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First Reports Evaluating the Effectiveness of Strategies for Preventing Violence: Early Childhood Home Visitation and Firearms Laws

**Findings from the Task Force
on Community Preventive Services**

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First Reports Evaluating the Effectiveness of Strategies for Preventing Violence: Early Childhood Home Visitation

Findings from the Task Force on Community Preventive Services

Prepared by
Robert A. Hahn, Ph.D.¹
Oleg O. Bilukha, M.D., Ph.D.¹
Alex Crosby, M.D.²
Mindy T. Fullilove, M.D.³
Akiva Liberman, Ph.D.⁴
Eve K. Moscicki, Sc.D.⁵
Susan Snyder, Ph.D.¹
Farris Tuma, Sc.D.⁵
Amanda Schofield, M.P.H.¹
Phaedra S. Corso, Ph.D.¹
Peter Briss, M.D.¹

¹*Division of Prevention Research and Analytic Methods
Epidemiology Program Office*

²*Division of Violence Prevention
National Center for Injury Prevention and Control, CDC
Atlanta, Georgia*

³*New York State Psychiatric Institute, Columbia University
New York, New York*

⁴*National Institute of Justice
U.S. Department of Justice
Washington, D.C.*

⁵*National Institute of Mental Health
National Institutes of Health
Bethesda, Maryland*

Summary

Early childhood home visitation programs are those in which parents and children are visited in their home during the child's first 2 years of life by trained personnel who provide some combination of the following: information, support, or training regarding child health, development, and care. Home visitation has been used for a wide range of objectives, including improvement of the home environment, family development, and prevention of child behavior problems. The Task Force on Community Preventive Services (the Task Force) conducted a systematic review of scientific evidence concerning the effectiveness of early childhood home visitation for preventing several forms of violence: violence by the visited child against self or others; violence against the child (i.e., maltreatment [abuse or neglect]); other violence by the visited parent; and intimate partner violence. On the basis of strong evidence of effectiveness, the Task Force recommends early childhood home visitation for the prevention of child abuse and neglect. The Task Force found insufficient evidence to determine the effectiveness of early childhood home visitation in preventing violence by visited children, violence by visited parents (other than child abuse and neglect), or intimate partner violence in visited families. (Note that insufficient evidence to determine effectiveness should not be interpreted as evidence of ineffectiveness.) No studies of home visitation evaluated suicide as an outcome. This report provides additional information regarding the findings, briefly describes how the reviews were conducted, and provides information that can help in applying the recommended intervention locally.

Background

Juvenile violence, child maltreatment, and intimate partner violence are substantial problems in the United States. In the last 25 years, juveniles aged <18 years have been involved as offenders in at least 25% of serious violent victimizations in the United States. Rates of homicide victimization among

The material in this report was prepared by the Epidemiology Program Office, Stephen B. Thacker, M.D., Director; Division of Prevention Research and Analytic Methods, Richard E. Dixon, M.D., Director.

youth aged <15 years are five times higher in the United States than they are in 25 other industrialized nations for which data are available, and rates of firearm-related homicide are approximately 16 times higher in the United States than in those same nations (1,2). In 1994, 33% of juvenile homicides involved a juvenile offender. Since 1976 or earlier, the peak rate of homicide in the United States has occurred among persons aged 18–24 years. In 1999, suicide was the sixth leading cause of death among persons aged 5–14 years and the third leading cause of death among those aged 15–24 years.

In 1999, 4.1% of children (aged <18 years) were reported to be victims of maltreatment. Of those reports, 33.8% were investigated by child protective services and not confirmed; however, additional cases of maltreatment were not reported, further complicating this picture (2–4). Child maltreatment can include physical, sexual, or emotional abuse; physical, emotional, or educational neglect; or a combination of abuse and neglect. Not only is child maltreatment a form of violence in itself, it also contributes to adverse consequences among maltreated children, including early pregnancy, drug abuse, school failure, mental illness, and suicidal behavior (5). Children who have been physically abused are more likely to perpetrate aggressive behavior and violence later in their lives, even when other risk factors for violence are taken into account (6,7). Because abuse and neglect are both associated with poverty and single-parent households, many home visitation programs in the United States are directed to poorer, minority, and single-parent families. Given that 12% of 4 million U.S. births in 1999 were to teenage mothers, 33% were to single mothers, and 22% of mothers had less than a high school education, the population at risk is substantial (8).

Intimate partner violence victimizes men as well as women in the United States, but women are three times as likely to be victims as are men (9). During her lifetime, one of four women in the United States will be the victim of partner violence: 7.7% will be victims of rape and 22.1% will be victims of other physical assault. Violent victimization of women, including threats of rape and sexual assault, is greatest among women aged 16–19 years. Such violence can also have severe physical and mental health consequences for victims (10).

Early childhood home visitation has been used for a wide range of public health goals for both visited children and their parents, including not only violence reduction and other health outcomes but also health-related outcomes such as educational achievement, problem-solving skills, and greater access to social services and other resources (11,12). Home visitation programs are common in Europe, where they are most often made available to all childbearing families, regardless of estimated risk of child-related health or social problems (13). This

review assesses scientific evidence concerning the effectiveness of early childhood home visitation in preventing violence by the visited child against others or self (i.e., suicidal behavior), violence against the child (i.e., maltreatment [abuse or neglect]), violence by the visited parent, and intimate partner violence.

Introduction

The independent, nonfederal Task Force on Community Preventive Services (the Task Force) is developing the *Guide to Community Preventive Services* (the *Community Guide*) with the support of the U.S. Department of Health and Human Services (DHHS) in collaboration with public and private partners. Although CDC provides staff support to the Task Force for development of the *Community Guide*, the recommendations presented in this report were developed by the Task Force and are not necessarily the recommendations of DHHS or CDC.

This report is one in a series of topics included in the *Community Guide*, a resource that includes multiple systematic reviews, each focusing on a preventive health topic. A short overview of the process used by the Task Force to select and review evidence and summarize its findings is included in this report. A full report on the findings and supporting evidence (including discussions of applicability, additional benefits, potential harms, and existing barriers to implementation), costs and cost-benefit of the intervention, and remaining research questions will be published in the *American Journal of Preventive Medicine*.

Methods

The *Community Guide* uses systematic reviews to evaluate the evidence of intervention effectiveness, and the Task Force bases its recommendations on the findings of these reviews. Recommendations regarding interventions reflect the strength of the evidence of effectiveness (i.e., sufficient or strong evidence of effectiveness) (14).^{*} Other types of evidence can also affect a recommendation. For example, evidence of harms resulting from an intervention might lead to a recommendation that the intervention not be used if adverse effects outweigh improved outcomes. When interventions are determined

^{*} At the June 2002 meeting of the Task Force on Community Preventive Services, new terminology was adopted to reflect the findings of the Task Force. Instead of being referred to as “strongly recommended” and “recommended,” such interventions are now referred to as “recommended (strong evidence of effectiveness)” and “recommended (sufficient evidence of effectiveness),” respectively. Similarly, the finding previously referred to as “insufficient evidence” is now more fully stated: “insufficient evidence to determine effectiveness.” These changes were made to improve the clarity and the intent of the findings.

to be effective, their costs and cost effectiveness are evaluated, insofar as relevant information is available (15). The instrument used to systematically abstract the economic data is available at <http://www.thecommunityguide.org/methods/econ-abs-form.pdf>. Although the option exists, the Task Force has not yet used economic information to modify recommendations. A finding of insufficient evidence to determine effectiveness should not be interpreted as evidence of ineffectiveness but rather as an indicator that additional research is needed before the effectiveness of the intervention can be determined. In contrast, sufficient or strong evidence of harmful effect(s) or of ineffectiveness leads to a recommendation that the intervention not be used.

The *Community Guide's* methods for conducting systematic reviews and linking evidence to recommendations have been described elsewhere (14). In brief, for each *Community Guide* topic, a multidisciplinary team conducts a review by performing the following actions:

- developing an approach to organizing, grouping, and selecting the interventions for review;
- systematically searching for and retrieving evidence;
- assessing the quality of and summarizing the strength of the body of evidence of effectiveness;
- assessing cost and cost-effectiveness evidence, identifying applicability and barriers to implementation (if the effectiveness of the intervention has been established);
- summarizing information regarding evidence of other effects; and
- identifying and summarizing research gaps.

For the systematic review of violence prevention intervention programs, early childhood home visitation was identified as a high-priority intervention by a group of consultants[†] representing diverse experience. They generated a comprehensive list of strategies and created a priority list of interventions for review based on 1) the potential to reduce violence in the U.S. population; 2) the potential benefits of expanding use of seemingly effective, but underused interventions and reducing use of seemingly ineffective, but overutilized interventions; 3) current interest among violence prevention audiences; and 4) diversity among intervention types.

[†]Members of the consultation team for the systematic reviews of violence prevention interventions were Laurie M. Anderson, Ph.D., CDC, Olympia, Washington; Carl Bell, M.D., Community Mental Health Council, Chicago, Illinois; Red Crowley, Men Stopping Violence, Atlanta, Georgia; Sujata Desai, Ph.D., CDC, Atlanta, Georgia; Deborah French, Colorado Department of Public Health and Environment, Denver, Colorado; Darnell F. Hawkins, Ph.D., J.D., University of Illinois at Chicago, Chicago, Illinois; Danielle LaRaue, M.D., Harlem Hospital Center, New York, New York; Barbara Maciak, Ph.D., CDC, Detroit, Michigan; James Mercy, Ph.D., CDC, Atlanta, Georgia; Suzanne Salzinger, Ph.D., New York State Psychiatric Institute, New York, New York; Patricia Smith, Michigan Department of Community Health, Lansing, Michigan.

Home visitation programs, reviewed in this article, might be useful in reaching several objectives of *Healthy People 2010* (16), the disease prevention and health promotion agenda for the United States. These objectives identify major preventable threats to health and focus the efforts of public health systems, legislators, and law enforcement officials in addressing those threats. Many of the *Healthy People* objectives in Chapter 15, "Injury and Violence Prevention," relate to home visitation and its proposed effects on violence-related outcomes (Box).

To be included in the review of effectiveness, studies had to 1) be primary investigations of the intervention selected for evaluation rather than, for example, guidelines or reviews; 2) provide information on at least one outcome of interest from the list of violent outcomes preselected by the team; 3) be conducted in Established Market Economies;[§] and 4) compare outcomes in groups of persons exposed to the intervention with outcomes in groups of persons not exposed or less exposed to the intervention (whether the comparison was concurrent between groups or before-and-after within the same group). The search covered any research published before July 2001.

The purpose of this review was to assess the effectiveness of home visitation programs in preventing violence. Home visitation programs have focused on diverse aspects of child and family development. In this review, home visitation was defined as a program that includes visitation of parents and children in their home by trained personnel who convey information, offer support, provide training, or perform a combination of these activities. Visits must occur during at least part of the child's first 2 years of life but may be initiated during pregnancy and may continue after the child's second birthday. Participation may be voluntary or mandated. Visitors may be nurses, social workers, other professionals, paraprofessionals, or community peers.

Home visitation programs are commonly targeted to specific population groups: low-income; minority; young; less educated; first-time mothers; substance abusers; children at risk for abuse or neglect; and low birthweight, premature, disabled, or developmentally compromised infants. Visitation programs include (but are not limited to) one or more of the following components: training of parent(s) on prenatal and infant care, training on parenting, child abuse and neglect prevention, developmental interaction with infants or toddlers,

[§]Established Market Economies as defined by the World Bank are Andorra, Australia, Austria, Belgium, Bermuda, Canada, Channel Islands, Denmark, Faeroe Islands, Finland, France, Germany, Gibraltar, Greece, Greenland, Holy See, Iceland, Ireland, Isle of Man, Italy, Japan, Liechtenstein, Luxembourg, Monaco, the Netherlands, New Zealand, Norway, Portugal, San Marino, Spain, St. Pierre and Miquelon, Sweden, Switzerland, the United Kingdom, and the United States.

BOX. Selected *Healthy People 2010 objectives potentially affected by home visitation programs**

Injury Prevention

- Reduce hospitalization for nonfatal head injuries from 60.6 to 45.0 per 100,000 population[†] (Objective 15-1).
- Reduce hospitalization for nonfatal spinal cord injuries from 4.5 to 2.4 per 100,000 population[†] (Objective 15-2).
- Reduce nonfatal poisonings from 348.4 to 292 per 100,000 population[§] (Objective 15-7).
- Reduce deaths caused by poisoning from 6.8 to 1.5 per 100,000 population[†] (Objective 15-8).
- Reduce deaths caused by suffocation from 4.1 to 3.0 per 100,000 population[†] (Objective 15-9).
- Reduce hospital emergency department visits from 131 to 126 per 1,000 population[§] (Objective 15-12).

Unintentional Injury Prevention

- Reduce deaths caused by unintentional injuries from 35.0 to 17.5 per 100,000 population[†] (Objective 15-13).
- (Developmental) Reduce nonfatal unintentional injuries (Objective 15-14).
- Reduce drownings from 1.6 to 0.9 per 100,000 population[†] (Objective 15-29).

Violence and Abuse Prevention

- Reduce homicides from 6.5 to 3.0 per 100,000 population[†] (Objective 15-32).
- Reduce maltreatment of children from 12.9 (in 1998) to 10.3 per 1,000 children aged <18 years (Objective 15-33a).[¶]
- Reduce child maltreatment fatalities from 1.6 (in 1998) to 1.4 per 100,000 children aged <18 years (Objective 15-33b).[¶]
- Reduce the rate of physical assault by current or former intimate partners from 4.4 (in 1998) to 3.3 per 1,000 persons aged ≥12 years (Objective 15-34).
- Reduce the annual rate of rape or attempted rape from 0.8 (in 1998) to 0.7 per 1,000 persons aged ≥12 years (Objective 15-35).
- Reduce sexual assault other than rape from 0.6 (in 1998) to 0.4 per 1,000 persons aged ≥12 years (Objective 15-36).
- Reduce physical assaults from 31.1 to 13.6 per 1,000 persons aged ≥12 years (Objective 15-37).
- Reduce physical fighting among adolescents from 36 to 32 percent (baseline: students in grades 9 through 12, fighting during the previous 12 months in 1999) (Objective 15-38).

* Source: US Department of Health and Human Services. *Healthy people 2010*. 2nd ed. With Understanding and Improving Health and Objectives for Improving Health (2 vols). Washington, DC: US Department of Health and Human Services, 2000.

[†] Baseline: 1998 data, age adjusted to year 2000 standard population.

[§] Baseline: 1997 data, age adjusted to year 2000 standard population.

[¶] Note that objective 15-33a is per 1,000 children aged <18 years, whereas objective 15-33b is per 100,000 children aged <18 years. Comparable objectives would be reduction of child maltreatment to 1,290 per 100,000 children aged <18 years and reduction of child maltreatment fatalities to 1.6 per 100,000.

family planning assistance, development of problem-solving skills and life skills, educational and work opportunities, and linkage with community services. In addition to home visits, programs can include day care; parent group meetings for support, instruction, or both; advocacy; transportation; and other services. When such services are provided in addition to home visitation, the program is considered multicomponent.

The systematic review development team (the team) reviewed studies of home visitation only if they assessed violent outcomes. If violence was not the primary target or outcome of the visitation, the study was included if it met epidemiologic criteria and assessed violent outcomes. The effects of other outcomes were not systematically assessed but are reported insofar as they are addressed in the studies reviewed. The studies reviewed examined any of four violent outcomes:

- violence by the visited child, against self or others;
- violence against the child (i.e., maltreatment that includes all forms of child abuse and neglect);
- violence by the visited parent, other than child maltreatment and intimate partner violence; and
- intimate partner violence.

The team developed an analytic framework for the early childhood home visitation intervention, indicating possible causal links between home visitation and predefined outcomes of interest. To make recommendations, the Task Force required that studies show decreases in preselected direct or proxy measures for at least one of the four categories of violent behavior described previously. If both direct and proxy measures were available, preference was given to the direct measure.

Electronic searches for intervention studies were conducted in MEDLINE, EMBASE, ERIC, National Technical Information Service (NTIS), PsycINFO, Sociological Abstracts, National Criminal Justice Reference Service (NCJRS), and CINAHL.[¶] Also reviewed were the references listed in all retrieved articles as well as additional reports as identified by the team, the consultants, and specialists in the field. Journal articles, government reports, books, and book chapters were included in the review.

Each study that met the inclusion criteria was evaluated by using a standardized abstraction form (17) and was assessed

[¶] These databases can be accessed as follows: Medline: <http://www.ncbi.nlm.nih.gov/PubMed>; EMBASE: DIALOG <http://www.dialogclassic.com> (requires id/password account), <http://www.sciencedirect.com/science/search/database/embase>; ERIC: <http://www.askeric.org/Eric/>; NTIS: DIALOG <http://www.dialogclassic.com> (requires id/password account), <http://grc.ntis.gov/ntisdb.htm>; PsycInfo: DIALOG <http://www.dialogclassic.com> (requires id/password account), <http://www.apa.org/psycinfo/products/psycinfo.html>; Sociological Abstracts: DIALOG <http://dialogclassic.com> (requires id/password account), <http://www.csa.com/detailsV5/socioabs.html>; NCJRS: http://abstractsdb.ncjrs.org/content/AbstractsDB_Search.asp; CINAHL: DIALOG <http://www.dialogclassic.com> (requires id/password account), <http://www.cinahl.com/wpages/login.htm>.

for suitability of the study design and threats to validity (14). On the basis of the number of threats to validity, studies were characterized as having good, fair, or limited execution. Results on each outcome of interest were obtained from each study that had good or fair execution. Measures adjusted for the effects of potential confounders were used in preference to crude effect measures. A median was calculated as a summary effect measure for outcomes of interest. For bodies of evidence consisting of seven or more studies, an interquartile range was presented as an index of variability. Unless otherwise noted, the results of each study were represented as a point estimate for the relative change in the violent outcome rate associated with the intervention. Percentage changes were calculated by using the following formulas:

- For studies with before-and-after measurements and concurrent comparison groups:

$$\text{Effect size} = [(I_{\text{post}} / I_{\text{pre}}) / (C_{\text{post}} / C_{\text{pre}})] - 1$$

where I_{post} = last reported outcome rate in the intervention group after the intervention; I_{pre} = reported outcome rate in the intervention group before the intervention; C_{post} = last reported outcome rate in the comparison group after the intervention; and C_{pre} = reported outcome rate in the comparison group before the intervention.

- For studies with postmeasurements only and concurrent comparison groups:

$$\text{Effect size} = (I_{\text{post}} - C_{\text{post}}) / C_{\text{post}}$$

- For studies with before-and-after measurements but no concurrent comparison:

$$\text{Effect size} = (I_{\text{post}} - I_{\text{pre}}) / I_{\text{pre}}$$

The strength of the body of evidence of effectiveness was characterized as strong, sufficient, or insufficient on the basis of the number of available studies, suitability of study designs for evaluating effectiveness, quality of execution of the studies, consistency of the results, and effect size (14).

Results

The systematic review development team identified four studies that evaluated effects of early childhood home visitation on violence by visited children. Because the results of these studies were inconsistent, the Task Force concluded that evidence was insufficient to determine the effectiveness of early childhood home visitation in preventing violence by visited children. Evidence from one study (as assessed by self-reported delinquency, the team's preferred measure) indicated no benefit and was inconsistent with evidence from the same study as

assessed by other measures (e.g., arrests and convictions) (18). A second study (19) indicated benefit of home visitation, and the two remaining studies (20,21) suggested no difference. No study evaluated the effects of home visitation on suicide by visited children.

The studies also yielded insufficient evidence to determine the effectiveness of early childhood home visitation in preventing violence by visited parents (other than child abuse) or intimate partner violence in visited families. The team identified only one study that evaluated effects of early childhood home visitation on violence by visited parents (other than child abuse) (22). This study indicated a beneficial effect, but one that was statistically significant only among low-income, single mothers. Similarly, only one study evaluated effects of home visitation on intimate partner violence in visited families (23). Evidence from this single study of partner violence indicated no statistically significant effect.

The team also identified 22 studies (representing 27 intervention arms) that evaluated effects of early childhood home visitation on child maltreatment. Participation in all programs was voluntary. Outcomes assessed were reported and confirmed abuse and neglect, hospital records of injury or ingestion (which may be associated with abuse or neglect), and out-of-home placement (i.e., removal from the home). One study (representing one intervention arm) was excluded because of limitations in its execution; the remaining 21 studies (with 26 intervention arms) were included in the body of evidence. Additionally, three economic studies were included in the review. Both the costs and benefits of early childhood home visitation were assessed in one study, whereas the other two studies estimated program costs only. A summary of key findings and recommendations is presented (Table).

On the basis of strong evidence of effectiveness, the Task Force recommends early childhood home visitation for prevention of child abuse and neglect in families at risk for maltreatment, including disadvantaged populations and families with low-birthweight infants.

Compared with controls, the median effect size of home visitation programs was a reduction of approximately 40% in child abuse or neglect. Benefit was found whether the outcome was directly assessed in terms of reported abuse or neglect or indirectly assessed as reported injury. The only study that assessed the effects of home visitation on out-of-home placement indicated a small nonsignificant increase associated with home visitation (the desired result would be a decrease in out-of-home placement). Effect sizes (and the benefits of home visitation in prevention of child abuse or neglect) may actually be greater than reported here because the presence of the home visitor increases the likelihood that abuse or neglect will be

TABLE. Recommendations from the Task Force on Community Preventive Services regarding the use of early childhood home visitation to prevent violence

Outcome category (No. of qualifying intervention arms/ no. of studies)	Task force recommendation for use	Outcomes assessed		Key findings
		Direct measures	Proxy measures	
Child maltreatment (26/21)*	Recommended (strong evidence of effectiveness)	Child abuse and neglect (e.g., child protective services reports, parent reports, visitor reports, clinic reports)	Emergency room visits for injury or ingestion; injury, trauma; out- of-home placement	Effective in decreasing child maltreatment (by several measures). Median relative percentage point change of -39% (interquartile range: -74%–24%). Programs delivered by professional visitors (nurses, mental health workers) might yield more consistent effects. For paraprofessional visitors, beneficial effects generally found in programs of longer duration (≥ 2 years). Available studies might underestimate actual effectiveness of programs because home visitors are required by law to report abuse and neglect (thus ascertainment of these outcomes is increased in the intervention group).
Violence by visited children (4/4) [†]	Insufficient evidence to determine effectiveness [§]	Reported or observed violence and violent crime	Delinquency (with violence), conduct disorder, externalizing behavior, arrests, convictions	Evidence insufficient because of small numbers of studies, inconsistent evidence of effectiveness, and limitations in design and execution of available studies.
Violence by visited parents (1/1) [¶]	Insufficient evidence to determine effectiveness [§]	Reported or observed violence and violent crime	Arrests, convictions	Evidence insufficient because of small numbers of studies, inconsistent evidence of effectiveness, and limitations in design and execution of available studies.
Intimate partner violence (1/1)**	Insufficient evidence to determine effectiveness [§]	Reported or observed partner victimization	Arrests, convictions for partner assault	Evidence insufficient because of small numbers of studies, inconsistent evidence of effectiveness, and limitations in design and execution of available studies.

* **Sources:** Barth RP. An experimental evaluation of in-home child abuse prevention services. *Child Abuse and Neglect* 1991;15:363–75. Brayden R, Altermeier W, Dietrich M, et al. A prospective study of secondary prevention of child maltreatment. *J Pediatr* 1993;122:511–6. Broton D, Kumar S, Brown LP, et al. A randomized clinical trial of early hospital discharge and home follow-up of very-low-birth-weight infants. *N Engl J Med* 1986;315:934–9. Caruso Whitney GA. Early intervention for high-risk families: reflecting on a 20-year-old model. In: Albee GW, Gullotta TP, eds. *Primary prevention works*. Thousand Oaks, CA: Sage Publications; 1997:68–86. Dawson P, Van Doornick WJ, Robinson JL. Effects of home-based, informal social support on child health. *Dev Behav Pediatr* 1989;10:63–7. Duggan A, Windham A, McFarlane E, et al. Hawaii's healthy start program of home visiting for at-risk families: evaluation of family identification, family engagement, and service delivery. *Pediatrics* 2000;105:250–9. Flynn L. The adolescent parenting program: improving outcomes through mentorship. *Public Health Nurs* 1999;16:182–9. Gray JD, Cutler CA, Dean JG, Kempe CH. Prediction and prevention of child abuse and neglect. *Journal of Social Issues* 1979;35:127–39. Hardy JB, Street R. Family support and parenting education in the home: an effective extension of clinic-based preventive health care services for poor children. *J Pediatr* 1989;115:927–31. Honig AS, Morin C. When should programs for teen parents and babies begin? Longitudinal evaluation of a teen parents and babies program. *Journal of Primary Prevention* 2001;21:447–54. Huxley P, Warner R. Primary prevention of parenting dysfunction in high risk cases. *Am J Orthopsychiatry* 1993;63:582–8. Katzev A, Pratt C, Henderson T, McGuigan W. Oregon's Healthy Start effort: 1997–98 status report. Corvallis, OR: Oregon State University Family Policy Program, 1999. Kitzman H, Olds DL, Henderson Jr. CR, et al. Effect of prenatal and infancy home visitation by nurses on pregnancy outcomes, childhood injuries, and repeated childbearing: a randomized controlled trial. *JAMA* 1997;278:644–52. Larson CP. Efficacy of prenatal and postnatal home visits on child health and development. *Pediatrics* 1980;66:191–7. Marcenko MO, Spence M, Samost L. Outcomes of a home visitation trial for pregnant and postpartum women at-risk for child placement. *Children and Youth Services Review* 1996;18:243–59. Mulsow MH, Murry VM. Parenting on edge: economically stressed, single, African American adolescent mothers. *J Fam Issues* 1996;17:704–21. Olds DL, Eckenrode J, Henderson Jr. CR, et al. Long-term effects of home visitation on maternal life course and child abuse and neglect: fifteen-year follow-up of a randomized trial. *JAMA* 1997;278:637–43. Siegel E, Bauman KE, Schaefer ES, Saunders MM, Ingram DD. Hospital and home support during infancy: impact on maternal attachment, child abuse and neglect, and health care utilization. *Pediatrics* 1980;66:183–90. Velasquez J, Christensen M, Schommer B. Intensive services help prevent child abuse. *Am J Matern Child Nurs* 1984;9:113–7. Wagner MM, Clayton SL. The Parents as Teachers program: results from two demonstrations. *The Future of Children* 1999;9:91–115.

[†] **Sources:** Achenbach TM, Howell CT, Aoki MF, Rauh VA. Nine-year outcome of the Vermont intervention program for low birth weight infants. *Pediatrics* 1993;91:45–55. Lally JR, Mangione PL, Honig AS. The Syracuse University Family Development Research Program: long-range impact of an early intervention with low-income children and their families. In: Powell DR, Sigel IE, eds. *Parent education as early childhood intervention: emerging directions in theory, research and practice*. Norwood, NJ: Alex Publishing Corporation; 1988. Olds DL, Henderson Jr. CR, Cole R, et al. Long-term effects of nurse home visitation on children's criminal and antisocial behavior: 15-year follow-up of a randomized controlled trial. *JAMA* 1998;280:1238–44. St. Pierre RG, Layzer JI. Using home visits for multiple purposes: The Comprehensive Child Development Program. *The Future of Children* 1999;9:134–51.

[§] A finding that evidence is insufficient to determine effectiveness should not be interpreted as evidence of ineffectiveness. A finding of insufficient evidence assists in identifying 1) areas of uncertainty regarding effectiveness of an intervention and 2) specific continuing research needs. In contrast, evidence of ineffectiveness, or evidence of harm outweighing benefits, leads to a recommendation that the intervention not be used.

[¶] **Source:** Olds DL, Eckenrode J, Henderson Jr. CR, et al. Long-term effects of home visitation on maternal life course and child abuse and neglect: fifteen-year follow up of a randomized trial. *JAMA* 1997;278:637–43.

** **Source:** Eckenrode J, Ganzel B, Henderson CR, Jr, et al. Preventing child abuse and neglect with a program of nurse home visitation: the limiting effects of domestic violence. *JAMA* 2000; 284:1385–91.

observed. This likelihood is indicated by the findings from two studies reviewed (24,25) and introduces a bias against the hypothesis that home visitation reduces abuse or neglect (26).

Stratified analyses provide information that might be useful in program design. Programs delivered by professional visitors (nurses or mental health workers [with either post-high school education or experience in child development]) yielded more beneficial effects than did those delivered by paraprofessionals. Programs delivered by nurses demonstrated a median reduction in child abuse of 48.7% (interquartile range: 24.6%–89.0%); programs delivered by mental health workers demonstrated a median reduction in child abuse of 44.5% (interquartile range not calculable). For paraprofessional visitors, effects were mixed: the median reduction in child abuse was 17.7%, but the variability of the findings is reflected in the interquartile range of -41.2%–65.7%. In programs using paraprofessionals, beneficial effects were consistently evident only when programs were carried out for ≥ 2 years. No additional benefit of multicomponent home visitation programs over single component programs was apparent. Time of initiation of programs (i.e., pre- or postnatally) did not affect the reduction of subsequent child maltreatment. Evidence from the single study of the effects of home visitation on partner violence (23) indicated that home visitation might not prevent child maltreatment in the presence of ongoing partner violence. The studies on which these conclusions are based are listed (Table).

The only available cost-benefit analysis of a nurse home visitation program to reduce child maltreatment was based on a limited, government perspective (i.e., including only those costs and benefits incurred by the government) (27). In the whole study sample, costs exceeded economic benefits directly attributable to reduced child maltreatment services by \$3,000 per family. Including benefits beyond those of the government, such as averted health-care costs, productivity losses, and other costs to the victim, is likely to result in greater net benefits. Program cost estimates — largely dependent upon frequency of home visits and program duration — ranged from \$958 to \$8,000 per family (in 1997 dollars). In the study subsample of low-income mothers, the analysis showed a net benefit of \$350 per family (in 1997 dollars).

Research Needs

Most systematic reviews for the *Community Guide* acknowledge the need for additional research, either to answer questions posed by the review findings or to generate enough information on which to base findings. When the findings indicate that evidence is insufficient to determine effectiveness, as is the case for much of the current review, the need for a research agenda is particularly great. The team has

developed such an agenda, and will publish it, along with a full review of the evidence, in a supplement to the *American Journal of Preventive Medicine*.

Use of the Recommendation in States and Communities

Given the substantial burden of child maltreatment in the United States, and the importance of this problem both from public health and societal perspectives, the Task Force saw the need to specifically review the effectiveness of home visitation programs in reducing this and other forms of violence. The finding that these programs are effective in reducing child abuse and neglect should be relevant and useful in various settings.

The Task Force recommendation supporting early childhood home visitation interventions for prevention of child abuse and neglect in families at risk of maltreatment can be used to support, expand, and improve existing home visitation programs, and to initiate new ones. In selecting and implementing interventions, communities should carefully assess the need for such programs (e.g., the burden of child maltreatment) and clearly define the target populations. Home visitation programs included in this review were generally directed to those populations and families believed to benefit most from common program components, such as support in parenting and life skills, prenatal care, and case management. Target populations included teenage parents; single mothers; families of low socioeconomic status; families with very low birthweight infants; parents previously investigated for child maltreatment; and parents with alcohol, drug, or mental health problems. The population that might benefit is large. For example, in 1999, approximately 33% of the 4 million births in the United States were to single mothers, 12.2% were to women aged <20 years, and 22% were to mothers with less than a high school education; 43% of births — approximately 1.7 million — were to mothers with at least one of these characteristics (B. Hamilton, National Center for Health Statistics, CDC, personal communication, 2002).

Studies included in this review were conducted in a variety of geographic locations in the United States and Canada and in populations with various ethnic and cultural backgrounds. The available evidence on the effectiveness of home visiting programs of sufficient duration indicates benefit for population subgroups in greatest need, provided that appropriate care is taken to tailor programs to local circumstances. Because no study reviewed assessed the effectiveness of home visitation in preventing violence in the general population, the broader applicability of these programs (e.g., to the general population) is uncertain.

Public health professionals and policy makers should carefully consider the attributes and characteristics of the particular program to be chosen for implementation. Given the heterogeneity of home visitation programs in the United States, which differ in focus, curricula, duration, visitor qualifications, and target populations, no single optimal, effective, and cost-effective approach could be defined for the multiplicity of possible outcomes, settings, and target populations. However, the robust findings across a spectrum of program characteristics increase confidence that these programs can be effective in a range of circumstances and reduce concern that effectiveness hinges on particular characteristics of one intervention or one context.

The Task Force found insufficient evidence to determine the effectiveness of early childhood home visitation in preventing violence by visited children and between adults. This conclusion does not imply that the intervention is ineffective in preventing these outcomes. Rather, the finding reflects a lack of enough high-quality studies with long enough follow-up periods to make a determination. These areas merit further research.

This review considered only studies that evaluated violent outcomes. Home visiting may also affect other outcomes. Other studies have reported many other desirable outcomes of early home visitation (11,28), including health benefits for premature, low birthweight infants and for disabled and chronically ill children as well as long-term benefits, including reductions in need for public support of visited mothers, particularly single mothers of low socioeconomic status. However, all home visiting programs are not equal. Some are narrowly focused, oriented, for example, only toward improving vaccination coverage (29). Others might influence a broader range of outcomes. Program selection and design should consider the range of options relevant to the particular communities. To meet local objectives, recommendations and other evidence provided in the *Community Guide* should be used in the context of local information — resource availability; administrative structures; and the economic and social environments of communities, neighborhoods, and health-care systems.

In conclusion, this review, along with the accompanying recommendation from the Task Force on Community Preventive Services, should prove a useful and powerful tool for public health policy makers, for program planners and implementers, and for researchers. It may help to secure interest, resources, and commitment for implementing these interventions, and will provide direction and scientific questions for additional empirical research in this area, which will further improve the effectiveness and efficiency of these programs.

Additional Information Regarding the Community Guide

In addition to the early childhood home visitation intervention reviewed in this report, reviews have been completed for eight firearms laws (30), and for therapeutic foster care to prevent violence. Reviews of several other violence prevention interventions are pending or under way, including those on the treatment of juveniles as adults in the justice system and on school-based social and emotional skill learning programs.

Community Guide reviews are prepared and released as each is completed. Findings from systematic reviews on vaccine-preventable diseases, tobacco-use prevention and reduction, motor vehicle occupant injury, physical activity, diabetes, oral health, and the social environment have already been published. A compilation of systematic reviews will be published in book form in 2004. Additional information regarding the Task Force, the *Community Guide*, and a list of published articles is available on the Internet at <http://www.thecommunityguide.org>.

References

1. CDC. Rates of homicide, suicide, and firearm-related death among children—26 industrialized countries. *MMWR* 1997;46:101–5.
2. Snyder HN, Sickmund M. Juvenile offenders and victims: 1999 national report. Washington, DC: U.S. Department of Justice, Office of Juvenile Justice and Delinquency Prevention, 1999. Available at <http://www.ncjrs.org/html/ojjdp/nationalreport99/toc.html>.
3. National Research Council. Understanding child abuse and neglect. Washington, DC: National Academy Press, 1993.
4. Sedlak AJ, Broadhurst DD. Third national incidence study of child abuse and neglect. Washington, DC: U.S. Department of Health and Human Services, Administration for Children and Families, National Center on Child Abuse and Neglect, 1996. Available at <http://www.calib.com/nccanch/pubs/statinfo/nis3.cfm>.
5. Kelley BT, Thornberry TP, Smith CA. In the wake of child maltreatment. *Juvenile Justice Bulletin*. Washington, DC: US Department of Justice, Office of Juvenile Justice and Delinquency Prevention, August 1997.
6. Youth violence: a report of the Surgeon General. Washington, DC: US Department of Health and Human Services, 2001. Available at <http://www.surgeongeneral.gov/library/youthviolence/youthvioreport.htm>.
7. Dodge KA, Bates JE, Pettit GS. Mechanisms in the cycle of violence. *Science* 1990;250:1678–83.
8. Eberhardt MS, Ingram DD, Makuc DM, et al. Health, United States, 2001. Urban and rural chartbook. Hyattsville, Maryland: US Department of Health and Human Services, CDC, National Center for Health Statistics, 2001.
9. Rennison CM. Intimate partner violence, 1993–2001. US Department of Justice: Bureau of Justice Statistics Crime Data Brief; NCJ 197838, 2003. Available at <http://www.ojp.usdoj.gov/bjs/abstract/jpv01.htm>.
10. Violence against women. Relevance for medical practitioners [comment]. *JAMA* 1992;267:3194–5.
11. Yoshikawa H. Long-term effects of early childhood programs on social outcomes and delinquency. *Future of Children* 1995;5:51–75.

12. Barnett WS. Long-term effects of early childhood programs on cognitive and school outcomes. *Future of Children* 1995;5:25–50.
13. Kamerman SB, Kahn AJ. Home health visiting in Europe. *Future of Children* 1993;3:39–52.
14. Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based *Guide to Community Preventive Services* —methods. *Am J Prev Med* 2000;18(1S):35–43.
15. Carande-Kulis VG, Maciosek MV, Briss PA, et al. Methods for systematic reviews of economic evaluations for the *Guide to Community Preventive Services*. *Am J Prev Med* 2000;18(1S):75–91.
16. US Department of Health and Human Services. *Healthy people 2010*. 2nd. ed. With understanding and improving health and objectives for improving health (2 vols). Washington, DC: US Department of Health and Human Services, 2000. Available at <http://www.health.gov/healthy-people>.
17. Zaza S, Wright-de Agüero L, Briss PA, et al. Data collection instrument and procedure for systematic reviews in the *Guide to Community Preventive Services*. *Am J Prev Med* 2000;18(1S):44–74.
18. Olds DL, Henderson CR, Jr, Cole R, et al. Long-term effects of nurse home visitation on children's criminal and antisocial behavior: 15-year follow-up of a randomized controlled trial. *JAMA* 1998;280:1238–44.
19. Lally JR, Mangione PL, Honig AS. The Syracuse University Family Development Research Program: long-range impact of an early intervention with low-income children and their families. In: Powell DR, ed. *Parent education as early childhood intervention: emerging directions in theory, research and practice*. Norwood, NJ: Alex Publishing Corporation, 1988:79–104.
20. Achenbach TM, Howell CT, Aoki MF, Rauh VA. Nine-year outcome of the Vermont intervention program for low birth weight infants. *Pediatrics* 1993;91:45–55.
21. St.Pierre RG, Layzer JI. Using home visits for multiple purposes: The Comprehensive Child Development Program. *Future of Children* 1999;9:134–51.
22. Olds DL, Eckenrode J, Henderson Jr. CR, et al. Long-term effects of home visitation on maternal life course and child abuse and neglect: fifteen-year follow-up of a randomized trial. *JAMA* 1997;278:637–43.
23. Eckenrode J, Ganzel B, Henderson. CR, Jr, et al. Preventing child abuse and neglect with a program of nurse home visitation: the limiting effects of domestic violence. *JAMA* 2000;284:1385–91.
24. Brayden RM, Altemeier WA, Dietrich MS, et al. A prospective study of secondary prevention of child maltreatment. *J Pediatr* 1993;122:511–6.
25. Dawson P, van Doornick WJ, Robinson JL. Effects of home-based, informal social support on child health. *Dev Behav Pediatr* 1989;10:63–7.
26. Olds DL, Henderson Jr. CR, Kitzman H, Cole R. Effects of prenatal and infancy home nurse visitation on surveillance of child maltreatment. *Pediatrics* 1995;95:365–72.
27. Olds DL, Henderson CR, Jr, Phelps C, Kitzman H, Hanks C. Effect of prenatal and infancy nurse home visitation on government spending. *Med Care* 1993;31:155–74.
28. Olds DL, Hill P, Robinson JL, Song N, Little C. Update on home visiting for pregnant women and parents of young children. *Curr Probl Pediatr* 2000;30:105–48.
29. Briss PA, Rodewald LE, Hinman AR, et al. Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. *Am J Prev Med* 2000;18(1S):97–140.
30. CDC. First reports evaluating the effectiveness of strategies for preventing violence: firearms legislation. Findings from the Task Force on Community Preventive Services. *MMWR* 2003;52(No. RR-14):11–20.

First Reports Evaluating the Effectiveness of Strategies for Preventing Violence: Firearms Laws

Findings from the Task Force on Community Preventive Services

Prepared by
 Robert A. Hahn, Ph.D.¹
 Oleg O. Bilukha, M.D., Ph.D.¹
 Alex Crosby, M.D.²
 Mindy Thompson Fullilove, M.D.³
 Akiva Liberman, Ph.D.⁴
 Eve K. Moscicki, Sc.D.⁵
 Susan Snyder, Ph.D.¹
 Farris Tuma, Sc.D.⁵
 Peter Briss, M.D.¹

¹*Division of Prevention Research and Analytic Methods
 Epidemiology Program Office*

²*Division of Violence Prevention
 National Center for Injury Prevention and Control, CDC
 Atlanta, Georgia*

³*New York State Psychiatric Institute, Columbia University
 New York, New York*

⁴*National Institute of Justice
 U.S. Department of Justice
 Washington, D.C.*

⁵*National Institute of Mental Health
 National Institutes of Health
 Bethesda, Maryland*

Summary

During 2000–2002, the Task Force on Community Preventive Services (the Task Force), an independent nonfederal task force, conducted a systematic review of scientific evidence regarding the effectiveness of firearms laws in preventing violence, including violent crimes, suicide, and unintentional injury. The following laws were evaluated: bans on specified firearms or ammunition, restrictions on firearm acquisition, waiting periods for firearm acquisition, firearm registration and licensing of firearm owners, “shall issue” concealed weapon carry laws, child access prevention laws, zero tolerance laws for firearms in schools, and combinations of firearms laws. The Task Force found insufficient evidence to determine the effectiveness of any of the firearms laws or combinations of laws reviewed on violent outcomes. (Note that insufficient evidence to determine effectiveness should not be interpreted as evidence of ineffectiveness.) This report briefly describes how the reviews were conducted, summarizes the Task Force findings, and provides information regarding needs for future research.

Background

Although firearms-related* injuries in the United States have declined since 1993, they remained the second leading cause of injury mortality in 2000, the most recent year for which complete data are available (1). Of 28,663 firearms-related

deaths in 2000 — an average of 79 per day—16,586 (57.9%) were suicides, 10,801 (37.7%) were homicides, 776 (2.7%) were unintentional, and an additional 500 (1.7%) were legal interventions or of undetermined intent.

An estimated 24.3% of the 1,430,693 violent crimes (murder, aggravated assault, rape, and robbery) committed in the United States in 1999 were committed with a firearm (2). In the early 1990s, rates of firearms-related homicide, suicide, and unintentional death in the United States exceeded those of 25 other high-income nations (i.e., 1992 gross national product US \$8,356 per capita) for which data are available (3). In 1994, the estimated lifetime medical cost of all firearms injuries in the United States was \$2.3 billion (4).

*A firearm is a weapon (e.g., a handgun, rifle, or shotgun) in which a shot is propelled by gunpowder.

The material in this report was prepared by the Epidemiology Program Office, Stephen B. Thacker, M.D., Director; Division of Prevention Research and Analytic Methods, Richard E. Dixon, M.D., Director.

Approximately 4.5 million new firearms are sold each year in the United States, including 2 million handguns. In addition, estimates of annual secondhand firearms transactions (i.e., sales, trades, or gifts) range from 2 million to 4.5 million (5,6). Further, an estimated 0.5 million firearms are stolen annually (6). Thus, the total number of firearms transactions could be as high as 9.5 million per year.

The 1994 National Survey of the Private Ownership of Firearms (NSPOF), conducted by Chilton Research Services for the Police Foundation, under sponsorship of the National Institute of Justice, indicated that American adults owned approximately 192 million working firearms, an average of one per adult (7). The NSPOF also indicated that firearm ownership was unevenly distributed in the population: only 24.6% of U.S. adults owned a firearm (41.8% of men and 9.0% of women). Another survey (2) found that 41% of adult respondents reported having a firearm in their home in 1994, and 35% did so in 1998. A third survey (8) reported that 35% of homes with children aged <18 years had at least one firearm. Rates of firearm ownership in the United States also exceed those of 14 other nations for which data are available, with the exception of Finland (9).

Of the estimated 192 million firearms owned in the United States at the time of the 1994 NSPOF survey, 65 million were handguns; 70 million, rifles; 49 million, shotguns; and the remainder were other guns (7). Among handgun owners, 34.0% kept their guns loaded and unlocked. An estimated 10 million handguns, one sixth of the handguns owned, were regularly carried by their owners, approximately half in the owners' cars and the other half on the owners' persons.

The manufacture, distribution, sale, acquisition, storage, transportation, carrying, and use of firearms in the United States are regulated by a complex array of federal, state, and local laws and regulations. This review examines firearms laws as one of many approaches to reducing firearms violence (10,11).

Introduction

The independent, nonfederal Task Force on Community Preventive Services (the Task Force) is developing the *Guide to Community Preventive Services* (the *Community Guide*) with the support of the U.S. Department of Health and Human Services (DHHS) in collaboration with public and private partners. Although CDC provides staff support to the Task Force for development of the *Community Guide*, the conclusions presented in this report were developed by the Task Force and are not necessarily the conclusions of DHHS or CDC.

This report is one in a series of topics included in the *Community Guide*, a resource that includes multiple systematic reviews, each focusing on a preventive health topic. A short

overview of the process used by the Task Force to select and review evidence and summarize its findings is included in this report. A full report on the findings and additional evidence (including discussions of possible additional benefits, potential harms, existing data problems, research gaps, and directions for future research) will be published in the *American Journal of Preventive Medicine*.

Methods

The *Community Guide's* methods for conducting systematic reviews and linking evidence to recommendations have been described elsewhere (12). In brief, for each *Community Guide* topic, a multidisciplinary team (the systematic review development team) conducts a review consisting of the following steps:

- developing an approach to organizing, grouping, and selecting the interventions to be reviewed;
- systematically searching for and retrieving evidence;
- assessing the quality of and summarizing the strength of the body of evidence of effectiveness;
- assessing cost and cost-effectiveness evidence, identifying applicability and barriers to implementation (if the effectiveness of the intervention has been established);
- summarizing information regarding evidence of other effects; and
- identifying and summarizing research gaps.

Firearms laws were identified as high-priority interventions for violence prevention review in April 1997 by a group of consultants[†] representing diverse experience. The group generated a comprehensive list of strategies and created a priority list of interventions for review on the basis of 1) the potential to reduce violence in the U.S. population; 2) the potential benefits of expanding use of seemingly effective, but underutilized, interventions and reducing use of seemingly

[†] Consultants for the systematic reviews of violence prevention interventions were Laurie Anderson, Ph.D., CDC, Olympia, Washington; Carl Bell, M.D., Community Mental Health Council, Chicago, Illinois; Red Crowley, Men Stopping Violence, Atlanta, Georgia; Sujata Desai, Ph.D., CDC, Atlanta, Georgia; Deborah French, Colorado Department of Public Health and Environment, Denver, Colorado; Darnell F. Hawkins, Ph.D., J.D., University of Illinois at Chicago, Chicago, Illinois; Danielle LaRaue, M.D., Harlem Hospital Center, New York, New York; Barbara Maciak, Ph.D., CDC, Detroit, Michigan; James Mercy, Ph.D., CDC, Atlanta, Georgia; Suzanne Salzinger, Ph.D., New York State Psychiatric Institute, New York, New York; Patricia Smith, M.S., Michigan Department of Community Health, Lansing, Michigan. Other aspects of this review benefited by comments from Phillip Cook, Ph.D., Duke University, Durham, North Carolina; Gary Kleck, Ph.D., School of Criminology and Criminal Justice, Florida State University, Tallahassee, Florida; Jon Vernick, Ph.D., Johns Hopkins University, Baltimore, Maryland; Daniel Webster, Sc.D., Johns Hopkins University, Baltimore, Maryland; James Wright, Ph.D., University of Central Florida, Orlando, Florida; Frank Zimring, J.D., University of California, Berkeley, California.

ineffective, but overutilized, interventions; 3) current interest in this intervention among potential audiences; and d) diversity of intervention types.

The interventions included in this review address several of the objectives outlined in *Healthy People 2010* (13), the disease prevention and health promotion agenda for the United States. Many of the *Healthy People 2010* objectives outlined in Chapter 15, “Injury and Violence Prevention,” relate to firearms laws and their proposed effects on violence-related outcomes (Box).

To be included in the review of effectiveness, studies had to 1) be a primary evaluation of the selected intervention rather than, for example, a guideline or review; 2) provide information on at least one outcome of interest from the list of violent outcomes preselected by the systematic review development team; 3) be conducted in Established Market Economies[§]; and 4) compare outcomes in groups of persons exposed to the intervention with outcomes in groups of persons not exposed or less exposed to the intervention (whether the comparison was concurrent between groups or before-and-after within the same group).

Electronic searches for any research published before July 2001 were conducted in MEDLINE, EMBASE, ERIC, National Technical Information Service (NTIS), PsychINFO, Sociological Abstracts, National Criminal Justice Reference Service (NCJRS), Public Affairs Information Service (PAIS), Criminal Justice Index, and Gale Group Legal Research Index.[¶] The references listed in all retrieved articles were also reviewed, and specialists on the systematic review development team and elsewhere were consulted to identify additional reports. Journal articles, government reports, books, and book chapters were included in this review.

[§]Established Market Economies as defined by the World Bank are Andorra, Australia, Austria, Belgium, Bermuda, Canada, Channel Islands, Denmark, Faeroe Islands, Finland, France, Germany, Gibraltar, Greece, Greenland, Holy See, Iceland, Ireland, Isle of Man, Italy, Japan, Liechtenstein, Luxembourg, Monaco, the Netherlands, New Zealand, Norway, Portugal, San Marino, Spain, St. Pierre and Miquelon, Sweden, Switzerland, the United Kingdom, and the United States.

[¶]These databases can be accessed as follows: MEDLINE: <http://www.ncbi.nlm.nih.gov/PubMed>; EMBASE: DIALOG <http://www.dialogclassic.com> (requires id/password account), ScienceDirect: <http://www.sciencedirect.com/science/search/database/embase>; ERIC: <http://www.askeric.org/Eric/>; NTIS: DIALOG <http://www.dialogclassic.com> (requires id/password account), <http://grc.ntis.gov/ntisdb.htm>; PsychINFO: DIALOG <http://www.dialogclassic.com> (requires id/password account), <http://www.apa.org/psycinfo/products/psycinfo.html>; Sociological Abstracts: DIALOG <http://dialogclassic.com> (requires id/password account), <http://www.csa.com/detailsV5/socioabs.html>; NCJRS: http://abstractsdb.ncjrs.org/content/AbstractsDB_Search.asp; PAIS: DIALOG <http://dialogclassic.com> (requires id/password account); Criminal Justice index: DIALOG <http://dialogclassic.com> (requires id/password account); Gale Group Legal Research Index: DIALOG <http://dialogclassic.com> (requires id/password account); CINAHL: DIALOG <http://www.dialogclassic.com> (requires id/password account), <http://www.cinahl.com/wpages/login.htm>.

BOX. Selected *Healthy People 2010** objectives potentially affected by firearms laws

Injury Prevention

- Reduce firearm-related deaths from 11.3 to 4.1 per 100,000 population[†] (Objective 15-3).
- Reduce the proportion of persons living in homes with firearms that are loaded and unlocked from 19% to 16%[†] (Objective 15-4).
- Reduce nonfatal firearm-related injuries from 24.0 (in 1997) to 8.6 per 100,000 population (Objective 15-5).

Unintentional Injury Prevention

- Reduce deaths caused by unintentional injuries from 35.0 to 17.5 per 100,000 population[†] (Objective 15-13).
- (Developmental) Reduce nonfatal unintentional injuries (Objective 15-14).

Violence and Abuse Prevention

- Reduce homicides from 6.5 to 3.0 per 100,000 population[†] (Objective 15-32).
- Reduce the rate of physical assault by current or former intimate partners from 4.4 (in 1998) to 3.3 per 1,000 persons aged ≥ 12 years (Objective 15-34).
- Reduce the annual rate of rape or attempted rape from 0.8 (in 1998) to 0.7 per 1,000 persons aged ≥ 12 years (Objective 15-35).
- Reduce sexual assault other than rape from 0.6 (in 1998) to 0.4 per 1,000 persons aged ≥ 12 years (Objective 15-36).
- Reduce physical assaults from 31.1 (in 1998) to 13.6 per 1,000 persons aged ≥ 12 years (Objective 15-37).
- Reduce weapon carrying by adolescents on school property from 6.9% (in 1999) to 4.9% (students in grades 9 through 12, carrying during the past 30 days) (Objective 15-39).

* Source: US Department of Health and Human Services. *Healthy people 2010*. 2nd ed. With *Understanding and Improving Health and Objectives for Improving Health* (2 vols). Washington, DC: US Department of Health and Human Services, 2000.

[†] Baseline: 1998 data, age adjusted to the year 2000 standard population.

Because the purpose of this review was to assess the effectiveness of firearms laws in preventing violence, studies of firearms laws were reviewed only if they assessed at least one violent outcome. The outcome measures evaluated to determine the effect of each intervention were violent crimes (i.e., murder, aggravated assault, robbery, and rape), suicide, and unintentional firearm injury. Aggravated assault was considered a health-related outcome insofar as it is “an unlawful attack by one person upon another for the purpose of inflicting severe or aggravated bodily injury” (2). Similarly, robbery was considered a health-related outcome insofar as it is “the taking or attempting to take

anything of value from the care, custody, or control of a person or persons by force or threat of force or violence or by putting the victim in fear" (2). For each of the firearms laws, the team developed an analytic framework indicating possible causal links between that intervention and one or more of the predefined outcomes of interest.

Each study meeting the inclusion criteria was evaluated with a standardized abstraction form (14) and was assessed for suitability of study design and threats to validity (12). On the basis of the number of threats to validity, studies were characterized as having good, fair, or limited execution. Results for each outcome of interest were obtained from each study that met the minimum quality criteria. Measures that were adjusted for the effects of potential confounders were used in preference to crude effect measures. If two or more studies of a firearms law overlapped in terms of population, time period, and outcomes studied, the systematic review development team chose the study with the fewest execution flaws and the best design to represent effects of the intervention.

A median was calculated as a summary effect measure for each outcome of interest. For bodies of evidence consisting of seven or more studies, an interquartile range was calculated as an index of variability. Unless otherwise noted, the results of each study were represented as a point estimate for the relative change in the violent outcome rate associated with the intervention.

The body of evidence of effectiveness was characterized as strong, sufficient, or insufficient on the basis of the number of available studies, the suitability of study designs for evaluating effectiveness, the quality of execution of the studies, the consistency of the results, and the median effect size (12).

The *Community Guide* uses systematic reviews to evaluate the evidence of intervention effectiveness, and the Task Force makes recommendations based on the findings of these reviews. The strength of each recommendation is based on the strength of the evidence of effectiveness (i.e., the Task Force can recommend an intervention [or recommend against its use] on the basis of strong evidence of effectiveness or sufficient evidence of effectiveness** [12]). Other types of evidence can also affect a recommendation. For example, evidence that harms from an intervention outweigh improved outcomes might lead to a recommendation against use of the intervention. If interventions are found to be effective, they are evaluated for cost

effectiveness by using economic evaluation guidelines developed for the *Community Guide* (15). Because none of the firearm laws reviewed was found to have sufficient evidence to draw conclusions regarding their effectiveness, no economic reviews were conducted.

A finding of insufficient evidence to determine effectiveness should not be interpreted as evidence of ineffectiveness but rather as an indicator that additional research is needed before an intervention can be evaluated for its effectiveness.

Results

The systematic review development team identified 51 studies that evaluated the effects of selected firearms laws on violence and met the inclusion criteria for this review. No study was excluded because of limitations in design or execution. Information on violent outcomes was available in 48 studies, and the remaining three studies, which provided information on counts or proportions of regulated firearms used in crime, were used as supplementary evidence. Several studies examined more than one type of firearm law.

Several separate studies evaluated effects of the same law in the same populations during overlapping time periods. Such studies were considered nonindependent, and effect estimates from the best study in the group (as determined by the quality of design and execution and the length of the follow-up period) were chosen to represent the effects of the intervention. The total number of studies for each intervention, and the number of studies that actually contributed effect estimates to the body of evidence, are listed (Table). More extensive evidence tables will be available at <http://www.thecommunityguide.org> when the full evidence review is published.

Evidence was insufficient to determine the effectiveness of any of these laws for the following reasons.

- **Bans on specified firearms or ammunition.** Results of studies of firearms and ammunition bans were inconsistent: certain studies indicated decreases in violence associated with bans, and others indicated increases. Several studies found that the number of banned guns retrieved after a crime declined when bans were enacted, but these studies did not assess violent consequences (16,17). Studies of the 1976 Washington, D.C. handgun ban yielded inconsistent results (18–20). Bans often include “grandfather” provisions, allowing ownership of an item if it is acquired before the ban, complicating an assessment of causality. Finally, evidence indicated that sales of firearms to be banned might increase in the period before implementation of the bans (e.g., the Assault Weapons Ban of 1994) (21).

**At the June 2002 meeting of the Task Force on Community Preventive Services, new terminology was adopted to reflect the findings of the Task Force. Instead of being referred to as “strongly recommended” and “recommended,” such interventions are now referred to as “recommended (strong evidence of effectiveness)” and “recommended (sufficient evidence of effectiveness),” respectively. Similarly, the finding previously referred to as “insufficient evidence” is now more fully stated: “insufficient evidence to determine effectiveness.” These changes were made to improve the clarity and the intent of the findings.

TABLE. Findings of the Task Force on Community Preventive Services regarding firearms laws and prevention of violence

Intervention (No. of studies contributing effect estimates)	Task force finding	Intervention description	Key findings
Bans on specified firearms or ammunition (6)*	Insufficient evidence to determine effectiveness [†]	Prohibit acquisition or possession of certain categories of firearms (e.g., machine guns or assault weapons) or ammunition (e.g., large-capacity magazines). Can also include prohibitions on the manufacture of the specified firearms. Often “grandfather” guns acquired before ban.	Evidence insufficient because of small numbers of studies, inconsistent evidence of effectiveness, and limitations in execution of available studies. Studies of Washington, D.C. handgun ban produced conflicting results that could not be resolved. Bans may lead to pre-ban increases in sales of firearms to be banned.
Restrictions on firearm acquisition (4) [§]	Insufficient evidence to determine effectiveness [†]	Prohibit purchase of firearms by persons with specified characteristics thought to indicate high risk of illegal or other harmful use. Restriction characteristics include criminal histories (e.g., felony conviction or indictment, domestic violence restraining order, fugitive of justice, conviction on drug charges), personal histories (e.g., adjudicated to be “mentally defective,” illegal immigrant, dishonorable military discharge), or other characteristics (e.g., juvenile).	Evidence insufficient because of small numbers of studies, inconsistent evidence of effectiveness, and limitations in design and execution of available studies. Record systems for assessing restriction histories of firearms purchase applicants are lacking, especially for restriction histories other than felony.
Waiting periods for firearm acquisition (7) [¶]	Insufficient evidence to determine effectiveness [†]	Require that the acquisition of a firearm be delayed for a specified period after application for firearm acquisition is filed. Requirement is usually imposed to allow time for a background check on prospective purchaser or to provide “cooling-off” period for persons at risk of committing suicide or an impulsive crime against others.	Evidence insufficient because of small numbers of studies, inconsistent evidence of effectiveness, and limitations in design and execution of available studies. Apparent reduction in rates of firearms suicide among persons aged >55 years, associated with the interim Brady Law, is attributable to waiting period in the interim law.
Firearm registration and licensing of firearm owners			
Registration of firearms (2)**	Insufficient evidence to determine effectiveness [†]	Record of owner of specified firearms must be created and retained.	Evidence insufficient because of small numbers of studies and limitations in the design and execution of available studies.
Licensing of firearm owners (5) ^{††}	Insufficient evidence to determine effectiveness [†]	License or other form of authorization or certification is required for purchase or possession of a firearm.	Evidence insufficient because of small numbers of studies, inconsistent evidence of effectiveness, and limitations in design and execution of available studies.
“Shall issue” concealed weapon carry laws (9) ^{§§}	Insufficient evidence to determine effectiveness [†]	Require issuing of concealed weapon carry permit to all applicants not disqualified by specified criteria. Usually implemented in place of “may issue” laws, in which issuing of a concealed weapon carry permit is discretionary (based on criteria such as perceived need or moral character of applicant).	Evidence insufficient because of critical flaws in quality of data used in the majority of studies and limitations in execution of available studies.
Child access prevention laws (3) ^{¶¶}	Insufficient evidence to determine effectiveness [†]	Designed to limit child access to, and use of, firearms kept in homes. Require owners to store firearms locked or unloaded and make the firearm owner liable when children use or threaten to use a household firearm to harm themselves or another.	Evidence insufficient because of small numbers of studies, inconsistent evidence of effectiveness, and limitations in execution of available studies. Inappropriate outcome measures used in studies (e.g., rates of juvenile victimization rather than perpetration of firearm violence by juveniles).
Zero tolerance laws for firearms in schools (1) ^{***}	Insufficient evidence to determine effectiveness [†]	Require that participating schools expel for at least 1 year students found carrying a gun in school. Local modifications possible for individual students.	Evidence insufficient because of absence of relevant studies; no studies evaluated violent outcomes of zero-tolerance laws. Possible violent and other harmful consequences of expulsion.
Combinations of laws			
Comprehensive national law studies (2) ^{†††}	Insufficient evidence to determine effectiveness [†]	Comprehensive firearm laws that include more than one kind of legislation.	Evidence insufficient because of small numbers of independent studies, inconsistent evidence of effectiveness, and limitations in study execution.
International comparative studies (3) ^{§§§}	Insufficient evidence to determine effectiveness [†]	Cross-national comparisons examining differences in an existing sum of national firearm laws.	Evidence insufficient because of small numbers of studies, inconsistent evidence of effectiveness, and limitations in the execution of available studies. Difficult to control confounding.
Studies that use the index of overall law restrictiveness (6) ^{¶¶¶}	Insufficient evidence to determine effectiveness [†]	Use a derived measure of overall restrictiveness of existing firearm laws a basis for comparison.	Evidence insufficient because of inconsistent evidence of effectiveness and limitations in execution of available studies. As conducted, index studies would not indicate which laws are effective (or ineffective) in which combinations.

TABLE. (Continued) Findings of the Task Force on Community Preventive Services regarding firearms laws and prevention of violence

- * **Sources:** Britt CL, Bordua DJ, Kleck G. A reassessment of the D.C. gun law: some cautionary notes on the use of interrupted time series designs for policy impact assessment. *Law Soc Rev* 1996;30:361–80. Kleck G, Patterson EB. The impact of gun control and gun ownership levels on violence rates. *J Quant Criminol* 1993;9:249–87. Loftin C, McDowall D, Wiersma B, Cottey TJ. Effects of restrictive licensing of handguns on homicide and suicide in the District of Columbia. *N Engl J Med* 1991;325:1615–20. Roth JA, Koper CS. Impacts of the 1994 Assault Weapons Ban: 1994–1996. Washington, DC: US Department of Justice, 1999. Vernick JS, Webster DW, Hepburn LM. Effects of Maryland's law banning Saturday night special handguns on crime guns. *Inj Prev* 1999;5:259–63. Weil DS, Knox RC. The Maryland ban on the sale of assault pistols and high-capacity magazines: estimating the impact in Baltimore. *Am J Public Health* 1997;87:297–8.
- † A determination that evidence is insufficient should not be interpreted as evidence of ineffectiveness. A determination of insufficient evidence assists in identifying 1) areas of uncertainty regarding effectiveness of an intervention, and 2) specific continuing research needs. In contrast, evidence of ineffectiveness or evidence of harm outweighing benefit leads to a recommendation against use of the intervention.
- § **Sources:** Kleck G, Patterson EB. The impact of gun control and gun ownership levels on violence rates. *J Quant Criminol* 1993;9:249–87. Ludwig J, Cook PJ. Homicide and suicide rates associated with implementation of the Brady Handgun Violence Prevention Act. *JAMA* 2000;284:585–91. Wintemute GJ, Wright MA, Drake C, Beaumont JJ. Subsequent criminal activity among violent misdemeanants who seek to purchase handguns. *JAMA* 2001;285:1019–26. Wright MA, Wintemute GJ, Rivara FP. Effectiveness of denial of handgun purchase to persons believed to be at high risk for firearm violence. *Am J Public Health* 1999;89:88–90.
- ¶ **Sources:** Cantor CH, Slater PJ. The impact of firearm control legislation on suicide in Queensland: preliminary findings. *Med J Aust* 1995;162:583–5. DeZee MR. Gun control legislation: impact and ideology. *Law Policy Q* 1983;5:367–79. Kleck G, Patterson EB. The impact of gun control and gun ownership levels on violence rates. *J Quant Criminol* 1993;9:249–87. Lott JR, Whitley JE. Safe-storage gun laws: accidental deaths, suicides, and crime. *J Law Econ* 2001;44:659–90. Ludwig J, Cook PJ. Homicide and suicide rates associated with implementation of the Brady Handgun Violence Prevention Act. *JAMA* 2000;284:585–91. Magaddino JP, Medoff MH. An empirical analysis of federal and state firearm control laws. In: Kates DB, ed. *Firearms and violence*. Cambridge, MA: Ballinger Publishing Company, 1984:225–58. Murray D. Handguns, gun control laws and firearm violence. *Soc Probl* 1975;23:81–92.
- ** **Sources:** Kleck G, Patterson EB. The impact of gun control and gun ownership levels on violence rates. *J Quant Criminol* 1993;9:249–87. Webster DW, Vernick JS, Hepburn LM. Relationship between licensing, registration, and other gun sales laws and the source state of crime guns. *Inj Prev* 2001;7:184–9.
- †† **Sources:** DeZee MR. Gun control legislation: impact and ideology. *Law Policy Q* 1983;5:367–79. Kleck G, Patterson EB. The impact of gun control and gun ownership levels on violence rates. *J Quant Criminol* 1993;9:249–87. Magaddino JP, Medoff MH. An empirical analysis of federal and state firearm control laws. In: Kates DB, ed. *Firearms and violence*. Cambridge, MA: Ballinger Publishing Company, 1984:225–58. Murray D. Handguns, gun control laws and firearm violence. *Soc Probl* 1975;23:81–92. Webster DW, Vernick JS, Hepburn LM. Relationship between licensing, registration, and other gun sales laws and the source state of crime guns. *Inj Prev* 2001;7:184–9.
- §§ **Sources:** Black DA, Nagin D. Do right-to-carry laws deter violent crime? *J Leg Stud* 1998;27:209–19. Kleck G, Patterson EB. The impact of gun control and gun ownership levels on violence rates. *J Quant Criminol* 1993;9:249–87. Lott JR. More guns, less crime: understanding crime and gun-control laws, 2nd edition. Chicago: University of Chicago Press, 2000. Ludwig J. Concealed-gun-carrying laws and violent crime: evidence from state panel data. *Int Rev Law Econ* 1998;18:239–54. McDowall D, Loftin C, Wiersma B. Easing concealed firearms laws: effects on homicide in three states. *J Criminal Law Criminol* 1995;86:193–206. Moody CE. Testing for the effects of concealed weapons laws: specification errors and robustness. *J Law Econ* 2001;44:799–813. Mustard DB. The impact of gun laws on police deaths. *J Law Econ* 2001;44:635–58. Olson DE, Maltz MD. Right-to-carry concealed weapon laws and homicide in large U.S. counties: the effect on weapon types, victim characteristics, and victim-offender relationship. *J Law Econ* 2001;44:747–70. Plassmann F, Tideman TN. Does the right to carry concealed handguns deter countable crimes? Only a count analysis can say. *J Law Econ* 2001;44:771–98.
- ¶¶ **Sources:** Cummings P, Koepsell TD, Grossman DC, Savarino J, Thompson RS. The association between the purchase of a handgun and homicide or suicide. *Am J Public Health* 1997;87(6):974–8. Lott JR, Whitley JE. Safe-storage gun laws: accidental deaths, suicides, and crime. *J Law Econ* 2001;44:659–90. Webster DW, Starnes M. Reexamining the association between child access prevention gun laws and unintentional shooting deaths of children. *Pediatrics* 2000;106:1466–9.
- *** **Source:** CDC. Violence-related attitudes and behaviors of high school students—New York City, 1992. *MMWR* 1993;42:773–7.
- ††† **Sources:** Magaddino JP, Medoff MH. An empirical analysis of federal and state firearm control laws. In: Kates DB, ed. *Firearms and violence*. Cambridge, MA: Ballinger Publishing Company; 1984:225–58. Department of Justice Canada. A statistical analysis of the impacts of the 1977 firearms control legislation. Ottawa, Ontario: Department of Justice Canada, Programme Evaluation Section, 1996.
- §§§ **Sources:** Centerwall BS. Homicide and the prevalence of handguns: Canada and the United States, 1976 to 1980. *Am J Epidemiol* 1991;134:1245–60. Sloan JH, Kellermann AL, Reay DT, et al. Handgun regulations, crime, assaults, and homicide: a tale of two cities. *N Engl J Med* 1988;319:1256–62. Sloan JH, Rivara FP, Reay DT, Ferris JAJ, Path MRC, Kellermann AL. Firearm regulations and rates of suicide: a comparison of two metropolitan areas. *N Engl J Med* 1990;322:369–73.
- ¶¶¶ **Sources:** Boor M, Blair JH. Suicide rates, handgun control laws, and sociodemographic variables. *Psychol Rep* 1990;66:923–30. Geisel M, Roll R, Wettick R. The effectiveness of state and local regulation of handguns. *Duke Law J* 1969;43:647–73. DeZee MR. Gun control legislation: impact and ideology. *Law Policy Q* 1983;5:367–79. Kleck G, Patterson EB. The impact of gun control and gun ownership levels on violence rates. *J Quant Criminol* 1993;9:249–87. Magaddino JP, Medoff MH. An empirical analysis of federal and state firearm control laws. In: Kates DB, ed. *Firearms and violence*. Cambridge, MA: Ballinger Publishing Company, 1984:225–58. Medoff MH, Magaddino JP. Suicides and firearm control laws. *Eval Rev* 1983;7:357–72.

- **Restrictions on firearm acquisition.** The federal government and individual states restrict the acquisition and use of firearms by individuals on the basis of their personal history. Reasons for restriction can include prior felony conviction, conviction of misdemeanor intimate partner violence, drug abuse, adjudication as “mentally defective,”^{††} and other characteristics (e.g., specified young age).

†† The term “mentally defective” is a determination by a lawful authority that a person, as a result of marked subnormal intelligence or mental illness, is a danger to self or others, or lacks the mental capacity to manage his or her own affairs. The term also includes a court finding of insanity in a criminal case, incompetence to stand trial, or not guilty by reason of lack of mental responsibility. **Source:** Bureau of Alcohol Tobacco and Firearms. Federal firearms regulations reference guide. Washington, DC: U.S. Department of the Treasury, Bureau of Alcohol, Tobacco and Firearms, 2000. ATF P 5300.4 (01-00). Available at http://www.atf.treas.gov/pub/fire-explo_pub/2000_ref.htm.

The Brady Law (22) established national restrictions on acquisition of firearms and ammunition from federal firearms licensees. The interim Brady Law (1994–1998) mandated a 5-day waiting period to allow background checks. The permanent Brady Law, enacted in 1998, eliminated the required waiting period. It normally allows 3 days for a background check, after which, if no evidence of a prohibited characteristic is found, the purchase may proceed (23). Certain states have established additional restrictions, and some require background checks of all firearms transactions, not only those conducted by federal firearms licensees.

The permanent Brady Law depends on the National Instant Criminal Background Check System (NICS). However, NICS lacks much of the required background information, particularly on certain restriction categories (23). Efforts to improve the availability of background

information have been supported by the National Criminal History Improvement Program (24). Approximately 689,000 applications to acquire a firearm (2.3% of 30 million applications) were denied under the Brady Law from its first implementation in 1994 through 2000 (25); the majority of denials were based on the applicant's criminal history. However, denial of an application does not always stop applicants from acquiring firearms through other means.

Overall, evaluations of the effects of acquisition restrictions on violent outcomes have produced inconsistent findings: some studies indicated decreases in violence associated with restrictions, and others indicated increases. One study indicated a statistically significant reduction in the rate of suicide by firearms among persons aged >55 years; however, the reduction in suicide by all methods was not statistically significant. Furthermore, this benefit appears to have been a consequence of the waiting period imposed by the interim Brady Law (which has since been dropped in the permanent law) rather than of the law's restrictions on the basis of the purchaser's characteristics (26).

- **Waiting periods for firearm acquisition.** Waiting periods for firearm acquisition require a specified delay between application for and acquisition of a firearm. Waiting periods have been established by the federal government and by states to allow time to check the applicant's background or to provide a "cooling-off" period for persons at risk of committing suicide or impulsive acts against others. Studies of the effects of waiting periods on violent outcomes yielded inconsistent results: some indicated a decrease in violent outcome associated with the delay and others indicated an increase. As noted previously, one study of the interim Brady Law indicated a statistically significant reduction in firearms suicide among persons aged >55 years associated with the waiting period requirement of the interim law. Several studies suggested a partial "substitution effect" for suicide (i.e., decreases in firearms suicide are accompanied by smaller increases in suicide by other means) (26).
- **Firearm registration and licensing of owners.** Registration requires that a record of the owner of specified firearms be created and retained (27). At the national level, the Firearm Ownership Protection Act of 1986 specifically precludes the federal government from establishing and maintaining a registry of firearms and their owners. Licensing requires an individual to obtain a license or other form of authorization or certification to purchase or possess a firearm (27). Licensing and registration requirements are often combined with other firearms regulations, such as safety training or safe storage requirements. Only four

studies examined the effects of registration and licensing on violent outcomes; the findings were inconsistent.

- **"Shall issue" concealed weapon carry laws.** Shall issue concealed weapon carry laws (shall issue laws) require the issuing of a concealed weapon carry permit to all applicants not disqualified by specified criteria. Shall issue laws are usually implemented in place of "may issue" laws, in which the issuing of a concealed weapon carry permit is discretionary (based on criteria such as the perceived need or moral character of the applicant). A third alternative, total prohibition of the carrying of concealed weapons, was in effect in six states in 2001.

The substantial number of studies of shall issue laws largely derives from and responds to one landmark study (28). Many of these studies were considered to be nonindependent because they assessed the same intervention in the same population during similar time periods. A review of the data revealed critical problems, including misclassification of laws, unreliable county-level crime data, and failure to use appropriate denominators for the available numerator crime data (29). Methodological problems, such as failure to adjust for autocorrelation in time series data, were also evident. Results across studies were inconsistent or conceptually implausible. Therefore, evidence was insufficient to determine the effect of shall issue laws on violent outcomes.

- **Child access prevention laws.** Child access prevention (CAP) laws are designed to limit children's access to and use of firearms in homes. The laws require firearms owners to store their firearms locked, unloaded, or both, and make the firearm owners liable when children use a household firearm to threaten or harm themselves or others. In three states with CAP laws (Florida, Connecticut, California), this crime is a felony; in several others it is a misdemeanor.

Only three studies examined the effects of CAP laws on violent outcomes, and only one outcome, unintentional firearms deaths, was assessed by all three. Of these, two studies assessed the same states over the same time periods and were therefore nonindependent. The most recent study, which included the most recent states to pass CAP laws and had the longest follow-up time, indicated that the apparent reduction in unintentional firearm deaths associated with CAP laws that carry felony sanctions was statistically significant only in Florida and not in California or Connecticut (30). Overall, too few studies of CAP law effects have been done, and the findings of existing studies were inconsistent. In addition, although CAP laws address juveniles as perpetrators of firearms violence, available studies assessed only juvenile victims of firearms violence.

- **Zero tolerance laws for firearms in schools.** The Gun-Free Schools Act (31) stipulates that each state receiving federal funds must have a state law requiring local educational agencies to expel a student from school for at least 1 year if a firearm is found in the student's possession at school. Expulsion may lead to alternative school placement or to "street" placement (full expulsion, with no linkage to formal education). In contrast to the 3,523 firearms reported confiscated under the Gun-Free Schools Act in the 1998–99 school year, school surveys (32) indicate that an estimated 3% of the 12th grade student population in 1996 (i.e., 85,350 students) reported carrying firearms on school property one or more times in the previous 30 days. Thus, even if only 12th grade students carry firearms, fewer than 4.3% of firearms are being detected in association with the Gun-Free Schools Act.

No study reviewed attempted to evaluate the effects of zero tolerance laws on violence in schools, nor did any measure the effect of the Gun-Free Schools Act on carrying of firearms in schools. One cross-sectional study, however, assessed the effectiveness of metal detector programs in reducing the carrying of firearms in schools (33). Although firearms detection is not explicitly required in the Gun-Free Schools Act, the effectiveness of the law may depend on the ability to detect firearms by various means. The study reported that schools with and without metal detectors did not differ in rates of threatening, fights, or carrying of firearms outside of school, but the rate of carrying firearms to, from, or in schools with detection programs was half that of schools without such programs. The effectiveness of zero tolerance laws in preventing violence cannot be assessed because appropriate evidence was not available. A further concern is that "street" expulsion might result in increased violence and other problems among expelled students.

- **Combinations of firearms laws.** Governmental jurisdictions (e.g., states or nations) can be characterized by the degree to which they regulate firearm possession and use. Whether a greater degree of firearms regulation in a jurisdiction results in a reduction of the amount of violence in that jurisdiction still needs to be determined. Three kinds of evidence were reviewed for this study: 1) studies of the effects of comprehensive national laws within nations; 2) international comparisons of comprehensive laws; and 3) studies in which law types within jurisdictions (i.e., regulation of specific, defined aspects of firearm acquisition and use) were categorized and counted, and counts compared with rates of specific forms of violence within the same jurisdictions. The latter type are referred to here as index studies because they developed indices of the degree of regu-

lation. In drawing conclusions about law combinations, findings from the three approaches were considered.

On the basis of national law assessments (the Gun Control Act of 1968 in the United States and the Criminal Law Amendment Act of 1977 in Canada), international comparisons (between the United States and Canada), and index studies (all conducted within the United States), available evidence was insufficient to determine whether the degree of firearms regulation was associated with decreased (or increased) violence. The findings were inconsistent and most studies were methodologically inadequate to allow conclusions about causal effects. Moreover, as conducted, index studies, even if consistent, would not allow specification of which laws to implement.

In summary, the Task Force found insufficient evidence to determine the effectiveness of any of the firearms laws reviewed for preventing violence. References and key findings are listed (Table).

Research Needs

The Task Force's review of firearms laws found insufficient evidence to determine whether the laws reviewed reduce (or increase) specific violent outcomes (Table). Much existing research suffers from problems with data, analytic methods, or both. Further high-quality research is required to establish the relationship between firearms laws and violent outcomes. Potential areas for further investigation will be discussed in detail in an upcoming article in the *American Journal of Preventive Medicine*.

Several recurring problems were associated with the studies that evaluated the effects of firearms laws on violent outcomes:

- The assessment or "measurement" of laws and their provisions has been noted as a problem in certain studies and may occur in others as well. As with all interventions, assessing the degree of implementation of laws may be important in evaluating their effects; yet this has not been a part of law evaluations. Better information regarding implementation might allow more sophisticated explanation of inconsistent effects.
- Several facets of the measurement of violent outcomes have been problematic. Crime data are substantially underreported and, at the county level, may not be sufficiently reliable for research purposes (29). In addition, selected outcome measures are often not directly relevant to the law being assessed (e.g., the evaluation of child access prevention laws by measurement of juvenile victims [rather than perpetrators] and the evaluation of shall issue laws by the measurement of crimes occurring in the home [where the law does not apply]). Another problem

is that crime data are often aggregated, so that the circumstances of violent events cannot be determined. Aggregated data hinder the assessment of the ways in which laws might and might not work. Individual record data systems currently being implemented — the National Incident-Based Reporting System of the FBI and the National Violent Death Reporting System of CDC and partners — might resolve some of these difficulties and greatly facilitate the evaluation of firearms laws.

- The measurement of potential confounders has been a challenge in evaluating the effects of firearms laws. Potentially important confounders include socioeconomic status and poverty, drug cycles, gang activity, and the intensity of law enforcement. Measuring these phenomena is difficult and requisite data are often not available. In addition, endogeneity (i.e., the presence of common characteristics, such as crime counts, as both dependent and independent variables in equations) has been a problem in firearms law evaluations.
- Study designs and analytic techniques used in firearms law evaluations have been problematic. Rates of violence may affect the passage of firearms laws and firearms laws may then affect rates of violence; knowledge of temporal sequence is thus critical in separating cause and effect, and cross-sectional studies are at a disadvantage. Time series analyses of firearms laws and violent outcomes have not consistently adjusted for temporal and spatial autocorrelation, and thus may have exaggerated hypothesized associations. Additionally, firearms studies often fail to note potential biases associated with measurement of outcomes not directly associated with the law in question (e.g., using victims rather than agents of violence in the assessment of CAP laws).

In conclusion, the application of imperfect methods to imperfect data has commonly resulted in inconsistent and otherwise insufficient evidence with which to determine the effectiveness of firearms laws in modifying violent outcomes.

This is a critical period for focused research on the effectiveness of firearms laws in reducing violence in the United States. International comparisons indicate that the United States is an outlier among developed, industrialized nations in rates of firearms violence (2). Widespread public concern exists about criminal firearms violence, firearms violence among youth, and other forms of firearms violence, and popular support for many firearms laws is evident (34,35). Although the Task Force's systematic review of the existing literature on firearms laws found insufficient evidence to determine the effectiveness of these laws in preventing violence, research should continue on the effectiveness of firearms laws as one approach to the prevention or reduction of firearms violence and firearms injury.

Evaluation should include not only the laws reviewed here, but the broad array of other federal, state, and local laws.

Additional Information Regarding the Community Guide

In addition to the firearms laws reviewed in this report, reviews for the *Community Guide* have been completed on the effectiveness of preventing violence through early childhood home visitation (36) and therapeutic foster care (to be published in the near future). Reviews of several other violence prevention interventions are pending or under way, including the effects of school-based, social and emotional skill learning programs, and the treatment of juveniles as adults in the justice system.

Community Guide topics are prepared and released as each is completed. The findings from systematic reviews on vaccine-preventable diseases, tobacco use prevention and reduction, motor vehicle occupant injury, physical activity, diabetes, oral health, and the social environment have been published. A compilation of systematic reviews will be published in book form in 2004. Additional information regarding the Task Force, the *Community Guide*, and a list of published articles is available at <http://www.thecommunityguide.org>.

References

1. Miniño AM, Arias E, Kochanek KD, Murphy SL, Smith BL. Deaths: final data for 2000. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics, 2002. (National vital statistics reports; vol. 50, no. 15). Available at http://www.cdc.gov/nchs/data/nvsr/nvsr50/nvsr50_15.pdf.
2. Bureau of Justice Statistics. Sourcebook of criminal justice statistics 2000. Washington, DC: US Department of Justice, Bureau of Justice Statistics, 2001.
3. Krug EG, Powell KE, Dahlberg LL. Firearm-related deaths in the United States and 35 other high- and upper-middle-income countries. *Int J Epidemiol* 1998;27:214–21.
4. Cook PJ, Lawrence BA, Bruce A, Ludwig J, Miller TR. The medical costs of gunshot injuries in the United States. *JAMA* 1999;282:447–54.
5. Bureau of Alcohol Tobacco and Firearms. Commerce in firearms in the United States. Washington, DC: US Department of the Treasury, Bureau of Alcohol, Tobacco and Firearms, 2000.
6. Cook PJ, Molliconi S, Cole TB. Regulating gun markets. *J Criminal Law Criminol* 1995;86:59–92.
7. Cook PJ, Ludwig J. Guns in America: results of a comprehensive national survey on firearms ownership and use. Washington, DC: US Department of Justice, National Institute of Justice, 1996.
8. Schuster MA, Franke TM, Bastian AM, Sor S, Halfon N. Firearm storage patterns in US homes with children. *Am J Public Health* 2000;90:588–94.
9. Cukier W. Firearms regulation: Canada in the international context. *Chronic Dis Can* 1998;19:25–34.
10. Kellermann AL, Lee RK, Mercy JA, Banton JG. The epidemiologic basis for the prevention of firearm injuries. *Annu Rev Public Health* 1991;12:17–40.

11. Powell EC, Sheehan KM, Christoffel KK. Firearm violence among youth: public health strategies for prevention. *Ann Emerg Med* 1996;28:204–12.
12. Briss PA, Zaza S, Pappaioanou M, et al. Developing an evidence-based Guide to Community Preventive Services—methods. *Am J Prev Med* 2000;18(1S):35–43.
13. US Department of Health and Human Services. Healthy people 2010. 2nd ed. With Understanding and Improving Health and Objectives for Improving Health (2 vols). Washington, DC: US Department of Health and Human Services, 2000.
14. Zaza S, Wright-de Aguero LK, Briss PA, et al. Data collection instrument and procedure for systematic reviews in the Guide to Community Preventive Services. *Am J Prev Med* 2000;18(1S):44–74.
15. Carande-Kulis VG, Maciosek MV, Briss PA, et al. Methods for systematic reviews of economic evaluations for the Guide to Community Preventive Services. *Am J Prev Med* 2000;18(1S):75–91.
16. Weil DS, Knox RC. The Maryland ban on the sale of assault pistols and high-capacity magazines: estimating the impact in Baltimore. *Am J Public Health* 1997;87:297–8.
17. Vernick JS, Webster DW, Hepburn LM. Effects of Maryland's law banning Saturday night special handguns on crime guns. *Inj Prev* 1999;5:259–63.
18. Loftin C, McDowall D, Wiersma B, Cottey TJ. Effects of restrictive licensing of handguns on homicide and suicide in the District of Columbia. *N Engl J Med* 1991;325:1615–20.
19. Britt CL, Bordua DJ, Kleck G. A reassessment of the D.C. gun law: some cautionary notes on the use of interrupted time series designs for policy impact assessment. *Law Soc Rev* 1996;30:361–80.
20. McDowall D, Wiersma B, Loftin C. Using quasi-experiments to evaluate firearm laws: comment on Britt et al.'s reassessment of the D.C. gun law. *Law Soc Rev* 1996;30:381–91.
21. Roth JA, Koper CS. Impacts of the 1994 Assault Weapons Ban: 1994–1996. Washington, DC: US Department of Justice, National Institute of Justice, 1999.
22. Public Law 103-159. Brady Handgun Violence Prevention Act, 18 USC, Section 922(t).1995.
23. US General Accounting Office. Gun control: options for improving the National Instant Criminal Background Check System. Washington, DC: US General Accounting Office, Report to Congressional Requesters, April 2000. GAO/GGD-00-56
24. US Department of Justice. Improving criminal history records for background checks. Bureau of Justice Statistics Highlights. Washington, DC: US Department of Justice, February 11, 2002.
25. Bowling M, Lauver G, Gifford SL, Adams DB. Background checks for firearm transfers, 2000. Bureau of Justice Statistics Bulletin. Washington, DC: US Department of Justice, July 2001.
26. Ludwig J, Cook PJ. Homicide and suicide rates associated with implementation of the Brady Handgun Violence Prevention Act. *JAMA* 2000;284:585–91.
27. DeFrancesco S, Vernick JS, Weitzel MM, LeBrun EE. A gun policy glossary: policy, legal and health terms. Baltimore, MD: The Johns Hopkins Center for Gun Policy and Research, 2000.
28. Lott JR, Mustard DB. Crime, deterrence, and right-to-carry concealed handguns. *J Legal Studies* 1997;26:1–68.
29. Maltz MD, Targonski J. A note on the use of county-level UCR data. *J Quant Criminol* 2002;18:297–318.
30. Webster DW, Starnes M. Reexamining the association between child access prevention gun laws and unintentional shooting deaths of children. *Pediatrics* 2000;106:1466–9.
31. Public Law 103-382. Improving America's Schools Act of 1994. 20 USC 8921, Section 14601, Gun-Free Schools Act, 1994.
32. US Department of Education and US Department of Justice. 1999 Annual report on school safety. Washington, DC: U.S. Department of Education and US Department of Justice, 1999. Available at <http://www.ed.gov/PDFDocs/InterimAR.pdf>
33. Ginsberg C. Violence-related attitudes and behaviors of high school students—New York City, 1992. *J Sch Health* 1993;63:438–40.
34. Merkle D. America: it's our right to bear arms. ABCNews.com, May 14, 2002. Available at http://abcnews.go.com/sections/us/DailyNews/guns_poll020514.html.
35. Smith TW. Public opinion about gun policies. *Future Child* 2002;12(2):154–63.
36. CDC. First reports evaluating the effectiveness of strategies for preventing violence: early childhood home visitation. Findings from the Task Force on Community Preventive Services. *MMWR* 2003;52 (No. RR-14):1–9.

Task Force on Community Preventive Services*

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Chair: Jonathan E. Fielding, M.D., Los Angeles Department of Health Services, Los Angeles, California

Vice-Chair: Patricia Dolan Mullen, Dr.P.H., University of Texas-Houston School of Public Health, Houston, Texas

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Consultants: Robert S. Lawrence, M.D., Bloomberg School of Public Health, Johns Hopkins University, Baltimore, Maryland; J. Michael McGinnis, M.D., Robert Wood Johnson Foundation, Princeton, New Jersey; Lloyd F. Novick, M.D., Onondaga County Department of Health, Syracuse, New York

*Patricia A. Buffer, Ph.D., University of California, Berkeley; Mary Jane England, M.D., Regis College, Weston, Massachusetts; Caswell A. Evans, Jr., D.D.S., National Oral Health Initiative, Office of the U.S. Surgeon General, Rockville, Maryland; David W. Fleming, M.D., CDC, Atlanta, Georgia; Fernando A. Guerra, M.D., San Antonio Metropolitan Health District, San Antonio, Texas; and Charles S. Mahan, M.D., College of Public Health, University of South Florida, Tampa, Florida, also served on the Task Force while the recommendations were being developed.

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