Effect of the Incident at Columbine on Students' Violence- and Suicide-Related Behaviors

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Background: This study examined the impact that the violent incident at Columbine High School may have had on reports of behaviors related to violence and suicide among U.S. high school students.

Methods: Nationally representative data from the 1999 Youth Risk Behavior Survey (YRBS) were analyzed using logistic regression analyses.

Results: Students who completed the 1999 YRBS after the Columbine incident were more likely to report feeling too unsafe to go to school and less likely to report considering or planning suicide than were students who completed the 1999 YRBS before the incident.

Conclusions: These results highlight how an extreme incident of school violence can affect students nationwide.

Medical Subject Headings (MeSH): adolescence, behavior, schools, suicide, violence (Am J Prev Med 2002;22(3):146–150)

On April 20, 1999, shootings at Columbine High School in Littleton, Colorado, resulted in the deaths by homicide of 12 students and one teacher and the suicides of the two teenage perpetrators. Despite the fact that <1% of homicides and suicides among school-aged children are associated with school,[1] when they do occur, they have numerous consequences for students, parents, and schools nationwide. After Columbine, students and parents reported being fearful of similar incidents at their schools,[2] and students perceived to be similar to the perpetrators were ostracized by both students and adults.[3] Many schools received threats of similar types of violence, and many schools initiated programs and policies to prevent violence and imposed stricter sanctions for violence-related behaviors.[4–8]

The Columbine incident and its consequences are likely to have affected the prevalence of violence- and suicide-related behavior reported after the incident. Because the incident occurred during data collection for the 1999 Youth Risk Behavior Survey (YRBS), which measures behaviors related to violence and suicide, the incident provided a "natural experiment" in which we were able to compare 1999 YRBS data collected before and after April 20, 1999.

We tested three hypotheses and made several comparisons related to the timing of the data collection. First, we hypothesized that the increase in students and parents' perceptions of vulnerability following the Columbine incident would result in more students reporting that they missed school because they felt too unsafe to attend. Second, because prior research has shown a positive association between adolescents' perceptions of vulnerability and their likelihood of weapon carrying,[9,10] we hypothesized that student weapon carrying would increase following the Columbine incident. We also explored whether student reports of fighting, being injured in a fight, fighting at school, and being threatened or injured by someone with a weapon at school changed following the Columbine incident. Our third hypothesis relates to the fact that the Columbine incident resulted in two youth suicides, which were widely covered in the media. Numerous studies suggest that media coverage of youth suicide can lead to imitation among vulnerable youth.[11] Therefore, we examined whether the percentage of high school students reporting considering, planning, or attempting suicide increased following the Columbine incident.

Methods

Study Design

This study used data from the 1999 national school-based YRBS. This survey used a three-stage cluster-sample design to

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0749-3797/02/$–see front matter
PII S0749-3797(01)00433-0

Table 1. Effect of survey timing on behaviors related to violence and suicide, 1999

Behavior	Before April 20 (n = 12,049) % (95% CI)	After April 20 (n = 3137) % (95% CI)	Adjusted OR[a] (95% CI)
Felt too unsafe to go to school[b]	3.9 (± 0.9)	10.2 (± 2.7)	2.64 (1.71–4.07)
Considered suicide[c]	20.0 (± 1.2)	16.4 (± 1.7)	0.85 (0.74–0.96)
Made a suicide plan[c]	15.7 (± 1.1)	10.4 (± 2.8)	0.67 (0.51–0.89)
Felt sad and hopeless[c]	28.3 (± 1.8)	28.2 (± 2.5)	1.01 (0.86–1.18)
Attempted suicide[c]	8.4 (± 1.0)	8.0 (± 2.2)	1.03 (0.73–1.46)
Injurious suicide attempt[c]	2.5 (± 0.6)	3.2 (± 1.6)	1.46 (0.85–2.52)
Carried a gun[b]	4.9 (± 1.3)	5.0 (± 3.7)	1.05 (0.51–2.17)
Injured in a physical fight[c]	3.9 (± 0.7)	4.3 (± 2.3)	1.06 (0.70–1.60)
Carried a weapon on school property[b]	7.5 (± 1.5)	4.8 (± 2.4)	0.68 (0.35–1.34)
Threatened or injured with a weapon on school property[c]	7.5 (± 0.9)	8.4 (± 1.8)	1.16 (0.85–1.57)
In a physical fight on school property[b]	14.2 (± 1.6)	14.3 (± 2.9)	1.02 (0.80–1.30)

[a] OR adjusted for gender, grade, race or ethnicity, metropolitan status, and geographic region.
[b] During the 30 days before the survey.
[c] During the 12 months before the survey.
CI, confidence interval; OR, odds ratio.

obtain a nationally representative sample of students in grades 9 through 12. The target population consisted of all public and private high school students in the 50 states and the District of Columbia. Details of the sample design have been described previously.[12]

Survey procedures were designed to protect student privacy and to allow for anonymous participation. Trained data collectors administered a questionnaire containing approximately 90 items in the classroom. The questionnaire covered six categories of behaviors: (1) those that contribute to unintentional injury and violence, (2) tobacco use, (3) alcohol and other drug use, (4) sexual behaviors that contribute to unintended pregnancy and sexually transmitted diseases, (5) dietary behaviors, and (6) physical activity. Students recorded their responses on computer-scannable questionnaire booklets.

Following local procedures, parental consent was obtained before survey administration. Several methods were used to maximize participation at all levels, including multiple mailings to parents and revisiting schools to collect data from previously absent students. The school response rate was 77%, the student response rate was 86%, and the overall response rate was 66%. A total of 15,349 students completed questionnaires between March 1 and June 4 of 1999. More than three quarters (78.4%) of the students (n =12,049) completed questionnaires on or before April 20, the date of the incident at Columbine High School.

Students answered eight questions about interpersonal violence and five questions related to suicide. Specifically, the questionnaire assessed weapon carrying, gun carrying, weapon carrying on school property, and missing school because of feeling unsafe during the 30 days preceding the survey. In addition, the questionnaire assessed physical fighting, injurious physical fighting, physical fighting on school property, and being threatened or injured with a weapon on school property during the 12 months before the survey. The questionnaire also assessed whether students felt sad and hopeless, seriously considered suicide, made a suicide plan, attempted suicide, and made a suicide attempt requiring medical attention during the 12 months before the survey. To calculate prevalence estimates, responses to each of the above questions that did not require a "yes" or "no" response were recoded into two categories: 0 versus 1 or more days or times.

Data Analysis

A weighting factor based on student gender, race, or ethnicity, and grade in school was applied to each record to adjust for student nonresponse and the oversampling of black and Hispanic students. The final overall weights were scaled so that the weighted count of students equaled the total sample size, and the weighted proportions of students in each grade matched national population projections for each survey year. All estimates are based on weighted data.

All analyses were performed using SUDAAN, a software package that accounts for the complex sampling design and weighting factors in the data set.[13] Data for racial or ethnic groups other than white, black, and Hispanic were combined in an "other" group because their individual sample sizes were too small for meaningful analysis. The effect of the timing of data collection (before or after the Columbine incident) on all variables related to violence and suicide was measured using logistic regression analyses that controlled for gender, grade, race, or ethnicity; metropolitan status (urban, suburban, and rural); and U.S. geographic region (Northeast, South, Midwest, and West).

Results

We compared by chi-square analyses the distributions of respondents completing questionnaires on or before and after April 20 on gender, grade, race or ethnicity, metropolitan status, and geographic region. Although we found no significant differences (all $p > 0.2$), we controlled for these variables in the subsequent analyses to eliminate any potential confounding.

As shown in Table 1, relative to students who completed the YRBS on or before April 20, those who completed the questionnaire after April 20 were at

Table 2. Relationship between violence- and suicide-related behaviors and survey timing, by metropolitan status

Behavior	OR (95% CI)		
	Urban	Suburban	Rural
Felt too unsafe to go to school[a]	2.50 (1.37–4.57)	2.77 (1.45–5.32)	12.33 (9.92–15.32)
Considered suicide[b]	1.00 (0.81–1.24)	0.72 (0.63–0.83)	0.74 (0.62–0.87)
Made a suicide plan[b]	0.98 (0.81–1.19)	0.52 (0.35–0.76)	0.75 (0.58–0.97)

[a] During the 30 days before the survey.
[b] During the 12 months before the survey. CI, confidence interval; OR, odds ratio.

increased odds of reporting that they felt too unsafe to go to school on one or more of the 30 days before the survey (adjusted odds ratio [OR], 2.64; 95% confidence interval [CI], 1.71–4.07). Specifically, 3.9% of students completing questionnaires on or before April 20 reported feeling too unsafe to go to school, compared with 10.2% of students who completed questionnaires after April 20. In addition, relative to students who completed the YRBS on or before April 20, those who completed questionnaires after April 20 were significantly *less* likely to report considering suicide (adjusted OR, 0.85; 95% CI, 0.74–0.96) or making a suicide plan (adjusted OR, 0.67; 95% CI, 0.51–0.89) during the 12 months before the survey. No other significant associations between data collection timing and behaviors related to violence and suicide were found.

Logistic regression analyses were then used to examine whether any of the significant effects of data collection timing were modified by metropolitan status or geographic region. These analyses revealed significant timing by metropolitan status interactions for feeling too unsafe to go to school (Wald $F=19.95$, $p<0.001$); considering suicide (Wald $F=3.63$, $p=0.034$); and making a suicide plan (Wald $F=6.31$, $p=0.004$).

The results of stratified analyses exploring these interactions are shown in Table 2. The effect of data collection timing on feeling too unsafe to go to school was statistically significant in urban, suburban, and rural areas, but effects were much stronger in rural areas. Specifically, the percentage of urban students who felt too unsafe to go to school increased from 4.7% before April 20 to 11.1% after April 20; in suburban areas, the percentage increased from 3.4% to 9.0%. In rural areas, however, it increased from 3.8% to 32.6%. For the suicide-related variables, the effect of data collection timing reached significance among suburban and rural students, but not among urban students. The percentage of suburban students considering suicide dropped from 19.6% to 15.0% after April 20; for making a suicide plan, the percentage dropped from 15.6% to 8.7%. Rural students were also less likely to report considering suicide after April 20 compared to before (22.0% vs 17.2%); the same pattern was found for making a suicide plan (16.5% vs 12.9%).

Additional logistic regression analyses revealed a significant interaction between data collection timing and geographic region for considering suicide (Wald $F=4.28$, $p=0.009$). The results of stratified analyses exploring this interaction showed that students in the Northeast and Midwest were at decreased odds of having considered suicide after April 20 as compared to before. The adjusted OR for students in the Northeast was 0.76 (95% CI, 0.62–0.92); the percentage of students in that region considering suicide decreased from 20.9% to 16.7%. For the Midwest, the adjusted OR was 0.59 (95% CI, 0.49–0.70); the percentage of students considering suicide decreased from 22.4% to 14.5%. Adjusted ORs for students in the South and West were not significantly different from 1.0.

Discussion

Although the percentage of students who reported feeling too unsafe to attend school did not increase significantly during the 1990s,[14] between 1997 and 1999 it increased 30%, from 4.0% to 5.2%.[12] The current study revealed that this increase was associated with data collection timing relative to the Columbine incident. Specifically, the percentage of students who reported feeling too unsafe to attend school before the Columbine incident (3.9%) was nearly identical to the 4.0% of students who reported feeling too unsafe to attend school in 1997. The increase between 1997 and 1999, therefore, can be attributed to reports from students who completed questionnaires after April 20; 1 in 10 of these students reported feeling too unsafe to attend school.

The dramatic increase in students' reports of missing school because they felt too unsafe to attend following the Columbine incident is consistent with our hypothesis that student and parent fears would have kept more students from attending school. The strength of this association was striking; the proportion of students missing school because of safety concerns was 2.6 times higher following Columbine than before the incident. This increase held regardless of whether the school was in an urban, suburban, or rural area, but was especially pronounced in rural areas where the likelihood of students' missing school was more than 12 times higher after Columbine. We did not, however, observe significant variation across U.S. geographic regions, indicat-

ing that students attending rural schools nationwide were more likely to have missed school after Columbine. This pattern may be attributable to the many reports emphasizing how the Columbine location differed from the urban setting that people tend to associate with youth violence.[15–18] Perhaps many students and parents in rural areas felt a greater connection to the incident at Columbine and therefore a heightened sense of vulnerability in its wake. Based on this reasoning, however, it is somewhat surprising that the increase in the percentage of suburban students who felt too unsafe to attend school, while statistically significant, was not of the same magnitude as the increase in rural areas.

Although students reported missing school because they felt too unsafe to attend, we did not see a significant increase in weapon carrying on school property, involvement in physical fights on school property, or being threatened or injured with a weapon on school property. Perhaps students perceived that weapon carrying was not an appropriate means of self-protection against potential offenders. Similarly, students carrying weapons for self-protection might have under-reported this behavior because they did not want to think of themselves as potential perpetrators. In addition, students who might otherwise have started carrying a weapon might have been dissuaded by increased emphasis on school security and punishment for students found possessing weapons.[4–8]

The finding that the percentage of students reporting that they considered or planned suicide decreased significantly following Columbine is inconsistent with our hypothesis that vulnerable youth might be at increased risk for suicidal ideation following exposure to media reports of suicide. Rather, this finding supports the notion of "converse imitation" (i.e., that instead of increasing suicidal thoughts and behaviors, the incident and its media coverage decreased the likelihood of such thoughts and behaviors).[11,19] Although the incident and its media coverage had some elements associated with risk for imitation, such as excessive reporting and presenting the suicide as a tool for accomplishing certain ends,[20] other elements thought to promote imitation were either absent or operating in the opposite direction. In terms of the incident itself, the fact that the suicide victims first committed homicide made this event quite different from most cases of suicide that lead to imitation. In terms of media reports, although the coverage following Columbine focused on the grief experienced by families and friends of the homicide victims, the coverage of the suicide victims did not honor them or focus on positive aspects of their lives that might have increased perceptions of the acceptability of suicide among vulnerable youth. In fact, in contrast to coverage that typically highlights positive aspects of the suicide victim's life, which might lead susceptible youth to conclude that the suicide victim is being honored, the Columbine coverage often attempted to identify the social problems these youth had experienced at school that may have led to the incident.[16,17,21,22]

It is unclear whether the reduction in students' reports of suicide thoughts or plans following the Columbine incident reflects a real decline in the prevalence of suicide ideation, or true "converse imitation." Rather, it seems more plausible that the change reflects students' unwillingness or inability to report these symptoms following Columbine. We might expect this to happen if the Columbine incident caused students to associate suicidal ideation with the type of violence that occurred there. Accordingly, they may have deliberately under-reported suicidal thoughts and plans; or, when recalling these thoughts, which may have occurred as much as a year earlier, perhaps students were less likely to interpret or recognize their thoughts as suicidal. This idea is supported by self-verification theory, which states that people tend to distort information that is discrepant with their beliefs about themselves.[23]

To further support our idea that there was no true change in suicidal ideation, we note that the percentage of students reporting actual suicide attempts was essentially the same before and after Columbine. Because suicide attempts—unlike thoughts or plans—are discrete events, they are less vulnerable to reinterpretation and misreporting than are suicidal thoughts and plans. Furthermore, it seems likely that adolescents who had attempted suicide would not be concerned about their attempts being associated with a risk for interpersonal violence, as in the Columbine incident, because their attempts were made without such violence. Additional research is needed to better understand how sociocontextual factors can influence reporting of suicidal ideation and how these factors might influence suicide attempts.

This study is subject to several limitations. First, the significant increase in the percentage of students reporting feeling too unsafe to go to school and the significant decrease in the percentage of students considering suicide or making a suicide plan after April 20 could have reflected a bias in the sample of schools whose students completed surveys after April 20. Specifically, these schools might have been more difficult to schedule for data collection, and characteristics related to scheduling difficulties might be reflected in these variables. It is difficult, however, to pinpoint what the bias might be that would cause these particular changes in reports of these particular behaviors. A second limitation is that the analyses of data collection timing by metropolitan status and geographic region might have been affected by small sample sizes in some cells, which is reflected in some of the wide confidence intervals for the ORs exploring those interactions. Finally, YRBS data are based on student self-reports. Although the survey questions demonstrate good test–

retest reliability,[24] students may under-report or over-report these types of behaviors because of various cognitive and situational factors. Because there is no "gold standard" by which to validate these behaviors, the extent of under-reporting or over-reporting cannot be determined, however.

Although we cannot assume that the Columbine incident caused the behavior changes we observed, these results highlight that the aftermath of an extreme incident of school violence can extend well beyond the immediate community to impact many more lives nationwide. Still, it is important to recognize that although school violence must be reduced, schools remain relatively safe places for children. Prevention efforts focused solely on violence in the school setting are likely to have a very limited impact on a child's overall risk of violent death.

Resources are available to schools and communities to help address interpersonal violence among youth. These resources include descriptions of evaluated youth violence prevention programs, guidance for schools in developing plans for responding to crises, and frameworks for comprehensive citywide prevention programs.[25–27] Ongoing research about youth violence will provide even more strategies for addressing this important public health problem.

References

1. Anderson M, Kaufman J, Simon TR. School-associated violent deaths in the United States, 1994–1999. JAMA 2001;286:2695–702.
2. Gillespie M. School violence still a worry for American parents: poll releases, September 7, 1999. Princeton, NJ: Gallup Organization, 1999.
3. Cooper KJ, Russakoff D. "Columbine hysteria" or smart policy? Schools accused of overreacting in disciplining students. Washington Post 1999 (May 27):A01.
4. McQuiston JT. Terror in Littleton: the echoes; wave of copycat threats leads to swift responses across U.S. New York Times 1999 (Apr 24):A15.
5. Firestone D. After shootings, nation's schools add to security. New York Times 1999 (Aug 13):A1.
6. Wilgoren D. Area schools enhancing security; shootings in U.S. prompt new policies. Washington Post 1999 (Aug 25):A1.
7. Cooper KJ. This time, copycat wave is broader; schools scramble to respond to violent threats since Littleton. Washington Post 1999 (May 1):A6.
8. Sessions Stepp L. Making schools safe. Washington Post 1999 (Sep 21):C4.
9. Sheley JF, McGee ZT, Wright JD. Gun-related violence in and around inner-city schools. Am J Dis Child 1992;146:677–82.
10. Simon TR, Crosby AE, Dahlberg LL. Students who carry weapons to high school: comparison with other weapon carriers. J Adolesc Health 1999;24: 340–8.
11. Velting DM, Gould MS. Suicide contagion. In: Maris RW, Silverman MM, Canetto SS, eds. Review of suicidology. New York: Guilford Press, 1997:96–137.
12. Centers for Disease Control and Prevention. Youth risk behavior surveillance: United States, 1999. MMWR CDC Surveill Summ 2000;49:1–96.
13. Shah B, Barnwell BG, Bieler GS. SUDAAN software for the statistical analysis of correlated data: user's manual, release 7.0. Research Triangle Park, NC: Research Triangle Institute, 1996.
14. Brener ND, Simon TR, Krug EG, Lowry R. Recent trends in violence-related behaviors among high school students in the United States. JAMA 1999;282:440–6.
15. Brooke J. Terror in Littleton: the overview; diary of a high school gunman reveals plan to kill hundreds. New York Times 1999 (Apr 27):A1.
16. Gibbs N. In sorrow and disbelief. Time 1999 (May 3):20.
17. Glick D, Keene-Osborne S, Gegax TT, et al. Anatomy of a massacre. Newsweek 1999 (May 3):25–31.
18. Kass J, Zuckoff M. A suicide mission; 2 students kill up to 23 in Colo. school rampage. Boston Globe 1999 (Apr 21):A1.
19. Etzersdorfer E, Sonneck G, Nagel-Kuess S. Newspaper reports and suicide. N Engl J Med 1992;7:502–3.
20. Centers for Disease Control and Prevention. Suicide contagion and the reporting of suicide: recommendations from a national workshop. MMWR Morb Mort Wkly Rep 1994;43:9–18.
21. Wilgoren J, Johnson D. Terror in Littleton: the suspects; sketch of the killers: contradictions and confusion. New York Times 1999 (Apr 23):A1.
22. Wilgoren J. Terror in Littleton: the group; society of outcasts began with a $99 black coat. New York Times 1999 (Apr 25):A30.
23. Swann WB. Identity negotiation: where two roads meet. J Personality Soc Psychol 1987;53:1038–51.
24. Brener ND, Collins JL, Kann L, Warren CW, Williams BI. Reliability of the Youth Risk Behavior Survey Questionnaire. Am J Epidemiol 1995;141:575–80.
25. Centers for Disease Control and Prevention. Resources to address interpersonal violence among youth. MMWR Morb Mort Wkly Rep 1999;48:450.
26. Centers for Disease Control and Prevention. Best practices of youth violence prevention: a sourcebook for community action. Atlanta, GA: Centers for Disease Control and Prevention, 2000.
27. U.S. Department of Health and Human Services. Youth violence: a report of the Surgeon General. Rockville, MD: U.S. Department of Health and Human Services, 2001.