

Capstone Project
Safer Schools – Prevention and Deterrence
Final Report

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Professor: Dr. Maria Trujillo

Rodney Kent | L. Scott Simkins

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Table of Contents

Abstract	3
Problem Statement	4
Research and Technical Approaches	6
Challenges of Managing a School Shooting: The Importance of Prevention and Threat Assessment	7
Technical Approach – LiveSafe	8
<i>Image 1. LiveSafe – Kristin and Shy</i>	9
<i>Image 2. LiveSafe Dashboard</i>	9
<i>Image 3. LiveSafe Mobile App</i>	10
Technical Approach – Safe2Tell	11
Making of a School Shooter	14
<i>Figure 1. The Amygdala</i>	17
<i>(Williams, n.d.)</i>	17
Fairfax County Public Schools Focus on Prevention – A Potential Business Case	18
<i>Table 1. All incidents of Discipline, Crime, and Violence 2016-2017 Statewide totals of all incident counts broken out by offense.</i>	22
Chart 1. The top fifteen offense codes represent 85 percent of all incidents that occurred for 2016-2017 (VDOE, 2018, pp. 3-6)	23
Financial Analysis, Presumptive Return of Investment (ROI), and Federal Grant Funding	23
<i>Table 2. Financial Analysis</i>	25
Ethical Concerns	26
Conclusion	27
References	29
Appendix	34
Seven Significant School Shootings	34
Incident 1 – Littleton, Colorado	34
Incident 2 – Red Lake, Minnesota	34
Incident 3 – Blacksburg, Virginia	35
Incident 4 – Oakland, California	35
Incident 5 – Newtown, Connecticut	36
Incident 6 – Parkland, Florida	36
Incident 7 – Santa Fe, Texas	37

Abstract

In recent years, incidents involving active aggressors, active shooters, rampage killing, and single-instance mass genocide have been occurring and making the news headlines with more apparent frequency. These occurrences placed a spotlight on the fact that a number of nations, governments, municipalities, local authorities, religious, and academic institutions are largely (if not wholly) unprepared to prevent, handle, and manage these types of horrifying incidents. Common targets for criticism or blame have often involved gun control, regulation, societal oppression, a culture of violence in television, movies, and video games. Much of the attention has given to the responses that occur during and after an event, while less thought and consideration have gone into the factors that occur prior to an event that subsequently result in extreme violence. While this project began as an effort to leverage technology as a means for handling and managing school shootings as they happen, more current and studies on the matter are establishing that there is a clear need for human and technological solutions around prevention and deterrence of, not only, school shootings, but also violence, aggressive and antisocial behavior, while maintaining a need to more proactively address mental health issues and other reported or unreported factors leading to extreme violence.

Problem Statement

Each time a rampage killing or mass shooting occurs in any public space where safety is expected, it is another reminder that humanity has failed, again, to take the necessary measures to stop a catastrophe where there were obvious opportunities to prevent it. Unfortunately, comprehensive policy change and large bureaucratic efforts take a lot of time, reactive reflection, and consensus to occur. That leaves too much opportunity for more incidents. Perhaps, there are more proactive and effective approaches to dealing with such a complicated problem.

Of course, there are statistics show that the general likelihood of being killed in a school shooting is very low. David Ropeik of the stated in his article, *School shootings are extraordinarily rare. Why is fear of them driving policy?*, “the statistical likelihood of any given public school student being killed by a gun, in school, on any given day since 1999 was roughly 1 in 614,000,000. And since the 1990s, shootings at schools have been getting less common,” (Washington Post, 2018, para. 2). While those statements and numbers indicate that the problem may not be that big in the grand scheme of things, any decent human being knows that it is completely unacceptable to stand by idly while children and innocent people die. This is not a responsibility we can simply diffuse and ignore because a statistic makes an enormous problem appear minimally significant.

Despite the small chance of becoming a victim in a mass murder in a school or other traditionally safe setting, there is evidence to the contrary. In his article entitled *Trending in the wrong direction. K-12 school violence is on the rise*, Todd Komiak says, “Incidents of school violence more than double in 2017-2018,” (Kominiak, 2018, para. 7). At the same time, school security guards are admitting that there is a lack of preparedness and training to help them prevent or control a school shooting. Evie Blad’s Education Week story, *Ready for a Shooter?*

1 in 5 School Police say No.,” plainly verifies that point, (2018, para. 1) that preparations are not being made. What does all this mean? It means that there is clearly problem to solve.

There are ways to solve the problem of rampage and/or school shootings, but they involve approaching the issue in new ways, by proactively leveraging resources, data, technology, cultural change, shifts in mindsets, and psychological research. The potential and available solutions can take some time to develop and implement, but ultimately empowering people at the local or personal level with new capabilities, resources, and more readily available information on prevention can allow change to occur much more rapidly than waiting for legislation to change or expecting another person or executive body to manage the problem by proxy. In their video entitled *School Shootings: A Conversation with Child and Adolescent Psychologists*, Lori Evans, PhD and Randi Pochtar, PhD from NYU Langone Health state the importance of reporting and enabling students, parents, and teachers to document concerns can be critical to dealing with problems before they become much larger (2018). In the pages to follow, the research collected and shown, along with mention of relevant technological solutions will help demonstrate that there are more effective ways to tackle the complex problem around school shootings, rampage killings, and curb violent behavior and ideations before they become a larger problem in reality.

Research and Technical Approaches

By looking at the money is being spent and the amount of grant money being generated, reviewing the incidents of shootings, exploring relevant psychological publications, talking with technology professionals developing prevention tools, and with review of existing implementations of existing web sites, applications, hotlines; it is apparent that more and more emphasis is being placed on prevention, threat assessment, reporting. Prevention and deterrence are now the common theme(s) and direction that people are moving for stopping future rampage killings, school shootings, and incidents of school violence. Federal and State governments entities are pooling millions of dollars to aide in the development of prevention solutions.

Meanwhile, despite the differences in each of the major school shootings detailed (see Appendix) there are commonalities with respect to warning signs along with reported and unreported behavior that should have warranted a closer look by authorities, administrators, and mental health professionals. Most retrospective efforts call out the missed opportunities to take action. Additionally, while countless people have been perplexed by past shooters and searching for motives, many have overlooked some relatively fundamental psychological principles and factors that affect every person with the propensity to become violent. It is incredibly difficult to imagine how someone could get to a place where their only course of action is to murder a number of defenseless peers. Though, what is not that difficult to understand is how someone could get stuck in a one-track mindset due to intense anxiety, feelings of hopelessness or insignificance due to perceived or actual peer oppression or abuse, and have a desire to make a mark or name for oneself in the world.

Challenges of Managing a School Shooting: The Importance of Prevention and Threat Assessment

Elizabeth Shimmer Bowers says it best in *School Shooters-Inside Their Minds*, “Schools need to have threat assessment procedures—multidisciplinary teams within the school, trained on threat assessment. Right now, at the secondary school level, the focus is on lockdown procedures. That is what you do when there is an armed intruder in the building. That is a little late. Lockdown procedures are going to minimize the damage; they won’t prevent an attack. The idea of threat assessment is you look for the warning signs that lead you to the attack-related behavior, you identify the risk before someone ends up with a gun in the school. And that means training the students, too, because if anyone knows who’s planning something, it is most likely the other kids, and they need to be trained. For example, if you see this or hear this, this is what you do and why you do it. And even if it is your friend who you think will be mad at you, if you don’t tell anyone, your friend is probably going to be dead or in jail for the rest of his or her life. You may be dead, your other friends may be dead, and you are going to have to live with that. So, kids need to be guided through and maybe given some role-plays and scenarios. They need to think through the ramifications.

In addition, teachers need to be trained in warning signs they may see that other people wouldn’t. There are kids who have written stories about kids killing other kids at school and handed them in as school assignments. A few weeks later they do exactly what they wrote about in their papers.

When Cho was in high school, Columbine occurred, and he wrote a paper in favor of Columbine. Virginia Tech didn’t know that, but when he was at Virginia Tech, he wrote a paper

about a guy named Bud who was planning a school shooting. Bud ended up not doing it, but there was an interdepartmental email from Virginia Tech where one of his professors told colleagues, ‘Every assignment he had handed in has been about shooting people.’ So, teachers may see suspicious school assignments. Harris and Klebold made a video in their video production class called “Hit Men for Hire,” where a kid was being picked on, and he hired Klebold to come in and shoot people,” (Bowers, 2013, para. 26-28). Finding information like this is what spurred a need to determine which technical solutions are available on the market and one notable one was LiveSafe, primarily because of its connection to the Virginia Tech shooting victim and widespread usage in universities around the nation (including Georgetown). Another, named Safe2Tell is also significant because it was created in response to the Columbine attack.

Technical Approach – LiveSafe

LiveSafe is a company based in Northern Virginia who developed a web/cloud-based and mobile application that ingests and manages the reporting emergency and non-emergency incidents and tips to a centrally managed command center and dashboard. It also comes geofencing capabilities for customer locations, and integration capabilities with school/venue/campus and local authorities. The company was founded by Shy Pahlevani, who was (at a time in his life) a victim of assault. The company was originally named *CrimePush*, as mentioned in the ARL Now article entitled *Rosslyn-Based LiveSafe Aims for a Safer School Year*, by Tom Risen, (2013, para. 17). Another notable employee and LiveSafe Spokesperson is Kristin Anderson, who was one of the surviving victims of the Virginia Tech shooting. Below, you will see a photo of the two of them together in the office, along with some images of the console and mobile app user interface.



Image 1. LiveSafe – Kristin and Shy
ARLnow.com (Risen, 2013)



Image 2. LiveSafe Dashboard
ARLnow.com (Risen, 2013)

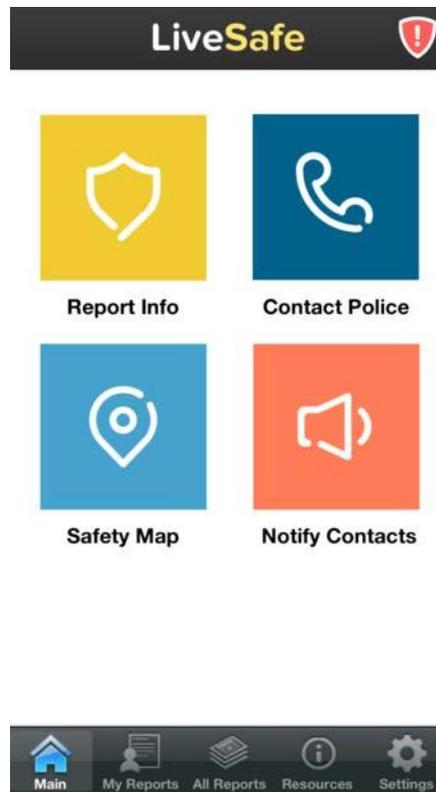


Image 3. LiveSafe Mobile App

ARLnow.com (Risen, 2013)

The LiveSafe solution runs, both, on the Amazon Web Services cloud platform and a free mobile app that is available in the Apple App and Google Play Stores. The LiveSafe solution is already in place at a variety of well-known universities around the United States. The mobile app allows users to authenticate with their phone number or two-factor authentication and place formal or anonymous tips to security and law enforcement personnel, with real-time location awareness, camera functionality, and messaging/chat capabilities. The user interface of the mobile app is simple and offers 4 main menu options, including Report Suspicious Behavior, Report Incident, Resources, and Emergency Options. Depending on the selection, a subsequent workflow or response sequence can be invoked, due to the central management application integration and customizations configured to match security and law enforcement response plans.

The mobile app also provides maps and nearby safety checkpoints within a pre-configured geofence. It also comes with a feature known as *Safewalk*, which allows users to share their location along with a walk time and route with a trusted friend. The central management dashboard and solution provide security personnel with a means to track and respond to each incident in, either, real-time or after a report has been submitted. It also comes with message broadcasting, differing alert severity indicators, reporting/note-taking, role delegation control, and analytics tools for Security personnel to use for sending out emergency or non-emergency alerts, providing shift-turnover information, limit access to the tools, and for data analysis to help with forecasting and future incident prevention. Reports can also be placed on maps to help draw attention to specific issues. As well, pre-set messages can be used for the purposes of periodic drills for staff and students.

On top of listing all the features, it was discussed that the likelihood of a person witnessing a crime taking action by reporting a tip or incident through a mobile app seems to be noticeably greater than a willingness to contact an emergency or non-emergency number. That is likely a cultural component of the widespread adoption and use of mobile devices and applications. Somehow people feel more empowered by using a mobile app and messaging platform and that helps reduce the diffusion of responsibility that occurs when a number of people witness a crime and assume that another witness will take steps to place the call to authorities, (Cynamon, A., et al., Personal Communication, 2018).

Technical Approach – Safe2Tell

Alternatively, Colorado's solution to the subject may be the answer. As a direct outcome of the Columbine Commission's Report, the Safe2Tell Initiative was created to implement a critical recommendation: "To provide an anonymous venue for parents, students, teachers,

school administrators, and law enforcement to share information” (S2T CO, n.d.). The Attorney General for the state of Colorado, in partnership with the Colorado State Patrol, the Safe Communities~Safe Schools group, and the Center for Study and Prevention of Violence at CU Boulder, has implemented a mobile solution call *Safe2Tell*. Safe2Tell provides users a safe, anonymous avenue to help someone who is struggling or hurting (S2T CO, n.d.). While the technological solutions are not solely focused on school violence, the information sharing of this critical data among law enforcement and school officials has increased exponentially. In fact, the number of reports and tips surrounding violent acts continues to increase, for instance, the 2017-2018 school year saw a 74% increase from the previous year’s reporting (C2T CO, n.d., Results). From purely a technological perspective, it is important to note that this solution leverages all venues of report—mobile app, standard telephone call, mobile web browsing, and PC web browsing.

The Safe2Tell application (regardless of venue used) provides a quick and easy way to provide information to the officials. Upon first use the user must complete a series of profile specific steps. This information ties the user to any information generated from their profile; however, it is important to note, no user personal information is recorded. While the tips and reports are anonymous in nature, each report is encoded with Tip ID and Password. The image below (Image 3) illustrates the common interface of the mobile application. The reporting and tip processes are broken down into manageable data components to streamline the reporting processes as well as supports quick routing of specific circumstances. Additionally, to ease the reporting of a situation, the user can upload critical imagery as well as video and audio in addition to any written accounts of the situation. Once the tip has been submitted, the user can utilize the Tip ID/Password combination to check the status of a tip as well as add information as

needed. The Safe2Tell Colorado mobile app is password protected, allows reporters to upload videos or photos, and features two-way dialogue functionality with the reporter and dispatcher for additional information (S2T CO, n.d.).

The Safe2Tell Reporting Process is a 5-step process that ensures the tip is handled in the most expedient means possible while preserving the safety, privacy, and ethical standards of the community. Safe2Tell Colorado uses a unique and highly sophisticated database program that allows for two-way dialogue between the reporting party and the answering point. The sophistication of the Safe2Tell Colorado database system is ever-evolving and helps identify trends of violence in schools and communities (C2T CO, n.d.). All information is encrypted, allowing for complete anonymity. Once the report is initiated, trained dispatchers review the information and route the tip to the proper officials for investigation. As the investigation forms, members of the law enforcement community as well as school officials are involved to gather the data and intelligence about the situation. As a result, professionals from many community organizations (law enforcement, medical, etc.) are involved to perform intervention and/or interruption actions concerning the situation reported. Lastly, as part of the feedback loop, the team reports the outcomes to Safe2Tell in order to ensure action is taken on every report (C2T CO, n.d.). Communities now focus on collaborative prevention efforts with support from multiple systems: justice, education, health, mental health, and human services. Safe2Tell Colorado provides a unique bridge between these agencies and the youth who need help to avert an act of violence or injury (C2T CO, n.d.).



Image 4. Safe2Tell Mobile Application home screen.
C2T CO (n.d.).

Given the relative privacy concerns surrounding the accumulation of this data, the Colorado state government established protocol on handling this information. C.R.S Section 24-31-601 of the Colorado Statutes guarantees the anonymity of every caller/tipster—there is no caller id and caller/user names are not asked.

Safe2Tell Colorado now operates as a state funded program of the Colorado Department Law, Office of the Attorney General.

Making of a School Shooter

What do we know about school shooters? What are some commonalities? What are known precursors? What are some of the key indicators or contributing factors?

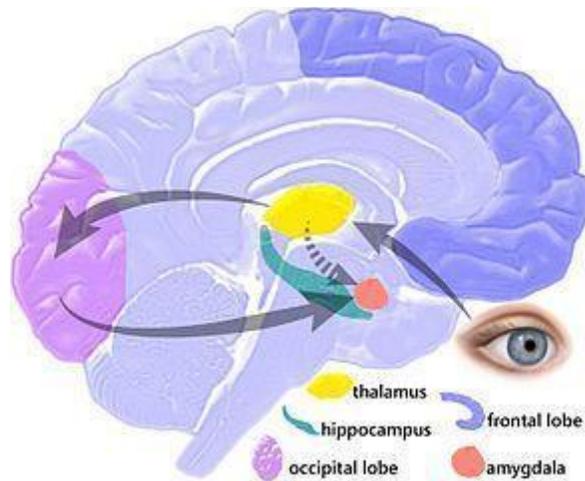
For better or for worse, it has been found that many of the school shooters are white males, as indicated by Marty Nemko, Ph.D. in *The Making of a Mass Shooter*, on Psychology Today's web site, (2017, para. 8). There are a couple notable incidents involving males of Asian descent, as noted in the aforementioned Virginia Tech and Oikos University incidents.

In a number of cases, the shooters have suicidal tendencies. Hence, the reason for a good number of shootings ending in suicide. More (and possibly most) importantly; in the majority of notable incidents, it is being found that there are mental health concerns that were either noted, documented, treated to an extent, or overlooked/ignored entirely prior to an event. Many of these mental health concerns, on some level, can be linked to anxiety disorders.

To go deeper into the mind of a potential shooter, it becomes necessary to understand some common and uncommon human behavior and thought processes. In plenty of cases, a seemingly ordinary person goes from being able to tolerate and withstand the behavior and interaction with/of others to what most could conclude or agree is a state of rage and single-minded vengeance. In a post on Psychology Today, entitled *Inside the Mind of a School Shooter*, Dr. Goulston explains how and why this is possible. He talks about the concepts of *Triune Brain*, *Triunal Rigidity*, and *Triunal Agility* that were established in a model by neuroscientist, Paul MacLean, and how some people who are capable of committing horrific atrocities become trapped in a state of Tribunal Rigidity. Dr. Goulston explains that, "Triunal Rigidity occurs when someone's thinking upper primate brain, emotional middle mammalian brain and "fight or flight" lower reptilian brain become rigidly locked like Lego blocks to each other and fixated on an external goal or mission that they are mentally unable to divert from," (2015, para. 1-2). Conversely, he goes on to mention that mentally stable people, "...develop Triunal Agility. That means that their three brains can couple together and line up with an

external reality and pursue goals effectively. When that reality changes, they have a fluidity in their brains and minds which enables them to decouple their thinking, feelings and actions and have them realign with the new reality,” (2015, para 3). He goes on to add that, “Nearly all the rampage shooters felt they belonged nowhere and had no chance of a better life,” and supports this by mentioning that the *fame* shooters can acquire through their horrific acts is “*the revenge of the nobody*,” (2015, para. 13-15). What that means, in plain terms is that someone who is stuck in a state of believing he (or she) is a nobody and opts to fight rather than flee seeks out a means to that end (to become *somebody*).

In support of Dr. Goulston’s shared experience and professionally developed beliefs, it is possible to go a step further into lizard brain (otherwise known as the amygdala). In Study.com article entitled, *The Amygdala: Definition, Role, and Function*, John Williams states that, “The amygdala is responsible for the perception of emotions such as anger, fear, and sadness, as well as the controlling of aggression. The amygdala helps to store memories of events and emotions so that an individual may be able to recognize similar events in the future. For example, if you have ever suffered a dog bite, then the amygdalae may help in processing that event and, therefore, increase your fear or alertness around dogs. The size of the amygdala is positively correlated with increased aggression and physical behavior,” (n.d., para. 5). For the sake of visualization, here is an image showing the location of the amygdala (see Figure 1).



*Figure 1. The Amygdala
(Williams, n.d.)*

Something very noteworthy, on the matter of the Amygdala (a.k.a. Lizard Brain) is that it can be deeply connected to anxiety. When we look into the list of perpetrators of rampage attacks that have made the news, there is a rather common trait among them. That trait is anxiety. Some have been noted as having especially high levels of anxiety.

In a BrainWorld Magazine online article called *Unlocking the Reptilian Brain: Understanding the Amygdala*, James Sullivan mentions that the amygdala, "... is this region of the brain that may play a role in the development of autism or post-traumatic stress disorder, disorders where the brain is locked in a defensive coping mechanism against antagonistic forces. A study conducted last summer at Stanford University with MRI scans showed that children exhibiting higher levels of stress and anxiety had an amygdala "fear center" of significantly larger volume in their brains when compared to their peers, all of which showed patterns of stronger connectivity to the rest of the brain than normal," (2018, para. 3). He also talks about how the amygdala is a common factor in sexual/libido differences between men and women.

Now, it starts to become possible to imagine the dangers of a teenage boy with raging hormones, high anxiety, a mind stuck in a state of seemingly hopeless fear of being worthless...with access to lethal weapons. While many mentally stable teenage boys can very likely understand the harm that would be done by carrying out a mass shooting, there will still be the select few that may not develop the capability to cope with their anxiety and lizard brains when they become outcasts or isolated from their social surroundings.

Fairfax County Public Schools Focus on Prevention – A Potential Business Case

Earlier this year, Fairfax County Public Schools (FCPS) released some articles and budget information regarding incidents like those mentioned above and recently released a 2018-2019 budget for implementing more security and mental health tools and resources. These findings indicate that there could be a strong business case for new technology solutions for supporting and complementing their initiative when future funds become available.

In addition to the aforementioned statements, the July 27th News Release on the fcps.edu web site entitled, “Fairfax County School Board Approves Funding for Security, Mental Health Enhancements,” states (in summary) that \$0.8 million was approved for new security, technical, assessment, and planning positions. To add, \$2.16 million was approved for psychological, social worker, and threat assessment positions. The funding for those roles will be part of a recurring spending plan. Additionally, \$1.0 million was approved for door lock replacements. Also, the budget came out of year-end funding and is part of their FY19 approved and adopted budget, (2018, para. 1-6).

A public article in the Fairfax Times, entitled, “FCPS recommends cameras, more mental health specialists for school safety,” confirms all the previously mentioned points and specifically references prior school shootings in Parkland, Fla., Columbine, Colo., and that those

incidents (among others) prompted FCPS to increase and enhance its security presence, (2018, para. 7-9).

To further demonstrate a need for more proactive prevention and deterrence technologies in school systems like Fairfax County's, there is available information from the Virginia Department of Education School Climate Reports site that encompasses annual reports on discipline, crime, violence and searchable web applications and databases that include various incidents warranting safety concerns along with prevention planning resources (VDOE School Climate Reports, n.d., para 1-2). The 2016-2017 Annual Report, as an example, provides information on the following criteria:

“Offense and Incident types reported in the SSIR are coded and grouped into offense categories. These offense categories are aligned according to severity of offense. There are nine categories:

- Weapons Related Offenses
- Offenses Against Students
- Offenses Against Staff
- Offenses Against Persons
- Alcohol, Tobacco, and Other Drugs
- Property Offenses
- Disorderly Disruptive Behavior
- Technology Offenses
- Other Offenses,” (2018, pp. 2).

To show more supporting detail, the following is a sampling of the information available in the 2016-2017 Annual Report from the Virginia Department of Education School Climate Reports page:

“OVERVIEW OF ALL INCIDENTS

This report focuses on the DCV data reported for the 2016-2017 school year and includes information submitted to the VDOE by all school divisions. In the school year 2016-2017, there were 147,155 incidents reported. The incidents of defiance, classroom/campus disruption, disruptive demonstrations, obscene language/gestures, minor physical altercations, and disrespect combined accounted for 61.15 percent of all incidents in 2016-2017.

The most frequently reported incidents were defiance 20,576, classroom/campus disruption 17,746, disruptive demonstrations 16,025, minor physical altercation 14,327, using obscene inappropriate language/gestures 11,119, and disrespect/walking away 10,198.

Due to the personally identifiable nature of the information represented in this report, numbers ten (10) and less are suppressed with the use of an asterisk (*). This includes all data including student counts, outcome counts, and incident count.” (VDOE, 2018, pp. 3-6)

Offenses	Offense Codes	Count	Percent
Defiance of Authority/Insubordination	D2C	20,576	13.98
Classroom or Campus Disruption	D5C	17,746	12.06
Disruptive Demonstrations	D3C	16,025	10.89
Minor Physical Altercation	F1T	14,327	9.74
Using Obscene/Inappropriate Language/Gestures	D6C	11,119	7.56
Disrespect/Walking Away	D1C	10,198	6.93
Fighting: Mutual Contact--No/Minor Injuries, No Med Attn.	FA2	7,356	5.00
Minor Insubordination	D8C	4,490	3.05
Threatening Student (physical or verbal threat or intimidation)	TI2	4,421	3.00

Other School Code of Conduct Violation Not Covered in These Codes	S3V	4,105	2.79
Harassment	HR1	3,983	2.71
Assault Against Student/No Weapon	BA4	2,834	1.93
Tobacco	TB1	2,616	1.78
Bullying	BU1	2,540	1.73
Assault/Battery against student without injury	BA6	2,255	1.53
Cellular Telephones	C2M	2,129	1.45
Theft Offenses (except motor vehicles)	TH1	2,040	1.39
Threatening Staff Member (physical/verbal threat)	TI1	1,829	1.24
Drug Possession/Use of Schedule I and II drugs	DR1	1,819	1.24
Attendance	A1T	1,498	1.02
Offensive Sexual Touching Against Student	SX2	1,150	0.78
Vandalism	VA1	1,124	0.76
Assault Against Staff: No Weapon	BA2	1,093	0.74
Sexual Harassment	SX0	829	0.56
Drug Violations Schedule III-VI Poss./Sale/Dist./Paraphernalia	DR5	739	0.5
Alcohol	AL1	678	0.46
Bringing a Knife to School/School Event (more than 3 inches)	WP5	667	0.45
Bringing Razor Blades/Box Cutters/Knife less than 3 inches to School/ Event	W8P	554	0.38
Misrepresentation (altering notes, false information, cheating, etc.)	S2V	494	0.34
Inappropriate Personal Property (food/beverage, clothing, toys, etc.)	S1V	492	0.33
Possession of Other Weapon (instrument/object to inflict harm)	WP9	457	0.31
Unauthorized Use of Technology and/or Information	T1C	454	0.31
Tobacco Paraphernalia to school events	T4B	380	0.26
Sexual Offenses Without Force	SX7	352	0.24
Electronic cigarette (possession, use, sale, distribution)	TB2	341	0.23
Violations of Acceptable Usage Policy	T3C	260	0.18
Cyber Bullying	BU2	264	0.18
Possession of Obscene/Disruptive Literature/Illustrations	D4C	261	0.18
Bomb Threat	BB1	231	0.16
Bringing a Toy/Look-Alike Gun to School/School Event	W3P	203	0.14
Drug Violations Schedule I and II Anabolic Steroid, Marijuana--Sale/Dist.	DR4	188	0.13
Over-the-Counter Medication Possession	D5G	182	0.12

Electronic Devices (radios, tape players, etc.)	C3M	156	0.11
Trespassing	TR1	155	0.11
Possession of a BB gun	WP0	148	0.1
Gang Activity	GA1	116	0.08
Drug violation-- look a-like--use/poss.	DR2	103	0.07
Inciting a Riot	RT1	108	0.07
Violations of Internet Policy	T4C	105	0.07
Bringing Fireworks/Explosives to School/School Event	W9P	105	0.07
Arson	AR1	84	0.06
Bringing Ammunition to School or School Event	W1P	70	0.05
Possession of Weapons/Chemical Substance	W2P	75	0.05
Over-the-Counter Medication Use	D4G	66	0.04
Offensive Sexual Touching Against Staff	SX1	66	0.04
Causing/Attempting to Cause Damage to Computer Hardware, Software or Files	T2C	61	0.04
Malicious Wounding without a weapon	BA5	37	0.03
Assault Against Student--Firearm or Other Weapon	BA3	51	0.03
Over-the-Counter Medication Sale/Distribution	D6G	39	0.03
Theft or Attempted Theft of Student Prescription Medication	DR3	29	0.02
Bringing a Handgun to School/School Event	WP1	25	0.02
Sexual Battery against Student	SB2	34	0.02
Possession of Taser	WT1	34	0.02
Robbery	RO1	17	0.01
Gambling	G1B	20	0.01
Extortion	EX1	15	0.01
Use of Inhalants	D16	15	0.01
Possession of Inhalants	D15	20	0.01
Breaking and Entering/Burglary	BR1	17	0.01
Possession of Stun Gun	WS1	16	0.01
Possession or Representation of Any Destructive Bomb Device	WP6	11	0.01
Bringing Other Weapon, Designed/May Be Converted to Expel	WP4	13	0.01

Table 1. All incidents of Discipline, Crime, and Violence 2016-2017 Statewide totals of all incident counts broken out by offense.

(VDOE, 2018, pp. 3-6)

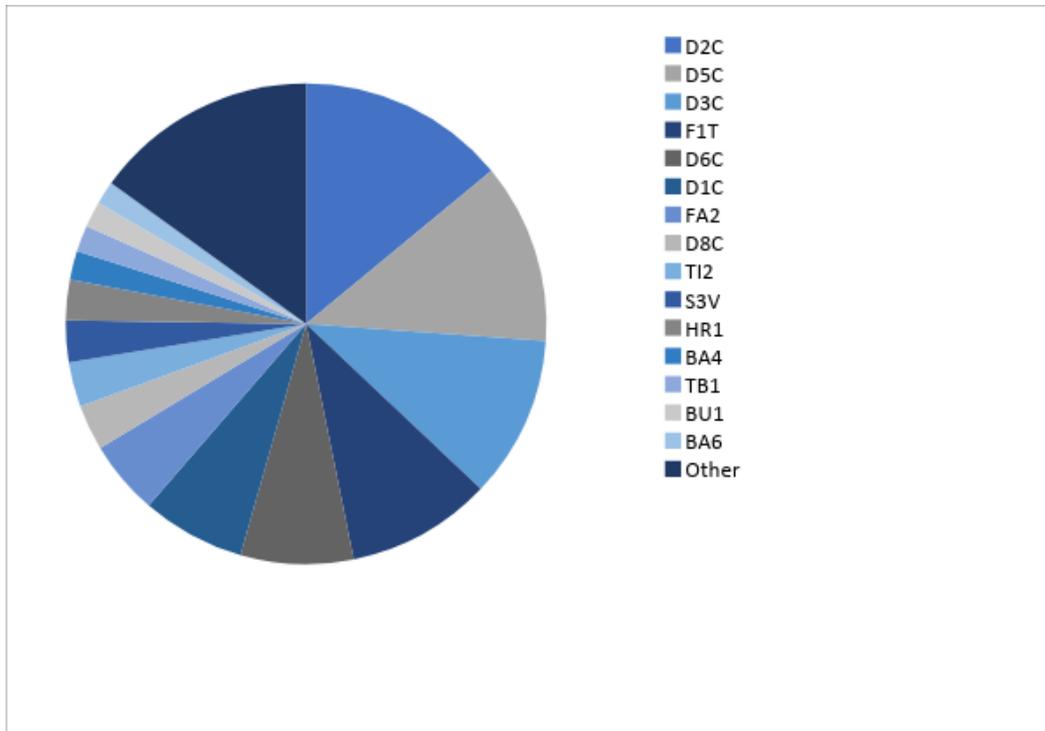


Chart 1. The top fifteen offense codes represent 85 percent of all incidents that occurred for 2016-2017 (VDOE, 2018, pp. 3-6)

Given this information on Fairfax County Public Schools, it is reasonable to assume that the people being hired into the newly established roles will eventually need tools and technology that can enable them to perform their job functions effectively. Tools like LiveSafe and Safe2Tell would very likely serve them well from a security and prevention standpoint, along with any other similar home-grown or system integrator custom developed applications and web sites which could help address other concerns around behavioral and mental health.

Financial Analysis, Presumptive Return of Investment (ROI), and Federal Grant Funding

With the particular niche field of the *LiveSafe* mobile application, along with the state-level funding of Colorado’s *Safe2Tell* solution, certain financial information is not publicly or

readily available for inclusion in this document. However, we utilized a presumptive ROI model based on the common infrastructure used for these types of solutions.

The basis of this financial analysis is centered on the delivery of a technological solution for the Fairfax County Public School system located in Fairfax, Virginia. The demographics of Fairfax County include a population of over 1.14 million people (Fairfax County, n.d.). According to the School Year 2015-16 Enrollment Analysis and Trends report, for the Fairfax County Public School system this translates to over 186,000 students (FCPS, 2015). It is important to note, given Fairfax County's metropolitan location and the likelihood of assistance from adjoining principalities, our financial analysis is centered on the resources allocated to and by Fairfax County based on a technological solution user-base of 600,000 people.

To assist in offsetting the financial impacts, the U.S Department of Justice (DOJ), Community Oriented Policing Services (COPS) is awarding \$25 million in grants as part of the Students, Teachers and Officers Preventing (STOP) School Violence: School Violence Prevention Program (SVPP) (Engel, 2018). Additionally, as part of the Stop School Violence Act of 2018, a grant was designed to support local and state governments, as well as federally-recognized Indian tribes, in their efforts to prevent and reduce school violence around the country (Engel, 2018). The joint effort between the DOJ's, Office of Justice Programs (OJP) and Bureau of Justice Assistance (BJA) is currently seeking applications for its Students, Teachers and Officers Preventing (STOP) School Violence Threat Assessment and Technology Reporting Program (Engel, 2018). The STOP school violence grants are broken into six categories based on the population. Additionally, grant applications can be submitted for one of two different areas of funding: (1) School Threat Assessment or (2) Technology Development (Engel, 2018). The Technology Development funding should be used for the creation and implementation of

technology that encourage anonymous reporting through applications, hotlines or websites (Engel, 2018). Given the population of Fairfax county, they are eligible for an award up to \$500,000.

Lastly, while LiveSafe is a commercially based solution, the Safe2Tell solution is owned and operated by a state government. The cost models for each solution is likely to significantly vary in costs.

Given all of these factors, the financial analysis breakdown is as follows:

Item	Annual Estimated Costs
Technology Infrastructure (cloud-based)	\$250,000
Mobile Application (LiveSafe/Safe2Tell)	\$225,000
Personnel (Administration, Dispatchers)	\$800,000
Grant	(\$500,000)
Total Investment	\$775,000

Table 2. Financial Analysis

While no price can be placed on a human life, some returns-of-investment can be visualized. Early detection is often seen as a true cost-savings in many arenas, especially in the health and medical space, this topic is no different. In this case, the ROI is both qualitative and quantitative. Qualitatively, a prevention and deterrence-based solution could positively charge the community and increase the sense of self for the general student body. Students, faculty, school officials, law enforcement and parents no longer feeling powerless in the prevention of school violence. Common core family values and the value of quality education without fear of violence are likely the cornerstones of the positive qualitative ROI. Financially, communities could visualize a reduction of services and equipment specifically designed to handle crisis situations. As trends develop, communities may choose to reallocate budget to more preventative devices versus crisis devices simply due to relevance and applicability.

Ethical Concerns

As the big data and analytical processing of personal data trends upward, the collection of sensitive information, by any organization, is highly scrutinized and warrants careful ethical considerations when implemented new data collection solutions. Both the LiveSafe and Safe2Tell mobile applications have a significant footprint of personal data—both privacy and civil liberties must be preserved to ensure the information is viewed as authentic, valid, and consistent with the rule of law.

First, the protection of personal data must be addressed. This protection includes the report information (suspected bad act, aggressor, etc.) as well as the witness (or tipster). The Colorado Safe2Tell program provides a significant balance of anonymity (protection of the tipster) and report information (protection of the aggressor) through the use of state laws (C.R.S Section 24-31-601) and rigid process flows for tips (C2T CO, n.d.). It is from this model we see many of the ethical concerns being addressed. It is important to note, given the LiveSafe commercial nature, there may be additional legal doctrine; however, our research did not extend into each customer organization of LiveSafe.

Second, the solution must ensure every tip is addressed. Users, communities, and tipsters have an expectation of thoroughness. As tips are introduced, the solution and the processes must maintain integrity throughout the entire process flow resulting in a resolution and/or action including feedback and closure for the tipster. Again, Colorado's Safe2Talk solution provides keen insight into the handling and routing of each report. As tips are routed to the professionals, the situation reported is uniquely handled via the independent authorities given to each professional in their position (School Principal, Law Enforcement, Counselor, etc.) (S2T CO, n.d.).

Lastly, the solution (and/or process) must ensure tips are valid. Communities employing this solution expect safety from false accusations and allegations. In many cases, given the anonymity of the solutions, users may report an aggressive act erroneously (sometimes feloniously) because of hurt feelings or retribution for an unrelated situation. To assist in reducing or eliminating this ethical concern, the solution must establish minimum standards coupled with a rigid data process focused on getting to the root cause of the report. This approach helps develop the authenticity of the information and validates the following resolution steps. While the reporting basis is foundationally anonymous, prosecution of false alarms and false accusations may prove somewhat difficult.

Conclusion

The evidence provided in this document is demonstrative of the apparent trend shifting toward a prevention and deterrence mindset. Psychologists, experts, law enforcement officers, school administrations, victims, and families of victims who have spent enough time studying and reflecting on prior incidents of school shootings have all been indicating that the sources of the problem are reporting the signs and threats and taking reports seriously enough to respond in kind. Prevention and deterrence are not just components a proactive mindset for solely preventing school shootings. They are also part of a much larger effort to reduce a litany of other problems around violence, harassment, bullying, and antisocial/behavioral issues. As well, this approach begins to offer new thought on assessing threats, providing assistance to students who are showing signs of psychological challenges, disorders, and suicidal ideation. It is at this juncture that we go beyond safeguarding potential victims and also start looking into ways to stop someone from becoming a shooter. When the potential perpetrator and victims can all be saved, that is when we can start declaring an implementation of a technological and procedural

solution a success. It is a delight to see that awareness around prevention and deterrence is growing in the areas of funding, recent news media and online resources, and in the school systems around the country because that can give us all the hope that the solution is stopping the problem before it begins is where the focus and emphasis is being placed. Tools like LiveSafe and Safe2Tell, that offer simple-to-use mobile applications and backend dashboards for professionals (such those being hired by Fairfax County Public Schools) to leverage for real-time and analytical data, are directly aimed at accomplishing this objective. Colorado was incredibly wise to generate a home-grown and localized application and it gives other states an indication of how they too can achieve similar results in a public school system. LiveSafe, at a broader level, with its pervasiveness and endorsements by experts in security services and at universities around the country gives the appearance of a solution that could fit nearly any school system that may not have the means or desire to generate a custom or home-grown solution. Of course, suppression and response tactics are still critically important, but any effort that can be put into a prevention and deterrence solution that also takes into consideration the safety of the honorable people serving in security and law enforcement lines of work is a noble and highly worthwhile endeavor. The goal is to save all the lives...not only a select few.

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Appendix

Seven Significant School Shootings

The following seven incidents referenced for information about the shooter, the ramifications of the attack, and outcomes. Each has some common themes with others, but also some differences for the sake of helping to prove that a prevention and deterrence strategy is a more effective approach than an attack suppression strategy.

Incident 1 – Littleton, Colorado

Overview	<ul style="list-style-type: none"> ● Year - 1999 ● School name – Columbine High School ● Shooter name(s) – Eric Harris and Dylan Klebold ● Attack timeframe was <20 minutes ● Shooters committed suicide ● 15 people were killed and 21 were wounded
Noteworthy Details	<ul style="list-style-type: none"> ● Slow police response ● Police did not enter the shooting area for several hours <ul style="list-style-type: none"> ○ Some victims bled to death as a result ● The shooters brought bombs and additional guns
Outcome(s)	<ul style="list-style-type: none"> ● No real clear indication of a motive was found ● Other schools in the country invested in private security and metal detectors

(The Britannica, 2018, para. 1-4)

Incident 2 – Red Lake, Minnesota

Overview	<ul style="list-style-type: none"> ● Year – 2005 ● School name - Red Lake Senior High School ● Shooter name – Jeffrey Weise ● Attack timeframe was <10 minutes ● 7 people were killed and 5 were wounded ● Shooter committed suicide after brief gunfight with police
Noteworthy Details	<ul style="list-style-type: none"> ● The shooter had warned that he would go after specific people in a shooting ● Derrick Brun, a security guard sacrificed himself to help others flee the shooter

	<ul style="list-style-type: none"> ● The shooter had a floor plan of the school
Outcome(s)	<ul style="list-style-type: none"> ● President Bush responded in the days following the event ● Less media attention than other comparable events, which was requested by a Tribal Council <ul style="list-style-type: none"> ○ No televised press conferences ○ Town turned inward for healing

(Topic, 2018)

Incident 3 – Blacksburg, Virginia

Overview	<ul style="list-style-type: none"> ● Year – 2007 ● School name – Virginia Polytechnic and State University ● Shooter name – Seung-Hui Cho ● Two separate shootings took place between 7:15AM and ~10:00AM ● 33 people were killed and 17 were wounded ● Shooter committed suicide upon police arrival
Noteworthy Details	<ul style="list-style-type: none"> ● Cho was believed to be schizophrenic and showed signs of anger <ul style="list-style-type: none"> ○ Despite a history of mental illness, Cho was able to acquire weapons ○ Cho’s roommate feared he was suicidal ● Cho referenced the Columbine shooters as martyrs ● The attack was planned and Cho sent videos to NBC
Outcome(s)	<ul style="list-style-type: none"> ● The attack renewed calls for better mental health services ● State concluded lawsuits with parents with an \$11 million settlement

(Tikkanen, 2018, para. 1-6)

Incident 4 – Oakland, California

Overview	<ul style="list-style-type: none"> ● Year – 2012 ● School name – Oikos University ● Shooter name – One L. Goh ● Arrested in a Safeway store following the shooting ● 7 people were killed and 3 were wounded
Noteworthy Details	<ul style="list-style-type: none"> ● Goh was believed to be schizophrenic ● Goh plead no-contest to all 10 counts of mass murder in a plea deal that helped him avoid the death penalty
Outcome(s)	<ul style="list-style-type: none"> ● Goh was declared mentally incompetent two weeks before his guilty plea and was committed for treatment

(Ruggiero, 2017, para. 1-9)

Incident 5 – Newtown, Connecticut

Overview	<ul style="list-style-type: none"> ● Year – 2012 ● School name – Sandy Hook Elementary School ● Shooter name – Adam Lanza ● Attack began around 9:30 AM and police entered minutes later around 9:35 AM ● 28 people were killed and 2 were wounded ● Shooter committed suicide prior to police arrival
Noteworthy Details	<ul style="list-style-type: none"> ● Lanza destroyed his computer hard drive making efforts to collect evidence difficult ● Lanza entered the school through a window and was confronted by administrators whom he fatally shot ● Staff attempted to barricade doors and protect children following a broadcast of a shooting underway ● Lanza killed his mother prior to the attack in the school and used her guns to carry out the shooting ● The attack was carefully planned ● The shooter was known to have prior mental health concerns and be on the autism spectrum
Outcome(s)	<ul style="list-style-type: none"> ● The school was demolished and replaced in 2014 (Collins, 2017, para. 13-14; Ray, 2018)

Incident 6 – Parkland, Florida

Overview	<ul style="list-style-type: none"> ● Year – 2018 ● School name – Marjorie Stoneman Douglas High School ● Shooter name – Nikolas Cruz ● Attack began around 2:30 PM in the afternoon and captured about an hour after the attack ● 17 people were killed and 14 were wounded ● Shooter was apprehended the same day
Noteworthy Details	<ul style="list-style-type: none"> ● Cruz had been expelled and the site of the attack was his former high school ● Cruz published videos on YouTube stating that he was going to be a school shooter ● Cruz was known to be reckless and people were aware that he led a challenging life ● Cruz concealed himself by fleeing the school along with other students ● Shooting occurred inside and outside the school
Outcome(s)	<ul style="list-style-type: none"> ● Cruz was charged with premeditated murder

	<ul style="list-style-type: none"> ● A nationwide outcry for better gun control followed the event (Chuck, Johnson, & Siemaszko, 2018)
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Incident 7 – Santa Fe, Texas

Overview	<ul style="list-style-type: none"> ● Year – 2018 ● School name – Santa Fe High School ● Shooter name – Dimitrios Pagourtzis ● Attack began ~ 7:45 AM ● 10 people were killed and 13 were wounded ● Shooter was arrested and charged with murder and aggravated assault
Noteworthy Details	<ul style="list-style-type: none"> ● Pagourtzis admitted his crimes after his arrest ● The shooter also had other bombs and weapons in his car ● Despite being known to be reserved, Pagourtzis wore a trench coat frequently and clothing that represented killing (posted on social media) along with communist, fascist, and religious symbols ● Pagourtzis avoided shooting students he liked ● Pagourtzis had been denied dates with a schoolmate after asking her out several times ● Pagourtzis was known to have suicidal ideations
Outcome(s)	<ul style="list-style-type: none"> ● Parents and security analysts called for an independent review of the mass shooting due to a lack of a reliable system for dealing with bullying ● An energy security consultant in the area claimed that people focus too much on response and not enough on prevention

(Jervis, 2018; Perez, Morris, & Ellis, 2018)