

PUBLIC HEALTH

Violence Epidemiologists Test The Hazards of Gun Ownership

Goodwin said, a strategy that would involve examining factors such as "social class" and "living in high-impact urban areas."

Goodwin declined a request by *Science* for an interview to get his side of the story. But other supporters of the violence initiative think Breggin's suspicions are entirely unfounded. Darrel Regier, director of the NIMH division of epidemiology and services research, told *Science* Breggin's description amounts to "a nefarious twisting of what we're doing." Goodwin's remarks and the crime conference "were pieced together to form a picture of a grand scheme that doesn't exist," Regier says. He says there is a study under way in which behavioral researchers are identifying "high-risk" children and trying to reform their behavior. In the study, headed up by Duke psychologist John Coie, 960 children over 3 years will be identified during kindergarten as being at a high risk for conduct disorders. Then, the researchers will provide "intervention" for the children in the form of parent training, tutoring, and social skills training. The children will be followed through high school. Contrary to what Breggin says, Regier insists there's nothing threatening about that effort at all: "It's basically a super Head Start program."

Nor is any of the other research on violence now under way at NIMH that is slated to be included in the initiative aimed at any particular race, says Regier. According to Regier, NIMH spends 8.8% of its budget (about \$20 million) on violence research, of which about 5% goes for research on biological causes or treatments for violence. In the violence initiative, that work would be complemented by research at CDC, ADAMHA, the Health Research Services Administration, and the NIH Office of Minority Health. Among the efforts at CDC that would be included are compilations of homicide mortality trends, assisting communities in designing youth violence prevention programs, and sponsoring research on the epidemiology of violence (see story beginning on this page).

Many scientists and policy makers feel that in view of the prevalence of violent crime in the United States, such programs are precisely what is needed—and that the people who might benefit the most are those who live in high-crime areas. Jim Mercy, chief of the epidemiology branch of the CDC's National Center for Injury Prevention and Control, argues that "if we reduce what already is a very low level of funding, then we really haven't been doing our job to address the public health issues of greatest concern." He and others in his camp worry that the firestorm of criticism from the black community could wind up harming the very groups that could benefit most from studies aimed at reducing the incidence of violence.

—Richard Stone



As nightmarish images of the Los Angeles riots flickered across television screens this past spring, they seemed to reinforce a fatalistic notion of American life: Beset by an epidemic of violence, citizens must rely on themselves for protection. Certainly Californians bought into this logic, to the tune of 58,311 firearms legally purchased in the month after the riots—the biggest month ever for California's gun dealers.

This surge in gun sales makes postriot California an uncontrolled experiment in the epidemiology of violence. One question at issue: Will the addition of all these firearms lead to an increase or a decrease in the rate of violent death? Or, to put it on an individual level: Is the protection offered by a gun worth the risk to friends and family of having one around? Such risk-benefit questions are hardly new; they have loomed over the country ever since the murder rate began to climb in the 1960s. But scientific study of them began in earnest only in the mid-1980s, when the Centers for Disease Control (CDC) created a sea change in firearms research.

The traditional work by sociologists studying violence had focused on guns in the hands of criminals. But a few isolated researchers had been taking a different approach, examining not so much the motives of the users as the statistical links between the presence of guns in society and the frequency of violent death. Beginning in 1983, the CDC picked up on that approach. The CDC declared firearm-related violence a public health hazard, to be studied with the same kinds of epidemiological tools applied to suspected pathogens and toxins. And last summer, even as those horrific images of riot played across our screens, this new effort to trace the public health impact of guns yielded a host of provocative results.

Published in special issues of the *Journal of the American Medical Association (JAMA)* as well as the *Journal of Trauma* and the *New England Journal of Medicine (NEJM)*, they included:

■ A study by CDC researchers putting a real price on gun possession: Firearm attacks on family members and intimate acquaintances

are at least 12 times more likely to result in death than are assaults using other weapons.

■ A study of violence and gender by Arthur Kellermann of the University of Tennessee, done in collaboration with Jim Mercy of the CDC. It showed that when women killed with a gun, "the victim was five times more likely to be their spouse, an intimate acquaintance, or a member of their family than to be a stranger or a person of undetermined relationship."

■ Another CDC-funded study by Kellermann and his colleagues, looking at the link between suicide and firearms. There is, it seems, an almost five-fold increase in the risk of suicide for those living in homes where guns are kept.

Meanwhile, other CDC-funded studies have started to suggest that gun control laws can reduce this toll. Says Patrick O'Carroll, the former chief of the CDC's intentional injury section, "The evidence is increasingly



Armed and dangerous. After Andrew, a Florida homeowner warns off intruders.

compelling that you would definitely prevent some number of homicides, suicides, and unintentional injuries if guns were less accessible than they are now"—to ordinary citizens as well as criminals. That kind of reasoning has subjected O'Carroll and his fellow researchers to relentless challenges from the forces opposed to gun control. It may be decades before they can respond with definitive data, the researchers admit. But even before then, they hope to make an impression on public attitudes by demonstrating that like the risks of cigarettes and alcohol, the hazards of access to guns can be studied scientifically.

An epidemic of violence

The idea that violence in America could be viewed as a public health problem has been slow to catch on, however. The year Presi-

dent Kennedy was assassinated, the national homicide rate stood at 4.6 per 100,000. Seven years later, it had doubled to 8.1 per 100,000. And today it is about 10 per 100,000. The trend wasn't lost on a few isolated researchers. In 1967, for example, Frank Zimring was an assistant law professor at the University of Chicago. One day, a colleague handed him the latest Chicago Homicide Report and said: "Homicides jumped 29% last year; find out what happened." Norman Rushforth, a statistician at Case Western Reserve University in Cleveland, was approached by two county coroners, Lester Adelson and Charles Hirsch, who remarked that they were doing more and more homicide autopsies and spending more and more time in court. The question was what had changed, and why?

Rushforth, Zimring, and a handful of other researchers went on to find that as the tide of homicides rose, the proportion of deaths involving guns, rather than knives or other weapons, increased as well. Meanwhile, the number of handguns entering the market each year rose from 750,000 to 2.4 million from 1964 to 1968. It seemed at least possible that the availability of guns, and not just lawlessness and social decay, was contributing to the epidemic of violence. But their work, Zimring recalls, had little impact on the ongoing debate over gun control. Many of the findings were published in specialty criminology and sociology journals and seemed to go for the most part unread. And even when the results appeared in more prominent journals, readers seemed unprepared to accept guns and violence as a legitimate topic in public health. When, in 1977, Rushforth and his colleagues published a study on changing patterns of Cleveland homicides between 1958 and 1974 in *NEJM*, the most noteworthy reaction, says Rushforth, was "a large number of letters to the editor that said that *NEJM* had no business publishing this sort of article, [because] it wasn't medically related at all."

Such resistance began to evaporate, however, in 1983, when the CDC created a violence epidemiology branch with a handful of in-house staff. Following the lead of Zimring, Rushforth, and other pioneering researchers, the CDC resolved to study violence as a public health problem, with firearms as a possible causative agent. Mercy, who heads the epi-

demology branch in the CDC's National Center for Injury Prevention and Control, into which the violence epidemiology branch was folded in 1985, explains the program's strategy: "Describe the problem using basic epidemiologic techniques. Then try to undertake analytic research [and] identify risk factors that can be the focus of interventions." The CDC realized, however, that it was dealing with a politically sensitive issue. "The violence branch is in a fledgling state," said one anonymous CDC staffer in the magazine *Science* '84. "If it steps too hard on the gun issue, it would be squashed in a heartbeat."

Thus the earliest studies published by the CDC were purely epidemiologic efforts to

the police to have been committed in self-defense. On the other side of the cost-benefit accounting were 12 accidental fatalities, yielding the same ratio of fatal accidents to self-defense killings in the home that Rushforth had found in Cleveland in an earlier study. There were also 41 criminal homicides and 333 firearm suicides. It amounted, says Kellermann, to "a ratio of less than ideal uses of a gun to self-protection uses of 43 to one."

But like all studies of firearms and violence, the results were open to interpretation. As Kellermann and his collaborators themselves pointed out—and opponents of gun control were quick to emphasize—the Seattle study could not take into account nonfatal incidents. It could not count intruders who were wounded or frightened away. Gun advocates claimed that those numbers would be so large as to dwarf the number of accidents, suicides, and criminal homicides and turn the cost-benefit accounting in favor of gun ownership. The same voices also argued that, in this study and others, statistics about gun-related homicides and suicides reflect rising criminality and social breakdown, not the accessibility of guns.

With CDC funding, Kellermann and his collaborators tried to isolate the effect of easy access to handguns by comparing overall rates of crime and statistics on assaults, homicides, and suicides in Seattle between 1980 and 1986 to those in Vancouver. The investigators chose those two cities because they had remarkably similar histories, geographies, climates, and socioeconomic characteristics; they even shared the same popular television programs. The crucial difference appeared to be that handguns are easy to obtain in Seattle and considerably less so in Vancouver. Thus, the Kellermann group reasoned, the comparison should provide a good test of the effect of access to handguns on crime and fatalities.

As it turned out, the two cities had similar rates of burglary, robbery, and assault, confirming that the two populations had similar levels of aggressiveness and criminal activity. But homicide was 60% higher in Seattle than in Vancouver, and homicide by firearms was 500% higher. Wrote Kellermann and his colleagues, "We conclude that restricting access to handguns may reduce the rate of homicide in a community."

With the publication of that study in *NEJM* in November 1988, the CDC was ready to broaden its research from analyzing the roots of the problem to looking for effective measures against it. Along with the Kellermann paper appeared an editorial by Mercy and Vernon Houk of the CDC declaring that "the time has come for us to address this problem in the manner in which we have addressed and dealt successfully with other threats to the public health." The next step, wrote Mercy and Houk, was to "identify suc-



Arms and the woman. Handgun ads directed at women (left) stress self-protection, but recent studies suggest that any protection comes at a high price.

size up the problem. One study confirmed the importance of handguns in the violence problem by showing that more than half the homicides in Atlanta between 1970 and 1978 were committed with firearms, mostly handguns. Another suggested that many of those homicides were committed on impulse. Among blacks and Hispanics, the ethnic groups at highest risk, the study found that the majority of homicide victims were killed not by strangers intent on committing a crime but "by either acquaintances or family members, in the context of arguments or other nonfelony related circumstances."

A tale of two cities

To probe more deeply into when and how firearms were used, the CDC began funding a series of studies by outside researchers in 1987. Among them was Kellermann, who had already done a study exploring an issue at the heart of the gun control debate: the risks and benefits of keeping a gun for self-protection. Kellermann and his colleagues found that out of 398 total firearms deaths in Seattle between 1978 and 1983, only two were intruders and seven were homicides believed by

cessful strategies to prevent firearm injuries."

A few researchers had already begun the search. Among them were Stephen Teret, director of the Johns Hopkins University Injury Prevention Center, Garen Wintemute, a physician in the department of family practice at the University of California, Davis, and Jess Kraus, head of the Southern California Injury Prevention Research Center at the University of California, Los Angeles. The three had collaborated on a California study of unintentional firearm deaths in which children (under age 14) shot children. "The most important finding," Wintemute explains, "was that a substantial percentage of those deaths might have been prevented by very simple changes in the way firearms are designed." That study sparked a General Accounting Office investigation, published last year, suggesting that 30% of all unintentional shootings of children and adults could be prevented by changes in firearm design, in particular the addition of automatic safeties that are always engaged unless the user holds them open. The CDC is now funding additional studies by the trio.

To measure the effect of making the guns themselves less available, the CDC also began supporting Colin Loftin, head of the Violence Research Group at the University of Maryland. Loftin and his colleagues looked at the effect of a 1976 gun control law passed in Washington, D.C. that prohibited civilians from acquiring handguns. After the law went into effect, they found, gun-related suicides and homicides declined by roughly one-quarter, while gun-related fatalities in nearby Maryland and Virginia remained unchanged.

As it began supporting such research, the CDC quickly came under criticism by opponents of gun control—mainly the National Rifle Association (NRA). The NRA believed the CDC was engaged in a thinly veiled attempt to lobby for gun control laws. Paul Blackman, the NRA's director of research, argues that the CDC founded its injury control division on the preconception that handguns ought to be banned, and rifles and shotguns licensed. More than that, says Blackman, the agency went on "to basically make sure it only hired employees of like mind." Not surprisingly, he says, "most of the research [the CDC] comes up with is fairly crummy." None of the CDC studies actually prove gun control will have an effect, Blackman says, and he isn't impressed by the patterns of evidence.

The CDC and its researchers don't expect further studies to dispel such objections. "We can't run to the laboratory," says Kellermann, "and set up an experiment with white rats and give half toy handguns and half not and see what happens." Instead, says Phil Cook, an economist and violence researcher at Duke University, "you have to look around for occasions in which nature has performed an experiment for you." In last summer's study on sui-

cides, for example, Kellermann and his colleagues had spent 3 years identifying 565 cases of suicide in Memphis and Seattle, then finding 438 matched households by going door to door in the victims' neighborhoods looking for households with someone of the same age, sex, race, and economic status. Such studies are not just time-consuming; lacking laboratory controls, they are all open to challenge.

To stem what they see as a tide of politically slanted research, Blackman and the NRA have lobbied the Department of Health and Human Services to shut down the CDC's research program on firearms injuries and have filed several Freedom of Information Act (FOIA) requests to see, says Blackman, "how they're selecting antigunners to give money to, and how grants are misused." Blackman feels that the CDC has been uncooperative in fulfilling the requests. CDC-funded researchers, for their part, complain that the FOIA requests are aimed only at frustrating their research.

In a recent attack against Kellermann and his colleagues, the NRA went even further: Blackman called upon the NIH Office of Scientific Integrity (OSI) to investigate Kellermann *et al.* for fraud in the Seattle-Vancouver study. In a lengthy letter to OSI, Blackman accused Kellermann and his colleagues of "blatantly antiscientific research," charging them with, among other things, saying the assault rates were similar in the two cities when they were only similar in 4 of the study's 7 years. (Kellermann and his colleagues had themselves raised the same point as a caveat in the discussion section of their paper.) OSI investigated the allegations and decided not to pursue the matter. Says Blackman, "They basically said, 'Go away and leave us alone.'"

Chipping away at the issue

The publication of last summer's crop of research on suicide, women and guns, and guns in the family did nothing to quell the political battle. In the special issue of JAMA, published on 10 June, former Surgeon General C. Everett Koop and JAMA editor George Lundberg fired one shot, arguing that the data are now compelling enough to justify legislation requiring guns to be registered and their owners tested, licensed, and monitored just as cars and their

drivers are. In a public letter, the NRA's Blackman was quick to return fire, arguing once again that none of the research is definitive, and certainly none of it "presented evidence to support the claim that firearms licensing and registration would reduce violence or homicide or gun-related violence."

But even though the CDC and its researchers don't expect to be able to come up with an

airtight case any time soon, they think parts of it are already as strong as anything in epidemiology. Kellermann, for example, feels he has settled the issue of whether the mere presence of a gun in the house adds to the risk of suicide—whether, as gun researchers

like to say, the lethality is in the instrument or the intention. "People have been fighting back and forth about this for 20 or 30 years," says Kellermann, "and people will fight about it still. But I think the validity of this is every bit as strong as the studies that linked cigarettes to lung cancer."

The CDC and its researchers often bring up cigarettes as the model for what they hope to achieve with firearms and violence. They point out that smoking is down 40% over the past 25 years and, with it, smoking-related diseases such as coronary heart disease. The decline has come about not because cigarettes have been made any more difficult to purchase, but only because millions of Americans have finally been convinced that it is in their best interest to give up smoking. "There's this sense of helplessness or resignation," says Kellermann. "People say gun-related violence is unpredictable, an inevitable part of the late 20th century. So if it's inevitable, what can you do about it? I don't buy it. I don't believe people's beliefs or attitudes on guns will change in 6 months, but maybe in 10 or 20 years there'll be major changes in beliefs and attitudes and in gun-related mortality as well."

—Gary Taubes

Gary Taubes is a free-lance writer.

Additional Reading

Arthur Kellermann *et al.*, "Suicide in the Home in Relation to Gun Ownership," *NEJM* 327, 467-472 (1992).

Arthur Kellermann and James Mercy, "Men, Women, and Murder: Gender-Specific Differences in Rates of Fatal Violence and Victimization," *The Journal of Trauma* 33, 1-5 (1992).

Philip J. Cook in Michael Tonry (Ed.) *Crime and Justice* 14 (University of Chicago Press, Chicago, 1991).

John Henry Sloan *et al.*, "Handgun Regulations, Crime, Assaults, and Homicide: A Tale of Two Cities," *NEJM* 319, 1256-1262 (1988).

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