & Black, 2003), and less than 1% of surveys were excluded due to incomplete responses (fewer than 75% of questions were answered). Surveys were available in Spanish, Portuguese, and Haitian Creole. Participation rates ranged from 71% to 85% from 1998–2002 (CPS, 2004).

For the purposes of this study, data from the Teen Health surveys in 1996, 1998, and 2000 for ninth graders and data from 1998, 2000, and 2002 for eleventh graders were used. These years were combined in order to expand the data set for each grade. The potential of a cohort effect was investigated by including a term for year as a potential confounder and effect modifier of predictor variables. The Teen Health Survey, like the YRBS is an anonymous survey and does not allow for linkage of individual students; however, given that between 75% and 85% of eleventh graders had started CRLS as ninth graders, no students were held back, and the drop-out rate was extremely low (2.5–1.4% during the years in question) (CPS, 2004), an attempt was made to capture the same students in both grades by using data on eleventh graders two years later.

In 1996, 421 ninth graders participated in the survey (85%); in 1998, 414 (81%) participated; and, in 2000, 395 (78%) participated. In 1998, 358 (71%) eleventh graders participated in the survey; in 2000, 357 (73%) participated; and, in 2002, 379 (78%) participated (CPS, 2004). The total sample for study was 1,230 ninth graders and 1,094 eleventh graders.

Questionnaire

Although the Teen Health Survey used many of the YRBS questions, particularly on drug and alcohol use and sexual activity, it

also incorporated questions from the Michigan Model® Survey (Michigan Department of Community Health, 1989), Monitoring the Future (Johnston, O'Malley, & Bachman, 1989), and locally designed questions. These local questions covered information on family constellation; stressful events such as a death in the family, divorce, or moving in the last year; a set of questions about "worry" over the last year particularly focused on school and home safety and violence; and the use of counseling services. In addition, there were questions addressing youth assets such as number of friends and participation in sports and after school activities. The question of interest used for this study was taken from the YRBS and read, "During the last 12 months, how many times did you actually attempt suicide?" This question has been used on the YRBS since 1991 and represents a stable data source (Gould et al., 2003). Additionally, it has been found to have high retest reliability ($\kappa = 76.4$) (Brener, Collins, Kann, Warren, & Williams, 1995; Brener, Kann, McManus, Kinchen, Sundberg, & Ross, 2002).

Measures

Only questions that were available for all survey years (77%) were included in the analysis. Data were merged to create a dataset with all ninth graders from the 1996, 1998, and 2000 surveys and a dataset for eleventh graders from the 1998, 2000, and 2002 surveys. The main outcome variable of suicide attempt was recoded as a dichotomous variable, with no attempts versus one or more attempts as the categories. Alcohol and marijuana use in the past 30 days were also recoded as dichotomous; none and 1–2 drinks in one category versus 3 or more. An illicit drug variable was created as never versus ever for any illicit drug tried in a lifetime, including heroin, cocaine, acid, other psychedelics, amphetamines, tranquilizers, barbiturates, glue, or other narcotics. In order to assess those students who were older age for grade, age was coded as a dichotomous variable with students less than 15 years of age and 15 or older as the categories for the ninth grade dataset and students less than 18 years of age and 18 years or older as the categories for the eleventh grade dataset. All variables that asked, "During the last 12 months has this ever happened to you?" which included a series of life events, sexual and verbal abuse, and at home violence, were coded as missing if the response was "don't know." A series of questions asked "During the past 12 months how often do you worry about . . . ?" These questions were originally coded on a 5-point Likert scale of *never*, *once in a while*, *sometimes*, *often*, and *always*. The distribution of the data suggested that adjacent categories be collapsed. With consideration for conceptual meaning they were recoded as dichotomous variables *with never/once in a while/sometimes* in one category and *often/always* in another.

Students with missing information on gender or the main question of interest, suicide attempts, were deleted from the dataset (67 students from the ninth grade dataset and 34 from the eleventh dataset). As with other urban school districts, there were a small number of students who were considered old or young for grade and likely to be developmentally different from their same grade peers. In order to focus on developmental groupings, only students 16 and younger were considered for the ninth grade analysis and only students 16 and older were considered for the eleventh grade analysis. The final sample consisted of 1,192 ninth graders and 1,055 eleventh graders. In addition, variables that had more than 5% of their values missing were not analyzed for that particular grade dataset.

Analysis

In order to assess the relationship between suicide attempts and risk and resiliency factors, bivariate analyses were conducted separately for each grade on a series of demographic, social, and behavioral factors. Odds ratios (OR) with 95% confidence intervals (95% CI) and p values were calculated for all variables. Then, using logistic regression, the factors that were independently related to

suicide attempts, controlling for grade and age, were determined. Risk and resiliency factors were grouped into ten categories. They were defined as: demographics, family violence, non-family violence, mental health, drugs and alcohol, sexual experiences, abuse, life events, social support, and school grades. Separate logistic regression models were performed for each category.

It was determined that, given the large underlying sample size in each analysis, only variables with an OR greater than 2 would be entered into the final model for each grade. Gender and depression were included in the model regardless of size of odds ratio because of a priori knowledge of their importance as factors in suicide attempts. In order to further reduce the variables for the final model, the best selection model option from SAS 8.0, which is based on the likelihood score statistic of the model, was employed (SAS, 2004). Based on the number of events with complete data, the final models for both the ninth and eleventh grades were restricted to six variables at most. This methodology ensured that there would be at least ten subjects with events per independent variable. The most parsimonious model with the largest likelihood score was selected as the final model.

In addition, a cumulative risk variable for each grade was created using the risk and resiliency factors from the final models. A regression model was then run separately for each datasets categorizing cumulative risk as having none of the risk factors, having one risk factor, or having two or more risk factors.

RESULTS

The final study sample consisted of 1,192 ninth graders and 1,055 eleventh graders. In both grade models, an effect for cohort year was not found to be a significant confounder or effect modifier.

Bivariate Analyses

General demographics of the two groups are presented in Table 1. A slight majority of ninth graders were male (52%), and identified themselves as White (37%) or Black (27%). The mean age was 14.5 and 52% were under 15 years. The eleventh graders had similar gender and race distributions, the mean age was 16.6 and 93% were less than 18 years.

Eighty-nine (7.5%) ninth graders and 70 (6.6%) eleventh graders reported having attempted to commit suicide one or more times during the past year. A number of sociodemographic and other risk variables were related to attempted suicide (Tables 2 and 3). Among ninth graders, students who attempted to commit suicide were more likely to be females. Teens in the ninth grade who reported a suicide attempt were more likely to have carried weapons out of school, been part of a gang, been arrested, and witnessed violence at home or experienced victimization at school. Having been verbally, physically, or sexually abused were also risk factors for suicide attempts. More students who attempted suicide also reported visiting a school-based health center in the prior 12 months or visiting a counselor. They are also eight times more likely to report worrying about depression most or all of the time in the previous 12 months. Use of cigarettes and problems with alcohol, marijuana, and other drugs were also associated with attempted suicide.

Among the eleventh graders, age was associated with suicide attempt. Students 18 or older were almost four times more likely to attempt suicide that those who were under 18. Eleventh graders who reported a suicide attempt were 12 times more likely to have been victimized at school and were also more likely to carry a weapon outside of school; to have witnessed family violence; and to have been verbally, physically, or sexually abused. Consumption of alcohol and marijuana use associated with suicide attempts was not statistically significant but use of other recreational drugs was. In addition, visiting a school-based health center, having seen a counselor, and worrying about depression were also associated with suicide attempts.

TABLE 1
Distribution of Demographic Characteristics Among 9th Grade and 11th Grade Students

	9th Grade		11th Grade	
Demographics	*n*	%	*n*	%
Gender				
Male	625	52.4	541	51.3
Female	567	47.6	514	48.7
Race				
Black	318	27	297	28.7
White	433	36.7	382	36.9
Hispanic	148	12.5	127	12.3
Asian	74	6.3	68	6.6
Other	207	17.5	162	15.6
Age				
13 yrs	5	0.4		
14 yrs	594	51.2		
15 yrs	523	45.1		
16 yrs	39	3.4		
16 yrs			509	53.5
17 yrs			378	397
18 yrs			52	5.5
19 yrs			8	0.8
20 or older			5	0.5
Born in one of 50 states in US				
Yes	910	76.7	768	73
Receive Public Assistance				
Yes	180	16.5	175	17.5
Receive Special Education				
Yes	111	10.4	111	11.2
Where do you live				
Parents/Guardian	972	82.7	852	81.4
Public Housing/Shelter/Temp Housing	204	17.3	194	18.6

Multivariable Analyses

The final model is presented in Table 4. Among the ninth graders, being a current cigarette smoker, having problems with alcohol, worrying about depression, having been raped, and familial verbal abuse—while controlling for gender—were associated with suicide attempts. Among the eleventh graders, the variables associated with suicide attempts, in addition to gender and worrying about depression, were being threatened in school, using illicit drugs, having been a victim of sexual abuse, and having one or more friends as a protective factor.

In an analysis of cumulative risk, ninth graders with one of the risk factors were approximately 3.6 times more likely to attempt suicide than those with no risk factors (95% CI 1.8–7.4), and those with two or more risk factors were about 22.3 times more likely to attempt suicide (95% CI 11.7–42.2). Among eleventh graders, those with one risk factor were about 3.3 times more likely to attempt

TABLE 2
Prevalence of Suicide Attempts and Associated Sociodemographic Risk Factors Among 9th (N = 1,192) and 11th Grade (N = 1,055) Students

	9th Grade			11th Grade		
	Attempted Suicide $N = 89$	% Attempt of those with risk factor	OR (95% CI)	Attempted Suicide $n = 70$	% Attempt of those with risk factor	OR (95% CI)
Gender						
Female	56	9.9	2.0 (1.3, 3.1)**	40	7.8	1.4 (0.9, 2.3)
Male	33	5.3	1.0 (ref.)	30	5.6	1.0 (ref.)
Race						
White	29	6.7	1.0 (ref.)	19	5.0	1.0 (ref.)
Black	17	5.3	1.2 (0.6, 2.4)	18	6.0	0.8 (0.4, 1.5)
Hispanic	14	9.5	2.0 (0.9, 4.2)	12	9.5	1.5 (0.7, 2.8)
Asian	6	8.1	2.2 (0.9, 5.4)	7	10.3	1.2 (0.5, 3.1)
Other	21	10.1	1.7 (0.8, 3.5)	13	8.0	1.6 (0.9, 2.8)
Age						
Less than 15 yrs	40	6.7	1.0 (ref.)			
15 or older	42	7.5	1.1 (0.7, 1.8)			
Age						
Less than 18 yrs				49	5.5	1.0 (ref.)
18 or older				12	18.5	3.9 (1.9, 7.7)***
Born in one of 50 states in US						
Yes	65	7.1	1.2 (0.8, 2.0)	41	5.3	1.9 (1.1, 3.1)*
Receive Public Assistance						
Yes	17	9.4	1.4 (0.8, 2.4)	12	6.9	1.1 (0.6, 2.1)
Receive Special Education						
Yes	17	15.3	2.6 (1.5, 4.6)**	9	8.1	1.4 (0.7, 2.9)
Where do you live						
Parents/Guardian	73	7.5	0.8 (0.4, 1.5)	53	6.2	1.4 (0.8, 2.4)
Public Housing/ Shelter/Temp Housing	12	5.9	1.0 (ref.)	16	8.3	1.0 (ref.)
Seen Counselor						
Yes	47	12.1	2.7 (1.7, 4.3)***	45	9.2	2.3 (1.3, 3.8)**
Teen Center						
Yes	74	8.7	2.3 (1.2, 4.3)**	47	9.4	2.6 (1.5, 4.4)**
GPA						
A and B	28	6.1	1.0 (ref.)	38	5.6	1.0 (ref.)
C, D and F	26	9.2	1.6 (0.9, 2.7)	27	8.0	1.5 (0.9, 2.5)

OR = odds ratio, CI = confidence interval
*$p < .05$, **$p < .01$, ***$p < .0001$

TABLE 3
Prevalence of Suicide Attempts and Associated Risk Factors Among 9th (N = 1,192) and 11th Grade (N = 1,055) Students

	9th Grade			11th Grade		
	Attempted Suicide $N = 89$	% Attempt of those with risk factor	OR (95% CI)	Attempted Suicide $n = 70$	% Attempt of those with risk factor	OR (95% CI)
Carried a weapon out of school 1 or more days						
Yes	28	5.6	3.6 (2.2, 5.9)***	16	6.0	2.0 (1.1, 3.7)*
Gang member						
Yes	15	19.7	3.9 (2.1, 7.3)***	6	14.3	2.4 (1.0, 5.9)
Current smoker						
Yes	36	22.6	5.7 (3.5, 9.1)***	12	5.4	0.7 (0.4, 1.4)
Past smoker						
Yes	28	7.5	1.0 (0.6, 1.6)	32	10.5	2.2 (1.3, 3.6)**
Taken any drugs[a]						
Yes	32	20.3	4.4 (2.7, 7.1)***	27	17.1	4.0 (2.4, 6.7)***
Alcohol in past 30 days						
0 days	23	3.9	1.0 (ref.)	27	6.2	1.0 (ref.)
1–2 days	19	7.5	2.0 (1.1, 3.8)***	12	6.2	1.0 (0.5, 2.0)
3 or more days	40	15.2	4.5 (2.6, 7.6)***	29	7.8	1.3 (0.7, 2.2)
Marijuana in past 30 days						
0 days	42	4.6	1.0 (ref.)	43	6.0	1.0 (ref.)
1–2 days	12	10.2	2.3 (1.2, 4.6)***	10	10.4	1.8 (0.9, 3.8)
3 or more days	29	24.2	6.6 (3.9, 11.0)***	17	8.0	1.4 (0.8, 2.5)
Arrested in past year						
Yes	14	19.7	3.7 (1.9, 6.9)***	3	5.3	0.8 (0.2, 2.6)
Worry about depression						
Often/Always	47	23.7	7.6 (4.8, 12.1)***	30	16.6	4.3 (2.6, 7.1)***
Worry about violence in neighborhood						
Often/Always	10	13.5	2.0 (1.0, 4.1)	7	13.5	2.3 (1.0, 5.3)
Worry about violence at home						
Often/Always	8	34.8	7.3 (3.0, 17.7)***	7	33.3	7.6 (3.0, 19.5)***
Worry about fights at home						
Often/Always	8	21.1	3.6 (1.6, 8.1)**	7	28.0	5.9 (2.4, 14.6)***
Worry about not having enough money						
Often/Always	12	20.3	3.6 (1.8, 7.1)**	13	20.0	4.2 (2.2, 8.1)***
Worry about housing or being homeless						
Often/Always	2	13.3	1.9 (0.4, 8.7)	4	16.7	2.9 (1.0, 8.8)
In past year had failing grades						
Yes	44	9.1	1.5 (1.0, 2.3)	33	8.6	1.6 (1.0, 2.6)
Problems with AOD						
Yes	32	36.4	10.8 (6.5, 18.0)***	23	17.6	3.9 (2.3, 6.7)***

Family has problems with AOD						
Yes	26	18.7	3.7 (2.2, 6.1)***	22	14.2	2.9 (1.7, 5.0)***
Parents divorced or separated						
Yes	13	10.7	1.6 (0.9, 3.1)	8	9.2	1.5 (0.7, 3.2)
Family moved						
Yes	19	10.1	1.5 (0.9, 2.6)	19	13.1	2.5 (1.4, 4.4)**
Family member or close friend died						
Yes	40	9.1	1.5 (1.0, 2.4)	31	8.4	1.6 (1.0, 2.5)
Witness family violence						
Yes	24	25.8	5.6 (3.3, 9.5)***	13	22.0	4.6 (2.3, 9.0)***
Threatened with a knife/gun at school						
Yes	12	35.3	7.9 (3.8, 16.6)***	10	43.5	12.3 (5.2, 29.3)***
Threatened with a knife/gun outside school						
Yes	12	14.8	2.4 (1.2, 4.6)**	14	18.2	3.6 (1.9, 6.9)***
Beaten or physically hurt by family member						
Yes	17	27.9	5.7 (3.1, 10.5)***	14	30.4	7.4 (3.7, 14.6)***
Beaten or physically hurt by non family member						
Yes	8	18.6	3.0 (1.4, 6.8)**	13	30.2	7.2 (3.5, 14.5)***
Sexually Abused						
Yes	21	191	6.5 (3.7, 11.4)***	11	16.8	6.0 (2.8, 12.5)***
Verbally or Emotionally Abused						
Yes	41	17.3	4.1 (2.6, 6.4)***	30	15.6	3.8 (2.3, 6.3)***
Mistreated due to appearance						
Yes	10	12.8	2.0 (1.0, 4.0)	11	22.0	4.5 (2.2, 9.3)***
Ever Had Sex						
Yes	45	13.6	3.1 (2.0, 4.8)***	41	8.7	2.3 (1.3, 3.9)**
Ever been Raped						
Yes	18	31.0	7.3 (3.9, 13.4)***	15	19.7	4.5 (2.4, 8.4)***
Ever had Homosexual Experience						
Yes	6	20.7	3.4 (1.4, 8.7)**	9	18.8	3.8 (1.7, 8.1)**
Ever Raped someone						
Yes	8	40.0	9.5 (3.8, 24.0)***	6	37.5	9.5 (3.3, 27.0)***
Participated in Intramural sports						
Yes	32	6.6	0.8 (0.5, 1.3)	21	5.0	0.6 (0.4, 1.1)
Participated in Community sports						
Yes	20	5.6	0.7 (0.4, 1.2)	10	4.3	0.6 (0.3, 1.1)
Number of friends						
None	7	16.7	0.4 (0.2, 0.9)*	11	5.9	0.3 (0.1, 0.6)**

OR = odds ratio; AOD = Alcohol or Drugs

[a]Drugs defined as LSD, psychedelics, cocaine, non-prescribed amphetamines, tranquilizers, barbiturates heroin, glue or other non-prescription narcotics.

*$p < .05$; **$p < .01$; ***$p < .0001$.

TABLE 4
Best Model Predicting Suicide Attempts Adjusting for Gender for 9th and 11th Grade Students

Risk Factors	9th Grade Odds Ratio	95% CI
Ever worry about depression	4.9	2.8, 8.8
Problems with alcohol	4.7	2.4, 9.1
Current smoker	3.2	1.7, 5.8
Ever been raped	3.1	1.4, 7.1
Verbal abuse	2.1	1.2, 3.7
Gender–female	1.4	0.8, 2.6

C statistic 0.83 Model *p* value < .0001

Risk Factors	11th Grade Odds Ratio	95% CI
Ever threatened in school	3.9	1.3, 12.1
Use of drugs in past year	3.2	1.8, 5.7
Ever worry about depression	2.9	1.6, 5.1
Ever sexually abused	2.5	1.0, 6.2
Gender–female	1.4	0.8, 2.5
Having more than one friend	0.3	0.1, 0.7

C statistic 0.76 Model *p* value < .0001

suicide (95% CI 1.8–6.1) and those with two or more were 14.8 times more likely to attempt suicide than those with no risk factors (95% CI 7.9–28.0).

DISCUSSION

The rates of reported suicide attempts by ninth and eleventh graders in this study were similar to those found in other studies (Brooks et al., 2002). The most important risk factors for suicide attempts, including experiencing violence, using substances, worrying about depression, and failing in school, were also consistent with those found in the literature (King et al., 2001; Kelly, Cornelius, & Clark, 2003; Lewinsohn et al., 2001; Woods et al., 1997). In the final model, as hypothesized, there were important differences in the risk factors for ninth and eleventh graders consistent with the developmental changes of adolescence.

While there were multiple common risk factors for suicide attempts in our bivariate analyses for both groups, there was far less overlap in our final model. Only gender and "worry about depression" were predictors of suicide attempts for both groups. There was no difference in the risk imparted by female gender, but the risk of suicide attempts for ninth graders who worried about depression was almost double (1.7 adjusted) that for eleventh graders. The relationship between depression and suicide attempts has been well-established (King et al., 2001; Lewinsohn et al., 2001; Woods et al., 1997); however, the relationship between "worry about depression" and suicide attempts has not. In this study, we found that "worry about depression" was significantly related to all expected risk factors for depression and suicide attempts.

The diminishing risk contribution of "worry about depression" to suicidal behavior from ninth and eleventh grade, seen in this analysis, is of interest. Lewinsohn et al. (2001), found that suicide attempts decreased with age more significantly than major depression did. While developmental maturation and decreasing impulsivity may be partly responsible for this change, it is also likely that other psychopathology plays a more important role with age. This may be particularly true of substance abuse, which peaks in later adolescence. Brent's autopsy studies found that older adolescent suicide victims were more likely to be substance abusers and have conduct and mood disorders than younger victims (Brent et al., 1999). Since this study did not assess other psychopathology, we are unable to determine its contribution. Further research on the relative role of these various risk factors in older adolescent suicide attempters is merited.

Consistent with other studies, our results indicated that substance use increased the risk for suicide attempts for students in both grades (Deykin & Buka, 1994; Kelly et

al., 2003; Wu et al., 2004). For ninth graders only, alcohol and cigarette use made it into the final model while for eleventh graders, other drugs played a more significant role. The typical sequence of drug use in adolescence begins with cigarettes and alcohol and progresses to illicit substances (Kandel, Yamaguchi, & Chen 1992). Prevalence estimates demonstrate that while ninth grade use of alcohol and marijuana is relatively uncommon, it is far more common in eleventh and twelfth grades (CDC, 2003). By eleventh grade, use of alcohol and marijuana may almost be considered a normative behavior. The use of other drugs, however, is less acceptable even in the eleventh grade, and therefore is likely to indicate other associated high risk behaviors including suicidal behaviors (Newcomb, Maddahian, & Bentler, 1986).

Childhood abuse has been shown to be a strong predictor of depression and other psychopathology (McHolm, MacMillan, & Jamieson, 2003; Taussig, 2002) as well as an independent risk factor for suicidal behavior (Ystgarrd, Hestertun, Loeb, & Mehlum, 2004). In this study, sexual abuse was a strong predictor of suicide attempts in unadjusted analyses for both grade populations; however, it was expressed somewhat differently in the final model. Whereas rape was a strong predictor for ninth graders, sexual abuse was a predictor for eleventh graders. It is difficult to determine the difference between sexual abuse and rape in the mind of young adolescents. The meaning of these terms may be age dependent. There is no doubt, however, that these traumatic experiences impart high risk for suicide attempts in both groups.

Experiencing familial physical or verbal abuse increased the risk for suicide attempts in both grades in the bivariate analysis. Yet in the final model, only verbal abuse by a family member emerged as a strong predictor of suicide attempts for ninth graders. This could be considered consistent with adolescent developmental stages as younger adolescents show greater vulnerability to family discord whereas older adolescents are more influenced by peer interactions. According to Brent and colleagues (1999), interpersonal loss or conflict was the most common precipitant of suicide for both age groups but generally involved a family member for younger individuals and a romantic relationship for older ones. These relationships have been born out in other postmortem studies of adolescent suicide victims (Groholt, Ekeberg, Wichstrom, & Haldorsen, 1998). One somewhat surprising finding in this study was that verbal abuse was a stronger predictor of suicide attempts compared with other forms of abuse. Little is known about the differential impact of physical, sexual, or verbal abuse on suicidal behaviors and this area requires further investigation.

For the eleventh graders, being victimized at school was the strongest predictor of suicide attempts. Given the significance of peer acceptance to older adolescents, it is not surprising that being threatened in school would convey great risk. In addition, recent studies have found that those involved in bullying as both victims and perpetrators have a high prevalence of depression (Saluja et al., 2004; Seals & Young, 2003). Experiencing victimization in school can lead to fear, isolation from peers, and depression. Consistent with the developmental tasks of adolescents, one would expect that older adolescents would be more vulnerable emotionally to negative peer interactions when compared to their younger counterparts.

We also examined a number of resiliency factors in our study including involvement in intramural and extramural sports, physical activity, and having friends; however, having friends was the only factor that made it into the final model for the eleventh graders. The protective nature of having friends further emphasizes the importance of peer relationships for the older adolescent (Bearman & Moody, 2004; Lerner & Galambos, 1998).

Perhaps most importantly, this study indicates that while individual risk factors are significant predictors of suicide attempts, having multiple risk factors increases the risk for suicide attempts exponentially in both grades. The cumulative risk of exposure to violence, substance use, and depression is

particularly concerning. Although true for both grades, this cumulative effect was particularly strong for ninth graders, suggesting that the impact of cumulative risk on younger adolescents may be of particular concern. Risk behaviors are less frequent in ninth grade and thus their presence is even more indicative of major problems. Identifying these students early and connecting them to services is an important step in prevention.

Strengths and Limitations

This study has several strengths and limitations. Cambridge is a diverse community located near a major urban center and is similar to other locations with these characteristics. The population studied represents a nonclinical community sample. The diversity of questions on the survey allowed researchers to investigate a variety of factors potentially related to suicide attempts that have not been previously examined in one study. The biannual administration of the Teen Health Survey allowed for combining datasets and gave us a unique opportunity to examine risk by grade level, which has not been done previously. In addition, the high rate of student retention from ninth to eleventh grade (75–85% of eleventh grade students started CRLS as ninth grade students) allowed reasonable assurance that a large number of students took the survey in both grades. The study is, however, limited to one urban high school, and may not be representative of other communities. In addition, students who dropped out by eleventh grade would not be included in the study. Since these students are often at highest risk for problem behaviors, (Gould, Fisher, Parides, Flory, & Shaffer, 1996) the eleventh grade sample may be healthier than the full population of teenagers of those ages. It is also possible that newly enrolled students may have impacted our conclusions about developmental differences in risk factors. While the anonymous nature of the survey has been shown to increase prevalence estimates of risky and socially stigmatized behavior by maximizing confidentiality (Kann, Brener, Warren, Collins & Giovino, 2002), the study was limited to a cross-sectional design. Given the format of the questions that asked only about suicide attempts in the last year, we were also unable to determine any temporal relationships between risk or resiliency factors or potentially mediating variables and suicide attempts. In addition, the suicide question that was used as the outcome variable does not describe the nature of the attempt. The intentionality and lethality of the attempt are not known. Finally, while grade was used as a proxy for developmental stage, there was no specific question that ascertained emotional or cognitive development on the survey.

CONCLUSION

Early use of gateway drugs, as well as experiences of familial abuse, increased the risk of suicide attempts for ninth graders, while eleventh graders were more vulnerable if they had been exposed to interpersonal violence at school and were using illicit substances. These differences reflect relational shifts consistent with adolescent developmental processes. For both groups, worrying about depression was a contributing risk factor although its effect diminished for eleventh graders. While particularly worrisome for ninth graders, the combination of abuse, substance abuse, and worry about depression represents an extremely high risk for suicide attempts in both grade cohorts.

Suicide continues to be a leading cause of mortality in this population. Early detection can help prevent deadly consequences by connecting young people to needed treatment. As our understanding of developmental vulnerabilities and protective factors for adolescents' suicide grows, it will provide guidance for more effective targeted prevention and intervention. Addressing these issues in a prospective, cohort study would provide much needed information about the developmental factors that require early intervention.

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