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## Systematic Review of Violence Prevention Economic Evaluations, 2000–2019

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### Abstract

**Context:** Health economic evaluations (e.g., cost-effectiveness analysis) can guide the efficient use of resources to improve health outcomes. This study aims to summarize the content and quality of interpersonal violence prevention economic evaluations.

**Evidence acquisition:** In 2020, peer-reviewed journal articles published during 2000–2019 focusing on high-income countries were identified using index terms in multiple databases. Study content, including violence type prevented (e.g., child abuse and neglect), outcome measure (e.g., abusive head trauma clinical diagnosis), intervention type (e.g., education program), study methods, and results were summarized. Studies reporting on selected key methods elements essential for study comparison and public health decision making (e.g., economic perspective, time horizon, discounting, currency year) were assessed.

**Evidence synthesis:** A total of 28 economic evaluation studies were assessed, most of which reported that assessed interventions yielded good value for money. Physical assault in the community and child abuse and neglect were the most common violence types examined. Studies applied a wide variety of cost estimates to value avoided violence. Less than two thirds of the studies reported all the key methods elements.

**Conclusions:** Comprehensive data collection on violence averted and intervention costs in experimental settings can increase opportunities to identify interventions that generate long-term value. More comprehensive estimates of the cost of violence can improve opportunities to demonstrate how prevention investment can be offset through avoided future costs. Better adherence to health economic evaluation reporting standards can enhance comparability across studies and may increase the likelihood that economic evidence is included in violence prevention decision making.

### CONTEXT

The WHO estimates that each year the populations of high-income countries incur 2.4 million disability-adjusted life years—a measure of lost life years owing to ill health,

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#### SUPPLEMENTAL MATERIAL

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disability, and early death—to interpersonal violence.<sup>1</sup> The burden of interpersonal violence in low- and middle-income countries is even higher. This estimate refers to physical, sexual, or psychological attack or deprivation perpetrated by families or partners (child abuse and neglect, intimate partner violence, elder abuse) or in the community (assault by acquaintances or strangers, including youth violence, violence related to property crimes, and workplace violence); collective (e.g., group) and self-directed violence are assessed separately.<sup>2</sup>

Previous research has demonstrated the substantial cost of interpersonal violence in high-income countries (e.g., estimated costs in the U.S. equivalent to 3% of the country's gross domestic product) and that the public sector usually pays the cost of violence-related medical care and criminal justice activities.<sup>3</sup> However, the economic impact of interventions to reduce violence is less studied. Health economic evaluations (cost-benefit analysis [CBA], cost-effectiveness analysis [CEA], and cost-utility analysis [CUA]) can inform resource allocation decisions by providing information on strategies that yield the greatest benefit for the lowest cost.<sup>4,5</sup>

A review of violence prevention economic evaluations published primarily in the 1980s and 1990s reported that most of such studies were based on interventions in the U.S., that the most common study topic was child abuse and neglect, and that several interventions (e.g., home visiting programs targeting at-risk families) were associated not just with reasonable cost compared with the value of associated benefits but with indeed overall cost savings.<sup>6</sup> Authors of that review also noted that assessed studies differed so much in terms of methods and measured costs that direct comparison between the studies was essentially impossible. More recent reviews have addressed economic evidence on the prevention of violence and related risk factors in specific populations or by intervention type, for example, interventions among high-risk young people or a focus on parenting interventions to improve a variety of outcomes, including violence risk factors.<sup>7,8</sup>

The literature is lacking a systematic and comprehensive review of recent economic evidence on interventions that aim to reduce interpersonal violence. This framing is timely and important. Evidence is growing on the substantial lifetime cost of violence, including intimate partner violence and child mal-treatment. This evidence provides new opportunities to demonstrate how the cost of violence prevention interventions ultimately can be offset partially or fully by the cost of medical care, criminal justice activities, lost productivity, and reduced quality of life that would be otherwise incurred among victims, perpetrators, and the community.<sup>9,10</sup> The aim of this study is to summarize the content and quality of interpersonal violence prevention economic evaluations published during the last 2 decades.

## EVIDENCE ACQUISITION

The approach for this review was informed by the systematic review criteria and reporting in the 2012 review of unintentional injury prevention economic evaluations conducted by Polinder et al.<sup>11</sup> English language peer-reviewed journal articles describing original economic evaluations of public health violence prevention interventions in high-income countries published during the past 2 decades were assessed.<sup>12</sup>

## Key Concept Definition

This review addressed interventions to reduce interpersonal violence as classified by the WHO (described previously). Studies that directly measured avoided violence were included, for example, the estimated attributable number of children that avoided clinical diagnosis of abusive head trauma on the basis of families' participation in a violence prevention intervention. Studies that described an original economic evaluation comparing intervention costs and benefits were included. For example, CBA measures both costs and health outcome benefits in monetary units (money saved compared with money invested), and CEA compares non-monetary per-unit effect and per-unit cost (e.g., cost per fall averted).<sup>4</sup> In CUA, a variant of CEA, effects are measured in terms of utilities, such as quality-adjusted life years (QALYs) gained owing to avoided ill health or injury. In CBA, results are typically presented in terms of benefit-to-cost ratios (e.g., \$5 in benefits for each \$1 invested). In CEA and CUA, costs and effects of interventions are typically presented as an incremental cost-to-effectiveness ratio (ICER) (e.g., the cost per avoided assault or the cost per QALY gained).

## Search Strategy and Data Extraction

A literature search was performed in PubMed, Embase, PsycINFO, SafetyLit, and Scopus databases for peer-reviewed journal articles published on January 1, 2000–December 31, 2019. Potential studies were screened for inclusion through title and abstract review and then full-text review by author agreement format (Figure 1 and Appendix Table 1, available online). Both authors conducted data extraction on the basis of the studies' published content; final data entries were determined by an agreement if differences existed. Potential studies were excluded on the basis of: violence outcome measure was outside the study focus (e.g., unintentional injury or terrorism violence), avoided violent events were not directly measured (e.g., study instead measured reduced risk factors for violence), or study was not an original economic evaluation (e.g., reporting on previous studies or no incremental comparison of intervention costs and benefits). Potential studies were included if 1 assessed intervention and assessed outcome met the inclusion criteria.

## Content and Reporting Quality Assessment

Study content, reporting quality, and overall economic results were assessed. All analyzed data from the assessed studies are demonstrated in Appendix Table 2 (available online). Study content was classified in terms of violence type (e.g., child abuse and neglect), prevention type (primary or secondary), intervention type (e.g., education program; categories emerged on the basis of the content of assessed studies), comparator type (usual care or another intervention), and applied average cost of avoided violence, a key modeling input. Studies that evaluated violent assault in the community but did not directly identify the inclusion of sexual assault were presumed to have addressed only physical assaults. Violence outcome measures (e.g., abusive head trauma clinical diagnosis), intervention target population, and summary economic results (ICER and benefit-to-cost ratios) were identified for each study. Additional information extracted from assessed studies included intervention details, country or region, detailed cost components (e.g., intervention costs, victim lost productivity costs, criminal justice costs), and a selected summary results

statement drawn from the article text about whether the intervention was ultimately framed as economically favorable by study authors.

The reporting quality of assessed studies was classified on the basis of selected elements from the Consolidated Health Economic Evaluation Reporting Standards checklist<sup>5</sup> and the Second Panel on Cost-Effectiveness in Health and Medicine<sup>13</sup> guidelines, which aim to standardize the reporting quality of economic evaluations and promote comparability across studies. This review did not attempt to assess all the recommended elements from both guidelines. Quality assessment was based on studies' reporting of selected key methods elements essential for study comparison and public health decision making: economic evaluation type (CEA, CUA, or CBA), study design (clinical trial or modeling—meaning that data merged from existing sources outside of an experimental setting), economic perspective (e.g., societal—costs to all payers—or healthcare payer or employer), time horizon (duration over which outcomes and costs were assessed), discounting (adjustment to account for future costs, typically valued less than present costs), cost categories (e.g., only direct healthcare costs or additional elements such as lost productivity and non-healthcare costs), currency year (e.g., 2019 U.S. dollars [USD]), unit cost data and source, effectiveness data (e.g., number of violent events averted through intervention, including utility weights) and source and sensitivity analysis. This review did not attempt to independently verify intervention effectiveness data that authors of economic evaluations applied in their studies.

## EVIDENCE SYNTHESIS

The combined database searches identified 719 articles (Figure 1 and Appendix Table 1, available online). Title and abstract screening indicated 50 articles for full-text review, and 28 articles—each describing a separate study—met inclusion criteria.

### Study Content

Almost half of the assessed studies ( $n=12$  of 28 studies, 43%) evaluated interventions to prevent community violence<sup>14–25</sup> (Table 1). A total of 3 of those studies directly addressed sexual violence,<sup>17,21,23</sup> and 1 directly addressed firearm violence<sup>14</sup> (Table 1). Most other studies (36%) addressed child abuse and neglect,<sup>26–35</sup> 3 studies (11%) addressed intimate partner violence,<sup>36–38</sup> 2 studies (7%) addressed bullying,<sup>39,40</sup> and 1 study (4%) addressed elder abuse<sup>41</sup> (Table 1). Approximately half of the studies evaluated an intervention pertaining to both primary (preventing violence before it starts) and secondary (responding to violence when it occurs) prevention (Table 1).

Many studies described an economic evaluation of a violence prevention intervention that was primarily an education program<sup>17,18,22,27,32,34–36,38–40</sup> (39%), a home visiting program<sup>26,28,29,33,34</sup> (18%), or a hospital-centered violence intervention program<sup>15,20,24,25</sup> (14%) (Table 1). Other studies assessed alcohol policy changes,<sup>19</sup> improvements to the built environment<sup>14</sup> (i.e., blight remediation), counseling,<sup>30</sup> multisystemic therapy,<sup>21,31</sup> social services,<sup>37,41</sup> or violence hot-spot services coordination<sup>16,23</sup> (e.g., information sharing between law enforcement and medical services providers to focus law enforcement resources in areas where violence previously occurred) (Table 1). Nearly half of the studies (43%) addressed interventions in the U.S. (Appendix Table 2, available online). Nearly all

studies (89%) compared an intervention with usual care (rather than with an alternative intervention) (Table 1).

A total of 15 studies reported the average monetary value of avoided violence that was used to evaluate the benefits of the assessed intervention (Appendix Table 2, available online). This is a key modeling input that influences economic evaluation results such as the incremental cost per violence avoided (i.e., the value of avoided violence compared with an intervention's cost and effectiveness). Values attributed to avoided child abuse and neglect ranged from \$63,000 (2013 USD)<sup>34</sup> to \$7.1 million (2014 Canadian dollars<sup>27</sup> or approximately \$6.5 million 2014 USD; [www.xe.com](http://www.xe.com) for currency conversion) per child (Appendix Table 2, available online). In the studies that applied these values, the lower value aimed to capture represented lifetime costs per child with administratively confirmed nonfatal abuse or neglect from a government payer perspective (i.e., costs such as special education typically paid by a government),<sup>34</sup> and the higher value aimed to capture the cost of fatal abuse or neglect per child from the societal perspective<sup>27</sup> (i.e., costs to all payers, in this case, including the intangible cost of pain and suffering) (Appendix Table 2, available online). Values attributed to avoided sexual violence in the community ranged from \$14,800 (2008–2009 Australian dollars<sup>23</sup> or \$14,140 2008 USD) to \$103,000 (2008 USD)<sup>21</sup> per assault (Appendix Table 2, available online). The lower cited value aimed to capture medical, lost productivity, and criminal justice costs as well as intangible costs on the basis of community willingness to pay to reduce alcohol-related harm in the local community (on the basis of household survey data) from the societal perspective,<sup>23</sup> and the higher cited value aimed to capture criminal justice, property damage, medical care, lost productivity, and intangible costs from the societal perspective (Appendix Table 2, available online).<sup>21</sup> Values attributed to avoided physical assault in the community ranged from £1,171 (2003 pound sterling<sup>16</sup> or \$1,900 2003 USD) to \$2.2 million (2011 USD)<sup>24</sup> per assault (Appendix Table 2, available online). The lower cited value aimed to capture physical and psychological impact, victim services, medical services, and criminal justice costs per nonfatal common (i.e., not wounding) assault from the societal perspective,<sup>16</sup> and the higher cited value aimed to capture the cost per homicide from the societal perspective<sup>24</sup> (Appendix Table 2, available online).

### Reporting Quality Assessment

Nearly half of the assessed studies (43%) were described as CEA, a third of them were described as CBA (32%), and the rest were described as CUA (21%) or multiple (4%) (Table 2). A minority of studies were conducted as part of a clinical trial (29%), and the majority used a modeling design (71%) (Table 2). Most studies reported costs and benefits from the societal perspective (39%) or multiple perspectives that included the societal perspective (29%) (Table 2 and Appendix Table 2, available online). The most common time horizon was between 1 and 10 years (46%), followed by lifetime (29%) (Table 2). The most common discount rate was 3% or 3.5% (combined 57% of studies), but several studies (18%) did not report discounting despite assessing costs and benefits over a period that exceeded 1 year (Table 2). Most studies (71%) assessed violence-related costs beyond direct medical care costs, such as criminal justice costs (Table 2).

Most studies reported on individual key methods elements, such as currency year (93%), unit cost data and source (82%), unit effectiveness and source data (86%), and sensitivity analysis (89%). However, less than two thirds (61%) of studies included completed reporting on all selected elements, defined as type of economic evaluation, study design, economic perspective, time horizon, discounting, currency year, unit cost and effectiveness data and source, and sensitivity analysis (Table 2).

### Summary Economic Results

A variety of interventions were reported to prevent violence and achieve substantial economic benefits in terms of avoided violence and costs relative to the cost of the intervention. A total of 16 studies reported summary economic results using an ICER (e.g., the incremental cost per QALY gained or violence avoided), 10 studies reported a benefit-to-cost ratio, and 2 studies reported neither<sup>32,41</sup> (Table 3).

The ICER calculations among CEA and CUA studies yielded results framed by the study authors as good value for money (e.g., the intervention dominated the comparator by being less costly and more effective or the ICER was within a cited willingness-to-pay threshold) for multiple interventions (Table 3), including Period of PURPLE Crying (education program for parents and caregivers of newborns to avoid pediatric abusive head trauma)<sup>27</sup>; Identification and Referral to Improve Safety program (training program for primary medical care providers to improve the response to women experiencing intimate partner violence; 2 studies)<sup>36,38</sup>; Parents under Pressure (home visiting program for methadone-maintained parents with young children)<sup>28</sup>; increased alcohol taxation to avoid violent assault<sup>19</sup>; school-based antibullying programs<sup>39,40</sup>; and multiple hospital-centered violence intervention programs, such as the Wraparound Program (1-on-1 case management and linkages to services, including mental health treatment, court services, and housing to avoid repeat violent assault among adolescents and young adults).<sup>15,18,20,25</sup>

Benefit-to-cost ratio calculations among CBA studies of 10 interventions reported positive cost-benefit ratios, that is, >\$1 achieved in terms of avoided violence costs for each \$1 spent on the intervention (Table 3). These interventions were Child-Parent Centers education program and Nurse-Family Partnership Home Visiting Program to prevent child abuse and neglect among families of young children<sup>34,35</sup>; multisystemic therapy to prevent child abuse and neglect among families referred by administrative child protective services<sup>31</sup> as well as to prevent repeat physical or sexual assault perpetration among juvenile offenders<sup>21</sup>; shelter services to prevent intimate partner violence<sup>37</sup>; urban blight remediation to prevent firearm assault<sup>14</sup>; education for hospitality workers and the general community to prevent alcohol-related assault<sup>22</sup>; a hospital-centered violence intervention program to connect violently injured patients with resources that reduce the risk of violent reinjury and perpetration<sup>24</sup>; and violence hot-spot services coordination, including law enforcement agencies to prevent physical assault<sup>16</sup> and alcohol-related sexual assault.<sup>23</sup>

## DISCUSSION

This review highlights at least 4 opportunities for future violence prevention economic evaluations. First, economic evaluations of violence prevention interventions remain

relatively uncommon. Researchers and practitioners of violence prevention can address this by incorporating cost collection and direct measurement of violence avoided into all program evaluation plans as well as high-quality reporting of economic evaluation results, consistent with current guidelines.<sup>5,13</sup> Economic evaluations of violence prevention programs require an estimated intervention cost per participant, an average value of avoided violence, and an estimated number of violent events avoided through the intervention. Organizations that are early to adopt effective interventions can build toward the data required for a full economic evaluation and assist decision making in other jurisdictions by publishing information on actual fixed and marginal intervention costs per participant.<sup>42</sup>

Second, this review demonstrated that recent violence prevention economic evaluations assigned a wide range of monetary values to averted violence. For example, the difference between the lowest and highest valuation of averted sexual assault in assessed studies (\$14,800 as 2008–2009 Australian dollars—or approximately \$15,000 as 2008 USD—and \$103,000 as 2008 USD) could potentially be the difference between concluding and not concluding that an intervention is economically beneficial.<sup>21,23</sup> A more recent estimate of the lifetime cost of rape (\$122,461 per victim as 2014 USD) exceeds the highest estimate applied among the assessed studies; however, even that more recent estimate is conservative because it did not include an estimated value of attributable intangible costs such as victim and community pain and suffering.<sup>43</sup> Even with the conservative valuations applied to averted sexual assault in the 2 cited economic evaluations included in this review, the assessed interventions (multisystemic therapy and violence hot-spot services coordination, respectively) were reported as likely cost saving.

In the absence of a directly applicable, robust, long-term, estimated monetary value of violence avoided through a particular intervention, researchers have at least 2 options that still permit insight about the economic value of effective interventions. One option is to present averted violence outcomes in terms of natural units, without assigning a monetary value to those outcomes. For example, 1 study assessed in this review presented results in terms of the cost per assault averted.<sup>25</sup> Notably, this approach is likely most palatable when an effective intervention has a low cost per participant, that is, an intervention cost low enough that most observers would judge it to be less than the assumed cost of the avoided violence. A second approach is to test an intervention's cost per effect against a range of plausible willingness-to-pay values.<sup>44</sup>

The third insight from this review is that direct comparisons among violence prevention economic evaluations continue to be inhibited by studies' reporting quality.<sup>6</sup> A previous systematic review of unintentional injury prevention economic evaluations reached a similar conclusion, as did a recent systematic review of economic evaluations of interventions to improve outcomes—including risk for violence—among high-risk young people.<sup>8,11</sup> As research grows on the economics of violence prevention, it is essential that such studies can be directly compared. Most studies included reporting on individual assessed methods elements (e.g., 93% of studies reported currency year), and yet, less than two thirds of the studies examined in this review included all key reporting elements (Table 2). The reporting elements assessed in this review truly represent the most basic elements required for economic evaluation studies. Without reporting on each of these elements, studies fail the

test of reproducibility that is the standard for peer-reviewed original analysis. Widespread reporting quality improvement among peer-reviewed violence prevention economic evaluations potentially could be addressed efficiently through journal submission requirements. The *British Medical Journal*, for example, requires authors to include the Consolidated Health Economic Evaluation Reporting Standards checklist when submitting health economic evaluation studies for review, including a location identified in the submission for each checklist element.

Finally, few violence prevention economic evaluations have retrospectively assessed the real-world cost effectiveness resulting from adopted intervention activities. It is valuable to directly observe the cost and health effects of prevention activities as implemented, which can verify whether outcomes anticipated from trial settings or model projections materialize in practice. In this review, 2 linked studies of the Identification and Referral to Improve Safety program intervention in the United Kingdom together demonstrated a desirable evolution of economic evidence related to a violence prevention intervention. The first study presented an economic evaluation on the basis of data from an RCT of the intervention, and the second study, published several years later, presented an economic evaluation of the intervention once widely implemented outside the trial setting.<sup>36,38</sup> The later observational study supported the economic findings of the clinical trial.

## Limitations

This review focused on English language peer-reviewed studies indexed in selected databases and that addressed interpersonal violence prevention in high-income countries. This narrow economic context aims to make results more generalizable in such countries, although evaluation of the intervention in specific countries would still be necessary. A growing literature addresses the economic value of violence prevention interventions in middle- and low-income countries and should be the subject of a future similar review.<sup>45,46</sup> This review systematically identified economic evaluations published in peer-reviewed journals and documented basic reporting quality. This review documented whether the assessed economic evaluations reported intervention effectiveness data and source but did not attempt to verify the intervention effectiveness results that were used. Careful consumers of economic evaluation results should be familiar with the benefits and limitations of contributing cost and effectiveness data. This review addressed the incremental comparison of intervention costs and benefits and did not include, for example, studies of only net benefits.<sup>47</sup> This review did not attempt to merge results from multiple studies of the same topic (i.e., not a meta-analysis). Economic evaluations with favorable results may be more likely to be published; some studies assessed for inclusion in this review suggested intention for both effectiveness and CEA but did not proceed to full reporting on cost-effectiveness results once the intervention was not found to be more effective than the comparator in reducing measured violence outcomes. This review focused on interventions with reported effectiveness to reduce violent outcomes (e.g., number of assaults) and did not address interventions with reported effectiveness in reducing only the risk factors for violence perpetration or victimization (e.g., interaction with the judiciary system or low self-regulation among youth at risk of perpetrating violence)<sup>48</sup> because the latter are less amenable to monetary valuation. If violence-related injuries were a minor element within a



study, the study may not have been indexed using terms captured by the search strategy presented in this review.

## CONCLUSIONS

This systematic review summarized the content and reporting quality of violence prevention economic evaluation studies published during the past 2 decades. The primary value of this review is in systematically assembling this information with the aim that researchers, policymakers, and public health practitioners can reference it in aggregate and understand where economic evidence for particular interventions exists or could be improved. Comprehensive data collection on violence averted and intervention costs in experimental settings can increase opportunities to identify interventions that effectively reduce violence and generate long-term value. More comprehensive estimates of the cost of violence can strengthen the case for how prevention investment can be offset through avoided future costs. Many violence prevention economic evaluations were consistent with some but not all reporting recommendations from current guidelines for reporting health economic evaluations. Standardized methodologic and reporting elements among future economic evaluations—perhaps based on journals requiring explicit adherence to existing reporting guidelines for such studies—have the potential to enhance comparability among studies and increase the likelihood that economic evidence is included in decision making related to violence prevention.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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CP and MCK led the study design and interpretation of results, analyzed data, edited the manuscript, and approved the final manuscript as submitted. CP conceived of the study and drafted the manuscript.

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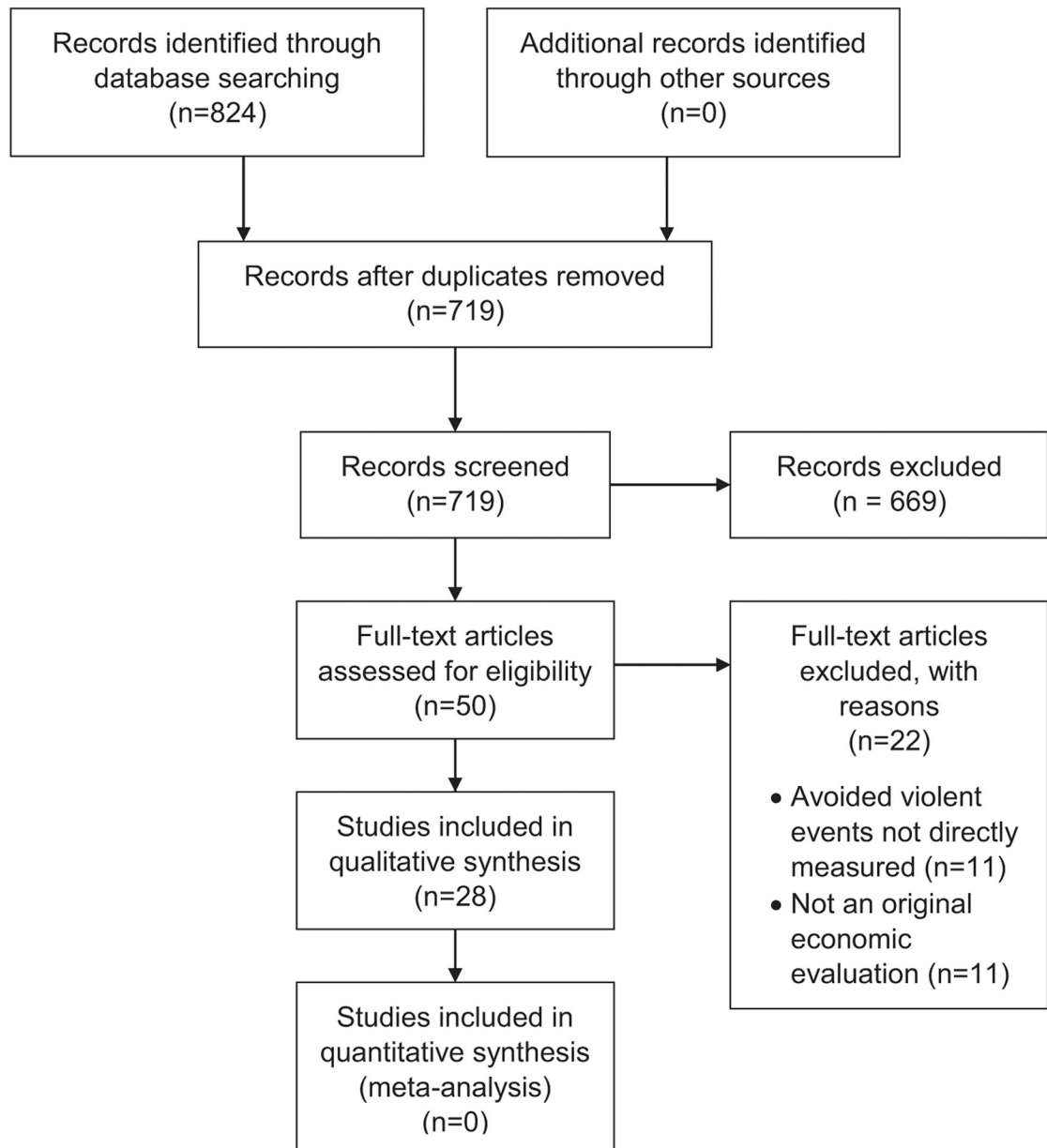
## REFERENCES

1. Global Health Estimates, DALYs, 2000–2016. WHO. [https://www.who.int/healthinfo/global\\_burden\\_disease/en/](https://www.who.int/healthinfo/global_burden_disease/en/). Accessed April 28, 2020.
2. Violence prevention alliance: definition and typology of violence. WHO. <https://www.who.int/violenceprevention/approach/definition/en/>. Updated January 2021. Accessed January 21, 2021.
3. Waters HR, Hyder AA, Rajkotia Y, Basu S, Butchart A. The costs of interpersonal violence—an international review. *Health Policy*. 2005;73(3):303–315. 10.1016/j.healthpol.2004.11.022. [PubMed: 16039349]
4. Drummond MF, Sculpher MJ, Claxton K, Stoddart GL, Torrance GW. *Methods for the Economic Evaluation of Health Care Programmes*. 4th ed. Oxford, United Kingdom: Oxford University Press, 2015.
5. Husereau D, Drummond M, Petrou S, et al. Consolidated Health Economic Evaluation Reporting Standards (CHEERS) statement. *Value Health*. 2013;16(2):e1–e5. 10.1016/j.jval.2013.02.010. [PubMed: 23538200]

6. Waters H, Hyder A, Rajkotia Y, Basu S, Rehwinkel JA, Butchart A. The economic dimensions of interpersonal violence. Geneva, Switzerland: Department of Injuries and Violence Prevention, WHO. [https://www.who.int/violence\\_injury\\_prevention/publications/violence/economic\\_dimensions/en/](https://www.who.int/violence_injury_prevention/publications/violence/economic_dimensions/en/). Published 2004. Accessed January 21, 2021.
7. Duncan KM, MacGillivray S, Renfrew MJ. Costs and savings of parenting interventions: results of a systematic review. *Child Care Health Dev.* 2017;43(6):797–811. 10.1111/cch.12473. [PubMed: 28557011]
8. Edmunds K, Ling R, Shakeshaft A, Doran C, Searles A. Systematic review of economic evaluations of interventions for high risk young people. *BMC Health Serv Res.* 2018;18(1):660. 10.1186/s12913-018-3450-x. [PubMed: 30139384]
9. Miller TR, Steinbeigle R, Lawrence BA, et al. Lifetime cost of abusive head trauma at ages 0–4, USA. *Prev Sci.* 2018;19(6):695–704. 10.1007/s11121-017-0815-z. [PubMed: 28685210]
10. Peterson C, Kearns MC, McIntosh WL, et al. Lifetime economic burden of intimate partner violence among U.S. adults. *Am J Prev Med.* 2018;55(4):433–444. 10.1016/j.amepre.2018.04.049. [PubMed: 30166082]
11. Polinder S, Segui-Gomez M, Toet H, et al. Systematic review and quality assessment of economic evaluation studies of injury prevention. *Accid Anal Prev.* 2012;45:211–221. 10.1016/j.aap.2011.07.004. [PubMed: 22269503]
12. World bank country and lending groups. The World Bank. <https://datahelpdesk.worldbank.org/>. Accessed January 21, 2021.
13. Sanders GD, Neumann PJ, Basu A, et al. Recommendations for conduct, methodological practices, and reporting of cost-effectiveness analyses: second panel on cost-effectiveness in health and medicine [published correction appears in JAMA. 2016;316(18):1924]. *JAMA.* 2016;316(10):1093–1103. 10.1001/jama.2016.12195. [PubMed: 27623463]
14. Branas CC, Kondo MC, Murphy SM, South EC, Polsky D, MacDonald JM. Urban blight remediation as a cost-beneficial solution to firearm violence. *Am J Public Health.* 2016;106(12):2158–2164. 10.2105/AJPH.2016.303434. [PubMed: 27736217]
15. Chong VE, Smith R, Garcia A, et al. Hospital-centered violence intervention programs: a cost-effectiveness analysis. *Am J Surg.* 2015;209(4):597–603. 10.1016/j.amjsurg.2014.11.003. [PubMed: 25728889]
16. Florence C, Shepherd J, Brennan I, Simon TR. An economic evaluation of anonymised information sharing in a partnership between health services, police and local government for preventing violence-related injury. *Inj Prev.* 2014;20(2):108–114. 10.1136/injuryprev-2012-040622. [PubMed: 24048916]
17. Foster EM, Jones D. Conduct Problems Prevention Research Group. Can a costly intervention be cost-effective?: an analysis of violence prevention. *Arch Gen Psychiatry.* 2006;63(11):1284–1291. 10.1001/archpsyc.63.11.1284. [PubMed: 17088509]
18. Ho KM, Geelhoed E, Gope M, Burrell M, Rao S. An injury awareness education program on outcomes of juvenile justice offenders in Western Australia: an economic analysis. *BMC Health Serv Res.* 2012;12(1):279. 10.1186/1472-6963-12-279. [PubMed: 22929004]
19. Holm AL, Veerman L, Cobiac L, Ekholm O, Diderichsen F. Cost-effectiveness of changes in alcohol taxation in Denmark: a modelling study. *Cost Eff Resour Alloc.* 2014;12(1):1. 10.1186/1478-7547-12-1. [PubMed: 24405884]
20. Juillard C, Smith R, Anaya N, Garcia A, Kahn JG, Dicker RA. Saving lives and saving money: hospital-based violence intervention is cost-effective. *J Trauma Acute Care Surg.* 2015;78(2):252–258. 10.1097/TA.0000000000000527. [PubMed: 25757108]
21. Klietz SJ, Borduin CM, Schaeffer CM. Cost-benefit analysis of multisystemic therapy with serious and violent juvenile offenders. *J Fam Psychol.* 2010;24(5):657–666. 10.1037/a0020838. [PubMed: 20954776]
22. Månsson AM, Rydberg MK, Wallin E, Lindholm LA, Andréasson S. A cost-effectiveness analysis of alcohol prevention targeting licensed premises. *Eur J Public Health.* 2007;17(6):618–623. 10.1093/eurpub/ckm017. [PubMed: 17387105]
23. Navarro HJ, Shakeshaft A, Doran CM, Petrie DJ. Does increasing community and liquor licensees' awareness, police activity, and feedback reduce alcohol-related violent crime? A benefit-cost

- analysis. *Int J Environ Res Public Health*. 2013;10(11):5490–5506. 10.3390/ijerph10115490. [PubMed: 24169411]
24. Purtle J, Rich LJ, Bloom SL, Rich JA, Corbin TJ. Cost–benefit analysis simulation of a hospital-based violence intervention program. *Am J Prev Med*. 2015;48(2):162–169. 10.1016/j.amepre.2014.08.030. [PubMed: 25442223]
  25. Sharp AL, Prosser LA, Walton M, et al. Cost analysis of youth violence prevention. *Pediatrics*. 2014;133(3):448–453. 10.1542/peds.2013-1615. [PubMed: 24515518]
  26. Barlow J, Davis H, McIntosh E, Jarrett P, Mockford C, Stewart-Brown S. Role of home visiting in improving parenting and health in families at risk of abuse and neglect: results of a multicentre randomised controlled trial and economic evaluation. *Arch Dis Child*. 2007;92(3):229–233. 10.1136/adc.2006.095117. [PubMed: 17068074]
  27. Beaulieu E, Rajabali F, Zheng A, Pike I. The lifetime costs of pediatric abusive head trauma and a cost-effectiveness analysis of the Period of Purple crying program in British Columbia, Canada. *Child Abuse Negl*. 2019;97:104133. 10.1016/j.chiabu.2019.104133. [PubMed: 31473380]
  28. Dalziel K, Dawe S, Harnett PH, Segal L. Cost-effectiveness analysis of the Parents under Pressure programme for methadone-maintained parents. *Child Abuse Rev*. 2015;24(5):317–331. 10.1002/car.2371.
  29. Dalziel K, Segal L. Home visiting programmes for the prevention of child maltreatment: cost-effectiveness of 33 programmes. *Arch Dis Child*. 2012;97(9):787–798. 10.1136/archdischild-2011-300795. [PubMed: 22764090]
  30. Dijkstra S, Creemers HE, van Steensel FJA, Dekovi M, Stams GJJM, Asscher JJ. Cost-effectiveness of Family Group Conferencing in child welfare: a controlled study. *BMC Public Health*. 2018;18(1):848. 10.1186/s12889-018-5770-5. [PubMed: 29986690]
  31. Dopp AR, Schaeffer CM, Swenson CC, Powell JS. Economic impact of multisystemic therapy for child abuse and neglect. *Adm Policy Ment Health*. 2018;45(6):876–887. 10.1007/s10488-018-0870-1. [PubMed: 29619643]
  32. Friedman J, Reed P, Sharplin P, Kelly P. Primary prevention of pediatric abusive head trauma: a cost audit and cost-utility analysis. *Child Abuse Negl*. 2012;36(11–12):760–770. 10.1016/j.chiabu.2012.07.008. [PubMed: 23141137]
  33. McIntosh E, Barlow J, Davis H, Stewart-Brown S. Economic evaluation of an intensive home visiting programme for vulnerable families: a cost-effectiveness analysis of a public health intervention. *J Public Health (Oxf)*. 2009;31(3):423–433. 10.1093/pubmed/fdp047. [PubMed: 19497944]
  34. Peterson C, Florence C, Thomas R, Klevens J. Cost–benefit analysis of two child abuse and neglect primary prevention programs for U.S. states. *Prev Sci*. 2018;19(6):705–715. 10.1007/s11121-017-0819-8. [PubMed: 28735447]
  35. Reynolds AJ, Temple JA, White BA, Ou SR, Robertson DL. Age 26 cost-benefit analysis of the child-parent center early education program. *Child Dev*. 2011;82(1):379–404. 10.1111/j.1467-8624.2010.01563.x. [PubMed: 21291448]
  36. Barbosa EC, Verhoef TI, Morris S, et al. Cost-effectiveness of a domestic violence and abuse training and support programme in primary care in the real world: updated modelling based on an MRC phase IV observational pragmatic implementation study. *BMJ Open*. 2018;8(8): e021256. 10.1136/bmjopen-2017-021256.
  37. Chanley SA, Chanley JJ, Campbell HE. Providing refuge: the value of domestic violence shelter services. *Am Rev Public Adm*. 2001;31(4):393–413. 10.1177/02750740122065018.
  38. Devine A, Spencer A, Eldridge S, Norman R, Feder G. Cost-effectiveness of Identification and Referral to Improve Safety (IRIS), a domestic violence training and support programme for primary care: a modelling study based on a randomised controlled trial. *BMJ Open*. 2012;2(3):e001008. 10.1136/bmjopen-2012-001008.
  39. Beckman L, Svensson M. The cost-effectiveness of the Olweus Bullying Prevention Program: results from a modelling study. *J Adolesc*. 2015;45:127–137. 10.1016/j.adolescence.2015.07.020. [PubMed: 26433734]

40. Persson M, Wennberg L, Beckman L, Salmivalli C, Svensson M. The cost-effectiveness of the Kiva Antibullying Program: results from a decision-analytic model. *Prev Sci.* 2018;19(6):728–737. 10.1007/s11121-018-0893-6. [PubMed: 29728796]
41. Ernst JS, Smith CA. Assessment in adult protective services: do multidisciplinary teams make a difference? *J Gerontol Soc Work.* 2012;55(1):21–38. 10.1080/01634372.2011.626842. [PubMed: 22220991]
42. Bush JL, Bush HM, Coker AL, Brancato CJ, Clear ER, Recktenwald EA. Total and marginal cost analysis for a high school based bystander intervention. *J Sch Violence.* 2018;17(2):152–163. 10.1080/15388220.2016.1275656.
43. Peterson C, DeGue S, Florence C, Lokey CN. Lifetime economic burden of rape among U.S. adults. *Am J Prev Med.* 2017;52(6):691–701. 10.1016/j.amepre.2016.11.014. [PubMed: 28153649]
44. Foster EM, Jones DE. The economic analysis of prevention: an illustration involving children's behavior problems. *J Ment Health Policy Econ.* 2007;10(4):165–175. [PubMed: 18166828]
45. Greco G, Knight L, Ssekadde W, Namy S, Naker D, Devries K. Economic evaluation of the Good School Toolkit: an intervention for reducing violence in primary schools in Uganda. *BMJ Glob Health.* 2018;3(2):e000526. 10.1136/bmjgh-2017-000526.
46. Redfern A, Cluver LD, Casale M, Steinert JI. Cost and cost-effectiveness of a parenting programme to prevent violence against adolescents in South Africa [published correction appears in *BMJ Glob Health.* 2019;4(3):e001147corr1]. *BMJ Glob Health.* 2019;4(3):e001147. 10.1136/bmjgh-2018-001147.
47. Clark KA, Biddle AK, Martin SL. A cost-benefit analysis of the Violence Against Women Act of 1994. *Violence Against Women.* 2002;8(4):417–428. 10.1177/10778010222183143.
48. Hajizadeh N, Stevens ER, Applegate M, et al. Potential return on investment of a family-centered early childhood intervention: a cost-effectiveness analysis. *BMC Public Health.* 2017;17(1):796. 10.1186/s12889-017-4805-7. [PubMed: 29017527]



**Figure 1.**  
PRISMA flowchart.

**Table 1.**

## Study Content

Study characteristics	Studies, N=28, n (%)
Violence type	
Bullying	2 (7)
Child abuse and neglect	10 (36)
Elder abuse	1 (4)
Intimate partner violence	3 (11)
Community violence	12 (43)
Sexual assault focus	3 (11)
Firearm assault focus	1 (4)
Prevention type	
Primary	8 (29)
Secondary	7 (25)
Both	13 (46)
Intervention type	
Alcohol policy change	1 (4)
Built environment	1 (4)
Counseling	1 (4)
Education program <sup>a</sup>	11 (39)
Home visiting program <sup>a</sup>	5 (18)
Hospital-centered violence intervention program	4 (14)
Multisystemic therapy	2 (7)
Social services	2 (7)
Violence hot-spot services coordination	2 (7)
Comparator type	
Usual care only	25 (89)

Note: Appendix Table 2 (available online) provides study details. Percentages by category may not sum to 100% owing to rounding.

<sup>a</sup>Sum of studies by intervention exceeds the total number of studies because 1 study<sup>34</sup> assessed 2 different interventions—an education program and a home visiting program.

**Table 2.**

## Study Methods and Reporting Quality

Study characteristics	Studies, N=28, n (%)
Economic evaluation type	
Cost–benefit analysis	9 (32)
Cost–effectiveness analysis	12 (43)
Cost–utility analysis	6 (21)
Multiple	1 (4)
Study design	
Trial setting <sup>a</sup>	8 (29)
Modeling <sup>b</sup>	20 (71)
Economic perspective	
Healthcare payer	5 (18)
Government or intervention payer	3 (11)
Societal	11 (39)
Multiple	8 (29)
Not reported	1 (4)
Time horizon <sup>c</sup>	
1 year	5 (18)
>1 to 10 years	13 (46)
>10 years	2 (7)
Lifetime	8 (29)
Discounting	
1.5%	1 (4)
3%	9 (32)
3.5%	7 (25)
5%	2 (7)
Not applicable ( 1-year time horizon for costs)	4 (14)
Not reported	5 (18)
Avoided violence valuation cost elements	
Direct healthcare costs only	4 (14)
Multiple cost types included	20 (71)
Violence outcomes not valued monetarily	4 (14)
Reporting on other key elements	
Currency year	26 (93)
Unit cost data and source	23 (82)
Unit effectiveness data <sup>d</sup> and source	24 (86)
Sensitivity analysis	25 (89)
Complete reporting of selected elements <sup>e</sup>	17 (61)

Note: Appendix Table 2 (available online) provides study details. Percentages by category may not sum to 100% owing to rounding.

<sup>a</sup>Includes RCT designs.

<sup>b</sup>Includes mathematical, quasiexperimental, Markov, and original observational data designs.

<sup>c</sup>Duration over which outcomes and costs were assessed.

<sup>d</sup>Includes reporting on utility weights and data source.

<sup>e</sup>Complete reporting refers to all the following: type of economic evaluation, study design, economic perspective, time horizon, discounting, currency year, unit cost data and source, unit effectiveness data and source, and sensitivity analysis.

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Summary Economic Results

Table 3.

Violence and intervention type	Study outcome measure	Target population	Time horizon <sup>a</sup>	Incremental cost-to-effectiveness ratio or benefit-to-cost ratio <sup>b</sup>
Bullying				
Education program <sup>39</sup>	Bullying (physical aggression, psychological aggression, social exclusion)	Students Grades 7–9	3 years	Per prevented victim of bullying: 131,250 (2013 SEK).
Education program <sup>40</sup>	Bullying (physical, relational, verbal)	Students aged 7–15 years	9 years	Per victim-free year: 7,879 (2017 SEK, or €829). Per QALY gained: 131,321 (2017 SEK, or €13,823).
Child abuse and neglect				
Counseling <sup>30</sup>	Child welfare agency referral	High-risk families	1 year	Per family that avoids child abuse or neglect: €80,413 (2015 EUR).
Education program <sup>27</sup>	Abusive head trauma diagnosis	Children aged 0–24 months	Lifetime	Per child that avoids abusive head trauma diagnosis: intervention dominant <sup>c</sup> (2014 CAN).
Education program <sup>35</sup>	Administrative substantiation of child abuse and neglect	Low-income families of children aged 3 years	23 years	Value of avoided violence per \$1 invested: \$4 (school-age program)–\$11 (preschool program) (2007 USD).
Home visiting program and education program <sup>34</sup>	Administrative substantiation of child abuse and neglect	Home visiting program: first-time births to low-income, unmarried mothers Education program: low-income children aged 3 years	Lifetime	Value of avoided violence per \$1 invested: \$6 (home visiting program) and \$2 (education program) (2013 USD).
Home visiting program <sup>26</sup>	Administrative investigation of child abuse and neglect	Vulnerable pregnant women	18 months	Per child that avoids abuse or neglect: £54,370 (2003–2004 GBP).
Home visiting program <sup>28</sup>	Administrative substantiation of child abuse and neglect	Methadone-maintained parents with young children	Lifetime	Per child that avoids abuse or neglect: AUD \$43,975 (2013 AUD).
Home visiting program <sup>29</sup>	Administrative involvement or medical services related to child abuse and neglect	Children aged 0–5 years	Lifetime	Per child that avoids abuse or neglect: AUD \$22,000 to several million (2010 AUD).
Home visiting program <sup>33</sup>	Out of home placement due to child abuse and neglect	Vulnerable pregnant women	18 months	Per child per month of avoided child abuse or neglect: £1,691 (2004 GBP).
Multisystemic therapy <sup>31</sup>	Administrative investigation or out of home placement due to child abuse and neglect	Families referred by child protective services	Lifetime	Value of avoided violence per \$1 invested: \$3 (2015 USD).
Intimate partner violence				
Education program <sup>36</sup>	Intimate partner violence victimization	Women aged 16 years seeking general practice medical care	10 years	Per QALY gained: £3,913 (2015–2016 GBP) (healthcare payer perspective) to intervention dominant <sup>c</sup> (societal perspective).
Education program <sup>38</sup>	Intimate partner violence victimization	Women aged 16 years seeking general practice medical care	10 years	Per QALY gained: intervention dominant <sup>c</sup> (2008 GBP).

Violence and intervention type	Study outcome measure	Target population	Time horizon <sup>d</sup>	Incremental cost-to-effectiveness ratio or benefit-to-cost ratio <sup>b</sup>
Social services <sup>45</sup>	Injurious assault	Intimate partner violence victims	1 year	Value of avoided violence per \$1 invested: \$7–\$18 (1998 USD).
Community violence				
Alcohol policy change <sup>19</sup>	Disability or death due to violence <sup>d</sup>	General population aged 16 years	Lifetime	Per DALY avoided: intervention dominant <sup>c</sup> (2009 EUR).
Built environment <sup>14</sup>	Firearm assault	General population	1–4 years	Value of avoided violence per \$1 invested: \$5–\$333 (2014 USD).
Education program <sup>17</sup>	Interpersonal violence perpetration	Families in high-crime and poverty neighborhoods	Lifetime	Per act of interpersonal violence avoided: \$736,010 (2004 USD).
Education program <sup>18</sup>	Hospitalizations or death due to violence <sup>d</sup>	Juvenile justice offenders	18 months–4 years	Per offense prevented: \$3,124 (2010 AUD). <sup>c</sup> Per serious injury avoided: \$42,169. Per undiscounted/ discounted life year gained: \$8,268/ \$17,910.
Education program <sup>22</sup>	Serious assaults, other assaults, unlawful threat, assault on law enforcement officials	General population	1 year	Value of avoided violence per \$1 invested: \$39 (2005 EUR).
Hospital-centered violence intervention program <sup>15</sup>	Repeat violent injury	ED patients aged 12–20 years with a firearm assault injury	5 years	Per QALY gained: \$2,941 (2010 USD).
Hospital-centered violence intervention program <sup>20</sup>	Repeat violent injury	Hospitalized assault patients aged 10–30 years	5 years	Per avoided reinjury and QALY gained: intervention dominant <sup>c</sup> (2011 USD).
Hospital-centered violence intervention program <sup>24</sup>	Violent assault perpetration or reinjury	Hospitalized assault patients	5 years	Value of avoided violence per \$1 invested: \$1–\$13 (2011 USD).
Hospital-centered violence intervention program <sup>25</sup>	Peer aggression (perpetration), peer victimization, or violence consequences (e.g., trouble at school because of fighting)	At-risk adolescents seeking care at an urban ED	1 year	Per violence event averted: \$17.06 (2012 USD).
Multisystemic therapy <sup>21</sup>	Repeat physical or sexual assault perpetration	Juvenile offenders	14 years	Value of avoided violence per \$1 invested: \$10–\$24 (2008 USD).
Violence hot-spot services coordination <sup>23</sup>	Sexual offenses reported to police	General population	18 months	Value of avoided violence per \$1 invested: \$22 (2008–2009 AUD).
Violence hot-spot services coordination <sup>16</sup>	Wounding or common assault	General population	5 years	Value of avoided violence per \$1 invested: £82 (2003 GBP).

<sup>a</sup>Duration over which outcomes and costs were assessed.

<sup>b</sup>Incremental cost-to-effectiveness ratios are typically reported for cost-effectiveness and cost-utility analysis; benefit-to-cost ratios are typically reported for cost-benefit analysis.

<sup>c</sup>Dominant=less costly and more effective.

<sup>d</sup>Violence outcomes were not separately reported; economic evaluation results were reported in combination with other health benefits of the assessed intervention (e.g., motor vehicle traffic injuries and violent assault injuries avoided due to alcohol policy change).

AUD, Australian Dollar; CAN, Canadian Dollar; DALY, disability-adjusted life year; ED, emergency department; EUR, Euro; GBP, Pound Sterling; QALY, quality-adjusted life year; SEK, Swedish Krona; USD, U.S. Dollar.

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