The Shots Heard 'Round the World

The massacre at Columbine High School last year unleashed a torrent of fresh concern over the threat that violence poses to society. It also energized a government research effort to understand and prevent violence

On a cool spring morning in April 1999, two forlorn teenage boys smuggled weapons into Columbine High School in Littleton, Colorado, and began a methodical murder spree, killing 12 of their peers, a teacher, and themselves. The massacre left deep wounds in the community and touched a national nerve. It also changed the lives of many scientists.

"Littleton was the wake-up call," says Steven Hyman, director of the National Institute of Mental Health (NIMH). Government-funded programs that had been working in relative obscurity on the causes of violence suddenly were in the spotlight. Researchers, however, had few immediate answers to offer a public desperate to know what demons were tormenting middle-class white children in the suburbs. "It got the attention of Congress," says Hyman. The groundswell of concern, he says, persuaded influential leaders such as Senator Arlen Specter (R–PA), a member of the appropriations committee, "to see youth violence as a public health problem."

Specter earmarked about $900 million in this year's budget of the Department of Health and Human Services (HHS), which oversees NIMH's parent agency—the National Institutes of Health (NIH)—for programs to study and combat youth violence. He hopes for more in 2001: The Senate appropriations report proposes $1.2 billion for a "youth violence prevention initiative," much of it to reorient existing education and public health programs. The report also asks NIH to step up support for behavioral studies of children and adolescents who are at risk for becoming violent (see p. 580). Among other things, the Senate report urges NIMH to develop better ways of preventing child neglect, treating attention deficit disorder, combating depression and suicidal thinking, and evaluating models of a tough social education process called "therapeutic foster care," an alternative to jail for some delinquents. The funding bill passed the Senate last month but isn't likely to clear Congress until late fall.

Surgeon General David Satcher, meanwhile, is preparing a major report on strategies for treating violence as a disease—an approach he has long advocated. It's due this fall. President Clinton has launched an independent, nonprofit outfit—the National Campaign Against Youth Violence—to create Web sites, videos, and other media products in a wishful effort to change attitudes on violence in 13 target cities. He also set up a White House National Council on Youth Violence Prevention nominally made up of Cabinet members; it's been meeting monthly since January.

Ironically, this flurry of activity comes at a time when youth violence, as reflected in crime statistics, is in decline. The trend has been downward in the United States since 1993, the all-time peak for homicides committed by young men, according to criminologist Alfred Blumstein of Carnegie Mellon University in Pittsburgh. A surge of homicides between 1985 and 1993—fueled, Blumstein says, by drug-related violence chiefly involving minorities in big cities—provoked a strong response. Elected officials adopted tougher drug laws, longer prison sentences, and boot camps for delinquents—a series of get-tough moves often credited with reducing the crime rate. Social scientists, however, remain skeptical that these policies in isolation made the difference (see p. 582).

Hand in hand with the crackdown came a boom in government-funded research on crime. Congress in 1994 gave the National Science Foundation $12 million to start an antiviolence research center. The foundation plowed the money into a "virtual" institute of electronically linked experts called the National Consortium on Violence Research, which has access to a unique U.S. Census database on crime victims. The center coordinates studies on crime and aggression—for example, observing the social development of delinquents and criminals—with an eye to improving policies. The consortium, headed by Blumstein, is now up for a 5-year renewal. The interest in violence also boosted preexisting research programs at the Centers for Disease Control and Prevention (CDC) in Atlanta and at the National Institute of Justice.

Eager to contribute to this new anti-

CREDITS: (CLOCKWISE FROM TOP RIGHT) KEVIN HIGLEY/AP; MORRY GASH/AP; TODD HOUGAS/AP PHOTO/*NEW BRITAIN HERALD*, JOE BROCKERT/AP; COLLAGE: C. FABER SMITH

A Sinister Plot or Victim of Politics?

When the Bush Administration proposed a "violence initiative" 8 years ago, an innocent bystander—David Wasserman—suddenly found himself at ground zero in a battle over racism and psychiatry. Wasserman, a policy researcher at the University of Maryland, Baltimore, says he was taken by surprise when his proposal to host a meeting on the genetics of crime sparked an explosion of antigovernment lobbying. He was on his honeymoon when activists began hurling accusations that his conference was part of a government conspiracy to dope up inner city kids on psychoactive drugs.

The accusations were keyed to a policy then being formulated by Louis Sullivan, Bush's secretary of Health and Human Services (HHS). In 1992, Sullivan wanted to launch a public health initiative to reduce urban violence. At the time, the per capita homicide rate in the United States was climbing to its highest level on record. But activists led by Peter Breggin, an independent psychiatrist in Bethesda, Maryland, saw a sinister purpose in Sullivan's plan. Citing biochemical research on aggression funded by the National Institutes of Health (NIH), Breggin claimed that NIH-funded psychiatrists were hatching a scheme to pacify inner city children with drugs such as Prozac and Ritalin (*Science*, 9 October 1992, p. 212). Breggin still pushes this message in a series of books attacking drug therapy.

It didn't help when the director of the Alcohol, Drug Abuse, and Mental Health Administration, Frederick Goodwin, made some remarks in 1992 about the "urban jungle," comparing aggressive behavior by humans and monkeys. Members of the Congressional Black Caucus took offense. In the resulting furor, the Bush Administration scuttled the conference on crime.

Three years later, however, Wasserman got to hold his meeting. "I was ready to quit," he recalls, but the university considered the funding cancellation—ordered by then–NIH director Bernadine Healy—as "irresponsible," he says, and a breach of academic freedom. The university appealed, won, and got a bigger grant from NIH ($133,000). In September 1995, Wasserman went ahead with the planned session on "The Meaning and Significance of Research on Genetics and Criminal Behavior." Protesters, invited by some sympathetic participants, showed up and invaded the hall (*Science*, 29 September 1995, p. 1808).

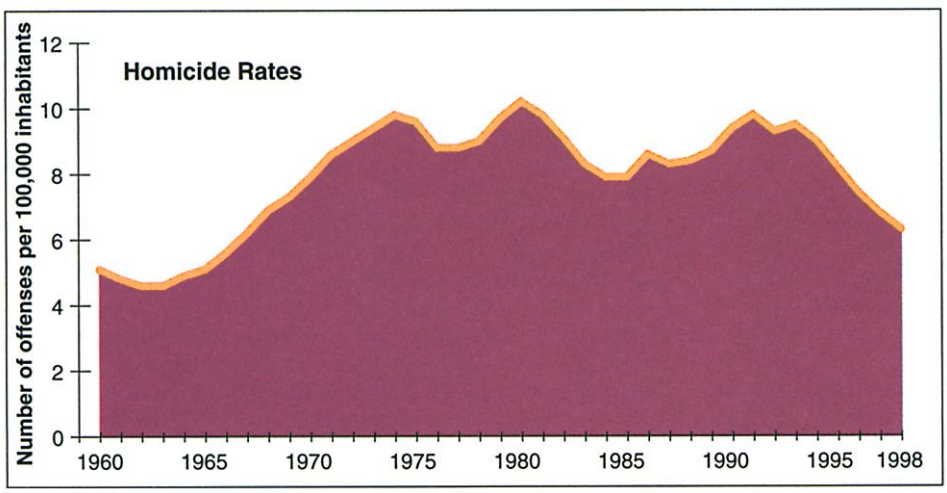
During the free-for-all, attendees exhibited some real aggression, Wasserman says. One invited researcher shoved a protester. At that point, a neurogenetics researcher from NIH stepped in and, acting as a prosecutor in an ad hoc trial, charged his fellow scientist with misbehavior. Wasserman, serving as judge, ruled that the accused would have to leave the conference. The meeting then continued without ado. Since then, Wasserman has edited the commissioned papers, and Cambridge University Press plans to publish them this year.

Sullivan's proposed violence initiative didn't fare so well. Susan Solomon, acting director of NIH's Office of Behavioral and Social Sciences Research, confirms that it simply died with the passing of the Bush Administration. A postmortem conducted in 1993 and 1994 by an HHS "blue ribbon" panel had several unremarkable suggestions, including advising the department to be more "culturally sensitive."

HHS adopted a few recommendations and ignored others. But it took one proposal to heart: to increase public funding of violence research. Since 1992, funding has grown significantly, although federal officials now stress the importance of social factors that contribute to violence and utter hardly a peep about genetics. **–E.M.**

violence agenda, research chiefs at NIH are also paying attention to environmental and behavioral studies—and talking less about biochemistry. Hyman, for example, distances himself from the policies of an earlier administration, which was fascinated by inherited traits that contribute to criminal behavior. Former director of the Alcohol, Drug Abuse, and Mental Health Administration, Frederick Goodwin, supported work on the biochemical markers of aggressive behavior in animals, such as low levels of serotonin in spinal fluid. A 1992 federal initiative on violence got entangled both in this sort of research and in an NIH-funded conference on the "genetics of crime." Attacked on ideological grounds, the conference was first canceled, then reinstated, and finally held in 1995. But the HHS antiviolence initiative itself petered out (see sidebar above).

Today, Hyman says, "we no longer take seriously the rather impoverished and deterministic models" that assume "the level of serotonin in your cerebrospinal fluid predicts whether you are going to kill yourself or someone else." Instead, his institute has moved to less controversial ground, adopting the view that violent behavior can best be understood—and prevented—if it is attacked as if it were a contagious disease that flourishes in vulnerable individuals and resource-poor neighborhoods. Scientists continue to probe the biological sources of violence in humans and in animals, however, arguing that valid lines of research have emerged from a field whose past is haunted by charlatans (p. 575). But to Hyman, the decisive public shift in thinking about violence—emphasizing social rather than biological factors—is "very, very healthy."



SOURCE: FBI

Roller-coaster ride. Recent U.S. school shootings belie the fact that homicide rates are falling.

Taking stock

Because NIMH still funds the largest portfolio of basic research on violence, about $40 million per year, it has assigned itself the task of reviewing practical measures—or "interventions," according to the jargon—that agencies might try out to divert young people from criminal behavior. NIMH staffer Della Hann has labored for more than a year, Hyman says, "taking stock" of what's been funded in the past and "sifting the wheat from the chaff to see what we actually know." The review examined decades' worth of NIMH-funded studies on risk factors that appear to contribute to aggressive behavior, such as neglect and abuse in childhood, harsh and inconsistent discipline, and associ-

ating with antisocial peers.

Hyman believes NIMH may have invested enough in identifying such risks. "Sometimes you get a cottage industry in doing certain kinds of research," he says, going repeatedly over the same ground. Now it is time to move on, he suggests, and apply this research to experiments in the real world. Assuming that youth violence can be treated as an illness, he says, "we want to try to target the risk factors, try to develop interventions, and make generalizations" about what's been learned. "We would do small efficacy trials first, then large effectiveness trials." Hann says NIMH staffers have sorted through more than 200 research projects, selecting the most promising for discussion in a report to be finished this month.

A few themes emerged from this retrospective analysis during a meeting of experts organized last October by the NIH director's Office of Behavioral and Social Sciences Research. One important message, according to NIMH official Farris Tuma, is that some well-meaning programs designed to control aggressive children may be worse than useless: They may be doing harm. For example, collecting young people in group homes or sending them to boot camps or on wilderness ordeals—popular in many states—may intensify rather than reverse antisocial behavior.

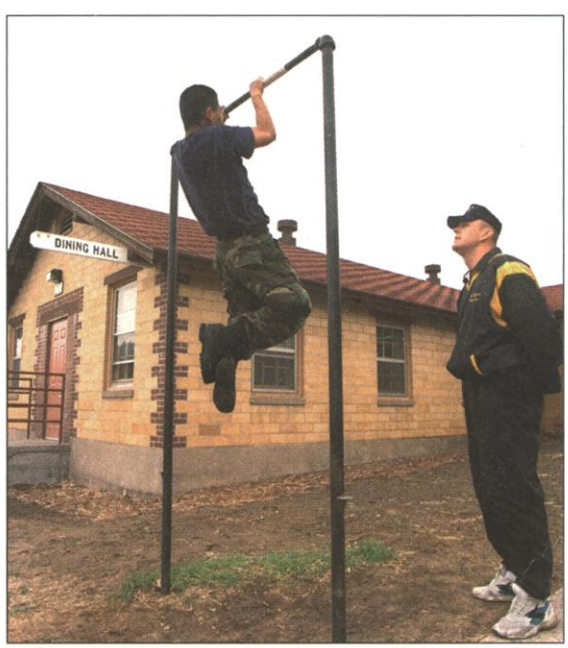
Clinical psychologist Thomas Dishion and colleagues at the Oregon Social Learning Center in Eugene, Oregon, for example, studied the development of a group of about 200 boys over 5 years. They found a consistent pattern: Rule-breaking children trained others in misconduct. Boys who did not smoke tobacco or marijuana or abuse alcohol before age 13 or 14, but who became friends of boys who did, advanced in a statistically predictable way to become substance abusers 2 years later. The researchers found that this "deviancy training" produced boys at ages 14 to 16 who admitted to acts of delinquency. The same process, they argue, molds criminals and violent adults. Dishion's group believes it's a terrible mistake to house young delinquents together. Using a medical term for hospital-borne disease, they claim this practice has the "iatrogenic" effect of magnifying the problem.

Studies by criminologist Delbert Elliott and colleagues at the University of Colorado, Boulder, also support this conclusion. By comparing the development of delinquents and nondelinquents, Elliott's group determined that the final step in a path to "serious offending" was invariably the same—joining an antisocial peer group. This may sound obvious, but it's important to have it documented, Hyman says, for it indicates that government-supported programs are heading in precisely the wrong direction. By aggregating delinquents in group homes or sending them through the adult justice system—as many localities are doing—Hyman maintains, "we are sending them to graduate school for violence and delinquency."

Searching for better ideas, the program review groups at NIH and elsewhere have identified strategies that have been tested and might have a better chance of preventing violent behavior. NIMH staffers point to work by Elliott called "Blueprints for Violence Prevention," funded by the state, the CDC, and the Department of Justice. To cull the best from a large crop of local programs, Elliott's group established some rigorous screening criteria. They insisted that to qualify as a success, a program had to be designed as a true experiment with clear outcomes, produce quantifiable benefits, exhibit long-term improvements among its graduates, and its good results had to be replicated at more than one site. A staffer says more than 500 programs have been screened through this sieve; Elliott's team identified 10 proven winners (www.colorado.edu/cspv/blueprints/Default.htm).

Interventions can't start too early, apparently. In one program, nurses make in-home visits to pregnant women and return periodically until the child is 2 years old. Fifteen years later, those children seem less likely to abuse drugs or commit crimes. A bullying-prevention program focuses on elementary schools and attempts to change the social climate so that intimidation is a less acceptable way to solve problems, says Elliott. And an intriguing experiment designed to keep adolescent delinquents from becoming criminals evolved under the direction of Patricia Chamberlain at the Oregon Social Learning Center. The approach is simple, but demanding. The researchers recruit and pay foster families to accept a delinquent child into their homes for a period of about 7 months. The delinquent, rescued temporarily from jail or confinement to a group home, must follow strict rules. The parents are drilled in rule-enforcement and provided with access to round-the-clock professional support.

Chamberlain says her group began working on what she calls "multidimensional treatment foster care"—a form of closely supervised parenting with professional backup—in the early 1980s. In 1990 her group received funding from NIMH to conduct a clinical trial. Delinquent boys (85% white and about 14 years old) were randomly assigned either to therapeutic foster care or to regular group homes. The results after the first year: Boys in foster care were far less likely to run away than those in group homes (30.5% versus 57.8%). Most important, boys in foster care were less likely to get into trouble, spending 60% fewer days behind bars in the year after treatment. Creating a network of foster families to treat one delinquent per household is difficult. But an economic analysis of the NIMH-funded study by the Washington State Institute for Public Policy in Olympia, Washington, found in 1999 that therapeutic foster care, costing $1934 per

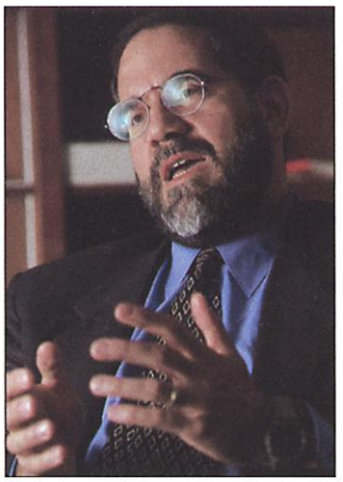


It's the company you keep. Some findings suggest that boot camps for juvenile offenders may intensify antisocial behavior.

PHOTOS BY ERIK DAILY/AP/LA CROSSE TRIBUNE

delinquent, is a bargain. The economists calculated that standard law enforcement costs an additional $27,000 per delinquent, mainly because boys held in juvenile detention are more likely to go to prison.

To expand the search for innovative programs, NIMH and three other NIH institutes are putting up $3 million this year. Their January 2000 request for applications offers to support about a dozen new projects on youth violence at $200,000 each, for up to 3 years. But NIH doesn't want more studies on risk factors, noting that they already make up two-thirds of the current portfolio. Instead, it wants well-designed social experiments. "Behavioral interventions should be thought of just like drugs," Hyman says: "It's easy to fool yourself about efficacy if you haven't done a proper clinical trial."



Biomedicine's role

The emphasis on using behavior-altering techniques for blunting violence, according to NIMH staffers, should not be seen as a rejection of biology. It's just a matter of what's ready for prime time, says Hyman. "We continue to fund long-term research ... on the circuits in the brain involved in all emotion." But this work on neural circuitry is "still in its early stages," he says: "Perhaps the most interesting question is how context interacts with the human brain to unleash different types of violence. After all, no airplane dropped DNA on the former Yugoslavia or Rwanda to unleash genocidal impulses." But he doesn't think it makes sense to promote studies of hormones such as serotonin—which he calls "bodily fluids research"—because such approaches have revealed "nothing about cause or mechanism" and have been "relatively sterile with regard to generating good follow-up questions."

It's easy to exaggerate the meaning of biological findings, Hyman asserts. As an example he points to studies of the prefrontal lobe, such as work by Adrian Raine of the University of Southern California in Los Angeles, that have associated decreased gray matter or injury with violent behavior. The research is "very well done," Hyman says. But he also thinks that some people, including Raine himself, read too much into the findings.

A recent commentary by Raine on the brain scans of a group of California murderers ran under the provocative headline: "Can We See the Mark of Cain?" To Hyman, this is reminiscent of phrenology, the 19th century practice of analyzing bumps on the skull to identify personality types. Hyman thinks that predicting violence on the basis of a brain scan is "vanishingly unlikely." Raine acknowledges that his work has run into criticism, which he considers mainly "political." But he insists that "more and more scientific evidence" demonstrates "a clear biological and genetic basis to crime and violence." Says Raine, "If you stick to the facts, science will win the day."

Scans may be useful, Hyman concedes, as a "first-cut" approach to finding links between risky behavior and physiological problems. Studies have shown that some children who get in trouble experienced head injuries early in life. Doing brain scans might make sense if it were possible to offer them specific therapy. But Hyman suggests that, as a leader in policy discussions on violence, NIMH should advance interventions that have been tested and proved useful.

In preventing violence, it's critical to avoid the "gulag point of view."

—Steven Hyman

But even some widely accepted therapies remain controversial. Children who fidget or disrupt class—if diagnosed with attention deficit hyperactivity disorder (ADHD)—are often prescribed Ritalin, a stimulant, to help them concentrate. However, a recent study of the widespread use of stimulants and other psychoactive drugs in young children has been described by Harvard psychiatrist Joseph Coyle as "troubling."

"Ritalin is both underused and overused," is Hyman's diplomatic view. Clinical trials have proved Ritalin safe and effective for treating ADHD—even "superior to purely behavioral interventions," says Hyman. Yet minority children don't get Ritalin when they most need it, in part because of negative publicity. At the same time, it is prescribed at higher rates than expected, considering the occurrence of ADHD (3% to 5%). "Kids who are not treated for attention deficit hyperactivity disorder," he says, "are known to have a higher risk of drug abuse and also of offending and getting involved with the criminal justice system." NIMH may try to redress the imbalance by offering straight information and funding to inner city researchers.

Indeed, psychiatrist Carl Bell of the Community Mental Health Council in Chicago says that the "antipsychiatry" movement, including the Church of Scientology, has plastered his neighborhood with "slick brochures" about a "genocidal plot" to drug minority children, and this has scared people. Bell, who is black himself, says he would welcome federal help in running clinical trials of Ritalin and other drugs that might help his patients. He argues that only a clinic like his own, which is controlled by a community board, will be trusted to carry out research of this kind.

NIMH also wants to intensify its focus on quiet children whose troubled behavior may be important to identify early. "A lot of attention has been paid" to agitated and disruptive children, Tuma says, "but not enough to the withdrawn, shy child." Many of the teenagers involved in recent school shootings "were not running around calling attention to themselves," Hyman notes. They were "sullen, withdrawn, alienated, and potentially depressed." Indeed, the older of the two Littleton shooters, investigators later discovered, had been taking a prescription drug for depression, Luvox, and had threatened peers long before the shootings. NIMH is investing $15 million in a clinical trial of adolescent depression coordinated by Duke University, Hyman says, to test the efficacy of Prozac, cognitive behavior therapy, and a combination of both versus a placebo. Ten centers have signed up since 1998 to enroll 430 children between the ages of 12 and 17; results could appear as soon as 2004. Hyman sees it as an important first step: "We need to establish the safety and efficacy of treatments for depression among school kids and adolescents," a topic that hasn't been adequately studied.

After Littleton, says Hyman, self-styled experts came out with all kinds of do-it-yourself "checklists" for identifying potential killers in the classroom. He sees the trend as dangerous, mainly because it could stigmatize vulnerable children—most of whom are not inclined to violence—and make them more resentful and withdrawn. Researchers can contribute to violence prevention initiatives, Hyman says, by disseminating scientifically vetted information to teachers, counselors, and the public. It's critical, he says, to help people identify good therapies, and to avoid personality checklists and the "gulag point of view"—and, for the moment, to push the genetics of violence offstage. **—ELIOT MARSHALL**

With reporting by Laura Helmuth.

CREDIT: RICK KOZAK