

## SUPPLEMENTAL METHODS TEXT

### California Department of Justice handgun sales data

We excluded from the study a private club that sold only to police personnel.

Records for both sales and denials included identifiers for the gun (manufacturer, type, caliber, model, and serial number); the retailer selling the gun (name, address, and license number); and the prospective purchaser. For completed sales, records included the date of sale and indicated whether the gun was sold at a gun show or to police personnel.

### Criteria for denial of handgun purchase

The California Department of Justice conducts a criminal and mental health records background check for all purchases of firearms unless the purchaser is specifically exempted from the background check requirement.

Under federal law (18 USC 922), firearms may not be possessed by a person who:

- Is under indictment for, or has been convicted of, a crime punishable by imprisonment for more than one year;
- Is a fugitive from justice;
- Is an unlawful user of, or is addicted to, any controlled substance;
- Has been adjudicated as a mental defective or committed to a mental institution;
- Is an illegal alien or has been admitted to the United States under a nonimmigrant visa;
- Was discharged from the US Armed Forces under dishonorable conditions;
- Has renounced US citizenship;
- Is subject to a court order restraining him or her from harassing, stalking, or threatening an intimate partner or child;
- Has been convicted in any court of a misdemeanor crime of domestic violence.

In addition, federal law prohibits most transfers of handguns to people under 21.

Many states have enacted additional prohibitions; California, for example, denies transfers of firearms to people convicted of a wide array of violent misdemeanors.

Most denials are due to previous criminal convictions. Denials for domestic violence restraining orders account for 4% of denials nationally and 7% in California.

Further information on denial nationwide is available in Bowling M. Background checks for firearm transfers, 2004. Bureau of Justice Statistics 2005. NCJ 210117. Available at <http://www.bjs.gov>.

Additional information on denial in California is available in Handgun Commerce in California 2000. Sacramento: Violence Prevention Research Program. Available at <http://www.ucdmc.ucdavis.edu/vprp/> (accessed October 2005).

### Gun traces by the Bureau of Alcohol, Tobacco, Firearms and Explosives

An ATF gun trace begins with a request from a police agency. The trace request includes identifiers for the gun and its possessor at the time of recovery, if any; the recovery date and location; and, at the submitting agency's option, the most serious crime to which the gun was linked. ATF attempts to reconstruct the initial chain of ownership of the gun, beginning with its manufacturer. Absent special

circumstances, traces are terminated when the first retail purchaser is identified. Completed traces contain identifiers for the gun's manufacturer, wholesaler, first retail seller, and first retail purchaser. The most recent data on the success of gun tracing are for the 77,250 traces initiated by ATF in 2000 as part of its Youth Crime Gun Interdiction Initiative: 70.8% identified the federal firearm licensee who first sold the gun at retail (typically a gun dealer or pawn shop, occasionally a distributor or manufacturer), and 61.5% identified the gun's first retail purchaser. Further information is available in Bureau of Alcohol Tobacco and Firearms. *Crime gun trace reports (2000)*. Washington, DC: Bureau of Alcohol, Tobacco and Firearms, 2002, available at <http://www.atf.gov>

### Linking gun sales records to gun trace records

Before linking the gun sales and gun trace datasets, we excluded 619 duplicate sales records and 10123 records of sales from one licensee to another.

### Period of follow up

The study period was initially defined as 1996–2000. After that analysis was completed, ATF and CDOJ provided records for January 1, 2001 through September 30, 2003. We extended our follow up to include the new data. We excluded from our new analysis 92 handguns that were traced during 2001–03 after having been sold during those years by a retailer other than the one to which they had been assigned using the 1996–2000 sales records.

### Local police policy on gun tracing

California cities with comprehensive tracing policies were Anaheim, Compton, Long Beach, Los Angeles, Oakland, Salinas, San Jose, Santa Ana, and Stockton. This was represented by a binary variable, coded as 1 if at any time during the study period the city in which the retailer was located had participated in the ATF's comprehensive training program, the Youth Crime Gun Initiative. A more complex specification using the number of years during the study period that each city performed comprehensive tracing did not provide a better fit to the data.

### Selection of sociodemographic variables

In our initial exploration of the data we included a binary variable coded 1 if the county in which the retailer was located was part of a Metropolitan Statistical Area. This variable was not significant in a preliminary multivariate analysis including the retailer level variables or in a separate analysis including only the other sociodemographic variables, and it was not included in the final analysis of the data.

### Calculation of gun years and use of gun years as an offset variable

As our period of exposure was January, 1996 through September, 2003, we estimated gun years for each retailer by a mid-interval approach as  $7.25 \times (1996 \text{ sales}) + 6.25 \times (1997 \text{ sales}) + 5.25 \times (1998 \text{ sales}) + 4.25 \times (1999 \text{ sales}) + 3.25 \times (2000 \text{ sales})$ . So few handguns were traced, relative to those sold, that we did not censor gun years as of trace dates but calculated gun years as if all guns had remained at risk for tracing until the end of the study period. Similarly, so few guns were recorded as having been sold more than once that we did not censor gun years attributable to first retailer to sell a gun as of the date of a subsequent sale. We verified the suitability of gun years for use as an offset variable by a regression of traces on the natural logarithm of (gun years/1000), which yielded  $\beta=1.09$ ,  $SE=0.05$ ,  $p<0.0001$ .

Appendix Table 1A Results for regression models containing variables for which  $p < 0.10$  in a bivariate regression, for handguns linked to violent and firearm related crimes\*

Variable	Model 1 retailer variables			Model 2 retailer and commerce/tracing variables		
	RR	95% CI	p Value	RR	95% CI	p Value
<b>Variables measured at the retailer level</b>						
Gun years from sales of inexpensive handguns, %	0.98	0.97–1.01	0.001	0.99	0.98–1.00	0.17
Gun years from police sales, %	0.99	0.98–1.00	0.02	0.99	0.98–1.00	0.007
Gun years from sales of multiple guns, %	1.04	1.02–1.05	<0.0001	1.02	1.00–1.03	0.01
Denials, % of (sales + denials)	1.73	1.57–1.92	<0.0001	1.50	1.36–1.65	<0.0001
Median time to crime for traced guns, y						
Median age of purchasers, y	0.92	0.91–0.94	<0.0001	0.94	0.92–0.95	<0.0001
Male purchasers, %	1.00	0.97–1.03	0.99	0.97	0.94–1.00	0.08
Retailer type (pawnbroker=1, gun dealer=0)	1.13	0.88–1.45	0.03	1.17	0.94–1.46	0.16
<b>Variables reflecting local gun commerce and tracing policy</b>						
Federal Firearm Licensees per 100000 people†				0.96	0.95–0.97	<0.0001
Retailer’s city traces all recovered guns (yes=1)				1.37	1.10–1.72	0.006

Variable	Model 3: retailer and commerce/tracing variables and crime rates			Model 4: retailer and commerce/tracing variables, crime rates, and sociodemographics		
	RR	95% CI	p Value	RR	95% CI	p Value
<b>Variables measured at the retailer level</b>						
Gun years from sales of inexpensive handguns, %	1.00	0.99–1.01	0.51	1.00	0.99–1.01	0.40
Gun years from police sales, %	0.99	0.99–1.00	0.03	0.99	0.99–1.00	0.03
Gun years from sales of multiple guns, %	1.01	1.00–1.02	0.06	1.01	1.00–1.02	0.08
Denials, % (of sales + denials)	1.42	1.28–1.56	<0.0001	1.42	1.29–1.57	<0.0001
Median time to crime for traced guns, y						
Median age of purchasers, y	0.95	0.93–0.96	<0.0001	0.95	0.93–0.97	<0.0001
Male purchasers, %	0.98	0.96–1.01	0.14	0.98	0.96–1.01	0.16
Retailer type (pawnbroker=1, gun dealer=0)	1.19	0.97–1.47	0.10	1.19	0.97–1.48	0.100
<b>Variables reflecting local gun commerce and tracing policy</b>						
Federal Firearm Licensees per 100000 people†	0.97	0.96–0.99	0.002	0.98	0.96–1.01	0.12
Retailer's city traces all recovered guns (yes=1)	1.40	1.13–1.73	0.002	1.47	1.18–1.83	0.001
<b>Crime rates per 100000 people†</b>						

Variable	Model 3: retailer and commerce/tracing variables and crime rates			Model 4: retailer and commerce/tracing variables, crime rates, and sociodemographics		
	RR	95% CI	p Value	RR	95% CI	p Value
Homicide	1.00	0.95–1.05	0.89	0.97	0.91–1.04	0.40
Robbery	1.00	1.00–1.00	0.03	1.00	1.00–1.01	0.01
Aggravated assault	1.00	1.00–1.00	0.40	1.00	1.00–1.00	0.53
Misdemeanor weapons offenses‡	0.99	0.98–1.01	0.47	0.99	0.97–1.01	0.22
<b>Sociodemographics†</b>						
Black population, %				1.00	0.96–1.05	0.97
Latino population, %				1.01	0.99–1.03	0.18
Unemployed people, % (of people ages ~16)				0.97	0.81–1.15	0.71
Households headed by single females, %				1.02	0.93–1.12	0.64
Males ages 20–29, as % of males ages 40–44				1.00	1.00–1.00	0.92
Median household income, × \$1000				1.00	0.98–1.01	0.51
Households per 10000 people				1.00	1.00–1.00	0.79

\*Gun years of exposure/1000 is employed as an offset variable; results are on a per 1000 gun year basis.

†Measured at the county level.

‡Arrest rate.

RR, rate ratio; CI, confidence interval.

Appendix Table 1B Results for regression models containing variables for which  $p < 0.10$  in a bivariate regression, for all traced handguns\*

Variable	Model 1: retailer variables			Model 2: retailer and commerce/tracing variables		
	RR	95% CI	p Value	RR	95% CI	p Value
<b>Variables measured at the retailer level</b>						
Gun years of exposure/1000	1.01	1.00–1.01	0.008	1.00	1.00–1.01	0.095
Gun years from sales of inexpensive handguns, %	0.99	0.98–1.00	0.004	1.00	1.00–1.01	0.51
Gun years from police sales, %	0.99	0.99–1.00	0.01	0.99	0.99–1.00	0.001
Gun years from sales of multiple guns, %	1.03	1.02–1.04	<0.0001	1.01	1.00–1.02	0.006
Denials, % (of sales + denials)	1.64	1.50–1.80	<0.0001	1.41	1.30–1.53	<0.0001
Median age of purchasers, y	0.93	0.92–0.95	<0.0001	0.95	0.93–0.96	<0.0001
Male purchasers, %	1.01	0.98–1.03	0.59	0.98	0.96–1.00	0.05
Retailer type (pawnbroker=1, gun dealer=0)	1.25	1.02–1.53	0.03	1.28	1.08–1.53	0.006
<b>Variables reflecting local gun commerce and tracing policy</b>						
Federal Firearm Licensees per 100000 people†				0.96	0.95–0.97	<0.0001

Variable	Model 1: retailer variables			Model 2: retailer and commerce/tracing variables		
	RR	95% CI	p Value	RR	95% CI	p Value
Retailer's city traces all recovered guns (yes=1)				1.49	1.24–1.78	<0.0001
Variable	Model 3: retailer and commerce/tracing variables and crime rates			Model 4: retailer and commerce/tracing variables, crime rates, and sociodemographics		
	RR†	95% CI	p Value	RR	95% CI	p Value
<b>Variables measured at the retailer level</b>						
Gun years of exposure, n	1.00	1.00–1.01	0.07	1.00	1.00–1.01	0.07
Gun years from sales of inexpensive handguns, %	1.00	0.99–1.01	0.93	1.00	0.99–1.01	0.87
Gun years from police sales, %	0.99	0.99–1.00	0.005	0.99	0.99–1.00	0.003
Gun years from sales of multiple guns, %	1.01	1.00–1.02	0.09	1.01	1.00–1.02	0.07
Denials, % (of sales + denials)	1.34	1.24–1.46	<0.0001	1.35	1.24–1.46	<0.0001
Median age of purchasers, y	0.95	0.94–0.97	<0.0001	0.95	0.94–0.97	<0.0001
Male purchasers, %	0.99	0.97–1.01	0.19	0.99	0.97–1.01	0.20
Retailer type (pawnbroker=1, gun dealer=0)	1.30	1.10–1.54	0.002	1.31	1.10–1.55	0.002

Variable	Model 3: retailer and commerce/tracing variables and crime rates			Model 4: retailer and commerce/tracing variables, crime rates, and sociodemographics		
	RR†	95% CI	p Value	RR	95% CI	p Value
<b>Variables reflecting local gun commerce and tracing policy</b>						
Federal Firearm Licensees per 100000 people†	0.97	0.96–0.99	<0.0001	0.98	0.96–1.00	0.01
Retailer’s city traces all recovered guns (yes =1)	1.54	1.30–1.83	<0.0001	1.57	1.31–1.89	<0.0001
<b>Crime rates per 100000 people†</b>						
Homicide	1.01	0.97–1.05	0.55	0.99	0.94–1.04	0.62
Robbery	1.00	1.00–1.00	0.13	1.00	1.00–1.00	0.19
Aggravated assault	1.00	1.00–1.00	0.23	1.00	1.00–1.00	0.44
Misdemeanor weapons offenses‡	0.99	0.98–1.00	0.10	0.99	0.97–1.00	0.09
<b>Sociodemographics†</b>						
Black population, %				1.02	0.99–1.06	0.21
Latino population, %				1.00	0.99–1.02	0.83
Unemployed persons, % (of persons ages ~16)				0.99	0.87–1.13	0.89
Households headed by single females, %				1.00	0.93–1.08	0.99

Variable	Model 3: retailer and commerce/tracing variables and crime rates			Model 4: retailer and commerce/tracing variables, crime rates, and sociodemographics		
	RR†	95% CI	p Value	RR	95% CI	p Value
Males ages 20–29, as % of males ages 40–44				1.00	1.00–1.00	0.74
Median household income/\$1000				1.00	0.99–1.01	0.72
Households per 10000 people				1.00	1.00–1.00	0.72

\*Gun years of exposure/1000 is employed as an offset variable; results are on a per 1000 gun year basis.

†Measured at the county level.

‡Arrest rate.

RR, rate ratio; CI, confidence interval.

Appendix Table 2 Results for reduced multivariate regression models for 351 retailers with handguns linked to violent and firearm related crimes\*

Variable	RR	95% CI	p Value
<b>Variables measured at the retailer level</b>			
Gun years from police sales, %	0.99	0.98–1.00	0.006
Denials, % (of sales + denials)	1.34	1.23–1.46	<0.0001
Median time to crime for traced guns, y	0.95	0.90–1.01	0.08
Median age of purchasers, y	0.96	0.95–0.97	<0.0001

Variable	RR	95% CI	p Value
Male purchasers, %	0.98	0.95–1.00	0.04
Retailer type (pawnbroker=1, gun dealer=0)	1.24	1.01–1.52	0.04
<b>Variables reflecting local gun commerce and tracing policy</b>			
Retailer's city traces all recovered guns (yes=1)	1.52	1.26–1.84	<0.0001
<b>Crime rates per 100000 people†</b>			
Robbery	1.00	1.00–1.00	<0.0001
Misdemeanor weapons offenses	0.99	0.97–1.00	0.10
<b>Sociodemographics†</b>			
Latino population, %	1.01	1.01–1.02	0.0007
Unemployed persons, % (of persons ages ≥16)	0.93	0.86–1.00	0.05

\*Gun years of exposure/1000 is employed as an offset variable; results are on a per 1000 gun year basis.

†Measured at the county level.

RR, rate ratio; CI, confidence interval.