

## ORIGINAL ARTICLE

## Firearm suicide in New York City in the 1990s

T M Piper, M Tracy, A Bucciarelli, K Tardiff, S Galea

*Injury Prevention* 2006;12:41–45. doi: 10.1136/ip.2005.008953

See end of article for authors' affiliations

Correspondence to:  
Associate  
Professor S Galea,  
Department of  
Epidemiology, University  
of Michigan, School of  
Public Health, 1214 S  
University, Ann Arbor, MI  
48104, USA; sgalea@  
umich.edu

Accepted 5 December 2005

**Objective:** Across the US, firearms are used in approximately 60% of all suicide deaths. Little research has assessed the role and determinants of firearms in suicide in major urban areas.

**Methods:** The authors collected data on all suicide deaths between 1990 and 2000 from the Office of the Chief Medical Examiner of New York City (NYC) and assessed trends and correlates of firearm related suicide deaths.

**Results:** During the period studied, there were a total of 6008 suicides in NYC; 1200 (20.0%) were firearm related suicides. There was a decrease in total suicides, total firearm suicides, and the proportion of firearm related suicides. In multivariable modeling, characteristics of suicide decedents associated with a greater likelihood of firearm suicide were: male, black race, residing in the outer boroughs, and use of cannabis.

**Conclusions:** The proportion of suicides caused by firearms in NYC is low compared to other parts of the US; differential access to means of committing suicide and the differential importance of firearms in different racial and ethnic groups may contribute to this observation. Innovative, local population based interventions that target non-firearm related suicide may contribute to lower suicide mortality overall in urban areas.

Suicide remains an important source of mortality in the United States. Over the past 100 years, suicide rates for the general population have remained relatively stable in the US, accounting for approximately 30 000 deaths a year in the last decade.<sup>1–2</sup> Suicide is the 11th cause of death in the US<sup>3</sup> and 13th leading cause of death worldwide.<sup>4–5</sup> In 2000, the US age adjusted suicide rate (10.6 per 100 000) was lower than the global estimated suicide rate (14.5 per 100 000).<sup>5</sup> In 2000, there were 1.7 times as many suicides as homicides in the US;<sup>3</sup> the global risk of suicide was 1.4 times that of homicide.<sup>6</sup>

Worldwide, the most commonly reported risk factors for suicide include psychopathology,<sup>7</sup> comorbid substance abuse and alcoholism,<sup>1</sup> previous suicide attempt, being male, access to lethal methods, poor health care, debilitating physical illness, economic instability, poverty, unemployment, and single (marital) status.<sup>4–10</sup>

Most studies consistently document that in the US, approximately 60% of suicides are firearm related.<sup>4–11–14</sup> In comparison, a study of 36 countries found that 11% of suicides are firearm related in high income countries (for example, Europe and Asia) and 17% of suicides are firearm related in upper middle income countries (for example, South America, Eastern Europe).<sup>4</sup> Over the past few decades, firearm related suicides as a percent of all suicides has increased steadily.<sup>15–16</sup> However, there may be appreciable differences of firearm use in urban areas compared to the rest of the US<sup>12–17</sup> and features of the urban environment may shape the use of violent means of injury.<sup>18–19</sup> We studied the trends and characteristics of firearm related suicides in New York City in order to assess changes in the use of firearms in suicides over the past decade and to identify factors that may be associated with an increased likelihood of firearm suicide in the largest and most densely populated urban area in the US.

## METHODS

All cases of suicide deaths in NYC from 1990 through 2000 were identified through manual review of medical files at the Office of the Chief Medical Examiner of New York City

(OCME). Data regarding demographics, cause of death, race/ethnicity, circumstances of death, and toxicology were collected.

We described the number of total and firearm related suicides each year from 1990 to 2000 and calculated the proportion of all suicide deaths that were attributed to firearms. We then described the demographic characteristics, circumstances of the death, and results of toxicological analysis (cocaine, opiates, cannabis, alcohol) for all suicide decedents. We used two tailed  $\chi^2$  tests to assess the relations between decedent characteristics and the likelihood of firearm related suicide. All covariates that were significant in bivariate analyses ( $p < 0.05$ ) were included in a multivariable logistic regression model predicting firearm related suicide.

This study was reviewed and approved by the Institutional Review Boards at the New York Academy of Medicine and the New York City Department of Health and Mental Hygiene.

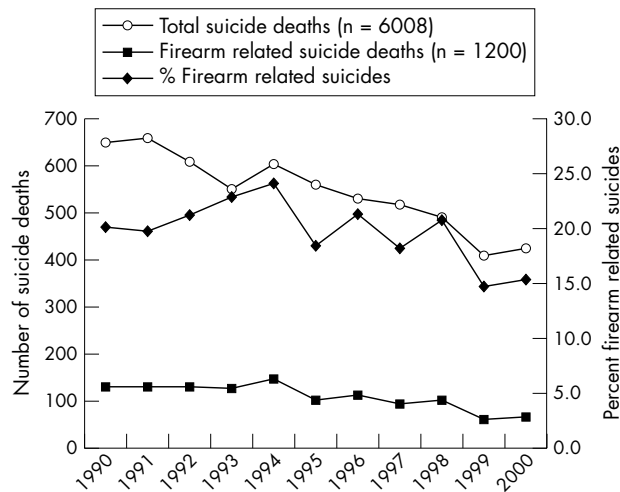
## RESULTS

There were a total of 6008 suicide deaths extracted from the OCME files in NYC between 1990–2000. The three leading causes of death for suicide were hanging, (1565 deaths or 26.1%), long falls (1436 deaths or 23.9%), and firearms (1200 deaths or 20.0%)

Figure 1 shows the number of total and firearm related suicides and the proportion of firearm related suicides in NYC from 1990–2000. Throughout the 11 year period, the total number of suicides and firearm suicides decreased (34.6% and 50.4% respectively). The proportion of firearm related suicides also decreased from 20.2% to 15.3% in the period studied, with the exception of a peak of 24.1% in 1994.

Table 1 shows the bivariate associations between decedent characteristics and the likelihood that a firearm was the cause of death. Male suicide decedents were more likely than female suicide decedents to use a firearm rather than some

**Abbreviations:** OCME, Office of the Chief Medical Examiner; NYC, New York City.



**Figure 1** Total suicides, firearm related suicides, and percent of firearm related suicides, New York City, 1990–2000.

other means of suicide. A greater proportion of black and Hispanic decedents used firearms than whites. Firearms were more common in the outer boroughs of NYC compared to Manhattan. Suicide decedents who had used any drug were

also more likely to use a firearm to commit suicide than decedents who had not used drugs.

Figure 2 shows the frequency of firearm related suicide by place of residence in each of the 59 community districts in NYC. Differential shading throughout each of the community districts identifies the frequency of firearm deaths.

Table 2 shows the unadjusted and adjusted relations between characteristics of the decedents and firearm related suicide. Variables significantly associated with firearm related suicides in a multivariable model were being male, black, age 15–24, place of injury as residence, place of injury as outside, residing in the Bronx, Brooklyn, Queens, and Staten Island, and using cannabis.

## DISCUSSION

We documented a decrease in the numbers of all suicides in New York City from 1990–2000. This suggests a difference in suicide trends in New York City compared to the suicide trends nationwide;<sup>20, 21</sup> most research suggests that the number of suicide deaths across the US has increased slightly or remained stable during the past decade.<sup>12, 22</sup>

The lower prevalence of firearm related suicide in NYC compared to the rest of the country is consistent with studies showing that firearm related suicide rates are lower in the northeastern US compared with the rest of the country.<sup>12–14, 23</sup> One potential explanation for this change may be differences in firearm availability and firearm law enforcement throughout the US, with increased availability and fewer gun control

**Table 1** Characteristics of total and firearm related suicides in New York City, 1990–2000

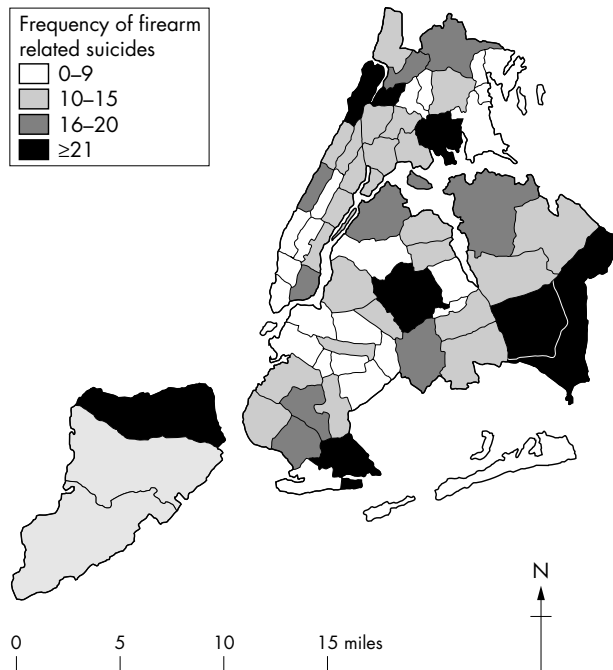
	Total suicides		Firearm suicides		p Value
	n*	%	n	%	
Total*†	6008	100.0	1200	20.0	
Sex					
Female	1521	25.3	114	7.5	<0.0001
Male	4486	74.7	1086	24.2	
Race/ethnicity					
White	3167	52.7	571	18.0	<0.0001
Black	1094	18.2	279	25.5	
Hispanic	1225	20.4	308	25.1	
Asian	351	5.8	22	6.3	
Other	167	2.8	20	12.0	
Age (years)					
10–14	24	0.4	3	12.5	<0.0001
15–24	759	12.6	266	35.0	
25–34	1309	21.8	279	21.3	
35–44	1292	21.5	200	15.5	
45–54	935	15.6	170	18.2	
55–64	647	10.8	125	19.3	
65–74	505	8.4	94	18.6	
75+	535	8.9	63	11.8	
Place of injury					
Inside (not residence)	1092	18.2	154	14.1	<0.0001
Residence	4302	71.9	932	21.7	
Outside	592	9.9	114	19.3	
Borough of residence					
Manhattan	1438	27.2	170	11.8	<0.0001
Bronx	876	16.6	247	28.2	
Brooklyn	1449	27.4	325	22.4	
Queens	1246	23.6	286	23.0	
Staten Island	275	5.2	81	29.5	
Drugs detected					
Any drug	2814	42.4	645	22.9	<0.0001
Cocaine	799	12.0	203	25.4	<0.0001
Opiates	660	9.9	103	15.6	0.003
Cannabis	308	4.6	117	38.0	<0.0001
Alcohol	2060	31.0	469	22.8	<0.0001

\*Totals within each covariate category may be less than 6008 due to missing values.

†Column percentages are presented for each of the covariates within the “total suicide” column; row percentages are presented for the proportion of total suicides within each covariate that are attributable to firearms.

**Table 2** Multivariate predictors of firearm related suicides, New York City, 1990–2000

	Unadjusted		Adjusted	
	OR	95% CI	OR	95% CI
Total				
Sex				
Female	1.00	–	1.00	–
Male	3.94	3.22–4.83	3.71	3.01–4.57
Race/ethnicity				
White	1.00	–	1.00	–
Black	1.56	1.32–1.84	1.26	1.05–1.51
Hispanic	1.53	1.31–1.79	1.15	0.96–1.38
Asian	0.30	0.20–0.47	0.33	0.21–0.52
Other	0.62	0.39–1.00	0.48	0.29–0.78
Age (years)				
10–14	1.00	–	1.00	–
15–24	4.12	1.23–13.9	3.99	1.15–13.82
25–34	2.08	0.62–6.97	2.20	0.64–7.59
35–44	1.40	0.42–4.72	1.56	0.54–5.40
45–54	1.70	0.51–5.74	1.96	0.57–6.80
55–64	1.84	0.54–6.21	2.27	0.65–7.89
65–74	1.75	0.52–5.96	2.12	0.61–7.43
75+	1.02	0.30–3.51	1.26	0.36–4.46
Place of injury				
Inside (not residence)	1.00	–	1.00	–
Residence	1.72	1.43–2.07	1.88	1.55–2.28
Outside	1.49	1.14–1.94	1.41	1.07–1.87
Borough of residence				
Manhattan	1.00	–	1.00	–
Bronx	2.86	2.35–3.48	2.34	1.89–2.88
Brooklyn	2.11	1.76–2.52	1.93	1.60–2.33
Queens	2.17	1.80–2.61	2.21	1.82–2.68
Staten Island	3.04	2.28–4.06	2.91	2.14–3.96
Cocaine detected				
No	1.00	–	1.00	–
Yes	1.44	1.21–1.71	1.09	0.90–1.34
Opiates detected				
No	1.00	–	1.00	–
Yes	0.71	0.58–0.89	0.69	0.54–0.87
Cannabis detected				
No	1.00	–	1.00	–
Yes	2.61	2.06–3.32	1.87	1.44–2.44
Alcohol detected				
No	1.00	–	1.00	–
Yes	1.30	1.14–1.48	1.09	0.94–1.25



**Figure 2** Firearm related suicides by place of residence within New York City, 1999–2000.

regulations in the South Central regions compared to the Northeast regions.<sup>13 14 24</sup>

There is a relation between the availability of highly lethal suicide methods and rates of suicide.<sup>13 25</sup> The high prevalence of long falls may be explained by the accessibility and availability of means as NYC is characterised by its tall buildings.<sup>26</sup> Firearm availability and access may be higher in the outer boroughs, explaining the significantly higher likelihood of suicide caused by firearms compared to Manhattan.

Recent studies show that among young black Americans (10–19 years), firearms are increasingly becoming the predominant method of suicide; among black males 15–19 years of age, firearms account for 72% of all suicides.<sup>27 28</sup> Over the past decades, suicide rates have increased most rapidly among young black males.<sup>27–29</sup>

Substance abuse is heavily implicated in suicide deaths, with an increasing use of substances found in young adults who commit suicide.<sup>30 31</sup> Most of the suicide literature focuses on drugs used during suicidal overdoses with relatively limited research on drugs used in firearm related suicide deaths. We are unclear in our study why cannabis users are more likely to use firearms in suicide. It is plausible that this is related to its use in combination with other drugs and its depressant qualities.

There are several considerations relevant to the interpretation of results in this study. During the period studied, NYC

had the same chief medical examiner, suggesting that data over the period of investigation were comparable, enabling analysis of temporal trends. Similar to research that relies on data abstracted from death certificates, the total number of suicides classified by the Medical Examiner Office may not be completely representative of the total suicides in New York City during the period studied because of misclassification of other deaths as suicides. However, it is unlikely that this misclassification alters the observations drawn here. In this paper, we do not present population based rates for ease of interpretation.

## IMPLICATIONS FOR PREVENTION

This study provides new evidence on the different profile of suicide firearm decedents in NYC compared to the rest of the United States. We note that the lower proportion of firearm suicide deaths in NYC is more similar to firearm suicide rates of international economic counterparts (for example, Europe, Asia) than to the US.<sup>4</sup> This suggests that there may be important differences between New York City and the country such as access to differential fatal means, population density, gun control regulations, and the urban context that define these findings. Firearm availability and firearm laws,<sup>14 23 32 33</sup> increased law enforcement practices in NYC during the 1990s,<sup>34</sup> such as the broken windows policing measures and the formation of CompStat Unit to accurately assess and report on neighborhood profiles of violence and crime, and characteristics of the urban context including social capital<sup>35</sup> may explain some of the findings documented here and the mechanisms that underlie them. Studies of the relation between gun availability and suicide in NYC and in the US that improve our understanding of the determinants of firearm related suicides in urban areas are needed. These data highlight people at highest risk of suicide in urban populations, and may help set priorities for innovative population based interventions and develop recommendations for suicide prevention and intervention research and programs in urban areas.

## ACKNOWLEDGEMENTS

This study was funded in part by grants DA-06534 and DA-12801-S1 from the National Institute on Drug Abuse. The sponsor played no role in study design, collection, analysis, interpretation of data, in the writing of this report, or in the decision to submit this paper for publication.

### Key points

- Across the US, firearms are used in approximately 60% of all suicide deaths. Between 1990–2000, there were 6008 suicides in New York City; 1200 deaths (20.0%) were firearm related suicides.
- Characteristics of suicide decedents that were associated with a greater likelihood of firearm suicide were: male gender, black race, residing in the outer boroughs of NYC, and use of cannabis.
- The proportion of suicides caused by firearms in NYC is low compared to other parts of the United States.
- Studies of the relation between gun availability and suicide in urban areas are needed to (1) improve our understanding of the determinants of firearm related suicide, (2) identify those at highest risk of suicide in urban populations, and (3) help develop innovative local population based interventions.

## Authors' affiliations

**T M Piper, M Tracy, A Bucciarelli, S Galea**, Center for Urban Epidemiologic Studies, New York Academy of Medicine, New York, NY, USA

**K Tardiff**, Department of Psychiatry, Weill Medical College, New York, NY, USA

**S Galea**, Department of Epidemiology, University of Michigan, School of Public Health, Ann Arbor, MI, USA

Competing interests: none.

## REFERENCES

- 1 **Mann JJ**. A current perspective of suicide and attempted suicide. *Ann Intern Med* 2002;**136**:302–11.
- 2 U. S. Public Health Service. The Surgeon General's Call to Action to Prevent Suicide. Washington, DC, 1999.
- 3 **National Center for Injury Prevention and Control**. Suicide in the United States. Center for Disease Control. Available at <http://www.cdc.gov/ncipc/factsheets/suifacts.htm> (accessed August 2005).
- 4 **Krug EG**, Powell KE, Dahlberg LL. Firearm-related deaths in the United States and 35 other high- and upper-middle-income countries. *Int J Epidemiol* 1998;**27**:214–21.
- 5 **Mercy JA**, Krug EG, Dahlberg LL, et al. Violence and health: the United States in a global perspective. *Am J Public Health* 2003;**93**:256–61.
- 6 **Reza A**, Mercy JA, Krug E. Epidemiology of violent deaths in the world. *Inj Prev* 2001;**7**:104–11.
- 7 **Jamison KR**. Suicide and bipolar disorder. *J Clin Psychiatry* 2000;**61**(Suppl 9):47–51.
- 8 **Goldney RD**. A global view of suicidal behaviour. *Emerg Med* 2002;**14**:24–34.
- 9 **Neeleman J**. Beyond risk theory: Suicidal behavior in its social and epidemiological context. *Crisis* 2002;**23**:114–20.
- 10 **Vahia VN**, Sonavane S, Gandhi A, et al. Suicide and depression. *Indian Med Assoc* 2000;**98**:232–6.
- 11 **Ikeida RM**, Gorwitz R, James SP. Trends in fatal firearm-related injuries, United States, 1962–1993. *Am J Prev Med* 1997;**13**:396–400.
- 12 **Romero MP**, Wintemute GJ. The epidemiology of firearm suicide in the United States. *J Urban Health* 2002;**79**:39–48.
- 13 **Hemenway D**, Miller M. Association of rates of household handgun ownership, lifetime major depression, and serious suicidal thoughts with rates of suicide across the US census regions. *Inj Prev* 2002;**8**:313–16.
- 14 **Kaplan MS**, Geling O. Firearm suicides and homicides in the United States: regional variations and patterns of gun ownership. *Soc Sci Med* 1998;**46**:1227–33.
- 15 **Ohsfeldt RL**, Morrisey MA. Firearms, firearms injury, and gun control: a critical survey of the literature. *Adv Health Econ Health Serv Res* 1992;**13**:65–82.
- 16 **Centers for Disease Control and Prevention**. WISQARS Injury Mortality Reports, 1981–1998. Available at <http://www.webappa.cdc.gov/sasweb/ncipc/mortrate9.html> (accessed August 2005).
- 17 **Branas CC**, Nance ML, Elliott MR, et al. Urban-rural shifts in international firearm death: different causes, same results. *Am J Public Health* 2004;**94**:1750–5.
- 18 **Stack S**. Suicide: A 15-Year Review of the Sociological Literature Part I: Cultural and Economic Factors. *Suicide Life Threat Behav* 2000;**30**:145–62.
- 19 **Stack S**. Suicide: A 15-Year Review of the Sociological Literature Part II: Modernization and Social Integration Perspectives. *Suicide Life Threat Behav* 2000;**30**:163–76.
- 20 **Brickman AL**, Mintz DC. Datapoints: U.S. rates of self-inflicted injuries and suicide, 1992–1999. *Psychiatr Serv* 2003;**54**:168.
- 21 **National Center for Health Statistics, Self-inflicted injury/suicide**. Center for Disease Control. Available at <http://www.cdc.gov/nchs/fastats/suicide.htm> (accessed August 2005).
- 22 **National Center for Injury Prevention and Control, WISQARS fatal injuries: Mortality reports**. Center for Disease Control. Available at <http://www.webappa.cdc.gov/cgi-bin/broker.exe> (accessed August 2005).
- 23 **Miller M**, Hemenway D, Azrael D. Firearms and suicide in the northeast. *J Trauma* 2004;**57**:626–32.
- 24 **Conner KR**, Zhong Y. State firearm laws and rates of suicide in men and women. *Am J Prev Med* 2003;**25**:320–4.
- 25 **Powell EC**, Sheehan KM, Christoffel KK. Firearm violence among youth: public health strategies for prevention. *Ann Emerg Med* 1996;**28**:204–12.
- 26 **Marzuk PM**, Leon AC, Tardiff K, et al. The effect of access to lethal methods of injury on suicide rates. *Arch Gen Psychiatry* 1992;**49**:451–8.
- 27 **Gary FA**, Yarandi HN, Scruggs FC. Suicide among African Americans: reflections and a call to action. *Issues Ment Health Nurs* 2003;**24**:353–75.
- 28 **Centers for Disease Control, Prevention (CDC)**. Suicide among black youths—United States, 1980–1995. *MMWR Morb Mortal Wkly Rep* 1998;**47**:193–6.
- 29 **Joe S**, Kaplan MS. Firearm-related suicide among young African-American males. *Psychiatr Serv (Chic)* 2002;**53**:332–4.
- 30 **Brent DA**, Perper JA, Allman CJ. Alcohol, firearms, and suicide among youth: temporal trends in Allegheny County, Pennsylvania, 1960 to 1983. *JAMA* 1987;**257**:3369–72.
- 31 **Mino A**, Bousquet A, Broers B. Substance abuse and drug-related death: A review. *Crisis* 1999;**20**:28–35.

- 32 **Centers for Disease Control and Prevention.** State Injury Profile for New York, 1989–1998. 2001. Available at [http://www.cdc.gov/ncipc/StateProfiles/sip\\_ny.pdf](http://www.cdc.gov/ncipc/StateProfiles/sip_ny.pdf) (accessed August 2005).
- 33 **Miller M,** Azrael D, Hemenway D. Household firearm ownership and suicide rates in the United States. *Epidemiology* 2002;**13**:517–24.
- 34 **Fagan J,** Zimring FE, Kim J. Declining homicide in New York City: a tale of two trends. *J Crim Law Criminology* 1998;**88**:1277–323.
- 35 **Cubbin C,** LeClere FB, Smith GS. Socioeconomic status and the occurrence of fatal and nonfatal injury in the United States. *Am J Public Health* 2000;**90**:70–7.