Investigation of a Youth Suicide Cluster in Kent and Sussex Counties – Delaware, 2012

Final Report

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Introduction

Between January 11 and March 22, 2012, eight adolescents and young adults (aged 13-21 years) were known to have died by suicide in Kent and Sussex counties, Delaware. These events attracted a great deal of local concern for two primary reasons: First, the number of suicide deaths in the first quarter of 2012 exceeded the number of suicide deaths typically reported in this two county area in an entire year; for example, from 2009-2011, the average annual number of deaths by suicide among persons aged 12-21 years was four. Second, four of these deaths occurred among students attending the same high school, over a period of about 2 months, increasing the perception that the deaths were part of a youth suicide cluster. Of the other four known decedents, one was a middle school student, one was a student at another high school, one was a young adult who had graduated from an area high school and was still living in Sussex County, and one was a young adult whose education status was unknown.

Suicide and nonfatal suicidal behavior are important public health concerns for adolescents and young adults. While the onset of suicidal behavior is observed at ages as young as six years, rates of death and rates of nonfatal injury resulting from suicidal behavior treated in hospital emergency departments (EDs) are relatively low until age 15[1,2]. In 2010, (the most recent national data available) in the United States, suicide was the 3rd leading cause of death among youth aged 10-14 and 15-19 years, and it was the 2nd leading cause of death among persons aged 20-24 years (Web-based Injury Surveillance Query

and Response System (WISQARS)[3]). During 2011, there were an estimated 174,030 hospital emergency department visits for self-inflicted injury among those aged 10-24 years (WISQARS[3]). In a 2011 nationally representative sample of students in grades 9-12, 7.8% (1 out of 13) reported having made a suicide attempt one or more times in the 12 months preceding the survey[4].

In epidemiology, clusters are defined as a closely grouped series of events, or cases of disease or other health-related phenomena, with well-defined distribution patterns in relation to time, space, or both. This framework has been extended to groupings of suicidal behavior[5]. Studies have found that suicide clusters occur almost exclusively among adolescents and young adults aged 15-24 years[1]. Though suicide clusters are relatively rare events, accounting for fewer than 5 percent of the total suicides among that age group, they can have dramatic and devastating effects on families and communities[6,7].

The Delaware Department of Health and Social Services (DHSS), Division of Public Health requested the assistance of the Centers for Disease Control and Prevention (CDC) in conducting an epidemiological study of this cluster of youth suicides in Kent and Sussex counties to determine the frequency of fatal and nonfatal suicidal behaviors in the first quarter of 2012, examine risk factors, and make recommendations about potential strategies that might be used by community and state leaders to prevent future suicides.

The objectives of the investigation were to: 1) characterize the fatal and non-fatal suicidal behaviors among youth occurring between January 1, 2012 and May 4,2012 (when the CDC visit would conclude), in Kent and Sussex

counties, Delaware; 2) describe trends in fatal and non-fatal youth suicidal behaviors over the past 4 years (2008 - 2012) in these counties to determine the degree to which the current suicide deaths demonstrate an increase over prior years; 3) identify, where possible, individual, family and community risk and protective factors; and 4) identify relevant prevention strategies for youth suicide.

Timeline of Activities

- 3/12/12 – CDC initially contacted by Jim Lafferty, Director of the Mental Health Association in Delaware at the request of Rita Landgraf, Secretary of DHSS. At this point there were 6 known suicide deaths (3 at High School A) among young people in Kent and Sussex counties since January 11, 2012. A conference call was scheduled for 3/26 to further discuss the possibility and scope of CDC assistance.
- 3/22/12 – Another suicide death occurs. Decedent is a student at High School A. Delaware Governor's office becomes involved. CDC receives a call directly from Rita Landgraf, Secretary of DHSS, requesting CDC assistance.
- 3/26/12 – First conference call with stakeholders in Delaware. Discussion includes immediate crisis response activities and process of initiating a formal request for CDC assistance.
- 4/2/12 – 4/22/12 - Multiple conference calls to discuss scope of the investigation and logistics regarding trip and activities.

- 4/24/12 – 5/4/12 – CDC Epi-Aid team travels to Delaware. Trip activities include:
    - Opening session with key stakeholders
    - Further consultation with stakeholders about potential sources of data
    - Finalized itinerary, confirmed meetings
    - Data review and collection
    - Key informant interviews (2 individual, 3 group) with High School A officials and local mental health crisis workers
    - Preliminary analysis of findings
    - Debriefing with stakeholders
- 5/7/12 – 5/18/12 – Continuing correspondence with DHSS staff assisting with additional data collection, and receipt of additional data.
- 5/21/12 – Data analysis and drafting of Epi-2 report begin
- 5/24/12 – Key informant interview with principal of High School B & interviews with staff (guidance counselor & health clinic) from High School B (3 individual interviews)
- 7/18/12 – Presentation of exit briefing to Delaware behavioral health and school board personnel.
- 7/25/12 – Briefing with DHSS Secretary Rita Landgraf about results to be presented in trip report
- 8/2/12 – Trip report issued to State of Delaware by CDC
- 8/3/12-present – Further analyses and drafting of the extended report.

Methods

This investigation consisted of the following phases:

- Development of case definitions
- Data gathering
  - Quantitative: Existing data on fatal and non-fatal suicidal behaviors from federal, state, and local sources
    - Medical examiner files
    - Emergency room medical records
    - Law enforcement reports
    - Survey data
  - Qualitative: Key informant interviews
    - Superintendent of School District A
    - Principal of High School A
    - Select teachers from High School A
    - Guidance counselors at High School A
    - Select crisis workers from area counseling service agency
    - Principal of High School B
    - Guidance counselor at High School B
    - Staff member from wellness center health clinic at High School B
- Data analysis
  - Quantitative
    - Descriptive findings
    - Case-control analyses
  - Qualitative
- Reporting results
  - Scientific report
  - Community debriefings

Phase 1: Case Definitions:

a) A **fatal case** (i.e., a youth who died by suicide) was defined as a resident of Kent or Sussex County, aged 12-21 years, whose death was classified in medical examiner records as being caused by intentional self-harm, and occurred between January 1, 2012 and May 4, 2012. For the case-control analysis, this window of time was expanded to include fatal cases occurring from January 1, 2009 to May 4, 2012 in order to improve the statistical power of the analyses.

b) A **non-fatal case** (i.e., a youth who attempted but did not die by suicide) was defined as resident of Kent or Sussex County, aged 12-21 years, whose records (medical record and/ or police report) indicated suicidal behaviors during the time period between January 1, 2012 and May 4, 2012. Nonfatal cases met the following criteria**:**

- Chief complaint that contained the word 'suicide' or variations of the word suicide (e.g., suicidal); psychiatric evaluation (for the ER only) or related terms (e.g., depression); or overdose or related terms (e.g., OD, ingestion, intentional overdose), OR
- Circumstances in the clinical narrative that indicated suicidal behavior, AND
- The record indicated that suicidal behavior occurred, either by explicitly stating that suicide was attempted or describing behavior consistent with a suicide attempt. Cases involving suicidal ideation

and threats that were not accompanied by suicidal behaviors were excluded.

c) A **control** (for purposes of a case-control analysis in which the above-defined fatal suicides constitute 'cases') was defined as a resident of the state of Delaware, aged 12-21 years, whose death was attributed to causes other than intentional self-harm (e.g., unintentional drug overdose, motor vehicle crash, natural causes) by the medical examiner, and occurred in the time period between January 1, 2009 and May 4, 2012 (the expanded time window was also used for the cases in the case control analysis).

Phase 2: Data Gathering:

Quantitative Data

Data sources were identified that could be used to determine the frequency of and risk factors for fatal and nonfatal suicidal behaviors in Kent and Sussex counties, as follow:

Fatal suicidal behaviors and controls: Medical examiner records were the primary source of information about the fatal suicide cases. These records typically included a lengthy narrative about the cause of death, circumstances surrounding the death, and personal histories of the decedents, as assessed by the investigators. These files included toxicology results per our request. Information about the controls represented in the case-control analysis also came from the medical examiner.

Law enforcement records served as a secondary source of information for the fatal cases. At times, law enforcement records were included in the medical examiner file. Law enforcement officials also made the records accessible to us through the Delaware health department. The investigator's notes provided information about the circumstances, setting, and methods used, and at times, the decedent's history of interactions with law enforcement. Witness statements added information about the circumstances and the personal history of the decedents.

Nonfatal suicidal behaviors: There were two primary sources and one secondary source of information about the nonfatal cases. Hospital emergency department data (ED) was one primary source. We collected data from the four EDs in Kent and Sussex counties that attend to the highest volume of patients. ED records included detailed information about the method of suicide attempt, , extent of injuries, level of medical treatment required, and toxicology results; circumstances surrounding the attempt; and disposition (i.e., recommended venue for aftercare).

The second primary source of information about nonfatal cases was inpatient psychiatric/behavioral health records. Youth typically remain at these facilities long enough for clinicians to conduct interviews, assessments, and thus compile detailed social and psychiatric histories. These records served as a comprehensive source of information about mental health, social functioning, circumstances leading up to the attempt, prior attempts, life history, and many other aspects of the youth's life and wellbeing.

Law enforcement records either included within inpatient behavioral health records or directly from law enforcement officials), served as a source of additional information about some youths' prior legal troubles.

Survey data: Delaware and national Youth Risk Behavior Survey (YRBS) Data for 2011 was used to examine bullying victimization at school and suicidal thoughts and behaviors for Delaware youth relative to U.S. youth in general.

National Suicide Prevention hotline reports for the state of Delaware and the nation were also examined to assess the possibility of an increase in suicidality across age groups in Delaware relative to the U.S. in general. We used the following data: Delaware call volume January 01, 2005 - March 31, 2012, the most recent time period available at the time of the investigation; year-to-date call volume report from December, 2011; and the March 2012 monthly report, the most recent report available at the time of the investigation.

Active case-finding methods were used for all data collection: We asked data providers to pull all files that potentially met our case definitions. Our team then reviewed each case to determine whether it should be included, and all information included in each record, abstracting the information into the database we created for this study.

Quantitative data were used to determine: (1) The frequency of fatal and non-fatal suicidal behaviors occurring between January 1 and May 4, 2012 in Kent and Sussex counties, Delaware, (2) Risk factors associated with the fatal and nonfatal suicide behaviors, (3) The descriptive epidemiological profile of the

cases, including demographics of the decedents/patients, methods used to attempt or complete suicide, and circumstances surrounding the suicidal behavior.

Comparisons were made with the frequency of fatal suicidal behaviors in the same counties in previous years (see Figure 1).

Qualitative Data

Seven key informant interviews (5 individual and 3 group) were conducted in Kent and Sussex counties. (See description of interviewees on p.5).

The purpose of the interviews was to talk to adults who regularly interacted with young people, particularly the youth affected by the recent suicide deaths in the community. The interview questions were designed to: 1) assess whether participants believed suicide was a problem in the Kent and Sussex county area; 2) ask participants what they thought was contributing to the problem; 3) determine awareness of available resources in the community; 4) inquire about barriers to accessing resources, and 5) ask participants what they thought could be done to prevent suicide in their community (see Appendix A).

Phase 3: Data Analysis:

Quantitative Data Analysis

Data were abstracted by the CDC team. An electronic data abstraction spreadsheet was prepared prior to the visit and updated throughout the investigation. A subset of cases were coded by two raters so that inter-rater

reliability could be calculated. Reliability was found to be sufficiently high for all variables (□□□□□ >.60).

Multiple variables were used to identify cases duplicated across sources. Duplicate cases were only counted once (e.g., if the same person had an ED and an ME record, they were only counted once among fatal cases

Descriptive statistics were calculated using the overall dataset. A case-control analysis of youth fatalities was conducted to identify unique preventable or treatable risk factors for suicide among Delaware youth. The timeframe of the case definition was expanded to encompass January 1, 2009-May 4, 2012 for this analysis to increase statistical power. All available cases and controls were included in the analyses. We conducted a series of binomial logistic regression analyses to generate unadjusted (crude) odds ratios, with case/control status as the dependent variable, and risk factor variables as independent or "exposure" variables. T-tests and chi-squared tests of independence were used to test case and control group demographic differences. Data were analyzed using Predictive Analysis SoftWare 18 (PASW/SPSS).

Additionally, we compiled two sets of survey data: (1) 2011 YRBS Kent and Sussex county data with state and national data on bullying (a topic of expressed local interest) and suicidal thoughts and behavior, and (2) a summary of National Suicide Prevention hotline national reports and report for the state of Delaware of suicide hotline calls from October 2011-March 2012. This time period was selected because it includes several months preceding the onset of the youth suicide cluster (October-December, 2011), and the timeframe in which

the cluster occurred (January-March, 2012). These two time periods were examined to investigate the possibility of a recent increase in overall suicidality in the area.

Qualitative Data Analysis

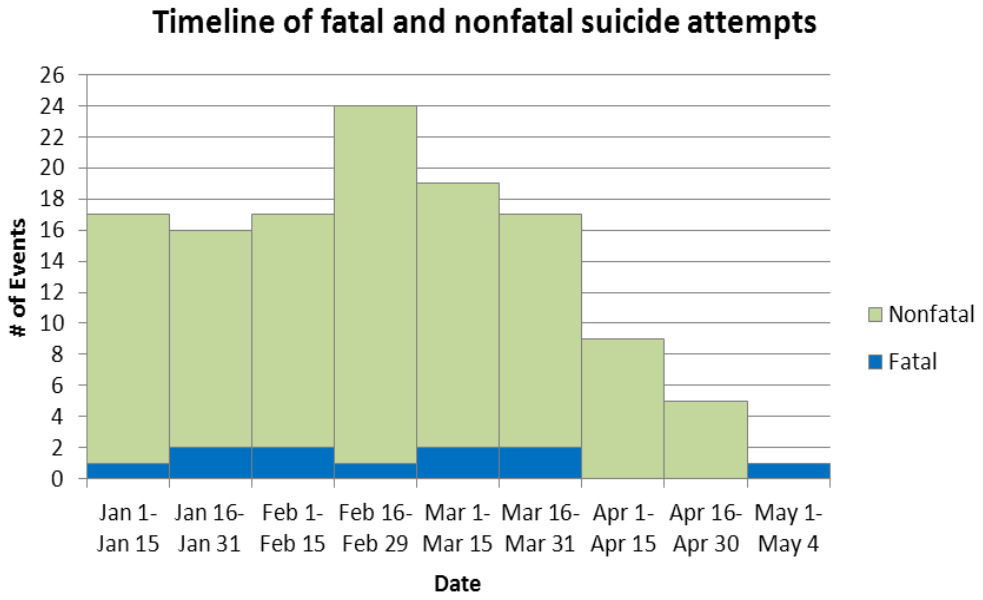
All scheduled key informant interviews were completed. Despite the sensitive nature of the discussions, participants expressed thoughts/feelings and shared their perspectives freely.

Key informant interview data preparation and analysis consisted of several steps. During the group sessions, there were a minimum of two note taker/observers present. To prepare the qualitative dataset, we converted the observer notes from each focus group into text files and made necessary modifications to correct inconsistencies among observer notes.

Next, the team identified the overall patterns and themes of responses across the focus groups on similar questions. Lastly, the team prioritized the qualitative findings and identified opportunities to compare and contrast the qualitative and quantitative findings in the report.

Results (Phase 4)

A timeline of the fatal and nonfatal suicidal behaviors in Kent and Sussex counties for the first quarter of 2012 was constructed:



Fatal cases

There were 11 deaths by suicide among youths aged 12-21 years in Kent and Sussex counties, Delaware between January 1 and May 4, 2012. This included one death that occurred during the course of our investigation (May 2). It excludes one death that occurred just prior to our cutoff date (death occurred on 11/20/11; body of decedent found 12/6/11). This case is notable not only due to its temporal proximity to the other cases, but also because the decedent was an adult education student at High School A. It is unclear whether this decedent knew any of the high school students from High School A who died by or attempted suicide in the months that followed.

Seven of 11 (64%) of the decedents were male, and 10 out of 11 (91%) were 16 years of age or older (see Table 1). These findings are consistent with national trends for suicide deaths[3].

Of the 11 decedents, 4 were students at High School A, 2 were students at other area high schools (2 different schools), 1 was a middle school student, 2 were graduates of area high schools still living in the area, 1 had dropped out of high school, and 1 was a young adult with an unknown education status.

Hanging (64%) was the most frequently used method of self-injury among the decedents, followed by self-inflicted gunshot wound (see Figure 2). This is consistent with the national pattern for this age group [3].

The most commonly found circumstances surrounding the suicides in this cluster were as follows: mental health problems (e.g., depression, anxiety, prior suicidal ideation); recent problem between decedent and parent(s); recent legal problems; recent problem with boyfriend or girlfriend; and substance use (see Table 2). These circumstances are consistent with the scientific research literature regarding the most commonly identified precipitating factors associated with youth suicidal behavior [8]. All decedents' cases included two or more of these circumstances; over half of the decedents were found to have experienced 5 or more (see Figure 3). This is consistent with research literature that indicates that youth who complete or attempt suicide usually have multiple risk factors for suicide[1,9].

Toxicology results were available for 10 out of 11 of the decedents. The following substances were detected at the time of death for these decedents: amphetamines (n=2), marijuana (n=2), prescription drugs other than antidepressants (n=2), antidepressants (n=1), cocaine (n=1), opiates other than heroin (n=1).

Case-control analysis

Twenty-nine deaths by suicide among Delaware youth aged 12-21 years between January, 2009 and May, 2012 were identified (see Table 3). A description of the case decedents follows: The median age of the case decedents was 18 years of age. Two (7%) were aged 12-14, 14 (48%) were aged 15-18, and 13 (45%) were aged 19-21. Twenty-two (76%) were male, and 7 (24%) were female. Twenty-two were White (76%), 4 were Black (13%), 2 were Hispanic/Latino (7%), and one was Asian (3%). The greatest number of deaths occurred in March, 2012: 4. Firearms (n=13, 45%) and hanging/strangulation (n=13, 45%) were the most common methods, followed by overdose/poisoning (n=2, 7%), and drowning (n=1, 3%).

Thirty-four control decedents were identified. The median age of the control decedents was 19 years. Twenty-two were male (65%), and 12 were female (35%). Twenty-eight were non-Hispanic White (82%), and 6 were non-Hispanic Black (18%). The causes of death for the control group were as follows: Overdose/poisonings (n=14, 41%), motor vehicle crash (n=11, 32%), adverse drug reactions (n=5, 15%), assaults (firearm, cut/pierce) (n=2, 6%), and natural causes (n=2, 6%).

Demographic and risk factor variables were compared using Chi-squared tests of independence for suicide decedents in the cluster spanning the time period between January 1 and May 4, 2012 (n=11) vs. suicide decedents whose deaths occurred in 2009-2011. Only one variable significantly differed between the two groups: Suicide death of a friend or family member was higher among

decedents in the cluster spanning January 1-May 4, 2012 (χ^2 = 6.57(1), p = .01). For this reason, case-control analyses were conducted with all suicide decedents from January 2009-May 2012 as one group.

The results of our case-control analyses provided additional information about risk factors associated with youth suicide in Delaware. There were no statistically significant differences between case and control group in their demographic characteristics (see Table 3). Potential relationships between case/control status and risk factors such as decedents' mental and physical health, life events, and environment were tested (see Table 4).

Cases were significantly more likely than controls to have a history of depression [odds ratio (OR) = 9.7, 95% confidence interval (CI) 2.4-38.8], a history of suicidal ideation/self-injurious behavior (OR = 8.4, CI = 2.1-33.8), and a history of injuries/hospitalizations (OR = 3.1, CI = 1.0-9.5). Cases were also more likely to have a history of arrest/incarceration (OR = 4.0, CI = 1.1-14.4), and were more likely to have a recent conflict or breakup with a romantic partner documented in the events preceding their death (OR = 10.5, CI = 1.2-91.4).

Controls were significantly more likely than cases to have a history of substance abuse (OR = 3.5, CI = 1.2-9.9), and toxicology results that indicated recent drug or alcohol use at the time of death (OR = 14.7, CI = 4.3-49.9). In particular, controls were much more likely to have a history of prescription drug abuse (OR = 4.4, CI = 1.2-15.4), and/or a positive screen for prescription drugs at the time of death (OR = 7.2, CI = 1.8-29.2), particularly opioids (e.g., oxycodone, morphine, oxymorphone; OR = 11.3, CI = 2.3-56.8).

Nonfatal cases

We identified 116 nonfatal suicide attempts among youths aged 12-21 years in Kent and Sussex counties, Delaware between January 1 and May 4, 2012. Although this estimate likely includes the majority of cases, it should be noted that we were unable to obtain data from every facility that might have attended a patient who had attempted suicide, and that there are often other persons who do not seek medical attention after making a suicide attempt and go undetected in official records. Sixty-five of 116 nonfatal cases were female (56%). Thirty-one (27%) were 14-15 years of age, 45 were 16-18 years of age (39%), and 32 (28%) were 19-21 years of age (see Table 1). These findings are consistent with national trends for nonfatal suicide attempts [10].

Method and history of attempts

Overdose was the most frequently used method of nonfatal suicide attempt (n=41, 35%). The majority of overdose attempts involved prescription and/or over-the-counter drugs (n=36, 87%). In many of these cases (n=18, 44%) it was unknown where the youth obtained the drugs used in the attempt. However, for those cases where it was known (23 out of 116 cases), 91% were obtained in the patient's own home (n=21) rather than from a source outside the home (n=2). The second leading method of attempt was cutting. These two leading methods are consistent with the methods recorded for this age group at the national level[10]. Forty-three nonfatal cases (37%) had a recorded previous

suicide attempt; of those, 15 (35%) were known to be attempts by the same method as the current attempt.

Lethality of current attempt

A Risk-Rescue rating[11] was calculated for n=114 of the nonfatal suicide attempts (the other 2 cases had no data about the circumstances surrounding the attempt). This rating system describes and quantifies the lethality of suicide attempts, and has been validated on a large sample of suicide attempts at a state general hospital. 'Risk' calculation takes into account several factors related to the method used and actual physical damage sustained in the course of the attempt, while 'Rescue' accounts for factors related to the availability of life-saving resources at the time of the suicide attempt (e.g., location, probability of discovery, whether the patient gave any indication of suicidality to others). The results were:

- Forty-three (38%) of nonfatal suicide attempts in this cluster were classified as low risk, 64 were low moderate risk (56%), and the remaining 7 were moderate risk or higher (6%).
- Fifty-five (48%) were classified as most rescuable, 46 were high moderately rescuable (40%), and the remaining 13 were moderately rescuable or lower (12%).

See Figure 4 for a histogram depicting the combined risk-rescue rating, which reflects the ratio of the two factors.

Influence of peer suicide attempts/completed suicide

Twenty-eight of the youth in our study who engaged in nonfatal suicide attempts had information in their medical record that indicated a personal connection with another young person in the community who died by or attempted suicide. Twenty-five of the 116 youth who attempted suicide indicated that a peer or friend had attempted or died by suicide; another 3 youth were currently attending a school where another student had attempted or completed suicide in the time since January 1, 2012 and therefore could also reasonably be counted among those although it was not specifically mentioned in their record

For a diagram that depicts the connections that we were able to determine among the individual nonfatal attempts and fatal attempts over time, aggregated within schools which had several nonfatal attempts, see Figure 5. Note that this diagram does not depict all nonfatal attempts that may have been influenced by peer suicidal behavior: Those that were not part of a subcluster of more than n=3 within a school, and/or that occurred at a school where the only known linkage was to other nonfatal attempts, are not depicted.

Risk factors and circumstances

Risk factors taken from the personal history described in the records of the nonfatal cases, and circumstances surrounding the nonfatal suicide attempts were also examined (see Tables 5 and 6).

Risk factors

Several of the most common mental health risk factors among the nonfatal cases were related to prior suicidal thoughts and behaviors: 42% of nonfatal

cases (n=49) had a history of suicidal ideation prior to the current attempt, and 41% (n=47) had a history of self-injurious behaviors. In addition, 41% of nonfatal cases (n=47) had a history of depression prior to the current attempt, and 47% (n=55) had received mental health treatment in the past.

In aggregate, 20% (n=23) of nonfatal cases had a history of some type of substance abuse. Alcohol was the most commonly abused substance (n=15), followed by marijuana (n=13). Twenty-three percent (n=27) had a history of law-breaking behavior, with consequences including arrests (n=21) and incarceration (n=5).

Thirty-four percent of nonfatal cases (n=40) had a history of violent victimization or abuse, most commonly sexual violence. Nineteen percent of nonfatal cases (n=22) had a history of engaging in violence or aggression toward others.

Circumstances

The most commonly identified circumstances surrounding the suicide attempts in this cluster were as follows: school problems (n=47; 41%); conflict with a parent (n=39, 34%); a recent change in home/family/caregiver (n=39, 34%); problems with a peer or peers (n=34, 29%); and problems with a boyfriend or girlfriend (n=26, 22%). The median number of circumstances per nonfatal case was 2 (range: 0-6). The majority of nonfatal cases (n=75, 65%) included 1 to 3 of these circumstances, while an additional 24% (n=27) included 4 or more.

These findings are again consistent with research literature that indicates that youth who complete or attempt suicide usually have multiple risk factors (both past and current) for suicide[1,9].

Toxicology results

Toxicology screens were conducted by the facilities attending to the youth presenting with nonfatal suicide attempts (n=102 youth). The following results are therefore based on these 102 cases (also (see Table 7). Among these, thirty percent of cases (n=31) showed a positive toxicology result for drugs or alcohol at the time of the suicide attempt. The most common substances detected were marijuana (n=14; 14%), antidepressants (n=11; 11%), and amphetamines (n=5; 5%). Less frequently detected substances included alcohol (at the level of intoxication), cocaine, and heroin. Five percent (n=5) of cases had a positive toxicology result for a substance other than the ones listed above, including barbiturates, and opiates other than heroin.

Qualitative results

The following themes about barriers to suicide prevention and accessing community resources emerged from the key informant interviews:

- Limited activities for youth outside of school
- Limited mental health resources, particularly for children and adolescents; long wait lists
- Lack of transportation to mental health appointments and activities

- Lack of parent/community education (mental health, substance use, suicide prevention, parenting skills)
- Resistance to seeking mental health treatment (parents and kids)
- Unsupervised access to firearms
- Limited student education on substance use, mental health, and suicide
- Limited ongoing staff training specific to substance use, mental health, crisis response, available resources

Other perspectives that emerged from the structured key informant interviews as well as through informal interviews with other adults who interact with youth in the community included the following:

- Although social media was not perceived to play a direct role in the suicide events in the community, it was often a source of information about suicidal behavior, including false rumors. Adults in the community expressed frustration with the degree to which social media is of intense interest among young people, and at the same time provides a virtually unchecked forum for rumors, gossip, and derisive comments.
- Adults generally agreed that the recent suicidal behaviors represent a perceived increase in the frequency of such behaviors among youth in the community. No one could recall another time when they observed a series of fatal or nonfatal suicide behaviors like this among young people in the community even though some had lived or worked in the community for more than 20 years.

- The clinical personnel at medical and mental health facilities reported impressions of an increase in patients hospitalized for nonfatal suicidal behaviors in the past few months. One provider hypothesized that some of this increase may be due to increased community sensitivity to suicidal ideation among young people, perhaps lowering the threshold for bringing a young person to the hospital. Other providers added that even though this is true, they perceive an increase in serious attempts as well.
- The suicides since January have taken an emotional toll on students in the community, and staff at local schools, particularly High School A.
- The death of the first decedent in the cluster at High School A was reported by the local media in a way that many people found sensationalistic. Namely, the reporter drew quotes and pictures from Facebook, and implied that bullying played a role in the student's death. Several key informants voiced disagreement that bullying was a circumstance in this decedent's suicide, and said that this was sensationalism.
- Several key informants reported that in addition to a lack of many other activities in the community, many young people engage in the use of illicit drugs and alcohol, and abuse prescription drugs.

Survey data

2011 Youth Risk Behavior Survey (YRBS) data regarding youth suicidal behavior and youth bullying were examined. The incidence of self-reported suicidal behavior among youth in both Kent and Sussex Counties was

approximately equal to the U.S. average (~8%). Youth in both counties reported a slightly lower prevalence of suicidal thoughts (~10-11%) than the U.S. average (~16%), although it is unknown if this represents a statistically significant difference. Youth in Kent County reported a slightly lower incidence of bullying victimization than the US average (~17% vs. ~20%) while those in Sussex County reported experiencing bullying at approximately the same rate as the US average. Again, it is unknown if this difference is statistically significant (see Figure 5).

State suicide hotline calls for October 2011-March 2012 did not show an overall increase in calls across age groups for the state during this time (see Figure 6).

Discussion and Recommendations

We identified 11 cases of youth aged 12-21 years who died by suicide and 116 youth who made nonfatal suicide attempts in Kent and Sussex counties, Delaware between January 1 and May 4, 2012. This is more than the eight fatalities originally identified. The number of nonfatal attempts (n=116) is approximately ten times the number of fatalities, which is consistent with the rate of hospitalizations vs. deaths attributed to suicidal behavior in this age group derived from large national surveillance systems, such as the most recent data from the CDC National Vital Statistics System[1, 8,10].

Case-control analyses revealed that a history of mental health problems such as depression and suicide attempts were significantly more likely among

Delaware youth who died by suicide than among control Delaware youth who died by other means in the same time period. This is consistent with findings from numerous studies that point to depression as an important risk factor for suicide[1,12]. Conversations with local informants revealed that a lack of training/ education about youth mental health and substance abuse problems is considered a significant barrier to suicide prevention in the community. Further, community informants expressed concern about scarcity of providers of youth mental health resources, and long wait-lists for services. Additionally, informants mentioned that few positive after-school activities are available and readily accessible to community youth.

The first two points are relevant because depression may go unrecognized or untreated in suicidal youth, creating a missed opportunity for intervention. Further, the finding that many case decedents had previously attempted suicide, almost always by less lethal means, shows that there may have been particularly concerning warning signs in some cases.

Although depression is an important risk factor for suicide, not all adolescents who engage in suicidal behaviors suffer from depression, as was seen in this cluster. Additionally, a subset of suicide attempts has been found to be unplanned and more impulsive in nature. Life stressors such as those seen in this cluster and discussed elsewhere in the literature also may precipitate suicide attempts (e.g., conflicts or breakup with a romantic partner, conflict with parents). Therefore, outreach to youth who are struggling with these and similar life

stressors is extremely important, even if they do not exhibit outward signs of depression or other mental distress.

In the process of quantifying and describing the nonfatal attempts that occurred in the same timeframe as the cluster of fatal cases, our analyses revealed two notable things: One, that the most common method of nonfatal suicide attempt was by overdose of an over-the-counter or prescription drug. This is important because it illustrates that drugs used in an overdose attempt are often of the type that are readily available, and that even youth who have no prior history of drug abuse may overdose in a suicide attempt. Additionally, the finding that when the source of the drugs used in the overdose was known, it often came from the youth's own home. This suggests that it may be productive to encourage parents to take enhanced precautions regarding substances in the home, particularly when a child is experiencing a period of poor emotional health or increased stress.

We linked a subset of nonfatal attempts to the fatalities in this cluster and to one another, and we observed that there were 5 schools that had more than 3 nonfatal attempts linked to fatal cases by students in this period. This further demonstrates the effect that youth suicides can have on other youth in the community, contributing not only to further deaths but to further injuries as well. Although the lethality index we calculated (the Risk-Rescue rating) indicated that most attempts were of relatively low lethality, this does not indicate that these attempts should be minimized or not taken seriously. As stated previously, those who die by suicide have often made prior attempts involving less lethal methods.

This was also seen in our sample, where 34% (n=10) of the decedents had a previous suicide attempt, with 80% of those (n=8) involving means of lower lethality. Despite the small numbers (n=7 and 13, respectively), it is important to consider the small number of suicide attempts that were of moderate and high lethality. Several of these involved methods or situations that easily could have been lethal.

Although not the focus of this study, our case-control analysis reflected something of public health interest about the controls: Youth who died by means other than suicide were significantly more likely to have a history of and/or postmortem toxicology result indicating drug use, particularly prescription drugs. This was also seen in our descriptive findings, where a large proportion (41%) of the controls died by accidental overdose/poisonings, and where a portion of the remainder of the control sample were involved in motor vehicle crashes that involved an alcohol or drug-impaired driver, or suffered from an adverse drug reaction due to ingestion of a prescription drug in a non-medically prescribed manner. These findings echo recent CDC reports on the dramatically rising incidence of prescription painkiller overdose[13], and overdose/poisonings as one of the top causes of fatal unintentional injuries among 15-19 years of age[14]. Although recommendations regarding this finding were not the focus of the present study, this supports the inclusion of information about prescription drug abuse in the recommended trainings about youth mental health and substance abuse.

Limitations

The findings described in this report are subject to several limitations. First, we did not speak directly with students or other young people in the community. It is possible that they may have differing or additional impressions about suicide, and its prevention and response in the community. As a related limitation, although we reviewed posted activity on High School A school social media accounts, we were unable to thoroughly investigate other social media activity (such as that between individual students) that could be related to the suicides in this cluster or suicidal behavior in the community. Taken together, this leaves open the possibility of events or dynamics that we were not aware of among the youth in the community. Still, our key informant adults had interviewed hundreds of youth during the immediate crisis period following several of the youth suicides, and there was no mention of social media as a relevant factor.

Second, although we canvassed the hospitals in the area that would have most likely received patients who had engaged in suicidal behaviors, and focused on those that would have received the majority of cases, we were unable to visit every facility.

Third, due to ambiguity of circumstances, suicidal behavior is sometimes misclassified. Therefore, there are cases that may have been missed during this investigation (e.g., single occupant motor vehicle crashes; poisonings, other injuries that appear to be unintentional). We addressed this by reviewing all cases classified as overdoses (which would likely be the most frequently misclassified) in the age group and time period of interest at all EDs visited to

determine whether narratives suggested suicidal intent. Some overdose cases were subsequently classified as suicide attempts in our analyses. As a check on misclassifications of other injuries, we reviewed all trauma cases in the age group and time period of interest at one ED. This review did not yield any additional cases. Still, it is always possible that some additional cases could have been missed because of the way they were classified in the hospital records systems.

Finally, there were some limitations to our case-control methodology, such as our use of deceased controls. Studies have shown that some exposure variables associated with an increased risk of premature death are overrepresented among deceased controls compared with living controls, possibly lowering the estimation of risk in the case group. Additionally, our analysis was limited to the information contained in medical examiner and law enforcement reports. It is possible that certain variables of interest in these analyses were not the subject of inquiry, particularly in cases that involved unintentional injury. Nevertheless, for most risk factors and circumstances there was a percentage of control decedents for whom each was indicated, leading us to conclude that where information was known it was recorded even for controls. It should also be noted that the case-control analysis was performed on a relatively small sample, and that many of the results include wide confidence intervals. Therefore, the results should be interpreted with caution, and may have limited generalizability.

Conclusions and Recommendations

Youth who die by or attempt suicide typically have multiple risk factors for suicide before an attempt is made. A precipitating event then often prompts the attempt in an already vulnerable person. Therefore, it is possible to detect risk factors and prevent suicidal behaviors in vulnerable young persons. With this in mind, our preliminary recommendations included the following:

(1) Mental health awareness training (including training on suicidal behavior and substance abuse) for persons in the community (e.g., staff in youth-serving organizations, families, peers), to help identify at-risk youth and guide them to appropriate services[15].

(2) Development of partnerships among community institutions in different sectors (e.g., education, faith-based organizations, recreation) so that resources may be combined to help address the needs of youth through programs and other activities. CDC has articulated a strategic direction in suicide prevention that emphasizes the importance of connectedness among individuals, families, their communities and social institutions[16]. Such partnerships could help foster connectedness as a protective strategy against youth suicide.

(3) Creation of additional partnerships (such as with primary care providers and pediatricians) that could strengthen the infrastructure of youth mental health primary care, so that signs of depression and other mental and behavioral health problems can be effectively recognized and treated.

(4) Review and implement evidence-based primary prevention strategies that address the associated risk factors for youth suicide. Examples specific to youth suicide prevention include strategies outlined in the Substance Abuse and

Mental Health Administration (SAMHSA) Suicide Prevention Resource Center's recently released toolkit "Preventing Suicide: A Toolkit for High Schools" (http://store.samhsa.gov/shin/content/SMA12-4669/SMA12-4669.pdf), and programs listed in the National Registry of Evidence-Based Programs and Practices (NREPP) searchable database (http://www.nrepp.samhsa.gov/). Some common themes in these programs include: training school staff, parents, and youth to be "gatekeepers" by recognizing warning signs of suicide and learning what to do when someone is at risk for suicide; and understanding of risk factors such as depression.

Evidence-based programs that focus on positive youth development by strengthening youths' social/emotional and behavioral competencies or enhancing family functioning or other supportive relationships could also be implemented. These programs often have broad prevention aims, such as prevention of substance abuse, unplanned pregnancies, and other-directed violence. Although they are not specific to suicide prevention, these programs target risk factors for youth suicide found in this investigation and other studies (e.g., emotional problems, family problems, lack of supportive relationships, substance abuse) and could be useful for youth experiencing a wide range of problems. NREPP searches yield several examples of programs of this type using terms such as 'positive youth development' and 'youth skills.'

Further, information on how to take what we know about suicide and make it more actionable for prevention can be found at: http://www.cdc.gov/ViolencePrevention/ASAP.html

(5) Continue to monitor trends in youth suicidal behaviors through local resources (e.g., health department, medical examiner, hospitals). Monitoring fatal and nonfatal suicidal behavior in the community over time can provide one measure to evaluate the effectiveness of programs or interventions, or may reveal new strategies for prevention and intervention;

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Table 1. Fatal and nonfatal suicide behaviors in youths aged 12-21 in Kent & Sussex Counties, Delaware, by age group and sex, January 1-May 4, 2012.

	Fatal		Nonfatal	
	n	*%*	*n*	*%*
Age Group				
12-13 years	1	9	8	7
14-15 years	0	0	31	27
16-18 years	8	73	45	39
19-21 years	2	18	32	28
Total	11	100	116	100
Sex				
Female	4	36	65	56
Male	7	64	51	44
Total	11	100	116	100

Table 2. Circumstances indicated in deaths by suicide among youths aged 12-21 in Kent & Sussex Counties, Delaware, Jan 1-May 4, 2012.

	Fatal	
	n	%
Circumstance		
Mental health problem(s)	7	64
Recent conflict w/parent	5	46
Recent legal problem	5	46
Recent problem w/boyfriend or girlfriend	4	36
Substance use	4	36
Academic problem	3	27
Left note, called or texted about suicide	3	27
Concerns regarding sexual orientation	2	18
Recent peer problem	2	18

Table 3. Demographic Information and Cause of Injury for Cases and Ccontrols

	Cases n (%)	Controls n (%)	Differences Between Groups
Age			
12-14	2 (7)	2 (6)	
15-18	14 (48)	12 (35)	
19-21	13 (45)	20 (59)	
Mean age in years	18.1	18.62	*t (61)* = -1.01, *ns*[1]
Sex			
Female	7 (24)	12 (35)	
Male	22 (76)	22 (65)	χ^2 (1) = .93, *ns*[2]
Race/ethnicity			
White	22 (76)	28 (82)	
Black	4 (13)	6 (18)	
Hispanic/Latino	2 (7)		
Asian	1 (3)		
			χ^2 (2) =3.73, *ns*[2]
Cause of injury			
Hanging/strangulation	13 (45)		
Firearms	13 (45)		
Drowning	1 (3)		
Overdose/poisoning	2 (7)	14 (41)	
Motor vehicle crash		11 (32)	
Adverse drug reaction		5 (15)	
Assault		2 (6)	
Natural causes		2 (6)	

[1]*ns* = not significant

[2]Pearson chi-square

Table 4. Logistic regression analysis of risk factors for youth suicide

Potential risk factor	Cases N=29 (n, %)	Controls N=34 (n, %)	Direction of effect	Odds ratio	95% CI	p-value[1]
History of mental health problems						
Depression	14 (48%)	3 (9%)	Cases>Controls	9.6	2.4-38.8	**<.001**
Anxiety	6 (21%)	2 (6%)		4.2	0.8-22.6	ns
Suicidal ideation/self-injury	13 (45%)	3 (9%)	Cases>Controls	8.4	2.1-33.8	**<.005**
History of violence						
Victim of violence	4 (14%)	2 (6%)		2.6	0.4-15.1	ns
Violence toward others	5 (17%)	0 (0%)				
History of legal problems						
Arrest/incarceration	10 (34%)	4 (12%)	Cases>Controls	4.0	1.1-14.4	**<.05**
History of medical problems						
Injuries/hospitalizations	13 (45%)	7 (21%)	Cases>Controls	3.1	1.0-9.5	**<.05**
Chronic illness/defects	6 (21%)	4 (12%)		2.0	0.5-7.8	ns
History of substance abuse						
Any substance	10 (34%)	22 (65%)	Controls>Cases	3.5	1.2-9.9	**<.05**
Alcohol	5 (17%)	9 (26%)		1.7	0.5-5.9	ns
Marijuana	4 (14%)	6 (18%)		1.3	0.3-5.3	ns
Cocaine	1 (3%)	2 (6%)		1.8	0.2-20.4	ns
Prescription drugs	4 (14%)	14 (41%)	Controls>Cases	4.4	1.2-15.4	**<.05**
Substance use detected by toxicology[2]						
Any substance	7 (32%)	28 (85%)	Controls>Cases	14.7	4.3-50.0	**<.001**
Alcohol	0 (0%)	8 (24%)				
Cocaine	1 (5%)	2 (6%)		1.4	0.1-15.9	ns
Heroin	0 (0%)	2 (6%)				
Antidepressants	2 (9%)	12 (34%)	Controls>Cases	5.5	1.1-27.4	**<.05**
Amphetamines	2 (9%)	5 (16%)		1.9	0.3-10.5	ns
Cannabis	3 (14%)	13 (41%)	Controls>Cases	4.3	1.1-17.7	**<.05**
Opioids (other than heroin)	2 (9%)	17 (53%)	Controls>Cases	11.3	2.3-56.6	**<.005**
Prescription drugs	3 (14%)	17 (53%)	Controls>Cases	7.2	1.8-29.2	**<.01**
Other circumstances						
Romantic conflict/breakup	9 (31%)	1 (3%)	Cases>Controls	10.5	1.2-91.4	**<.05**

[1]ns = not significant
[2]Overall ns for toxicology results; Case overall n=22, Control n=33 due to a small number of decedents who were not screened

Table 5. Risk factors indicated in nonfatal suicide attempts among youths aged 12-21 in Kent & Sussex Counties, Delaware, Jan 1-May 4, 2012.

	Nonfatal cases	
	n	*%*
Risk factor		
Mental and behavioral health history		
Past mental health treatment	55	47
Suicidal ideation	49	42
Depression	48	41
Self-injurious behaviors	47	41
Previous suicide attempt	43	37
ADHD/LD or developmental delay	23	20
Bipolar disorder	17	15
Anxiety	15	13
Family history of mental illness	15	13
Psychotic symptoms or disorder	9	8
Conduct disorder/ODD/PD	5	4
Violence history		
Victim of interpersonal violence	40	34
Sexual violence†	23	58
Non-sexual violence†	17	43
Engaged in violence or aggression toward others	22	19
Legal history		
Law-breaking behavior§	27	23
Arrests	21	18
Incarceration	5	4
Medical history		
Chronic health condition	47	41
Injuries/hospitalizations	19	16
Substance abuse history		
Alcohol	15	13
Marijuana	13	11
Cocaine	6	5
Prescription drugs	5	4
Other	11	9
History of abusing any drug or alcohol	23	20

†Percentage within those who were victims of interpersonal violence. Also note that many individuals were victims of multiple forms of abuse. When categorized that way, 35% of the total victims of interpersonal violence (n= 14) had experienced sexual violence only, 35% had experienced multiple forms of abuse, and 23% (n=9) had experienced only one form of non-sexual abuse.

§ Diverse category including: Assault, battery, breaking and entering, burglary, possession of drugs/paraphernalia, rape, criminal mischief, DUIs, auto theft, possession of weapons on school property, running away, truancy, cruelty to animals, and probation violation

Table 6. Circumstances indicated in nonfatal suicide attempts among youths aged 12-21 in Kent & Sussex Counties, Delaware, Jan 1-May 4, 2012.

	Nonfatal cases	
	n	*%*
Circumstance		
School problems	47	41
Conflict w/parent	39	34
Change in home/family/caregiver	39	34
Peer problems	34	29
Problem w/boyfriend or girlfriend	26	22
Suicide of friend or peer	25	22
Disclosed intent	22	19
Other family conflict	18	16
# of circumstances per patient		
0	14	12
1	24	21
2	27	23
3	24	21
4	10	9
5	15	13
6	2	2
Total	116	100

Table 7. Toxicology results for youth aged 12-21 in Kent & Sussex Counties, Delaware who engaged in nonfatal suicide attempts between Jan 1-May 4, 2012.

	Nonfatal cases	
	n	*%*
Positive toxicology result		
Any substance	33	28
Marijuana/THC	14	12
Antidepressants	13	11
Amphetamines	7	6
Other	6	5
Elevated blood alcohol content†	4	3
Cocaine	4	3
Heroin	1	1

†Defined as BAC ≥.08 g/dL

Figure 1. Number of deaths by suicide among Kent and Sussex County youth aged 12-21 from 2009 to May 2012, by year

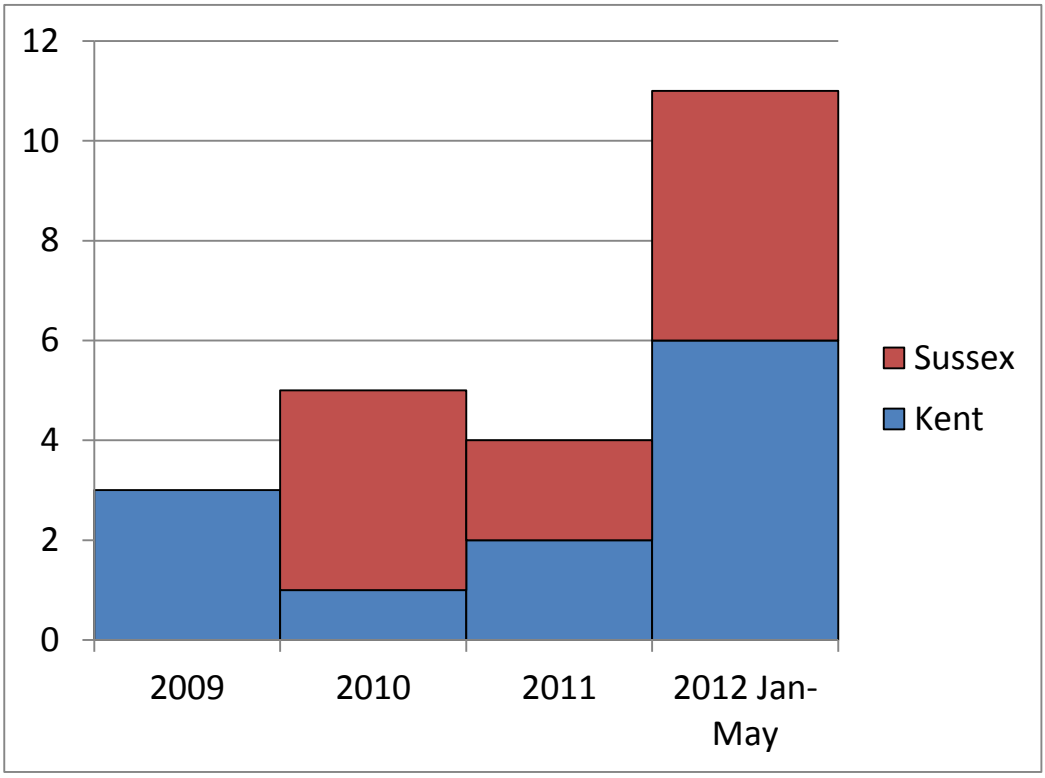
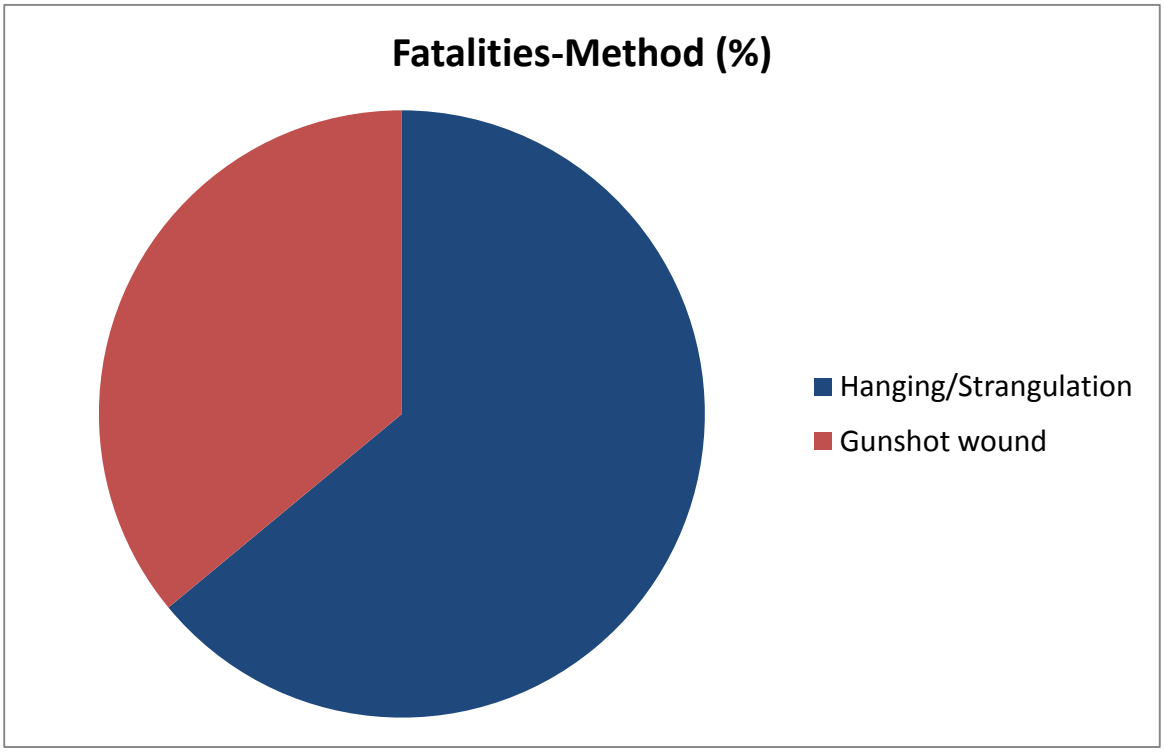


Figure 2. Method of suicide attempt or death by suicide for fatal and nonfatal cases among Kent and Sussex County youth aged 12-21 from January 1 - May 4, 2012



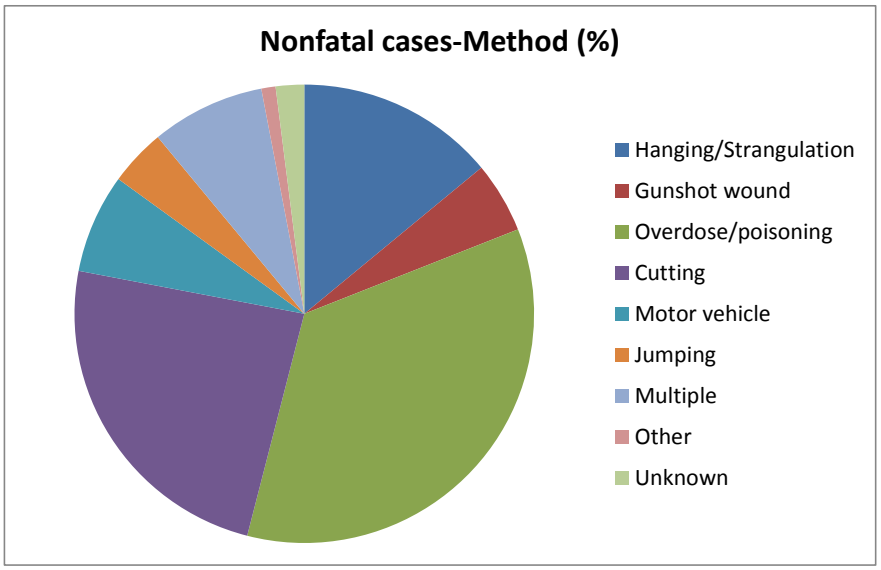


Figure 3. Number of circumstances per decedent in Kent and Sussex County youth suicide cluster January 1- May 4, 2012

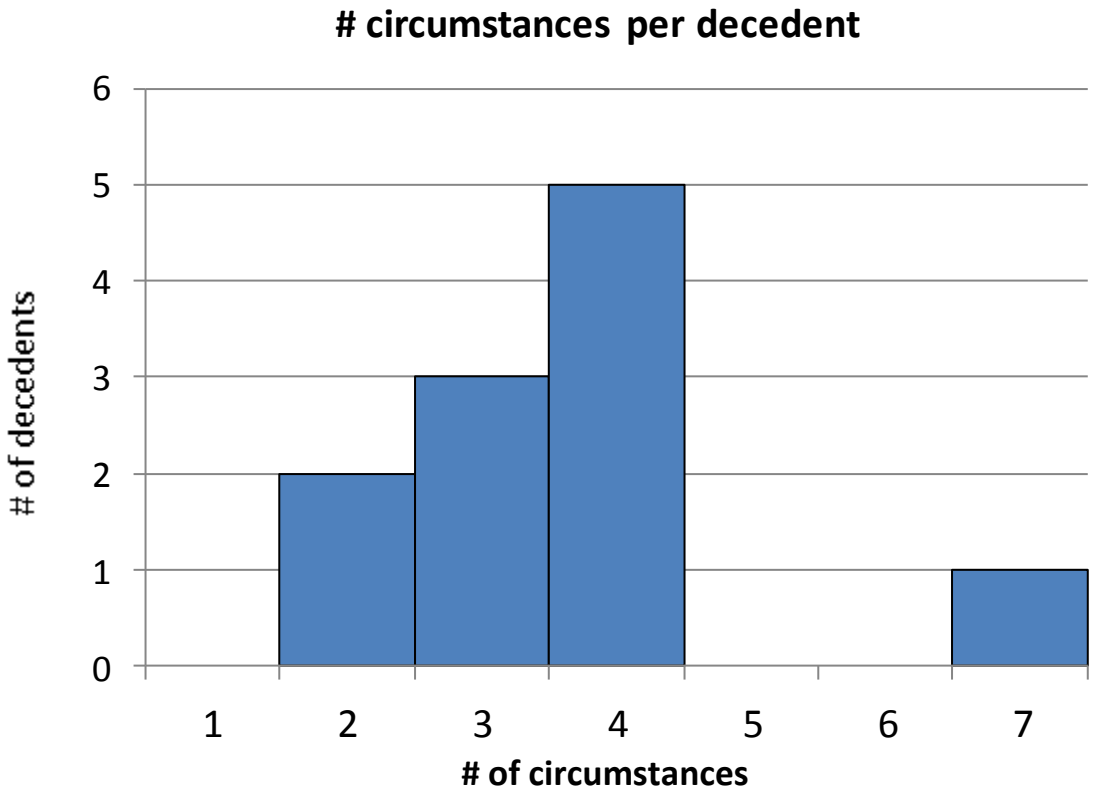
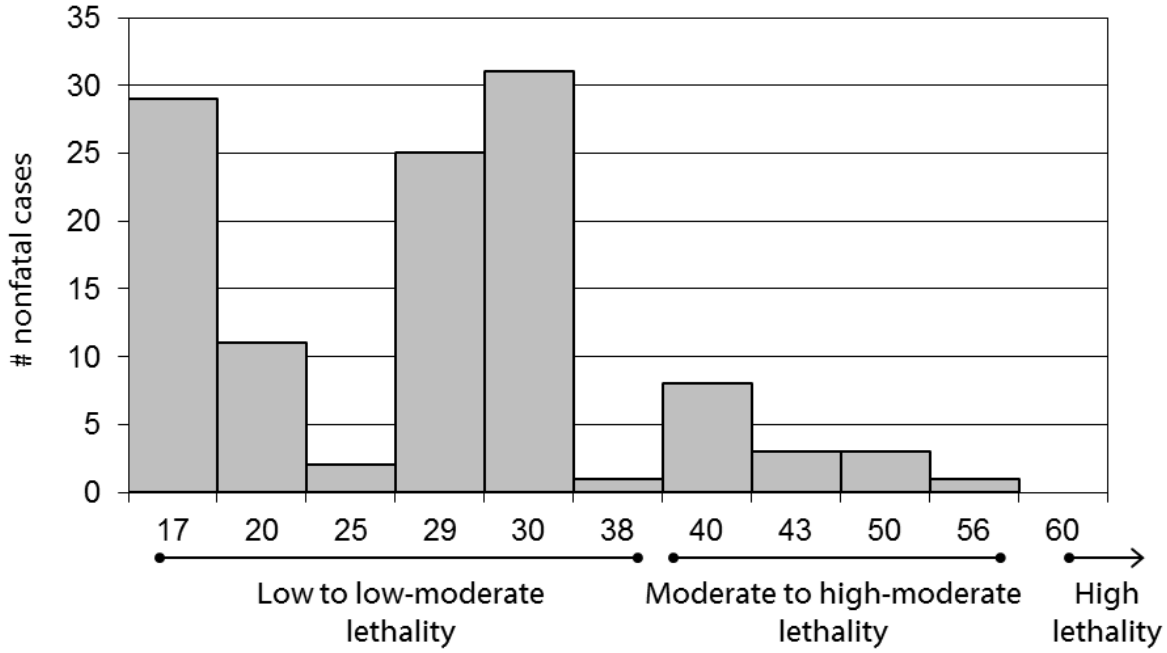


Figure 4. Distribution of risk-rescue combined rating of lethality†: Nonfatal suicide attempts among Delaware youth aged 12-21 years, January 1-May 4, 2012.



† 'Risk' accounts for lethality of methods used and severity of injuries sustained in the attempt; 'Rescuability' accounts for availability of life-saving resources at time of attempt (e.g., location, probability of discovery, disclosure of intent to commit suicide). The combined rating accounts for these two dimensions together.

Figure 5. Connections among fatal and nonfatal suicide events between January and May, 2012 among Kent and Sussex county youth, aggregated by schools with several nonfatal attempts

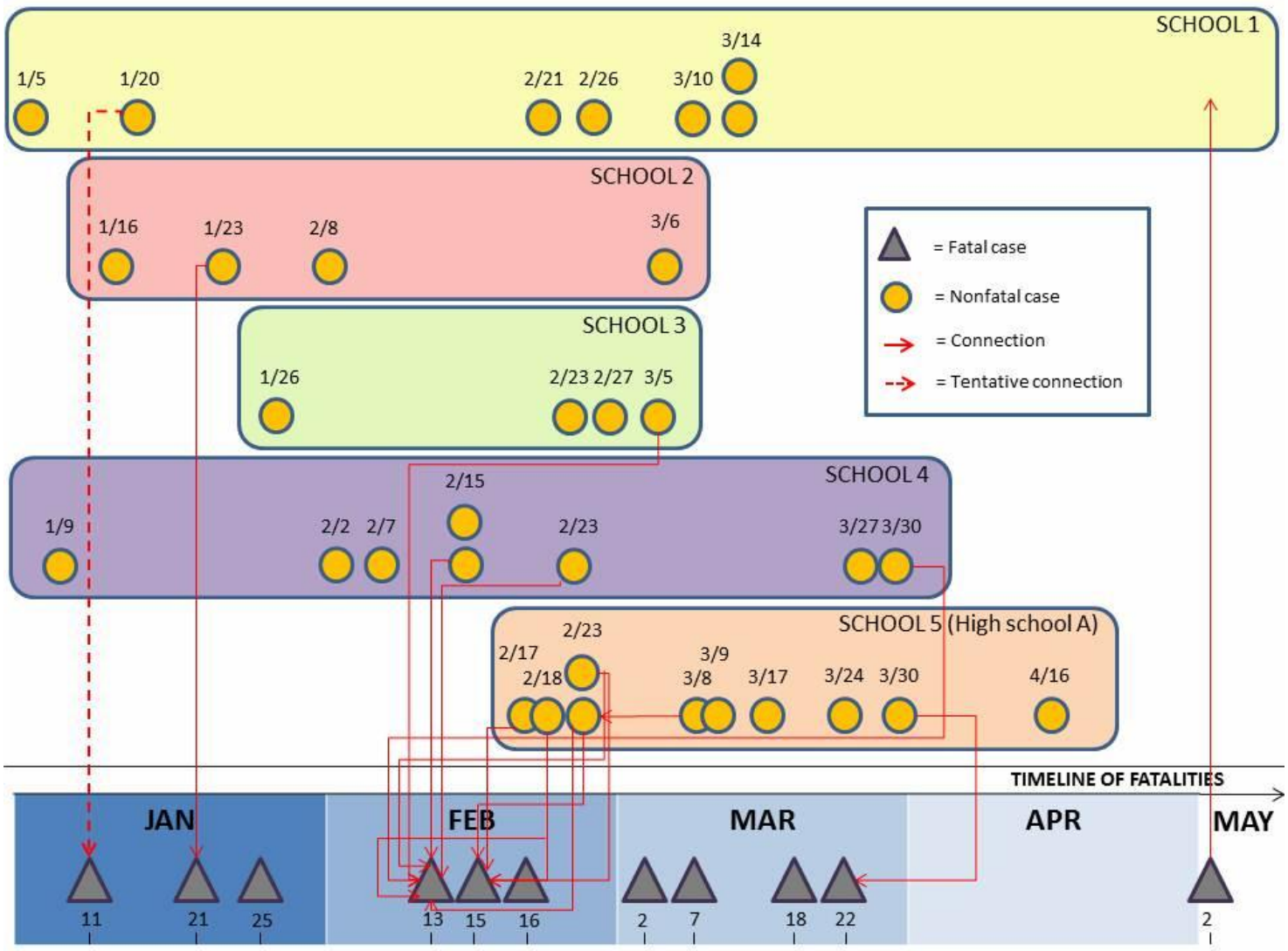
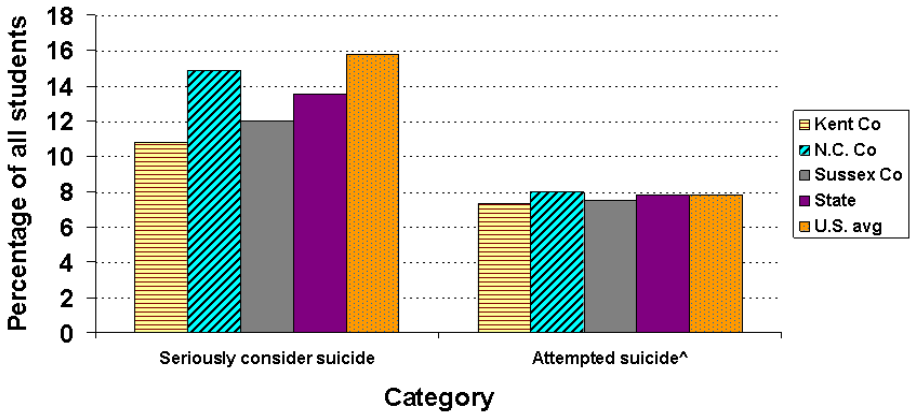


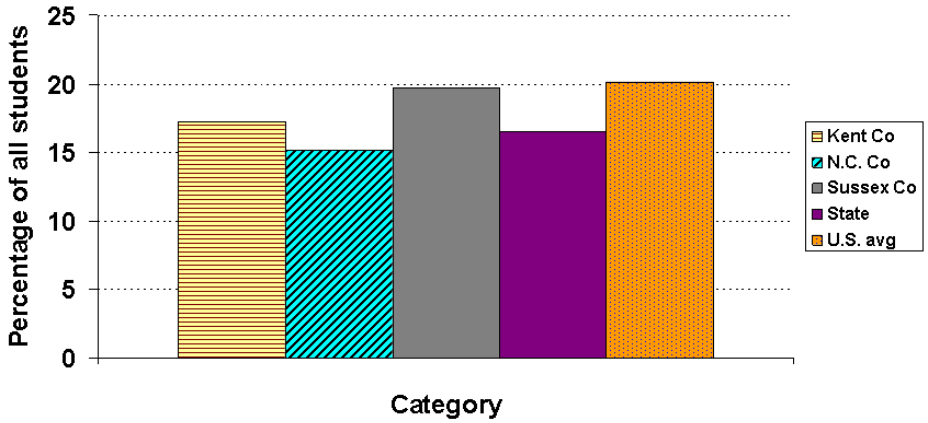
Figure 6. YRBS suicidal ideation and bullying data: Kent and Sussex counties, state of Delaware, and national data.

Suicidal ideation and behavior among high school students – Delaware and U.S., 2011



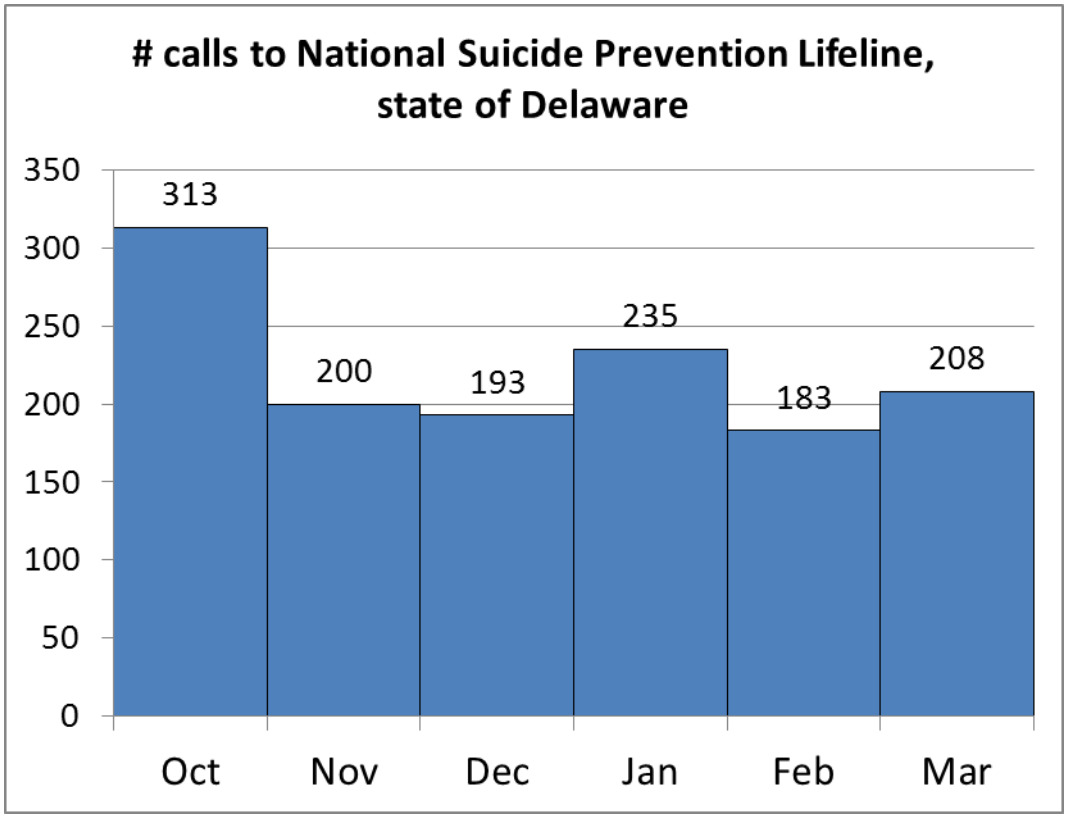
Source: CDC Youth Risk Behavior Survey
* During the 12 months preceding the survey
^One or more times

Ever bullied on school property among high school students – Delaware and U.S., 2011



Source: CDC Youth Risk Behavior Survey
* During the 12 months preceding the survey

Figure 7. National Suicide Prevention Lifeline calls for the state of Delaware from October 2011 – March 2012



Appendix A. Key informant interview

Introductory information

a) Title/position:

b) Role in the community

c) How long this person lived and/or worked in the community (is this person from the area or an "outsider". Does s/he remember any previous local cluster to current events?

Questions:

1. Do you think there is a suicide problem in this area? Why or why not?

    a) If yes, do they think it's specifically a youth suicide problem?

2. Do you personally know someone who died by suicide or attempted suicide?

3. Have you been affected by the recent suicides in the community? How?

4. How do people in this area respond when someone dies by suicide?
    a) How does the town respond?

    b) How do schools respond?

    c) How do parents respond?.

    d) How do young people respond?

5. Is there something about this community that affects the way people think about or respond to suicide?

6. What resources are available in the area for helping young people who might be feeling suicidal?

7. What kind of resources or people do you think might help prevent suicide?

a. Are those people currently involved?

b. If not, what might help them get involved?

8. When it comes to addressing the needs and problems of young people, what do you think the community needs most?

9. What are the barriers, if any, to seeking and accessing mental health care/resources?

   a. Any specific barriers among youth/young adults?

   b. In the community, in general?

10. Do you think or know of any role social media has played in the recent events (suicides)?

11. Is there anything else you think we should know?