

- 2018 Student Paper of the Year -

Gun violence, related costs, medical implications,  
and promising interventions

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## INTRODUCTION

Gun violence in Chicago and the US as a whole has been very prominent in the news recently, owing to an increase in gun-related injuries and deaths throughout the country. In the US, there are more than 200 fatal or nonfatal victims of gun violence per day<sup>1</sup>, the number of fatalities from gun-related injuries is approximately the same as fatalities from motor-vehicle crashes<sup>2</sup>, and every year approximately 30,000 patients are hospitalized for gunshot wounds (GSW)<sup>3</sup>. The epidemic, as many researchers have called it, has been particularly prevalent in Chicago<sup>4</sup>. According to the Tribune's *Crime in Chicagoland* series, there were more shootings in January 2017 than there were in January of 2016, a record-setting year of its own. January 2018 has been more promising, with 103 fewer shootings recorded than 2017 as of January 28<sup>th</sup>, but the trend still exists<sup>2</sup>.

Much of the research devoted to gun violence and prevention has focused on modeling and predicting trends. One Chicago-specific study by Green et al. took the common epidemic comparison one step further. Being sociologists and data scientists, they attempted to model gun violence in the same way as they would an epidemic, applying theories of social contagion and assigning GSW victims to "networks" of social interaction. They found that from 2006 to 2014 in Chicago, 70% of all victims of gun violence were located in networks containing less than 5% of all the city's population, telling us that gun violence, though clearly highly prevalent in Chicago, is also highly localized. Not only that, their data suggested that the diffusion of violence does indeed follow an epidemic-like process of social contagion, i.e., it is spread from person to person by social interactions. Many programs that attempt to intervene and extinguish violence (for example, Cure Violence) take advantage of this "mode of transmission" and exert their efforts at the level of the person, victim or perpetrator, to control the spread. Such programs will be discussed at the end of this paper.

In another Chicago-specific study, it was determined that, from 2001-2009, GSWs were more likely to happen on Fridays and Saturdays, increased in frequency as maximum daily temperature increased, and were less likely to happen on rainy days. Also, in the US, 67% of deaths from non-accidental trauma were directly attributable to gun-related injuries<sup>5</sup>. Importantly, young black men experience rates of gun homicide 10 times higher than their white counterparts in urban communities<sup>4</sup>. The disproportionate effect of gun violence on particular populations makes this issue not only a health issue, but also an equity issue that deserves our attention and resources. This paper will begin by discussing the tangible: cost-effectiveness calculations in an effort to effect policy change. Following that will be the less tangible, but more patient-centered, human impact of violent trauma. The paper will

conclude with a summary of the goals and effectiveness of current hospital- and community-based intervention programs.

## COSTS

Unfortunately, due to a 1996 congressional appropriations bill, the funds allocated to the Center for Disease Control (CDC) for injury prevention cannot be used to advocate or promote gun control, which has led to a sparsity of funding for research about these issues. Between 1996 and 2012, funding for firearm injury fell 96%<sup>6</sup>; the decrease in funding has led to a decrease in publications, which has limited policymakers' ability to reference evidenced-based research in policy proposals. Compared with other leading causes of death, gun violence research is associated with less funding and fewer publications than predicted based on mortality rate<sup>7</sup>. In a recent interview, the former director of the CDC (Tom Frieden) was asked what the CDC's involvement in gun violence research should be; he said that requests to allocate more money have been made, but Congress has opted not to fund the research<sup>8</sup>. Given the current political climate in Washington, D.C., it does not seem likely that increases in funding will be made any time soon.

Though I wish that the sheer psychological impact of learning about the atrocities of gun violence would be an effective way to change policy, calculation of cost-effectiveness is often a more powerful course of action. There are many ways to attempt to calculate the total cost of a nonfatal gunshot wound. The following are some important questions to ask when considering any estimation: Did the injury result in hospitalization? What were the total medical costs? What were the societal losses (wage loss, ED transport, police reports, criminal justice, insurance claims processing, decreased quality of life)? What were the total follow-up costs?

Ted Miller, PhD, from the Pacific Institute for Research and Evaluation (PIRE) is an expert on calculating total costs of specific medical events. First, he considers direct costs, such as emergency services, police investigations, court and prison costs, and long-term medical and mental-health care. Second, he considers indirect costs, such as lost income, losses to employers, and impact on quality of life. Third, he acknowledges that outside of those two categories, there still exist deeper societal impacts: trauma to entire communities and the cost of societal fear<sup>9</sup>. Using this approach in a recent investigative article in *Mother Jones*, Miller calculated the total annual cost of gun violence in the US to be \$229 billion, more than the cost of obesity (\$224 billion). Of that total, only \$8.6 billion was spent on direct costs, underlining the significance of indirect costs on victims<sup>9</sup>.

## HUMAN IMPACT

While cost calculations are important, I am more interested in the human impact – what are the effects of violent trauma on patients and their families? A recent study from the UK conducted a comprehensive survey of the relationship between violent trauma and public health of a city. Using a postal questionnaire, they sought to answer the question “how does violence affect a person's health?” The results included psychological symptoms such as stress, sleeping difficulties, lack of confidence, and

depression. Altered behaviors included avoidance of certain places, of going out after dark, and of going out alone. Health effects included increased likelihood to seek medical treatment and greater odds of detrimental psychological health impacts<sup>10</sup>. This all might seem obvious, but it is important to take the time to quantify the likelihoods and tease out the most impactful effects.

Another method for analyzing the effects of gun violence on victims is to focus on what the victims themselves perceive as their biggest obstacles after experiencing a GSW injury. In a qualitative study of post-discharge needs of violently-injured patients, Patton et al. 2016 found that patient-cited needs fell into one of three categories: (1) institutional, (2) community, and (3) access. One, the patients felt the institutions often stigmatized them for being victims of gun violence and that they were discharged too soon. Two, they found that it was difficult to return back to their communities and to get transport to and from the trauma center for their follow-up care. Three, they felt they needed help with financial/insurance paperwork and more mental health counseling for themselves and their families<sup>11</sup>. I will focus on the third concern – mental health care, specifically post-traumatic stress disorder (PTSD).

Today, the definition of PTSD in the DSM-V requires 8 conditions: a stressor, intrusion symptoms, avoidance of trauma-related stimuli, negative alterations in cognitions and mood, alterations in arousal and reactivity, duration greater than one month, functional impairment, and exclusion of other causes. And while the classic image of a PTSD patient is a wounded soldier or survivor of a natural disaster, there is a growing body of evidence that PTSD can occur following personal assault, motor-vehicle accidents, rape, childhood physical and sexual abuse, loss of loved ones, and medical crises such as burns, cancer, and myocardial infarction. Estimates of life-time PTSD incidence is 20.4% in women and 8.2% in men, with higher rates in African Americans and Native Americans<sup>12</sup>.

At John H. Stroger, Jr. Hospital of Cook County in Chicago, researchers used the primary care PTSD screen to evaluate trauma patients and their families for symptoms of PTSD. Forty-two percent of the patients surveyed screened positive for PTSD. Patients with gun-shot wounds (GSWs) were 13 to 15 times more likely to screen positive than patients with fall injuries; of patients with GSWs, 52% screened positive for PTSD symptoms<sup>13</sup>. Looking at violent traumatic events specifically, a 2006 survey assessed the psychosocial needs of African American 10-18 year olds who had come to the ED with violent interpersonal injuries. They found that one of their most significant needs was accurate assessment in the ED of future psychosocial care to be able to provide effective follow-up care after discharge<sup>14</sup>.

One study examined the relationship between PTSD and loss of physical functioning, demonstrating that the two are related in a reciprocal way: early symptoms of PTSD predict lower levels of physical functioning and early low levels of physical functioning predict more symptoms of PTSD<sup>15</sup>. Clearly, after traumatic GSW injuries, patients and families experience psychosocial distress at high rates and this can impair their ability to lead normal, healthy, and productive lives.

## HOSPITAL-BASED INTERVENTION

For years, physicians have been writing about the need for gun violence control and prevention. This is likely because they see the outcomes of this violence firsthand. Doctors have a front row seat to the chaos of emergency rooms after shootings, the devastating wounds caused by high-caliber assault rifles, and the panicked families and friends of victims. Fortunately, the AMA is the fourth-largest lobbyist in the country, giving it the power to have a real effect, but only if it makes gun violence research a priority (*Nature Editorial*, 2016). As stated above, we will need to continue finding ways to fund research about the best strategy to combat gun violence from the medical perspective; that strategy should start from when the patient enters the hospital with a GSW and not end until they have healed and have an executable plan for their future healthcare needs.

Many trauma centers have specific protocols for the discharge of violently-injured patients. Low-input ones called standard risk reduction strategies include standard counseling and referrals. High-input ones called hospital-centered violence intervention programs (HVIPs) include intensive case management services. The standards by which those programs are measured are generally health outcomes and recidivism of violent injury and criminal justice, and they have been found to be successful clinically<sup>16</sup>. A recent study measured the cost-effectiveness of HVIPs versus standard risk reduction strategies and found that HVIPs do indeed lower total costs, as measured by recidivism rates and re-hospitalization charges<sup>17</sup>.

As we know, the emergency room provides a golden opportunity to intervene in the lives of victims of gun violence and studies have shown that intervention can improve patient outcomes<sup>18,19</sup>. One group that is working to do that is *Healing Hurt People Chicago*, currently run out of John H. Stroger Jr. Hospital of Cook County and Comer Children's Hospital. It is modeled on the original *Healing Hurt People* program developed by emergency room physicians at Drexel University School of Medicine (John Rich, MD; Ted Corbin, MD; Sandy Bloom, MD). Their stated goals are to take advantage of the "teachable moment" that accompanies violent injury and interrupt the cycle of violence by treating trauma-related emotional and behavioral dysregulation<sup>13</sup>. We refer to this kind of medical care as "trauma-informed care."

There are 5 pillars of trauma-informed care. They are: (1) safety, (2) screening, (3) understanding context, (4) avoiding re-traumatization, and (5) discharge planning. Safety is a basic human necessity and violent trauma can abruptly destabilize a patient's feeling of safety. Screening is necessary to identify trauma-exposed patients who may not want to bring up their traumatic experience. Understanding the context of the patient's trauma is key to understanding their response. Avoiding re-traumatization avoids the triggers involved with PTSD. And discharge planning provides a framework for follow-up after leaving the hospital. There are many examples in the literature about why trauma-informed care should be understood by physicians, especially in emergency and primary care settings<sup>20</sup>.

A recent article by Green et al. in *Family Medicine* describes how continuing medical education (CME) can be an effective way to further train physicians in trauma-informed care. In their study, 30 primary care residents were graded on their patient-centered interactions with standardized patients to

acquire a baseline, with the actor's script describing a violent, traumatic experience. The residents were then trained in patient-centered care. Their post-training scores were higher than their pre-training scores, indicating that the CME program improved their interactions with patients<sup>21</sup>. This study is important because it is the first in the literature to test CME training of primary care physicians with a focus on trauma, thus providing us with information on (1) the training process and (2) the process of evaluating that training. The paucity of existing research is of course due to the fact that trauma and violence research is chronically underfunded.

## COMMUNITY-BASED INTERVENTION

Being a city with a high incidence of violent crime, Chicago also has numerous programs aimed at reducing that crime. In 2009, a movie was released called *The Interrupters*, which was an exploration of a program called CeaseFire (now Cure Violence) that has its roots in Chicago. CeaseFire was started in 1995 in conjunction with the Chicago Project for Violence Prevention (CPVP) by physician-epidemiologist Gary Slutkin, who at the time led the World Health Organization Intervention Development Unit and was a Professor of Epidemiology and International Health at the University of Illinois/Chicago School of Public Health. CPVP was also associated with U of I's school of public health. The CeaseFire initiative began in West Garfield Park and reduced shootings by 67% in its first year<sup>22</sup>.

Today, the core values of the program as a whole are in line with the epidemic theory of gun violence: interrupting transmission directly, identifying and changing the thinking of potential transmitters (i.e., those at highest risk of perpetrating violence), and changing group norms regarding violence. Staff work with at-risk individuals one-on-one and also participate in public demonstrations, education campaigns, and post-shooting vigils. In addition, "Violence Interrupters" are people from the local community who are trained to mediate impending or ongoing street conflicts before a shooting occurs. They have been said to be the major impactful unit of the program<sup>23</sup>.

In 2013, Whitehill et al. examined street conflict mediation using the original Chicago CeaseFire program as an example along with the Baltimore Safe-Streets program (an adaptation very similar to CeaseFire) by holding a focus group of the Violence Interrupters. Participants (the violence interrupters) from Chicago were mainly males in their 40s, 80% were previously incarcerated, and 100% had resided or hung out in the target neighborhood. The main point that they cited as crucial for the program's success was credibility, described as "a combination of trustworthiness, authenticity, and an ability to relate to high-risk individuals and community members"<sup>24</sup>.

All evidence indicates that the program is phenomenally effective. In an evaluation by Skogan et al. in 2009, CeaseFire implementation caused a 31% greater decrease in homicides and a 19% greater decrease in shootings compared to control districts<sup>25</sup>. Due to its success, the program (or an adaptation of the program) has since expanded to many cities throughout the country including New York, Philadelphia, Baltimore, Pittsburgh (adaptation) and Phoenix (adaptation). This is a very promising answer to the question of when and where to provide intervention and of who has the ability to do it.

For the most part, medical professionals and students, such as myself, at Rush and other institutions cannot gain the same credibility as the Violence Interrupters in these communities. So how can we get involved? Medical school curriculums all over the country are lacking in education on topics of caring for patients who are victims of violence, so any exposure comes from extra-curricular groups. I am one of the co-leaders of the Students Against Gun Violence group at Rush Medical College, which provides the funding for us to bring in speakers and support mentorship programs. We organize events to raise awareness about topics such as trauma-informed care and intervention programs. Recently, we have gotten involved with the Precious Blood Ministry of Reconciliation. There, a widely-loved nun, Sister Donna Liette, supervises programs offered to young men who have been victims of gun violence in the Back of the Yards neighborhood. Their goal is simple – to show these young men that they are cared for and supported – and it has worked. Our role there will be to help out at events and mentor some of the participants. Another point of impact that medical students can access is reaching out to political leaders to voice opinions.

More broadly, we need to use our role in the community to continue to call for increases in funding for research into treatment and prevention of gun violence. As outlined in this paper, major effects on patients have been identified, as well as major intervention programs. Treating gun violence as an epidemic and looking at it as a multi-faceted issue will help us further identify the multi-faceted approach that can eventually control its spread. There are cost-effectiveness reasons and medical system implications that give economists, sociologists, physicians, and data scientists all a basis for figuring out how to make gun violence less prevalent, to make communities safer, and, in the end, to improve lives.

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