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Study 1: 630 Domestic-Terrorist, Mass-Murdering, Spree-Shooters Differ from 623 Controls and Study 2: 15 Domestic-Terrorist, Mass-Murdering, Spree-Shooters Differ From 23 Homicidal and 36 Controls on the Standard Predictor of Violence Potential and the MMPI-2/A: Implications Are to Use Computer Tests and Machine Learning Equations

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Abstract

Study 1: 630 spree-shooters [1936-2021] (1,650 deaths; 3,123 injuries; 194 suicides [31%]), 623 controls logistic regression differences (F= 260.44, df=10/1242, R=.82, R^2=.68, p<.01): (1) homicidal ideation; (2) planning-preparation; (3) stressful-life-event; (4) revenge-motive; (5) acquired-multiple-weapons; (6) elicited-concern; (7) school-location; (8) personal-grievance; (9) suicide; (10) current-student. Study 2: 15 spree-shooters differences, adult, teen: [SP] violence (F=17.48, 123.09); [MMPI-2/A] infrequency (F=92.15, 17.22); lie (F=13.13, 33.91); depression (F=37.76, 26.18); psychopathic-deviance (F=44.66, 57.45); paranoia (F=50.58, 23.92); schizophrenia (F=53.85, 21.69); alcohol (F=42.01, 16.84); addiction (F=57.34, 38.88) compared with 23 homicidal, 36 controls. Spree-shooter loss (1936-2021) = [$2,416,042,490 (630 @ $3,834,988.08) + $6,327,730,332 (1,650 @ $3,834,988.08) + $105,474,702.96 (3,123 @ $33,773.52) = $8,849,247,525.36] + [insurance, tax-increases $11,504,021,782.97 ($8,849,247,525.36 x 1.3] **=$20,353,269,308.33**. Projecting 2021 to 2105 insurance industry with no computer tests, machine learning equations, **$40,706,538,616.66**, 3,330 deaths, 6,246 injuries, 388 suicides. Projecting 2017 U.S. Church pedophilia loss (2012-2037, 2038-2056, 2057-2082, 2083-2107), $5,719,865,400 x 5 = **$28,599,327,000**, 5,679 x 5 = 28,395 victims.

Keywords: spree shooters, computer tests, machine learning equations, logistic regression differences, controls, homicidal, costs to insurance industry and U.S. Roman Catholic Church

Introduction

After verbally and physically threatening a teacher, 17-year-old Robert L. is jailed in a juvenile detention center for a month. Exhibiting good behavior and no confrontations, he is slated to be released from jail soon. The counselor has a nagging doubt, thinking, “There is something going on. But I don’t know what?” Following a computer personality test and machine learning equation for violence potential, what should the judge and the counselor do? Is Robert L. a spree-shooter or is he just another aggressive, impulsive adolescent? Daily, this is a question posed by thousands of offenders globally. This article will address the issue of spree-shooters and how to find them before the shooting occurs when high risk persons come to courts, hospitals, human resources and schools, by using computer tests and machine learning equations. Specifically, the reader will learn that regardless of when and where the violence-prone high risk person appears, computer tests and machine learning equations can intercept and divert the individual from costly domestic-terror, mass-murder, spree-shooting

Domestic-terrorists, mass-murderers, and spree-shooters plague every country. Little, vigorous, scientific evidence

exists regarding identifying these high risk youth and adults before fatalities occur. This study presents quasi-experimental design with controls, robust statistics, and strong research methods of many records, over different locations and times, to describe spree-shooters. Also, spree-shooters are compared with homicidal and controls on the Standard Predictor of Violence Potential and the Minnesota Multiphasic Personality Inventory Second and Adolescent Versions to show that not only are spree-shooters different from "normal" persons, but they vary from homicidal.Mass murder is a challenge that requires a practical solution to the thousands of lives and the tens of billions of U.S. dollars lost. The goal of this study is to show that there are a finite group of characteristics to find spree-shooters before they commit their expensive, horrendous crimes. Actuarial threat assessment exists for a century (Warner, 1923; Burgess, 1928). This objective, reliable, sensitive, specific, valid threat assessment approach improves on the most commonly used current approaches **(**interviews and professional judgment**)** that are biased and error filled. Knowing the individual is at high risk, interventions, like jobs, anger management, and mentoring, medications, therapy, or incarceration, are options and computer tests and machine learning improve on current threat assessment significantly.

Humans Believe That Judgment is Superior to Statistical Decision Making

Humans believe judgment is superior to statistical decision-making, yet repeatedly human decisions miss the mark. Horrendous events are the end result of human error. In some extreme cases thousands of families are impacted. Homicide, mass-murder, overdosing, sex-offending, and suicide arise from a complex set of characteristics and events that no human mind, even a genius can possibly manage empirically. Calculating the cumulative interactions that arise from the complex set of characteristics and circumstances or situations, no human, can manage empirically. The millions of possibilities are beyond human mental capacity. Only computer tests and machine learning equations combine the characteristics, the circumstances, the situations and simultaneously compare the individual against millions in data bases to discover the high-risk person and prevent loss of life and expense.

Study Outline

First, there is a brief review of actuarial assessment with computer tests and machine learning equations. Second, there is a short assessment of the validity of current methods that are now used by the military, police and professionals. Third, there is a limited discussion of why these current methods are inadequate [background checks (25% sensitive-specific), interviews or judgment (46% accurate), medical exams (49% precise), paper-and-pencil, psychological exams (75% correct), combined (39% reliable, valid)] need to be augmented with and in some cases replaced by a more empirically validated, objective, reliable, sensitive, and specific approaches of computer tests and machine learning equations that offer an improvement of 97%. Fourth, there is a concise review of behavioral economics, which is consistent with concrete, experimental evidence half a century that humans need equations to enhance decision-making. In the Economics Nobel Laureate Kahneman (2011) winning book on human decision making, there are conflicts between the thinking fast (instinctual, reflexive mind), versus the thinking slow (logical thought processes). It is this latter approach that finds high risk persons. Fifth, there is a short synopsis of spree-shooters, focusing on machine learning equations and computer testing findings. Spree-shooters have the following characteristics namely being deceptive, depressed, suicidal, psychopathic, paranoid, schizophrenic, alcoholic-substance abusing, and violent. Sixth, there is a concise discussion of practical solutions to pre-identify violence-prone, potential spree-shooter persons by establishing new insurance procedures at the emergency room and hospital, the special education school departments, the court, jail and prison intake, college counseling centers, and human resource employee assistance programs, where the violence-prone person typically comes before the fatal spree-shooting multiple times.

Machine Learning Equations and Computer Tests

For more than a century, return-to-court offending with a machine learning equation has been predicted by tracking criminals over time. Then one compares the recidivists to those who reformed to have a machine learning equation (Warner, 1923; Burgess, 1928, 1929a, 1929b, 1936). Daily, worldwide, dozens of probation-parole tests are used, because these are based on actuarial data [of at least 184,483 female and male, adolescent and adult, prisoners from three-continents, five-countries, and dozens of provinces, and states tracked for ten-years after release from jail] (Zagar, Busch, Grove, and Hughes, 2009). These machine learning equation based assessments have excellent psychometric qualities including empirical validation, objectivity, reliability, sensitivity, and specificity. Machine learning equations prevent violence at a much higher rate than clinical judgment (Grove and Meehl, 1996; Quinsey, Harris, Rice, and Cormier, 2006; Monahan, 2006; Harris, Rice, and Quinsey, 2007). For years, machine learning equations, regardless of location used, are consistently more precise. Accuracy is stated in terms of sensitivity and specificity: the power to identify positives, while simultaneously avoiding negatives, respectively.

There are two basic approaches to assessment of the risk of violent offending: one, clinical judgment and two, actuarial prediction which encompasses computer tests and machine learning equations. Clinical judgment relies on the subjective impression of experienced decision-makers. This is the most common way to find risk. In summary, across

assessors, clinical judgment is less accurate than chance. Risk factors vary from case to case, and are combined intuitively to generate an opinion about the probability of violence. In contrast, an empirically tested, valid, actuarial tool is both accurate and precise, meaning that on the average, it gives correct predictions, for both the group and the individual. If clinical judgment is based only on experience, results often in over-identifying or under-identifying the dangerous persons. Gladwell (2019) shows that New York judges are more biased and error prone than a machine learning equation in determining, who will fail to return to court after posting bail (Kleinberg, Lakkaraju, Leskovec, Ludwig, and Mullainathan (2018). Also, parents and teachers cannot tell, when children are intentionally lying, or are misinformed (Shao and Ceci; 2001). Yet, most continue to assert faith in their ability to make these human decision based determinations, despite being confronted with the bias and error in human decision-making.

Current Methods 39% vs. 97% Accuracy of Machine Learning Equations and Computer Tests

Monahan (1996) showed that psychiatrists and psychologists are 30% accurate in predictions of violence among hospital patients. Clinicians are 39% precise in rating pretrial violent defendants (Sepejak, 1983). Lidz (1993) proved that clinicians correctly predicted post discharge violence among 53% of violent and 64% of the "safe" patients. In contrast, the better option, machine learning equations combine the risk scores and provide better results: to yield an objective estimate of potential violence, and improve these percentages to 97% (Meehl, 1954; Underwood, 1979; Meehl, 1986; Zagar, Kovach, Basile, Hughes, Grove, *et al.*, 2013).

In 128 of 136 empirical, scientific studies comparing clinical judgment versus actuarial assessment, Grove and Meehl (1996) demonstrated the superiority of statistical decision-making with computer tests and machine learning equations. In two hundred studies, contrasting human judgment with actuarial assessment, Kahneman (2011) established a 60% significantly better accuracy and precision with machine learning equations (Hoffman, Slovic, and Rorer, (1968), Dawes, (1979), Stanteau (1988). Other comparisons are a tie, but because computer tests and machine learning equations are less expensive, equality is a win (Zagar, Zagar, Arbit, Bartikowski, and Busch, 2009; Zagar and Grove, 2010; Kahneman, 2011; Zagar, Kovach, Basile, Grove, Hughes, Busch, *et al.*, 2013; Zagar, Zagar, Busch, Garbarino, Ferrari, *et al*., 2016).

Why Is Human-Judgment and Decision-Making 46%Accurate?

Pope, Butcher and Seelan (2006) demonstrated that on a personality test, the Minnesota Multiphasic Personality Inventory Second and Adolescent Editions (MMPI-2/A), there are seven reliable, valid measures of deceptive self-presentation. These include infrequency, lying, defensiveness, faking-at-the-back-of-the-test, true-or false-inconsistency, and superlative-self-presentation. If one takes these seven scales, deceptive self-presentations into a Poisson's distribution (7 x 6 x 5 x 4 x 3 x 2) = 40,300 ways to deceive in assessing dangerousness. This compounds the issue of differentiating among the 1,000 different neurological and psychiatric illnesses (International Classification of Diseases Tenth Edition, World Health Organization, 2013 and Diagnostic Statistical Manual Fifth Edition, American Psychiatric Association, 2013). So, multiply 40,300 x 1,000 = 40,300,000 different neurological, psychiatric, deceptive self-presentations. No human being can match a computer test and machine learning equation in comparing an individual client against millions of persons in data bases and recall tens of millions of equations simultaneously (Siegel, 2016; Zagar, Zagar, Busch, Garbarino, Ferrari, *et al*., 2016; Zagar, Varela, Busch, Garbarino, Zagar, Kovach, *et al.*, 2019).

A Century Old "7-Point Violence Profile" on Probation-Parole Tests and the MMPI-2 and MMPI-A

Among 320,051 persons tested over 95 years, within 210 studies, there is a "seven-point violence profile" (Zagar, Varela, Busch, Garbarino, Zagar, Kovach, *et al.*, 2019). This "seven-point violence profile" includes measures of (1) violence potential, (2) deception (infrequency or lie), (3) depression, (4) psychopathic-deviance, (5) paranoia, (6) schizophrenia, and (7) alcoholism-addiction. In order to discover whether a person is of violence-prone, high risk individual, one must use a machine learning equation such as the Standard Predictor of Violence Potential with 98 items for adults and 116 items for youth. This should be followed up with a computer test, the MMPI-2 with 567 items for adults, or the MMPI-A with 468 items for teens to measure deception and psychopathology and psychopathic deviance. With a machine learning equation and the computer test, one will know whether a person has the "seven-point violence profile." The computer generates a one page report with the probability of violence potential. Also, the computer produces a ten to thirty page report of concrete information about the person's probability outcome, namely symptomatic patterns, interpersonal relations, diagnoses, and treatment considerations. If there is a "seven-point violence profile," the individual is at high risk for homicide, domestic-terrorism-mass-murder-spree-shooting, overdose-substance-abuse, sex-offense, and suicide-completion (Zagar, Zagar, Busch, Garbarino, Ferrari, Hughes, *et al.*, 2016). The "seven-point violence profile" was cross-validated on 136 female and male, adolescent, adult, controls, homicidal, overdosing, sex-offending, and suicidal-completers (Zagar, Varela, Busch, Garbarino, Zagar, Kovach, *et al*., 2019; Butcher, 1996; Butcher, Ellertsen, Bubb, Lucio, Lim, J. *et al.*, 2000; Pope, Butcher and Seelan, 2006).

Behavioral Economic Studies Showing Computer Tests, Equations Are Better than Judgment

Human decision-making regarding dangerousness is fraught with bias and error. In contrast, organizations are reasonable in using checklists, encouraging each other to watch out for the minefields of dangerousness, and slower thinking. When computer tests and machine learning equations are used within an organization, risky prospects are described in terms of outcomes and outcome probabilities. The barrier to entry of computer reports and machine learning equations is loss aversion, which favors stability and the status quo, rather than change, which is why the numbers of victims and expenses continue rising in a gradually ascending curve. The fundamental challenge is that humans cannot accept the simple fact that sensitively and specifically, a computer test and a machine learning equation is often used to calculate violence potential probability better than a person can. Regardless of whether the equation is ciphering Bordeaux wine investment, building integrity, car engineering, medical illness, or mortgage risk, an algorithm is better than the human judgment bias and error (Kahnemann, 2011). Kahneman (2011) elaborates the challenges of decision-making that include framing, illusory correlation and validity, loss aversion, misconceptions of deviance, reality and regression to the mean, using limited data, and utility theory. These are the reasons why computer tests and machine learning equations improve prediction and prevention of dangerousness, and provide a way to lower the loss in lives and money.

Spree-Shooters Have Health, Mental Health and Personal Challenges

Many think that severely mentally ill people are harmless. Anthropological research is consistent with the fact that 70% of American psychotic auditory hallucinations urge violence against others. In contrast within India, only 20% and within Ghana only 10% of psychotic hallucinations urge violence (Luhrmann, Padmavati, Tharoor, and Osei, 2015). Some persons with serious mental health challenges commit homicides. From 2000 to 2013, the Federal Bureau of Investigation (FBI) investigated 160 active-shooters. An active-shooter is a person killing or attempting to murder people in a confined, populated area. In contrast, mass-murderers have at least four victims (Blair and Schweit, 2014). Among 39 domestic-terrorist events, there were 117 deaths, with 40% suicides and mental health issues in 56-66% of the active-shooters (Foxx and Levin, 2011). Data from the same time period of 2000 to 2013 are consistent with active shooters having psychiatric challenges (Blair and Schweit, 2014) that result in 1,046 deaths (FBI, 2012). Over 50 years, Hempel, Meloy and Richards (1999) studied 30 mass killings, showing that 66% of the perpetrators were psychotic. In looking at active-shooters from 1982 to 2012, Follman, Aronsen, and Pan (2012) concluded that 61% are psychiatrically ill.

The estimates of psychiatric illness prevalence among mass-murderers ranged from 50-66%, with an average (*M*) of 59% (Welch and Hoyer, 2013; FBI, 2014). In an analysis of 64 mass-murderers with 381 victims, Meloy and Felthaus (2004) reached several conclusions: (a) that family members are often the first victims; (b) that firearms increase the emotional distance and the killing efficiency; and (c) that spree-shooters know their victims and often commit suicide after the killing. Meloy, Hempel, Mohandie, Shiva, and Gray (2001) confirmed that there is often a diagnosis of psychosis among mass-murderers. Fein, Vossekuil, and Holden (1995), Fein and Vossekuil (1998, 1999), and Borum, Fein, and Vossekuil (1999) pioneered mass-murder threat assessment of instantaneous killing at a distance, characterizing spree-shooters as murdering after abusing alcohol and substances; being bullied, and leaking intent.

In the mental health risk pattern, serial murderers are similar to mass-murderers. Their essential difference is that with monetary or sexual gain motivation, serial killers focus on vulnerable victims, often women. In contrast, mass-murderers concentrate on instantaneous killing at a distance (Culhane, Hildebrand, Walker, and Gray, 2014). Culhane, Walker, and Hildebrand (2017) found that 61 male serial murderers have a significantly ($p < .01$) higher scores on the Minnesota Multiphasic Personality Inventory Second Edition, namely, deception, depression, psychopathic-deviance, paranoia, schizophrenia, alcohol-addiction, and the potential for violence, consonant with the "seven-point violence profile." Regardless of whether the person is tested before or after killing, these static demographic characteristics are present. Hanlon, Brook, Stratton, Jensen and Rubin (2013) studied 77 mass and serial killers with these discriminators: 92% completed their high school education; 86% had a head injury; 84% had alcohol-substance abuse; 56% had a personality disorder; many had prior arrests (60% criminal, 37% delinquent); 47% were diagnosed with psychosis; 43% had a learning disorder; 42% had a developmental delay; and 36% had a history of physical and sexual abuse. The bottom-line is that mass-murderers are undiagnosed persons sophisticated in hiding their illnesses, who don't want to be discovered, diagnosed, and treated, who exploit the weakness in human-decision making bias and error, to avenge some imaginary revenge motive with a personal grievance, elicit concern of others, experience a stressful life event, and with planning and preparation, access multiple weapon(s) and target a school or workplace co-student or co-worker and staff.

A Solution to the Costs of Violence: Computer Tests and Machine Learning Equations

What follows is an example of how a corporation or system can change when confronted with the reality that violence

can lead to bankruptcy. In May of 2015, the Jesuit Education Secretary globally for 200 universities took a scientific paper (Zagar, Zagar, Busch, Garbarino, Ferrari, *et al*., 2016) to the Pope and the Jesuit Superior General. In this paper was the startling fact that U.S. Roman Catholic pedophile settlements will bankrupt the Church by 2141 (currently $2,486,898,000 payments averaging $437,921 US dollars for 5,679 victims [BishopAccountability.org, 2021]. In December, 2018, the Pope, the Jesuit Superior General in Rome, and Chicago and Boston cardinals (Zagar, 2018) received the seven-point violence profile study (Zagar**,** Varela, Busch, Garbarino, Zagar, Kovach, *et al*., 2019) with 4,000 pages of 136 case studies (controls, homicidal, overdosing, sex-offending, suicidal-completers) using a computer test and machine learning equation in English, French, Italian, Polish, and Spanish with power-points. In February 2019, 179 prelates and the Pope met on protecting minors. In March of 2019 the Pope communicated to the *Washington Post*, that the church uses psychological testing to prevent pedophilia (Zauzmer, 2019).

On June 1, 2021, Pope Francis with the Pontifical Commission for the Protection of Minors forbids clerical and lay religious organizational leader's sex-offending (Poggioli, 2021). The new Catholic Church canonical law involves 80 articles on crime and punishment (offenses against life, dignity and liberty), part of a seven-book codes of 1,750 articles (Harlan, 2021). This new law that took effect 1 January 2022 expands the definitions of violence-prone sexual predatory behavior to include pedophilia, rape, and child pornography possession (Glatz, 2021). The Pope's goal is to reduce the canonical court judge's discretionary penalties, in order to avoid bankruptcy with pedophile settlements, the steady loss of church goers, and lower donations (Vatican Press, 2021; Wooden, 2021). This example illustrates that communicating concrete information, educating leadership in the economic and the human expenses, and the scientific demonstration that violence-prone persons can be discovered with computer tests and machine learning equations, can lead to administrative and legal changes that can be put into place to save lives and money. Insurance executives are coming to realize the value of using empirically based equations is cost effective and lifesaving in emergency rooms, psychiatric hospital admission, special education school departments, college counseling offices, court, jail, prison intake, and human resource employee assistance programs, health insurance mental health and violence referral process to use actuarial assessment. The end goal is to prevent dangerous behavior, save lives, health costs, and disability, errors-and-omissions, health, liability, life, personal-injury, and workers-compensation expense.

Null hypotheses

In study 1, the null hypothesis is that there is no significant difference between spree-shooters and controls. The alternative hypothesis is that there are differences. In study 2 the null hypothesis is that there are no significant differences in deception (lying, faking), depression, psychopathic-deviance, paranoia, schizophrenia, alcoholism-addiction and violence ["seven-point violence profile" (Zagar**,** Varela, Busch, Garbarino, Zagar, Kovach, *et al*., 2019) when the spree-shooters are compared with homicidal and control adults and adolescents as measured with the Minnesota Multiphasic Personality Inventory Second Edition (MMPI-2) and Adolescent Version (MMPI-A) and the Standard Predictor of Violence Potential. The second alternative hypothesis is that there are differences among spree-shooters, homicidal and controls. In fact, the spree-shooters have more deception, psychopathology, psychopathic-deviance and a greater potential for violence.

Method Definitions

"Domestic-terrorist, mass-murdering, spree-shooters" is a broad group in comparison with "active-shooters." The U.S. Departments of Education, Federal Emergency Management, Justice, and Homeland Security, the F.B.I and the White House definition of an "active-shooter is "an individual actively engaging in killing or attempting to kill people in a confined, populated area." In this study the expanded definition of "spree-shooter" is "an individual, or team of individuals with a common and/or specific operational purpose, indulging their pre-meditated or spontaneous desire(s) to either plan or attempt to kill people, using any device, equipment, tool or weapon, in a confined, populated space, regardless of success or failure.

Statistics

The spree-shooter characteristics are presented in raw numbers and percentages. Statistics include chi-squares (X^2), independent-sample, two-tailed, *t*-tests, one-way analysis of variance (*ANOVA*), degrees of freedom (*df*), and logistic regressions. X^2 goodness of fit test determines if sample data matches a population. X^2 test for independence compares two variables in a contingency table to see if they are related. A *t*-test and one-way *ANOVA* is an inferential statistic to determine if there is a significant difference between the means of two groups. These parametric tests compare the dependent variables and the characteristics. Assumptions of normality and homogeneity of data are met for *t*-tests and *ANOVA* (Bock, 1975). The independent variable is group, spree-shooters or controls. Logistic regression is a statistical model that in its basic form uses a logistic function to model a binary dependent variable, although many more complex extensions exist. In regression analysis, logistic regression (or logit regression) is estimating the parameters of a logistic model (a form of binary regression).

Study 1: Sample Selection Spree-shooter Records: General Notes on Measures

Thirteen investigators assessed spree-shooter characteristics in medical, police, press, school, and work open source records from 1936 to April 15, 2021. The nine categories of characteristics are: (1) demographics; (2) health; (3) mental health; (4) education; (5) employment; (6) warning signs; (7) abuse and criminal history; (8) crime scene; and (9) crime method. *Demographic*s include: (1) age; (2) gender; (3) ethnicity/race; (4) family situation or living dynamics; and (5) social interactions and observations. *Health* contains: (1) medical history; (2) stressful life events; (3) substance abuse; (4) prescribed medication; and (5) prescribed medication types. *Mental health* is: (1) concerns and symptoms; (2) disorders; (3) treatment history; and (4) alleged, known, or suspected behaviors, experiences and/or performance within a professional setting. *Education* comprises: (1) degree or training specialization; (2) highest level of schooling completed; (3) behavior and performance in an academic setting; and (4) types of program or schooling attending or enrolling in. *Employment* consists of: (1) alleged, known, suspected behaviors, experiences and/or performance in a professional setting; (2) military service; and (3) vocational classification. *Warning signs* cover: (1) beliefs; (2) interests and fantasy; (3) cyber behaviors; (4) conflict indicators; and (5) operational behaviors. *Abuse and criminal history* incorporate: (1) experienced or witnessed abuse during childhood: (2) perpetrated abuse during childhood: (3) experienced or witnessed abuse during adulthood; (4) perpetrated abuse during adulthood; (5) the police interactions initiated by; (6) military misconduct; and (6) criminal misconduct. *Crime scene* has: (1) attacker's relationship to individual (intended if foiled); (2) attacker's relationship to institution (intended if foiled); (3) attack location; (4) motive; (5) number of attackers; (6) outcome of attack; (7) type of attack; (8) characteristics of selected victim; (9) victim demographics (deceased victims only); (10) victim's institution (intended if foiled); and (11) threatened one or more targeted or actual victims. *Crime method* constitute: (1) body armor and/or accessories; (2) chemicals, electronic weapons; (3) specialized weapon; (4) explosive material or detonator; (5) origin point of explosive; (6) firearm; (7) tactical equipment; (8) tactical training; (9) tactical response and situational analysis; (10) weaponized platforms; and (11) weapons. Within these nine categories and fifty-four subcategories are 650 items that make up the characteristics of spree-shooters and controls.

Follow-up or Error Control

Where possible only official documents were used that are all open source. This means that there is much data on many killers and minimal data on others. In this study, intra-coder reliability is done to undertake a continuous coding and recoding process, as well as a repeated analysis of data. Two investigators code small subsets of data. This ensures reliability over time and minimizes threats, including fatigue and stress impacting human error. Inter-coder reliability is acceptable, ensuring the validity of the information. Domestic data mimics foreign terrorist threat assessment, resulting in lowering serious, mass military deaths and injuries. These military approaches are now helping police proactively identify national threats before they occur.

Control Sample Selection

Controls are 623 survey monkey responders who anonymously answered questions online in February and March 2021 during the virus pandemic. Questions are the same 650 items that the thirteen analysts used in reviewing spree-shooter open source records (excluding some crime method and crime scene). Many of the controls are gun owners or former military and police.

Comparison of the United States Population and Controls

The U.S. population (U.S. Census Bureau, 2019) is compared with 623 controls on age, gender, ethnicity/race to show that they are similar. The U.S. population and the controls differ on age and gender, but not on ethnicity and race. See Table 1.

Table 1. U.S. Population (2019) and Spree-shooter Controls: % with X^2 * p<.01 significance

Gender	U.S Population	Controls	X^2
Female	51%	24%	15.52*df=1
Male	49	76	
Age: Birth – 17 years	24	4	22.15*df=4
18-24 years	9	22	
25-35 years	27	28	
36-50 years	21	31	
51+ years	19	15	
Ethnicity / Race: African American	13	16	5.86, df=6
Asian	5	13	
Caucasian	60	56	
Hispanic-American	18	12	
Middle Eastern	1	1	
Native American	1	2	
Native Hawaiian	2	1	

Sample Selection

There is the U.S. population from 1936-2021 population estimates from 2019 (N=308,745,538), and from this population, 630 domestic-terrorist, mass-murdering, spree-shooters records are collected and reviewed. Data for spree-shooters come from medical, police, press, school, and work records. There are two subgroups of spree-shooters, 232 school-shooters and 370 workplace shooters. School-shooters kill in alternative, elementary, high, home, private, religious, religious-based, special education, trade and technical schools, colleges, and universities. Workplace-shooters murder in government, manufacturing, production, or distribution (closed to the public), military base or facility, profession office excluding medical, religious institution, restaurant, retail or other commercial (open to the public), and other locations. Data for 623 survey monkey respondents match on ethnicity and race, but closely match shooters on age and gender. The same 650 items were collected on survey monkey respondents except for crime method and scene. See Figure 1.

Demographics of Spree-Shooters and Controls

Demographics of 630 spree-shooters and 623 controls are, gender, 32 females (5%) vs. 152 (24%), 598 males (95%) vs. 471 (76%), age, birth – 12 years, 6 (1%) vs. 13-17 years, 138 (22%) vs. 19 (3%), 18-24 years, 123 (20%) vs. 139 (22%), 25-35 years, 131(21%) vs. 173 (28%), 36-50 years, 154 (24%) vs. 195 (31%), 51+ years, 7 (12%) vs. 91 (15%), ethnicity / race, African-American, 98 (16%) vs. 97 (16%), Asian, 32 (5%) vs. 81 (13%), Caucasian, 213 (34%) vs. 347 (56%), Hispanic-American, 34 (5%) vs. 74 (12%), Middle Eastern, 23 (4%) vs. 8 (1%), Native American, 6 (1%) vs. 15 (2%), Native Hawaiian, 2 vs. 1, unknown, 222 (35%) vs. 0.

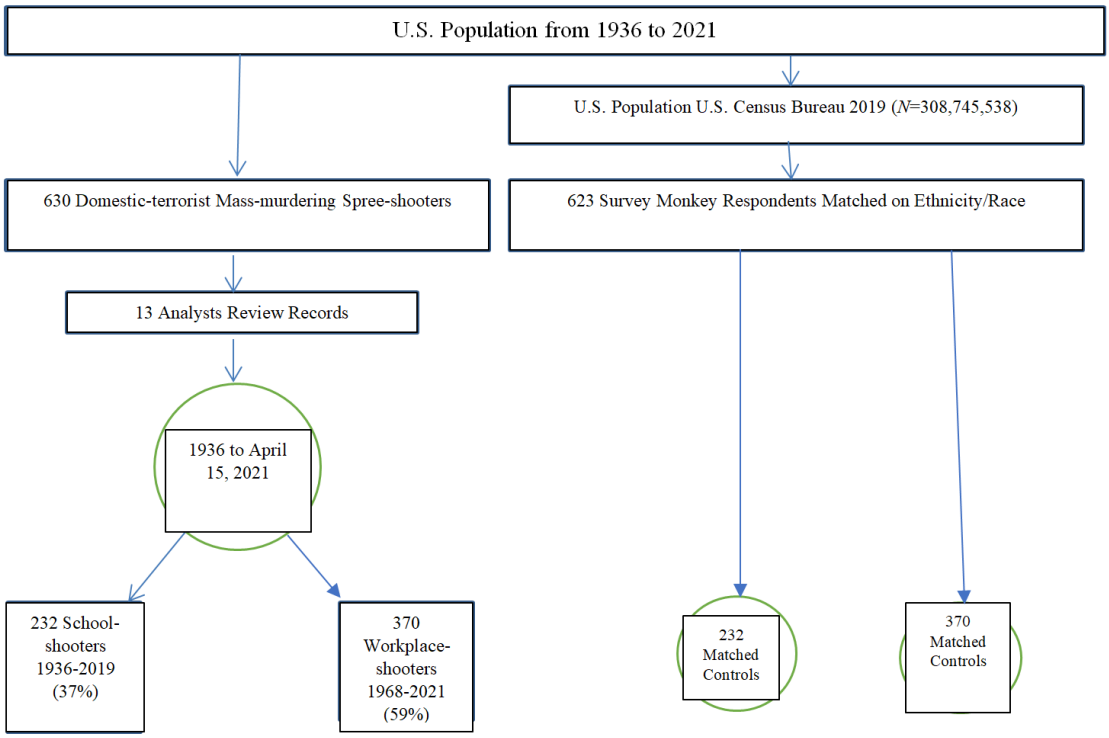

Figure 1. Sample selection of Spree-shooters

States in Which 630 Spree-Shooters Have Left Dead and Injured (1936-2021)

Figure 2 has the states in which the 630 spree-shooters killed from 1936 to April 15, 2021. California, Colorado, Florida, and Texas have the most spree-shooters. Note that more populated states have five or more spree-shooters. The most populated states have ten or more domestic-terrorists. States are listed with the number of spree-shooters. There is Alabama (13), Arizona (11), Arkansas (8), California (87), Colorado (25), Florida (46), Georgia (12), Illinois (16), Indiana (9), Kansas (8), Kentucky (8), Louisiana (14), Maryland (11), Massachusetts (9), Michigan (12), Minnesota (6), Mississippi (9), Missouri (11), Nebraska (5), Nevada (12), New Jersey (15), New Mexico (9), New York (31), North Carolina (12), Ohio (22), Oregon (10), Pennsylvania (27), South Carolina (13), Tennessee (20), Texas (39), Virginia (18), Washington (23), and Wisconsin (15).

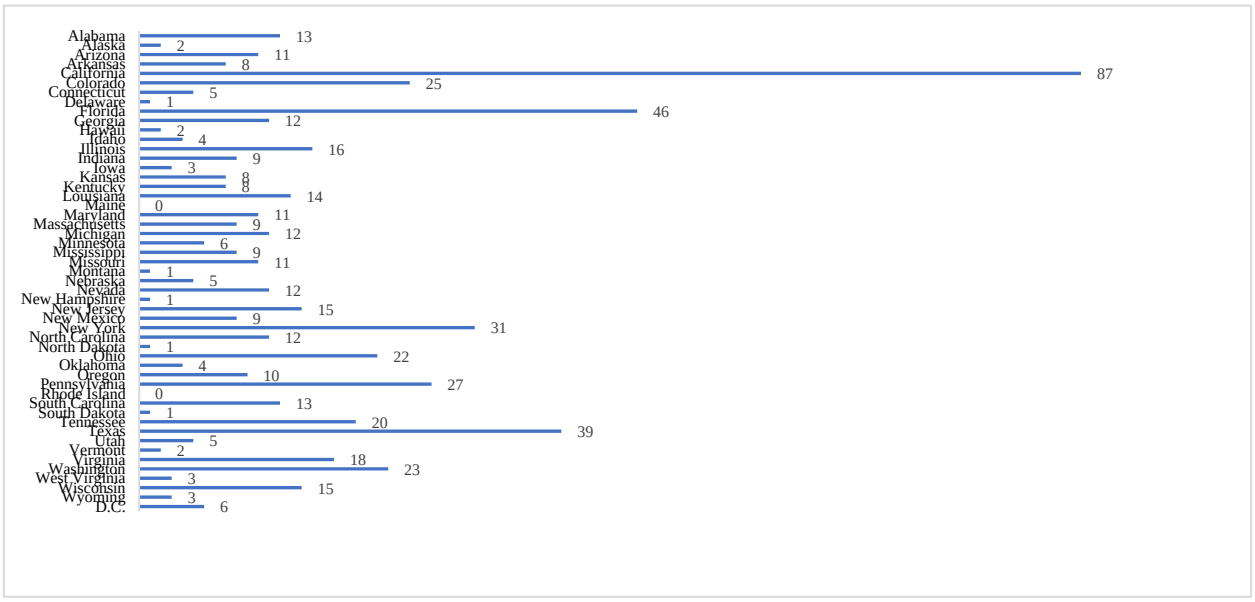

Figure 2. 630 Spree-shooters in Each American State from 1936 to April 15, 2021

Annual Number of Spree-Shooters from 1936-2021

In Figure 3, there is the cumulative (1936-2021) yearly number of spree-shooters. There is an upward opening parabola third degree curve (adding an x^3 term to a parabolic model) of the cumulative number of spree-shooters. In Table 2 is the annual number of spree-shooters (1936-2021) totaling 630.

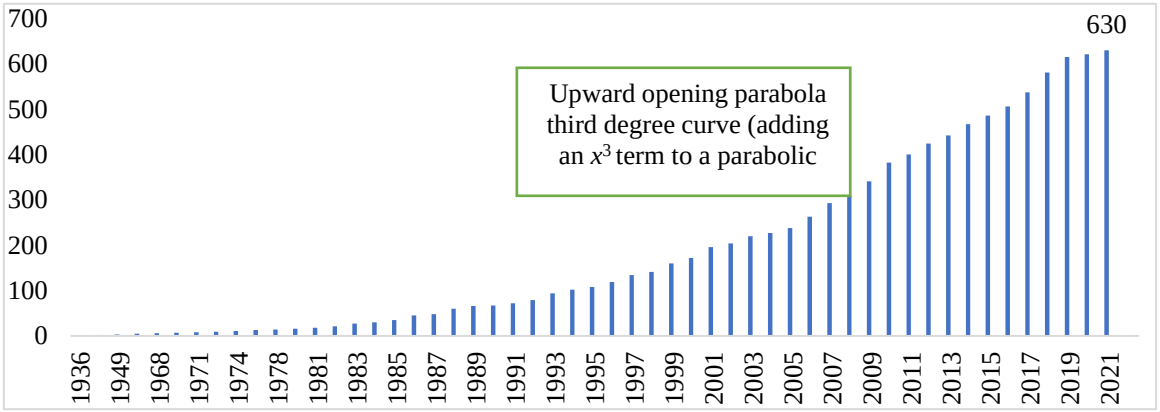

Figure 3. Annual Number of Spree-Shooters from 1936 to 2021

Table 2. Annual number of spree-shooters from 1936-2021

Year	Frequency	Percent	Cumulative Percent
1936	1	0.2	0.2
1940	1	0.2	0.3
1949	1	0.2	0.5
1966	2	0.3	0.8
1968	1	0.2	1
1970	1	0.2	1.1
1971	1	0.2	1.3
1973	1	0.2	1.4
1974	2	0.3	1.7
1976	2	0.3	2.1
1978	1	0.2	2.20
1979	2	0.3	2.5
1981	2	0.3	2.9
1982	3	0.5	3.3
1983	6	1	4.3
1984	3	0.5	4.8
1985	5	0.8	5.6
1986	10	1.6	7.1
1987	3	0.5	7.6
1988	12	1.9	9.5
1989	6	1	10.5
1990	1	0.2	10.6
1991	5	0.8	11.4
1992	7	1.1	12.5
1993	15	2.4	14.9
1994	8	1.3	16.2
1995	6	1	17.1
1996	11	1.7	18.9
1997	15	2.4	21.3
1998	7	1.1	22.4
1999	19	3	25.4
2000	12	1.9	27.3
2001	24	3.8	31.1

2002	8	1.3	32.4
2003	16	2.5	34.9
2004	7	1.1	36
2005	11	1.7	37.8
2006	25	4	41.7
2007	30	4.8	46.5
2008	16	2.5	49
2009	32	5.1	54.1
2010	41	6.5	60.6
2011	18	2.9	63.5
2012	24	3.8	67.3
2013	18	2.9	70.2
2014	25	4	74.1
2015	19	3	77.1
2016	20	3.2	80.3
2017	31	4.9	85.2
2018	44	7	92.2
2019	34	5.4	97.6
2020	6	1	98.6
2021	9	1.4	100
Total	630	100	

Annual Deaths from Spree-Shooters (1936-2021)

In Figure 4, there are the numbers of yearly spree-shooter deaths. These are rising similar to the number of spree-shooters in an upward curve. The reasons for this growth include the surge of single parent families in the 1970s (PEW Research Center, 2015), the growing deinstitutionalization of psychiatric patients in the 1980s, the rising numbers of incarcerated mentally ill starting in 1980 and spiraling in the 1990s and now (Figure 20, Zagar, et al, 2016). There is also less access to mental health service due to federal and state budget cuts beginning in the 1950s and insurance company limits (Higgins, 2017; National Council of Mental Well Being, 2018). Over the 86 years, the total number of deaths is 1,650.

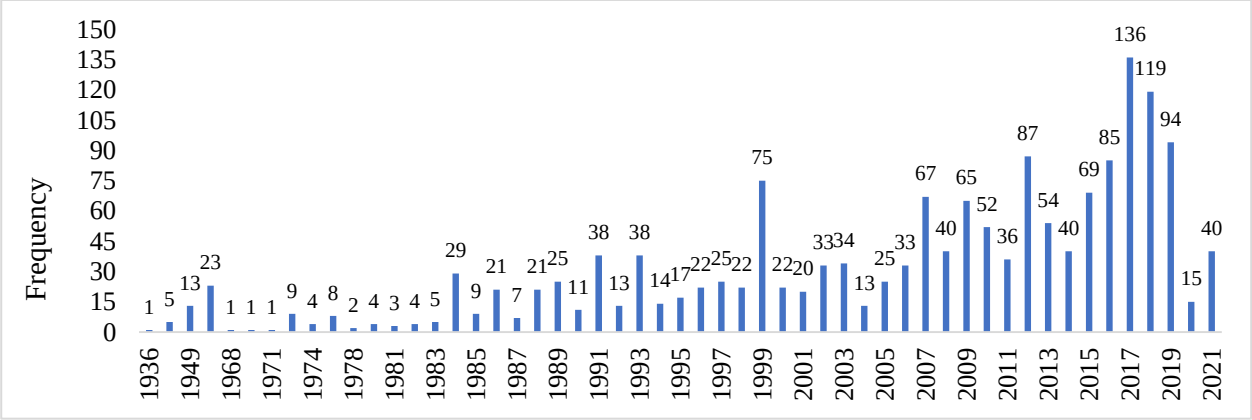

Figure 4. Annual Deaths from Spree-shooters (1936-2021)

Cumulative (1936-2021) Cost of 630 Spree-shooters (@ One Homicide = $3,834,988.08)

In Figure 5, there is the cumulative cost of 630 spree-shooters, using an economist's estimate of total losses $2,905,294 in 2006 U.S. dollars (Miller, Cohen, and Wiersma, 1996; Zagar, Zagar, Bartikowski, and Busch, 2009) x 1.32 or 132% (Consumer Price Index Calculator, May 20, 2021, 15-years inflation) = $3,834,988.08 [2021 US dollars]. This is then multiplied times the number of spree-shooters for each year. There is the combined cumulative cost from 1936 to April 15, 2021 is $2,416,042,490.40. The costs are projected forward as if computer tests and machine learning equations are not used to stop the rise in spree-shooters, namely $4,832,084,980.80.

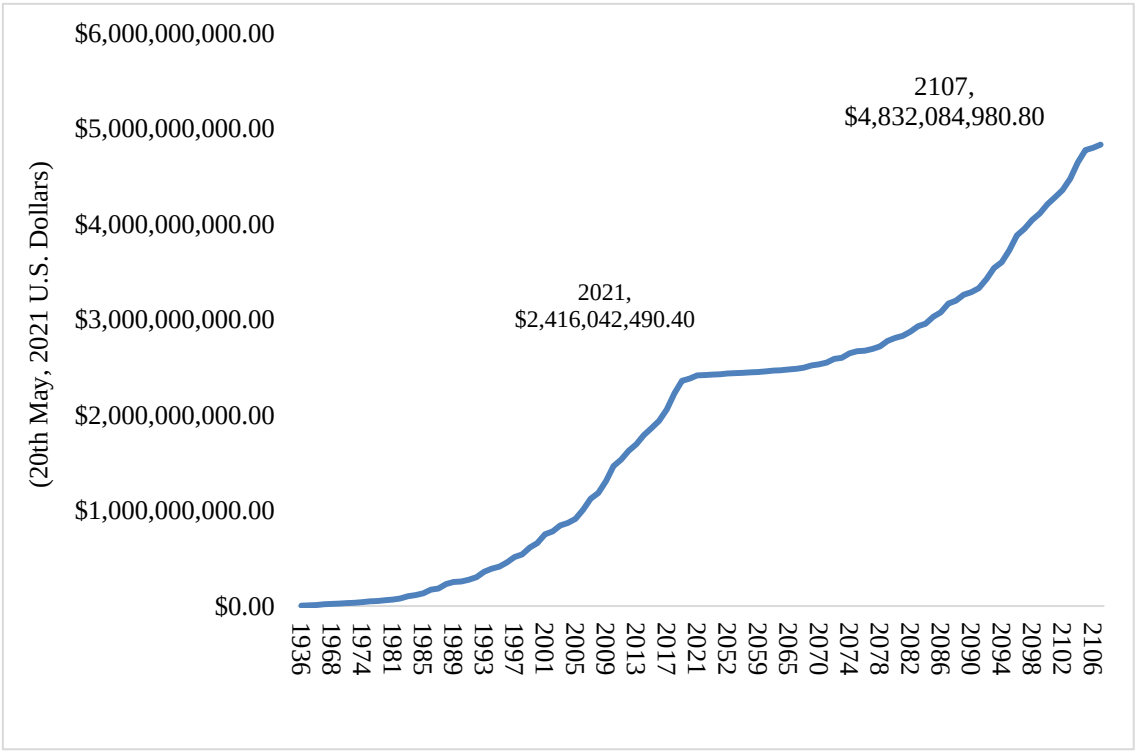

Figure 5. Cumulative (1936-2021) Cost of 630 Spree-shooters @ $3,834,988.08

Cumulative (1936-2021) Cost of 630 Spree-shooter's 1,650 Deaths

In Figure 6, there is the cost per homicide ($3,834,988.08) times each year's number of spree-shooter's dead from 1936 to April 15, 2021 or 1,650 dead x $3,834,988.08 = $6,327,730,332.00. This is projected to 2107 with no use of computer tests and machine learning equations to stop the increase in spree-shooter dead to be $12,655,460,664.00.

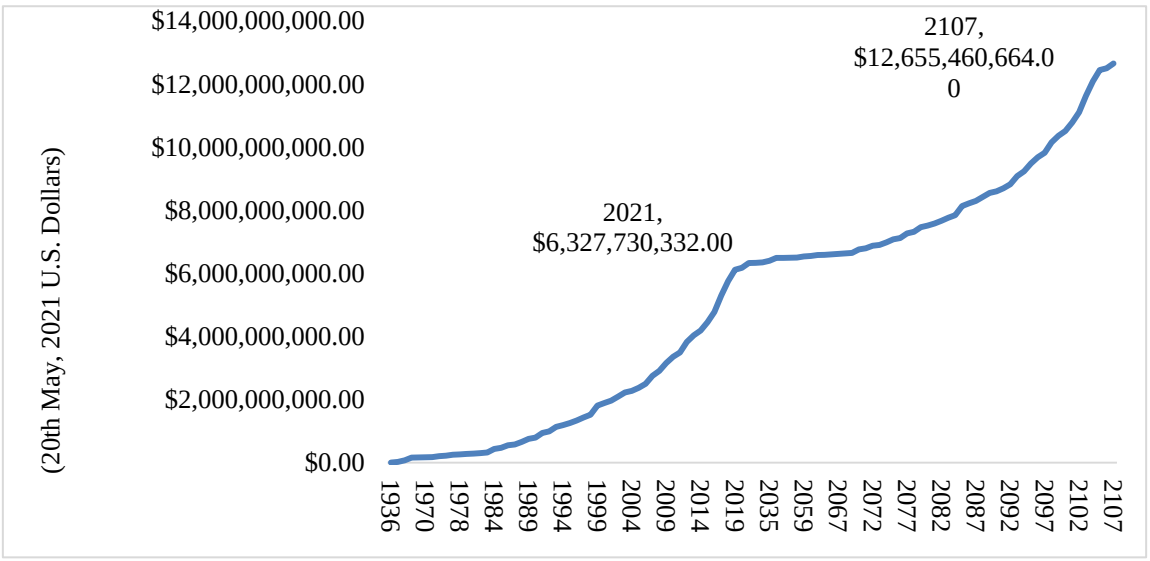

Figure 6. Cumulative (1936-2021) Cost of 630 Spree-shooter's 1,650 Dead @ 3,834,988.08

Cumulative (1936-2021) Cost of 630 Spree-Shooter 3,123 Injured

In Figure 7, there is the cost per assault with injury or $25,440 in 2006 US dollars (modified from Miller, Cohen, and Wiersma, 1996; Table 4, Zagar, Zagar, Bartikowski, and Busch (2009) times 132% (Consumer Price Index Calculator, 2021, May 20) 1.32 (15 year's inflation) = $33,773.52. The combined cumulative cost, 3,123 times $33,773.52 = $105,474,702.96. This is a reasonable number because a Nevada court mediated $800,000,000 in the MGM Hotel 2019 settlement for 4,400 victims (57 deaths, 4,343 injured) of the Vegas Strip massacre. This cumulative cost is then projected to 2107 with no use of computer tests and machine learning equations to stop the increase in spree-shooter injured to be

$210,949,405.92.

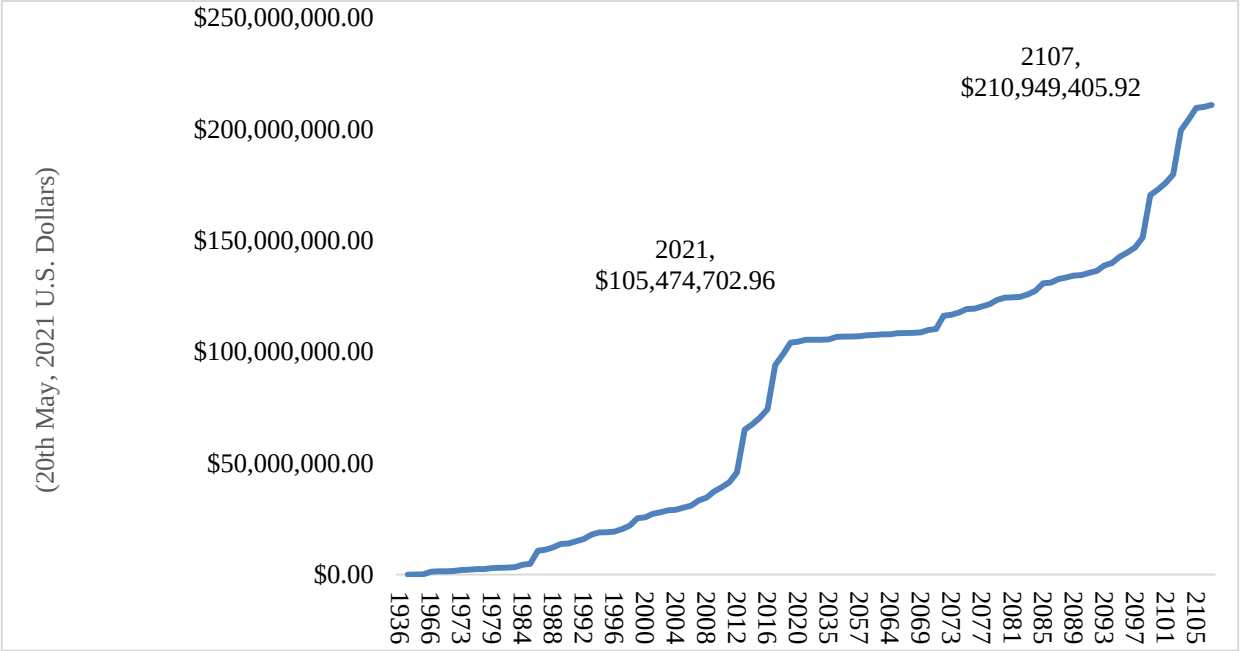

Figure 7. Cumulative (1936-2021) Cost of 630 Spree-Shooter 3,123 Injured @ 33,773.52

Cumulative (1936-2021 Combined Cost of 630 Spree-shooters, 1,650 Dead and 3,123 Injured

In Figure 8, there is the combined cost for each of 630 spree-shooters, 1,650 dead, and 3,123 injured that are added for each year, $2,416,042,490.00 + $6,327,730,332.00 + $105,474,702.96 = $8,849,247,525.36. This is projected to 2107 with no use of computer tests and machine learning equations and computer tests to stop the increase in spree-shooters, dead and injured to be $17,698,495,050.72. Placing a value on suffering from violence is challenging. Without a firm assessment, one cannot evaluate the losses. It is crucial to have practical information. The victimization cost is less well known. It is an issue to collect data on out-of-pocket expenses, with estimates at 20% of direct victimization costs and 35% of pain, suffering, and lost quality of life (Miller, Cohen and Wiersma, 1996). Out-of-pocket expenses for medical bills, property loss, reduced productivity at work, home, and school, and nonmonetary losses (fear, pain, suffering, and lost quality of life) exist. There is tangible loss per victimization including productivity, medical care and ambulance, police and fire services, mental health care, social victim service, and property loss and damage (Zagar, Zagar, Bartikowski, and Busch, 2009).

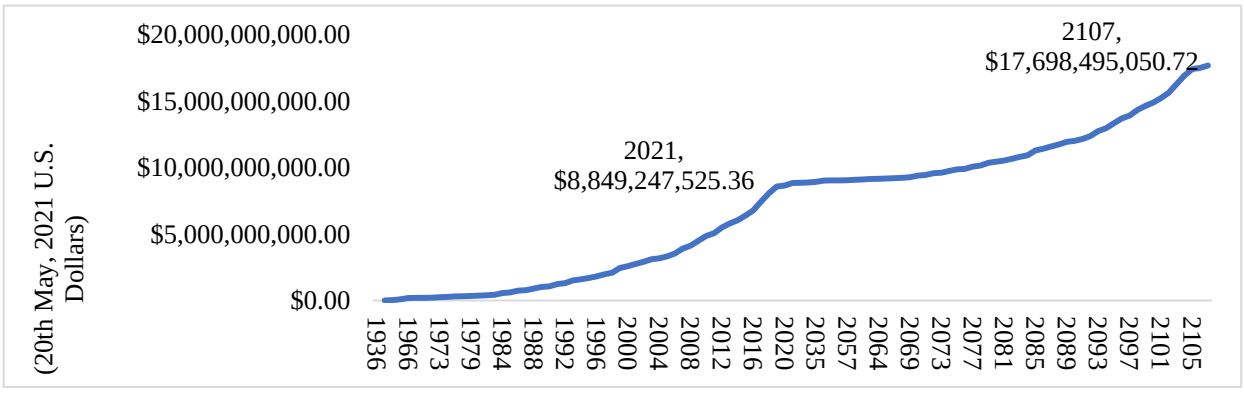

Figure 8. Cumulative Sum of the Cost of 630 Spree-shooters + 1,650 Deaths + 3,123 Injuries

Cumulative (1936-2021) Combined Cost: Spree-shooters, Dead, Injured, Higher Insurance and Taxes

The combined cost of higher insurance and taxes from 630 spree-shooters is computed by taking the combined cost for each year's spree-shooter, dead, and injured victims and multiplying by 1.3, the number. Bottan and Perez Truglia (2015); Rotanda, 2016; Ruhl and Ruhl, 2016, found that 1.3 is the lost donations of the U.S. Roman Catholic Church due to

pedophilia. Since pedophilia is a violent offense, it makes sense to take this estimate as the higher insurance and taxes following a shooting. In Figure 9, the combined cost of spree-shooters, dead and injured victims, and lost business, customers increased insurance is computed by adding each year's spree-shooter, dead and injured victim, and lost business cost. There is the combined cumulative cost to be $20,353,269,308.33. Who pays this $20,353,269,308.33? Taxpayers and insurance purchasers pay because the government and insurers (disability, errors and omission, health, life, liability, personal injury, workers compensation, etc.) cover the expense for the families of the dead and injured and the cost of incarceration of the spree-shooter. There is also the lost business, residents moving from a spree-shooter location, the direct and indirect health costs of the stress. This does not include the inflation of the rising consumer price index. See Figure 9.

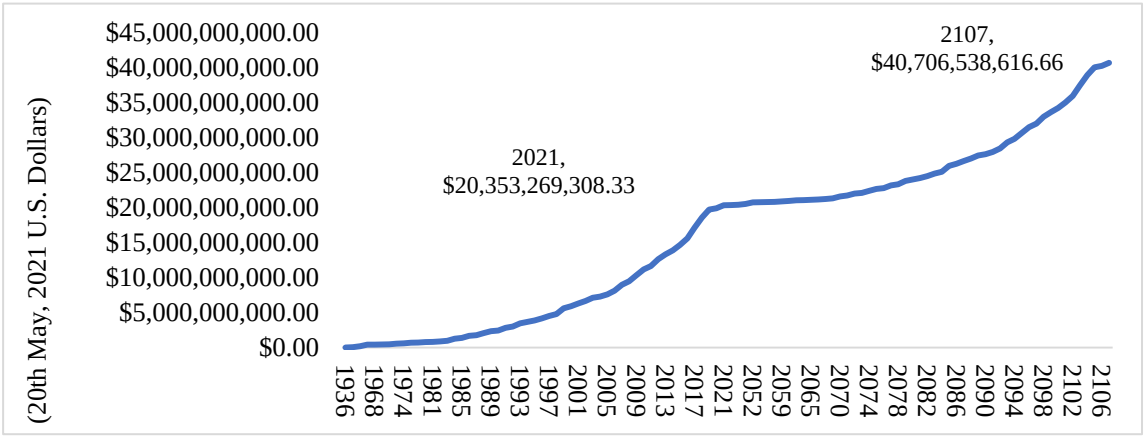

Figure 9. 1936-2107 Combined Cumulative Cost of 630 Spree Shooters Dead Injured Insurance & Tax**es**

630 Spree-shooters (1936-2021) and 277 FBI Active-Shooters (2000-2018) FBI

In Table 3 and Figure 10, see the contrast of 630 spree-shooters (1936-2021) and the 277 FBI active-shooters (2000-2018) with a $\chi 2 = 105.0$, $df=2$, significant ($p<.01$) difference. The current data set of 630 is more inclusive with a larger number of shooters, more deaths and injuries.

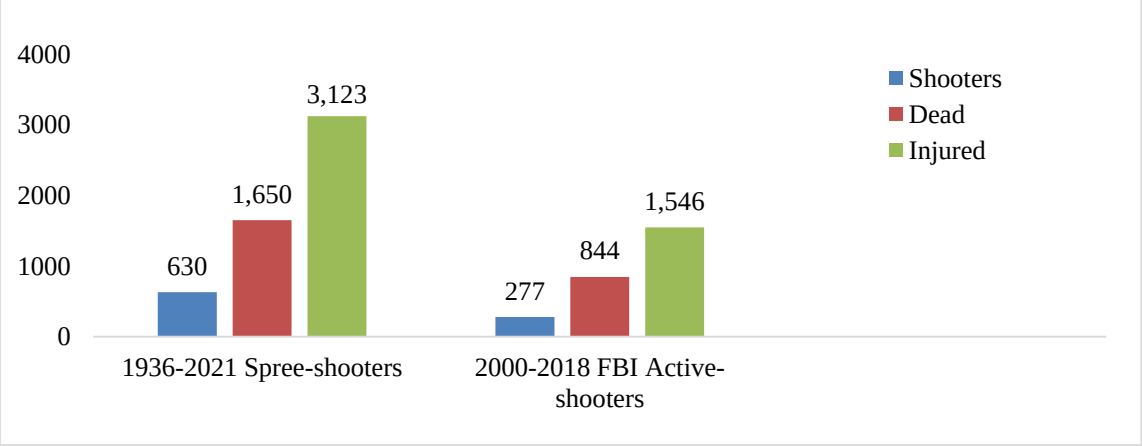

Figure 10. Comparing 630 Spree-shooters (1936-2021) and 277 FBI Active-Shooters (2000-2018)

Table 3. Comparing 630 Spree-shooters (1936-2021) and 277 Active-shooters (2000-2018)

	1936-2021	FBI 2000-2018	X^2
Shooters	630	277	105.0* *df*=2
Deaths	1,650	844	
Injured and Wounded	3,123	1,546	

* *p*<.01 significance **p*<.05 significance

Table 4. Contrasting Locations of 630 Spree-shooters (1936-2021) and 277 Active-shooters (2000-2018)

Attack Location (Number, **%)**	630 Spree-shooters	277 Active-shooters	Increase (%)
Academic (Schools, Colleges, Universities)	232 (37%)	57 (21%)	407
Homes or Residential	50 (8%)	12 (4%)	417
Government	60 (10%)	19 (7%)	316
Closed Commercial (closed to pedestrian traffic): Distribution, Manufacturing, Production, and Non-Medical Professional Office	95 (15%)	37 (13%)	258
Religious Institution (Houses of Worship Church Mosque Synagogue Temple, etc.)	23 (4%)	11 (4%)	209
Medical Office or Facility	25 (4%)	12 (4%)	171
Military Base or Facility	12 (2%)	7 (2%)	171
Open Commercial (open to pedestrian traffic): Restaurant, Retail or Other Commercial	136 (22%)	84 (30%)	162
Street or Open Space	27 (4%)	37 (13%)	-27
Other	25 (4%)	1 (.4%)	2500

F=4.84** *df*=10, *p*<.05, * *p*<.01 significance **p*<.05 significance

Locations of 630 Spree-Shootings (1936-2021) and 277 FBI Active-Shootings (2000-2018)

In Table 4 and Figure 11, there ae the locations of 630 spree-shootings compared to 277 FBI active-shootings with a significant (*p*<.01) $\chi 2 = 59.88$, *df* = 9. School and workplace shootings have increased substantially. The locations are, *academic* (schools, colleges, universities) [232 (37%) vs. 57 (21%)], *homes or residential* [50 (8%) vs. 12 (4%)], *governmen*t [60 (10%) vs. 19 (7%)], *closed to pedestrian traffic* [distribution, manufacturing, production, and non-medical professional office 95 (15%) vs. 37 (13%)], *religious institution* [23 (4%) vs. 11 (4%)], *medical office or facility* [25 (4%) vs. 12 (4%)], *military base or facility* [12 (1.9%) vs. 7 (2.5%)], *open to pedestrian traffic* (restaurant, retail or other commercial) [136 (22%) vs. 84 (30%)]; *street or open space* [27 (4%) vs. 37 (13%)], or *other location* [25 (4%) vs. 1 (.4%)]. When the locations of the 630 spree-shootings are compared with the 277 FBI active-shootings, there is a significantly (p<.05) different one-way *ANOVA*, *F*=4.84, *df* = 9, *p*<.05. Academic and home spree shooting locations quadruple (407% and 417%). Government spree-shootings locations triple (316%). Places of worship and closed to pedestrian traffic business spree-shootings locations double (258% and 209%). Military base and open to pedestrian traffic business increase (162% and 171%). School-shooting locations make up 232 or 37% of the total. Workplace-shooting locations are up to 370 or 59% of the total. Workplace-shooters, at homes or residential, government, closed or open to pedestrian traffic, medical offices, military bases, or other, occur more frequently, killing, injuring, and costing more.

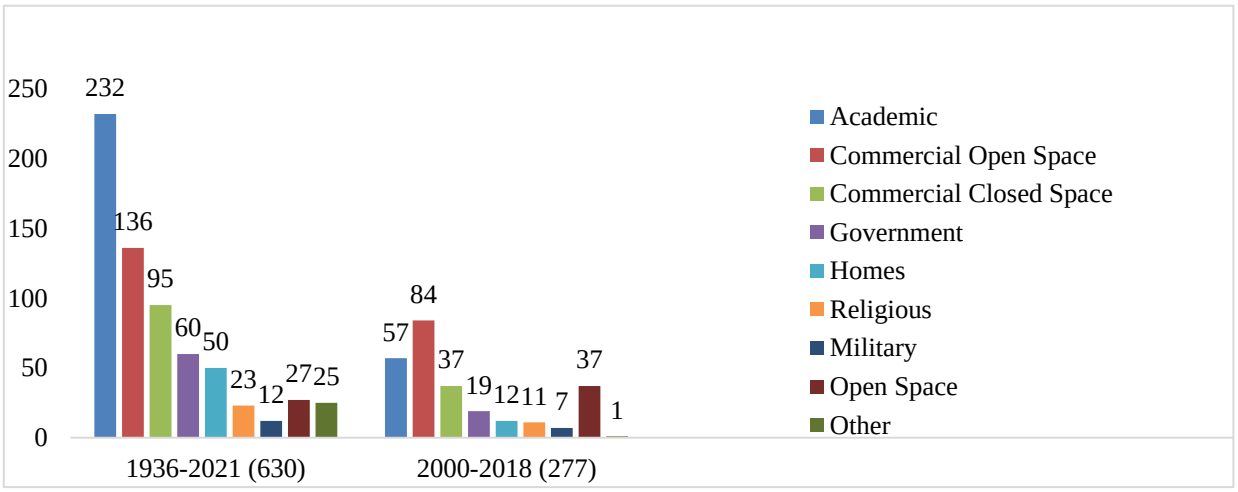

Figure 11. Contrasting locations: 630 Spree-shootings (1936-2021) and 277 Active-shooting (2000-2018)

Relying Only on Open-Source Media Records for Active-shooters May Be Biased and Error-Prone

Silva (2019) studied the accuracy of the media reports on spree-shooters with bivariate analyses (i.e., crosstabs) of media coverage/frames by shooting characteristics used to determine the perpetrator, motivation, and incident characteristics that receive more coverage. These analyses address the media newsworthiness and framing hypotheses, specifically, the significance of characteristics influencing coverage. The data collection process identified 275 successful mass shooting attacks in the United States between January 1st, 1966, and December 31st, 2016. Jihadist-inspired extremists receive at least one article 100% of the time, followed by far-right (93%), and the substantially less covered far-left (70%). Hate, fame-seeker, female, 17 and younger, Arab-descent and Asian perpetrators crimes receive more coverage. Gender-based perpetrators receive less coverage. Mental health and gun access frames are more often dedicated to younger offenders. Terrorism framing is mid-to-younger age range. The crime and news frames are fairly even across all ages. Results support Schildkraut and Elsass (2016) finding that gun and mental health framing of the social problem is the most salient. Gun access is largely considered a general problem (i.e., the gun control problem at-large), while mental illness is more often framed within the context of the specific mental health issues (i.e., depression, psychosis, schizophrenia, etc.). Terrorism and crime are also pervasive strategies for contextualizing the social problem. Jihadist-inspired motivations are one of the greatest predictors of newsworthiness. There is the public fascination with terrorism in the aftermath of 9/11, and the growing concern over lone-wolf terrorism and international threats. School shootings are one of the greatest predictors of newsworthiness. There is the public misconception of the mass shooting phenomenon as largely a school shooting problem (Schildkraut & Elsass, 2016). In fact, workplace shootings are more common. The intertextual nature of media coverage, academic knowledge, and public understanding (i.e., the strategic web of facticity) is what determines social construction more broadly. Similar to the mediated construction of reality, it is important to recognize academic "reality" of mass shootings as a social construction (Silva, Duran, Frielick and Chermak, 2019). The FBI based their data collection on active shooters on media records. The spree-shooter data included many medical, police, press, school and work records, likely a more sensitive, specific estimate of spree-shooters.

Spree-Shooter Sample Limitations

It is unknown whether this 630 spree-shooter sample is representative beyond the U.S., because random samples are better estimates. It is likely that some upper-, middle-, and lower-class cases with knowledge and resources are able to avoid police detection of multiple homicides and also evade the multiple sources of records on persons, so data may be incomplete. Because some cases with incomplete data are excluded, there is differential attrition in selection. The limitation of nonrandom sampling, avoiding detection, evading being in records, and exclusions of incomplete cases, affect the generalizability of findings, including the distributions and the relationships of characteristics (dependent variables) to spree-shooting. However, these 630-spree-shooters, complete records provided a better set of data across age, gender, ethnicity, location, and time. The data serve as a cost warning.

Study 2. Comparing Controls, Homicidal, and Domestic-Terrorist, Mass-Murdering, Spree-Shooters

The homicidal and domestic-terrorist, mass-murdering, spree-shooters were contrasted with controls.

Adult Controls: Among 24 persons there were 18 men and 6 women. The M_{age} = 41.75, and the SD_{age} = 14.67 years. The $M_{education}$ = 16.00, and the $SD_{education}$ = 1.88 years, or a college degree. There were seven Euro-Americans (29%), 13 African-Americans (54%), 3 Hispanic-Americans (12%) and 1 other (Asian, Filipino, or Native American Indian)

[5%]. Occupations included bookkeeper, bus driver, college track coach, emergency medical technician, engineer, firefighter, finance manager, golf professional, minister, nurse, Olympic athlete, occupational therapist, payroll personnel, physical therapist, pilot, policewoman, priest, programmer, psychiatrist, rabbi, scout leader, stewardess, train engineer, and university volleyball champion with Air Force, Army, Coast Guard, Marine, and Navy veterans. The control group comprised inpatient and out-patients referred to hospital, industry, and university clinics from 1992 to 2018 by health care workers. Part or full time and summer work included babysitting, car washing, cashier, coding, cooking, delivery, dishwashing, farming, housekeeping, janitor, landscaping, nanny, painting, restaurant work, sales, snow removal and volunteering at nonprofit and religious organizations.

Adult Homicidal: Among the 12 homicidal adults, there were 9 men and 3 women. The M_{age} = 38.25 and the SD_{age} = 13.28 years, or middle age. They had $M_{education}$ = 13.41, and the $SD_{education}$ = 3.31 years. or some college. There were 3 Euro-Americans (25%), 6 African-Americans (50%), 2 Hispanic-Americans (17%) and 1 other (Asian, Filipino, or Native American Indian) [8%]. Occupations included professional coach, electric station controller, firefighter, handyman, mechanic, physician, police officer, port shipping supervisor, programmer, rabbi, salesperson, and teacher with Army, Marines and Navy veterans. "Homicide" is defined as adjudication and conviction, before a judge in court for killing of another individual(s), and by Illinois state law.

Adult Domestic-Terrorist, Mass-Murdering, Spree-Shooters: The 9 spree-shooters are all men. The M_{age} = 35.66 and the SD_{age} = 14.85 years, or middle age. They had $M_{education}$ = 12.66, and the $SD_{education}$ = 3.84 years, or some college. There were 3 Euro-Americans, 3 African-Americans, 2 Hispanic-Americans and 1 other (Middle-Eastern Asian). Occupations included kitchen worker, train engineer, truck driver and prisoner.

Teen Controls: Among the 12 teen controls, there were 6 boys and 6 girls. The M_{age} = 15.91, and the SD_{age} = 1.56 years. The $M_{education}$ = 10.08 and the $SD_{education}$ = 1.68 years, or some high school. There were 3 Euro-Americans (25%), 6 African-Americans (50%), 2 Hispanic-Americans (17%), and 1 other (Asian, Filipino, or Native American Indian [8%]). Controls were randomly selected from 50,000 clinic-referred youth and adults. Referrals were for developmental, hearing, learning, motor, speech, visual, or other issues to assess level of function for interventions, schooling, or treatment.

Teen Homicidal: The 11 homicidal teens were all boys. The M_{age} = 16.18 and the SD_{age} = 0.87 years. The $M_{education}$ = 9.27 and the $SD_{education}$ = 1.35 years, or some high school. There were 3 Euro-Americans (27%), 5 African-Americans (45%), 2 Hispanic-Americans (18%) and 1 other (Asian, Filipino, or Native American Indian [10%]). Homicide" is defined as adjudication and conviction before a judge in court and by Illinois state law.

Teen Domestic-Terrorist, Mass-Murdering, Spree-Shooters: There are 6 male teen domestic-terrorist, mass-murdering, spree-shooters. The M_{age} = 15.16 and the SD_{age} = 1.83 years. The $M_{education}$ = 9.16 and the $SD_{education}$ = 1.72 years, or some high school. There are 2 Euro-Americans, 2 African-Americans and 2 Hispanic-Americans. All were prisoners.

Results

Nine Descriptive Categories of Spree-Shooter vs. Control Characteristics

There are 650 items characterizing spree-shooters and controls within 54 subcategories namely: (a) 48 demographic items; (b) 106 health; (c) 63 mental health; (d) 46 education; (e) 52 employment; (f) 96 warning signs; (g) 24 abuse and criminal history; (h) 114 crime scene; and (i) 101 crime method items. Given this many items, subcategories and categories of spree-shooter and control characteristics, no human can match computer tests and machine learning equations in comparing the violence-prone high risk person with the empirically demonstrated "seven-point violence profile" to find them before fatalities and divert or intervene to prevent death or expense.

Logistic Regression's Ten Characteristics of Spree-Shooters

The logistic regression, F=260.44, with the multiple R, R^2 and t-tests on the *beta* weights are significant (p<.01) for homicidal-ideation, planning-preparation, stressful-life-event, revenge-motive, acquired-multiple-weapons, elicited-concern, personal-grievance, suicide, current-student, and school- location. Logistic regression gives a linear equation showing which variables are most strongly associated with spree-shooting. Therefore, in the common sense of the term, it is a classification of group membership (status). Studies are not only statistical analyses predicting outcomes; since the data are longitudinal, the resulting equations are truly "predictive" in the common sense of the word. Prior risk factors are used to predict whether the individual would later commit spree-shooting. In logistic regression, it is the area under the receiver operating characteristic (*ROC*) curve, the area under the curve (*AUC)*, which captures the overall accuracy or sensitivity-specificity of the prediction outcomes of interest such as spree-shooting by comparing "hits" versus "misses."

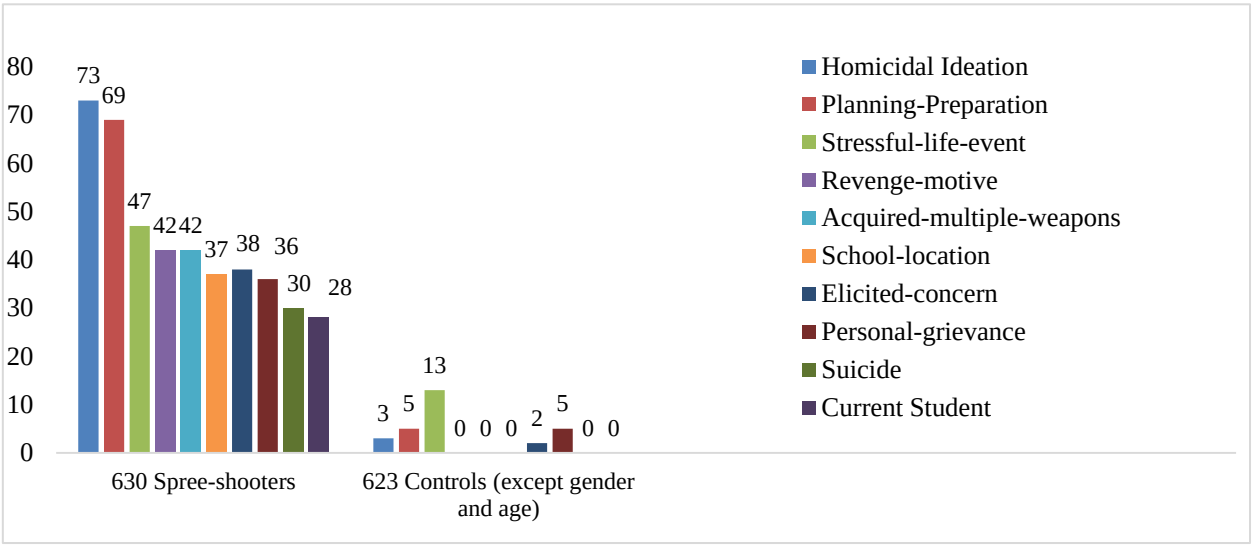

Figure 12. Differentiating Characteristics of 630 Shooters and 623 Controls

Table 5. Logistic Regression of 630 Spree-shooters and 623 Controls

R	R^2	Adjusted R^2	Standard Error Estimate	R^2 change	*F* Change	df_1/ df_2		
.823	.677	.675	.28537	.677	260.442	10/ 1242		
ANOVA Model	Sums of Squares	*df*	Mean Square	*F*	Significance			
Regression	212.096	10	21.210	260.442	.000			
Residual	101.145	1242	.081					
Total	313.240	1252						
Characteristic	Unstandardized *B*	Coefficients Standard Error	Standardized Coefficients *B*	*t*	Significance	Zero order	Correlations partial	Partial
Constant	+	+	+	77.294	.000			
Homicidal-ideation	+	+	+	-11.312	.000	-.720	-.306	-.182
Planning-preparation	+	+	+	-4.751	.000	-.661	-.134	-.077
Stressful-life-event	+	+	+	-2.251	.025	-.378	-.064	-.036
Revenge-motive	+	+	+	-9.280	.000	-.514	-.255	-.150
Acquired-multiple-weapons	+	+	+	-4.696	.000	-.407	-.132	-.076
Elicited-concern	+	+	+	-5.368	.000	-.446	-.151	-.087
Personal-grievance	+	+	+	3.158	.002	-.379	.089	.051
Suicide	+	+	+	-11.234	.000	-.426	-.304	-.181
Current-student	+	+	+	-1.975	.049	-.399	-.056	-.032
School-location	+	+	+	-8.278	.000	-.474	-.229	-.133

+ *Beta* coefficients are not provided to maintain test integrity and security.

Table 6. Area Under the Curve (*AUC*) for Differentiating Characteristics of 630 Spree-shooters

Characteristics	*AUC*	Standard Error	Significance	95% Lower Bound	95% Upper Bound
Homicidal-ideation	.850	.012	.01	.827	.873
Planning-preparation	.820	.013	.01	.795	.844
Stressful-life-events	.673	.015	.01	.643	.703
Revenge-motive	.710	.015	.01	.681	.739
Acquired-multiple-weapons	.676	.015	.01	.646	.706
Elicited-concern	.680	.015	.01	.650	.710
School-location	.684	.015	.01	.654	.714
Personal-grievance	.654	.016	.01	.623	.684
Suicide	.654	.016	.01	.624	.684
Current-student	.638	.016	.01	.607	.669
Average	.704				

The total group is treated as if it is a population, and samples are drawn without replacement from it, one after another, until 1,000 or more have been drawn. Logistic regressions are calculated for each sample and a corresponding *AUC* is estimated. The overall analysis yields an estimate of *AUC* that is the mean of all 1,000 samples' *AUC*s. The *AUC* is a desirable measure of prediction performance because it is not influenced by the base rate of the phenomenon being predicted and of the cutting scores on predictors used to make predictions. The *AUC*, or area under the binormal receiver operating characteristic (*ROC*) curve, is the proportion of the area to the range of the area index, plotted on linear probability scales, ranging from 0.5 to 1.0. This area under the curve is equal to the probability of a correct response in a two-alternative, forced-choice test (such as membership or non-membership in a group, namely spree-shooting) that accounts for both the true positives and the false positives, i.e., sensitivity and specificity. Logistic regressions with resulting *AUC*s provide an easily understood, quantitative measure of the risk factors increase the probability of spree-shooting. See Tables 5 and 6 and Figure 13.

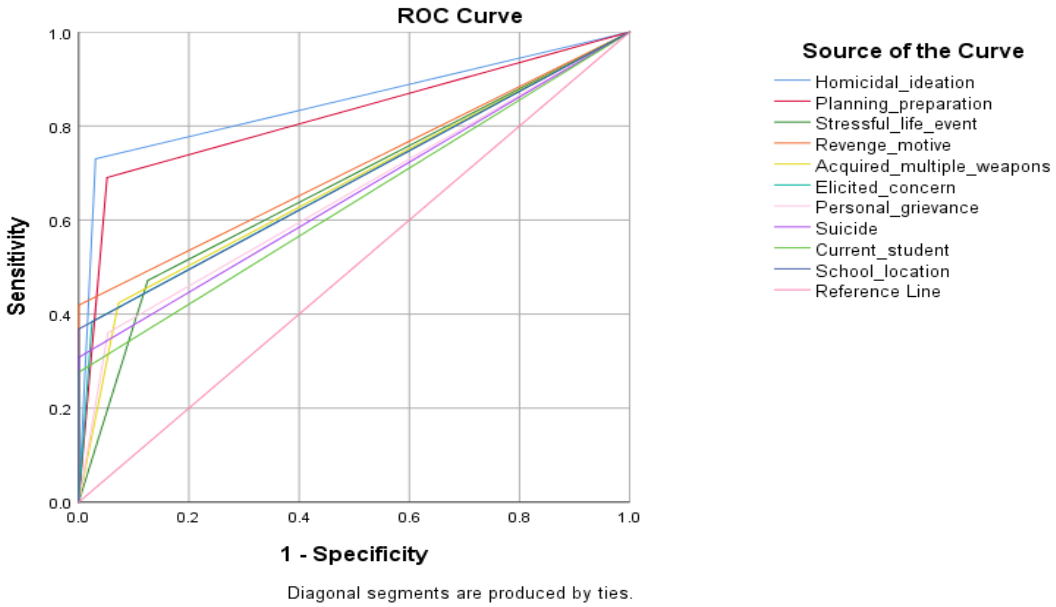

Figure 13. Receiver Operating Characteristic Curve (ROC): Characteristics of 630 Spree Shooters

Study 2. Computer Tests and Machine Learning Equation

Several tests with high reliability, sensitivity, specificity, and validity were chosen, after an exhaustive review of the research of actuarial evaluation. A brief description of the selected tests follows, along with the data collection, decision making algorithm, statistics, and experimental design.

Computer Test: Minnesota Multiphasic Personality Inventory Second and Adolescent Edition (MMPI) The

MMPI Second Edition (MMPI–2) and / or the Adolescent Edition (MMPI–A) is an evaluation of mental health, personality, and deceptive self-presentation. Across the three editions, with item duplication, the computerized test takes less than 60 minutes to complete. The MMPI–2 for adults has 567 true-false format questions, while the MMPI–A for adolescents, has 478 true-false items. Computer administration allows for instantaneous scoring and report generation with a precision that exceeds 90%, in detecting mental illness. The MMPI alone is not sufficient in assessing violent-prone persons, because within the more than 100 scales, there is no reliable, sensitive-specific, valid measure of violence. This is why many court, hospital and human resource professionals, add a probation parole decision making risk test, like the Standard Predictor to the MMPI. Over 19,000 empirical studies and 250 appellate court cases attest to the usefulness of the MMPI-2 and the MMPI-A assessment that originated in the 1930s.

Machine Learning Equation: Standard Predictor of Violence Potential

The Standard Predictor of Violence Potential (SP) is an assessment of adults, with 96 true-false or multiple-choice format items and an Area under the Curve (*AUC)* = .99. The SP for Adolescents has 116 items with *AUC* = .91. The test-retest reliability was .75-.76 and Cronbach's alpha of .75-.78 with sensitivity of 97% and specificity of 97%. The SP evaluates specific, historical self-descriptions and requires 15 minutes to complete. The SP has no items from any of the other tests and is a free-standing instrument with 96 or 116 independent items, distinct from the other tests. This measure was successful in discriminating randomly selected violent oleanders (1,595 adults and 1,127 adolescents) from matched controls with *AUC* = .96 in a combined adult and adolescent version, based on a sample of 2,722 (Zagar and Grove, 2010). This *AUC* is noteworthy because most tests in the literature attempting to predict criminal recidivism or "return to court" have *AUCs* from .7 to .8 (Moosman, 2013).

Data Collection

Testing of these individuals was done to assess current functioning and address the hypotheses, as well as the more immediate issues of offering interventions, assessing fitness for duty, schooling, screening, and/ or medical or psychological treatment. Then, records for these individuals were obtained from court, industry, hospital, school, and/or universities. The records were checked and accepted as accurate, with regard to convictions and illnesses. Records were examined for previous court contacts for neglect, substance-dependency, physical and sexual abuse, delinquent and criminal oneness such as truancy, disorderly conduct, solicitation, phone harassment, forgery, mob action, violating a court order, drug possession or sales, property damage, auto theft, theft, burglary, robbery, unlawful weapon possession [firearm(s)], arson, assault or battery, aggravated criminal sexual assault, and homicide and domestic terror, mass murder, spree shooting (same procedure as used in Zagar, Busch, Grove, and Hughes, 2009 and Zagar, Kovach, Basile, Hughes, Grove, *et al.,* 2013).

Computer Test and Machine Learning Equation

According to the published test manual instructions, psychologists administered the MMPI–2 or the MMPI–A and the SP Adult or Adolescent Version. The order of test administration was randomized. All of the MMPI data were scored using the Pearson Assessment and University of Minnesota Press computerized Clinical Interpretative Report. The instruments had high test-retest reliability, large standardizations samples, good internal consistency, and high concurrent and construct validity. When possible, the tests were administered on the internet.

Records

After physical and psychological examinations, current medical and other records were coded using the International Classification of Diseases (ICD–9; World Health Organization, 1977) and the Diagnostic Statistical Manual V (American Psychiatric Association, 2013) and juvenile and adult court and school and industry records were reviewed by two independent psychologists, with coefficients of inter observer agreement of r=.92-.94.

Machine Learning Equation: Decision Making Algorithm

For adults or adolescents, using the record and test data, two independent psychologists' classified individuals with the following algorithm, to assess mental health including substance-abuse using test results: (a) The MMPI–2 (MMPI–2) or the MMPI–A with significantly ($p < .01$) elevated validity and/or basic clinical scales consistent with a t score of 65 or above. Finally, (b) the SP Adult version cut-off was 70.6%, the lowest score of convicted violent offenders; the SP Adolescent version cut-off was 82.9%, the lowest score of convicted adolescent violent offenders (Zagar and Grove, 2010). With this decision-making algorithm, for the two independent psychologists, Pearson product moment coefficients of inter-observer agreement were .92–.96 ($p < .01$). The results of this algorithm were compared with records of the individuals' actual histories.

Statistics and Experimental Design

For adults and adolescents, the means and standard deviations were computed for age and years of education completed

and the test scales. The test scales were normally distributed according to the Komolgorov-Smirnov Test and met the assumptions of homogeneity of variance on Bartlett's test. In simple terms, the data was normally distributed and homogenous, conditions for analysis of variance (*ANOVA*s). For the domains and tests employed, the sample size was sufficient (Kirk, 1982). The criterion for mental health including substance-abuse, abuse, and delinquency or crime was the individuals' actual records. These included court or health records of mental illness, substance-abuse, violence, and/or abuse. For example, if the records showed a finding of mental illness, it was assumed that the individual had mental illness, and so forth for the various criteria, substance-abuse, violence, and/or abuse. This carefully selected set of tests was administered over the internet with a total test time of 60-90 min for 578 items for adults and 492 items for adolescents. In the internet format, tests with automated reports cost 70 to 80% less than current paper-and-pencil version reports. First, the adult domestic-terrorist, mass-murdering, spree-shooters, homicidal and control group data were subjected one way *ANOVA*. Then the teen data were subject to *ANOVA*. All the psychometric measures or dependent measures met the assumptions of normality (Kolmogorov Smirnov Tests) and homogeneity of variance (Bartlett's Tests).

Comparing Adult and Teen Average t-Scores

When the adult and teen spree-shooter, homicidal, and controls average and standard deviation *t-scores* were compared, there were significant ($p < .01$) differences. There is the "7-point violence profile" across adult and teen spree-shooters and homicidal, but not the controls, namely the Standard Predictor of Violence Potential, the MMPI-2/A deception (infrequency, lie) depression, psychopathic deviate, paranoia, schizophrenia, and alcohol-addiction. See adult and teen t-score and percentiles in Figures 14-17 and Table 7.

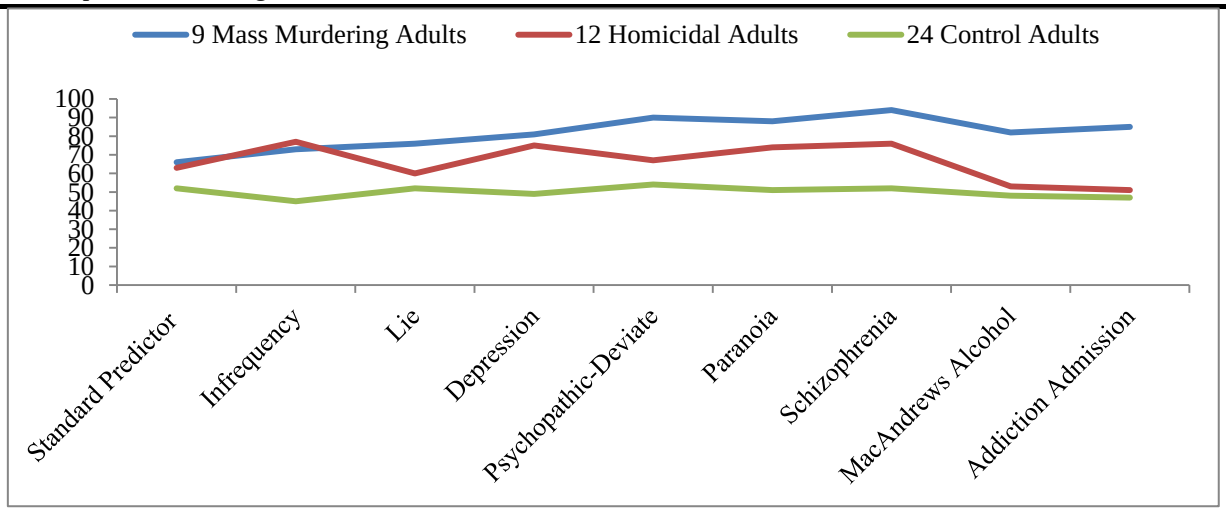

Figure 14. Adult Controls, Homicidal, Spree-Shooters Standard Predictor and MMPI-2 t-scores

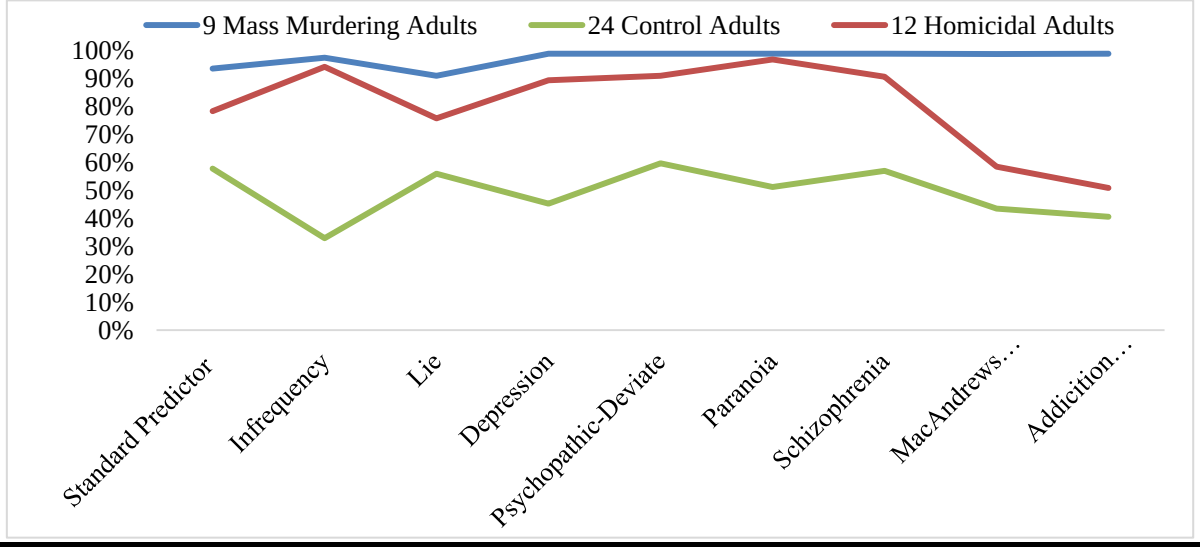

Figure 15. Adult Controls, Homicidal and Spree-Shooters Standard Predictor and MMPI-2 Percentiles

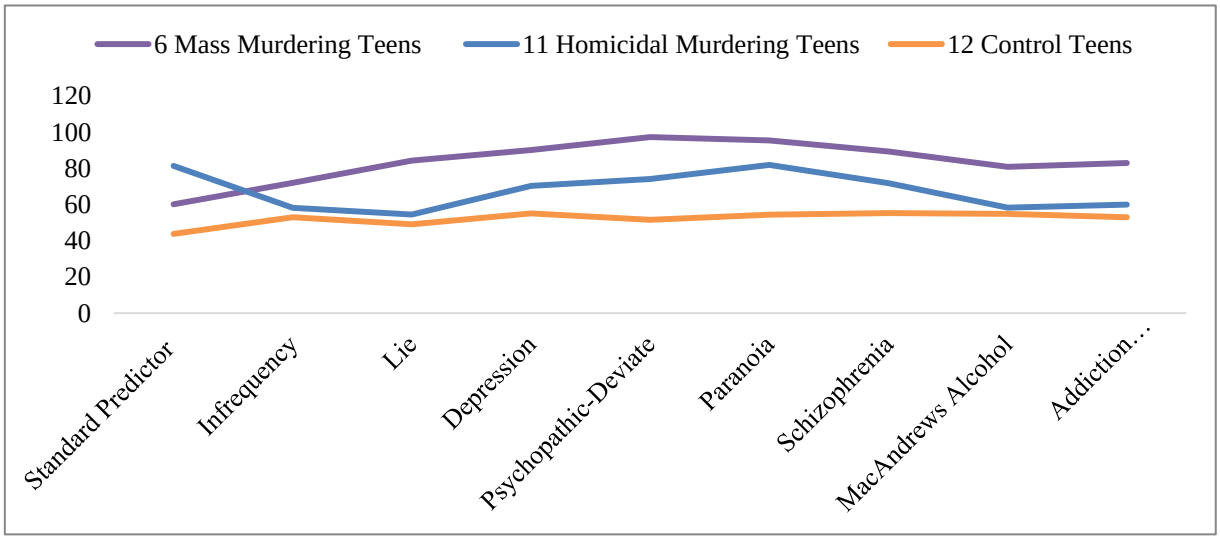

Figure 16. Teen Control, Homicidal, Spree-Shooters Standard Predictor and MMPI-A t-scores

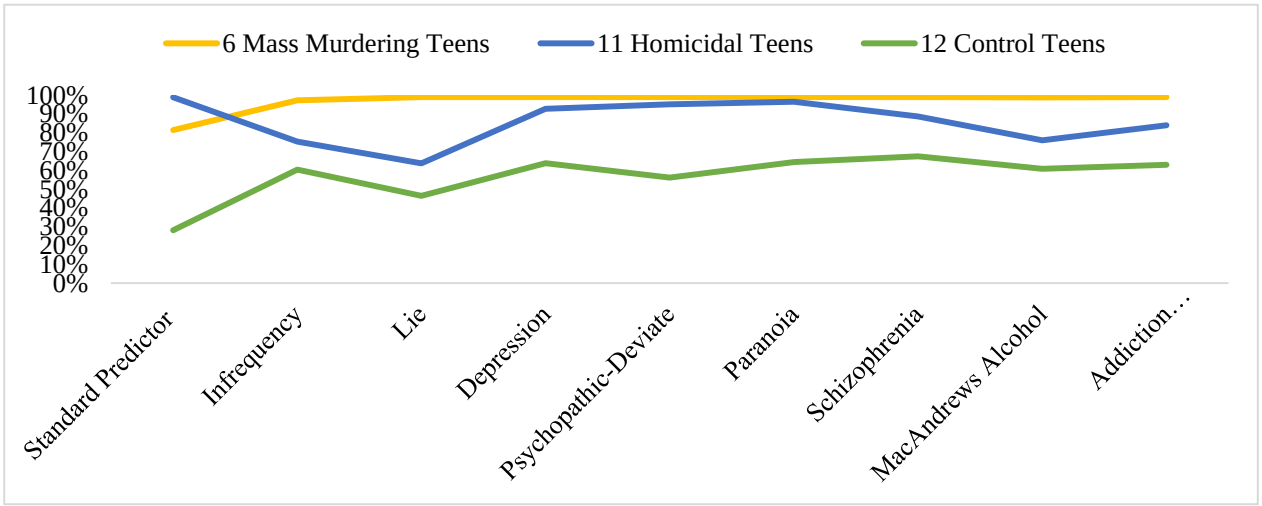

Figure 17. Teen Controls, Homicidal and Spree-Shooters Standard Predictor and MMPI-A Percentiles

Table 7. Standard Predictor and MMPI-2/A 7 Point Violence Profile ANOVA Table

All: *p<.01		Adult				Teen			
		Sum of Squares	*df*	Mean Square	*F*	Sum of Squares	*df*	Mean Square	*F*
Standard Predictor	Between Groups	1666.12	2	833.06	17.48*	8096.13	2	4048.06	123.09*
	Within Groups	2001.87	42	47.66		855.04	26	32.89	
	Total	3668.00	44			8951.17	28		
MMPI Infrequency	Between Groups	10453.35	2	5226.68	92.15*	1451.68	2	725.84	17.22*
	Within Groups	2382.29	42	56.72		1096.18	26	42.16	
	Total	12835.64	44			2547.86	28		
MMPI Lie	Between Groups	3666.93	2	1833.46	13.13*	5221.51	2	2610.76	33.91*
	Within Groups	5863.51	42	139.61		2001.73	26	76.99	
	Total	9530.44	44			7223.24	28		
MMPI Depression	Between Groups	9215.89	2	4607.94	37.76*	4985.09	2	2492.55	26.18*
	Within Groups	5125.89	42	122.04		2475.04	26	95.19	
	Total	14341.78	44			7460.14	28		
MMPI Psychopathic Deviate	Between Groups	8887.31	2	4443.65	44.66*	8740.94	2	4370.47	57.45*
	Within Groups	4178.47	42	99.49		1977.89	26	76.07	
	Total	13065.78	44			10718.83	28		
MMPI Paranoia	Between Groups	10259.13	2	5129.56	50.58*	8051.23	2	4025.61	23.92*
	Within Groups	4259.18	42	101.41		4375.33	26	168.28	
	Total	14518.31	44			12426.55	28		
MMPI Schizophrenia	Between Groups	12960.70	2	6480.35	53.85*	4805.19	2	2402.60	21.69*
	Within Groups	5054.10	42	120.34		2879.64	26	110.75	
	Total	18014.80	44			7684.83	28		
MMPI MacAndrews Alcohol	Between Groups	7499.46	2	3749.73	42.01*	2870.74	2	1435.37	16.84*
	Within Groups	3748.85	42	89.26		2216.29	26	85.24	
	Total	11248.31	44			5087.03	28		
MMPI Addiction Admission or Acknowledgement	Between Groups	9934.78	2	4967.39	86.63*	3661.45	2	1830.72	.47.09*
	Within Groups	2408.33	42	57.34		1011.00	26	38.88	
	Total	12343.11	44			3661.448	28		

Table 8. MMPI-Adolescent/MMPI-2nd Edition Standard Predictor 7-Point Violence Profile-650 Items

630 Spree-shooter Characteristics	7-Point Violence Profile Youth	7-Point Violence Profile Adults
Ambush tactical training, Move & shoot, cover & conceal, Changed in behavior, mood and/or personality, Obsessive	1A. MMPI-A Deception Lie Scale tendency to create a favorable impression, denial, rigid, repression, response bias, conventional, moralistic,	1A. MMPI-Deception Lie Scale attempts by individuals to present themselves in a favorable light, lack of insight
Fixated or delusions, Mental illness motive, Psychosis or psychosis symptoms, Significant mental health history, Mental illness motive	1B. MMPI-A Deception F Infrequency Scale random, exaggerated responses, psychopathology, acting out, resentment, not paying attention and moodiness	1B. MMPI-2 Deception F Infrequency Scale trying to appear worse than one really is severe psychological distress, randomly answering
Suicide, Suicidal ideation, Attempted suicide, public suicide, Suicide by cop, getting things in order, Stressful life event, Inappropriate affect, being bullied or harassed	2.MMPI-A Depression Scale, pessimism, worry, pessimism, worry, guilt feelings, tension, poor concentration, sad, somatic complaints	2.MMPI-2 Depression Scale, poor morale, hopelessness, helplessness, general dissatisfaction, life situation unhappiness
Psychopathy, Military, criminal misconduct, Others noted strange, aberrant behavior, Significant family stressor Elicited other's concern, Criminal, hate, power-control, recognition, or religion motive Bulling or harassing others, unprovoked anger outbursts	3.MMPI-A Psychopathic Deviate Scale low impulse control, extroverted, dis-identification with societal standards authority marital and family conflicts, inconsiderate, parasitic	3.MMPI-2 Psychopathic Deviate Scale social deviation, amorality, externalizes blame on others, hostility, poor judgment, lack of acceptance of authority disregards morality
Concerns about being followed, harassed, or persecuted Paranoid schizophrenia, Revenge motive, Personal grievance	4.MMPI-A Paranoia Scale belligerent, overly sensitive, vengeful, ideas of reference, delusions of persecution, grandiosity	4.MMPI-2 Paranoia Scale suspiciousness rigidity, feeling persecuted, grandiose self- concepts, excessive sensitivity
Psychosis or psychotic thinking, Hearing voices, Schizophrenia, Schizotypal personality, Incompetent to stand trial, psychiatric facility commitment, Narcissistic, Sexual fixation, masculine issues, Pedophilia & related interests	5.MMPI-A Schizophrenia Scale disorganized, reality testing breakdown schizoid, unreality feelings, insecurities, alienation, fantasizing, nonconforming, sexual difficulties and preoccupations, narcissistic, immature	5.MMPI-2 Schizophrenia Scale bizarre thoughts, low impulse control, strange perceptions, social alienation, poor family relationships, inattentive, uninterested, poor self-worth, self-identity disturbing thoughts
Substance Abuse: Abused prescription drugs, Unknown illicit drug abuse, type(s) Unknown psychiatric medication or type	6.MMPI-A Alcohol/Drug Problems Acknowledgement Scale (ACK) Alcohol/Drug Problems Proneness (PRO Scale, admissions, attitudes, beliefs, problematic use, symptoms of potential alcohol or drug problems	6.MMPI-2, MacAndrews Alcoholism Revised (MAC-R), Addiction Potential Scale, Alcohol-Addiction Scale (AAS) direct measure of substance abuse, alcohol, drug problems
Homicidal, Criminal Misconduct, Gang peer fringe group involved, Bullying, harassing others, Personal grievance, Planning, preparing murder, Creating kill list, Developing, posting manifesto, Previously attacked location, Holding or planning hostages, Surveilling target, Acquired multiple weapons, Possessing bomb diagrams, Prior murder interest, Authoring violent content, Watching violent media, Admiring prior murderers, Random violence, hate crime, terrorism motive, Habitually, making angry violent threats, Male, Physically, fighting, Intent leakage, formal job discipline, Disgruntled, Work termination, Problem worker	7. Standard Predictor Violence Potential - Youth (*N*=1127) Low executive function or poor decision-making Prior court contact, criminal or delinquent misconduct Male Alcohol and substance use Violent family Underachievement Illnesses Single parent or orphan, stepparent home Physically abused Truancy, suspension, expulsion Alcohol and substance abuse Epilepsy Low social maturity or adaptive behavior Alcohol abuse alone	7. Standard Predictor Violence Potential–Adults (*N*=1595) Poor decision-making Prior court contact, criminal or delinquent misconduct Male Alcohol substance use Violent family Unemployment Underachievement Antisocial personality disorder Hyperactivity, Attention deficit, Learning Disorder Low socioeconomic status Illnesses

report, Animosity to a culture, ethnicity, race, or religion, Below average grades, Significant family stressor, Separated, divorced, Removed from parental home, foster, group home, Abused prescription drugs, Unknown illicit drug abuse, type(s), Unknown psychiatric medication or type, Juvenile/teen romantic interest victim	Substance abuse alone	

650 Psynetix Item Similar in Content to 7-Point Violence Profile of SP and MMPI-2/A

As described in the 212 studies in 320,051 over 95-years, the test descriptions of the MMPI-A/2 and Standard Predictor of Violence Potential (Zagar, Varela, Busch, Garbarino, Zagar, Kovach, et al., 2019; Butcher, 1996; Butcher, Ellertsen, Lucio, Lim. et al., 2000, Pope, Butcher, and Seelan, 2006; Zagar and Grove, 2010) are similar to the 650 Psynetix items as seen in Table 8. On the "7-point violence profile," spree-shooters compare with the definition of *deception lie scale* with ambush tactical training and changing behavior, mood, and or personality, *deception infrequency* with mental illness motive and psychosis, *depression* with suicidal ideation, *psychopathic-deviance* with psychopathy, criminal and military misconduct, others noted strange or aberrant behavior, and significant family stressor, *paranoia* with concerns about being followed, harassed or persecuted, revenge motive, and personal grievance, incompetent to stand trial and/or psychiatric facility commitment, sexual fixation, and pedophilia & related interests, *alcohol-substance* with substance abuse, alcohol, and other substances and prescription drugs abuse, and *violence potential* with criminal misconduct, male, alcohol substance use, planning-preparation, creating possessing kill list, habitually making violent threats when angry, involved in physical fights, employment termination, below average grades, significant family stressor, and separated or divorced. These 630 spree-shooters have characteristics similar to the "7-point violence profile" found in 212 Studies of 320,051 persons in 95 years including 21,130 homicidal, serial killing, and violent offenders, in 44 studies over 65 years Zagar, et al., 2019) with a cross-validation among 136 homicidal, overdosing- substance-abusing, sex-offending, suicide-completers, and controls including the twelve homicidal adults there are nine men and three women.

Computer Tests: Youth: Behavior Assessment for School Children Third Edition/

Minnesota Multiphasic Personality Inventory Adolescent Version

Adult: Minnesota Multiphasic Personality Inventory Second Edition

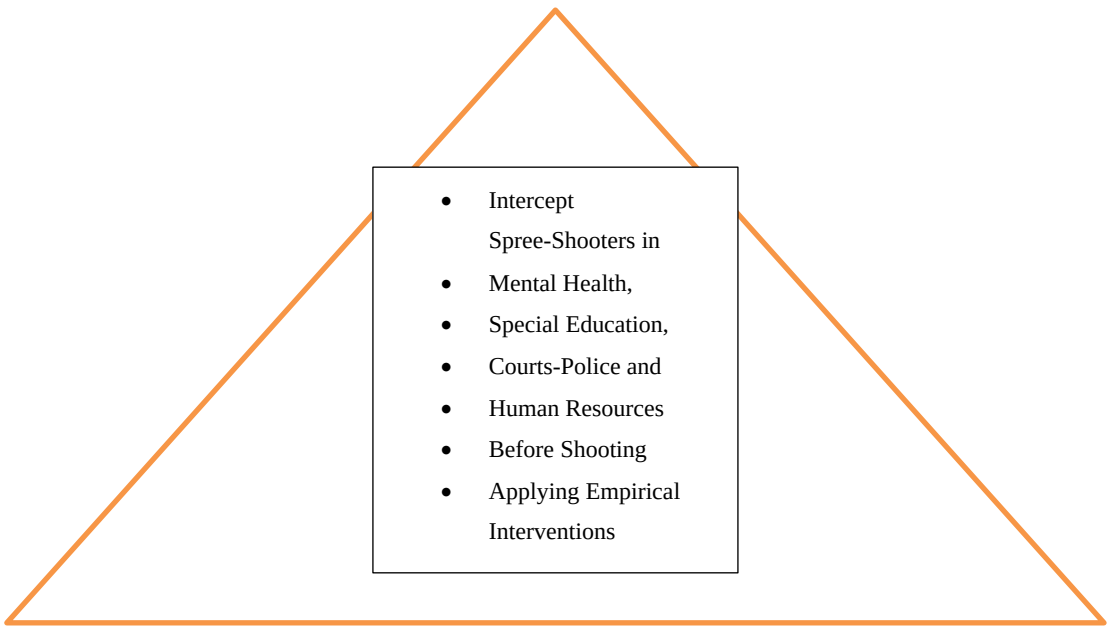

Figure 18. Computer Tests and Machine Learning Intercept Spree-Shooters Before Shooting

Machine Learning Equations: Psynetix Laboratories Equation Standard Predictor Violence Potential (Adult or Youth Versions)

Spree-Shooters Exploit Mental Health, Special Education, Court-Police and Human Resource

Table 9. 630 Spree-shooters Access Mental Health, Special-Education, Courts-Police Human Resources Twice Before Shooting

Mental Health History: Anti-Anxiety	5	1%
Anti-Depressant(S)	23	4%
Anti-Epileptic(S)	1	
Anti-Psychotic(S)	9	1%
Mood Stabilizer(S)	2	
Narcotic(S)	3	
Sedative(S)	3	
Unknown Psychiatric Medication or Type	28	4%
Mental Health Hospitalization	57	9%
Attended Counseling and/or Therapy	69	11%
Rec'd Inpatient Treatment for Alcoholism	3	
Seeking to Begin Treatment	13	2%
Subtotal	216	34%
Education History: Graduate Equivalency Diploma (GED)	5	1%
Technical Diploma	2	
Below Average Grades	46	7%
Academic Probation	1	
Acted Out and/or Caused Trouble in Class	33	5%
Decline in Academic Performance	18	3%
Did Not Graduate College/ University (If Enrolled)	33	5%
Did Not Graduate High School	14	2%
Expelled from College / University, Technical, Or Other	3	
Expelled from Middle or High School	11	2%
Suspended	33	5%
Truancy	10	2%
Special Education	15	2%
Homeschool	8	1%
Alternative School	16	3%
Subtotal	248	39%
Employment History: Formally Disciplined	94	15%
Disgruntled	92	15%
Employment Terminated	74	12%
Aggression, Sexual Harassment, Or Inappropriate Behaviors	40	6%
Below Average Performance	28	4%
Reported to Be a Problem Employee	27	4%
Knowledge or Suspicion of Impending Job Loss	22	3%
Placed on Mandatory Leave	9	1%
Decline in Work Performance	7	1%
History of Being Harassed by Supervisors	3	
History of Unstable Employment	31	5%
Subtotal	427	68%
Abuse/Criminal History: Interactions Initiated By: Law Enforcement	177	28%
Experienced/Witnessed Abuse During Childhood: Yes	53	8%
Perpetrated Abuse During Childhood: Yes	15	2%
Experienced/Witnessed Abuse During Adulthood: Yes	2	
Perpetrated Abuse During Adulthood: Yes	66	10%
Military Misconduct: Yes	22	3%
Criminal Misconduct: Yes	249	40%
Subtotal	584	93%
Total	1475	234%

As seen in Table 9, 216 of 630 spree-shooters access mental health before the shooting and 248 access special education, while 427 of 630 have human resource issues, and 584 have court or police contact, all before the shootings. The total is 1,475 or twice the number of spree-shooters. The bottom line is that domestic-terrorist, mass-murdering, spree-shooters don't want to be discovered, diagnosed, or treated. They are homicidal, suicidal and have access to multiple weapons, and experiencing a stressful life event, they elicit other's concern with a personal grievance and revenge motive. They target a current student in a school and commit suicide. Machine learning equations and computer tests need to be used in all sectors.

First Null and Alternative Hypotheses

The null hypothesis on spree-shooters and control differences is rejected. The alternative hypothesis is that spree-shooters are different on, (1) homicidal ideation, (2) planning or preparation, (3) stressful life even, (4) revenge motive, (5) acquired multiple weapons, (6) elicited concern, (7) personal grievance, (8) suicide, (9) current student, and (10) school location.

Second Null and Alternative Hypotheses

The second null hypothesis on spree-shooters, homicidal and controls is also rejected. The alternative hypothesis that spree-shooters tend to be deceptive, depressed, psychopathic deviate, paranoid, confused thought processes (schizophrenia scale of the MMPI), alcohol-substance abusing and violent is accepted. But the real question is what are the costs of spree-shooters? The answer will drive use of machine learning equations and computer tests. The cost is thousands of lives and tens of billions of dollars.

Domestic-Terrorism, Mass-Murdering, Spree-Shooter Expense

There is empirical evidence of the effects of mass murders. Dursun (2019) discovered in utero effects in the immediate county location at the time of mass-murders include lower birth weight and premature births. Soni and Tekin (2020) showed 27% points decrease in well-being and 13% point lowering in health measures in the immediate vicinity or county of the mass-murder. After a mass-murder, Rossin-Slater, Schnell, Schwandt, Trejo, and Unia (2019) found that the adolescent antidepressants use increased in the immediate county. The Las Vegas strip mass-murder in 2017 resulted in 57 deaths, 4,343 injured, and an $800,000,000 settlement to 4,400 victims (Ritter, 2020). Applying the 130% lost donations and churchgoing attendance (Bottan and Truglia, 2015, 13% lost donations, -14% lost churchgoers = -27% = the donation loss greater than payouts) x the payout gives an estimate of the lost MGM hotel customer business and insurance increase [$800,000,000 x 1.3 =] 1.04B + $800,000 = $1,804,000,000 total loss [Rotanda, 2016; Ruhl and Ruhl, 2016]. There is little on school-workplace liabilities, but given these estimates, there are higher taxes and insurance for disability, errors-and-omission, health, life, personal injury, workers compensation.

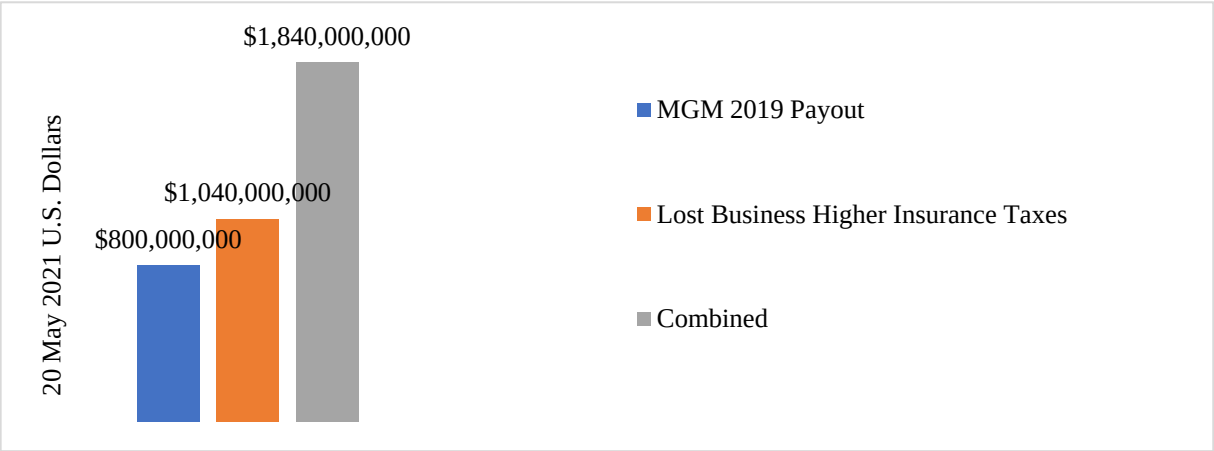

Figure 19. MGM Hotel Shooter Payout (Dead + Injured) + Lost Business, Increased Insurance, Taxes

Columbine Colorado, Parkland Florida, Sandy Hook Connecticut, and Virginia Tech Dead Costs

Columbine, Colorado has [17 deaths @ $3,834,988.08 (cost/homicide) = $65,194,797.36] + [payouts @ 1.3 for losses (Bottan and Perez-Truglia, 2015) = $84,753,236.57] = $149,948,033.96. Parkland, Florida has [17 deaths @ $3,834,988.08 = $65,194,797.36] + [payouts @ 1.3 for losses = $84,753,236.57] = $149,948,033.93. Sandy Hook Connecticut has [27 deaths @ $3,834,988.08 = $103,544,678.16] + [payouts @ 1.3 = $134,608,081.61] = $238,152,759.77. Virginia Tech has [32 deaths @ $3,834,988.08 = $122,719,618.56] + (payouts @ 1.3 for losses = $159,535,504.13] = $282,255,122.69. See Figure 20. This does not include injured cost. The schools do not have in-person learning due to virtual training in the pandemic which has resulted in less school-shooting.

Workplace-shootings continue, i.e., Indianapolis FedEx, by a dismissed schizophrenic worker, as a current, local example.

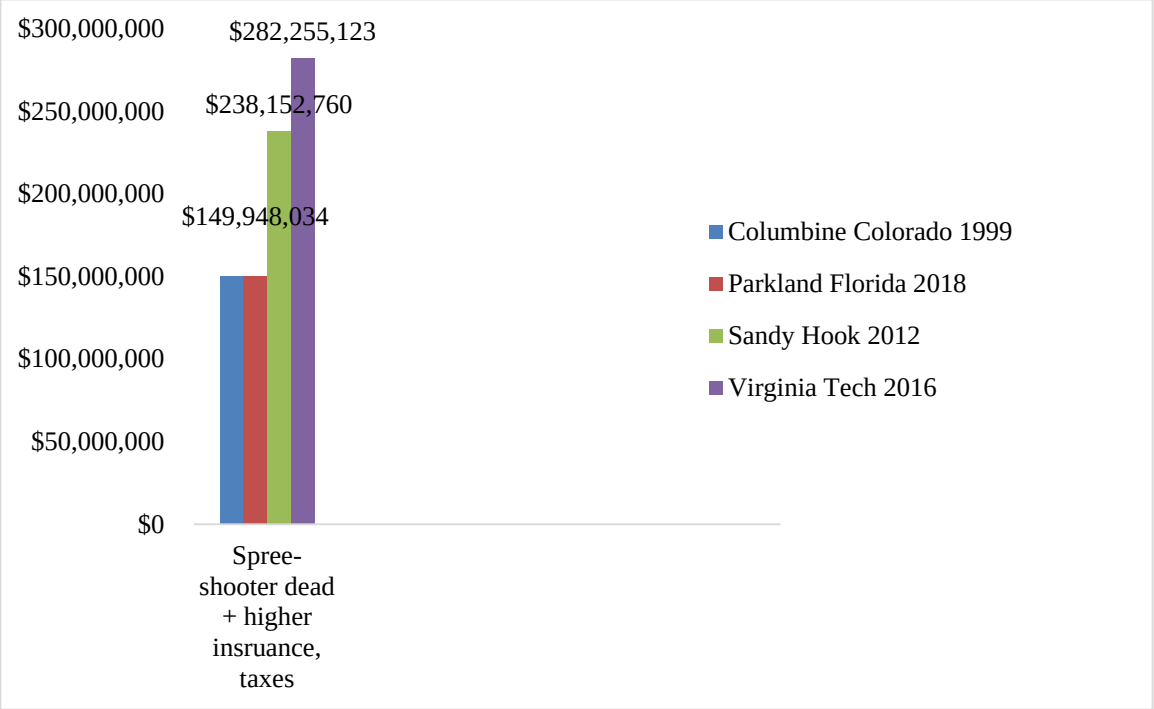

Figure 20. Columbine, Sandy Hook, Parkland and Virginia Tech Death and Payout x 1.3 Costs

School-Workplace Violence, Payout, Donation Loss Example: the U.S. Roman Catholic Church

In 2007, total U.S. Roman Catholic payout is $4,520,363,843 and in 2008, $436,000,000. Gallagher Insurance of Illinois, who insures Catholic dioceses payout = $1,500,000,000 (Wilhelm, 2010; United States Conference of Catholic Bishops, 2014). Since 1994, 21 US Roman Catholic dioceses bankruptcies occur with a trend of all 198 being bankrupt by 2144. See Figure 21. Partially due to pedophilia there is a 9 to 14% decline in Roman Catholic affiliation, which if it continues will result in 0% Roman Catholics with five centuries in the U.S population. Given each pedophilia-affected annual zip code, estimated U.S. Roman Catholic loss is 1.3 in total charitable contributions. Bottan and Perez-Truglia, 2015, Rotanda, 2016, computed this annual lost collections and donation revenue as roughly greater than payouts in each location are donation loss. With 1.3 x 3,000 scandals the loss is equal to $1,770,000 per year. Non-itemized contributions are 25% of all giving. Bottan and Perez-Truglia assume similar effects on non-itemized givers. A pedophilia scandal costs $590,000,000 per year equal to $1,770,000,000 plus $590,000,000 which equals to $2,366,000,000 per year (Ruhl and Ruhl, 2016). Charitable giving does return, and the losses affect the pedophilia localized diocese (Zagar, Zagar, Busch, Garbarino, Ferrari, Hughes, Patzer, Kovach, Grove, Tippins, Imgrund, Dempsey, and Basile (2016); Zagar, Varela, Busch, Garbarino, Zagar, Kovach, Tippins, Hughes, and Singh, (2019).

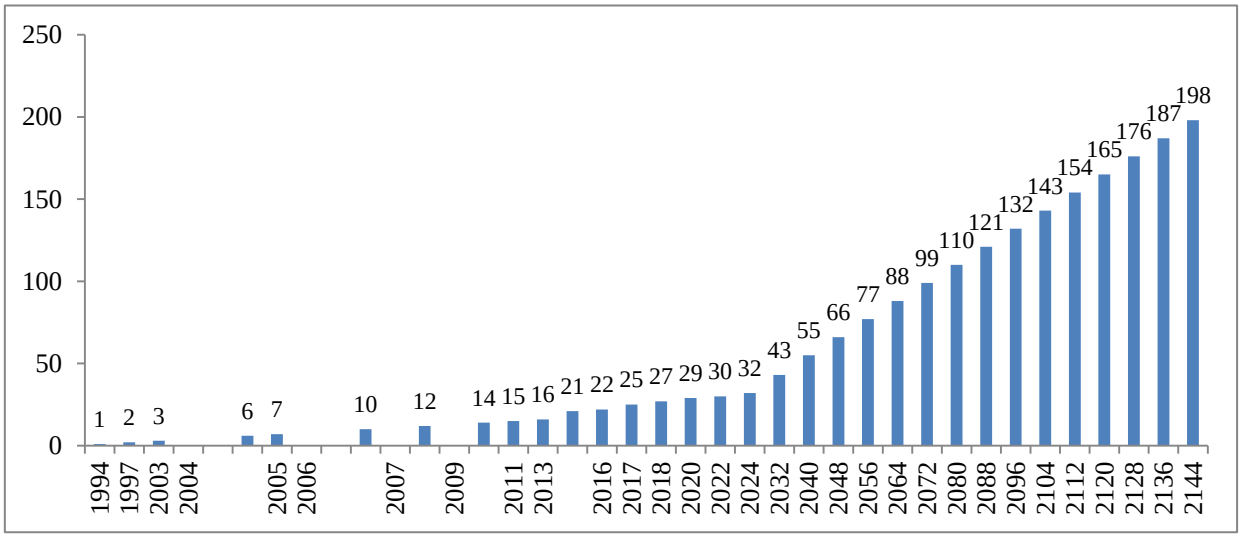

Figure 21. 1994-2016 Bankrupt and 198 Projected Bankrupt US Roman Catholic Dioceses

Practical Evidence-Based Solutions: Machine Learning Equations and Computer Tests

There is a solution for insurance chief financial officers and Roman Catholic Church leadership, namely the use of machine learning equations and computer tests and improving security in all locations. Spree-shooters have definitive risks. Given the complex profile, current ways that are 39% reliable, sensitive, specific, valid compared with 97% machine learning equations and computer tests, the only option is wider use of these tools in mental health, special education, human resources, and courts-police. If carefully applied without violating constitutional mandates, deaths, injuries, and expense is avoided. Current estimates of 5% use of machine learning equations and computer tests versus 95% of professionals using the 39% unreliable, insensitive, nonspecific, invalid human decision-making is likely why there is a steady increase in spree-shooters.

Continuing Education Licensing Requirements to Use Machine Learning Equations and Computer Tests

There must be mandatory continuing education and licensing requirements for use of machine learning equations and computer tests (Zagar *et al.*'s 2009, 2013, 2016, and 2019) to identify homicidal, mass-murdering, overdosing, sex-offending, suicide-completers. A Standard Predictor of Violence Potential test manual and two texts, one summarizing the math and another with case studies, are in preparation.

Impact on the Insurance industry

The insurance industry determines rates based upon claims projections. Those projections are based upon actuarial calculations using past loss data and models to project experience into the future. If this were solely the case insurance premiums would be just a pass through of claims costs plus insurance company expenses and profits. However, in commercial insurance in particular, another important factor is considered – risk management. Firms that proactively take actions such as employee training, product design, etc. realize lower premiums because the insurance industry has quantified the impact of numerous risk management activities. Many of these activities fall under the broad rubric of pre-loss loss control. Activities taken before events occur to eliminate or reduce the impact of losses. The data presented here should be considered important and exciting for the insurance industry. In most cases, losses due to shootings are paid, to a large extent, by insurers. Taking the simple steps outlined herein can help make claims expenses lower and more predictable (high degrees of variance make insurance pricing much more difficult). Insurance firms that include this type of testing and premium credits will be market leaders and be able to capture larger shares of business in many different lines of coverage

Machine Learning Equations and Computer Tests

Inexpensive reliable sensitive specific valid tools include the Pearson, PsychCorp, Behavior Assessment System for Children Third Edition (BASC-3) has 150 items for parents, teachers, and infants, children, teens, and adults from birth to 25 years for $5 US (2021 dollars) generating a 30-page report with diagnosis and treatment (Kamphaus and Reynolds, 2015a; 2015b). The Pearson MMPI-A/2 has 500+ items giving a 30-page report comparing the teen or adult with millions including personal, interpersonal skills, diagnosis, treatment, and probability outcomes for $50 US (2021 dollars) [Pope, Butcher, and Seelan, 2006]. The PAR Incorporated, Psytec, Child Abuse Potential Inventory is another test for adult violence risk with 150 items for 18 to 99 years with an objective, reliable, sensitive, specific, valid rating scale for shooter (Milner, 1986) with a one-page report. The Standard Predictor of Violence Potential, along with the MMPI-2/A, have a

combined specificity and sensitivity for deception, mental illness, substance abuse and violence of 0.97 (Zagar and Grove, 2010; Zagar, Kovach, Basile, Hughes, Grove, *et al.*, 2013) for homicidal, overdosing-substance-abusing, sex-offending and suicide-completers. The Standard Predictor of Violence Potential (SP) is an assessment of adults, with 96 true-false or multiple-choice format items and an Area under the Curve (*AUC)* = .99. The SP for Adolescents has 116 items with *AUC* = .91. The test-retest reliability was .75-.76 and Cronbach's alpha of .75-.78 with sensitivity of 97% and specificity of 97%. The SP evaluates specific, historical self- descriptions and requires 15 minutes to complete. The SP has no items from any of the other tests and is a free-standing instrument with 96 or 116 independent items, distinct from the other tests. This measure was successful in discriminating randomly selected violent oleanders (1,595 adults and 1,127 adolescents) from matched controls with *AUC* = .96 in a combined adult and adolescent version, based on a sample of 2,722 (Zagar and Grove, 2010). This *AUC* is noteworthy because most tests in the literature attempting to predict criminal recidivism or "return to court" have *AUCs* from .7 to .8 (Moosman, 2013). Psynetix is a ddeveloper of human behavioral analysis software and artificial intelligence designed to create better functioning business, finance, criminal, and counter-terror human personality profiles. Psynetix also develops predictive software to identify "Students of Concern" who might become violent on campus. The company's human behavioral analysis software fuses advanced mathematical and technical knowledge from top research institutions, along with decades of police investigative and military special operations experience to provide an innovative and highly efficient behavioral analytics, deep-learning program with actionable insights, enabling law enforcement, national intelligence and national defense entities to instantly identify and disrupt dangerous behavioral patterns before criminals and terrorists act.

Summary and Conclusions: Persistent Belief of Superior Human Decision-Making Is the Barrier to Entry

Kahneman (2011) discusses the persistence in bias and error in human decision-making despite concrete, evidence base scientific facts since Meehl in1965 showed actuarial statistical methods are an improvement over clinical judgment. When more professionals learn to use machine learning equations and computer tests, there will be a decrease in violence, whether the issue is spree-shooters, homicide, overdose, sex-offending, or suicide completion. Education of insurance chief financial officers, bishops, cardinals, and church chief financial officers in the use of machine learning equations and computer tests namely Psynetix and the Standard Predictor of Violence Potential, the math of machine learning equations and computer tests, and case studies of homicidal, mass murdering, overdosing, sex-offending, suicide-completers are available for weekend seminars in the USA and EU. There is hope for safer world where humans need not be afraid.

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