IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ILLINOIS
EASTERN DIVISION

SHAWN GOWDER	)	
	)	
	)	
Plaintiff,	)	
v.	)	
	)	
	)	**CASE NO. 11-CV-1304**
CITY OF CHICAGO, a municipal corporation, the CITY OF CHICAGO DEPARTMENT OF ADMINISTRATIVE HEARINGS, MUNICIPAL HEARINGS DIVISION, SCOTT V. BRUNER, Director of the City of Chicago Department of Administrative Hearings, the CITY OF CHICAGO DEPARTMENT OF POLICE, and JODY P. WEIS, Superintendent of the City of Chicago Department of Police	)	
	)	
	)	
Defendants.	)	

INDEX OF EXHIBITS TO DEFENDANTS' LOCAL RULE 56.1(b)(3)(C) STATEMENT OF ADDITIONAL FACTS

Exhibit	Description
1.	Responsible Gun Ownership Ordinance
2.	Uniform Crime Reporting Statistics – 10 Cities
3.	June 29, 2010 Ludwig Written Testimony to Chicago City Council Committee
4.	*The Benefits of Reducing Gun Violence: Evidence from Contingent-Valuation Survey Data*, J. Ludwig and P. J. Cook, 22 Journal of Risk and Uncertainty 207 (2001)
5.	June 29, 2010 Webster Testimony to Chicago City Council Committee
6.	Garen J. Wintemute, *et al.*, *Prior Misdemeanor Convictions as a Risk Factor for Later Violent and Firearm-Related Criminal Activity Among Authorized Purchasers of*

Handguns, 280 J. Am. Med. Ass'n. 2083, 2086 (Dec. 1998)

7. Mona A.Wright, et al., *Felonious or Violent Criminal Activity that Prohibits Gun Ownership Among Prior Purchasers of Handguns: Incidence and Risk Factors*, J. Trauma Injury, Infection, & Critical Care (2010)

8. *Is Gun Control Likely to Reduce Violent Killings*, Franklin Zimring, 35 University of Chicago Law Review 721 (1968)

9. *The Medium is the Message: Firearm Caliber as a Determinant of Death From Assault*, Franklin Zimring, 1 Journal of Legal Studies, 97 (1972)

10. *Underground Gun Markets*, P. Cook, et al., 117 Economic Journal (2007)

11. June 29, 2010 Written Testimony of Chicago Police Department Deputy Superintendent Ernest Brown for Chicago City Council

12. July 1, 2010 Legislative Findings of City Council Committee on Police and Fire

13. Notice of Deposition

14. October 18, 2011 Hearing Transcript

15. Plaintiff's Criminal History Data

EXHIBIT 1

(Published by the Authority of the City Council of the City of Chicago)

COPY

JOURNAL of the PROCEEDINGS of the CITY COUNCIL of the CITY of CHICAGO, ILLINOIS

Special Meeting -- Friday, July 2, 2010

at 10:00 A.M.

(Council Chambers -- City Hall -- Chicago, Illinois)

OFFICIAL RECORD.

RICHARD M. DALEY
Mayor

MIGUEL DEL VALLE
City Clerk

Attendance At Meeting.

Present -- The Honorable Richard M. Daley, Mayor, and Aldermen Moreno, Fioretti, Dowell, Preckwinkle, Hairston, Lyle, Jackson, Harris, Beale, Pope, Balcer, Cárdenas, Olivo, Burke, Foulkes, Thompson, Thomas, Lane, Rugai, Cochran, Brookins, Muñoz, Zalewski, Dixon, Solis, Maldonado, Burnett, E. Smith, Graham, Reboyras, Suarez, Austin, Colón, Rice, Mitts, Allen, O'Connor, Reilly, Daley, Tunney, Levar, Shiller, Schulter, M. Smith, Moore.

Absent -- Aldermen Waguespack, Mell, Laurino, Doherty, Stone.

Call To Order.

On Friday, July 2, 2010 at 10:00 A.M., the Honorable Richard M. Daley, Mayor, called the City Council to order. The Honorable Miguel del Valle, City Clerk, called the roll of members and it was found that there were present at that time: Aldermen Moreno, Fioretti, Dowell, Hairston, Lyle, Jackson, Harris, Beale, Pope, Balcer, Cárdenas, Olivo, Burke, Foulkes, Thompson, Thomas, Lane, Rugai, Cochran, Brookins, Muñoz, Zalewski, Dixon, Solis, Maldonado, Burnett, E. Smith, Graham, Reboyras, Suarez, Austin, Colón, Rice, Mitts, Allen, O'Connor, Reilly, Daley, Tunney, Levar, Shiller, Schulter, M. Smith, Moore -- 44.

Quorum present.

Pledge Of Allegiance.

Alderman Beale led the City Council and assembled guests in the Pledge of Allegiance to the Flag of the United States of America.

Invocation.

Rabbi Meir Chai Benhiyoun of Chabad Center for Jewish Life of Downtown Chicago, accompanied by his daughter, Ruth Shaina who read a passage from Isaiah 4:2, opened the meeting with prayer.

Placed On File -- CALL FOR SPECIAL MEETING.

[F2010-213]

The Honorable Miguel del Valle, City Clerk, informed the City Council that the following call for a special meeting was filed in his office on June 30, 2010 at 8:53 A.M.:

OFFICE OF THE MAYOR
CITY OF CHICAGO

June 30, 2010.

Honorable Miguel del Valle
City Clerk
City Hall, Room 107
121 North LaSalle Street
Chicago, Illinois 60602

DEAR MR. DEL VALLE -- I hereby call a special meeting of the City Council of the City of Chicago, to be convened at 10:00 A.M. on Friday, July 2, 2010 in the City Council Chambers in City Hall, for the sole purpose of considering and voting on an ordinance regulating firearms.

Very truly yours,

(Signed) RICHARD M. DALEY,
Mayor.

COMMITTEE ON POLICE AND FIRE.

AMENDMENT OF TITLES 2, 4 AND 8 OF MUNICIPAL CODE ESTABLISHING NEW REGULATIONS GOVERNING FIREARMS.

[O2010-3644]

The Committee on Police and Fire submitted the following report:

CHICAGO, July 1, 2010.

To the President and Members of the City Council:

Your Committee on Police and Fire held its meeting on June 28, 2010 which reconvened June 29 and July 1, 2010 to consider an ordinance (direct introduction) introduced by the Honorable Mayor Richard M. Daley, at the request of the Corporation Counsel, concerning firearm regulation, and having had the same under advisement, begs leave to report and recommend that your Honorable Body *Pass* the proposed item transmitted herewith.

Respectfully submitted,

(Signed) ANTHONY A. BEALE,
Chairman.

On motion of Alderman Beale, the said proposed ordinance transmitted with the foregoing committee report was *Passed* by yeas and nays as follows:

Yeas -- Aldermen Moreno, Fioretti, Dowell, Preckwinkle, Hairston, Lyle, Jackson, Harris, Beale, Pope, Balcer, Cárdenas, Olivo, Burke, Foulkes, Thompson, Thomas, Lane, Rugai, Cochran, Brookins, Muñoz, Zalewski, Dixon, Solis, Maldonado, Burnett, E. Smith, Graham, Reboyras, Suarez, Austin, Colón, Rice, Mitts, Allen, O'Connor, Reilly, Daley, Tunney, Levar, Shiller, Schulter, M. Smith, Moore -- 45.

Nays -- None.

Alderman Pope moved to reconsider the foregoing vote. The motion was lost.

The following is said ordinance as passed:

WHEREAS, A recent study by the Centers for Disease Control and Prevention found that in the United States there were 30,896 deaths from firearms in 2006, making firearms one of the top ten causes of death in the country; and

WHEREAS, Annually, more than 100,000 people in our nation are shot or killed with a firearm, with more than 3,000 of these victims being children or teenagers; and

WHEREAS, The United States is one of the few remaining developed nations that places only a minimal restrictions on the sale or possession of firearms; and

WHEREAS, Firearm-related injuries and deaths are the cause of significant social and economic costs to the City and our communities and have a severe impact on our criminal justice and health care systems; and

WHEREAS, In 2009, in the City there were 1,815 aggravated batteries with a firearm, of which 83 were shootings inside a residence, and there were 379 murders with a firearm, of which 34 were murders involving a firearm inside a home; and

WHEREAS, Between the beginning of this year and June, 15, 2010, there were 742 aggravated batteries with a firearm, of which 36 took place inside a residence, and 152 murders with a firearm, of which 19 were inside a residence; and

WHEREAS, Given the dangerous and deadly nature of handguns, in 1982 the City of Chicago enacted a ban on registering handguns as a method to protect public safety and the health and welfare of its residents; and

WHEREAS, In 2008, the Supreme Court of the United States decided the case of *District of Columbia v. Heller*, which held that the Second Amendment to the United States Constitution protects an individual right to possess a firearm unconnected with service in the militia; and

WHEREAS, After the *Heller* decision, the City's handgun registration ban was challenged in the case of *McDonald v. the City of Chicago*; and

WHEREAS, On June 28, 2010, the Supreme Court issued its opinion in the *McDonald* case and ruled that the Second Amendment's right to possess a handgun for self-defense in the home also applied to the states; and

WHEREAS, Although the State of Illinois has already enacted several laws to regulate the sale and possession of firearms, these laws are not sufficient to protect the City from the unique and heightened risk of firearm violence, especially handgun violence, endemic in densely populated urban areas, and

WHEREAS, In order to provide for the ongoing protection of the public welfare and safety, it is essential for the City Council of the City of Chicago to promptly pass an ordinance that provides for reasonable regulation of firearms in compliance with the rulings of the United States Supreme Court, but still is effective in protecting the public from the potentially deadly consequences of gun violence in our City; and

WHEREAS, When a gun is registered with the City, certain personal identifying information, such as the registrant's address, is obtained so that a first responder can be advised that a gun is present in that home. In order to protect the privacy and safety of people registering guns, any information provided in the registration procedure should not be available to the public. The City is requesting that Illinois Attorney General Lisa Madigan issue an opinion, as expeditiously as possible, on whether the information provided to the City for gun registration is exempt from disclosure under the Illinois Freedom of Information Act, 5 ILCS 140, et seq.; and

WHEREAS, As a consequence of the United States Supreme Court decisions in *Heller* and *McDonald*, it is anticipated that gun ownership in many communities, including large urban areas, will increase. To ensure public safety and the welfare of a community, it is essential that local law enforcement agencies be made aware of any gun brought into their jurisdictions. Therefore, the United States Congress must pass a law mandating that the Bureau of Alcohol, Tobacco, Firearms and Explosives timely notify a local law enforcement agency of any purchase or sale of a firearm by a resident of that community; and

WHEREAS, In addition, the ability to have handguns in a home will expose taxpayers to greater costs and expenses associated with the increased number of incidents involving a first responder entering a home where a gun is present. In order to minimize the impact of these costs to the taxpayers, the United States Congress and the State of Illinois must pass laws that grant immunity for the City and its first responders from any civil liability for any accidental or lawfully intentional actions by the first responders in responding to a situation in a home where a gun is present and the first responder perceives a danger caused by the presence of the gun; now, therefore,

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF CHICAGO:

SECTION 1. Chapter 2-14 of the Municipal Code of Chicago is hereby amended by deleting the language struck through, and by adding the language underscored, as follows:

2-14-132 Impoundment.

(1) Whenever the owner of a vehicle seized and impounded pursuant to Sections 3-46-076, 3-56-155, 4-68-195, 9-80-220 or 9-112-555 of this Code (for purposes of this section, the "status-related offense sections"), or Sections 7-24-225, 7-24-226, 7-28-390, 7-28-440, 7-38-115(c-5), 8-4-130, 8-8-060, ~~8-20-015~~, 8-20-070, 9-12-090, 9-76-145, 9-80-240, 9-92-035, 11-4-1410, 11-4-1500 or 15-20-270 of this Code (for purposes of this section, the "use-related offense sections") requests a preliminary hearing in person and in writing at the department of administrative hearings, within 15 days after the vehicle is seized and impounded, an administrative law officer of the department of administrative hearings shall conduct such preliminary hearing within 48 hours of request, excluding Saturdays, Sundays and legal holidays, unless the vehicle was seized and impounded pursuant to Section 7-24-225 and the department of police determines that it must retain custody of the vehicle under the applicable state or federal forfeiture law. If, after the hearing, the administrative law officer determines that there is probable cause to believe that the vehicle was used in a violation of this Code for which seizure and impoundment applies, or, if

the impoundment is pursuant to Section 9-92-035, that the subject vehicle is eligible for impoundment under that section, the administrative law officer shall order the continued impoundment of the vehicle as provided in this section unless the owner of the vehicle pays to the city the amount of the administrative penalty prescribed for the code violation plus fees for towing and storing the vehicle. If the vehicle is also subject to immobilization for unpaid parking and/or compliance violations, the owner of the vehicle must also pay the amounts due for all such outstanding violations prior to the release of the vehicle. If the administrative law officer determines there is no such probable cause, or, if the impoundment is pursuant to Section 9-92-035, that the subject vehicle has previously been determined not to be eligible for impoundment under that section, the vehicle will be returned without penalty or other fees.

(omitted text is unaffected by this ordinance)

2-14-190 Municipal hearings division – Jurisdiction.

(a) The department of administrative hearings is authorized to establish a system of administrative adjudication for the enforcement of all provisions of the Municipal Code that are not adjudicated by the vehicle, buildings, environmental safety or consumer affairs hearings divisions, except that it shall not adjudicate violations of the following chapters and sections: chapter 4-92 (Massage Establishments and Massage Services); chapter 4-144 (Weapons); and Section 7-28-190 (Health Nuisances – Throwing Objects into Roadways)~~; chapter 8-20 (Weapons), other than Section 8-20-015 (Unlawful Firearm in Motor Vehicle – Impoundment); and chapter 8-24 (Firearms and Other Weapons)~~.

(omitted text is unaffected by this ordinance)

SECTION 2. Chapter 2-84 of the Municipal Code of Chicago is hereby amended by adding a new section 2-84-075, as follows:

2-84-075 Sale of firearms and ammunition authorized by the superintendent.

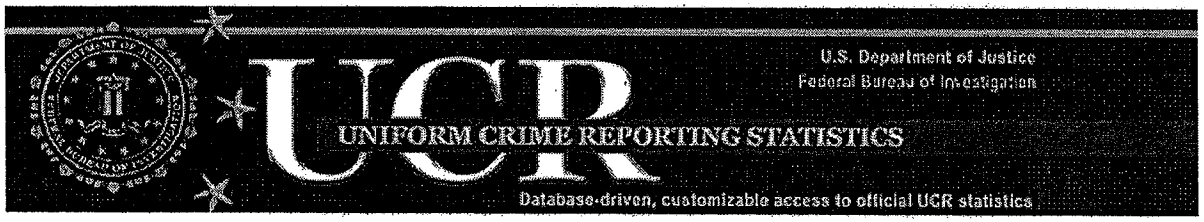
Notwithstanding any other provision of this code to the contrary, the superintendent may authorize the sale of firearms or ammunition by a person issued a federal firearms license to a member of the police department, if that member is authorized to carry such firearm or ammunition. Such sales shall be conducted at department of police facilities.

SECTION 3. Title 4 of the Municipal Code of Chicago is hereby amended by adding a new section 4-144-065, by adding the language underscored, and by deleting the language struck through, as follows:

4-144-010 License – Required.

It shall be unlawful for any person to engage in the business of selling, or to sell, ~~or~~ give away or otherwise transfer, any ~~pistol, revolver or other firearm,~~ dagger, stiletto, billie, derringer, bowie knife, dirk, stun gun or taser, as defined in Section 24-1 of the Illinois Criminal Code, 720 ILCS 5/24-1, or other deadly weapon which can be carried or concealed on the person, or any ammunition, as that term is defined in Section 8-20-010, without securing a weapons dealer license. The license required by this chapter shall be in addition to any other license required by law. It shall be unlawful for any person licensed under this chapter to engage in the business of selling, or to sell, give away or otherwise transfer, any firearm as that term is defined in Section 8-20-010.

EXHIBIT 2



Results from Large Local Agency Reported Crime database Query date: January 26, 2012

Spreadsheet of this table (.csv file) | **Spreadsheet help** **Revise this query | Get a different type of table**

Definitions. Also see notes at the end of the page.
For caution, see ***Caution against ranking***

Population Selection: Cities 1,000,000 or over

Crime in 2009

				Number of offenses reported					Crime rate per 100,000 population				
				Violent crime					Violent crime				
Agency	State	Months reporting	Population coverage	Violent crime total	Murder and nonnegligent manslaughter	Forcible rape	Robbery	Aggravated assault	Violent Crime rate	Murder and nonnegligent manslaughter rate	Forcible rape rate	Robbery rate	Aggravated assault rate
Chicago Police Dept	IL	12	2,848,431		458		15,877	15,727		16.1		557.4	552.1
Dallas Police Dept	TX	12	1,290,266	10,221	166	485	5,501	4,069	792.2	12.9	37.6	426.3	315.4
Houston Police Dept	TX	12	2,273,771	25,593	287	823	11,367	13,116	1,125.6	12.6	36.2	499.9	576.8
Las Vegas Metropolitan Police Department	NV	12	1,377,282	13,039	111	698	4,495	7,735	946.7	8.1	50.7	326.4	561.6
Los Angeles Police Dept	CA	12	3,848,776	24,070	312	903	12,217	10,638	625.4	8.1	23.5	317.4	276.4
New York City Police Dept	NY	12	8,400,907	46,357	471	832	18,597	26,457	551.8	5.6	9.9	221.4	314.9
Philadelphia Police Dept	PA	12	1,547,605	19,163	302	896	9,037	8,928	1,238.2	19.5	57.9	583.9	576.9
Phoenix Police Dept	AZ	12	1,597,397	8,730	122	522	3,757	4,329	546.5	7.6	32.7	235.2	271.0
San Antonio Police Dept	TX	12	1,373,936	7,844	99	628	2,683	4,434	570.9	7.2	45.7	195.3	322.7
San Diego Police Dept	CA	12	1,314,773	5,931	41	318	1,905	3,667	451.1	3.1	24.2	144.9	278.9

Notes: When data are unavailable, the cells are blank or the year is not presented.
Variations in population coverage and reporting practices may cause differences in reporting from year to year. (See **definitions**).
MSA and non-MSA county populations are not available.
Crime rates are not available for agencies that report data for less than 12 months of a year.

- Illinois agencies 1985-Present - The data collection methodology for the offense of forcible rape used by the State Uniform Crime Reporting (UCR) Program does not comply with national UCR Program guidelines. Consequently, their figures for forcible rape and violent crime (of which forcible rape is part) are not included in this tool. The exception, however, is Rockford, Illinois. The agenc has provided valid forcible rape crime counts as of 2006.

Sources: FBI, Uniform Crime Reports as prepared by the National Archive of Criminal Justice Data

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EXHIBIT 3

THE UNIVERSITY OF CHICAGO

Crime Lab

55 East Monroe
30th Floor
Chicago, IL 60603
crimelab@uchicago.edu

Testimony
Chicago City Council
The Social Costs of Handgun Violence
June 29, 2010
Jens Ludwig, PhD
McCormick Foundation Professor of Social Service Administration, Law, and Public Policy
University of Chicago

Good morning and thank you for inviting me to testify about the costs of gun violence in the city of Chicago.

I would like to begin by discussing the role that guns play in contributing to gun violence:

- Guns make violent events more lethal compared to crimes that involve knives or other weapons.
- This means that in places where guns are more readily available, a higher percentage of assaults and robberies will result in the victim's death, and so those places will have relatively higher rates of homicide.
- The increased lethality of guns compared to other weapons is one reason why guns are involved in the vast majority of homicides, both nationally (67%) and in the city of Chicago specifically (80.6%).
- The vast majority of the time that a gun is used in homicide in Chicago (98% of the time to be exact), it is a handgun

The role that guns play in making violent crime more lethal imposes massive costs on the city of Chicago, which are widely shared among all of the city's residents but disproportionately so by the most economically vulnerable among us:

- Based on previous research that I have published with colleagues in the *Journal of the American Medical Association* (Cook, Lawrence, Ludwig and Miller, 1999) suggesting that the average medical costs per crime-related gunshot injury is around $45,000 (in inflation-adjusted 2010 dollars), combined with my estimate that there were around 2,060 assault-related gunshot injuries in Chicago in 2008,[1]

[1] I estimate the number of assault-related total gunshot injuries in the city of Chicago for 2008 as follows. Data from the Chicago Police Department indicate that there were 412 firearm homicides in Chicago in 2008. Previous research by my colleague Philip Cook of Duke University (Cook, 1985) suggests that around one of five assault-related gunshot injuries are fatal. These two numbers together imply that there were around 412*5 =2,060 total assault-related gunshot injuries in Chicago in 2008.

implies that the medical costs associated with inter-personal gun violence in Chicago in 2008 were nearly $94 million—over half of which was paid for by government programs, that is, by taxpayers.[2]

- My previous research suggests that gun violence increases the costs of running our criminal justice system by at least $64 million each year.[3]

- Previous research has found that every homicide reduces a city's population by around 70 people. Data from the Census Bureau shows that from 2000 to 2008, the total population of Chicago declined from 2,896,016 to 2,853,114, a decline of nearly 50,000 people. To put this number into perspective, the total population of Hyde Park in 2000 was 29,920. My calculations suggest that if Chicago's homicide rate for the past 8 or 9 years had been more like New York City's, which has a homicide rate that is around one-third of ours, then Chicago's population would have actually *increased* by several hundred thousand residents, rather than declined.[4]

- Previous research by NYU economist Amy Ellen Schwartz and her colleagues show that the massive crime drop in New York over the 1990s contributed substantially to the growth in property values in that city. My calculations suggest that eliminating gun involvement in crime Chicago might increase total property values in the city by perhaps $30 billion or so, and increase property tax revenues by around $30 million per year.[5]

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[2] My 1999 paper in JAMA notes that the lifetime total cost of fatal gunshot injuries in Maryland was $13,191, equal to $19,420 in 2010 dollars, while the total lifetime cost of non-fatal gunshot injuries was $35,367, equal to $52,067 when adjusted to 2010 dollars. The average medical costs are a weighted average of these two figures, where the weights are proportional to the share of total crime-related gunshot injuries that are fatal (20%) versus non-fatal (80%).

[3] To see how this figure is derived, consider the effects of an intervention that results in 100 fewer gunshot injuries. Previous studies suggest that, on average, every 100 assault-related gunshot injuries will lead to 20 deaths. To be conservative, assume that all of the 100gunshot injuries that are prevented are replaced by 100 non-gun injuries, of which around 7 will be fatal on average (see Cook and Leitzel, 1996). The savings to the criminal justice system from eliminating 100 gunshot injuries equals the difference between the criminal justice costs of the 13 "excess" homicide cases (13 times $243,960 = $3.2 million) and the costs of 13 non-fatal aggravated assaults (13 times $6,200 = $80,600). The criminal justice costs for gunshot injuries in Chicago then equal the costs per gunshot injury ($31,000) times the number of gunshot injuries, or 2,060, as noted above. See Cook and Ludwig (2000), p. 86-87, esp. footnote 5.

[4] Data from the CPD's 2008 homicide report indicates that the city experienced a total of (633+667+656+601+454+451+471+445+511) = 4,559 homicides from 2000 through 2008. If our homicide rate had been like New York's over this period (that is, about one-third the actual Chicago homicide rate), then we would have had around 3,009 fewer homicides, or about 3,009*70 = 210,600 more residents. Note that from 2000 to 2008 New York City did indeed have a population increase of several hundred thousand people (from 8,008,278 to 8,363,710, a 4.4 percent increase).

[5] Estimates from Amy Ellen Schwartz and colleagues (2003) suggest that a decline in violent crime rates of 50 percent would increase property values by 7-9 percent. My calculations suggest that about half of this effect comes from homicides, the vast majority of which as noted above are committed with guns. My guess of roughly half the effect comes from evidence from Cullen and Levitt (1996) that each part 1 offense reduces city population by 1 person, while each homicide (as they report in unpublished estimated discussed in Cook and Ludwig, 2000) reduces city population by 70 people. In Chicago in 2008 there were 35,797 part 1 violent crimes and 510 homicides, which implies that about half the population loss due to crime was due to homicides. I assume that the effect on property values is proportional to the effect on population out-migration. Data from the Cook County government reports

- My previous research with Duke Professor Philip J. Cook estimates that the total social costs per assault-related gunshot injury is on the order of around $1 million (Cook and Ludwig, 2000; Ludwig and Cook, 2001). This total social cost estimate includes the intangible costs of crime, such as the fear of losing a loved one to gun violence (which makes life almost unlivable in some of our city's most distressed and dangerous communities) as well as the costs that many people incur to reduce their risk of being shot, such as living far away from where they work. My estimates suggest that the total social cost of gun violence for Chicago annually is around $2.5 billion, or $2,500 per year for each Chicago household.

- A standard principle in economics is that the optimal tax on consumer goods should be equal to the net social costs that the good imposes on the rest of society. Based on the estimates for the social costs of crime that Philip Cook and I have calculated, together with our estimate for the effects of increased household gun ownership rates on an area's homicide rate, Cook and I estimate that the optimal licensing fee for a household to keep a gun would be around $600 per year (Cook and Ludwig, 2006)[6].

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that total property value in the county is $656.5 billion, and that (very roughly) property tax revenues for governmental-type activities in 2008 were $619 million in 2008 http://www.cookcountygov.com/taxonomy/Finance/Documents/CAFR/cc_2008CAFR.pdf. Eliminating gun involvement in crime in Chicago would have the equivalent impact on property values (and hence taxes) as cutting the violent crime rate in half, and so would increase property tax collection by 7-9% of $619 million, or $43 to $56 million. Around 60 percent of Cook County's population lives in Chicago, so I assume the change in Chicago's property tax revues would be 60 percent of $43 to $56 million, or $26 to $34 million. My calculations imply that the total property value of Chicago would be approximated as 60% * $656.5 billion, or $394 billion, and so eliminating gun involvement in crime would lead to an increase in property values of 7-9% of that, or $28 to $35 billion.

[6] In other words, a licensing fee of $600 per year represents the net effect of one more household having a gun on the total volume of gun violence in the local area and the social costs per extra crime related gunshot injury.

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EXHIBIT 4

The Journal of Risk and Uncertainty, 22:3; 207–226, 2001

The Benefits of Reducing Gun Violence: Evidence from Contingent-Valuation Survey Data*

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Georgetown University and National Consortium on Violence Research

PHILIP J. COOK cook@pps.duke.edu
Duke University, National Consortium on Violence Research, and National Bureau of Economic Research

Abstract

This article presents an estimate of the benefits of reducing crime using the contingent-valuation (CV) method. We focus on gun violence, a crime of growing policy concern in America. Our data come from a national survey in which we ask respondents referendum-type questions that elicit their willingness-to-pay (WTP) to reduce gun violence by 30%. We estimate that the public's WTP to reduce gun assaults by 30% equals $24.5 billion, or around $1.2 million per injury. Our estimate implies a statistical value of life that is quite consistent with those derived from other methods.

Keywords: costs of crime, gun violence, contingent valuation

JEL Classification: K42, H43, J17

1. Introduction

Since the early 1970s, the United States have averaged nearly 14,500 gun homicides and perhaps another 70,000 non-fatal injuries from gun assaults.[1] Concern about gun

*Portions adapted from Cook and Ludwig, *Gun Violence: The Real Costs* (Oxford University Press, 2000). This article was supported by a grant from the Joyce Foundation and written in part while the first author was visiting scholar to the Northwestern University/University of Chicago Joint Center for Poverty Research. We are indebted to the Johns Hopkins Center for Gun Policy and Research and the National Opinion Research Center at the University of Chicago for the opportunity to make use of their annual gun survey. Thanks to Mark Cohen, Julie Cullen, Ted Gayer, Arlene Greenspan, Jay Hamilton, Steve Hargarten, David Hemenway, Joel Huber, Arthur Kellermann, Debby Leff, Steve Levitt, Will Manning, Ted Miller, John Mullahy, Terry Richmond, Seth Sanders, Bill Schwab, Kurt Schwabe, Kerry Smith, Tom Smith, Steve Teret, Daniel Webster, seminar participants at Duke University, the University of North Carolina at Chapel Hill, the American Society of Criminology, and the American Economic Association, as well as to W. Kip Viscusi and an anonymous referee for helpful comments. Thanks to Bruce Lawrence and Bob Malme for help with the calculations. Any errors of fact or interpretation are our own.

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violence has prompted a substantial policy response. For example, in New York City, the elite Street Crimes Unit has employed aggressive stop-and-search tactics to reduce illegal gun carrying in high-crime neighborhoods (Bratton and Kobler, 1998). In St. Louis the police sought parental consent to search homes and seize illegal firearms kept by teens (Rosenfeld and Decker, 1996), while the Boston Gun Project targeted illegal gun trafficking and gang shootings (Kennedy, Piehl, and Braga, 1996; Piehl, Kennedy, and Braga, 1998). Richmond, Virginia's Project Exile threatens felons who use guns with prosecution and sentencing in federal court (Cook and Ludwig, 2000). And at the national level, policies ranging from background checks for gun-show sales to an outright ban on handguns are being actively considered.[2]

While some of these programs may be effective in reducing the risk of assault-related gunshot injuries to citizens (Blumstein and Rosenfeld, 1998; Blumstein and Wallman, 2000; Cook and Ludwig, 2000), each imposes some cost on society in the form of additional government expenditures and inconvenience to citizens. One of the central insights from the economics of crime is that information about the benefits and costs of crime reduction may be useful in deciding how to make these tradeoffs (Becker, 1968; Stigler, 1970; Rottenberg, 1970). Yet applying this insight to the case of gun violence requires some estimate for the benefits of reducing gun injuries.

The present article represents the first attempt to estimate the benefits of reducing crime using the contingent-valuation (CV) method. Our focus on gun violence in particular is motivated by the growing policy concern about this issue. We adopt the standard approach of public economics and define the benefit of a public good as what society is willing to pay (WTP) to achieve some change in the level of the good (Viscusi, 1992). The public good in question here is freedom from the *ex ante* risk of victimization. This *ex ante* approach is appropriate for the decision problem facing policymakers, who must decide whether to fund crime-control programs that will prevent injuries to victims whose identity is not yet known.

The estimates presented in the current article are obtained from a nationally representative CV survey of 1,204 adults conducted in 1998. The survey elicits respondents' WTP to finance a 30% reduction in gun violence through programs that target gun thefts and illegal gun dealers. Since such interventions should have little effect on the ability of most adults to own guns, the public good of interest is a marginal decrease in assault-related gunshot injury (hereafter "gun crime" or "gun violence") holding constant whatever benefits may be associated with widespread gun ownership. Responses to this CV question should in principle yield comprehensive estimates for the benefits of reductions in the risk of gunshot injury. Our results suggest that a 30% reduction in gun violence is worth $24.5 billion to the American public. Dividing this figure by the number of gunshot injuries in 1998 implies a WTP per injury equal to around $1.2 million.

Despite some limitations of the CV data used to derive our estimates, these findings are consistent with a number of reasonable benchmarks. First, we find that WTP is positively correlated with household income. Controlling for other background characteristics, WTP also increases with household size; since the reduction in risk the household experiences is related to the number of members, this finding suggests that the responses are driven at

least in part by the demand for specified reductions in the risk of gunshot injury. Second, Anderson (1999) finds that the average household currently spends around $1,800 per year in taxes and consumption expenditures to fund the criminal justice system and private protection measures. Thus, it does not seem implausible that the average household will spend an additional $240 per year to reduce the threat of gunshot injury by 30%, particularly since the fear of crime in America appears to be driven largely by the threat of *violent* crime (Zimring and Hawkins, 1997; Hamermesh, 1998; Cullen and Levitt, 1999).[3] Third, our estimates imply a value for one statistical life that is quite consistent with those derived in other contexts (Viscusi, 1992, 1993).

Compared with earlier research, our estimates provide a very different picture of both the magnitude and distribution of the costs of gun violence. Previous studies of the benefits of reducing gun violence have adopted an *ex post* approach that begins with a count of the annual number of gunshot injuries and then multiples this figure by some estimate of the cost per injury.[4] The primary limitation with this *ex post* method is that it does not fit the decision problem that faces policymakers, and ignores averting behaviors and other costs imposed even on those who are not victimized. Much of this research has been conducted within the public health "cost-of-illness" (COI) tradition, which is likely to understate the cost per injury by focusing only on medical treatment for gunshot injuries and other direct costs plus a measure of lost productivity (Max and Rice, 1993).[5] And in fact the leading COI study reports a cost per injury (equal to about $80,000 in 1998 dollars) that is far lower than our own estimate (Max and Rice, 1993).

More recent studies improve on the COI approach by adding measures for the value of life and health obtained from the workplace-risk or jury-award literatures (Miller and Cohen, 1996, 1997; Miller, Cohen, and Wiersema, 1996; Anderson, 1999), and generate estimates that are closer in magnitude to our own. But these studies like the COI literature adopt an *ex post* approach.

Our CV evidence suggests instead that the costs of gun violence are far more evenly distributed across the population than victimization statistics would suggest. Although gunshot injuries are concentrated disproportionately among low-income young men (Cook and Ludwig, 2000), as noted above the WTP to reduce gun violence is highest among middle-class parents. Although these households are at low personal risk of injury, their stake in reducing gun violence comes in part from the costly averting behaviors that they undertake in response to the threat of gunshot injury. For example, economists have found that decisions about whether to live in the city or suburb (Cullen and Levitt, 1999) and whether to work in the evening (Hamermesh, 1998) are affected by the risk of homicide victimization, most of which is accounted for by the risk of gun homicide. Cook and Ludwig (2000) show that the cost of administering the criminal justice system are increased by $2 billion or more each year because guns increase the likelihood that a robbery or fistfight results in a homicide. Gunshot injuries increase the net medical expenditures of public and private health insurance programs. And schools and other government agencies divert scarce resources to metal detectors and other security precautions designed largely to reduce the risk of gunshot injury.

The rest of the article is organized as follows. The second section reviews the willingness-to-pay (WTP) approach and discusses the application of this method to the

case of gunshot injuries. The third section describes our data and the fourth presents the empirical results. The fifth section discusses the implications of these findings.

2. The WTP approach

In this section we discuss the WTP approach within the context of gun violence, and then discuss different methods for estimating WTP.

Defining WTP

Under the traditional benefit-cost framework of public economics, the benefits of a violence-reduction program consists of the sum of the values that citizens are WTP to fund some program or policy that reduces the risk of injury victimization. Previous research suggests that individual WTP to support a program to reduce gun violence may be motivated by four factors (Schelling, 1968):

- First, the individual may attach some value to the reduction in risk of being shot.
- Second, she may value the reduction in risk to other members of her household. Because we assume that individuals value the well-being of others in the household and because households pool income, we follow Manning et al. (1991) and treat households as the economic unit of interest.
- Third, she may derive some value from reducing the risk of others outside her household for whom she feels altruistic (Viscusi, Magat, and Forrest, 1998).
- Fourth, a reduction in the population risk of gunshot injury may have secondary benefits by improving her material quality of life. Part of this benefit comes from reductions in her own preventive expenditures (Berger, Blomquist, Kenkel and Tolley, 1994), while reductions in preventive behaviors by others may produce additional benefits. (For example, the overall quality of life in the community may improve from a reduction in gun violence, as a reduced threat of being caught in the cross fire engenders more socializing). Further, she may also receive some financial gain from reductions in the number of gunshot injuries to strangers through reductions in taxes or insurance premiums (Cook et al., 1999, Cook and Ludwig, 2000).

Total societal WTP is then defined as the sum of what each individual household is willing to pay.

Measuring WTP

One way to measure societal WTP for programs that reduce health risks is to examine marketplace behavior. For example, a widely used approach is to examine the extra wage compensation that workers require in order to take risky jobs; these wage premiums

reflect the price of some health risk in the labor market (see, for example, Moore, and Viscusi, 1988a,b, 1990a,b; Viscusi and Moore, 1989). Another possibility is to examine variations in the prices of housing (Gayer, Hamilton, and Viscusi, 2000) or other consumer goods (Viscusi, 1993) related to health risks to estimate the value that people attach to risk reduction. In practice, identifying the independent effects of health risks on wages and prices is complicated by the possibility of other job or product attributes that may be correlated with these risks. Another complication stems from the choice of the appropriate risk measure that should be used. Most studies rely on some objective measure of the health risk facing consumers or workers, under the assumption that perceived and actual risks are closely related. This assumption is usually justified by noting that individuals have tangible incentives to gather information about the risks associated with particular consumer products or jobs.

When market behavior cannot be directly examined to estimate societal WTP for a public good, the preferred method, known as "contingent-valuation (CV)," is to survey a representative group of respondents about how much they would be willing to pay. A 1992 panel sponsored by the National Oceanic and Atmospheric Administration (NOAA) outlined the key components of a CV study that would maximize the likelihood of producing reliable results (Arrow et al., 1993), which include the use of referendum formats that ask respondents to vote on a hypothetical government program. The referendum format is deemed preferable to open-ended questions because citizens have experience in casting such votes, and because the referendum format minimizes incentives to free ride (Mitchell and Carson, 1989).

Whether even high-quality CV studies produce reliable estimates of WTP remains the topic of ongoing debate. One concern is that individuals will have limited information about the nature of the risk that is being asked about. This issue should not pose a major problem for our CV study because individuals already make decisions about where to live and when to work in response to the threat of gun violence (Hamermesh, 1998; Cullen and Levitt, 1999), decisions that provide people with incentives to gather information about these risks on their own.

Another concern stems from the tendency of survey respondents to present themselves favorably to interviewers (Sudman and Bradburn, 1974), which produces social desirability bias or yea-saying. A related concern is the possibility that CV responses are motivated more by the respondent's desire to "purchase moral satisfaction" rather than support the provision of a defined quantity of some public good (Kahneman and Knetsch, 1992). Both problems may manifest themselves in what is known as the "embedding effect," where the respondent's WTP is independent of the quantity of the public good that is being provided.

Perhaps the primary concern that most economists have about CV research is that respondents have no incentive to take the questions seriously since they relate to hypothetical rather than actual market behavior, what Kenkel, Berger, and Blomquist (1994) call "hypothetical bias." The use of referendum-type CV questions is one attempt to address this concern by increasing the realism of the survey exercise.

The empirical evidence on the existence of embedding effects is somewhat mixed (see, for example, Desvousges et al., 1993; Balson et al., 1990; Beattie et al., 1998; Hammitt

and Graham, 1999). Some evidence against hypothetical bias comes from experimental designs that compare reported with actual WTP, and from comparisons of CV responses with estimated travel times to use parks and other public goods or to wage premiums associated with health risks (Brookshire et al., 1982; Viscusi and O'Conner, 1984; Brookshire and Coursey, 1987; Smith, 1992; Hanemann, 1994), though several studies do find some discrepancies between hypothetical and actual behavior (Hausman, 1993; Diamond and Hausman, 1994; Johannesson et al., 1999). More generally, CV responses are typically consistent (at least broadly) with economic theory, in the sense that WTP increases with income and decreases with the availability of substitute goods (Tolley and Fabian, 1988; Kenkel, Berger, and Blomquist, 1994).

In sum, while most economists agree that WTP is the conceptually appropriate measure for valuing improvements to health and safety, most also agree that none of the available methods for measuring WTP are entirely satisfactory. Wage-risk tradeoffs cannot be used to value the benefits of reducing gun violence in part because of limited data on the risks of gunshot injury across occupations. Wage-risk tradeoffs will also fail to capture the value that workers place on reductions in the averting behaviors that they undertake in their private lives, or the value of reductions in risks to family, friends, and others in the community. In contrast the contingent-valuation method will produce WTP measures that are (at least in principle) complete. Despite the ongoing debates about contingent valuation there are, as Hammitt and Graham (1999, p. 58) note, "few good alternatives."

3. CV survey data

The 1998 National Gun Policy Survey (NGPS) is a nationally representative telephone survey of 1,204 American adults conducted during the Fall of 1998 by the National Opinion Research Center (NORC) at the University of Chicago. Interviews were conducted with one adult per sampled household, with the adult chosen randomly via the most-recent-birthday method. The response rate for the NGPS was 61% (see Kuby, Imhof, and Shin, 1999).

After a series of questions asking about their attitudes towards government and various current or proposed gun regulations, respondents are asked the following questions: "Suppose that you were asked to vote for or against a new program in your state to reduce gun thefts and illegal gun dealers. This program would make it more difficult for criminals and delinquents to obtain guns. It would reduce gun injuries by about 30%, but taxes would have to be increased to pay for it. If it would cost you an extra [$50/$100/$200] in annual taxes would you vote for or against this new program?" The amount of the tax increase that the respondent is asked about, either $50, $100 or $200, is randomly determined by the survey software. Respondents are then asked a follow-up where the dollar amount asked about in the initial referendum question is either doubled or halved, depending on whether the respondent's initial answer was positive or negative, respectively.

The intervention specified in the CV scenario should have no effect on hunting or defensive gun uses, and previous research suggests that gun availability within an area

increases the lethality but not the volume of violent crime (Cook, 1979, 1981, 1983). Thus the implicit counterfactual scenario that respondents are asked to "buy" in the NORC survey is a 30% reduction in gun crime, an equivalent increase in the number of non-gun crimes, and no change in the number if defensive gun uses. It is possible that respondents ignore the possibility of a countervailing increase in non-gun crimes when formulating their WTP responses, which will lead them to overstate the value of moving from the *status quo* to the counterfactual that we have in mind. Yet the degree of bias is likely to be modest, given the evidence cited above that Americans appear to be far more worried about serious injuries than other criminal victimizations.

As noted earlier, we assume that respondents are reporting on the total dollar value that their *household* would be willing to pay to fund this program, rather than reporting strictly on the value that they themselves would pay. Our assumption is conservative in that if respondents are in fact reporting on personal rather than household WTP, our estimates will understate total societal WTP to fund the hypothetical reduction in gun crime.[6]

4. Empirical results

We begin by presenting a non-parametric estimate for WTP to reduce gun violence by 30%. This estimate does not impose any assumptions on the population distribution of WTP, and suggests a WTP equal to $21.8 billion. We then present a more elaborate set of maximum-likelihood estimates that are derived under alternative assumptions about the distribution of WTP. Our preferred estimates suggest a societal WTP of $24.5 billion, equal to around $1.2 million per gunshot injury avoided.

Non-parametric estimates

Table 1 presents the descriptive statistics from the NGPS data. The proportion of respondents who vote to support the violence-reduction program decreases as the amount required to fund the program increases, ranging from 76% at a cost of $50 more in annual taxes to 38% at a cost of $400. Figure 1 provides a graphical representation of the cumulative distribution function implied by these descriptive statistics.

If we integrate under the area shown in Figure 1 and multiply by the total number of households in the US—equal to 102.5 million in 1998 (US Bureau of the Census, 1999a)—we obtain an estimated total WTP of $21.8 billion to reduce assault-related gunshot injuries by 30% (Table 2). In these calculations we assign a WTP of $0 to those respondents who answer no to both the first and follow-up CV questions, under the assumption that each individual's WTP to reduce gunshot injuries must be non-negative.[7] Although some people may object to the specific *mechanism* used to reduce gun injuries, presumably few people would be willing to pay to see more Americans shot, and in any case it is not clear that such preference should be given standing in benefit-cost analysis. In order to convert this estimate into WTP per gunshot injury avoided,

Table 1. Descriptive statistics from the 1998 NGPS

	How vote on program to reduce gunshot injuries by 30% but cost $50 more per year in income taxes?	How vote on program to reduce gunshot injuries by 30% but cost $100 more per year in income taxes?	How vote on program to reduce gunshot injuries by 30% but cost $200 more per year in income taxes?
% Vote in favor of program (N)	75.8 (400)	68.5 (400)	63.6 (404)
% Vote in favor of program on follow-up Q (N)			
Amount asked about on follow-up Q			
$25	23.3 (95)		
$50		24.2 (112)	
$100	67.2 (290)		27.9 (133)
$200		59.4 (268)	
$400			59.4 (253)

Source: Authors' calculations from 1998 NGPS; descriptive statistics are calculated using the 1998 NGPS sampling weights. Figures are in 1998 dollars.

we can divide total WTP by the estimated annual incidence of assault-related gunshot woundings—around 68,900 in 1998[8]—multiplied by 30%. This suggests WTP per injury equal to around $1.1 million.

Parametric estimates

The non-parametric estimate understates societal WTP because it does not interpolate the underlying distribution between the CV bid values or extrapolate beyond the highest value used in the survey. The non-parametric approach is also limited in that it only uses a fraction of the information available with the CV data. In this section we develop refined estimates that use maximum-likelihood methods to estimate societal WTP under a number of different assumptions.

Our empirical strategy is based on the framework outlined by Cameron and James (1987) and Cameron (1988). Let Y_i equal the (unobserved) WTP value that respondent (i) has in mind when answering the first and second referendum questions in the NGPS. The respondent will answer in the affirmative to the first referendum question ($I_{1i} = 1$) if the "price" of the program in the form of higher taxes (t_{1i}) is not greater than the respondent's WTP ($Y_i \geq t_{1i}$). Similarly, the respondent will support the program in the follow-up CV question ($I_{2i} = 1$) if the new price t_{2i} is less than WTP ($Y_i \geq t_{2i}$), where t_{2i} is equal to double t_{1i} if $I_{1i} = 1$ and half of t_{1i} if $I_{1i} = 0$. We initially assume that Y_i is log-normally distributed (equation 1), which constrains WTP to be positive.

$$\log Y_i = \beta + u_i, \quad u_i \sim N(0, \sigma^2) \tag{1}$$

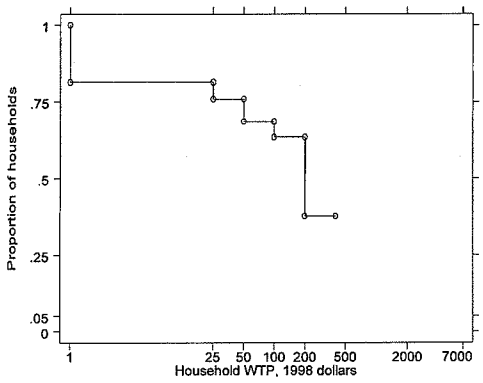

Figure 1. Demand for 30% reduction in gun violence.

From this setup we can estimate household WTP using the "interval-data" or "double-bounded" model from Hanemann, Loomis, and Kanninen (1991). The probabilities for the four possible joint outcomes for the first (I_{1i}) and second (I_{2i}) referendum questions are given in equations (2)–(5) (recall that $t_{2i} = 2t_{1i}$ if $I_{1i} = 1$, and $t_{2i} = 0.5t_{1i}$ if $I_{1i} = 0$).

$$\begin{aligned} P[I_{1i} = 1, I_{2i} = 1] &= P[Y_i \geq t_{2i} > t_{1i}] = P[Y_i \geq t_{2i}] \\ &= P[u_{1i}/\sigma \geq (\log t_{2i} - \beta)/\sigma] \\ &= 1 - F[(\log t_{2i} - \beta)/\sigma] \end{aligned} \tag{2}$$

Table 2. Nonparametric estimates for mean WTP from NGPS

Frequency distribution of maximum WTP to reduce gun assaults by 30% implied by descriptive statistics in Table 1	(% households)
$ 0	18.6
25	5.6
50	7.3
100	4.9
200	25.8
400	37.8
Implied mean WTP per household	$212.7
Implied aggregate WTP[a]	$21.8 billion

Notes: Estimates calculated from (weighted) descriptive statistics for NGPS shown in Table 1. Results reported in 1998 dollars.

[a]Obtained by multiplying mean WTP per household by number of households in the United States in 1998, which is equal to 102.5 million (US Bureau of the Census, 1999a,b).

$$P[I_{1i}=0, I_{2i}=0] = P[Y_i < t_{2i} < t_{1i}] = P[Y_i < t_{2i}]$$
$$= P[u_{1i}/\sigma < (\log t_{2i} - \beta)/\sigma]$$
$$= F[(\log t_{2i} - \beta)/\sigma] \quad (3)$$

$$P[I_{1i}=1, I_{2i}=0] = P[t_{1i} \le Y_i < t_{2i}] = P[Y_i < t_{2i}] - P[Y_i < t_{1i}]$$
$$= F[(\log t_{2i} - \beta)/\sigma] - F[(\log t_{1i} - \beta)/\sigma] \quad (4)$$

$$P[I_{1i}=0, I_{2i}=1] = P[t_{2i} \le Y_i < t_{1i}] = P[Y_i < t_{1i}] - P[Y_i < t_{2i}]$$
$$= F[(\log t_{1i} - \beta)/\sigma] - F[(\log t_{2i} - \beta)/\sigma] \quad (5)$$

We obtain estimates for the parameters of this model by applying maximum-likelihood estimation (MLE) to the log-likelihood function in equation (6).

$$\ln L = \sum_i (I_{1i})(I_{2i})\{1 - F[(\log t_{2i} - \beta)/\sigma]\}$$
$$+ (1 - I_{1i})(1 - I_{2i})\{F[(\log t_{2i} - \beta)/\sigma]\}$$
$$+ (I_{1i})(1 - I_{2i})\{F[(\log t_{2i} - \beta)/\sigma] - F[(\log t_{1i} - \beta)/\sigma]\}$$
$$+ (1 - I_{1i})(I_{2i})\{F[(\log t_{1i} - \beta)/\sigma] - F[(\log t_{2i} - \beta)/\sigma]\} \quad (6)$$

The coefficient estimate for the variables t_{1i} and t_{2i} is an estimate for $1/\sigma$, which in turn allows us to identify an estimate b for the parameter β. Calculating the standard errors for mean and median household WTP is complicated by the fact that our estimate for b is really the ratio of two estimates—the estimated value for β/σ divided by an estimate for $1/\sigma$. Our method for calculating standard errors is provided in the technical appendix. If w_i represents the NGPS sampling weight for household (i), which equals the number of households in the population that each sampled household represents, then estimated societal WTP is given by equation (7). While b provides an unbiased estimate for the expected value of log WTP, for a log-normal variable the mean of WTP itself will be given by $\exp(b) \times \exp(0.5\sigma^2)$ as in equation (7) (Manning, 1998).

$$\text{Societal WTP} = \sum_i w_i \times \exp(b) \times \exp(0.5\sigma^2) \quad (7)$$

In Figure 2, we compare the cumulative distribution function for WTP implied by the parametric estimates presented in Table 3 with the non-parametric function from Figure 1. The MLE estimates imply mean and median household WTP equal to $203 and aggregate WTP equal to $20.8 billion, or around $1 million per injury (Table 4). The parametric estimate does not exceed the non-parametric figure as might be expected because the former uses data from both the first and second CV questions, while the latter is based largely on responses to the first CV question.

We further refine our parametric estimates by calculating mean household WTP conditional on a vector of household characteristics $\mathbf{X}_i$ that may affect the risk of gunshot

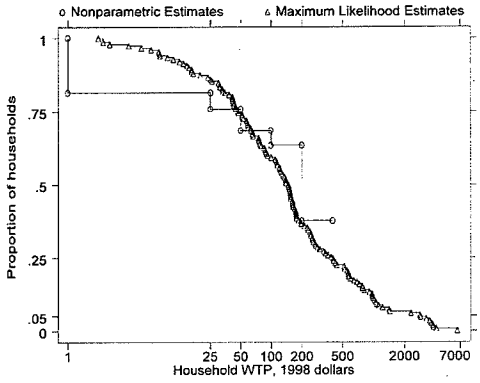

Figure 2. Demand for 30% reduction in gun violence.

Table 3. Coefficient estimates from MLE estimates, from NGPS contingent valuation referendum data

Variable	Without household covariates	With household covariates
Intercept	3.078 (0.155)**	3.096 (0.220)**
Bid value ($1/\sigma$)	0.600 (0.030)**	0.634 (0.033)**
Race		
African-American		−0.046 (0.131)
Hispanic		−0.129 (0.155)
Other Race		−0.213 (0.213)
Region		
Northeast		0.057 (0.119)
Midwest		−0.156 (0.100)
West		−0.155 (0.116)
HH composition		
# Children < 6 in HH		0.229 (0.064)**
# Children 6–17 in HH		0.115 (0.041)**
# Adults in HH		−0.027 (0.057)
Family income		
$20–39,999		0.214 (0.121)*
$40–59,999		0.438 (0.135)**
$60,000 plus		0.449 (0.133)**
Income missing		0.081 (0.141)
Gun in home		−0.201 (0.088)**
N	1,145	1,110
Log likelihood	−804.57	−759.3

Notes: Author calculations from applying maximum likelihood estimation to equation (3) for the 1997 gun survey data and equation (11) for the 1998 gun survey data, under the assumption that WTP is normally distributed. Figures are in 1998 dollars.

*Statistically significant at the 10% level.

**Statistically significant at the 5% level.

injury, attitudes towards risk, or ability to pay. In our empirical analysis the vector of household variables includes income, household composition (the number of children under 6 or 6–17, and the number of adults), household gun ownership, and race.[9]

As seen in Table 3, income has a strong positive effect on support for the violence program. We also find that households with guns have lower WTP than other households to support gun-violence reduction, consistent with previous findings that gun owners are less supportive of gun control than non-owners (Teret et al., 1998). Table 3 also provides some support for the assumption that respondents are reporting on household (rather than individual) WTP, since WTP has a strong correlation with the number of children in the home.

Including the household covariates serves to increase our estimated mean WTP per household from $203 to $239 (Table 4). Total WTP to reduce gun violence by 30% equals $24.5 billion, or around $1.2 million per injury. We use household-level covariates because we interpret the CV responses as reflections of household (rather than individual) WTP. If different individuals within the home would report different WTP values, then our estimates should still be unbiased (since adults are randomly selected from households) but may be inefficient.[10]

Sensitivity analyses

We find that our estimates are fairly robust to assumptions about the distribution of WTP. Re-estimating equation (7) with covariates under the assumption that WTP has a log-logistic (rather than log-normal) distribution produces an estimated mean WTP of $206. Using a normal distribution, which allows WTP to be negative, produces an estimate of $213.

One concern with these CV data is the possibility that responses to the follow-up CV question are influenced by the initial question. As Cameron and Quiggin (1994) note,

Table 4. Maximum likelihood estimates for WTP to reduce gun assaults by 30%, from NGPS data

	Without covariates	With covariates[a]
Estimated WTP to reduce GSW by 30%		
Mean	$203	$239
(95% confidence interval)	(185–220)	(103–375)
Median	$203	$204
(95% confidence interval)	(185–220)	(68–340)
Estimated societal WTP for program to reduce gun assaults by 30%[b]	$20.8 billion	$24.5 billion
Estimated societal WTP for each gun assault avoided	$1.0 million	$1.2 million

Notes: Figures are in 1998 dollars.

[a]Covariates included in model are household income, household composition (the number of children under 6 or 6–17, and the number of adults), household gun ownership status, and race

[b]Obtained by multiplying mean WTP per household by number of households in the United States in 1998, which is equal to 102.5 million (U.S. Bureau of the Census, 1999a,b).

respondents may become more certain about their response to the second rather than first question because they have had more time to reflect on the public good in question. Alternatively, respondents may believe that the first question provides information about the actual average cost of the public good, and may then react negatively to the second question that asks the respondent to pay "more than it costs." The descriptive statistics presented in Table 1 provides some evidence to support this second effect. For example, Table 1 shows that 69% of respondents who are asked about a $100 tax increase in the first question will pay this much to support the program, though only 51% of those who are asked about a $50 increase in the first question will support a $100 tax increase (76% × 67%).

To address the possibility that the respondent is sensitized by the first CV question, and thus that the first and second questions produce draws from slightly different WTP distributions, we follow Cameron and Quiggin (1994) and re-estimate WTP using a bivariate probit model. The bivariate probit model allows for different means for the first and second WTP values ($\beta_1 \neq \beta_2$), as well as separate error processes that have different variances ($\sigma_1^2 \neq \sigma_2^2$) and are only imperfectly correlated ($\text{Corr}[u_{1i}, u_{2i}] = \rho < 1$). Although the bivariate probit model affords greater flexibility than the MLE model given by equation (6), this strategy comes at the cost of less precise estimates (Alberini, 1995) and makes interpretation of the results somewhat complicated. Relative to our preferred WTP estimate of $239 in Table 4, the bivariate-probit estimate for the first referendum response is 30% higher and for the second response is 13% lower. Both of these are within the 95% confidence interval for the estimate in Table 4.

Another concern that commonly arises with CV studies is that of "protest zeroes," defined as cases in which the respondent rejects the hypothetical market scenario even though her true WTP exceeds the stated "price" of the referendum (Mitchell and Carson, 1989). The proper definition of protest zeroes is complicted in our application. Fairly uncontroversial is the case of tax protestors—those respondents who object to financing the program out of tax revenues, but who would be willing to pay the stated amount to achieve a 30% reduction in gun violence if the program were financed by some other means. One possibility is to identify as tax protesters the 24% of respondents who "strongly agree" with the survey question that "taxes are too high." When we re-estimate our model without these respondents in the sample—which is the preferred method for dealing with protesters (Freeman, 1993)—our estimate is only 13% higher than the $239 figure reported in Table 4.

More complicated are cases where the respondent objects to the mechanism for reducing gun violence, rather than the mechanism for financing the program. The NGPS asks about programs that target the illegal use or transmission of firearms, which in turn should reduce gun violence holding the overall crime rate constant. Respondents who object to these interventions should *only* be counted as protest zeroes if alternative interventions exist that could plausibly reduce gun crime without reducing the overall crime rate.

In any case, when we exclude "intervention-protesters," defined as those who "strongly disagree" that "the government should do everything it can to keep handguns out of the hands of criminals, even if it means that it will be harder for law-abiding citizens to

purchase handguns," the result is only a 7% increase in WTP compared with Table 4. Another way to assess the problem of "intervention-protestors" is to estimate WTP for those households that own guns, which turns out to be only slightly lower than the estimate for all households ($211 versus $239 per household).

5. Discussion

This article estimates the demand for reductions in crime using CV methods. Our estimates suggest that a 30% reduction in gun violence is worth $24.5 billion to the American public in 1998 dollars, around $1.2 million per injury. These findings are generally quite robust to our decisions about the estimation procedure—even the descriptive statistics imply a societal WTP of $21.8 billion.

The most fundamental issue is whether NGPS respondents take the CV questions seriously and provide thoughtful answers, and, if so, whether these responses reflect underlying preferences about a given quantity of violence reduction rather than social desirability bias, moral satisfaction or some other motivation. CV responses that are motivated by something other than the public's demand for a public good may be insensitive to the quantity of the public good that is offered (the embedding effect), and thus not useful for benefit-cost analysis.

Some evidence that respondents devote at least some thought to answering the CV questions comes from the positive correlation of WTP with family income, consistent with economic theory, and negative correlation with household gun ownership, consistent with previous research that gun owners are less supportive of government efforts to reduce gun violence (Teret et al., 1998).

Our crude test for an embedding effect with the NGPS data suggests that WTP is in fact sensitive to the amount of risk reduction provided. Table 4 shows that WTP increases with the number of children in the home, which in turn is related to the total amount of risk reduction that the households gains from a violence-reduction program. Since these findings could be explained by taste or other differences between households with and without children, we re-estimated our models using only those households with children. We find that each additional child in the home under the age of 6 increases the respondent's WTP by 50%, and each additional child between 6 and 17 increases WTP by 25%. Although these findings provide some evidence against an embedding effect, for some reason additional adults within the home do not appear to increase household WTP.

Our estimates are based on CV questions that are limited in length and level of detail by the constraints of telephone survey methods, and are thus necessarily imperfect. The CV questions used in the gun survey described here can be criticized for excluding important information about the hypothetical interventions that respondents are asked to support, a problem that plagues all CV studies to some degree. In particular, the NGPS questions do not specify the baseline risk to the respondent, although there is substantial heterogeneity in the risk of gunshot injury within the population. This problem may be mitigated somewhat if, as we have suggested earlier, individuals already have incentives

to obtain information about their risk of gunshot injury as part of their decisions about where to work and live.

A related concern is that respondents to these CV questions may overstate the baseline risk of gunshot injury as a result of the rash of school shootings that have occurred during the past several years. Although we have no way to directly assess this problem, it is useful to note that the CV survey was conducted during the Fall of 1998, several months before the most heavily publicized school shooting in Littleton, Colorado. Prior to the survey, the most recent school shooting that received substantial national attention occurred in March, 1998 in Jonesboro, Arkansas.

Despite the limitations of these CV survey data, some support for the credibility of our findings comes from their consistency with other benchmarks. As noted above, our estimates for what households are willing to pay to reduce gun crime by 30% seems reasonable compared to what households currently pay in taxes and private expenditures to protect themselves against crime. Our estimates for society's WTP to reduce gun violence are also remarkably consistent with previous estimates from wage-risk tradeoffs. Deriving a value of statistical life from our CV results is complicated somewhat by the fact that our question reflects WTP for both fatal and nonfatal gunshot injuries. If we start with the extreme assumption that WTP is driven entirely by concern about fatal gunshot injuries, then our preferred estimate of $1.2 million per gunshot injury avoided implies a value per statistical life equal to around $6.8 million. But presumably part of WTP to reduce gun injuries is motivated by concern about non-fatal gunshot injuries. If we assume that non-fatal gunshot injuries are twice as undesirable as the average workplace injury, our estimates imply a value per statistical life of around $5.4 million.[11] By way of comparison, studies of wage-risk tradeoffs produce estimates for the value of life (also in 1998 dollars) between $3.7 and $8.6 million (Viscusi, 1993).

We would expect societal WTP to be far smaller if citizens were concerned only about reducing the risk of gun injury to themselves and members of their families. The reason is that gunshot injuries in the United States are highly concentrated among a group of people who on average are far less risk averse than are members of the general population. Two-thirds of all firearm homicides in 1996 were to males between the ages of 15 and 39 (CDC, 1999), and three-quarters of gun homicide victims under 21 in Boston in 1990–94 had criminal records (Kennedy, Piehl, and Braga, 1996). Levitt and Venkatesh (2000) studied the records documenting the opportunities and violence-victimization risks for members of a crack-dealing street gang: Comparing the risk to the reward suggests that they placed a value on a statistical life of just $55,000 on average. Our WTP estimates thus suggest that the benefits from reducing gun violence in America are substantial, and accrue primarily to citizens at low personal risk of injury through reductions in risk to friends, family and others for whom they feel altruistic, lower tax bills, or improvements to the overall quality of community life.

Finally, it is important to note that our CV estimates are for *marginal* reductions in the prevalence of gun violence, and can provide only limited information about the benefits of eliminating gun violence altogether. Simply multiplying our estimates for the value of a 30% reduction in gun violence by 3.33 may either understate or overstate the value of a 100% reduction. This simple extrapolation may produce a number that is

too low if some forms of averting behavior only respond to the complete elimination of gunshot injuries. On the other hand, this extrapolation could produce a number that is too high if the technology of reducing gunshot injuries is different from that of complete elimination. Although marginal reductions in gun violence are possible without much affecting hunting or defensive gun use, the complete elimination of gun violence is unlikely to be attainable without at least some effect on whatever benefits arise from guns. Of course, with more than 200 million guns already in circulation (Cook and Ludwig, 1996), ending gun violence altogether in America is an unrealistic objective for public policy in any case.

Appendix

A. Calculating standard errors for mean and median WTP

The usual standard error formula for a linear predictor evaluated at some value of the regressors $\mathbf{x}_0$ is given by equation (A1)

$$SE(\mathbf{x}_0'\mathbf{b}) = (\mathbf{x}_0\mathbf{V}\mathbf{x}_0')^{1/2} \tag{A1}$$

Estimation of the log likelihood given in equation (7) is simplified somewhat because b is a scalar rather than a vector, so V is also a scalar equal to the variance of b, $x_0 = 1$, and equation (A1) simplifies to (A2)

$$\mathrm{SE}(b) = (V)^{1/2} \tag{A2}$$

The complication in our case comes from the fact that b is actually the ratio of two estimates b'/s', where b' is an estimate for (β/σ) and s' is an estimate for $(1/\sigma)$. In this case the variance for $b = b'/s'$ can be approximated by the formula given in equation (A3) (Yates, 1981, p. 190)

$$V = \mathrm{Var}(b) = \mathrm{Var}(b'/s') \approx (b'/s')^2\left[(\mathrm{Var}(b'))/(b')^2 + (\mathrm{Var}(s'))/(s')^2\right] \tag{A3}$$

The final complication is that (A3) gives us the variance for the estimated mean of the natural log of Y (WTP), while ultimately we are interested in the variance of predicted mean of the untransformed WTP. With $E[\ln Y] = b$ and $\mathrm{Var}(E[\ln Y]) = V$ then the variance of $E[Y]$ is given by equation (A4) (Maddala, 1977, p. 33).

$$\mathrm{Var}(E[Y]) = \exp(2b + V) * (e^V - 1) \tag{A4}$$

Notes

1. Unpublished figures from the Vital Statistics for fatal gun homicides from 1972 onward were provided to us by James Mercy of the Centers for Disease Control and Prevention. Estimates for the number of non-fatal assault-related gunshot injuries come from applying the case-fatality ratios reported in Cook and Ludwig (2000).
2. See for example Fox Butterfield, "Small-Print Provisions of Gun Bill Please Federal Officials Best," *New York Times*, May 22, 1999, and "Handguns: Who Will Stand Up?" Editorial, *Washington Post*, April 28, 1999.
3. Unpublished calculations kindly provided to us by Julie Cullen and Steve Levitt show that each additional homicide reduces a city's population by 70 residents, far larger than the 1-resident reduction caused by each additional non-fatal violent or property crime.
4. Only a handful of studies have adopted an *ex ante* approach to evaluating the benefits of reducing crime. All of these studies rely on hedonic-pricing methods to relate crime rates and housing prices (Thaler, 1978; Hellman and Naroff, 1978; Rizzo, 1979). These estimates rely on data from a single city, may confound the price effects of crime with other factors, and are incomplete. None of these studies focuses on gun violence specifically.
5. The COI approach defines lost productivity as foregone earnings plus the lost value of household work; all other forms of non-market production are excluded. See Kenkel (1994) for a detailed review of the COI approach.
6. One implication of this assumption is that our analysis should convert the NGPS sampling weights from person weights into household weights. The NGPS respondent weights calculated by NORC equal one divided by the probability of the household's selection into the sample. The weights are then divided by the adult's probability of selection from within the household, equal to (1/A) where A is the number of adults in the home. To convert these into household weights we multiply by (1/A).
7. The estimate in Table 2 for the proportion of households who would pay $400 per year is derived by multiplying the proportion of household who say they would pay $200 to fund the program in the first CV question (63.6% from the last column of Table 1) by the proportion who answer yes to the follow-up CV question. To derive the share of households whose WTP is $200 we multiply those who say yes to an initial bid value of $100 by the fraction who say no to the follow-up question. The estimates in Table 2 for WTP of $0 and $25 are derived using an analogous procedure for those who say no to an initial bid value of $50. The estimated proportion of households whose WTP is $50 in Table 2 comes from subtracting the share of households whose WTP is $0 or $25 (Table 2) from the proportion of households who say no to an initial bid value of $100 (Table 1). The figure for the $100 WTP level in Table 2 comes from subtracting the share of household whose WTP is $200 or $400 from the share who say yes to an initial bid value of $100.
8. Data from the Vital Statistics census of deaths suggest that there were 12,102 firearm homicides in 1998 (NCHS, 2000). To calculate the total number of assault-related firearm injuries we multiply the number of gun homicides by the estimated ratio of total to fatal assault-related gun injuries for 1997 (5.69) from Cook and Ludwig (2000).
9. Since only 2.2% of all marriages were inter-racial in 1992, the last year for which such data are available (US Bureau of the Census, 1999b), we infer "household race" from the respondent's race. The household gun ownership measure will slightly understate the true prevalence of gun ownership across households because some married women either do not know about or are unwilling to report on guns owned by their spouses (Ludwig, Cook, and Smith, 1998).
10. To explore this possibility, we re-estimated our preferred MLE model after restricting the sample to married respondents and including an indicator for the respondent's gender. While the coefficient estimate for an indicator variable for husbands is negative and statistically significant, inclusion of this variable serves to reduce estimated mean WTP by less than 7% compared with the results obtained when the variable is excluded.
11. This comes from multiplying twice the highest estimate for workplace injuries reported in Viscusi (1993), around $300,000 in 1998 dollars, by the number of nonfatal gun injuries for every fatality (4.69), and subtracting this figure ($1.4 million) from the estimated value of 5.69 gunshot injuries ($6.8 million).

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EXHIBIT 5

COPY

CITY OF CHICAGO

COMMITTEE ON POLICE AND FIRE

REPORT OF PROCEEDINGS of a meeting of the City of Chicago, Committee on Police and Fire, taken on June 29, 2010, 1:00 p.m., City Council Chambers, Chicago, Illinois, and presided over by ALDERMAN ANTHONY BEALE, Chairman.

Reported by: Donna T. Wadlington, C.S.R.

CHAIRMAN BEALE: Any other questions? Thank you so much for your testimony.

MS. LEFTWICH: Yes. Thank you. My pleasure.

CHAIRMAN BEALE: We're going to take a five minute recess. We'll be back at 3:27.

(WHEREUPON, a brief recess was held.)

CHAIRMAN BEALE: All right. Our next person we have is Daniel Webster.

MR. WEBSTER: Good afternoon, Chairman. Thank you for the opportunity to testify here today.

My name is Daniel Webster. I'm Co-Director of The Center for Gun Policy and Research at Johns Hopkins. I'm also a professor in the School of Public Health there.

However, I just want to be clear from the onset that my statements here today are my own. They don't reflect any official position of Johns Hopkins University or my center.

I've studied gun violence and its prevention for about 20 years now, and I've worked with several cities on their policies and procedures to address the problem of gun violence.

I come here today to urge the Council to develop a comprehensive set of policies and procedures to regulate guns that are grounded in the best science that we have.

Based upon my reading of the science and the studies that I have conducted myself, I feel the most effective gun policies have the following basic elements: First, they proscribe the most high-risk individuals from possessing firearms. Secondly, they establish accountability measures to discourage illegal transfer to those proscribed individuals. They prohibit the sale, possession and use of particular kinds of firearms that are more dangerous than other firearms.

And finally, that they impose other measures to protect public safety that --

without substantially interfering with the ability of law-abiding adults to have guns in their home -- a gun in their home.

Compared with other states, Illinois, I'm thankful, has relatively high standards for legal gun possession. However, I think Chicago can improve these standards in a few ways based upon the scientific evidence available to us.

What should come as common sense, but also is backed by sound science, is that those with a track record of committing criminal violence are at much higher risk for future commission of violence.

And while, of course, federally and in most states prohibit felons from possessing firearms, there's a good bit of research to say that misdemeanants who have been convicted of crimes involving violence, as well as crimes -- misdemeanors involving drugs, and alcohol and misuse of firearms, are at substantially higher risk of committing violent

offenses than our truly law-abiding adults. There's good research from the State of California to back this up.

Another category of high-risk individuals, of course, as it's been mentioned before, are domestic violence abusers. Research that I have been involved in that studied couples where there was intimate partner violence, we found that the single factor that increased the risk of lethal outcomes the most was the abuser's ownership of a firearm. It increased the risk for lethal outcomes by fivefold.

There are policies that have been put in place to restrict access to violent misdemeanants as well as domestic violence abusers, and there's research that showed that those policies are associated with lower risks of committing violence and domestic homicides.

Another category of individuals that is prudent to keep firearms from, of course, are individuals with substance

abuse problems. I believe the practical and defensible way of identifying alcohol abusers would be to proscribe possessing firearms to anyone who has committed two or more violations of driving under the influence of alcohol or illegal drugs over a five-year period.

There have been a number of studies to show that repeat offenders of drunk driving have a fairly high level of substance abuse problems, as well as other psychiatric disorders, have problems with self-control, and also have a fairly high rate of rearrests for other types of violent crimes.

In addition to setting high standards for legal firearm ownership, Chicago should set a regulation of enforcement procedures to reduce the likelihood that dangerous people can obtain firearms.

As was just explained by Ms. Leftwich, the combination of a permitting system for firearm purchasers, as well as a registration system for the firearms that they

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Testimony on firearm sales regulations before the Chicago City Council's Committee on Police and Fire, June 29, 2010

Chairman Beale and council members, thank you for inviting me to testify today. I am co-director of the Johns Hopkins Center for Gun Policy and Research and a professor at the Johns Hopkins Bloomberg School of Public Health. However, my statements today are mine alone and do not represent a position of the Center or of the Johns Hopkins University. I have studied gun violence and its prevention for 20 years and have worked with several cities on their efforts to curb gun violence. I am here to urge the Council to develop a comprehensive set of policies and procedures for regulating guns that are grounded in the best available science relevant to protecting public safety.

The most effective gun policies will 1) proscribe the most high-risk people from possessing firearms; 2) establish accountability measures to discourage illegal transfer to and acquisition by those proscribed individuals; 3) prohibit the sale, possession, and use of particular types of firearms that, by their design, present unacceptable risks beyond other firearms; and 4) impose other measures to protect public safety without substantially interfering with the ability of law-abiding adults to have guns in their homes.

Compared with other states, Illinois has relatively high standards for legal firearm ownership. However, Chicago can improve these standards in several ways based on scientific evidence regarding factors associated with an increased risk for perpetrating violence. It should be no surprise that those who have previously perpetrated criminal violence are at increased risk for perpetrating future violence. Prior research has shown that young men with misdemeanor convictions who were legally able to purchase handguns went on to commit crimes involving violence at a rate that was 2- to 10-times higher (depending on the prior offense) than that of men with no prior convictions when they purchased a handgun.[1] A study which I co-authored found that a domestic violence abuser's ownership of a firearm increased the risk of domestic homicide five-fold.[2] Prohibitions of firearm ownership by violent misdemeanants has been linked with lower rates of violence by this high-risk group[3] and has broad public support, even among gun owners.[4] State laws prohibit firearm possession by persons restrained by protective orders issued by courts to protect victims of domestic violence have been demonstrated to reduce domestic homicides.[5]

Individuals who abuse alcohol and/or illicit drugs are also at increased risk for perpetrating violence.[6] I believe a practical and defensible way of identifying alcohol abusers who should be proscribed from possessing firearms would be to prohibit anyone who has 2 or more violations for driving while under the influence of alcohol or illicit drugs over a five year period. In addition to having demonstrated a history of reckless behavior that threatens public safety, repeat drunk driving offenders have very high rates of substance abuse and other psychiatric disorders.[7,8,9] Repeat drunk driving offenders have less self-control[10] and have higher rates of repeated arrests[11] – a group posing an unacceptably high risk to public safety.

In addition to setting high standards for legal firearm ownership, Chicago should have a set of regulations and enforcement procedures to reduce the likelihood that dangerous people can obtain firearms. As you know, Illinois has a permitting system for firearm owners. Prior research that I led showed that in cities where there were both permitting systems for handgun purchasers as well as a registration system for handguns, the vast majority of guns used in crime had been originally purchased outside of the state where the gun was recovered by police.[12] This suggests that permitting of purchasers plus registration of firearms helps to prevent the diversion of guns to criminals. Indeed, in cities where the large majority of

guns used in crime had to travel across state lines following retail sale, lethal violence was less likely to involve a firearm.

To prevent theft and unauthorized access to underage youth, it is prudent to require gun owners to keep their guns stored safely when they are not being used. In addition to reducing accidental shootings,[13, 14, 15] my research has shown that safe gun storage laws significantly reduce adolescent suicides.[16] Some of this research has indicated that so-called Child Access Prevention (CAP) laws are most effective when penalties are strong.[17, 18] Thus, I believe there is good justification to allow for felony prosecution when a gun owners' failure to comply with the CAP law results in injury to others, to penalize unsafe gun storage that enables a minor to access the firearm. It makes sense to have these safe gun storage requirements apply when there are children or teens under age 18 in the home. Illinois's CAP law only protects youth up to age 14, yet risks of death from unintentional shootings are 74% higher for 17 year-olds than 14 year-olds and risks for firearm suicides are more than 300% higher for 17 year-olds compared to 14 year-olds.

The final recommendation, supported by research I have led, is that Chicago should ban the sale and possession of "junk guns" – a category of handguns characterized not only by their poor design and construction making them prone to unintentionally fire (e.g., if dropped) and jam and therefore much less useful for lawful self-defense, but also by their very small size making them very easy to conceal. Research has shown that these guns are at greater risk for involvement in crime compared with other handguns.[17]

Several states, including Maryland, have banned junk guns (though through somewhat different approaches or criteria) because they are prone to misfire, fire when dropped, and are disproportionately involved in crime. My colleagues and I studied the effect of a large gun dealer near Milwaukee who, after receiving bad publicity for the large number of his guns that were being linked to violent crimes, voluntarily decided to stop selling junk guns. This change in sales policy led to 77% reduction in the number of new guns sold by the dealer that were soon recovered from criminals.[18] Research that I led on Maryland's ban of these guns demonstrated that the law was associated with 40 fewer homicides per year during the first 9 years the law was in place.[19]

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EXHIBIT 6

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Prior Misdemeanor Convictions as a Risk Factor for Later Violent and Firearm-Related Criminal Activity Among Authorized Purchasers of Handguns

Garen J. Wintemute; Christiana M. Drake; James J. Beaumont; et al.

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Prior Misdemeanor Convictions as a Risk Factor for Later Violent and Firearm-Related Criminal Activity Among Authorized Purchasers of Handguns

Garen J. Wintemute, MD, MPH; Christiana M. Drake, PhD; James J. Beaumont, PhD; Mona A. Wright, MPH; Carrie A. Parham, MS

Context.—Under current federal law, many persons with prior convictions for misdemeanor offenses pass criminal records background checks and legally purchase handguns.

Objective.—To determine whether authorized handgun purchasers with prior misdemeanor convictions are more likely than those with no criminal history to be charged with new crimes, particularly offenses involving firearms and violence.

Design.—Retrospective cohort study.

Setting and Participants.—A total of 5923 authorized purchasers of handguns in California in 1977 who were younger than 50 years, identified by random sample.

Main Outcome Measures.—Incidence and relative risk (RR) of first charges for new criminal offenses after handgun purchase.

Results.—Of the 5923 authorized purchasers, 3128 had at least 1 conviction for a misdemeanor offense prior to handgun purchase, and 2795 had no prior criminal history. Follow-up to the end of the 15-year observation period or to death was available for 77.8% of study subjects and for a median 8.9 years for another 9.6%. Handgun purchasers with at least 1 prior misdemeanor conviction were more than 7 times as likely as those with no prior criminal history to be charged with a new offense after handgun purchase (RR, 7.5; 95% confidence interval [CI], 6.6-8.7). Among men, those with 2 or more prior convictions for misdemeanor violence were at greatest risk for nonviolent firearm-related offenses such as weapon carrying (RR, 11.7; 95% CI, 6.8-20.0), violent offenses generally (RR, 10.4; 95% CI, 6.9-15.8), and Violent Crime Index offenses (murder or non-negligent manslaughter, forcible rape, robbery, or aggravated assault) (RR, 15.1; 95% CI, 9.4-24.3). However, even handgun purchasers with only 1 prior misdemeanor conviction and no convictions for offenses involving firearms or violence were nearly 5 times as likely as those with no prior criminal history to be charged with new offenses involving firearms or violence.

Conclusions.—Handgun purchasers with prior misdemeanor convictions are at increased risk for future criminal activity, including violent and firearm-related crimes.

JAMA. 1998;280:2083-2087

IN 1995, 1.2 million firearm-related violent crimes were committed in the United States, including 13 673 firearm homicides.[1,2] In 1994, an estimated 60 900 persons were treated in hospital emergency departments for nonfatal gunshot wounds received during an assault; 60% required hospitalization.[3]

One generally accepted policy to prevent firearm-related violence is to prohibit the purchase of guns by persons believed to be at high risk for future criminal activity. The Gun Control Act of 1968[4] outlaws the purchase and possession of firearms by felons, fugitives from justice, persons adjudicated to be mentally ill, and others. Under the provisions of the Brady Handgun Violence Prevention Act,[5] background checks of prospective handgun purchasers are conducted nationwide. They identify approximately 70 000 prohibited persons each year, most of whom have been convicted of felonies.[6-8]

For editorial comment see p 2120.

It is a common misperception that such policies prohibit gun purchase by all but the law-abiding. In fact, many thousands of persons with a history of criminal activity legally purchase firearms every year. It is well established that persons with a history of even a single prior arrest are, as a group, substantially more likely than persons with no such history to engage in criminal behavior in the future.[9-12] The possibility therefore exists that some authorized handgun purchasers are at higher risk than others for later criminal activity. This is not just a theoretical concern; it has been noted that "a considerable fraction of people who commit violent crimes are legally entitled to own guns."[13]

To study this issue, we undertook a long-term retrospective cohort study of criminal activity among 5923 persons younger than 50 years who legally purchased handguns in California in 1977, with follow-up through the end of 1991. The study population included 3128 handgun purchasers with at least 1 prior conviction for a misdemeanor offense and 2795 handgun purchasers with no prior criminal history. (Misdemeanors are less serious crimes than felonies; they are punishable by incarceration, typically in a local facility and for 1 year or less.[14]) All these purchasers passed a criminal rec-

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ords background check that applied the criteria in the Gun Control Act of 1968, which differ only slightly to those currently in force under federal law.

Our hypotheses were that (1) handgun purchasers with prior misdemeanor convictions would be at increased risk for later criminal activity, particularly for violent and firearm-related offenses, (2) the increase in risk would be related inversely to age and directly to the number of prior convictions that subjects had received, and (3) purchasers with prior convictions for offenses involving firearms or violence would be at greatest risk for such offenses after handgun purchase.

METHODS

Sampling and Cohort Formation

The study population was identified by random sampling from a computerized registry of all persons who purchased a handgun from a licensed firearms dealer in California in 1977, the first year such a registry was compiled. Duplicate entries for persons who purchased more than 1 handgun that year were removed prior to sampling. The remaining entries were stratified by a notation that, when present, indicated that the purchaser had a record on file with the California Department of Justice (CDOJ) at the time of handgun purchase and may have had a criminal history at that time. One sample was drawn from each stratum.

Preliminary sampling suggested that approximately half of all handgun purchasers with any prior criminal history had been charged with an offense involving firearms or violence. Sample sizes were planned to maximize statistical power for comparisons involving this subgroup, with the size of the cohort sufficient to detect a relative risk (RR), depending on the incidence of a specific outcome event, of 1.5 or higher with an α of .05 and a power of 0.8 or higher.[15]

Criminal records were requested for all sampled purchasers, and final determination of eligibility and study group assignment was made only after the records had been obtained and reviewed. Of 3002 sampled persons (among 126 903 eligible) whose registry entries did not indicate that a record was on file at CDOJ, 41 were found to have had a criminal history at the time of handgun purchase and were assigned to that study group. Of 16 637 sampled persons (among 45 472 eligible) whose registry entries indicated a record was on file at CDOJ, 7095 were found to have no criminal history at the time of handgun purchase; their records were related to employment screening or other matters. A random sample of 435 of these were assigned to the no prior criminal history study group, such that these purchasers were appropriately represented in that group, and the rest were excluded.

This initial review of criminal records also identified 4162 persons who were found to have had a criminal history prior to handgun purchase but whose records had subsequently been purged and were not available. The CDOJ periodically reviews a portion of its inactive criminal records and purges those that meet defined criteria. Records must be retained for specified periods after an arrest or conviction; the retention period is contingent on the nature and the severity of the offense.[16] In practice, CDOJ's purging program focuses on records for the oldest persons in its file. Among our potential study subjects, the proportion whose records had been purged was substantially higher for those 50 years or older than for younger handgun purchasers. We therefore excluded from the study all persons who were 50 years or older at the time of handgun purchase. There remained 2555 persons younger than 50 years whose criminal records had been purged.

Another 1148 handgun purchasers were excluded because, while they had previously been arrested, they had not been convicted of any crime prior to purchasing their handguns. A total of 276 persons were excluded because it could not be determined whether they had a criminal history at the time of handgun purchase, another 85 because their records were missing for unknown reasons, and 25 because they never received their guns or transferred them to other owners shortly after purchase.

Data Acquisition and Management

Senior CDOJ criminal records technicians trained our project staff in criminal record review, and ambiguous criminal records were discussed with CDOJ staff. We used double data entry procedures for all study data sets, with computerized and manual comparisons.

All convictions and charges were recorded. Convictions were not counted as evidence of prior criminal activity if they had also been dismissed before handgun purchase. A charge for a new offense during the period of follow-up was considered to be evidence of new criminal activity.

Crimes were grouped into the following classes: those involving neither firearms nor violence (eg, petty theft, driving under the influence of alcohol), those involving firearms but not violence (eg, carrying a concealed firearm in a public place), those involving violence (eg, simple assault, robbery) and, as a subset of violent offenses, those classified by the Federal Bureau of Investigation as Violent Crime Index offenses: murder and nonnegligent manslaughter, forcible rape, robbery, and aggravated assault.

Similarly, subjects with prior misdemeanor convictions were grouped by whether they had been convicted of firearm-related or violent offenses as follows: (1) prior conviction(s), but none for offenses involving either firearms or violence; (2) prior conviction(s) involving firearms, but none involving violence; and (3) prior conviction(s) involving violence. No subgroup of subjects with prior convictions involving violence, but none involving firearms, could be established as it was not possible to distinguish between violent offenses that involved firearms and those that did not. For example, of 843 charges of assault with a deadly weapon filed against study subjects, only 158 (18.7%) specified the nature of the weapon.

The follow-up period began 15 days following application for handgun purchase, the first day on which legal acquisition of the handgun could have occurred, and ended December 31, 1991. Only arrests occurring in California were eligible for consideration as outcome events since reliable data were not available for events occurring elsewhere. Subjects were considered to be at risk for those events for only so long as their continued residence in California could be verified independently. This was done by linkage to the state's driver's license records, credit agency data, registries of property owners, telephone directories, city directories, and state and national mortality files.

This study was approved by the University of California, Davis, Human Subjects Review Committee.

Statistical Analysis

The main outcome event was the first occurrence of a charge for a new offense. Observed incidence density rate data were used to estimate RRs by Poisson regression,[15] with adjustment for sex, race, age at purchase, and time since purchase, and stratification by the type and number of offenses for which subjects had previously been convicted. Interactions between the demographic variables and criminal history were incorporated when necessary. Confidence intervals (CIs) were calculated using likelihood methods. Goodness of fit was assessed by likelihood ratio statistics and residual analysis.

In a separate analysis, these results were weighted to account for the handgun purchasers who were known to have a criminal history at the time of handgun purchase but whose records had been purged. This was accomplished as follows. First, of all potential subjects

younger than 50 years in our initial criminal records review who had any arrest or conviction history at the time of handgun purchase and whose records were available, we identified 1301 "purge-eligible" persons whose criminal records met all the CDOJ criteria for purging. Of these, 744 persons with at least 1 misdemeanor conviction had been enrolled as study subjects. We calculated, on an age-, race-, and sex-specific basis, the proportion of the 1301 purge-eligible persons who had prior misdemeanor convictions and applied these proportions to the 2555 handgun purchasers whose records had been purged. We estimated on that basis that 1455 of these 2555 handgun purchasers had prior misdemeanor convictions.

Separate rates and RRs were then calculated for the purge-eligible study subjects and for those who were not eligible for purging. We took a weighted average of these results to estimate rates and RRs for all handgun purchasers having a prior misdemeanor conviction, including those whose records had been purged. In each separate analysis, the weights assigned to the results for the purge-eligible subjects were proportionate to the entire estimated percentage of handgun purchasers in that analysis whose records had met the criteria for purging—both the purge-eligible study subjects and persons whose records had actually been purged.

These procedures assumed that CDOJ staff, having determined which criminal records were eligible for purging, exercised no selection bias in determining which records would actually be purged. We therefore also conducted a sensitivity analysis to estimate the maximum effect due to potential selection bias, in which we adopted the extreme assumption that no purchaser whose record had been purged was charged with any criminal activity after handgun purchase.

RESULTS

By extrapolation from our samples, we estimate that of 139 052 handgun purchasers younger than 50 years in California in 1977, 13 750 (9.9%) had at least 1 prior misdemeanor conviction and 118 560 (85.3%) had no prior criminal history. (The remaining handgun purchasers had previously been arrested, but had no prior convictions.) Our study population of 5923 included 3128 handgun purchasers who were known to have had at least 1 misdemeanor conviction prior to handgun purchase and 2795 who had no prior criminal history. Demographic differences between the study groups, and between subjects whose records were eligible for purging and handgun purchasers whose criminal records had been purged, were relatively minor (Table 1).

Table 1.—Demographic Characteristics of Handgun Purchaser Study Groups*

Characteristic	No Prior Criminal History (n = 2795)	Prior Misdemeanor Conviction (n = 3128)		Records Purged† (n = 2555)
		Not Eligible for Purging (n = 2384)	Purge-Eligible (n = 744)	
Age, mean (± SD), y	31.8 ± 8.0	32.3 ± 8.1	31.6 ± 7.7	30.9 ± 7.9
Sex				
Men	2374 (85)	2228 (94)	709 (95)	2382 (93)
Women	421 (15)	156 (6)	35 (5)	173 (7)
Race				
White	1970 (71)	1347 (57)	532 (71)	1651 (65)
Black	194 (7)	357 (15)	64 (9)	271 (11)
Hispanic	428 (15)	582 (24)	117 (16)	430 (17)
Other or unknown	203 (7)	85 (4)	31 (4)	203 (8)

*Values are number (percentage) unless otherwise indicated.
†Data are presented for the entire population of 2555 handgun purchasers whose prior criminal records were purged; an estimated 1455 persons in this group had misdemeanor convictions prior to handgun purchase. Race values were extrapolated from an equal probability sample of 226 subjects.

Table 2.—Estimated Aggregate Criminal History Characteristics, at the Time of Purchase, of 3128 Handgun Purchasers Who Had at Least 1 Prior Misdemeanor Conviction

Nature of Prior Convictions	No. of Prior		Median No. (Range)*	
	Convictions	Charges	Convictions	Charges
Any offense	7907	15 868	2 (1-33)	3 (1-56)
Nonviolent firearm offense	337	590	1 (1-4)	1 (1-8)
Violent offense	672	2179	1 (1-6)	1 (1-12)
Violent Crime Index offense	118	794	1 (1-2)	1 (1-7)

*Among persons having convictions or charges for such offenses.

Table 3.—Handgun Purchasers Charged With New Criminal Activity Over 15 Years From Earliest Possible Date of Handgun Acquisition*

Study Group	Nature of New Offense, No. (%)			
	Any Offense	Nonviolent Firearm Offense	Violent Offense	Violent Crime Index Offense
Prior misdemeanor conviction†	1379 (50.4)	361 (13.2)	682 (24.9)	421 (15.4)
No prior criminal history‡	239 (9.8)	50 (2.0)	108 (4.4)	60 (2.5)

*Results are only for subjects with independent verification of continued residence in California.
†Total number of handgun purchasers with prior misdemeanor conviction is 2735.
‡Total number of handgun puchasers with no prior criminal history is 2442.

Independent evidence of subjects' continued residence in California for the entire period of follow-up or to their deaths was available for 77.8% of study subjects. Another 9.6% of subjects were confirmed as remaining in the state for part of the follow-up period (median, 8.9 years).

As of their date of application for handgun purchase, the 3128 handgun purchasers with at least 1 prior conviction for a misdemeanor offense had amassed 7907 such convictions in total, including 337 for nonviolent firearm-related offenses and 672 for violent offenses (Table 2). A total of 1628 (52.0%) of 3128 persons had been convicted of 2 or more offenses. In total, 15 868 criminal charges had been filed against these handgun purchasers (Table 2). Felony charges had been filed against 1631 persons (52.1%), more than once for 826 persons (26.4%), and 576 persons (18.4%) had been charged with a Violent Crime Index offense.

In the first year of follow-up, 18.5% of purchasers with at least 1 prior misdemeanor conviction, and 1.6% of those with no criminal history, were charged with at least 1 new offense. By the end of the study period these proportions had risen to 50.4% and 9.8%, respectively (Table 3). Multiple new arrest charges were filed against 33.4% of purchasers with at least 1 prior misdemeanor conviction and 5.1% of those with no prior criminal history.

Handgun purchasers with at least 1 prior misdemeanor conviction were more than 7 times as likely as purchasers with no prior criminal history to be charged with a new offense (RR, 7.5; 95% CI, 6.6-8.7). Relative risk was not related to age and was moderately related to sex and race (Table 4). Men were also at increased risk for nonviolent firearm offenses (RR, 6.3; 95% CI, 4.7-8.5), violent offenses (RR, 6.1; 95% CI, 4.9-7.5), and Violent Crime Index offenses (RR, 6.3; 95% CI, 4.8-8.3) (insufficient data were available to calculate results for women).

Table 4.—Relative Risk for a First Charge of Any New Offense for Handgun Purchasers Who Had a Prior Misdemeanor Conviction, Compared With Those Without a Criminal History, Over 15 Years From the Earliest Possible Date of Handgun Acquisition

Characteristic	Relative Risk (95% Confidence Interval)
All purchasers*†	7.5 (6.6-8.7)
Age <30 y	7.3 (6.1-8.7)
Age ≥30 y	7.9 (6.4-9.8)
Men*	7.1 (6.1-8.2)
White	7.4 (6.2-9.0)
Black	3.3 (2.3-4.8)
Hispanic	5.8 (4.3-7.8)
Other	13.7 (7.0-26.9)
Women*‡	11.7 (7.2-18.9)

*Adjusted for age and time elapsed since handgun purchase.
†Adjusted for race and time elapsed since handgun purchase.
‡Too few subjects to generate results by race.

Table 5.—Relative Risk for a First Charge for a New Offense for Handgun Purchasers Who Had 1 or More Prior Misdemeanor Convictions, Compared With Those Without a Prior Criminal History, Over 15 Years From the Earliest Possible Date of Handgun Acquisition*

Type and No. of Prior Conviction(s)	Relative Risk (95% Confidence Interval) for Occurrence of a First New Offense			
	Any Offense	Nonviolent Firearm Offense	Violent Offense	Violent Crime Index Offense
Any conviction(s)				
1	5.9 (5.1-6.9)	5.0 (3.6-7.0)	5.0 (4.0-6.2)	5.1 (3.8-6.9)
≥2	8.4 (7.2-9.8)	7.7 (5.6-10.5)	7.3 (5.9-9.1)	7.6 (5.7-10.2)
Conviction(s), none involving firearms or violence				
1	5.9 (5.0-6.9)	4.8 (3.4-6.7)	4.8 (3.8-6.0)	5.0 (3.7-6.8)
≥2	7.8 (6.7-9.2)	6.5 (4.7-9.1)	6.8 (5.4-8.6)	6.4 (4.7-8.7)
Conviction(s) involving firearms, but none involving violence				
1	6.4 (4.9-8.2)	7.7 (4.8-12.3)	4.4 (3.0-6.6)	5.2 (3.1-8.5)
≥2	10.9 (6.0-20.0)	14.7 (5.8-36.9)	13.0 (6.3-26.7)	12.4 (5.0-31.0)
Conviction(s) involving violence				
1	9.3 (7.7-11.3)	8.7 (6.0-12.6)	8.9 (6.8-11.6)	9.4 (6.6-13.3)
≥2	11.3 (8.3-15.3)	11.7 (6.8-20.0)	10.4 (6.9-15.8)	15.1 (9.4-24.3)

*Data are for males only. Results are adjusted for age and time elapsed since handgun purchase.

The RR of being charged with a new offense was strongly and directly related to the number of prior convictions (Table 5). Subjects with only 1 prior conviction, and none involving either firearms or violence, were at increased risk for nonviolent firearm offenses (RR, 4.8; 95% CI, 3.4-6.7), violent offenses (RR, 4.8; 95% CI, 3.8-6.0), and Violent Crime Index offenses (RR, 5.0; 95% CI, 3.7-6.8). A history of more than 1 prior conviction for offenses of any 1 type predicted a still greater RR of being charged with new offenses of all types. Persons with 2 or more prior convictions for violent offenses were at greatest risk for new offenses, particularly nonviolent firearm offenses (RR, 11.7; 95% CI, 6.8-20.0) and Violent Crime Index offenses (RR, 15.1; 95% CI, 9.4-24.3).

Relative risks remained high in the weighted analysis, which assumed that the risk for new criminal activity among handgun purchasers whose criminal records had been purged was equal to that of study subjects whose records were eligible for purging. Under this assumption, handgun purchasers with at least 1 prior conviction were more than 4 times as likely to be charged with a new offense (RR, 4.3). Men were also at increased risk for nonviolent firearm offenses (RR, 3.0), violent offenses (RR, 2.1), and Violent Crime Index offenses (RR, 4.1).

Relative risks were lower in the sensitivity analysis, which assumed that no handgun purchaser whose criminal record had been purged had been charged with a new offense after handgun purchase. Handgun purchasers with at least 1 prior misdemeanor conviction remained twice as likely as those with no criminal history to be charged with a new offense (RR, 2.4). Men remained at increased risk for nonviolent firearm offenses (RR, 1.8), violent offenses generally (RR, 1.2), and Violent Crime Index offenses (RR, 4.1).

COMMENT

Under current federal law, persons who have been convicted of misdemeanor crimes, including violent crimes and those involving firearms, generally remain eligible to purchase handguns. In our study population, handgun purchasers with prior misdemeanor convictions had substantially higher rates of criminal activity after handgun purchase than did purchasers with no prior criminal history. Overall a strong dose-response relationship between extent of prior criminal history and risk for later criminal activity was observed. Handgun purchasers who had more than 1 prior conviction for a violent offense were more than 10 times as likely to be charged with new criminal activity, and 15 times as likely to be charged with murder, rape, robbery, or aggravated assault, as were those with no prior criminal history. But those whose prior misdemeanor convictions did not involve firearms or violence were also at increased risk for those types of offenses after handgun purchase. And handgun purchasers who had prior convictions for nonviolent firearm-related offenses such as carrying concealed firearms in public, but none for violent offenses, were at increased risk for later violent offenses.

At the same time, it is important to note that most handgun purchasers in this study—approximately 50% of those with a misdemeanor conviction at the time of handgun purchase and more than 90% of those with no prior criminal history—were not charged with new criminal activity after purchasing their handguns.

Our findings of a dose-response relationship and of an increase in risk for new criminal activity among handgun purchasers with relatively minor prior criminal records are similar to those from studies of recurrent criminal behavior in other populations.[9-12,17-19] Our estimates of the low incidence of new criminal activity among handgun purchasers with no prior criminal history also appear to be similar to those from general population studies.[20-22] This is not surprising, as more than 40% of adults in the United States live in a household with firearms and 25% own a firearm themselves.[23,24]

We chose to require a conviction as evidence of prior criminal activity and used arrest as a measure of new criminal activity. In the former case, our decision is consonant with public policies pertaining to the criminal history screening of prospective handgun purchasers where prior conviction (or felony indictment), rather than arrest, is the standard on which eligibility to purchase is determined. The use of arrest as a measure of recurrent criminal activity, or recidivism, is common in criminologic research.[9-12,17-22] The probability of type I error (classifying a subject as having committed a new crime when he/she has not) based on the use of arrest is considered to be substantially less than the probability of type II error (classifying a subject as not having committed a new crime when he/she has) based on the use of conviction.[19,25]

Criminal records had been purged for a sizeable number of handgun purchasers who would otherwise have been eligible for this study. This injects a level of uncertainty into our final findings that cannot be completely quantified. However, our weighted analysis and particularly our sensitivity analysis, which relied on the extreme assumption that none of these handgun purchasers was charged with any crimes after handgun purchase, still found that handgun purchasers with prior misdemeanor convic-

tions were at increased risk for later criminal activity.

The question arises of whether our results for persons who purchased handguns in 1977 are applicable to present handgun buyers. However, the criteria under which our subjects passed a background check differ only slightly from those that remain in force today at the federal level and in most states.

Several sources of conservatism in our results deserve mention. First, handgun purchasers with prior misdemeanor convictions in other states would have been classified by us as having no prior criminal history if those convictions did not appear on their California criminal records. Continuing criminal activity by even a small number of such subjects would have substantially increased the observed rate of new criminal activity among purchasers classified as having no prior criminal history; the RRs reported herein would then be underestimates. Second, we were not able to present results for offenses involving both firearms and violence with which subjects were charged, either before or after handgun purchase. In our data, only 18.7% of charges of assault with a deadly weapon specified the type of weapon involved, and only 5.3% were reported to involve a firearm. Nationally, approximately 20% of such offenses involved a firearm.[26] Finally, we studied only the incidence of first offenses following handgun purchase and did not provide data on the total number of new offenses with which the handgun purchasers in our study population were charged.

Long-standing federal and state statutes deny the purchase of firearms to persons who, as a result of their prior criminal history or for other reasons, are considered to be at unacceptably high risk for later criminal activity. Our findings indicate that the characterization of high risk also applies to handgun purchasers with prior convictions for misdemeanor offenses, regardless of the nature of those offenses. Whether or not that increased risk is acceptable is a public policy decision. We note that in 1996, Congress acted to deny handgun purchase to persons with misdemeanor domestic violence convictions.[27] California and other states now include prior convictions for selected violent misdemeanors as grounds for denial of handgun purchase.[28]

Expanding the criteria for denial of handgun purchase would complicate the process of screening prospective handgun purchasers. The Brady Handgun Violence Prevention Act of 1994 requires that an "instant check" screening of prospective handgun purchasers be implemented.[5] That system became operational on November 30, 1998. It would not be feasible either at present or in the near future to implement an "instant check" system to identify prospective handgun purchasers with prior misdemeanor convictions.[29,30]

Results of a new nationwide survey indicate that, depending on the nature of the offense, as much as 95% of the population—and 91% of gun owners—support prohibiting the purchase of firearms by persons convicted of misdemeanor crimes.[31] And there now is evidence that denial of handgun purchase reduces the incidence of subsequent criminal activity among high-risk persons.[32] These findings might justify expanding the criteria for denial of handgun purchase, even if a waiting period for handgun purchase remained necessary as a result.

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EXHIBIT 7

ORIGINAL ARTICLE

Felonious or Violent Criminal Activity That Prohibits Gun Ownership Among Prior Purchasers of Handguns: Incidence and Risk Factors

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Background: Federal law prohibits firearm possession by felons and certain others. Little is known about criminal activity resulting in new ineligibility to possess firearms among persons who have previously purchased them.

Methods: Cohort study of handgun purchasers ages 21 to 49 in California in 1991, 2,761 with a non-prohibiting criminal history at the time of purchase and 4,495 with no prior criminal record, followed for up to 5 years. The primary outcome measures were the incidence and relative risk of conviction for a felony or violent misdemeanor resulting in ineligibility to possess firearms under (a) California law or (b) federal law. Secondary measures were the incidence and relative risk of conviction for murder, forcible rape, robbery, or aggravated assault; and of arrest for any crime.

Results: A new conviction for a felony or violent misdemeanor leading to ineligibility to possess firearms under federal law was identified for 0.9% of subjects with no prior criminal history and 4.5% of those with 1 or more prior convictions (hazard ratio, 5.1; 95% confidence interval, 3.3–7.7). Risk was related inversely to age and directly to the extent of the prior criminal history; incidence rates varied by a factor of 200 or more among subgroups based on these characteristics.

Conclusions: Among legal purchasers of handguns, the incidence of new felonious and violent criminal activity resulting in ineligibility to possess firearms is low for those with no prior criminal history but is substantially higher for those with a prior criminal record and is affected by demographic characteristics.

Key Words: Firearms, Handguns, Violence, Crime, Policy.

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Both the authors had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Both participated in the conceptualization and design of the study, the acquisition of data, the analysis and interpretation of data, and the drafting and revision of the manuscript. Dr. Wintemute obtained the funding and provided study supervision.
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There is general agreement that persons who are at unacceptably high risk for committing firearm-related violence should not be permitted to purchase or possess firearms. Under federal law, individuals who seek to purchase firearms from licensed dealers must first undergo a background check to verify that they are eligible to do so. Felons, persons convicted of misdemeanor domestic violence offenses or subject to domestic violence restraining orders, controlled substance addicts, and certain others are prohibited.[1] Some states have enacted broader controls, including more comprehensive prohibitions and, in some cases, a requirement that nearly all gun sales include a background check.[2] In 2008, federal and state agencies conducted 9,900,711 background checks on potential firearm purchasers, of which 147,080 (1.5%) resulted in a denial of purchase.[3]

Persons who purchase guns legally, like the rest of the population, may later commit serious crimes. In 1 study, 24.9% of legal handgun purchasers who had prior convictions for misdemeanor crimes, and 4.4% of those with no prior criminal record at all, were charged with new violent crimes over a 15-year period of follow-up.[4] In 2002, California's Attorney General estimated that there might be 170,000 persons in that state who had purchased handguns or assault-type firearms and had since, usually because of a criminal conviction, become prohibited from owning them.[5] Denying gun purchases by persons who are prohibited from owning them is associated with a roughly 25% decrease in the prospective purchasers' risk for committing new firearm-related or violent crimes.[6,7] By extension, identifying persons who have previously and legally purchased guns—who are likely still to be gun owners—among those who have been convicted of crimes that prohibit gun ownership might also be a valuable violence prevention measure.

We undertook this study to determine the incidence of and risk factors for a conviction for a prohibiting criminal offense among legal handgun purchasers in California, which has not previously been done. Our study population comprises 7,256 persons ages 21 to 49 who purchased handguns in 1991, of whom 4,495 had no prior criminal record, 1,204 had previously been arrested but had never been convicted of a crime, and 1,557 had 1 or more prior criminal convictions. Follow-up is for as much as 5 years after handgun purchase. Given prior findings,[4,6,7] we hypothesized that risk would be low for those with no prior criminal history but substantially higher for those with prior convictions or arrests, would be

directly related to the extent of a prior criminal history, would be inversely related to age, and would be unrelated to gender.

MATERIALS AND METHODS

Identifying the Study Population

The California Department of Justice (CDOJ) provided records for all handgun purchases from licensed gun dealers in 1991. We identified the study population following procedures described previously.[4] After eliminating multiple entries for persons who had purchased more than 1 handgun, the purchase records were stratified by the presence or absence of a CDOJ identifying number indicating that, at the time of purchase, the buyer had an identification record on file at CDOJ and therefore might have a criminal history. (Most purchase records with identifying numbers were known to be for persons whose identification records at CDOJ related to pre-employment screening or other matters.) One sample was then drawn from each stratum: 6,300 with an identification number and 4,000 without. The sample size was such as to yield cohorts sufficient, based on prior results,[4] to detect a relative risk of 1.5 to 2.0, depending on the outcome measure, with a power of 0.9 or higher.

Criminal records were requested for all potential subjects. All persons having criminal records at the time of handgun purchase (including a small number whose handgun purchase records had no CDOJ identifying number) were assigned to the prior criminal history cohort. Persons without identifying numbers who proved to have no criminal record at the time of handgun purchase were assigned to the no prior criminal history cohort, along with a random sample of persons whose identifying numbers proved to be for reasons other than a prior criminal record. The size of this sample reflected our best estimate of the proportion of all handgun purchasers who had an identification number but no criminal record.

The age range for the initial samples was 21 years to 54 years. To minimize the impact of CDOJ's practice of purging inactive criminal records from its archives, which was done more commonly for persons above age 50,[4] we excluded 514 persons ages 50 to 54. Records for 285 potential subjects ages 21 to 49 had also been purged. They were excluded from the study population, and a sensitivity analysis was added to assess the impact on our results.

We also excluded 56 persons with a prior criminal history that, on our review, appeared to prohibit them from purchasing firearms. Fourteen had been convicted of a prohibiting misdemeanor within 10 years of their purchase (California's misdemeanor prohibitions expire after 10 years); 24 had been convicted of a felony; 17 had been adjudicated as juveniles for crimes that would have been felonies had these persons been adjudicated as adults; the record for 1 person could not be located.

Data Acquisition and Management

We used double data entry procedures throughout, with automated and manual comparisons. Differences were resolved by discussion led by a senior staff member.

Demographic information was available from the handgun purchaser records; this information was variably provided by either the purchaser or the seller. For subjects having criminal records, all charges and convictions were recorded. Information on restraining orders was not available. The misdemeanors for which a conviction prohibits firearm ownership under California law are specified in statute.[8] We included only convictions for a misdemeanor having domestic violence as a required element of the offense as prohibiting firearm ownership under federal law, as we did not have information on the facts surrounding individual offenses. Felony convictions were usually identified as such in the criminal record; if the nature of the conviction was not specified, we required that the offense be specified as a felony in the California Penal Code. The violent Crime Index offenses are defined as murder, forcible rape, robbery, and aggravated assault.

The follow-up period began 15 days after the application for handgun purchase—the first day on which legal acquisition of the gun could have occurred. Following procedures that have been described previously,[4,7] we verified subjects' continuing residence in California for up to 5 years afterward, independent of any instances of criminal activity, using driver's license, credit agency, and death records. Subjects were considered to be at risk for only so long as their residence in California could be verified and only arrests and convictions occurring in the state were included in the analysis.

Statistical Analysis

Our primary outcome events were first new convictions for felony or prohibiting misdemeanor crimes under either California or federal law. Secondary outcome measures were first new convictions for violent Crime Index offenses, and first new arrests. Arrest is often used as a measure of the incidence of new criminal activity[9–11] and has been used in prior studies of criminal activity among gun purchasers.[4,6] Incidence rates for all outcomes were calculated as the number of subjects who experienced each outcome divided by the total person-time at risk. The probability of sustaining an outcome event during follow-up was estimated by the Kaplan-Meier method.[12] The significance of differences in probabilities was assessed by the log-rank statistic.

Cox proportional hazards regression was used to calculate hazard ratios (HRs) and 95% confidence intervals (CIs). Models including age, sex, and, where appropriate, number of prior convictions were used to estimate adjusted HRs. (Race or ethnicity was not used in the regression analyses given its varying sources.) Age was stratified (21–24, 25–34, 35–49) as was prior criminal history (none; 1 or more arrests, but no convictions; 1; 2; or 3 or more convictions).

For the sensitivity analysis, we repeated the main regressions with persons whose criminal records had been purged added to the data under the assumptions of (1) no occurrence of any outcome event and (2) follow-up for the entire 5-year observation period. To compare rates in our study population with those of the adult population of California, crude arrest and conviction rates for study subjects

were calculated as the total number of arrests and convictions divided by the person time at risk. Arrests on multiple charges were counted as single events; each conviction was counted separately. Rates for the adult population of California (ages 18–69) were available from published reports.[13–18]

The significance of differences between subjects with and without independent follow-up was estimated using the χ^2 statistic. All tests of significance were 2-sided, with $p < 0.05$ taken to represent statistical significance. SAS software was used for all procedures (PC-SAS, Version 9.1, SAS Institute, Cary, NC). This study was approved by the institutional review board of the University of California, Davis.

RESULTS

There were 4,495 handgun purchasers with no prior criminal history and 2,761 with 1 or more prior arrests or convictions. Differences in the demographic characteristics of the 2 groups were small but statistically significant (Table 1). Of subjects with a prior criminal history, 56.5% (1,557 persons) had at least 1 criminal conviction before handgun purchase; 18.6% had 2 or more. The remainder (1,204 persons, 43.6%) had arrests only.

Evidence of subjects' continued residence in California for the entire 5-year period of follow-up was available for 2,048 (45.6%) of those with no prior criminal history and 1,542 (55.8%) of those with a criminal history ($p < 0.0001$). Partial follow-up was available for another 1,815 (40.4%) and 1,051 (38.1%), respectively ($p < 0.0001$). Complete absence of follow-up was related to subjects' study cohort (no prior criminal history, 14.1%; prior criminal history, 6.1%; $p < 0.001$), and to age, though the difference was small (21–24, 13.9%; 25–34, 10.3%; 35–49, 10.5%; $p = 0.001$), but not to sex (male, 10.9%; female, 11.8%; $p = 0.50$) or extent of prior criminal history (arrest only, 6.6%; 1 conviction, 5.7%; 2 convictions, 7.0%; ≥3 convictions, 4.2%; $p = 0.40$).

TABLE 1. Demographic and Prior Criminal History Characteristics of Handgun Purchasers*

Characteristic	Criminal History at Time of Handgun Purchase: None (n = 4,495)	Any (n = 2,761)	p
Sex			<.001
Male	3,944 (87.7)	2,563 (92.8)	
Female	551 (12.3)	198 (7.2)	
Age, yr			<.001
21–24	898 (20.0)	425 (15.4)	
25–34	1,792 (39.9)	1,213 (43.9)	
35–49	1,805 (40.2)	1,123 (40.7)	
Race/ethnicity			<.001
White	2,487 (55.3)	1,429 (51.8)	
Black	324 (7.2)	356 (12.9)	
Hispanic	1,106 (24.6)	748 (27.1)	
Asian/other	391 (8.7)	126 (4.6)	
Missing/unknown	187 (4.2)	102 (3.7)	
No. of prior convictions			
0†	—	1,204 (43.6)	
1	—	1,045 (37.9)	
2	—	272 (9.9)	
≥3	—	240 (8.7)	

* Data are expressed as number (percentage) of subjects. Percentages may not add to 100% due to rounding.

† These subjects had 1 or more prior arrests but no known convictions.

During follow-up, 1.0% of handgun purchasers with no prior criminal history (39 persons) were convicted of a felony or prohibiting misdemeanor and became ineligible to own firearms under California law; slightly fewer (33 persons, 0.9%) became ineligible under federal law (Table 2). Among subjects with prior misdemeanor convictions, 5.5% (78 persons) and 4.5% (64 persons) experienced a prohibiting conviction under state and federal law, respectively (state-law prohibition HR 5.2, 95% CI 3.6–7.7; federal-law HR 5.1, 95% CI 3.3–7.7). Findings were similar for purchasers with prior arrests only, for secondary outcomes, and for age- and sex-specific comparisons (Table 2; Kaplan-Meier event curves are at Supplemental Figure 1, http://links.lww.com/TA/A30). Among purchasers with prior convictions, risk for all outcomes was greater for those with 2 convictions than for those with 1, but there was no further increase among those with 3 or more (Table 2; Supplemental Figure 2, http://links.lww.com/TA/A31).

Among handgun purchasers with any prior criminal history, whether involving arrests only or prior convictions, the incidence of new prohibiting convictions was strongly related to age for all outcomes (Table 2, Supplemental Figure 3, http://links.lww.com/TA/A32). Purchasers ages 21 to 24 experienced conviction rates that were generally 2.5 to 3 times those for purchasers ages 35 to 49 (Table 2). Among purchasers ages 21 to 24 with prior criminal convictions, 3.0% were subsequently convicted of murder, rape, robbery, or aggravated assault. The age effect was even more pronounced among purchasers with no prior criminal record, chiefly as a result of the very low incidence of new criminal activity among those ages 35 to 49.

Incidence rates for males and females were essentially equal among purchasers with no prior criminal history or with prior arrests only. Among purchasers with prior convictions, rates were higher among females.

Incidence rates that were both age- and criminal history-specific varied by a factor of 200 or more; Figure 1 displays findings for the outcome of any arrest.

The regression findings persisted in models that adjusted for age and sex (Table 3). Handgun purchasers with 3 or more prior misdemeanor convictions were more than 10 times as likely as those with no prior criminal history to experience a prohibiting conviction, including a conviction for murder, rape, robbery, or aggravated assault.

In the sensitivity analysis, HRs for all outcomes among purchasers with a prior criminal record were necessarily diminished, but they remained elevated and statistically significant.

During 1991–1996, the adult population of California (ages 18–69) had an average annual arrest rate of 67.9 per 1,000 persons and an average annual conviction rate for violent Crime Index offenses of 2.2 per 1,000 persons. Com-

TABLE 2. Incidence of and Crude HR for Outcome Events*

Criminal History at Time of Handgun Purchase	No. of Subjects	Arrest for Any Crime: No. (%) Arrested	Arrest for Any Crime: No. of Events per 1,000 Person Years	Arrest for Any Crime: Crude HR (95% CI)	Conviction for Felony or Violent Misdemeanor (California Prohibition): No. (%) Convicted	Conviction for Felony or Violent Misdemeanor (California Prohibition): No. of Events per 1,000 Person Years	Conviction for Felony or Violent Misdemeanor (California Prohibition): Crude HR (95% CI)	Conviction for Felony or Domestic Violence Misdemeanor (Federal Prohibition): No. (%) Convicted	Conviction for Felony or Domestic Violence Misdemeanor (Federal Prohibition): No. of Events per 1,000 Person Years	Conviction for Felony or Domestic Violence Misdemeanor (Federal Prohibition): Crude HR (95% CI)	Conviction for Violent Crime Index Crime†: No. (%) Convicted	Conviction for Violent Crime Index Crime†: No. of Events per 1,000 Person Years	Conviction for Violent Crime Index Crime†: Crude HR (95% CI)
None													
All subjects	3,863	144 (3.7)	9.3	1.0 (Referent)	39 (1.0)	2.5	1.0 (Referent)	33 (0.9)	2.1	1.0 (Referent)	11 (0.3)	0.7	1.0 (Referent)
Sex													
Male	3,390	128 (3.8)	9.4		35 (1.0)	2.5		29 (0.9)	2.1		10 (0.3)	0.7	
Female	473	16 (3.4)	8.5		4 (0.9)	2.1		4 (0.9)	2.1		1 (0.2)	0.5	
Age, yr													
21–24	746	75 (10.1)	25.2		22 (3.0)	7.1		20 (2.7)	6.4		8 (1.1)	2.5	
25–34	1,549	66 (4.3)	10.5		16 (1.0)	2.5		12 (0.8)	1.9		3 (0.2)	0.5	
35–49	1,568	3 (0.2)	0.5		1 (0.1)	0.2		1 (0.1)	0.2		0	0	
Arrest(s) only													
All subjects	1,124	272 (24.2)	64.8	6.9 (5.6–8.4)	82 (7.3)	17.4	7.0 (4.8–10.3)	72 (6.4)	15.2	7.3 (4.8–11.0)	26 (2.3)	5.4	7.8 (3.9–15.8)
Sex													
Male	1,045	252 (24.1)	64.9	6.8 (5.5–8.4)	77 (7.4)	17.6	7.0 (4.7–10.4)	67 (6.4)	15.2	7.3 (4.7–11.3)	26 (2.5)	5.8	8.1 (3.9–16.8)
Female	79	20 (25.3)	64.0	7.5 (3.9–14.6)	5 (6.3)	14.3	6.9 (1.9–25.7)	5 (6.3)	14.3	6.9 (1.9–25.7)	0	0	0
Age, yr													
21–24	221	72 (32.6)	91.4	3.6 (2.6–4.9)	23 (10.4)	24.7	3.5 (1.9–6.3)	18 (8.1)	19.1	3.0 (1.6–5.6)	5 (2.3)	5.1	2.0 (0.7–6.3)
25–34	515	143 (27.8)	76.8	7.2 (5.4–9.7)	46 (8.9)	21.4	8.6 (4.9–15.1)	42 (8.2)	19.4	10.4 (5.5–19.8)	19 (3.7)	8.6	18.6 (5.5–62.7)
35–49	388	57 (14.7)	36.9	76.4 (23.9–244.0)	13 (3.4)	7.9	49.5 (6.5–378.6)	12 (3.1)	7.3	45.6 (5.9–350.9)	2 (0.5)	1.2	0
Misdemeanor conviction(s)													
All subjects	1,419	298 (21.0)	54.6	5.8 (4.8–7.1)	78 (5.5)	12.9	5.2 (3.6–7.7)	64 (4.5)	10.5	5.1 (3.3–7.7)	22 (1.6)	3.5	5.2 (2.5–10.6)
Sex													
Male	1,313	275 (20.9)	54.2	5.7 (4.6–7.1)	69 (5.3)	12.2	4.9 (3.2–7.3)	55 (4.2)	9.7	4.7 (3.0–7.3)	20 (1.5)	3.5	4.9 (2.3–10.4)
Female	106	23 (21.7)	60.3	7.0 (3.7–13.3)	9 (8.5)	21.2	10.2 (3.1–33.2)	9 (8.5)	21.2	10.2 (3.1–33.2)	2 (1.9)	4.5	8.7 (0.8–95.9)
Age, yr													
21–24	165	53 (32.1)	92.8	3.6 (2.5–5.1)	14 (8.5)	19.9	2.8 (1.4–5.5)	13 (7.9)	18.4	2.9 (1.4–5.8)	5 (3.0)	6.8	2.7 (0.9–8.4)
25–34	612	147 (24.0)	63.0	6.0 (4.5–8.0)	40 (6.5)	15.3	6.2 (3.5–11.0)	31 (5.1)	11.8	6.4 (3.3–12.4)	11 (1.8)	4.1	8.9 (2.5–31.9)
35–49	642	98 (15.3)	38.4	79.4 (25.2–250.5)	24 (3.7)	8.7	54.7 (7.4–404.4)	20 (3.1)	7.3	45.4 (6.1–338.6)	6 (0.9)	2.2	0
No. of prior convictions													
1	972	181 (18.6)	48.0	5.1 (4.1–6.4)	42 (4.3)	10.1	4.1 (2.6–6.3)	32 (3.3)	7.6	3.7 (2.3–6.0)	13 (1.3)	3.1	4.4 (2.0–9.9)
2	242	62 (25.6)	67.9	7.2 (5.4–9.7)	20 (8.3)	19.5	7.9 (4.6–13.5)	17 (7.0)	16.5	7.9 (4.4–14.2)	5 (2.1)	4.7	6.9 (2.4–19.8)
3+	205	55 (26.8)	71.6	7.6 (5.6–10.4)	16 (7.8)	18.3	7.4 (4.2–13.3)	15 (7.3)	17.1	8.2 (4.5–15.1)	4 (2.0)	4.4	6.5 (2.1–20.3)

HR, hazard ratio.

* Limited to subjects for whom follow-up independent of new criminal activity was available.

† Murder, forcible rape, robbery, aggravated assault.

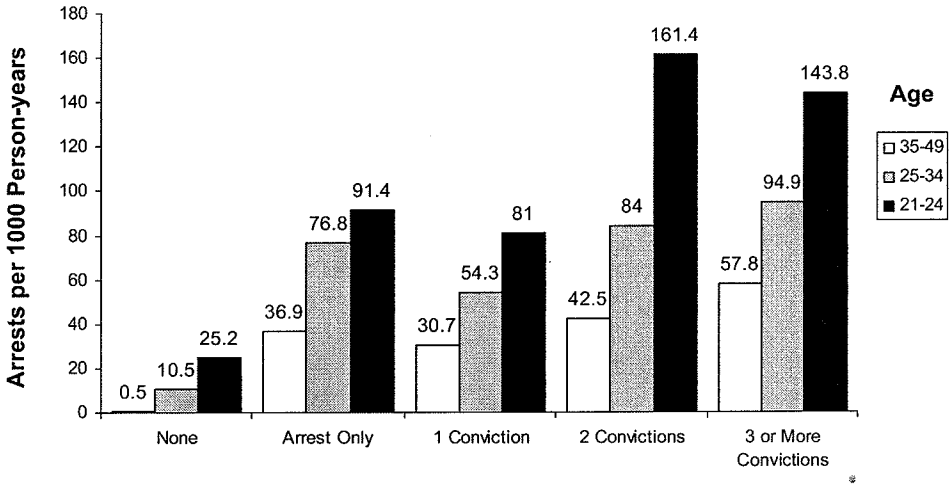

Figure 1. Incidence rates for arrest after handgun purchase for purchasers grouped by age and extent of prior criminal history.

TABLE 3. Adjusted HR for Outcome Events*

Characteristic	Arrest for Any Crime Adjusted HR (95% CI)	Conviction for Felony or Prohibiting Misdemeanor (California Prohibition) Adjusted HR (95% CI)	Conviction for Felony or Domestic Violence Misdemeanor (Federal Prohibition) Adjusted HR (95% CI)	Conviction for Violent Crime Index Crime† Adjusted HR (95% CI)
Arrest(s) only				
No criminal history	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)
1 or more	6.7 (5.5–8.2)	6.7 (4.6–9.8)	7.0 (4.6–10.6)	7.0 (3.5–14.2)
Sex				
Male	1.0 (0.7–1.4)	1.2 (0.6–2.3)	1.0 (0.5–1.9)	3.2 (0.4–23.6)
Female	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)
Age, yr				
21–24	4.9 (3.6–6.6)	5.9 (3.2–10.8)	5.3 (2.8–10.0)	11.7 (2.6–51.8)
25–34	3.1 (2.3–4.1)	3.7 (2.0–6.5)	3.4 (1.9–6.3)	8.9 (2.1–38.0)
35–49	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)
Misdemeanor conviction(s)				
No criminal history	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)
1	5.6 (4.5–6.9)	4.5 (2.9–6.9)	4.2 (2.5–6.8)	4.9 (2.2–11.1)
2	9.0 (6.7–12.2)	9.9 (5.7–17.1)	10.4 (5.7–18.8)	9.2 (3.1–26.8)
3+	11.4 (8.3–15.7)	11.6 (6.4–21.2)	13.6 (7.2–25.6)	11.0 (3.4–35.6)
Sex				
Male	1.0 (0.7–1.3)	0.8 (0.4–1.4)	0.6 (0.3–1.1)	0.9 (0.3–3.1)
Female	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)
Age, yr				
21–24	4.9 (3.7–6.4)	5.3 (3.1–9.1)	6.1 (3.5–10.8)	7.7 (2.8–20.9)
25–34	2.4 (1.9–3.1)	2.6 (1.6–4.1)	2.4 (1.4–4.1)	2.6 (1.0–6.9)
35–49	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)	1.0 (Referent)

HR, hazard ratio.
* Limited to subjects for whom follow-up independent of new criminal activity was available. HRs are adjusted for all variables in the table.
† Murder, forcible rape, robbery, aggravated assault.

parison rates in our study population (Table 4) were substantially lower for handgun purchasers with no prior criminal history but were generally higher, except for subjects ages 35 to 49, among those with prior arrests or convictions.

Of all subjects with a prior criminal history, 62.6% (1,729 persons) had been charged with a violent misdemeanor within 10 years of their handgun purchase, or with a felony. This was true for 60 (76.9%) of the 78 handgun purchasers with prior misdemeanor convictions who were later convicted of crimes that prohibited them from owning guns under California law, and 52 (81.3%) of the 64 persons with prior misdemeanor convictions who later became ineli-

TABLE 4. Total-Event Rates of Arrest for Any Crime and of Conviction for a Violent Crime Index Crime*†

Criminal History at Time of Handgun Purchase	Events per 1,000 Person-Years	
	Arrest for Any Crime	Conviction for Violent Crime Index Crime
None		
All subjects	13.9	0.7
Sex		
Male	13.8	0.7
Female	14.5	0.5
Age, yr		
21–24	35.2	2.5
25–34	16.1	0.5
35–49	0.6	0
Arrest(s) only		
All subjects	87	6.5
Sex		
Male	87.8	7.0
Female	76.8	0
Age, yr		
21–24	130.2	5.0
25–34	92.1	10.6
35–49	54.4	1.8
Misdemeanor conviction(s)		
All subjects	77.2	4.6
Sex		
Male	74.8	4.6
Female	107.8	4.4
Age, yr		
21–24	154.2	12.0
25–34	83.3	5.1
35–49	50.6	2.1
No. of convictions		
1	65.2	4.0
2	95.9	7.5
3+	111.3	4.4

* Measured as the total number of events per 1,000 person-years over the period of follow-up. Comparison rates for the general adult population of California (ages 18–69) were 67.9 per 1,000 persons per year for any arrest and 2.2 per 1,000 persons per year for a conviction for a violent Crime Index crime.

† Murder, forcible rape, robbery, aggravated assault.

gible to own guns under federal law. Prior felony or violent misdemeanor convictions would have prohibited the handgun purchases that led to their inclusion in the study.

DISCUSSION

In this population of legal purchasers of handguns, the incidence of felonious and violent criminal activity among those with no prior criminal history was quite low. Only 1% of them, and only 1 individual among the 1,568 such purchasers ages 35 to 49, were convicted of a felony or violent misdemeanor over 5 years of follow-up. In the 1 prior study of such a population, just 10% of handgun purchasers with no prior criminal history were charged with new criminal activity during 15 years after purchasing their guns.[4]

But for handgun purchasers with a prior criminal history, whether involving prior convictions or only arrests, the findings were quite different. Approximately 20% to 25% of these subjects were arrested during follow-up; approximately 5% to 7% were convicted of a felony or violent misdemeanor. Their risk for all outcomes, adjusted by age and sex, was increased by a factor of between 5 and 8. There appeared to be a dose-response effect; relative risks for all outcomes were higher for those with multiple prior misdemeanor convictions than for those with just 1.

As predicted, age was inversely associated with absolute risk for all outcomes. This effect was quite large among handgun buyers with no prior criminal history, for whom incidence rates among those ages 21 to 24 were 30 to 50 times higher than rates among those ages 35 to 49. Among handgun buyers with a prior criminal history, however, rates for persons ages 21 to 24 were generally only 2 to 3 times higher than rates for persons ages 35 to 49. Conversely, there were age-related increases in the relative risk associated with a prior criminal history. For handgun buyers ages 35 to 49, relative risks associated with a prior arrest or conviction were greater than 40.

The most remarkable differences were seen when age and criminal history were considered together. Across all outcomes, handgun purchasers ages 21 to 24 with multiple prior misdemeanor convictions had incidence rates that were at least 200 times those for purchasers ages 35 to 49 with no prior criminal history.

Findings related to sex were sometimes unexpected. Within-group absolute event rates for males and females often differed little and were sometimes higher for females than for males, suggesting that, at least in this population, prior criminal history is more important than gender as a predictor of future criminal activity. Relative risks associated with prior misdemeanor convictions were greater for females than for males.

For 3 reasons, our results probably underestimate the true incidence of felonious and violent criminal activity leading to a prohibition on firearm ownership in our study population. First, we were unable to identify subjects who had been placed under felony indictment during follow-up or had become subject to domestic violence restraining orders; both events prohibit firearm possession under federal and state law. At any time, there are approximately 200,000 domestic violence restraining orders in force in California, not including temporary orders.[19] Second, our relatively short period of follow-up makes it likely that a meaningful fraction of arrests for prohibiting crimes among our study subjects had not been adjudicated; additional instances of prohibition probably occurred when those verdicts were handed down. Last is incomplete reporting by the courts of convictions when they occur, a problem common to all criminal justice records systems.[20]

One additional factor reduced our estimation of the incidence of ineligibility to possess firearms in this population under federal law only. We were unable to identify as domestic violence offenses those cases in which a subject was convicted on a charge of simple assault (or a similarly

nonspecific offense) and had a domestic relationship with the victim. Although such convictions have recently been found to be "misdemeanor crime[s] of domestic violence" by the Supreme Court, the facts of individual cases must be known to make a determination.[21]

To an even greater extent, for all the reasons just given and 1 more, our results probably underestimate the incidence of new ineligibility under federal law among persons who purchase handguns from licensed retailers in much of the United States. Since 1991, California has prohibited persons convicted of nearly all violent misdemeanors from purchasing firearms. Such persons are therefore excluded from our study population, but they remain able to purchase firearms elsewhere. They are at especially high risk for subsequent criminal activity after handgun purchase. In a prior study, as compared with purchasers with no prior criminal history, handgun purchasers with 2 or more prior convictions for violent misdemeanors had a 15-fold increase in risk of arrest for murder, rape, robbery, or aggravated assault.[4]

Limitations

As just described, California's population of legal handgun purchasers is systematically different from such populations in other states. Replications of this study would be very helpful. To our knowledge, however, no other state has the requisite information and makes it available for analysis. We did not study handgun purchasers above 50 years of age, as we believed that they were at relatively low risk for serious criminal activity. Because we relied on published arrest and conviction rates for the general population of California, our comparisons are not age- and sex-specific and are not adjusted for differences in those characteristics. Our sample was structured to maximize statistical power, and purchasers with a prior criminal history are overrepresented.

It is also possible that the incidence of criminal activity among handgun purchasers that leads to a prohibition on firearm ownership has fallen since our study period. California's adult felony arrest and conviction rates have fallen by 18% and 12%, respectively, from 1991–1996 to 2007, the most recent year for which data are available.[18]

Most of our outcome measures were based on convictions—criminal justice events that resulted in a change in legal status regarding firearm ownership. We did not measure the incidence of felonious or violent criminal activity per se, for which arrest would have been more suitable[9–11] and for which rates would have been higher.[4,6,7]

Implications

The frequency of felonious and violent criminal activity among authorized purchasers of handguns leads to 2 considerations. First, it may be desirable to require a criminal records background check before all purchases of firearms to identify prospective purchasers who have become ineligible since a prior background check, if any, was done. In most states that already occurs when the purchase is made from a licensed dealer, but there is an important exception. In 14 states containing 26% of the population, holders of permits to carry concealed firearms are exempt from background checks while the permits remain in effect—4 or 5 years—and any eligible person who requests such a permit must be given one.[22] Our findings suggest that a considerable number of these permit holders will have become ineligible to purchase firearms before their permits have expired.

Only 6 states require a background check for all, or nearly all, firearm purchases. In 33 states private individuals may sell firearms directly, without the participation of a licensed retailer.[2] Such transactions account for as many as 40% of all firearms acquisitions nationwide,[23] and background checks are not required.

Second, if the incidence of serious criminal activity among gun purchasers with a prior criminal history is deemed unacceptable, 2 additional interventions may be worthy of consideration. One is to expand the criteria for denial of firearm purchase, which has been shown to reduce the risk of violent and firearm-related crime among those directly affected by about 25%.[7] The second is to work aggressively for the conviction of persons charged with prohibiting offenses when supported by the facts. More than 75% of the handgun purchasers with prior misdemeanor convictions who were later convicted of crimes that prohibited gun ownership had been charged with prohibiting offenses before purchasing their guns.

When records of gun purchases are retained, the same data that are now used to screen for prohibiting criminal activity among prospective gun purchasers can be used to screen for gun ownership among persons who have committed a prohibiting criminal act. Risk for criminal recidivism is highest after an index event and declines steadily, and a person recently convicted of a felony or violent misdemeanor who has previously purchased firearms—and is now prohibited from possessing them—might be given a high priority for intervention in a comprehensive violence prevention program. Two existing programs could serve as models, but neither has been subjected to a rigorous outcome evaluation. The Federal Bureau of Investigation and the Bureau of Alcohol, Tobacco, Firearms and Explosives have successfully retrieved hundreds of firearms from prohibited persons who acquired them when the 3-day waiting period mandated by federal law expired before their background checks were completed.[24] Since 2006, the California Department of Justice's Armed and Prohibited Persons System has identified prior handgun purchasers among newly prohibited persons. Hundreds of firearms have been retrieved.[25]

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EXHIBIT 8

Is Gun Control Likely To Reduce Violent Killings?

Frank Zimring

One of the major arguments for the elimination of firearms, and derivatively for gun control laws, is that such measures would reduce the number of criminal homicides.[1] It has been argued, however, that eliminating guns would have no such effect because if somebody wants to kill, he will find a weapon to achieve "his destructive goal"; there is, it is said, more than one way to skin a cat.[2] This paper is an attempt to bring this phase of the gun control debate closer to a resolution, through analysis of data from the Police Department of the City of Chicago on reported criminal homicides and serious, but not fatal, criminal assaults during 1965, 1966, and 1967.

Homicide and the Intention To Kill

If all homicides resulted from such a single-minded intention to kill as gangland killings, laws prohibiting firearms would not have a substan-

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1 "It would be fairly easy to reduce the number of murders. Rational and effective laws would cut homicide sharply." Norval Morris, quoted in Look, Sept. 19, 1967, at 32.

2 "More than the availability of a shooting weapon is involved in homicide. Pistols and revolvers are not difficult to purchase . . . in Philadelphia. . . . The type of weapon used appears to be, in part, the culmination of assault intentions or events and is only superficially related to causality. To measure quantitatively the effect of the presence of firearms on the homicide rate would require knowing the number and type of homicides that would not have occurred had not the offender—or, in some cases, the victim—possessed a gun. Research would require determination of the number of shootings that would have been stabbings, beatings, or some other method of inflicting death had no gun been available. It is the contention of this observer that few homicides due to shootings could be avoided merely if a firearm were not immediately present, and that the offender would select some other weapon to achieve the same destructive goal. Probably only in those cases where a felon kills a police officer, or vice versa, would homicide be avoided in the absence of a firearm." M. Wolfgang, Patterns in Criminal Homicide 82-83 (1958).

tial effect on homicide. Even assuming such assassins would be unable to obtain guns—a doubtful supposition—they would resort to other weapons on the order of dynamite to achieve their intention. But not all homicides are so unambiguously motivated. The question is: Do a significant proportion of homicides result from a less deliberate and determined intention? If this question may be answered in the affirmative, and if the probable substitute for firearms in these situations is less likely to lead to death, then the elimination of guns would reduce the number of homicides.

The hypothesis is more easily stated than proved. For obvious reasons, there are no precise data on the intention of an attacker toward his victim—whether he wished to wound or injure, with some apprehension of the risk of death or some desire to kill, or whether he single-mindedly intended to kill at any cost. Either of these mental states would be consistent with a finding of murder if homicide results. But the more ambiguous intention might well lead to the termination of an attack before lethal consequences ensue. The barroom fight ends when one of the two participants has been stabbed, shot, or beaten into submission.[3] At that point the issue has been decided. Similarly, the violent domestic dispute may end decisively without fatal consequences.

A series of statistics for the city of Chicago throws light on the degree to which homicides result from an ambiguous, rather than a single-minded, intention to kill. The first table corncerns the relationship between attacker and victim in homicide cases:

TABLE 1

RELATIONSHIP BETWEEN HOMICIDE VICTIM AND ATTACKER: CHICAGO, 1967

Relationship	%
Friends and acquaintances	41
Spouse or lover	20
Other family	7
Neighbors	3
Business	3
No relationship	22
Undetermined	4
Total	100
Number of cases	554

More than two-thirds of all killings involved spouses, lovers, friends, or tavern guests as victim and attacker.

Closely related to data on relationship are statistics about the motive of the attack:

[3] For statistics on non-fatal serious assaults, see Tables 7, 8, and 9 *infra*. See also WOLFGANG, *supra* note 2, at 86, for a discussion of the quality of intention in homicides by beating in Philadelphia.

TABLE 2

MOTIVES OF HOMICIDE AS ESTABLISHED BY POLICE: CHICAGO, 1967

Motives		%
Altercations:		
General Domestic		17
Money		9
Liquor		7
Sex		2
Triangle		6
Racial		1
Children		2
Other		38
		82
Teen Gang Disputes:		3
Robbery:		
Strong Arm		3
Armed		9
Other Motive:		3
Total		100
Number of cases	551	

82% of the homicides in Chicago in 1967 occurred as a result of altercations—domestic, money, liquor, etc.—precisely the situations where the intention is more apt to be ambiguous rather than single-minded.

Third, a comparison of victims of homicide with victims of serious assaults, with respect to their race and sex, shows:

> Victims of homicides and victims of serious assaults are distributed quite similarly by race and sex among the population and differ substantially in these characteristics from the Chicago population as a whole. (See Table 3.)

Next, it should be noted that only 30% of the victims of fatal gunshot attacks in 1967 were wounded by more than one shot. While data are not available on the number of shots fired, it may be readily assumed that the majority of the 70% of single wound homicides occurred in situations where the attacker did not exhaust the multiple shot capacity of his firearm.[4]

Finally, in 54% of the situations which led to homicide in 1967, the police noted that the offender or the victim or both had been drinking prior to the homicidal attack. This figure probably does not include a number of situations in which the police officer was unable to determine whether intoxicants were involved.

4 When one offender kills more than one victim, this inference may not hold. Nine cases where the police noted the weapon was exhausted were found in the 1967 records. More may have gone without notation.

TABLE 3

HOMICIDE AND SERIOUS ASSAULT VICTIMS AND CHICAGO POPULATION BY RACE AND SEX

	Homicide Victims 1967 %	Serious Assault Victims of Gun and Knife Attacks 5th Period, 1968 %	Chicago Population 1960[1] %
White			
Male	15	15	37
Female	7	4	39
Negro			
Male	59	61	11
Female	12	15	12
Other			
Male	6	5	—[2]
Female	1	1	—[2]
Total	100%	100%	100%
Number	553	480	3,540,100

[1] More recent data on Chicago population by both race and sex are not available. Nonwhites are estimated to have comprised 30% of the city's population in April 1968, as compared with 24% in 1960. Hospital Planning Council for Metropolitan Chicago, Chicago Regional Hospital Study: Population Estimates for Municipalities and Counties in the Chicago Consolidated Area, 1967 and 1968, Table 2 (mimeo. July 1968).

[2] Less than 0.5%.

It may be inferred from these data that many homicides are related to variable states of intention and that a significant proportion do not result from an attack committed with the single-minded intention to kill. The next question that must be asked in order to determine whether elimination of firearms would result in a lower homicide rate, is whether firearms as a class are more dangerous in the normal assault situation than the most dangerous probable substitute weapon. If they are not, then their elimination would not reduce the homicide rate, which is a function of the dangerousness of the weapons used multiplied by the number of serious attacks. Before an answer may be sought from the data, it is necessary to define "dangerousness" of a weapon in a manner that permits empirical study.

DEFINING DANGEROUSNESS

To say that weapon A is more dangerous than weapon B might mean either that weapon A can facilitate the implementation of intentions to attack in situations where weapon B cannot, or that consummated attacks with weapon A are more dangerous than consummated attacks with weapon B, or both. Certainly, the capacity of a particular weapon

to make a homicidal attack possible—its range—is an element of any definition of weapon dangerousness.[5] But no available experience statistics indicate how many attacks with weapon A would not have been attacks at all if weapon B and not weapon A were available.

We do know (1) that firearms as a class have a greater range for carrying intention into act than any other frequently used assault mechanism, and (2) that most homicides involve individuals who are acquainted with one another and take place in "inside" locations such as homes, taverns, and common passageways.[6] The prior acquaintance of victim and offender and the location of most homicidal attacks suggest that it is correct to assume that weapon range is a critical factor in attack situations in only a comparatively small number of cases.[7] Nonetheless, to the limited extent that range has any bearing on the dangerousness of weapons in attack, guns must be considered more dangerous than alternative weapons in common usage. Where range is important, as in the killing of police, the absence of firearms may have preventive effects beyond the scope of this study.

The Most Dangerous Probable Substitute Weapon

In order to assess the impact of effective gun control on homicide fairly, the dangerousness of firearms in attack situations should be judged against the dangerousness of the most dangerous weapon which probably *would be*—as opposed to *could be*—used in assault situations were firearms not available.

There are a number of dangerous instrumentalities widely available to most of the population. Knives, other cutting instruments, automobiles, and blunt instruments of all kinds are freely available. Hands and feet, potentially lethal instruments in their own right, are a part of man's standard equipment. Some, but not all, poisons are available in various forms. Many flammable and explosive substances are within the average citizen's reach. Thus, weapon availability is a threshold which excludes only a few of the more exotic or technically sophisticated means of destruction. A far more important screening question is whether a particular form of attack instrumentality is available in the perceptual sense—likely to enter the thoughts and physical reach of an individual who is contemplating attack.

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[5] Range is of particular importance in political killings and in killing armed individuals. Thus, factors affecting range would concededly affect the rate of police officers killed. *See* WOLFGANG, *supra* note 2, at 83.

[6] In 1967, over 2/3 of Chicago homicides took place in inside locations. *See also* HOMICIDE SECTION, AGGRAVATED ASSAULT SECTION, REVIEW UNIT, CHICAGO POLICE DEP'T., MURDER ANALYSIS—1966. For statistics on relationship, see Table 1 *supra*.

[7] *See* WOLFGANG, *supra* note 2, at 83.

A rough estimate of the perceived availability of instrumentalities as murder weapons can be obtained by analyzing the type of weapons actually used in homicides reported to the police:

Homicide by Weapon: Chicago, 1966[8]

	%
Firearms	52
Knives	30
Other weapons	8
No weapon	10
Not known	1
	100%
Total number: 510	

It is true, of course, that some attack instruments may be underreported because it is difficult to discover that they have caused a death (*e.g.*, some forms of poison) or because death caused by the instrumentality is not normally suspected as intentionally caused whether or not intention was actually present (*e.g.*, automobiles). Poison is not even listed as a cause of death in Chicago homicide in 1966. An automobile is listed as accounting for one suspected intentional death. The great disproportion between knife and bodily attacks and other instrumentalities does not allow for the serious competition of automobiles and poison.

Thus, unless the people who make homicidal attacks with firearms are radically different from those who make homicidal attacks with other weapons known to the police, the absence of guns would produce a great many more knife attacks and a substantially greater number of attacks using hands or feet as potentially homicidal weapons.

There are two separate kinds of evidence suggesting that guns and knives are used by the same sorts of people:

> As table 4 shows, in general, the same kinds of altercations produce gun and knife killings.
>
> As table 5 shows, firearms and knives are used by whites and Negroes in about the same proportions.

Although knives result in three times as many homicides as attacks with the hands or feet, it is not necessarily true that knife attacks are more physically dangerous than all kinds of attacks with hands or feet. Some forms of attack involving the hands or feet, such as strangulation, might conceivably result in death in a greater proportion of attacks in earnest than some forms of knife attack. But comparison of the propor-

[8] MURDER ANALYSIS—1966, *supra* note 6. 1967 homicides by weapon show the same pattern: guns 57%, knives 25%, hands or feet 10%, other 8%, total number 553.

TABLE 4

POLICE-NOMINATED MOTIVE OF HOMICIDES BY WEAPON: CHICAGO, 1966

	% Shot	% Stabbed	% Other
Altercations:			
General Domestic	21	25	23
Money	6	7	2
Liquor	2	8	4
Sex	1	3	2
Gambling	2	1	0
Triangle	5	5	3
Theft (alleged)	—	—	2
Children	2	1	1
Other	41	30	28
	—	—	—
	80	80	65
Robbery:			
Strong Arm	—	—	10
Armed	9	9	4
Burglary:	—	—	—
Sex:			
Perversion	2	3	5
Assault of Woman	—	4	7
Wanton Use of Weapons:	2	—	1
Undetermined:	6	4	4
Gangland Type:			
Organized	1	—	—
Crim. of Victim			
Burglar	—	—	—
Undetermined	—	—	1
Other:			
Mercy Killing	—	—	1
Mental Disorder	—	—	2
	100%	100%	100%
Number	265	152	93

TABLE 5

HOMICIDE WEAPON USED BY RACE AND SEX OF OFFENDER: CHICAGO, 1967

	Male		Female	
	Negro	White	Negro	White
Guns	60	59	40	50
Knives	21	16	54	33
No weapon	12	17	1	0
Other	8	8	4	17
Total	100%	100%	100%	100%
Number of Offenders	330	71	72	12

tions of killings does indicate one of two things: (1) if attacks using the hands or feet are very much more common than the homicide statistics indicate, they are physically very much less dangerous than knife attacks, or (2) if attacks using the hands or feet are physically more dangerous than knife attacks, they are very much less used and therefore less available in the perceptual sense.

Strangulation is very rare in Chicago. There were six such reported fatalities in 1966: most homicides by hand or foot attack were attributable to beatings. Since beatings are common in attack situations, it is more probable that knives are physically more dangerous. In either case, since we are talking about the predominant probable substitute for gun attacks, the balance would seem to favor the use of knife attacks. The use of beatings would lead to even stronger differences than those noted.

Fatality Rates from Gun and Knife Attacks

Chicago police records include data which permit useful comparison between serious knife and gun attacks and between knife and gun killings. (See Table 6.) For 1967, these data show:

> 2.3 times as many serious knife attacks were reported to the police as gun attacks.
>
> Knives accounted for less than half the number of homicides that guns did.
>
> *The rate of knife deaths per 100 reported knife attacks was less than 1/5 the rate of gun deaths per 100 reported gun attacks.*

These figures support the inference that if knives were substituted for guns, the homicide rate would drop significantly.

TABLE 6

Number of Non-Fatal Attacks and Homicides With Knives and Firearms Recorded by Police: Chicago, 1965-67

	Non-Fatal Attacks	Homicides
1965		
Knives	5,285	104
Firearms	1,298	195
1966		
Knives	5,230	152
Firearms	1,873	265
1967		
Knives	5,612	135
Firearms	2,412	317
Total		
Knives	16,127	391
Firearms	5,583	777

The figures, though not the inference, are subject to qualification, however. Not all gun or knife attacks are called to the attention of the police. That attacks reported to the police are not a complete census of weapon attacks in the population would not, by itself, disturb the validity of inferences made from comparisons of police statistics. But if a plausible argument can be made that the police statistics are not a reliable *index* of attack rates in the total population, and if the factors which undermine the use of police statistics as an index could be expected to overstate the proportion of knife relative to gun attacks reported, the validity of inferences from police attack statistics could be questioned.

Two plausible reasons why attacks with one weapon could be more often reported than attacks using a second weapon may be noted. First, the more serious a victim perceives an attack to be, the more likely it is that he will report the attack to the police. Attacks with weapons which are considered more serious will be reported to the police proportionately more often than weapons considered less serious. It must be stated that we do not here deal with the fine distinctions that people may make regarding the lethal potential of various weapons. Thus, if individuals considered both knife and gun attacks to be very serious, the marginal differences in their opinions regarding the two weapons could not be expected to produce significant reporting differentials. Second, to the extent that aggressive patrol, investigation, police pressure on victims to promote disclosure, or a patrolman's decision to report an attack may affect police records, the police perception of weapon dangerousness will influence the proportional relationships found in police statistics. A series of interviews of Chicago police officials at various levels indicates that the unanimous feeling of concerned police officers is that gunshot attacks are more dangerous than knife attacks. To the extent that police and victim perceptions distort police statistics, therefore, they apparently result in underestimation rather than overestimation of the ratio of knife attacks to gun attacks in Chicago.

To rebut the inference that substituting knife attacks for gun attacks would reduce the homicide rate, it can also be argued that because a knife is viewed as a less serious weapon than a gun, a lower proportion of knife attacks represent attacks in earnest. The statistics clarify the form such an argument would have to take. First, it can be noted that the use of attacks reported to the police as a standard to construct attack proportions has already screened out a certain number of attacks which are not considered terribly serious, because it is plausible that attacks perceived of as being more serious are more often reported. Second, in order to equalize the number of deaths per 100 attacks in earnest with each weapon, the "non-earnest knife attack" hypothesis must explain

over 75% of the total number of reported knife assaults even if it is assumed that *every* firearm attack reported to the police in 1966 represents an attack in earnest. To the extent that less than all firearm attacks are considered in earnest, an even greater proportion of knife attacks must be discounted. On its face, this seems implausible. The demographic similarity between knife attack victims and homicide victims is an additional indication that the two statistics may be two products of closely similar forms of attack, in essence a continuum rather than two discrete behaviors. Given the magnitude of the difference between reported knife and gnn assaults, and the substantial probability that reporting biases underestimate the proportional impact of knife assaults if they have any influence at all, the non-earnest hypothesis seems an incomplete explanation of the different assault/killing ratios noted in Chicago.

The Attack Study

To obtain a more accurate impression of the character of knife and firearm attacks reflected in Chicago police records, police assault records for the period November 9-December 6, 1967 were analyzed in detail. The ratio of knife attacks to gun attacks was somewhat lower during this period than in any of the larger periods which have been the basic focus of analysis. Still, the number of knife attacks was substantially greater than the number of firearm attacks. And the ratio of gun killings to knife killings rose even more dramatically in this period than the ratio of gun attacks to knife attacks. There were 34 deaths attributable to firearms during this police period and eight deaths attributable to stabbings. The rate of knife deaths per 100 reported knife assaults was less than one-sixth of the rate of gun deaths per 100 reported gun assaults during this police period. This relationship is consistent with the overall one to five statistic found in the earlier large period comparisons.

One way of estimating the seriousness of an attack is to determine where the attacker sought to wound his victim. It may be assumed that actual wound location is a generally reliable indicator of the intended target, particularly for knives. It is highly unlikely that a great number of individuals intending superficial wounds to a non-vital area of the victim's body would by mistake stab him in the back, chest, neck or abdomen. Indeed, to the extent that "mistakes" produce a patterned difference between intended and actual location of wounds, the bias would probably understate rather than overstate the seriousness of a large group of attacks.

Table 7 sets forth the most serious area of the body where a wound was sustained in a knife or gun attack. It shows:

70 knife wounds per 100 knife attacks occurred in areas that are associated with serious attacks—chest, abdomen, head and face, back, and neck—while only 56 gunshot wounds per 100 firearm attacks occurred in these areas.

Knife attacks resulting in wounds to non-vital areas—thighs and extremities—occurred no more frequently per 100 attacks than similar gun wounds. A smaller number of knife wounds to legs and thighs per 100 attacks is balanced against a larger number of knife wounds to arms, hands, and wrists per 100 attacks. Of every 100 reported firearm attacks, 12 resulted in no wound, while there was only one reported knife attack during the period which resulted in no wound.

TABLE 7

NON-FATAL AND FATAL KNIFE AND GUN ATTACKS BY LOCATION OF MOST SERIOUS WOUND: CHICAGO, NOVEMBER 9-DECEMBER 6, 1967

Location of most serious wound	Non-Fatal Attacks		Fatal Attacks		Total	
	Knife %	Gun %	Knife %	Gun %	Knife %	Gun %
Serious						
Chest	15	13	50	44	15	17
Abdomen	17	12	—	18	17	13
Head	15	11	38	32	16	14
Back	10	3	13	3	10	3
Neck	4	1	—	—	4	1
Shoulders	8	8	—	3	8	7
Total	69	48	100	100	70	56
Non-Serious						
Legs	7	28	—	—	7	24
Arms	24	10	—	—	23	9
Missed	—	14	—	—	—	12
Total	31	52	—	—	30	45
Total	100%	100%	100%	100%	100%	100%
Number	358	213	8	34	366	247

These data appear to support three inferences, each of which will be discussed in turn.

1. *Not all gun attacks can be per se considered attacks in earnest.* About 56% of the reported firearm attacks, including all of the fatal attacks noted during the sample police period, produced wounds in the chest, abdomen, head area, and the back and shoulders. It is, of course, true that many of the gun wounds in locations like the back or chest were not the kinds of wounds which led to fatalities. However, since we are using wound location as an index of the *intended* seriousness of an

attack, and wound seriousness is an indication of outcome rather than intention, it is probably safe to assume that a substantial proportion of those gun attacks with dangerous area wounds could qualify as attacks in earnest, since they generated the risk of fatal consequences.

It can be argued, however, that since the relationship between the intended locale of an attack and the actual locale of the wounding is not complete, many of the firearm attacks that have been coded as misses, or attacks culminating in a wound no more serious than an arm, hand, hip, leg, or foot wound, were actually much more seriously intended. A proponent of this position would point out that when a police report indicates that a man firing a gunshot has missed, as it does in a substantial number of cases, there is no information on what area of the body the gunshot wound has missed, and therefore no inference may be drawn about the seriousness of the attack. The normal attack capacity of a firearm, however, is substantially more than one shot. If an individual does not wound a victim as seriously as he intended on the first try, he may try again. Since Table 7 only codes wounds by *location of the most serious wound area of a particular attack,* attacks coded in less serious areas are attacks in which the assailant *did not* try again, or at least had no greater success. If attacks resulting in multiple wounds are presumptively considered serious and added to those resulting in actual wounds to serious areas, the total is less than 58% of all gun attacks. (See Table 8.) Adding shotgun attacks not already included still leaves the total at roughly 60%. It is doubtful, therefore, that *all* gun attacks are accompanied by even ambiguous intentions to kill.

2. *A substantial proportion of the knife attacks reported to police appear to be attacks in earnest.* The data show that a far greater number of knife attacks resulted in wounds to serious than to non-serious locations. If the 29 multiple knife wounds in non-serious locations are added to the knife wounds in serious areas, the total is approximately 77%. (See Table 8.) While it is doubtless true that not all attacks resulting in serious area wounds were in earnest, it may also be presumed that some of the attacks resulting in non-serious wounds to the arms represent attacks in earnest partially thwarted by the victim's defensive use of his arms. In any event, it is difficult to argue that only an insiguificant proportion of knife attacks are made in earnest.

3. *There is no evidence that attacks in earnest are much more common with guns than with knives.* Adding multiple wounds in non-serious locations to all serious wound locations makes possible a very rough estimate of the proportion of attacks which are in earnest for guns and knives. As indicated above, these figures are approximately 60% and 77%, respectively. Obviously, these are only rough estimates. Their

TABLE 8
KNIFE AND GUN ATTACKS RESULTING IN MULTIPLE WOUNDS:
CHICAGO, NOVEMBER 9-DECEMBER 6, 1967

	Knife	Gun[1]
Serious Area		
Number of Multiple Wound Attacks	117	19
% of—		
Non-Fatal Attacks	46%	16%
Fatal Attacks	50%	19%
Non-Serious Area		
Number of Multiple Wound Attacks	29	5
% of—		
Non-Fatal Attacks	26%	5%
Fatal Attacks	—	—

1 Does not include shotgun attacks resulting in multiple, non-serious area wounds.

trend, however, may be usefully compared with police estimates of the gravity of the most serious wound sustained by the victim. Since the gravity of the wound may reflect a number of factors independent of the attacker's intention, the use of these police data should be secondary, to safeguard against any unwarranted inferences from the wound location data.

The police classify knife wounds as "slash" and "puncture" wounds. Slash wounds involve a shallower penetration than puncture wounds. Some gun wounds are classified by the police as "grazing," less serious wounds. The police estimates (see Table 9) indicate:

> 34% of the serious area knife wounds were slash wounds; 25% involved only one serious area slash wound. If this latter group is excluded, 59% of the knife attacks resulted in puncture wounds to serious areas or multiple knife wounds.
>
> 9% of the serious area firearm wounds were grazings. Excluding these leaves 56% of all firearm attacks resulting in serious area or multiple gunshot or shotgun wounds.

Excluding slash and graze wounds from attacks in earnest is not necessarily the best method of arriving at final figures. While slash and graze wounds where there was only one serious area wound may have resulted from less ominous attack intentions than penetrating wounds, the dangerousness of the area where the wound was sustained militates against this interpretation. Nevertheless, the exclusion results in a conservative estimate of the proportions of knife and gun attacks which are in earnest.

These statistics support two complementary propositions: (1) a roughly equal proportion of knife and gun attacks are of the kind which may not have been attacks in earnest, and (2) a roughly equal proportion of police reported knife and gun attacks are of the kind that suggest the

TABLE 9

POLICE-NOTED EXTENT OF WOUND BY WEAPON AND AREA OF WOUND: NON-FATAL ATTACKS, CHICAGO, NOVEMBER 9-DECEMBER 6, 1967

Serious Area			
Knife[1]		*Gun*[2]	
Puncture	66	Wound	92
Slash	34	Graze	9
	100%		100%
Number of Cases	247		106
Non-Serious Area			
Knife		*Gun*	
Puncture	70	Wound	99
Slash	30	Graze	1
	100%		100%
Number of Cases	110		81

1 Does not include one "menaced."

2 Does not include 29 "missed."

attack was probably seriously intended. If the area of wounding is taken as an index of seriousness, a greater number of knife wounds than gun wounds are presumptively in earnest, and a lesser number of knife wounds than gun wounds are of the kind where the location of the attack creates some doubt about the earnestness of the attack. If the presence or absence of multiple shooting or stabbing is examined, nothing about the data suggests that the average knife attack is any less seriously intended than the average gun attack. Indeed, multiple knife attacks are more common per 100 reported attacks than multiple gun attacks. Finally, if all single knife slash wounds are removed from the class of presumptively serious attacks, this still leaves roughly equal proportions of presumptively serious attacks, with the gun figure slightly higher than the knife figure. If all single *and* multiple knife slash wounds are removed from the class of presumptively serious attacks, a rather radical use of the data, a gap of less than 10% opens between knife attacks considered presumptively serious and gun attacks considered presumptively serious.

The implications of these data on the basic question posed about weapon dangerousness can best be set into perspective by taking the most negative interpretation of the attack statistics and tracing its implications. If it is assumed that only those wounds inflicted by knives in serious area locations that resulted in police reported punctures can be presumptively considered attacks in earnest, but that every gunshot attack reported is an attack in earnest or worse, the death rate per 100

attacks in earnest by guns would still be two and one-half times that of the death rate per 100 attacks in earnest by knives. Certainly, more reasonable use of these data would involve a substantially smaller number of asymmetrical assumptions. If the comparison is between knife puncture wounds in serious areas and gun wounds in serious areas, guns exhibit a death rate five times greater than knives.

Thus, when the data on the character of assaults are discussed in light of assault rates by weapon in Chicago and death rates by weapon in Chicago, a difference in attack intentions by weapon great enough to explain the differential death rates experienced is highly unlikely.

Conclusion

The beginning of the present exercise is found in a crude but suggestive set of ratios: the rate of homicide per 100 police reported attacks is about five times as great for firearms as for knives, the next most dangerous weapon available in Chicago's homicide experience. Since a very substantial part of Chicago's homicide rate appears to be attributable to ambiguously motivated deadly attacks, it seems clear that the deadliness of a particular weapon in an attack situation is a significant determinant of the homicide rate. If this is true, then the killing per 100 attack ratio cited above is a conclusive demonstration that the absence of firearms would depress the otherwise expectable homicide rate, unless the disproportionate number of killings per police reported attack could be explained by a plausible rival hypothesis.

We have sought an explanation which would comport with the reality of homicide in Chicago and still explain the disproportionate killing per attack ratios noted in official statistics. The biases built into the way attacks are reported could only work to understate rather than overstate the disproportionate dangerousness of firearm attacks. The remaining rival hypothesis was then phrased in the form of the prediction that the vast majority of all police reported knife attacks were non-earnest in nature and all of the police reported gun attacks were of the kind that were likely to produce ambiguously motivated homicides or worse. In fact, an investigation of patterns of knife and gun wounding has suggested that a roughly equal proportion of both knife and gun attacks appear to be of a class likely to produce the ambiguously motivated homicide. The negative conclusion available from these data has already been stated: It is highly unlikely that the attack in earnest hypothesis which seeks to differentiate knife and gun attacks could, in the light of our study of wound location, completely explain the difference in kill ratios previously noted. But what of an affirmative conclusion?

It might be thought that the five to one kill ratio relationship between knives and guns, when combined with the apparent similarity of attack in earnest ratios, could lead to a prediction that the absence of firearms in Chicago's population would reduce Chicago's homicide experience by four-fifths of the present gun-attributable total, or by some other finite amount. Unfortunately, this is not the case. First, while a substantial proportion of all homicides can be thought to be ambiguously motivated, we cannot make that assumption about all homicides, and we cannot conclusively isolate the proportion of homicide experience which is attributable to this kind of attack. Since the single-minded attack with intent to kill surely results in death more often per 100 attacks than an ambiguously motivated attack in earnest, we cannot confidently exclude the number of single-minded killings which constitute a part of reported homicides. However, there are some interesting data which might bear on the proportion of single-minded killings. The proportion of multiple woundings is only slightly higher in fatal gun attacks than in non-fatal, serious gun attacks. Further, multiple wound figures in homicides for all of 1967 account for only 30% of the gunshot killing totals. This would tend to limit the number of "kill at any cost" cases which might exaggerate the impression of firearm dangerousness in the attack statistics.

Second, it is not unlikely that the apparent similarity between knife and gun attack figures does conceal some disproportion between the attack in earnest ratios noted in knife versus gun attacks. The only unlikely conclusion is that weapon dangerousness does not affect the gross expectable homicide rate. The precise extent of that effect is a matter for conjecture. On their face, the data suggest that the effect of firearm elimination would itself be quite substantial. But that phrase is a hedge, and the method of this inquiry is non-experimental. The words "quite substantial" are as far as the data will take us.

A final note should be taken of the initial assumption of this enterprise: that a degree of continuity exists between homicide and non-fatal but serious assaults with deadly weapons. The similarities between serious attacks reported by police and homicides are compelling. Both events fall with disproportionate impact on the Negro community, and upon a disproportionately high number of male victims. Since relationship is a confirmed element of a great many such attacks, both phenomena can be attributed to a similarly skewed group of attackers.[9] The attack data do not reveal substantial differences between fatal attacks using particular weapon forms and serious area, non-fatal attacks involving the same weapon. During the sample period:

9 *See* WOLFGANG, *supra* note 2, table 22, at 379; MURDER ANALYSIS—1966, *supra* note 6.

46% of the non-fatal knife attacks resulting in wounds to serious areas, and 50% of the fatal knife attacks, involved multiple wounds.

16% of the non-fatal serious area firearm attacks, and 19% of the fatal shootings, resulted in multiple wounds. (See Table 8.)

Perhaps these data are telling us it would be advisable to shift the focus of concentration from the species of homicide to the genus of deadly attack. The portion of the population subject to this threat is as skewed as the homicide statistics indicate, but the problem is larger. In the final years of this decade, a further study of this culture of violence is an obligation to its survivors.