

Suicides and Self-Injury by Firearm Pennsylvania, 2000-2006



This report is supported by cooperative agreement #U17/CCU324804 from the Centers for Disease Control and Prevention (CDC). The content is solely the responsibility of the authors and does not necessarily represent the official views of the Centers for Disease Control and Prevention.

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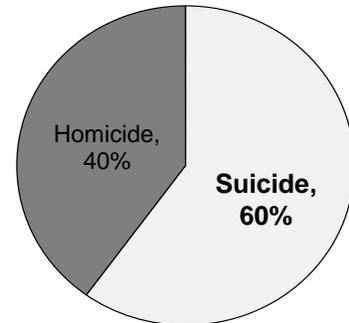
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Executive Summary:

Most victims of gun violence are not killed by strangers but by themselves. Suicide by firearm represents a major public health issue, and one that does not often receive due attention. Suicide by firearm is the number one violence-related cause of death in Pennsylvania. Firearms are the leading mechanism of suicide, with over half of male suicides in the state using a firearm. In this report we examine the problem of firearm self-injury and suicide using data from death certificates as well as hospital discharges. Our data sources cannot provide the full story behind a suicide, but we may begin to learn the contours of the problem in terms of public health.

**Violent Deaths by Firearm,
PA 2000-2006** [▽]



Firearm self-injury and suicide rates have remained largely stable from 2000 to 2006. Across all age groups, rates are higher for males than for females and rates are higher for rural males than for urban males. Males age 75 and older show the highest rates of suicide overall, and significantly higher rates for firearm suicide than younger males. However *counts* of firearm suicides are higher among males age 45 to 54 than among all males over age 70 combined. Whites showed higher rates of firearm suicide than other racial and ethnic groups. Consequently the distribution of firearm suicides is comprised largely of white males, with a median age of 48.

Nearly five thousand Pennsylvanians killed themselves by means of firearm between 2000 and 2006, although this number represents a very narrow perspective on the act of suicide. The victim must first make the decision to self-injure, choose a method of self-injury and finally execute the act – to whatever outcome follows. Approximately 9 out of every 100 people who used a firearm to self-injure died of their injuries. We do not know what causes a person to self-injure, nor do we know what determines the outcome of self-injury. Our data can, however, show us who uses firearms the most, adding another dimension to our analysis.

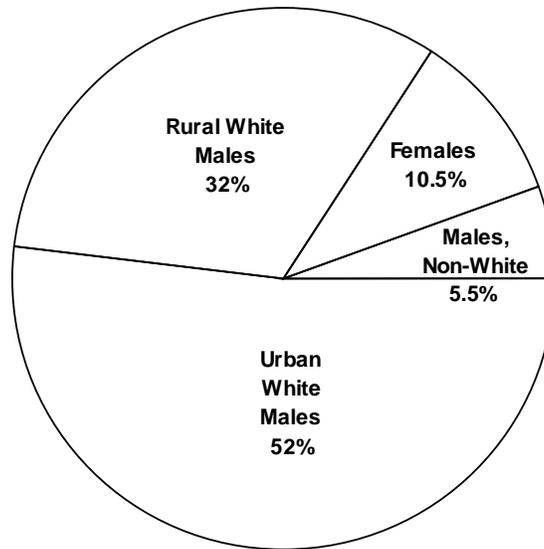
Among rural white males over the age of 70, firearms are the most common method of self-injury (for most demographics, poisoning is the most common method by far). White and Asian males show the highest percentages of self-injury using a firearm. Hispanics self-injure the most, but they use firearms for self-injury the least of any demographic group. Whites show the highest rates of using firearms for self-injury. When firearms are commonly used suicide rates tend to be higher, owing to the inordinately high percentage fatality of firearms. When used for self-injury, firearms afford little opportunity for error or intervention in the suicide attempt.

This monograph describes the extent of the firearm suicide problem within Pennsylvania. Important to note is that the consequences of suicide, as with other violent deaths, extend beyond the immediate victim. Entire communities can be shaken by the sudden loss, and survivors (those who lose a loved one to suicide) outnumber suicide victims by a wide margin. The social impacts of suicide are difficult to measure and will not be addressed here. Nor will we prescribe solutions to the problem of self-injury. Our goal is to provide perspective by situating suicide in context of the data. With this shared understanding we hope to move forward in the field of prevention.

Suicides and Self-Injury by Firearm in Pennsylvania

Firearm self-injury is an important public health problem. Suicide by firearm is Pennsylvania’s fourth leading cause of injury-related death, after motor-vehicle traffic accidents, unintentional poisonings and unintentional falls. Suicide by firearm is the number one violence-related cause of death in Pennsylvania, with homicide by firearm as the second violence-related cause overall.

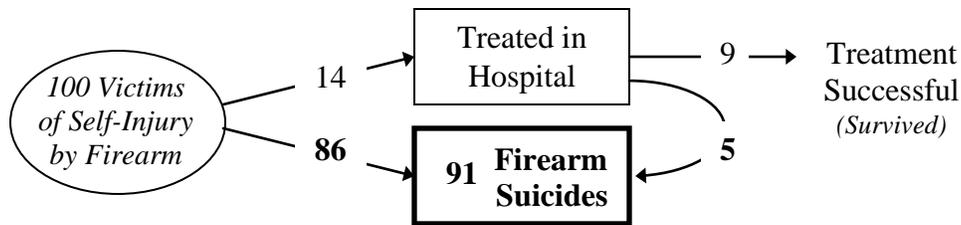
Figure 1: Firearm Suicides, PA 2000-2006 [▽]



As we can see in Figure 1, the distribution of firearm suicides leans heavily toward white males. Urban white males comprise approximately one half of all firearm suicides, rural white males comprise approximately one third and females and non-white males – collectively – one sixth.

The distribution of *non-fatal* firearm self-injuries differs slightly, with females comprising 18 percent of non-fatal inpatient hospitalizations for firearm self-injury. However less than 500 non-fatal self-injuries by firearm were recorded over the 2000-2006 period, while suicides by firearm numbered ten times that many (nearly 5,000). Figure 2 illustrates both outcomes.

Figure 2: Outcomes of Self-Injury by Firearm, PA 2000-2006 ^{▽⊕}

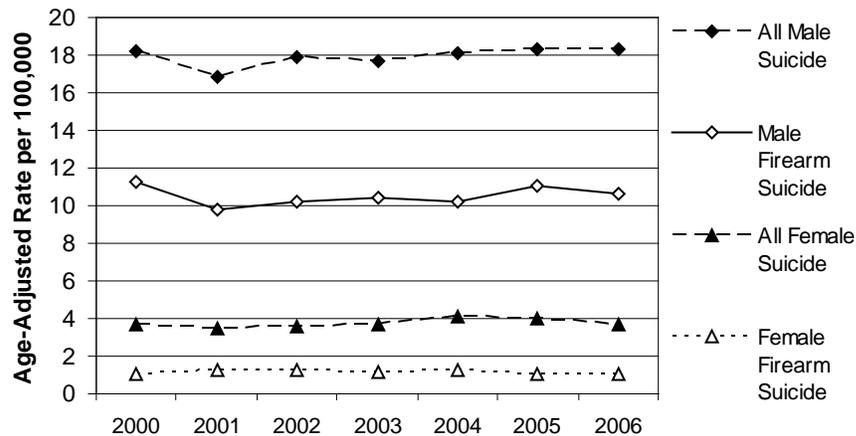


As we see here, most people who use a firearm to self-injure will become suicides. Given this information, we will focus most of our attention on firearm suicides.

[▽] Source: PA Vital Statistics
[⊕] Source: PHC4

Rates of suicide by firearm and suicide overall remained stable for both genders over the period 2000-2006. The male age-adjusted firearm suicide rate, at 10.5 suicides per 100,000 population, is nine times the firearm suicide rate for females. This gender discrepancy in firearm suicides is greater than among suicides overall, where males outnumber females 4.5 to 1.

Figure 3: Age-Adjusted Suicide Rates by Gender and Year, PA ▽

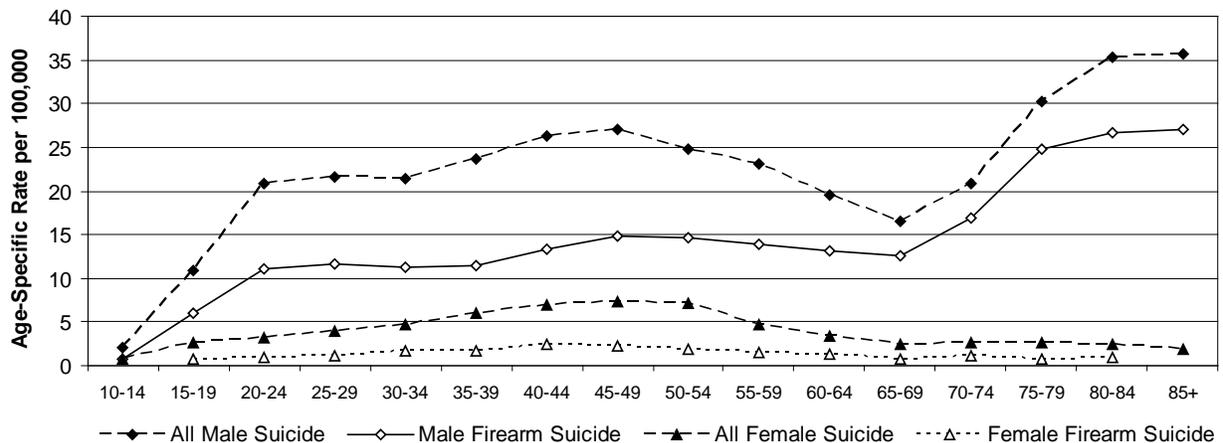


As we may infer from Figure 3, in every year from 2000 to 2006 over half of all male suicides in the state used a firearm. In fact, only eleven (mostly urban) counties in PA showed less than half of all suicides using firearm¹. Among older males, however, the percentage is much greater. Three out of every four suicides by PA males over age 65 used a firearm.

Rates of firearm suicide exhibit less variation across the lifespan than rates of suicide overall, as shown in Figure 4. After leveling off at age 20, male firearm suicide rates stay fairly stable, peaking slightly at ages 45-49, before increasing dramatically after age 70.

Males age 75 and older show the highest rates of suicide overall, and significantly higher rates for firearm suicide than younger males. Important to note is that while elderly males suffer the highest *rate* of firearm suicide, they comprise less than ten percent of the male population. Males ages 45 to 54 account for more firearm suicides than all males over age 70 combined.

Figure 4: Suicide Rates by Gender and Age, PA 2000-2006 ▽



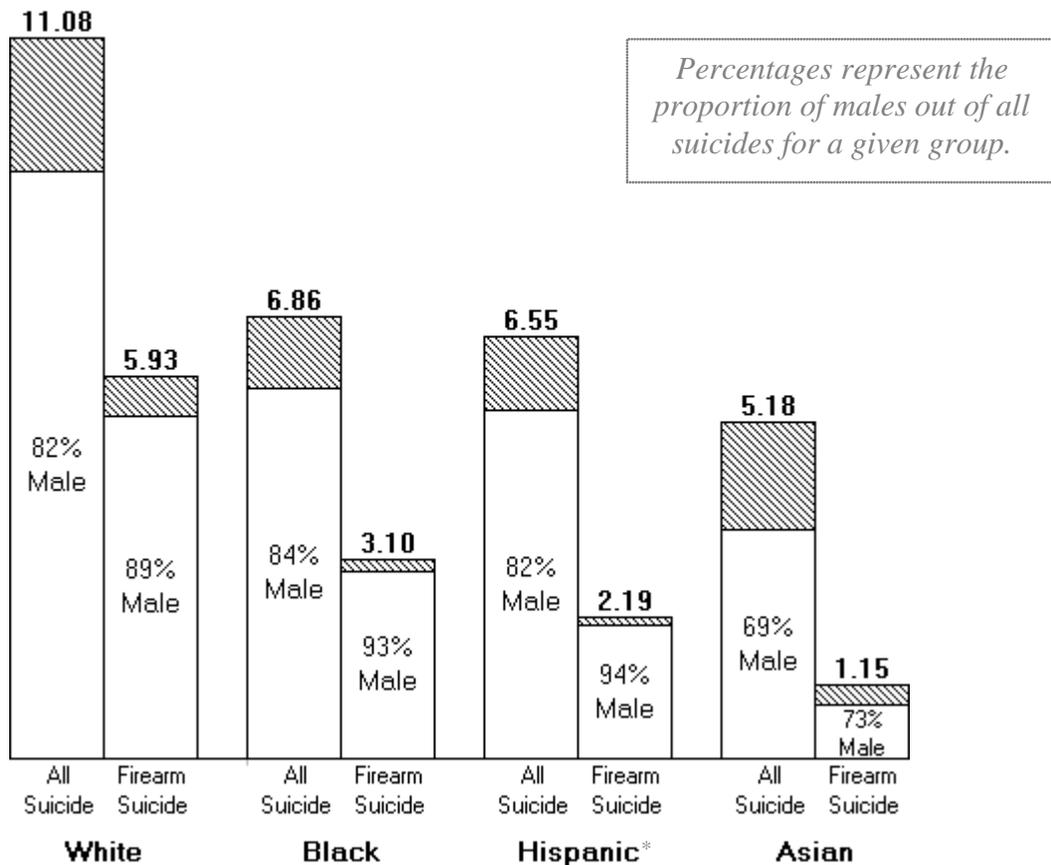
▽ Source: PA Vital Statistics
 ⊕ Source: PHC4

Suicide by Race and Ethnicity:

Males predominate among suicides for all racial and ethnic groups, and comprise an even larger majority among suicides by firearm. Firearm suicide victims are far more likely to be male.

Figure 5: Age-Adjusted Suicide Rates by Race and Ethnicity, PA 2000-2006 ▽

(Rates, in **bold**, are per 100,000 population)



As illustrated in Figure 5, whites show the highest rates of firearm suicide and suicide overall – significantly higher rates than other racial and ethnic groups. Notably, *firearm* suicide rates for white males are not significantly different than *overall* suicide rates for black or Hispanic males.

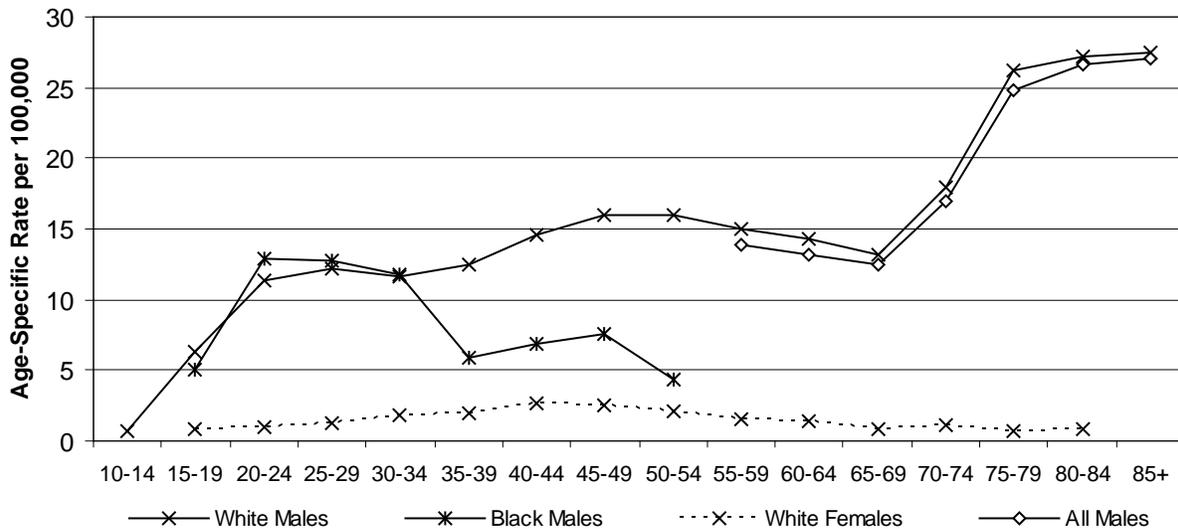
5 out of every 6 firearm suicide victims in Pennsylvania over 2000-2006 were white males.

Whites also show the highest proportion of suicides using a firearm. Over half (55 percent) of all suicides by whites used a firearm, while other racial and ethnic groups used firearms for suicide less often. 45 percent of suicides among blacks used firearms, compared to 33 percent for Hispanics and 26 percent for Asians.

Note: Because firearm suicide data is dominated by white males and Pennsylvania’s population is largely white, few other demographic groups offer enough data to produce rates. Only black males and white females experienced enough firearm suicide during the seven years from 2000-2006 to enable further analysis.

Although whites show higher male firearm suicide rates than blacks overall, the difference is not uniform across the lifespan, as shown in Figure 6. From age 15 until age 35 firearm suicide rates among black males are not significantly different from firearm suicide rates among white males.

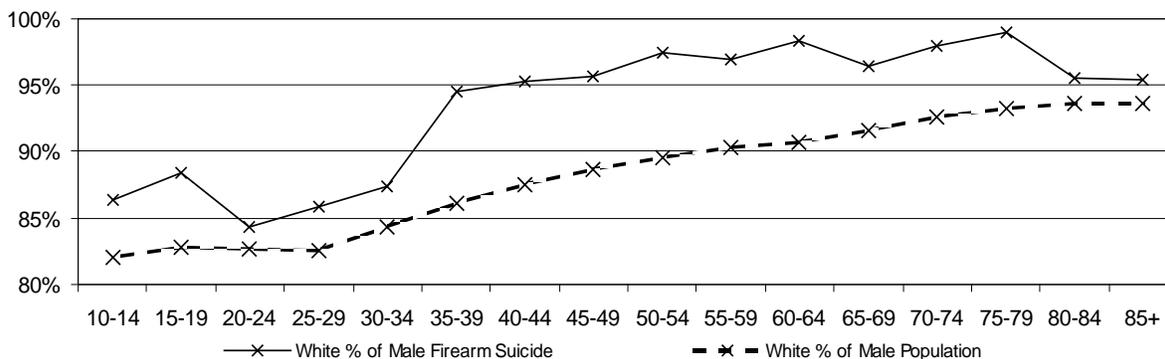
Figure 6: Age-Specific Rates of Firearm Suicide by Race and Gender, PA 2000-2006 ▽



There are not enough events for black males age 55 and older to calculate rates. Nonetheless, we may observe race trends in older age groups indirectly by comparing the white firearm suicide rate to the overall firearm suicide rate. In Figure 6 the overall rate for ages 55 and older can be seen to be below the white rate – evidence that white rates remain higher throughout later years.

Since whites comprise the majority of Pennsylvania’s population, state rates for suicide and self-injury by firearm closely mirror the rates shown by Pennsylvania’s white population.

Figure 7: Whites as Percentage of Male Firearm Suicide vs. Whites as Percentage of Male Population, PA 2000-2006 ▽



Note: The white firearm suicide percentage in Figure 7 is closely tied to the black firearm suicide rate in Figure 6.

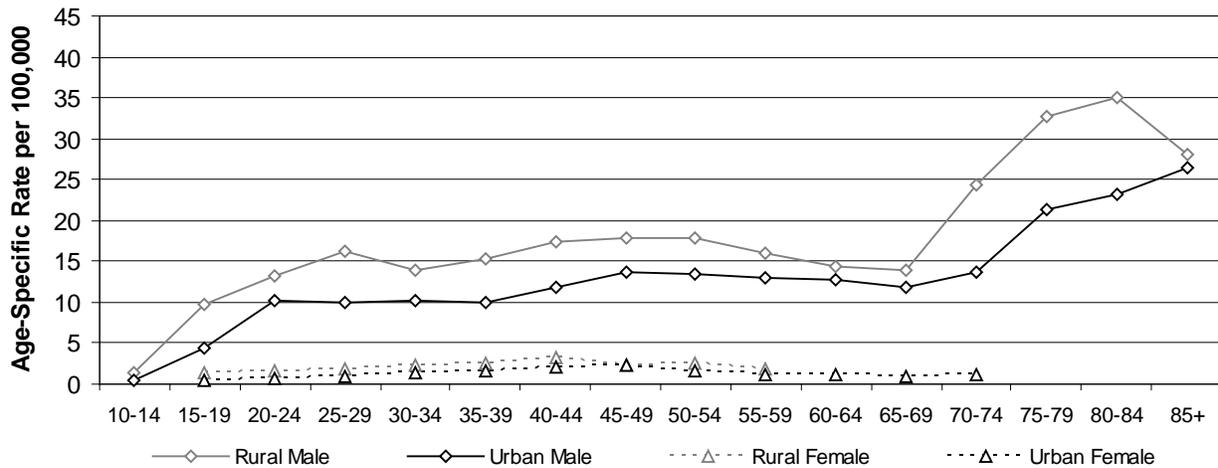
As can be drawn from Figure 7, whites comprise a disproportionate number of the male firearm suicides in Pennsylvania. After age 40, over 95 percent of male firearm suicides are by whites.

Suicide in Urban and Rural Populations:

More revealing than trends among races and ethnicities are the trends between urban and rural regions. We use the Center for Rural Pennsylvania’s definitions of urban and rural counties, based on population densityⁱⁱ. Age-adjusted rates of firearm suicide are higher in rural regions for both genders; with rates of 13.3 for rural males and 1.5 for rural females (per 100,000) compared to 9.4 and 1.0 (per 100,000) for urban males and females, respectively.

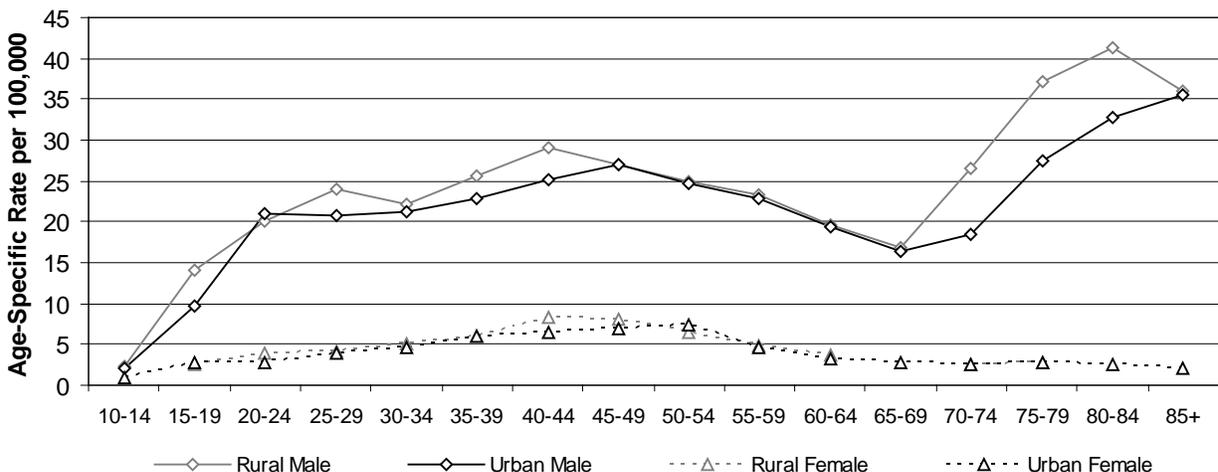
Rural male firearm suicide rates are higher than urban male rates in all age groups, as shown in Figure 8, and are significantly higher for all age groups except ages 55-69 and ages 85 and older.

Figure 8: Age-Specific Firearm Suicide Rates by Urbanization, PA 2000-2006 ▽



Overall suicide rates are similar between urban and rural regions across much of the lifespan. Rural rates are significantly higher only for males ages 15-19 and 70-79, as shown in Figure 9. As with firearm suicides, the late-life increase in overall suicide rates for rural males begins earlier than for urban males – at age 70 instead of age 75.

Figure 9: Age-Specific Suicide Rates by Urbanization, PA 2000-2006 ▽

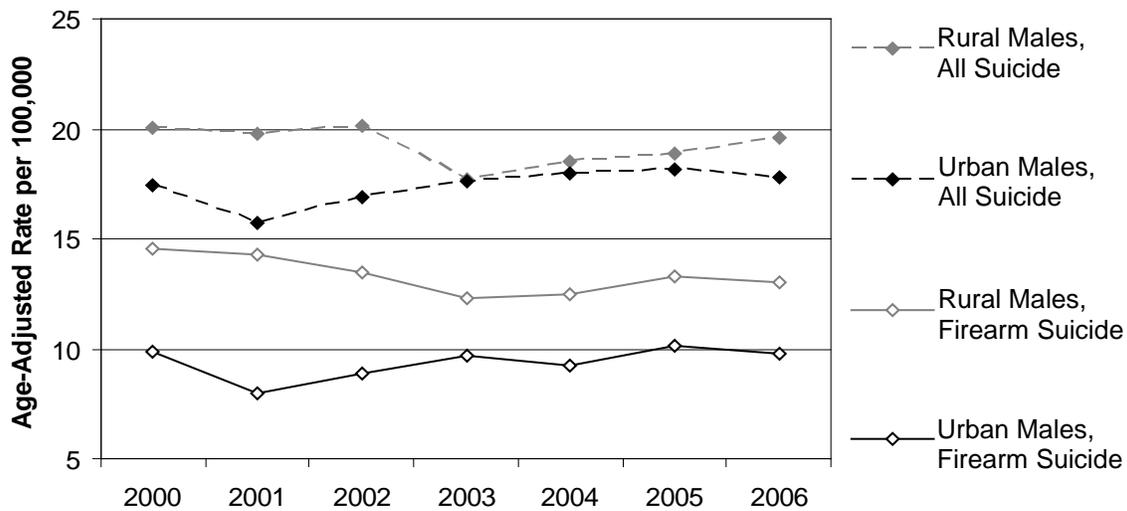


Smaller gaps between urban and rural rates in suicide overall (versus firearm suicide) suggest that urban regions experience higher suicide rates using some other method(s).

▽ Source: PA Vital Statistics
⊕ Source: PHC4

Both urban and rural firearm suicide rates for males appear to be fairly stable over time. Among male firearm suicide, rural rates are significantly higher for 2000-2006. For male suicide overall, rural and urban rates are not significantly different after 2002. Again, differences in urban and rural rates of male firearm suicide are greater than the differences in male suicide rates overall.

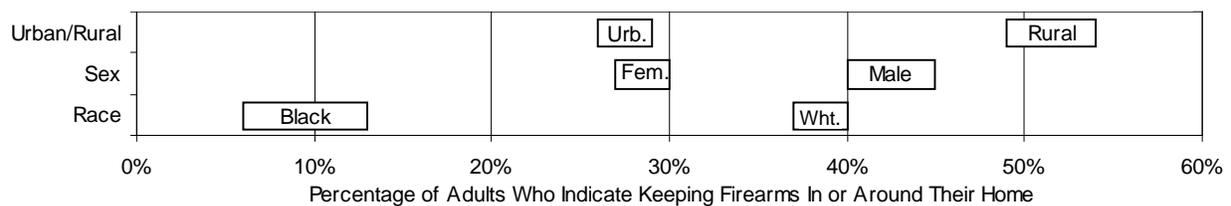
Figure 10: Age-Adjusted Male Suicide Rates by Urbanization, PA ▽



Why do rural males show markedly higher rates of firearm suicide, but not suicide overall?

We may begin to answer this question by looking at data from Pennsylvania’s 2004 BRFSS*ⁱⁱⁱ. Asked if firearms are kept in or around their home, over half of responding rural adults (51%) indicated keeping firearms, compared to only 27% of responding urban adults. As with trends in firearm suicide, adult males indicated keeping firearms more often than adult females and white adults more often than black adults, shown in Figure 11. Access to firearms is one of the many factors leading to firearms being used by someone attempting self-harm.

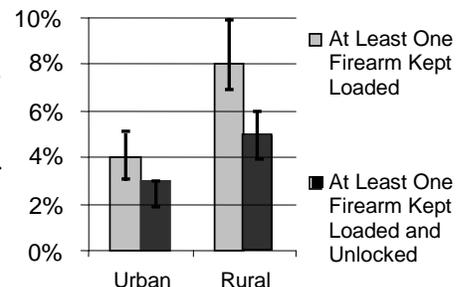
Figure 11: 95% Confidence Intervals for ‘Yes’ Answer to Firearms Question on 2004 BRFSS



Unlike male firearm suicide, possession of firearms among males does not increase in later life. While ages 30-44 and 45-64 report significantly higher firearm possession than that reported by ages 18-29, ages 65 and older report the least of all.

Rural adults also reported significantly higher percentages of keeping loaded firearms, and of keeping firearms loaded and unlocked compared to urban adults, as shown in Figure 12.

Figure 12: 2004 BRFSS Data

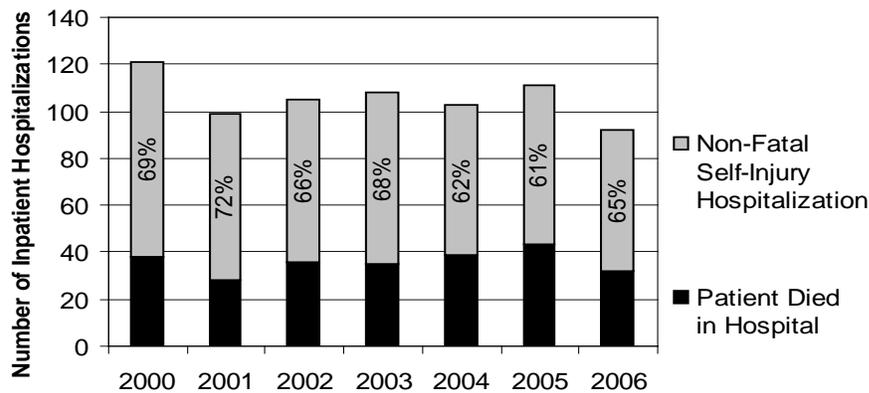


* Behavioral Risk Factor Surveillance System, see endnote for further explanation.

Inpatient Hospitalization: An Unintended Outcome

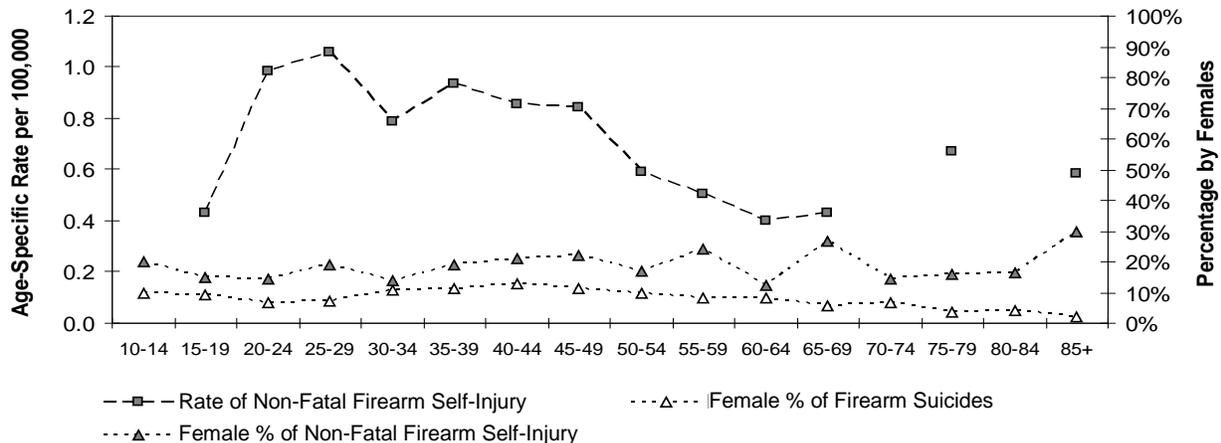
Self-injury by firearm does not always result in immediate death. 739 people were recorded as inpatient hospitalizations in PA for self-inflicted injury by firearm over 2000-2006. Of those hospitalized, 488 survived treatment while 251 did not survive – to be recorded as a suicide^{iv}. The percentage surviving an inpatient hospitalization for firearm self-injury has not improved from 2000 to 2006, as can be seen from Figure 13. Only two out of every three inpatients survived treatment for a self-injury by firearm, compared to nine out of ten for hanging and drowning, or up to 99 percent for self-injuries by either poisoning or cutting.

Figure 13: PA Inpatient Hospitalizations for Self-Inflicted Injury by Firearm[⊕]



The age distribution of survivors of firearm self-injury, as shown in Figure 14, largely mirrors that of firearm suicides. Both distributions are bimodal and males comprise the large majority.

Figure 14: Rate of Non-Fatal Inpatient Hospitalization for Self-Inflicted Injury by Firearm, PA 2000-2006^{▽⊕}



However, the late-life peak for non-fatal self-injury by firearm is *lower* than the earlier peak, whereas for suicides by firearm the late-life peak is at a *higher* rate than the former. Also, a larger fraction of non-fatal firearm self-injury is completed by females. Still, at less than one event per 100,000, rates of non-fatal firearm self-injury are generally much lower than firearm suicide rates, even compared to the low female rate of firearm suicide.

▽ Source: PA Vital Statistics
 ⊕ Source: PHC4

Cost of Inpatient Hospitalizations for Self-Injury by Firearm: ⊕

In addition to the human costs of these inpatient hospitalizations, firearms self-injuries carry a considerable financial toll. With a median charge of over \$30,200 per inpatient hospitalization, firearms show the highest median hospitalization charges of any leading self-injury method[∇]. Charges for firearm self-injury inpatient hospitalizations over 2000-2006 exceeded \$57 million.

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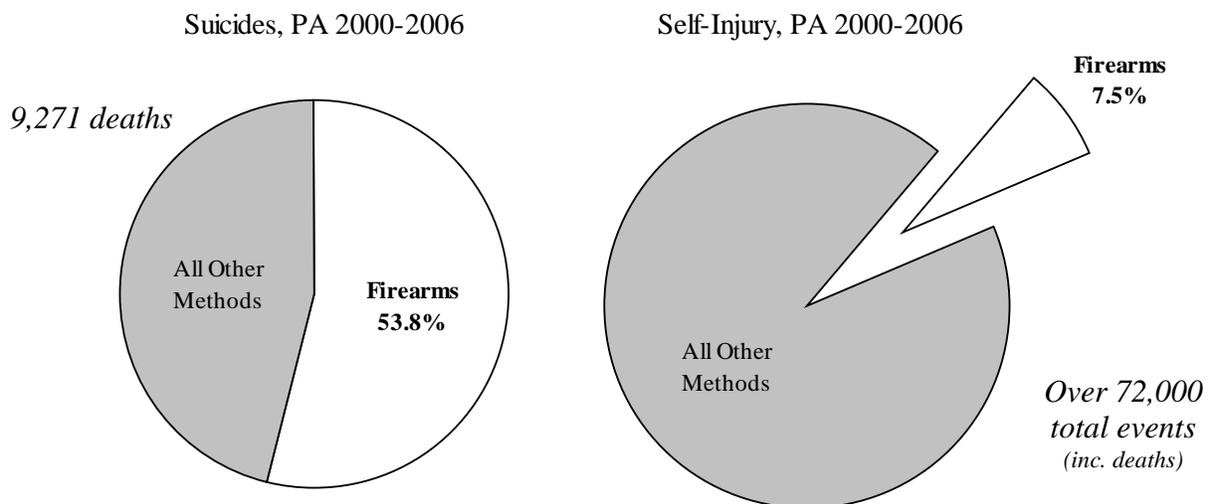
Perhaps the most striking feature of non-fatal firearm self-injury hospitalizations is not the cost but their relative scarcity, at least compared to the number of firearm suicides. Over 2000-2006, PA suffered over ten firearm suicides to every one non-fatal self-injury inpatient hospitalization. In reality, however, these two events merely represent different outcomes of the same underlying behavior – a decision to self-injure and the subsequent decision to use a firearm. Our data cannot show why people self-injure, but we can identify those groups most likely to use a firearm.

If we combine the number of fatal self-injuries (suicides) with the number of non-fatal inpatient hospitalizations for self-inflicted injury we get an estimate of the total number of self-injuries by a particular method. We shall use ‘self-injury’ to refer to this composite measure. Note that our definition of self-injury, using only inpatient hospitalization records and death files, excludes all emergency department visits that did not end in an inpatient hospitalization and any self-injuries that did not require treatment. Our estimate may be most accurate for firearms, as non-fatal self-injuries by firearm would likely require hospital attention.

We may now move beyond mere tabulation of hospitalizations and deaths to see firearms in a meaningful context – contrasting use of firearms against other self-injury methods. As we shall see, using a firearm represents an ominous decision.

While our self-injury estimate probably undercounts non-fatal events, we can assume suicide numbers (fatal self-injuries) to be accurate to the level of coding accuracy. We may therefore decisively conclude that more Pennsylvanians used a firearm to kill themselves than used *all other methods combined* during the 2000-2006 period. Yet Figure 15 shows firearms comprise only a small part of self-injury overall. Why are firearms so prevalent among suicides but not among self-injury as a whole?

Figure 15: Suicide and Self-Injury by Method ∇⊕

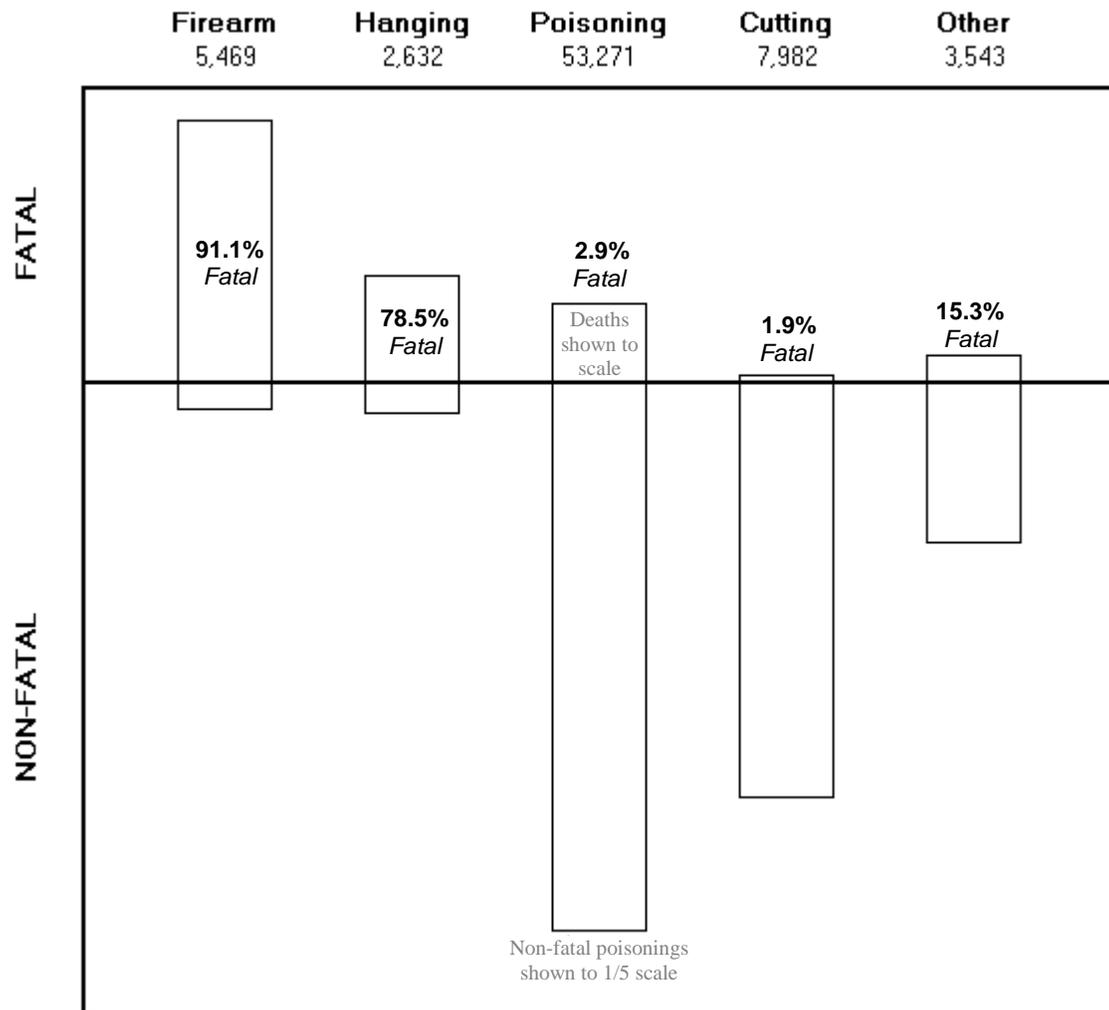


∇ Source: PA Vital Statistics

⊕ Source: PHC4

A Uniquely Lethal Mechanism:

Figure 16: Self-Injury by Method and Outcome, PA 2000-2006 [∇]⊕



Firearm self-injury is special compared to self-injury by other methods in that the vast majority of outcomes are fatal. We refer to this fatal proportion of self-injuries as the fatality percentage.

$$\text{Fatality \% (for a method of self-injury)} = \frac{\text{Number of suicides (fatal self-injuries) by this method}}{\text{Number of self injuries by this method, whether fatal or not}}$$

Figure 16 illustrates this measure. Since we probably underestimate non-fatal self-injury – in the denominator – for methods other than firearms, our fatality percentages likely are *overestimates* for these methods. Even so, firearms show the highest fatality percentage of common self-injury methods^{vi}. Yet we must take care not to interpret this measure with regards to suicidal intent.

Not all self-injurers bear the same intention. Fatal self-injuries may not have been intended as suicides, while some non-fatal self-injuries may have had suicidal motivations. We have no way of determining intent; therefore we limit our fatality discussion to arithmetic observations.

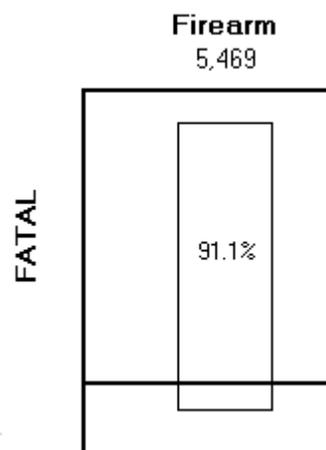
[∇] Source: PA Vital Statistics
[⊕] Source: PHC4

Some may question our use of a single percentage to summarize fatality of a self-injury method, when the intentions of a self-injurer often play a large role in the outcome of the event. Indeed, fatality does vary depending upon the characteristics of the self-injurer. Males display a higher fatality percentage than females across all methods. Likewise, self-injurers over age 50 show a higher fatality percentage than those under age 50 for firearms as well as most other methods^{vii}.

Still, there is little room for subtlety in the context of self-injury by firearm. Whether impulsive or deliberate, what happens after the trigger is pulled is unfortunately clear. Over 90 percent of firearms self-injuries during 2000-2006 resulted in death. Only five percent of fatal firearm self-injuries came after an inpatient hospitalization. By comparison, over 18 percent of fatal poisoning self-injuries had been treated in a hospital before dying.

Having the highest fatality percentage means that if people using firearms for self-injury instead use any other method, we expect overall numbers and rates of suicide to decrease.

Excerpt from Figure 16



To the extent that fatality stems from the method rather than the individual, choice of method can ultimately determine the outcome of a self-injury. By one estimate, if all who used firearms for self-injury during 2000-2006 had instead used another method, the number and rate of suicides could decrease significantly – as much as forty-five percent^{viii}. In raw terms, over 4,200 suicides conceivably might have survived their self-injury and Pennsylvania would have very nearly met the Healthy People 2010 goal of reducing suicides from 10.5 to 5.0 per 100,000 population.

...

More important than hypothetical situations, however, are the practical implications of firearms' high lethality. Consider two populations, each of which experiences the same fatality percentage by method as observed in Pennsylvania over 2000-2006. The first population has an inordinately high self-injury rate – 1,000 events per 100,000 – while the latter population has a more typical rate of overall self-injury – 70 events per 100,000. Nevertheless, both suffer the same incredibly high rate of suicide, at 64 suicides per 100,000. Figure 17 shows how this might be possible.

Figure 17: Example Applying Percentage Fatality, PA 2000-2006

<i>Each Population = 100,000</i>	Case 1:	Case 2:	
Number of Self-Injuries:	1,000	70	Case 1) Suicide rates are high because <i>overall rates of self-injury are high</i>
% Choosing Firearms:	0%	100%	Case 2) Suicide rates are high because <i>highly lethal means are utilized</i>
Number of Suicides:	64	64	

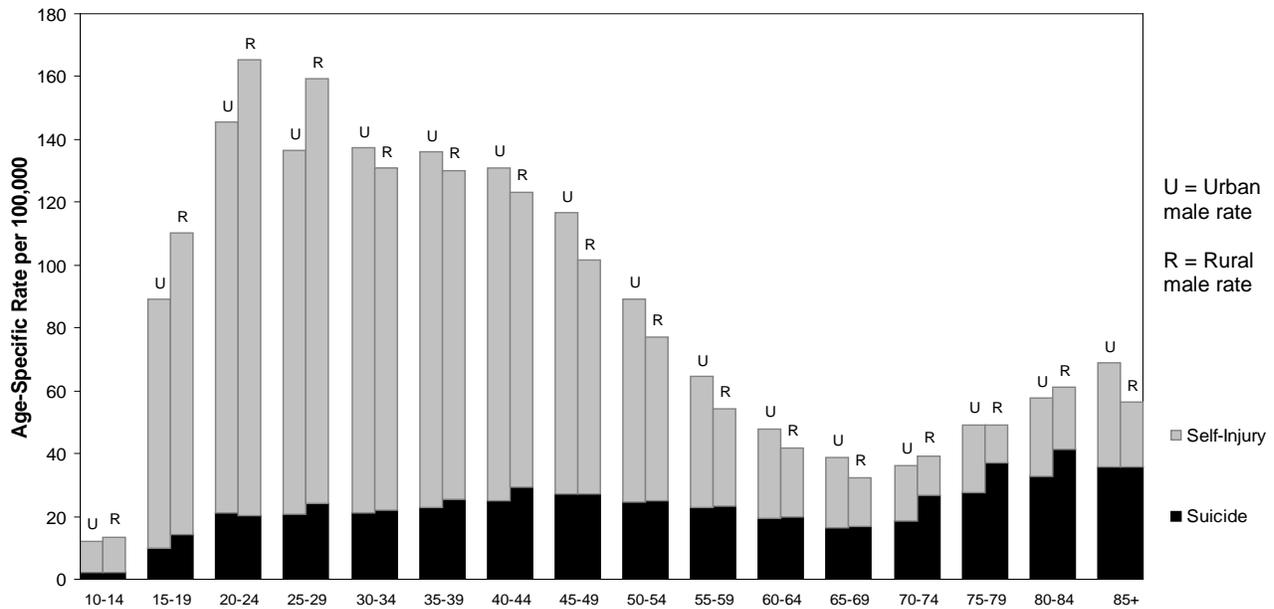
In the first case overall percentage fatality is 6.35% because no one uses firearms for self-injury. Yet in the second case overall percentage fatality is 91.1% since all self-injurers use a firearm. While exaggerated for effect, these cases illustrate a corollary of firearms uniquely high lethality; suicide rates may not be the result of self-injury at large but rather may follow choice of method.

If a high suicide rate is observed, it is important to know what combination of the two scenarios is at work. Each represents a different public health problem and requires a different response.

▽ Source: PA Vital Statistics
⊕ Source: PHC4

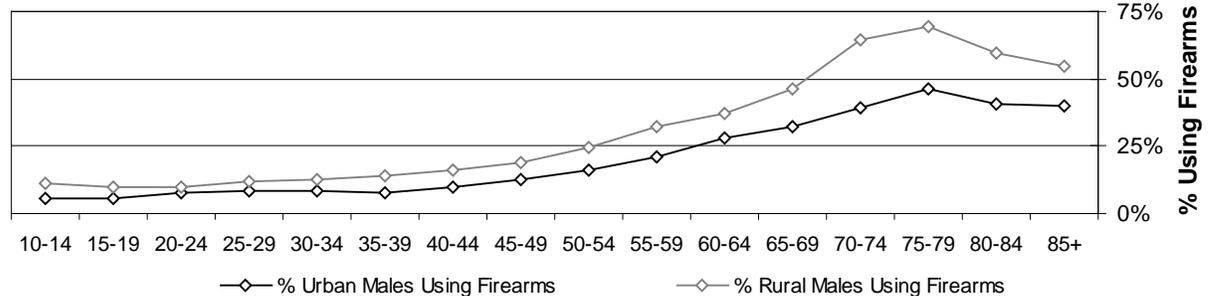
For a more realistic application, where the percentages of self-injury using a firearm lie between 0 and 100 percent, we compare suicide trends for males in urban and rural Pennsylvania.

Figure 18: Self-Injury and Suicide among Urban and Rural Males, PA 2000-2006 ^{▽⊕}



In Figure 18 we see that from ages 30-69 urban males show higher rates of self-injury whereas rural males show higher suicide rates. Higher usage of firearms for self-injury by rural males, as shown in Figure 19, likely contributes to the discrepancy (most clearly observed ages 35-44).

Figure 19: Percentage of Self-Injury by Firearm, Urban and Rural Males, PA 2000-2006 ^{▽⊕}



Even greater contrast is observed later in the lifespan. Among ages 75-79, urban and rural males experience nearly identical self-injury rates, yet rural males show a much higher rate of suicide. As counterpoint, among ages 85 and older we see urban and rural males suffering very similar suicide rates, but among urban males suicides amount to a much smaller portion of self-injury. In both instances rural males show a markedly higher usage of firearms for self-injury. By using a highly lethal method more often, rural males experience more suicides per self-injury event.

Of course, all groups do not follow the pattern. Ages 20-24, for example, defy easy explanation. Although rural males show a higher self-injury rate *and* higher usage of firearms for self-injury, urban males display a slightly higher suicide rate. Such age groups notwithstanding, it should be clear that usage of highly lethal methods provides a key indicator of a population's suicidality.

▽ Source: PA Vital Statistics
 ⊕ Source: PHC4

A Dangerous Preference

We measure usage of a particular self-injury method in a given population by means of a ratio.

$$\begin{array}{l} \text{\% Usage} \\ \text{(for a method} \\ \text{of self-injury)} \end{array} = \frac{\text{Number of self injuries using this method, whether fatal or not}}{\text{Total number of self injuries, fatal or not, using any method}}$$

Note that this ratio uses self-injury numbers without regard to the outcome – including both fatal and non-fatal events. Therefore, we can interpret the usage ratio as an estimate of the percentage of self-injurers *choosing* a particular self-injury method from among all possible methods.

Granted, many factors influence ‘choice’ of method including availability, socio-cultural norms and the likelihood of death. Still, usage ratios provide a reasonable summary measure.

Figure 20: Rates of Self-Injury by Race, Ethnicity and Percentage by Firearm, PA 2000-2006 ^{∇⊕}

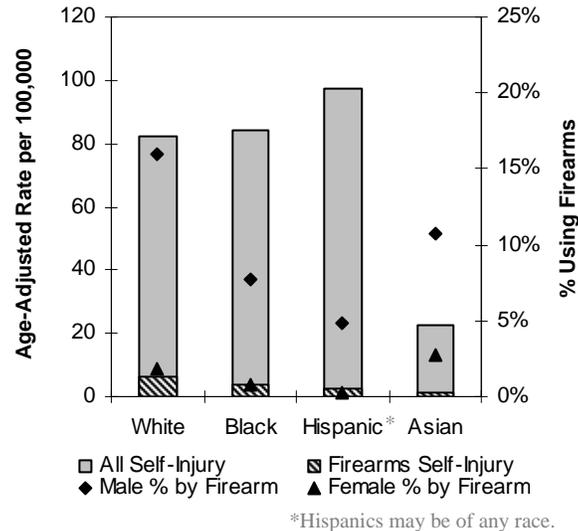
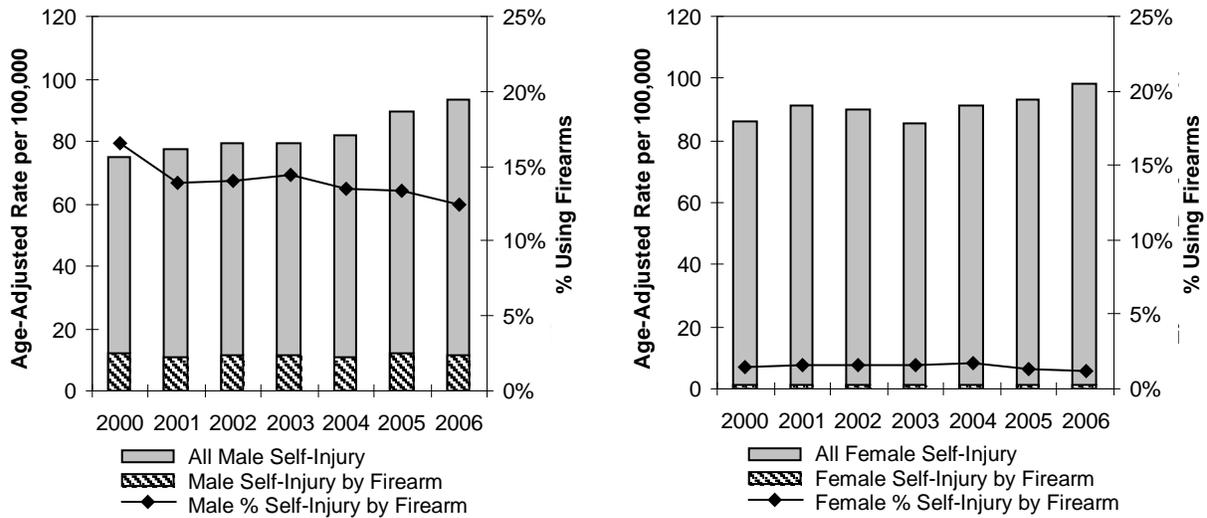


Figure 20 illustrates the rates of self-injury and self-injury by firearm for several different racial and ethnic groups. The percentage of self-injury involving a firearm is shown on the right axis. The percentage reflects the ratio of the striped firearm self-injury bar to the entire self-injury bar. On Figure 20 the percentage markers are stratified by gender, and so we see that across all major racial and ethnic subgroups males show higher utilization of firearms than females.

Yet each racial and ethnic subgroup displays a distinct pattern of self-injury behavior. Hispanics show the highest self-injury rate but show the lowest percentages of self-injury using a firearm. Whites show the highest rate of firearm self-injury and the highest percentage of self-injury using a firearm among males. Whites use firearms for self-injury twice as often as blacks.

Figure 20 provides valuable contrast to the suicide incidence rates presented in Figure 5 (page 4). Suicide is a multi-dimensional behavior; each representation of the data adds a new perspective.

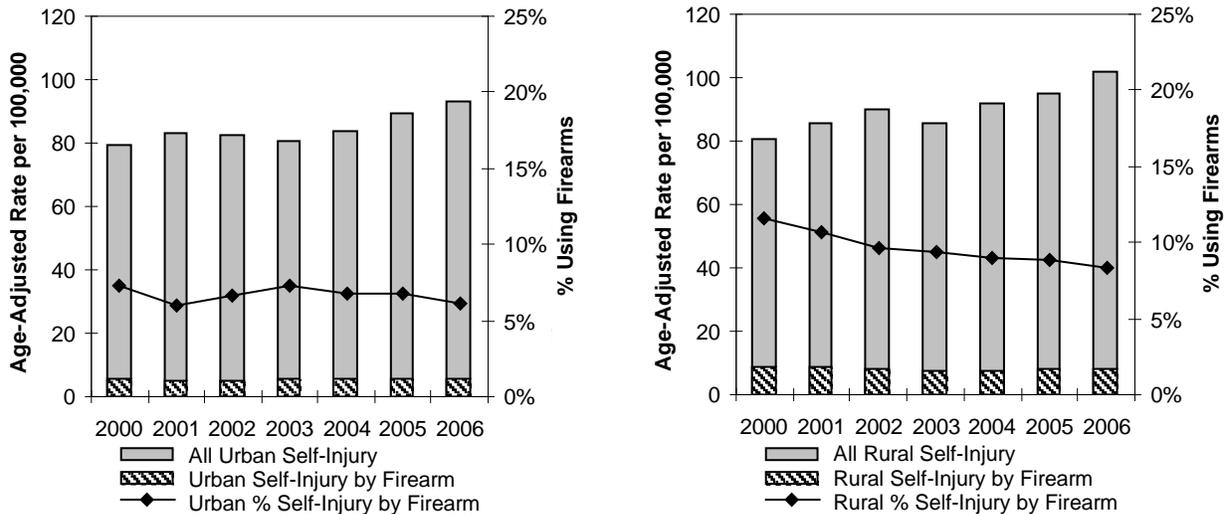
Figure 21: Rates of Self-Injury by Gender and Percentage by Firearm, PA 2000-2006 ^{▽⊕}



While females show the higher overall rates of self-injury, males show higher rates of self-injury using a firearm. 14.2% of male self-injuries used a firearm, while only 1.6% of self-injuries by females used a firearm. For males, rates of self-injury have increased but rates of self-injury by firearm have not, resulting in the percentage of male self-injury by firearm decreasing over time.

While rates of self-injury measure use of a method among a given population, usage ratios measure utilization of a method among all methods of self-injury

Figure 22: Rates of Self-Injury by Urbanization and Percentage by Firearm, PA 2000-2006 ^{▽⊕}

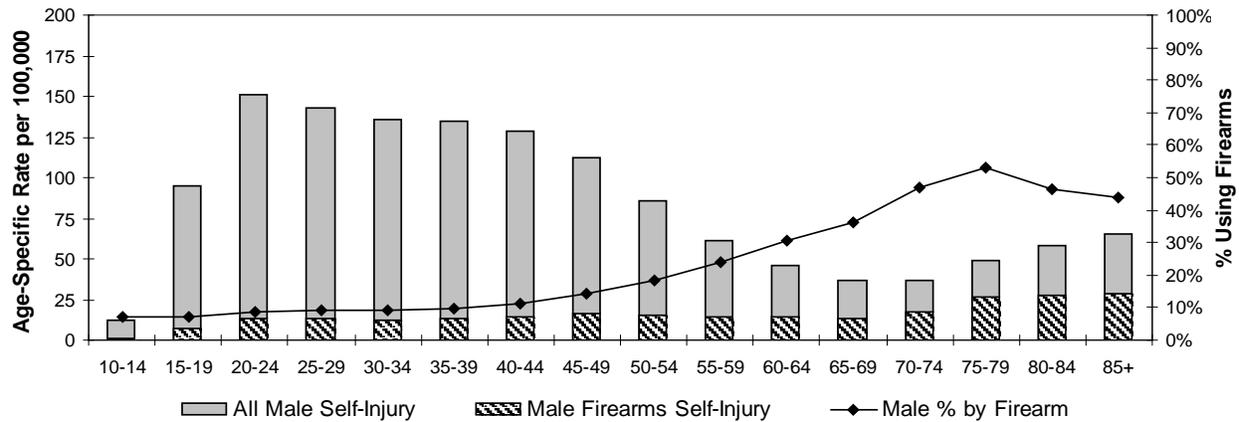


Rural populations tend to suffer higher rates of self injury as well as more self-injury by firearm. 18.5% of self-injury by rural males used a firearm, whereas only 12.4% of self-injury by urban males used firearm. As with the male population of Figure 21, rates of self-injury in the rural population have increased over time while firearm self-injury rates have remained fairly stable. Consequently, as shown in Figure 22, the percentage of self-injury using firearms has decreased among rural populations over the period 2000-2006.

▽ Source: PA Vital Statistics
 ⊕ Source: PHC4

Perhaps the most dramatic trend in the utilization of firearms follows differences in age.

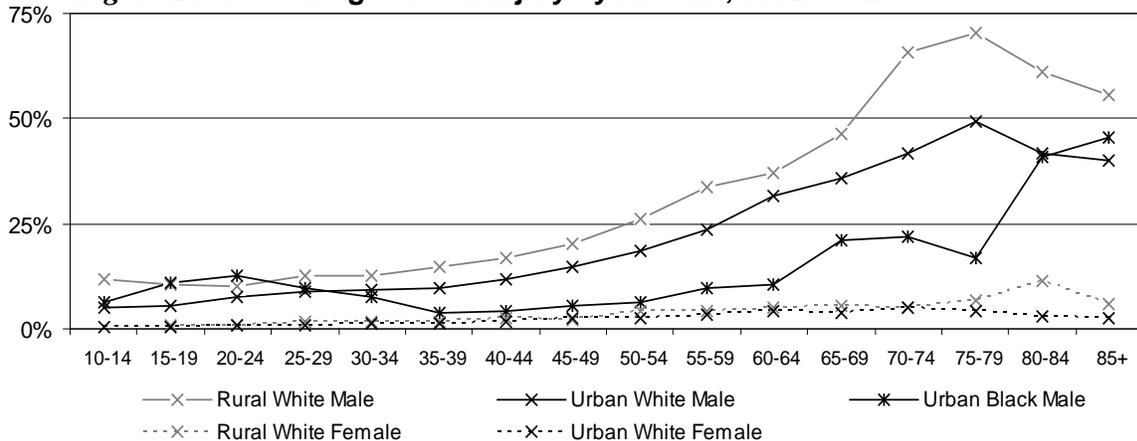
Figure 23: Male Rates of Self-Injury by Age and Percentage by Firearm, PA 2000-2006 ^{▽⊕}



While overall self-injury generally *decreases* with age, self-injury by firearm *increases* with age. In later life up to half of all self-injury by males used a firearm, as shown in Figure 23. Female usage of firearms also increases with age, but less dramatically. Female usage of firearms ranges from less than one percent for ages under 30 to a high of five percent for ages 70-84.

Applying all of these trends (gender, race, age and urbanization) we see that elderly white males in rural Pennsylvania show the highest overall usage of firearms as a self-injury method. Rural white males show the highest firearm usage across most age groups. Among youth ages 15-24, however, urban black males show the highest utilization of firearms as a self-injury method.

Figure 24: Percentage of Self-Injury by Firearm, PA 2000-2006 ^{▽⊕}



We have already seen the sad consequences of such a highly lethal method; less than 10 percent of the victims represented in Figure 24 survived their self-injury.

For elderly male populations, especially white males or males in rural Pennsylvania, high usage of firearms for self-injury is a key component of the high suicide rate

Many factors might contribute to usage of firearms for self-injury. Among populations such as elderly males at high risk to use firearms for self-injury, determining what drives firearm usage may provide valuable direction for suicide prevention efforts.

While differing method preferences may partially explain suicide rates of certain demographics, they do not tell the whole story. A truly comprehensive view of firearm suicide should attempt to capture the *why* behind the event. For this information we look to Allegheny County.

ACISS Results: 2000-2002

The Allegheny County Injury Surveillance System (ACISS), in operation from 1994 until 2002, collected data on several types of violence and injury – among them suicides by firearm. Using information from the coroner’s office, including toxicology and forensic results, and from police reports where available, ACISS reveals information about firearm suicides irretrievable from our hospitalization and death records. Based on 188 suicides by firearm in Allegheny County during the period 2000-2002, these findings reflect roughly nine percent of firearm suicides in the state. While Allegheny County is largely urban, its demographics approximate those found statewide.

Note: ACISS findings use different methodology and results may not be compatible with our firearm suicide data.

ACISS data, for example, allow us to flesh out the picture of a typical suicide by firearm:

Victim was depressed, had recently consumed alcohol or drugs, and finally, while at home, used a medium caliber handgun to shoot himself in the head.

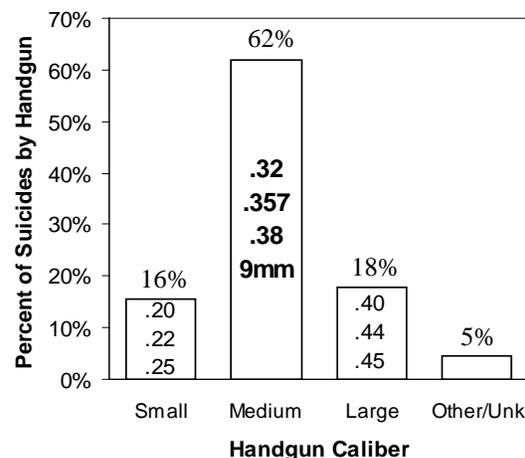
According to ACISS, over half of all firearm suicide victims in Allegheny County, 2000-2002, were depressed or showed a history of depression, and over half tested positive for either drugs, alcohol or both. Over 85 percent of firearm suicides took place at home and over 90 percent of victims shot themselves in the head. At least 2 out of every 3 firearm suicides used a handgun, with medium caliber handguns being by far the most common, as shown in Figure 25.

Motivating factors noted by ACISS include:

- Serious physical illness (26% of cases)
- Relationship problem (24% of cases)
- Alcohol dependence (14% of cases) or substance abuse
- Job or income problem (11% of cases)
- Other mental disorder (12% of cases) (excluding depression)

Moreover, using ACISS data we may gather the circumstances of firearm suicides. Over 20% of victims had stated an intention to commit suicide and over 30% left a suicide note. Less than 10% of victims had any previously recorded attempts.

Figure 25: Handgun Caliber in Firearm Suicides Allegheny County, 2000-2002 (ACISS)



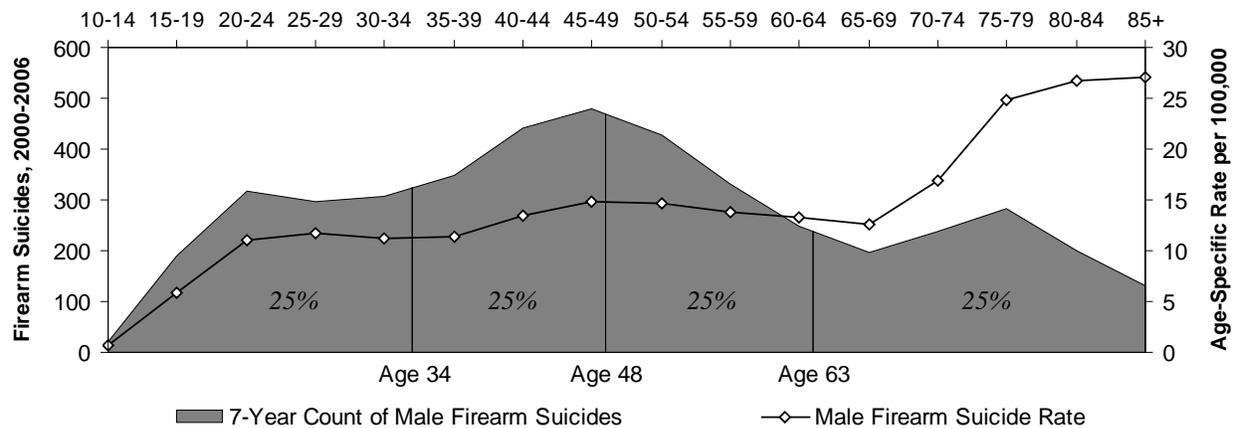
Building on the foundation established with ACISS, Allegheny County participated in the pilot study for the National Violent Death Reporting System (NVDRS) in 2000-2001. The NVDRS, begun in 2002 by the CDC, includes many of the ACISS data elements as well as other sources. But while the NVDRS has since expanded to include 17 states, Pennsylvania does not currently participate. Still, the ACISS findings presented here demonstrate the powerful new information that could be made available statewide should Pennsylvania join the NVDRS^{ix}.

∇ Source: PA Vital Statistics
 ⊕ Source: PHC4

Conclusion:

Nearly five thousand Pennsylvanians killed themselves by means of firearm from 2000 to 2006, an average of 59 victims per month, with 50 of those victims being white males. Over half of all suicides used a firearm. While *rates* of firearm suicide are highest for males ages 70 and older, middle aged males account for the largest *number*. Half of male firearm suicide occurs between ages 34 and 63, as shown in Figure 26. Age 48 is the median age for a male firearm suicide.

Figure 26: Rates and Counts of Male Firearm Suicide, with Quartiles, PA 2000-2006 ▽



Firearms are most commonly used among elderly male populations, especially among whites or males in rural areas. Among rural white males over the age of 70, firearms are the *most common* self-injury method. Where firearms are frequently used suicide rates tend to be higher, owing to the inordinately high percentage fatality of firearms. For elderly males especially, high overall suicide rates are driven largely by frequent utilization of firearms as a self-injury method.

In some cases the method, rather than intent of the self-injurer, may determine the outcome of a self-injury. For these cases firearms pose an especial danger. Among vulnerable populations, *means restriction* – reducing access to a highly lethal self-injury method like firearms – could prove more fruitful than trying to address self-injury behavior directly. Several organizations are promoting means restriction as an important component of firearms suicide prevention^x.

Firearms suicide will only gain in prominence in the upcoming decade as Pennsylvania's elderly population expands. By 2020, the population ages 70 and older is expected to grow by almost 20 percent or 100,000 males. That equates to nearly 100 additional firearm suicides at current rates.

Still, our limited data sources only tell us about the incidence and demographics of suicide, not which factors or circumstances may have precipitated the event. For a more complete picture we look to data such as offered by ACISS or – for other states – the current NVDRS. Only with the additional perspective of these resources may we begin to understand the problem of self-injury and start piecing together how self-injury becomes a suicide.

For more information on firearm suicides, contact the Violence and Injury Prevention Program.

Website: <http://www.health.state.pa.us/injuryprevention>

Phone: (717) 787-5900

Endnotes:

ⁱ Suicides by firearm represent 54% of all suicides in Pennsylvania, and comprise over half in all but a few counties:

- Allegheny (48%)
- Erie (48%)
- Northampton (47%)
- *Northumberland* (46%)
- Lehigh (45%)
- Montgomery (45%)
- *Bucks* (44%)
- *Philadelphia* (43%)
- *Lackawanna* (42%)
- *Snyder* (41%)
- *Delaware* (39%)

Among male suicides, only six PA counties (see italicized names above) had less than half of suicides use a firearm.

ⁱⁱ Pennsylvania’s population density is 274 persons per square mile. Center for Rural PA defines an urban county to be any county with a population density higher than the State, and a rural county any county with a lower density. By this definition, the following 19 Pennsylvania counties are considered urban: Allegheny, Beaver, Berks, Bucks, Chester, Cumberland, Dauphin, Delaware, Erie, Lackawanna, Lancaster, Lebanon, Lehigh, Luzerne, Montgomery, Northampton, Philadelphia, Westmoreland and York. All other counties are considered rural.

ⁱⁱⁱ The Behavioral Risk Factor Surveillance System (BRFSS) is the largest ongoing telephone health survey in the world. The Centers for Disease Control and Prevention (CDC) implemented the BRFSS in the mid-1980’s in order to measure and address modifiable behavioral risk factors and associated health issues. The BRFSS now includes all fifty states. The Pennsylvania Department of Health has been participating in the BRFSS since 1989.

The 2004 BRFSS included three firearms questions, preceded by the scripted dialogue “The next questions are about firearms. We are asking these in a health survey because of our interest in firearm-related injuries. Please include weapons such as pistols, shotguns, and rifles; but not BB guns, starter pistols, or guns that cannot fire. Include those kept in a garage, outdoor storage area, or motor vehicle.” The following were the three firearms questions.

- 21.1 “Are any firearms kept in or around your home?”
- 21.2 “Are any of these firearms now loaded?”
- 21.3 “Are any of these loaded firearms also unlocked? By unlocked, we mean you do not need a key or combination to get the gun or to fire it. We don’t count a safety as a lock.”

All three questions had the same four possible answers: Yes, No, Don’t Know/Not Sure, Refused.

^{iv} We assume that all inpatient hospitalizations dying of self-inflicted injuries before being discharged will be coded as a suicide on the death certificate. Unfortunately the death data do not allow us to verify this assumption.

^v Below are median charges by method for all self-injury inpatient hospitalizations. (Data: PA, 2000-2006)[⊕]

Self-Injury Method:	Firearm	Fall/Jump	Hanging	Drowning	Fire/Flames	Poisoning	Cutting
Median Charges :	\$30,279	\$29,697	\$15,187	\$12,002	\$10,253	\$6,617	\$6,538

^{vi} Below are estimated fatality percentages by method of self-injury. (Data: PA, 2000-2006)[⊕]

Self-Injury Method:	Firearm	Drowning	Hanging	Fall/Jump	Fire/Flames	Poisoning	Cutting
Percentage Fatality:	91.1%	80.6%	78.5%	28.1%	12.9%	2.9%	1.9%

^{vii} As we see from the below table, percentage fatality generally increases with age, regardless of self-injury method. Males show a higher percentage fatality than females by all common self-injury methods. (Data: PA, 2000-2006)^{∇⊕}

<i>Self-Injury Method</i>	<i>Percentage Fatality by Age Group and Gender</i>					
	Ages 10-29	Ages 30-49	Ages 50-69	Ages 70+	Male	Female
Firearm	86.5%	89.6%	93.7%	95.5%	91.8%	85.3%
Poison	1.0%	3.1%	6.1%	8.2%	4.1%	2.0%
Hanging	70.0%	79.9%	90.3%	88.1%	79.8%	72.6%
Cutting	0.3%	1.8%	7.6%	10.6%	3.1%	0.6%
All Other	8.9%	16.0%	24.1%	21.1%	18.4%	10.6%

∇ Source: PA Vital Statistics
 ⊕ Source: PHC4

^{viii} Estimate quoted assumes a best-case scenario in which intent is independent of outcome. Model considered each age group separately by gender and urban/rural status. Self-injuries by firearm were applied to other methods based on the percentage preference for that method in that group observed in PA, 2000-2006 (preference remained fixed). A fatality matrix was applied, using the same percentage fatality of a method within each group as observed in PA, 2000-2006. The resulting deaths were tabulated in the same manner as the actual firearms data. By this method, factoring in the higher percentage fatality of men and the elderly, regardless of method, and the differing method preferences between urban and rural self-injurers, the resultant age-adjusted suicide rate overall was 5.68 suicides per 100,000 population. As expected, the largest decreases in suicide projected by the model occurred among males (50 percent of actual suicides could have survived, versus 30 percent for females) and among rural populations (where over half of the actual suicides could have survived, versus less than half for urban populations).

For those uncomfortable with this model, let us consider a worst-case alternative, where intent – not method – is the sole determinant of fatality. In other words, we assume that all those ‘serious’ about killing themselves will succeed regardless of the method used, and that all non-fatal self-injurers are not serious about suicide. Looking at the data, this alternative seems highly improbable. It would imply a singular preference for firearms among those ‘serious’ attempters, since over half of suicide is committed by firearm. It would further imply that men are categorically more serious about suicide than women, since males suffer more suicide by all common methods. While untestable, since we have no data to show the true ‘intent’ of the victims, such disparate implications are clearly troublesome. Even if we were to accept a massive discrepancy in suicidality among men and women, the preference for firearms by serious attempters belies the entire argument. Why would there be such a clear preference for firearms among ‘serious’ attempters if we assume these people would succeed regardless of method? A natural inference might be that firearms offer a more certain death, corroborating our own intuition that firearms are inherently more lethal.

The most reasonable assumption seems to be that both method and intent influence fatality. Firearms, we posit, are to some extent inherently more lethal than other self-injury methods (whether viewed in terms of a higher overall fatality or a higher preference among ‘serious’ attempters). Therefore, to the extent that the method determines the fatality of a self-injury, we expect suicides to decrease with reduction in usage of firearms. Our model, and the “45 percent” estimate quoted in the paper, provides a likely upper bound for this decrease if all who used firearms had instead used another method. By comparison, if we assume all who self-injured by firearm in PA during 2000-2006 had instead used hanging, with percentage fatality as in the original estimate, we could still expect overall suicides to decrease by up to 6 percent. The point remains that firearms high lethality means there could be *some* decrease.

^{ix} “NVDRS is a state-based surveillance system that links data from law enforcement, coroners and medical examiners, vital statistics, and crime laboratories to assist each participating state in designing and implementing tailored prevention and intervention efforts. NVDRS provides data on violence trends at national and regional levels; each state can access all of these important data elements from one central database.

States that are funded for NVDRS operate under a cooperative agreement with CDC to whom all violent deaths are voluntarily reported. NVDRS funded six states initially. In 2006 CDC received funding to expand the system to a total of 17 states. The goal is to include eventually all 50 states, all U.S. territories, and the District of Columbia in the system.” (from the NVDRS website, <http://www.cdc.gov/ncipc/profiles/nvdrs/default.htm>)

^x The Harvard Injury Control Research Center is currently promoting means reduction as an important component of a comprehensive suicide prevention strategy. According to the program website, “The mission of the Means Matter campaign is to increase the proportion of suicide prevention groups who promote activities that reduce a suicidal person's access to lethal means of suicide.” In America, that means reducing access to firearms for people with demonstrated risk factors for suicide. An example is “lethal means counseling,” where a clinician concerned that a patient is suicidal will specifically ask, either the patient or the parents, about the patient’s access to guns. Information is provided regarding the increased risk of suicide from having guns readily available. The clinician will then recommend to the patient or those concerned that restricting or removing the patient’s access to guns, if possible, may be temporarily in the patient’s best interest until the situation improves.

For more information please visit: <http://www.hsph.harvard.edu/means-matter/>