EXHIBIT
5

Effectiveness of Denial of Handgun Purchase to Persons Believed to Be at High Risk for Firearm Violence

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ABSTRACT

Objectives. The purpose of this study was to determine whether denial of handgun purchase is an effective violence prevention strategy.

Methods. Individuals denied handgun purchase because of a prior felony conviction and handgun purchasers with a felony arrest at time of purchase were examined.

Results. Relative to those denied purchase, handgun purchasers were found to be at greater risk for subsequent offenses involving a gun (relative risk [RR] = 1.21, 95% confidence interval [CI] = 1.08, 1.36) or violence (RR = 1.24, 95% CI = 1.11, 1.39), after adjustment for number of prepurchase weapon/violence charges.

Conclusions. Denial of handgun purchase to persons with a prior felony conviction may lower their rate of subsequent criminal activity. (*Am J Public Health.* 1999;89:88–90)

There were an estimated 1.2 million firearm-related violent crimes in the United States in 1995, more than 80% of which involved handguns.[1–3]

One measure to prevent firearm-related crime would prohibit handgun purchase by individuals thought to be at high risk for such crimes: convicted felons and persons under active felony indictment.[4,5] Criminal record background checks now prevent handgun purchases by nearly 80 000 prohibited persons each year.[6,7] No evaluation of denial of handgun purchase as a crime prevention measure has been conducted.

We report the results of a cohort study of criminal activity among 2 groups of persons attempting to purchase handguns in California in 1977. The first group's handgun purchases were denied as a result of a prior felony conviction. The second group's purchases were approved; members of this group had prior felony arrests but no felony convictions. We hypothesized that the risk for subsequent criminal activity would be lower for those whose handgun purchases were denied than for those whose purchases were approved.

Methods

All data for this study were obtained from the California Department of Justice.

We defined exposure as the purchase of a handgun. Our purchaser cohort consisted of 2470 individuals who had a prior felony arrest but no felony conviction and who purchased a handgun after passing a background check in 1977. (A felony is a crime punishable by death or incarceration in prison.[8]) This cohort was identified from an equal probability sample, drawn from a registry of approved handgun sales, of 4276 purchasers with prior criminal records (subjects of a larger study).[9]

No registry of denied handgun purchase applications was available; 273 potential subjects were identified by a manual search of more than 115 000 purchase application forms. No criminal records were available for 82 of these individuals (30%)—50 with no criminal record, 28 with unavailable records, and 4 without explanation. Fourteen had no felony convictions, and 7 appeared on the registry of approved sales. The final cohort consisted of 170 individuals.

Arrest charges (charges filed at the time of arrest) for new offenses occurring in the 3 years following handgun purchase were the outcomes of interest. Relative risks were calculated via the Mantel–Haenszel method. Percentage of attributable risk was calculated as the difference of incidence rates divided by rate of new criminal activity among the purchasers.[10]

Results

Men predominated in both the purchaser (93%) and denied (94%) cohorts. Purchasers were younger than those denied (mean age: 32.5 ± 9.4 years vs 35.4 ± 10.5 years). Race/ethnicity distributions were similar (purchasers: 58% White, 19% Black, 19% Hispanic; those denied purchase: 56% White, 26% Black, 14% Hispanic).

Prior to handgun purchase, the 2470 members of the purchaser cohort had accumulated 14 192 arrest charges (mean: 5.7 ± 6.2; range: 1–90) and 6227 misdemeanor convictions (mean: 2.5 ± 3.2; range: 1–33). One third of charges were felonies; 21% of charges and 16% of convictions involved a weapon or violence.

The 170 members of the denied cohort had amassed 1869 prior arrest charges (mean: 11.0 ± 14.5; range: 1–107) and 815 convictions (mean: 4.8 ± 6.4; range: 1–50). Felonies constituted 38% of prior charges and 44% of convictions. Seventy-six persons (45%) had more than one felony conviction. Sixteen percent of charges and 14% of convictions involved a weapon or violence.

Over 3 years of follow-up, 31% of subjects in each cohort were arrested. Handgun

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TABLE 1—Crude and Adjusted Relative Risks for Criminal Activity After Attempt to Purchase a Handgun, for Purchasers Relative to Persons Whose Purchases Were Denied

	Relative Risk (95% Confidence Interval)		
	Any Offense	Gun Offense	Violent Offense
Nonadjusted	1.00 (0.76, 1.32)	1.13 (0.65, 1.98)	1.16 (0.72, 1.86)
Adjusted for age at attempt to purchase	0.94 (0.92, 0.95)	1.13 (1.05, 1.21)	1.07 (1.03, 1.10)
Adjusted for no. of prior weapon/violent arrest charges	1.05 (1.04, 1.07)	1.21 (1.08, 1.36)	1.24 (1.11, 1.39)
Adjusted for no. of prior nonweapon/ nonviolent arrest charges	1.15 (1.11, 1.21)	1.27 (1.09, 1.47)	1.27 (1.12, 1.45)

purchasers accrued 1860 new arrest charges: 17% involved a firearm, 24% involved violence, 38% were felonies, and 13% were Violent Crime Index offenses (murder and nonnegligent manslaughter, forcible rape, robbery, aggravated assault[11]). Those subjects denied handgun purchase compiled 129 new arrest charges: 12% involved a gun, 19% involved violence, 57% were felonies, and 9% were Violent Crime Index offenses. Twenty percent of those denied purchase and 19% of purchasers were convicted of one or more new crimes.

The overall incidence rates for new offenses were similar (132.7 per 1000 person-years for the purchaser cohort and 132.5 per 1000 person-years for the denied cohort). Rates for new gun and violent offenses were 30.5 and 44.0 per 1000 person-years, respectively, for the purchasers and 26.9 and 38.0 per 1000 person-years for those denied.

Purchasers were at increased risk for new gun and violent offenses after adjustment for age or for number of prior arrest charges (Table 1). In a stratified analysis, risk was substantially increased for purchasers among subjects who had one prior weapon or violent arrest charge (Table 2).

We estimate that 12% of gun offense and 14% of violent offense arrests among handgun purchasers were attributable to the handgun purchase. In our study population, an estimated 25 gun offenses and 41 violent offenses might have been prevented had these purchases not occurred.

Discussion

To isolate the effect of denial of handgun purchase on subsequent risk for criminal activity, we compared handgun purchasers having a prior felony arrest with persons whose purchase was denied because of a prior felony conviction. At the time of attempt to purchase, those whose purchases were denied had, on average, nearly twice as many prior arrests and convictions as did those whose purchases were permitted. Yet, essentially equal proportions of the 2 groups

TABLE 2—Relative Risks for Criminal Activity After Attempt to Purchase a Handgun, Stratified by Characteristic Prior to Purchase, for Purchasers Relative to Persons Whose Purchases Were Denied

	Relative Risk (95% Confidence Interval)		
Characteristic	Any Offense	Gun Offense	Violent Offense
Age at attempt to purchase, y			
≤29	0.85 (0.58, 1.26)	1.35 (0.55, 3.29)	1.08 (0.55, 2.11)
≥30	1.02 (0.69, 1.51)	0.99 (0.48, 2.05)	1.05 (0.53, 2.07)
No. of prior weapon/violent arrest charges			
0	1.01 (0.63, 1.62)	0.96 (0.35, 2.64)	1.03 (0.42, 2.55)
1	1.98 (0.82, 4.81)	2.71 (0.38, 19.52)	3.94 (0.55, 28.29)
≥2	0.93 (0.64, 1.34)	1.15 (0.56, 2.36)	1.10 (0.61, 1.99)
No. of prior nonweapon/ nonviolent arrest charges			
≤3	1.09 (0.64, 1.85)	1.35 (0.43, 4.25)	2.96 (0.73, 11.96)
4–6	1.24 (0.73, 2.09)	1.63 (0.51, 5.20)	1.50 (0.61, 3.70)
≥7	1.14 (0.75, 1.73)	1.08 (0.49, 2.36)	0.87 (0.46, 1.63)

were arrested for or convicted of new crimes in the 3 years following handgun purchase. The percentage of these new crimes that involved guns or violence was higher for purchasers than for those whose purchases were denied. After adjustment, purchasers were found to be at significantly greater risk for new crimes involving guns or violence.

Our findings suggest that denial of handgun purchase is associated with a reduction in risk for later criminal activity of approximately 20% to 30%. The size of this effect is comparable to that seen in other crime prevention measures, such as sentence enhancements for crimes committed with the use of a firearm[12] and small-area bans on the possession of handguns.[13]

This modest benefit may reflect the fact that members of both study groups had extensive prior criminal records and therefore were at high risk for later criminal activity.[14–16] The effects of handgun purchase denial would be expected to be moderate in such a population.

Among those with only one prior weapon or violence arrest charge, purchasers were 2 to 4 times as likely to be charged with new offenses as those who were denied. No such effect was seen among persons with no prior charges for such offenses or among

those with 2 or more. Persons with no prior charges for these offenses may be at low risk; for them, handgun purchase denial would have less of an effect. Persons with 2 or more prior charges may have established a pattern of activity unaffected by denial of handgun purchase. Persons with a single prior arrest charge for a weapon or violent offense may be at high but modifiable risk.

In terms of some potentially important differences in risk for later criminal activity, this study was too small to determine whether the differences occurred by chance. Also, we assumed that there was no difference between individuals whose criminal records were available and those whose records were unavailable. These records are likely to have been deleted for lack of new activity. If so, our effect estimates are conservative.

We do not know whether those denied legal handgun purchase obtained a firearm by other means.[17] But while this policy's immediate objective is to prevent acquisition of handguns by high-risk individuals, its overall goal is to reduce their rate of criminal activity. Our evidence indicates that this occurs. □

Contributors

Ms Wright codesigned the project; performed data collection, data management, and data analysis;

wrote numerous drafts; and presented the results at a scientific meeting. Dr Wintemute conceived the original idea for the study, codesigned the project, provided epidemiological and criminological expertise, contributed to the interpretation of the results, and commented on all drafts. Dr Rivara provided epidemiological expertise, contributed to the interpretation of the results, and commented on all drafts.

Acknowledgments

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Deaths Attributable to Alzheimer's Disease in the United States

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ABSTRACT

Objectives. This study provided 2 estimates of the number of deaths attributable to Alzheimer's disease in the United States.

Methods. One estimate was based on data from the East Boston, Mass, study. The second was based on a simulation using population-based estimates of prevalence and separate estimates of excess death by duration of disease.

Results. Despite different methods and very different estimates of prevalence, these 2 methods led to very similar estimates of 173 000 and 163 000 excess deaths.

Conclusions. These estimates suggest that 7.1% of all deaths in the United States in 1995 are attributable to Alzheimer's disease, placing it on a par with cerebrovascular diseases as the third leading cause of death. (*Am J Public Health.* 1999;89:90–92)

Over the past 20 years, Alzheimer's disease, once a little-known, rare form of early senility, has become a widely recognized, common disease of the elderly. One reason for this increased awareness is the high estimates of the number of cases of Alzheimer's disease and the number of deaths attributable to it.[1] Some journalists have accepted an estimate of 100 000 excess deaths from Alzheimer's disease annually in the United States The origin of this estimate is obscure, and many observers doubt its accuracy; it is not supported by vital statistics data based on death certificates.[2] I use data on the prevalence of Alzheimer's disease and excess mortality among cases to estimate the number of deaths attributable to Alzheimer's disease.

Methods

I present 2 sets of estimates. The first is based on the East Boston, Mass, study, which provides both prevalence and excess mortality rates.[3,4] The second estimate is based on a simulation model. This model combines prevalence data from several population-based studies with data on excess mortality.

To estimate excess deaths at each age up to 104 years, I calculated a life table up to 105 years of age for the United States for the period 1989 to 1991[5–7] with adjustments for age misreporting.[8] To bring the estimates up to date, I assumed that the rate of excess deaths in each age group stayed constant between 1990 and 1995, and I applied these rates to the estimated age distribution for 1995.[9]

Since the prevalence of Alzheimer's disease among minority groups is uncertain, I produced estimates for Whites and then adjusted them for higher prevalence rates among Blacks. I assumed that at every age the prevalence of Alzheimer's disease among US

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