

# **Injury Prevention: What Works? A Summary of Cost-Outcome Analysis for Injury Prevention Programs (2014 Update)**



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**(Fact Sheets)**

## FAST FACTS

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- How can you convey the cost-effectiveness of the injury intervention that you are considering? Use a fast fact! These can be written for any of the interventions summarized in these fact sheets based on the information in the table. The format of the fast facts is “[*Intervention name*] yields an estimated cost savings of [Total Benefits] for a cost of only [Cost per Unit]”. For example, [*Zero Alcohol Tolerance for Drivers Under 21*] yields an estimated cost savings of [\$1,030] for a cost of only [\$42 per driver].
- *Midnight Driving Curfew Combined with Provisional Licensing* for teenage drivers yields an estimated cost savings of \$730 for a cost of only \$91 per driver.
- *Sobriety Checkpoints* yield an estimated cost savings of \$89,000 for a cost of only \$13,086 per checkpoint.
- *Battery-Operated Smoke Alarms* yield an estimated cost savings of \$880 for a cost of only \$48 per smoke alarm.
- *Treatment Foster Care* yields an estimated cost savings of \$197,000 for a cost of only \$3,004 per child.
- *A 20% Alcohol Tax* yields an estimated cost savings of \$111 for an annual cost of only \$12 per drinker.
- *Poison Control Centers* yield an estimated cost savings of \$360 for a cost of only \$46 per call.
- *A Bicycle Helmet, Ages 3-14*, yields an estimated cost savings of \$630 for a cost of only \$14 per helmet.
- *Child Safety Seat Distribution, Ages 0-4*, yields an estimated cost savings of \$2,400 for a cost of only \$57 per seat provided.

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# 1. METHODOLOGY

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## INTRODUCTION

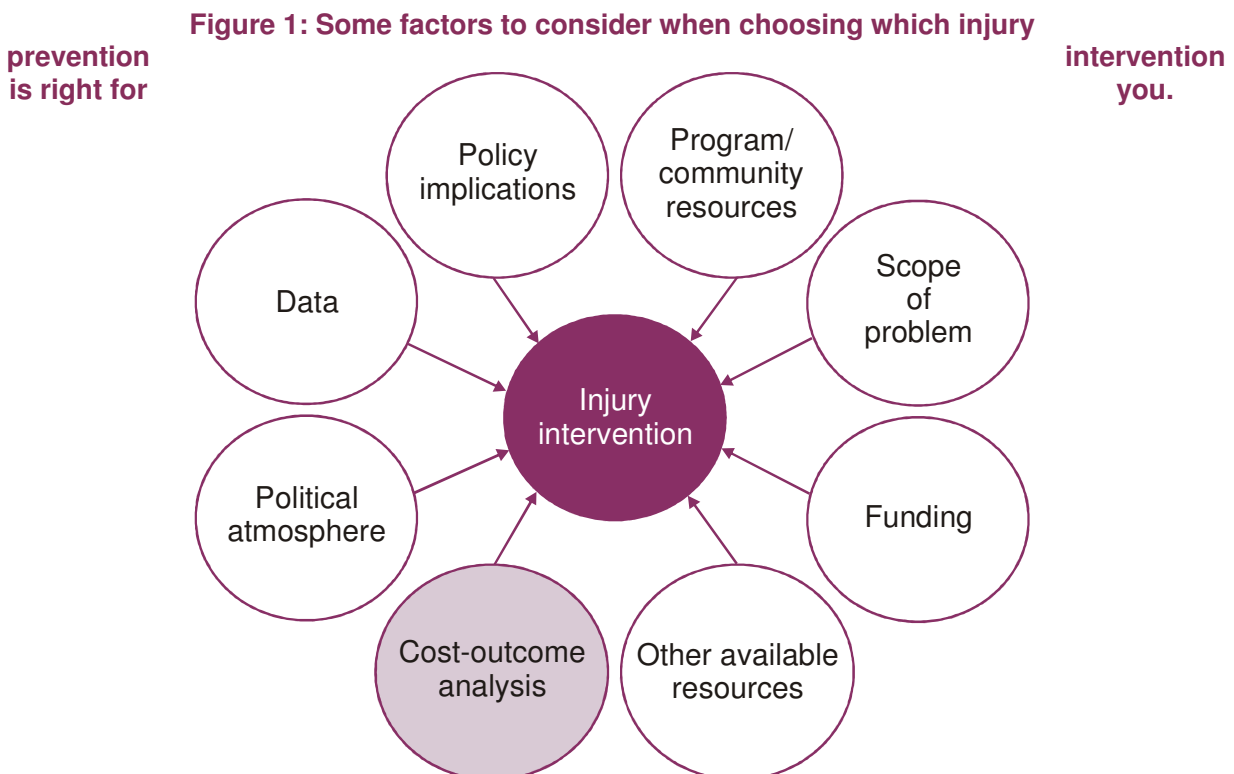
Injury and violence are among the most serious social, economic, medical, and public health issues. Injuries and violence are a leading killer among all ages, and the number one killer among kids, teens, and young adults ages 1-44. Injuries and violence affect all of us including the families left behind, disabled survivors, and the general public who support our overburdened health care system. However, the majority of injuries and violence can be prevented through education, behavior and environmental changes, policy implementation and enforcement, and technology. But how can you tell if a particular prevention program or intervention is right for you, your family, and/or your community? Figure 1 shows some of the factors that you should consider; the only factor discussed in these fact sheets is costs. Costs are a universal metric that allow you to compare dissimilar interventions on the same scale. Costs can be used to produce cost-outcome analyses (see glossary for definitions of terms in bold) that are useful tools for the evaluation of prevention and intervention programs. This Fact Sheet Series can be used as an advocacy tool, to assist with the development of injury prevention plans, to guide the selection of an intervention, to provide technical assistance, to assist with resource allocation, or to promote a particular intervention in educational materials. Disciplines that are essential or tangential to injury prevention have a need to evaluate programs in terms of costs.

This Fact Sheet Series presents cost-outcome analyses for motor vehicle, impaired driving and pedestrian, open-flame/burn, substance abuse, violence, and other interventions. In a resource-constrained world, decision makers want to know if a program produces desired results less expensively than alternative approaches. For example, cost-outcome analyses allow you to say:

- On average, a \$57 child safety seat generates \$2,400 in benefits to society, or stated another way, child safety seats yield an estimated cost savings of \$2,400 for an average cost of only \$57.
- On average, a \$38 booster seat generates \$2,700 in benefits to society.
- On average, a \$14 bicycle helmet for ages 3-14 years generates \$630 in benefits to society.
- On average, a \$48 battery-operated smoke alarm generates \$880 in benefits to society.
- Childproof cigarette lighters cost \$0.05 per lighter and generate \$4 in benefits to society.

- The average call to a poison control center costs \$46 and saves \$360 in medical costs. At \$46 a call, each \$1 spent on poison control center services saves over \$8 in medical spending.
- The average admission to a triaged regional trauma system costs \$2,082 and saves \$5,600.
- On average, injury prevention counseling by pediatricians (TIPP) costs \$12 per child ages 0-4 and generates \$106 in benefits to society.
- A sobriety check point costs \$13,086 and generates an average of \$89,000 in benefits to society.
- The Harlem Hospital Safe Communities program costs an average of \$81 per child and generates an average of \$4,100 in benefits to society.

The majority of the interventions presented reduce injuries, disability, and death. However, these fact sheets are a partial literature summary of available injury interventions with cost outcome analysis results. Children's Safety Network (CSN) is not suggesting that you choose any of the interventions over others. The focus of these fact sheets is on the cost-effectiveness of interventions, but cost effectiveness should **NOT** be the only factor considered when choosing an intervention to replicate or endorse. Interventions should be chosen based on a multitude of factors, including policy implications, program or community resources, funding, political atmosphere, cost implications, scope of problem, data, votes, personal interests, understanding the problem, time, competing priorities/interest groups, feeling of control over the situation, and other available resources (see Figure 1).



CSN ([www.childrenssafetynetwork.org](http://www.childrenssafetynetwork.org)) is funded by the [Health Resources and Services Administration's Maternal and Child Health Bureau](#) (U.S. Department of Health and Human Services).

## **METHODS FOR THE COST-OUTCOME ANALYSIS OF INJURY INTERVENTION PROGRAMS**

The purpose of this section is to help the user properly use the tables and information provided. Details about suggested values to use in determining the appropriateness of an intervention are NOT meant to solely be used in determining the selection of an intervention. Cost-outcome analyses that show cost-savings are just one of many factors to consider.

The 168 injury-related interventions consist of 60 youth only interventions, 50 adult only interventions, and 58 youth and adult interventions. Estimated cost savings (benefits to society) per injury prevented are from a set of related studies or use compatible values from the U.S. Consumer Product Safety Commission's Injury Cost Model. In several highway safety studies, intervention costs included increased travel time or reduced mobility. We valued travel time at 50% of the wage rate for production workers and valued mobility loss at the average cost of vehicle operation including amortization. All costs take society's viewpoint (everyone's costs and savings count) and use 2013 dollars and a 3% discount rate. Savings from any demonstration programs were reduced by 25%. When demonstration programs are replicated by others, there are usually differences between the replication and the original (demonstration) program, such that the savings are usually lower.

Savings for some interventions would be higher if we looked at the government perspective. For example, the cost of a sobriety checkpoint includes the time spent by drivers stopped at the checkpoints. If this were excluded, the savings would be higher.

The injury interventions presented were selected from U.S. published and unpublished studies from 1987-2010 identified through Medline and internet searches, bibliographic reviews, and federal agencies. Serious study flaws were corrected when possible. However some studies were subjectively excluded based on the rigor of program cost and effectiveness estimates. Analyses of occupational, air, rail, and water transport safety programs were also excluded. In addition, studies which showed reductions in fatalities, but ignored nonfatal injuries were excluded. All excluded studies are not shown in these fact sheets.

There are two cost measures which can be used to compare interventions: benefit-cost ratios and cost per QALY (quality adjusted life years) saved. If the benefit-cost ratio is greater than 1.0, the cost of implementing the intervention is less than the total benefits gained by preventing injuries. The total benefits include the dollar value of medical costs, work loss, and lost quality of life costs. A benefit-cost ratio greater than 1 means the intervention offers a positive return on investment and is cost-effective. Costs per QALY is a more stringent measure because it only includes savings



from medical costs and other tangible resources and does not include quality of life savings. If the medical and other resource cost savings generated by the prevented injuries exceed the total cost of the intervention, the intervention is cost-saving and the cost/QALY is "<\$0." If the intervention is effective, but the cost of the intervention exceeds the medical and other resource cost-savings, the cost/QALY will be greater the \$0. If the intervention is not effective



at all, the cost/QALY will be infinite (i.e., an infinite number of dollars can be spent on the intervention without improving health outcomes). In summary the best interventions are cost-effective (a BCR > 1) and cost-saving (cost/QALY < \$0). In general interventions with a BCR > 2 and a cost/QALY < \$100,000 are considered acceptable interventions.

### Summary of Number and Types of Cost-Outcome Analysis Interventions

Intervention	Youth	Adult	Youth and Adult	Total
Motor Vehicle and Highway Safety	9	0	30	39
Impaired Driver	1	10	0	11
Open-Flame/Burn	1	0	11	12
Violence	15	17	2	34
Other Injury	6	2	3	11
Alcohol and Substance Abuse	24	4	12	40
Tobacco	4	17	0	21
Total	60	50	58	168

Updated 08/29/14

## STUDY SUPPORTERS AND REFERENCES

Development and update of this Fact Sheet Series is supported by contracts from the Health Resources Services Administration Maternal and Child Health Bureau through the Children's Safety Network (CSN). Support for the estimates also came from the Center for Substance Abuse Prevention, National Institute on Alcohol Abuse and Alcoholism, and National Highway Traffic Safety Administration. All cost-outcome analyses presented in these fact sheets were conducted by or compiled by Ted Miller, PhD and others from the CSN Economics and Data Analysis Resource Center at the Pacific Institute for Research and Evaluation (PIRE). Most of the analyses are in the following sources:

- Miller TR, Levy DT. (2000). Cost-outcome analysis in injury prevention and control: Eighty-four recent estimates for the United States. *Medical Care* 38(6):562-582.
- Zaloshnja E, Miller TR, Galbraith M, Lawrence BA. (2003). Reducing injuries among Native Americans: Five cost-outcome analyses. *Accident Analysis and Prevention* 35(5):631-639.
- Miller TR. (2001). The effectiveness review trials of Hercules and some economic estimates for the stables. *American Journal of Preventive Medicine* 21(4S):9-12.
- Miller TR, Hendrie D. (2009). Substance abuse prevention dollars and cents: A cost-benefit analysis, Rockville MD: Substance Abuse and Mental Health Services Administration, DHHS Publication No. (SMA) 07-4298.
- Miller TR, Finkelstein E, Zaloshnja E, Hendrie D. (2012). The cost of child and adolescent injuries and the savings from prevention. In K Liller (ed.), *Injury Prevention for Children and Adolescents: Research, Practice, and Advocacy*, Second Edition, Washington DC: American Public Health Association, 21-81.

- Miller TR, Hendrie D. (2012). Economic evaluation of injury prevention and control programs. In G Li, S Baker (ed.), *Injury Research: Theories, Methods and Approaches*, New York: Springer, 641-666.
- Miller TR, Hendrie D. (2012, in press). Economic evaluation of public health laws and their enforcement. In S Burris, A Wagenaar, (ed.), *Public Health Law Research: Theory and Methods*, Wiley.



## 2. MOTOR VEHICLE

### COST ANALYSIS OF MOTOR VEHICLE AND PEDESTRIAN SAFETY INTERVENTION PROGRAMS

Motor vehicle collisions are the leading cause of fatal injuries. Motor vehicle collisions often result in medical costs, lost work time, and lost quality of life. The total annual cost of motor vehicle related death and injury is over \$240 billion. Interventions to reduce motor vehicle injuries include interventions to improve driver and pedestrian safety, vehicle design, and road design.

Driver and pedestrian safety interventions include broad federal traffic safety programs, speed limits, provisional licenses and curfews for teenage drivers, laws requiring child seats, and distribution of child seats. Vehicle design interventions include installing airbags, seatbelts, and automatic daytime vehicle lights. Road design interventions include bridge end guard rails, median barriers, and post mounted reflectors.

#### CHILD SEATS

Child seats are an effective way of reducing child injuries in motor vehicle crashes.<sup>1</sup> Three types of child seat programs with cost-benefit analyses are included in these facts sheets: *Pass Child Safety Seat Law – Ages 0-4*, *Child Safety Seat Distribution – Ages 0-4*, and *Child Seat Misuse Reduction & Design Improvement* through education campaigns and check points. *Child Safety Seat Laws* require that children ages 0-4 be appropriately restrained when traveling in passenger vehicles. *Child Safety Seat Distribution (Ages 0-4)* encompasses giving away approved child safety seats to parents and caregivers and a *Child Seat Misuse Reduction & Design Improvement* at a car seat checkpoint involves ensuring that child safety seats are properly installed in vehicles, that children are appropriately fastened in the child seat, and that parents and caregivers have an understanding of procedures. Uniform latches to anchor seats contributed to the effectiveness of this intervention.

### DRIVER AND PEDESTRIAN SAFETY PROGRAMS

Of the nineteen driver and pedestrian programs, twelve were cost-saving; for these programs, the medical, property damage, and other resource cost savings exceed the intervention costs. *Child Safety Seats (Ages 0-4)* and *Booster Seats (Ages 4-7)*



reduce injuries to children in motor vehicle accidents, and the amount saved by preventing these injuries was more than the costs to implement the program. Other cost-saving interventions are *Safety Belt Laws*, *Child Bicycle Helmets*, and *Motorcycle Helmets*. For communities with limited resources to invest in driver and pedestrian safety programs, these programs also offer the highest return.

<sup>1</sup> Childhood Injury Cost and Prevention Facts. Children's Safety Network Economics and Data Analysis Resource Center fact sheet series (September, 2005).

The remaining programs produced benefits in injuries prevented, but were less **cost-effective**. *Motorcycle Helmet Laws*, *All Terrain Vehicle Helmets*, and *Willy Whistle (Child) Pedestrian Safety Programs* were all effective in reducing injuries, but had a net cost for every year of perfect health gained.

### Benefit-Cost Ratios of Motor-Vehicle Injury and Pedestrian Safety Intervention Programs (2013 dollars)

For information on the research methodology, see Methodology section of this Fact Sheet Series.

		Cost per Unit	Total Benefits	Benefit Cost Ratio	Cost/QALY
<b>Driver and Pedestrian Safety Interventions</b>					
1	Pass Child Safety Seat Law, Ages 0-4	\$63/new user	\$2,400	38	<\$0
2	Child Safety Seat Distribution, Ages 0-4	\$57/seat provided	\$2,400	42	<\$0
3	Pass Booster Seat Law, Ages 4-7	\$42/new user	\$2,700	63	<\$0
4	Booster Seat, Distribution, Ages 4-7	\$38/seat	\$2,700	71	<\$0
5	Pass Safety Belt Law	\$374/new user	\$6,600	18	<\$0
6	Upgrade Secondary Belt Law to Primary	\$374/new user	\$6,600	18	<\$0
7	Enhanced Belt Law Enforcement	\$386/new user	\$6,600	17	<\$0
8	Driver Airbag	\$467/bag	\$2,100	4.4	\$14,700
9	Passenger Airbag	\$241/bag	\$490	2	\$72,000
10	Pass Motorcycle Helmet Law	\$2,270/new user	\$6,600	2.9	\$49,000
11	Voluntary Motorcycle Helmet Use	\$107/helmet	\$6,600	62	<\$0
12	Pass Bicycle Helmet Law, Ages 3-14	\$14/new user	\$630	45	<\$0
13	Pass Bicycle Helmet Law, Ages 15 & Over	\$442/new user	\$310	0.7	\$309,000
14	Bicycle Helmet Distribution, Ages 3-14	\$13/helmet	\$630	48	<\$0
15	Voluntary Bicycle Helmet Use, Ages 15 & Over	\$21/helmet	\$310	15	<\$0
16	Voluntary All-Terrain Vehicle Helmet Use	\$57/helmet	\$620	11	\$11,000
17	Install Bridge-End Guardrail	\$12,215/bridge	\$459,000	38	<\$0
18	Install Median Barrier (1-12 foot median)	\$25,684/mile	\$660,000	2.6	\$60,000
19	Install Median Barrier (>13 foot median)	\$25,684/mile	\$154,000	0.6	\$336,000

Note: If the cost/QALY is <\$0, the intervention is effective and cost saving. If the cost/QALY is infinite, the intervention is not effective (i.e., an infinite number of dollars can be spent on the intervention without improving health outcomes). Updated 08/29/14.



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## VEHICLE DESIGN SAFETY RESEARCH AND REGULATION



Of these seventeen interventions, eleven were cost-saving. Even personal protective equipment with very low average benefits may be worth the cost to some consumers. For example, among this list, Adding Rear Seat Shoulder Belts is the least cost-effective safety equipment, in part because there are no rear seat passengers in many collisions. However, a car purchaser who expects to regularly have passengers in the back seat might find that rear shoulder belts offered a positive return on investment.

Driving curfews for youth may force them to curtail their drinking and reduce impaired driving and resulting injuries. However curfews have a social cost from lost mobility. A Midnight Driving Curfew Combined with Provisional Licensing offers a higher return than a 10 PM Driving Curfew and is an appropriate intervention for many communities.

		Cost per Unit	Total Benefits	Benefit Cost Ratio	Cost/QALY
Vehicle Design Safety Research and Regulation and Road Design and Upgrading					
20	Federal Traffic Safety Programs	\$4/driver	\$200	55.3	<\$0
21	Federal Vehicle Safety Program	\$71/vehicle	\$400	5.6	\$8,000
22	Federal Road Safety Program	\$7/driver	\$200	35.2	<\$0
23	Mobile Speed Camera	\$801,940/camera-year	\$15,200,000	19	<\$0
24	Red Light Camera	\$12,545/camera-year	\$53,690	4	<\$0
25	Striping / Painting Lines on Roads	\$290/mile	\$19,500	67.3	<\$0
26	Post-mounted Reflectors	\$405/reflector	\$45,000	111.1	<\$0
27	Flatten Crest Vertical Curves	\$349,296/curve	\$250,000	0.7	\$250,000
28	Flashing Beacons on Hazardous Curves	\$22,885/beacon	\$365,000	15.9	<\$0
29	Side Impact Protection	\$401/vehicle	\$1,200	3	\$38,000
30	Automatic Daytime Vehicle Lights	\$87/vehicle	\$300	3.8	\$23,000
31	55MPH speed limit	\$9.61/added travel hour	\$26	2.7	\$24,000
32	Child Pedestrian Safety Program	\$2,044/child	\$18,400	9	<\$0
33	Safety Belts, Front Seat	\$83/vehicle	\$4,500	53.6	<\$0
34	Shoulder Belts, Rear Seat	\$30/vehicle	\$13	0.4	\$434,000
35	Child Seat Misuse Reduction & Redesign Improvement	\$6.60/seat in use	\$600	81.2	<\$0
36	Livestock Control, Native America	\$53,703/impound vehicle	\$91,292	1.7	<\$0
37	Livestock Control, Native America	\$9.11/grate	\$16	1.8	<\$0
38	Provisional Licensing + Midnight Driving Curfew	\$91/driver	\$730	8	<\$0
39	Change Driving Curfew to 10 PM	\$176/driver	\$440	2.5	\$41,000

### 3. IMPAIRED DRIVING

#### COST ANALYSIS OF IMPAIRED DRIVING AND PEDESTRIAN INTERVENTION PROGRAMS

Impaired driving, or driving under the influence of alcohol, is a major source of fatalities and injuries. A person with a blood alcohol concentration (BAC)  $\geq .08$  drove one of every 140 miles driven in the United States in 2004. Police in the United States reported 935,923 crashes involving a driver or pedestrian with a BAC of .01 or more. However, the alcohol involvement of drivers and pedestrians are not always captured in the police report for various reasons. When alcohol involvement is estimated in crashes where this information was not captured by the police, the number of alcohol involved crashes almost doubles to an estimated 1,826,390 crashes. These crashes killed 16,694 and injured an estimated 410,000 people.<sup>3</sup>

##### STREETLIGHTS AT BARS

In the *Streetlights at Bars* intervention, the Eastern Arizona District of the IHS's Office of Environmental Health and the White Mountain Apache Tribe (population 10,000) installed 28 streetlights along a 1.1-mile section of highway to reduce pedestrian injuries, primarily to intoxicated victims, in Whiteriver, Arizona. The project also involved the State Transportation Department and the local electric utility.<sup>2</sup>

#### Benefit-Cost Ratios of Impaired Driving Prevention Programs (2013 dollars)

For information on the research methodology, see Methodology section of this Fact Sheet Series.

		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
<b>Impaired Driving Prevention Programs</b>					
40	.08% Driver Blood Alcohol Limit	\$4/driver	\$59	15	<\$0
41	Zero Alcohol Tolerance, Drivers Under 21	\$42/driver	\$1,030	25	<\$0
42	Sobriety Checkpoints	\$13,086/checkpoint	\$89,000	6.8	<\$0
43	Administrative License Revocation (ALR)	\$3,851/ALR	\$65,000	17	<\$0
44	ALR with Per Se Law	\$3,616/ALR	\$77,000	21	<\$0
45	Alcohol-Testing Ignition Interlock	\$1,282/vehicle	\$8,800	6.8	<\$0
46	DWI Offender Auto Impoundment	\$1,097/vehicle	\$5,900	5.4	<\$0
47	DWI Offender Electronic House Arrest	\$1,920/arrestee	\$6,500	3.4	<\$0
48	DWI Intensive Probation + Treatment	\$1,714/arrestee	\$6,500	3.8	<\$0
49	Australia-Style Anti-DWI Media Campaign	\$947/million population	\$13,400	14.2	<\$0
<b>Impaired Pedestrian Harm Reduction</b>					

<sup>2</sup> Zaloshnja, E., Miller, T., Galbraith, M., Lawrence, B., DeBruyn, L., Bill, N., Hicks, K., Keiffer, M., & Perkins, R. (2003). Reducing injuries among Native Americans: Five cost-outcome analyses. *Accident Analysis and Prevention*, 35(5), 631-639.

<sup>3</sup> Impaired Driving in the United States 2007, PIRE Fact Sheet.



50	Streetlights at Bars, Native America	\$493/light	\$4,200	8.4	<\$0
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Note: If the cost/QALY is <\$0, the intervention is effective and cost saving. If the cost/QALY is infinite, the intervention is not effective (i.e., an infinite number of dollars can be spent on the intervention without improving health outcomes).

Updated 08/29/14.

Impaired driving fatalities and injuries can be prevented by lessening the number of drinking drivers, and the number of times that drinking drivers drive while impaired. Safety measures that improve the survivability of traffic crashes (i.e., proper in-car restraints, airbags, or guardrails) also prevent or improve the outcomes of impaired driving crashes; however, they are listed on the Motor Vehicle Safety section of this Fact Sheet Series.

These interventions all offer excellent returns for the amount invested. All eleven of the measures reported here directly reduce harm from drinking by reducing impaired driving frequency. All of these interventions were cost-saving (cost/QALY < \$0) meaning that the medical, property damage, and other resource costs saved by these programs exceeded the costs of the program.

These interventions may avert specific incidents and also have a general deterrence effect. For example, Sobriety Checkpoints avert specific incidents by apprehending impaired drivers who would otherwise have crashed. Sobriety Checkpoints also have a general deterrence effect because some people choose not to drive after drinking to avoid getting caught in checkpoints. Typically this general deterrence effect dominates.

Measures such as Zero Alcohol Tolerance for Drivers Under 21 and .08% Driver Blood Alcohol Limits may have additional benefits such as reducing consumption and associated harms including crime, high-risk sex, and suicide acts. However, only their impact on impaired driving has been evaluated.

Some interventions work well in combination. As a package, automatic Administrative License Revocation invoked when caught driving at a blood alcohol level above a 0.08% or even a 0.10% limit and Zero Alcohol Tolerance for Drivers Under 21 during the first year of driving, and intensive Sobriety Checkpoints have worked well in concert to reduce impaired driving deaths among young drivers.

Interventions that can prevent re-offending include Alcohol-Testing Interlocks that prevent automobile use by impaired drivers, DWI Offender Auto Impoundment, and DWI Offender Electronic House Arrest. Any of these three interventions probably should be coupled with intensive case managed treatment. Auto Impoundment and DWI Offender Electronic House Arrest are also still at demonstration stages. Importantly, their impact on domestic violence has not been evaluated.

## IMPAIRED PEDESTRIAN PREVENTION MEASURE

One intervention, *Streetlights at Bars*, was designed to protect intoxicated pedestrians. Streetlights were installed on a bar-lined street to increase visibility and reduce the likelihood of drivers hitting impaired pedestrians. It merits replication where similar conditions exist.



## 4. OPEN-FLAME/BURNS

### COST ANALYSIS OF PREVENTING OPEN-FLAME BURNS

In the year 2007, fire was the seventh leading cause of unintentional injury deaths in the United States. In 2007, 3,375 people were killed and 31,590 were hospitalized for fires or by burns. An open flame is the leading cause of burn injury for adults, while scalding is the leading cause of burn injury for children. Eight inexpensive prevention devices are reviewed here.

#### Benefit-Cost Ratios of Open-Flame Burn Prevention Programs (2013 dollars)

For information on the research methodology, see Methodology section of this Fact Sheet Series.

		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
51	Childproof Cigarette Lighter	\$0.05/lighter	\$3.8	77	<\$0
52	Less Porous Cigarette Paper	\$0.0001/pack	\$0.08	809	<\$0
53	Pass Smoke Alarm Law	\$53/new user	\$880	17	<\$0
54	Alkaline-Battery-Operated Smoke Alarm Voluntary Use	\$48/home	\$880	18	<\$0
55	Lithium-Battery Smoke Alarm Installation & Fire Education (SAIFE) Program	\$335/home	\$1,640	5	\$24,000
56	Sprinkler System: Colonial	\$2,475/home	\$6,000	2.5	\$56,000
57	Sprinkler System: Townhouse	\$2,261/home	\$6,000	2.7	\$50,000
58	Sprinkler System: Ranch House	\$988/home	\$6,000	6.2	\$14,000
59	Require Sprinkler System, New Colonial House	\$2,673/home	\$6,000	2.3	\$62,000
60	Require Sprinkler System, New Townhouse	\$2,441/home	\$6,000	2.5	\$55,000
61	Require Sprinkler System, New Ranch House	\$1,068/home	\$6,000	5.7	\$16,000
62	Mattress Flammability Standard	\$29/mattress	\$80	2.7	\$53,000

Note: If the cost/QALY is <\$0, the intervention is effective and cost saving. If the cost/QALY is infinite, the intervention is not effective (i.e., an infinite number of dollars can be spent on the intervention without improving health outcomes). Updated 08/29/14.

### RESULTS

#### FIRE PREVENTION MEASURES

*Smoke Alarm Laws* and voluntary *Smoke Alarm Purchases* are a proven way to reduce death, injury, and property damage resulting from fires, providing \$880 in benefits for as little as \$53 per smoke alarm. *Less Porous Cigarette Paper* will self-extinguish if left to smolder, thus reducing the chance of cigarette fires. *Less Porous Cigarette Paper* has a very high return on investment. Although it may only provide benefits of 8 cents per pack of cigarettes, the cost of the paper is very low and the number of potential cigarette burns is high. *Child Resistant Cigarette Lighters* reduce unintentional

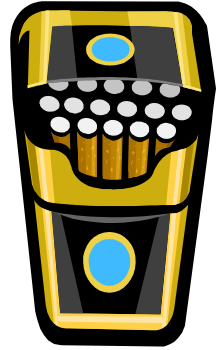


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fires and injuries by making it more difficult for young children to operate the lighters. All of these interventions are cost-saving, meaning the medical, property damage, and other resource cost savings exceed the intervention costs.

## WHAT IS “LESS POROUS” CIGARETTE PAPER?

Various methods for slowing the burn rate of a cigarette by making the paper less porous are currently in use. Some new paper has rings of ultra-thin paper that are applied on top of traditional cigarette paper during the paper-making process. These rings act as “speed bumps” to slow down the rate at which the cigarette burns as the lit end crosses over them. Some brands use a “double wrap” around the tobacco column. This has the effect of making the cigarette paper less porous, thereby decreasing the flow of oxygen to support combustion.



## CHILD RESISTANT SAFETY LIGHTERS

In 1994, the U.S. Consumer Product Safety Commission (CPSC) set a Safety Standard for Cigarette Lighters that required outfitting disposable and novelty cigarette lighters with a child-resistant mechanism making the lighter difficult for children under the age of 5 to operate. This has resulted in an estimated savings of \$80 for every dollar spent.



## 5. VIOLENCE

### COST ANALYSIS OF VIOLENCE PREVENTION PROGRAMS

Interpersonal violence accounts for approximately one-eighth of medical care spending on injury in the United States. Nationally, homicide is the fifth leading cause of death for people from 1 to 45 years of age (2007). In 2001 dollars, the measurable total costs to society for rape are estimated at \$208 billion; robbery \$10 billion; aggravated assault \$100 billion; and murder at \$69 billion. The resource costs include medical costs, mental health costs, property damage, police costs, victim services, and adjudication and sanctioning costs (e.g., incarceration and probation). Added to these costs are the value of lost work and quality of life.<sup>4</sup>

#### PERRY PRESCHOOL AND HOME VISITS PROGRAM

The *Perry Preschool and Home Visits Program* provides early education to children ages 3 and 4 from families with low socioeconomic status. The preschool lasts 2 years and is designed to offer high-quality early childhood education and promote young children's intellectual, social, and physical development. In addition, this intervention provides weekly home visits by teachers and referrals for social services, when needed. For more information, see:

<http://www.highscope.org/Content.asp?ContentId=219>

### RESULTS

#### NONOFFENDER PROGRAMS

Two of the nonoffender programs, the Perry Pre-School and Home Visits Program and the Nurse-Family Partnership 2-Yr Home Visits, were cost-saving, meaning that the medical, property damage, and other resource costs saved by these programs exceeded the costs to implement the program. Intensive home visitation programs can reduce infant/toddler abuse and other problems as the targeted low-income toddlers reach adolescence and adulthood. However, the return on these costly investments takes decades and is not always obtained. Other programs such as Parent Training (Child Behavior Monitoring) and Big Brothers/Big Sisters Mentoring do not produce as many benefits, but may be appropriate when resources are limited.

#### Benefit-Cost Ratios of Violence / Crime Prevention Programs (2013 dollars)

For information on the research methodology, see Methodology section of this Fact Sheet Series.

		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
<b>Nonoffender Programs</b>					
63	Perry Preschool Program (includes home visitation)	\$21,814/child	\$107,000	4.9	<\$0
64	Nurse-Family Partnership 2-Yr Home Visits	\$11,628/child	\$56,000	4.8	<\$0
65	Syracuse Family Development Research Program (includes 5-Yr home visitation)	\$71,247/child	\$65,000	0.91	\$158,000

<sup>4</sup> Cohen, A., Miller, T., and Rossman, S. (1994). The costs and consequences of violent behavior in the United States. In A. Reiss and J. Roth (Eds.) *Understanding and Preventing Violence Vol. 4*. National Academy Press: Washington DC.

		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
66	Parent Training (child behavior monitoring)	\$5,016/child	\$20,000	3.9	\$30,000
67	Big Brothers/Big Sisters Mentoring Cost	\$5,193/child	\$9,200	1.8	\$25,000
68	Financial graduation incentives & intensive counseling for disadvantaged youth	\$26,210/child	\$12,900	0.5	\$331,000

Note: If the cost/QALY is <\$0, the intervention is effective and cost saving. If the cost/QALY is infinite, the intervention is not effective (i.e., an infinite number of dollars can be spent on the intervention without improving health outcomes). Updated 08/29/14.

## YOUTH OFFENDER PROGRAMS

The four youth offender programs focus on intensively treating troubled youth ages 12–17 and three of them are cost-saving. These interventions address the causes of delinquency and seek to improve family and school/community functioning. Multi-Systemic Therapy costs more per youth than the other three cost-effective interventions but also has a greater impact on problem behaviors. Multi-Systemic Therapy is very effective if resources are available, but Functional Family Therapy also is a credible choice. Treatment Foster Care produces considerable benefits but may be limited by the number of trained, dedicated foster parents; therefore this approach is best offered as a complement to one of the other two programs and primarily for extreme, abusive, or neglectful situations where the child should be removed from the home.

## ADULT OFFENDER PROGRAMS

Nine of the fifteen adult offender programs were cost-saving. Measures that are strong candidates for adoption are Drug Courts that case-manage substance abuse treatment, In-Prison Vocational and Adult Basic Education, Job Search Counseling at Release to help offenders transition back into society, and cognitive-behavioral Moral Reconciliation Therapy to raise moral development and treat moral reasoning disorders of treatment-resistant populations. Subsidized Jobs produced benefits only for individuals older than 27 years. These six adult offender programs address different aspects of violent crime and should yield large returns when used in concert with each other.

## NARROWLY TARGETED CRIME PREVENTION MEASURES

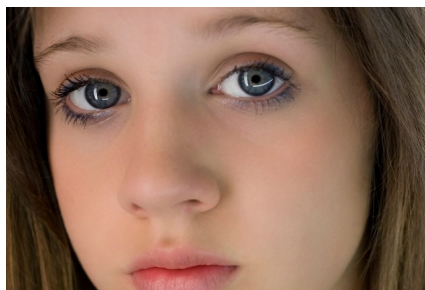
Eight measures are intended exclusively to reduce crime. Three of these measures are cost-saving, Youth Offender Aggression Replacement Training, Diversion of low-risk first offenders from juvenile court to a service-oriented system, and Intensive Probation Supervision of Youth. However, Intensive Probation Supervision for young offenders yields net cost-savings primarily because it is less expensive than incarceration, not because it improves outcomes. Young Offender Boot Camp was less expensive per client than incarceration, but this program produced negative benefits: those who were exposed to it significantly increased their criminal behavior compared to a control group of offenders.



**Benefit-Cost Ratios of Violence / Crime Prevention Programs (2013 dollars) con't.**

		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
<b>Youth Offender Programs</b>					
69	Multi-Systemic Therapy	\$7,106/client	\$275,000	39	<\$0
70	Functional Family Therapy	\$3,237/client	\$103,000	32	<\$0
71	Multidimensional Treatment Foster Care	\$3,004/client	\$197,000	66	<\$0
72	Delinquency Supervision	\$16,774/child	\$31,200	1.9	\$80,000
<b>Adult Offender Programs</b>					
73	Drug Courts	\$3,133/client	\$12,800	4.1	<\$0
74	In-Prison Substance Abuse Therapy	\$8,616/client	\$25,000	2.9	<\$0
75	Post-release Substance Abuse Treatment	\$3,356/client	\$0	Infinite	Infinite
76	Optimized Sentencing	\$18,076/crime	\$39,000	2.2	\$68,000
77	3 Strikes & You're Out	\$24,364/crime	\$39,000	1.6	\$94,000
78	Job Search/Counseling @Release	\$843/client	\$9,000	11	<\$0
79	Financial Assistance @ Release	\$3,867/client	\$12,200	3.2	<\$0
80	Subsidized Jobs, Age < 27	\$14,353/client	\$0	Infinite	Infinite
81	Subsidized Jobs, Age >+27	\$14,353/client	\$40,000	2.8	<\$0
82	Work-Release Programs	more than \$0/client	\$0	Infinite	Infinite
83	In-Prison Vocational Education	\$2,937/client	\$25,400	8.6	<\$0
84	In-Prison Adult Basic Education	\$2,956/client	\$19,000	6.4	<\$0
85	In-Prison Life Skills Programs	\$1,266/client	\$0	Infinite	Infinite
86	Moral Reconation Therapy	\$447/client	\$14,000	31	<\$0
87	Reasoning & Rehabilitation	\$463/client	\$4,300	9.4	<\$0
<b>Crime Prevention, Narrowly Targeted</b>					
88	20-Bed Domestic Violence Shelter	\$19,485/bed	\$217,000	11.1	<\$0
89	Monitored Burglar and Fire Alarms	\$993/home/year	\$1,060	1.1	\$132,000
90	Aggression Replacement Training (Youth Offender)	\$632/client	\$57,000	90	<\$0
91	Lansing Adolescent Diversion	\$2,363/client	\$93,000	39	<\$0
92	Intensive Probation Supervision, Youth	\$2,350/client	\$10,400	4.4	<\$0
93	Intensive Probation Supervision, Adult	\$5,236/client	\$7,100	1.4	\$48,000
94	Scared Straight Type Programs (Young Offenders)	\$0/	\$0	Infinite	Infinite
95	Young Offender Boot Camp	\$3,074/client	-\$34,000	-0.09	Infinite
96	Cognitive-Behavioral Sex Offender Treatment	\$10,081/client	\$21,000	2.1	\$28,000

Note: If the cost/QALY is <\$0, the intervention is effective and cost saving. If the cost/QALY is infinite, the intervention is not effective (i.e., an infinite number of dollars can be spent on the intervention without improving health outcomes). Updated 08/29/14.



## 6. SUBSTANCE ABUSE

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### COST ANALYSIS OF SUBSTANCE ABUSE INTERVENTION PROGRAMS

Alcohol abuse in the U.S. costs an estimated \$501 billion and drug abuse cost \$181 billion in 2002. Of the alcohol costs, 10% is medical care cost, 6% is property damage and other resource costs, 15% is work loss, and the remaining 69% is the value of pain, suffering, and lost quality of life.

Most harm caused by substance abuse is crime or injury. Crime accounted for 19% of alcohol abuse costs and 20% of drug abuse costs. Impaired driving accounted for another 19% of alcohol costs; other injuries—notably pedal-cyclist injuries, falls of people under age 65, burns, drownings, and suicides—accounted for 26%.

#### STRENGTHENING FAMILIES PROGRAM

The *Strengthening Families Program* (SFP) is a 7-week intervention aimed to reduce substance use among 10-14 year-olds and improve the parent-child relationship by teaching various communication, problem-solving, and perspective-taking skills to parents and adolescents. For more information see the SFP website at <http://www.extension.iastate.edu/sfp/>

### RESULTS

These fifty-one interventions target reducing consumption or over-the-limit consumption of alcohol, drug use, underage drinking, and youth tobacco use.

The first set of eighteen interventions reduces substance abuse in various ways, including raising the price by increasing taxes (20% Alcohol Tax and 30% Alcohol Tax, inducing servers to discontinue service for the intoxicated (Enforce Serving Intoxicated Patron Law), combining peer pressure with random testing for illicit drugs or alcohol in a workplace (Workplace Peer Support and Drug Testing, and Workplace Peer Support and Alcohol Testing), and medical interventions (Brief Medical Alcohol Intervention). Fifteen of these eighteen interventions are cost-saving (cost/QALY < \$0), meaning the cost of implementing the programs is less than the medical and other resource cost savings they yield. Among the interventions listed, several warrant widespread implementation: the 20% Alcohol Tax, Substance Abuse Treatment, and Brief Medical Alcohol Intervention (physician lecture to heavy drinkers). In workplaces coupling a peer support and workplace culture change program, management support for substance abuser rehabilitation, and drug and alcohol testing is quite promising (Workplace Peer Support and Drug Testing, Workplace Peer Support and Alcohol Testing) and merits broader evaluation. Enforcing Laws Against Serving Intoxicated Patrons seems very promising but needs wider evaluation before moving to national implementation.

**Benefit-Cost Ratios of Substance Use/Abuse Interventions (2013 dollars)**

		<b>Unit Cost</b>	<b>Total Benefits</b>	<b>Benefit Cost Ratio</b>	<b>Cost/QALY</b>
<b>Substance Use/Abuse Interventions</b>					
97	20% Alcohol Tax	\$12/drinker/year	\$111	9.3	<\$0
98	30% Alcohol Tax	\$23/drinker/year	\$140	6.3	\$7,800
99	21 Minimum Legal Drinking Age	\$221/youth 18-20	\$780	3.5	\$24,000
100	Mandatory Server Training	\$63/driver	\$211	3.4	\$29,000
101	Enforce Serving Intoxicated Patron Law	\$0.50/driver	\$34	71	<\$0
102	TV Alcohol Advertising Ban	\$6,680/M population	\$60,900	9.1	<\$0
103	10% Outlet Density Reduction	\$1,717/M population	\$15,200	8.9	<\$0
104	10 Fewer Sales Hours/Week	\$4,202/M population	\$38,100	9.1	<\$0
105	Retain PA's State Run Wine & Spirits Retail Store Monopoly	\$0.49/drink foregone	\$6.0	12.2	<\$0
106	Communities That Care	\$725/youth	\$12,600	17.4	<\$0
107	Team Awareness, Retail Workers	\$220/participant	\$1,850	8.4	<\$0
108	Team Resilience, Restaurant Workers under Age 26	\$183/participant	\$2,710	14.8	<\$0
109	Prime Life	\$14/participant	\$310	21.9	<\$0
110	PREVENT for Young Workers	\$389/participant	\$20,000	51.5	<\$0
111	Workplace Peer Support + Drug Testing*	\$82/employee	\$1,900	24	<\$0
112	*Add Alcohol Testing to Peer Support	\$14/employee	\$840	30	<\$0
113	Brief Alcohol Intervention	\$133/lecture	\$3,900	30	<\$0
114	Substance Abuse Treatment	\$16,877/abuser	\$801,000	47	<\$0
<b>Youth Development Programs</b>					
115	Across Ages	\$2,255/pupil	\$3,000	1.3	\$137,000
116	Adolescent Transitions	\$1,566/pupil	\$12,900	8.3	\$11,800
117	CASASTART (National Center on Addiction and Substance Abuse, Striving Together to Achieve Rewarding Tomorrow)	\$7,277/pupil	\$7,300	1	\$213,000
118	Child Development Project	\$299/pupil	\$2,300	7.8	<\$0
119	Good Behavior Game	\$79/pupil	\$3,900	50	\$400
120	Guiding Good Choices (formerly Preparing for the Drug Free Years)	\$919/family	\$5,700	6.2	<\$0
121	Project PATHE	\$1,063/pupil	\$0	0	infinite
122	Seattle Social Development Program-Parent-Teacher Training/SOAR (Skills Opportunity and Recognition)	\$4,124/child	\$5,000	1.2	\$145,000
123	Social Competence Promotion	\$456/pupil	\$4,300	9.5	<\$0
124	Strengthening Families	\$1,138/family	\$14,600	13	<\$0
<b>Youth Substance Abuse Prevention Programs</b>					
125	All Stars	\$182/pupil	\$6,800	37.1	<\$0
126	DARE	\$132/pupil	\$0	0	infinite
127	Family Matters	\$204/family	\$3,200	15.9	\$1,900
128	Keepin' It Real	\$165/pupil	\$4,700	28.6	<\$0
129	Life Skills Training	\$289/pupil	\$7,100	24.6	<\$0
130	Project ALERT (Adolescent Learning Experience in Resistance Training)	\$150/pupil	\$1,400	9.4	<\$0
131	Project Northland	\$516/pupil	\$10,700	20.7	<\$0

CSN ([www.childrenssafetynetwork.org](http://www.childrenssafetynetwork.org)) is funded by the [Health Resources and Services Administration's Maternal and Child Health Bureau](#) (U.S. Department of Health and Human Services).



		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
132	Project STAR (Students Taught Awareness and Resistance, Midwest Prevention Program) aka MPP	\$516/pupil	\$6,600	12.7	<\$0
133	Project Toward No Drugs (TND)	\$233/pupil	\$1,920	8.2	<\$0
134	STARS for Families	\$157/family	\$1,130	7.2	<\$0
135	Other Social Influence/Skills Building	\$202/pupil	\$2,600	13.1	\$5,600
136	Other Risk & Protective Factors	\$532/pupil	\$10,100	18.9	\$0
<b>Youth Tobacco Programs</b>					
137	Know Your Body (smoking)	\$184/pupil	\$10,400	56.7	<\$0
138	MN Smoking Prevention Program	\$122/pupil	\$8,200	67.3	<\$0
139	Project Toward No Tobacco (TNT)	\$232/pupil	\$4,400	19	\$6,500
140	Youth Anti-smoking Mass Media Campaign	\$482/pupil	\$3,900	8	\$20,000
<b>Tobacco Cessation Programs</b>					
141	Stop Smoking Mass Media Campaign	\$1,366/ quitter	\$84,000	61.4	<\$0
142	Reduce Cessation Program Prices	\$284/ quitter	\$93,000	328.6	<\$0
143	Minimal Tobacco Counseling	\$8,517/ quitter	\$93,000	11	\$11,000
144	Add Nicotine Patch	\$5,894/ quitter	\$93,000	15.8	\$6,800
145	Instead Add Nicotine Gum	\$11,147/ quitter	\$93,000	8.4	\$15,000
146	Brief Tobacco Counseling	\$7,244/ quitter	\$93,000	12.9	\$8,900
147	Add Nicotine Patch	\$5,217/ quitter	\$93,000	17.9	\$5,800
148	Instead Add Nicotine Gum	\$9,177/ quitter	\$93,000	10.2	\$12,000
149	Full Tobacco Counseling	\$3,602/ quitter	\$93,000	25.9	\$3,200
150	Add Nicotine Patch	\$3,411/ quitter	\$93,000	27.4	\$2,900
151	Instead Add Nicotine Gum	\$5,330/ quitter	\$93,000	17.5	\$5,900
152	Individual Intensive Tobacco Counseling	\$4,404/ quitter	\$93,000	21.2	\$4,500
153	Add Nicotine Patch	\$3,615/ quitter	\$93,000	25.8	\$3,300
154	Instead Add Nicotine Gum	\$4,509/ quitter	\$93,000	20.7	\$4,700
155	Group Intensive Tobacco Counseling	\$2,582/ quitter	\$93,000	36.1	\$1,600
156	Add Nicotine Patch	\$2,890/ quitter	\$93,000	32.3	\$2,100
157	Instead Add Nicotine Gum	\$5,558/ quitter	\$93,000	16.8	\$6,300

For information on the research methodology, see Methodology section of this Fact Sheet Series.

Note: If the cost/QALY is <\$0, the intervention is effective and cost saving. If the cost/QALY is infinite, the intervention is not effective (i.e., an infinite number of dollars can be spent on the intervention without improving health outcomes). Updated 08/29/14.

The remaining thirty-three programs focus on general youth development, strengthening families, substance abuse prevention in youth specifically, and youth tobacco use. Ten of these programs are cost-saving (cost/QALY < \$0). Some of these programs are family centered interventions with a school component such as the Strengthening Families Program, Seattle Social Development Program (Parent – Teacher Training), Family Matters, and STARS for Families. Other programs are school-based life skills training programs such as The Child Development Project, All Stars, Keepin’ It Real, and Life Skills Training which focus on students. A broader family program like the Strengthening Families Program can be more costly than school-based life skills training but may also offer larger returns. School based programs also offer solid returns. With a limited budget, they will let a school system reach the most children, but the same money may yield greater benefits if spent targeting the broader family-centered programs.



## 7. HEALTH SERVICES AND MISCELLANEOUS

### COST ANALYSIS OF HEATH SERVICES AND MISCELLANEOUS INJURY PREVENTION PROGRAMS

The total cost of hospitalized and fatal injuries in the US in 2000 was \$1.1 trillion including \$86.3 billion in medical costs, \$242.3 billion in work loss, and \$785.3 billion in quality of life costs. Poisoning hospital injuries account for \$2.3 billion of the medical costs and \$1.5 billion of the work loss cost. Poisoning fatalities account for \$397 million in medical costs, \$48.2 billion in work loss costs, and \$102 billion in quality of life costs. Drowning injuries cost over \$16 billion.

Health services interventions to prevent injury and improve injury outcomes include poison control centers, triaged regional trauma systems, and pediatrician injury prevention counseling. Miscellaneous injury prevention programs in Native American settings include a youth suicide prevention program and a winter coats that float to reduce drowning. Other injury prevention programs include the Harlem Hospital Safe Communities child safety program and a fall prevention program for the elderly.

#### SAFE COMMUNITIES

The *Harlem Hospital Safe Communities* program is designed to reduce injury to community children by making changes in community social and physical environment, raising local awareness of problems, and improving individual safety knowledge through education and training. This program is involved in a wide range of community activities including traffic safety education, renovating area public parks, community gardening projects, rebuilding playgrounds for elementary schools, and establishing dance and art programs at the hospital. For more information see:

<http://www.nhtsa.gov/Driving+Safety/Safe+Communities/Success+Stories+1996-2005>





## Benefit-Cost Ratios of Health Services Interventions and Miscellaneous Injury Prevention Programs (2013 dollars)

For information on the research methodology, see Methodology section of this Fact Sheet Series.

		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
<b>Health Services Interventions</b>					
158	American Academy of Pediatrics TIPP Injury Prevention Counseling, Ages 0-4	\$12/child	\$106	8.8	\$6,300
159	Poison Control Center Services	\$46/call	\$360	7.8	<\$0
160	Regional Trauma System Services	\$2,082/admit	\$5,600	2.7	<\$0
161	Tetanus-Diphtheria-Pertussis Vaccination, Ages 0-6	\$101/child	\$2,500	24.5	<\$0
<b>Miscellaneous Injury Prevention Programs</b>					
162	Youth Suicide Prevention, Native America	\$233/youth	\$8,200	35	\$3,570
163	Baby Walker Redesign to Prevent Stairway Falls	\$4/walker	\$200	50	<\$0
164	Impact-Absorbing Playground Surfacing	\$15,585/playground	\$30,930	2	\$37,830
165	Winter Coats that Float Drowning Prevention, Native Alaska	\$0.13/person	\$270	2092	<\$0
166	Harlem Hospital Injury Prev. Program	\$81/child	\$4,100	51.2	<\$0
167	Fall Prevention: Hi Risk Elderly	\$1,539/person	\$13,200	8.6	<\$0
168	Fall Prevention: Low Risk Elderly	\$1,315/person	\$800	0.6	\$289,000
169	American Academy of Pediatrics TIPP Injury Prevention Counseling, Ages 0-4	\$12/child	\$106	8.8	\$6,300

Note: If the cost/QALY is <\$0, the intervention is effective and cost saving. If the cost/QALY is infinite, the intervention is not effective (i.e., an infinite number of dollars can be spent on the intervention without improving health outcomes).

Updated 08/29/14.

## HEALTH SERVICES INTERVENTIONS

The four health services interventions reduce the cost of injuries. Three of these programs were cost-saving (cost/QALY < \$0) which means that the medical costs and other tangible resources saved by these programs exceeded the costs to implement the program.

Health services improve outcomes of trauma cases including injuries associated with alcohol and violence. Establishing regional hospital specialties in trauma care, then triaging serious injuries to these hospitals (Triaged Regional Trauma System Services), raises the costs of initial treatment but ultimately improves outcomes and reduces the medical care costs required to achieve maximum medical recovery. A regional or national phone-in poison control center (Poison Control Center) consults 24-hours a day on intentional and unintentional poisonings including drug overdose, food poisoning, suicide, and children accidentally taking medications. The centers greatly reduce poisoning treatment costs and probably improve outcomes by advising on whether treatment is needed, supervising home treatment of minor poisonings without more costly medical intervention, more quickly linking serious cases to appropriate treatment, and providing toxicological consultation to hospital staff. Both measures will reduce the harm from injury and warrant implementation.

Pediatrician Injury Prevention Counseling for Children Ages 0-4 is part of The Injury Prevention Program (TIPP). TIPP is a national program that provides pediatricians with age-appropriate topics for counseling parents about ways to reduce child injuries (e.g., car seats). While this program did reduce injuries, the costs of

prevention counseling by pediatricians exceeded the medical and other resource cost savings from the prevented injuries.

## **MISCELLANEOUS INJURY PREVENTION PROGRAMS**

Two of the miscellaneous interventions have only been tried in Native American settings and need further evaluation prior to widespread implementation. One is a Youth Suicide Prevention program that combines counseling, peer support and prevention of alcohol abuse, child abuse, and domestic violence. The second, Winter Coats that Float Drowning Prevention, located winter coats that float and convinced local residents who use small boats to buy them, thus aiding boaters who fall overboard this intervention is demonstrates cost-savings (cost/QALY < \$0).

The Fall Prevention program was a comprehensive community-based fall prevention demonstration targeting the elderly. Benefits were analyzed separately for elderly participants who were at high risk for fall injuries and participants who were at low risk. There was a net cost-saving for high-risk elderly, but its costs exceeded its benefits for low risk elderly.

The Harlem Hospital Safe Communities program is a comprehensive community based child safety program. It also demonstrated cost-savings.



## GLOSSARY OF DEFINITIONS

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**Benefit-cost ratios** express the total benefits in saved medical and other costs compared to the costs of the program. A benefit cost ratio is calculated for each intervention by dividing the total savings, including the value of preserving quality of life and preventing pain and suffering, by the unit cost of the intervention. The benefit-cost ratio describes the return on investment in the intervention.

**Cost-effective** means the benefit-cost ratio is greater than 1.0 and the cost of implementing the intervention is less than the total benefits gained by preventing injuries. The total benefits include medical costs, other resource costs, work loss, and quality of life costs. A cost-effective intervention offers a positive return on investment.

**Cost-outcome analysis** is the calculation of the economic benefits and costs associated with an intervention so that the intervention can be compared to other interventions.

**Cost per quality-adjusted life year (cost/QALY)** is the cost of the intervention minus the medical and other tangible resource savings divided by the number of QALYs saved. It does not include quality of life savings.

**Cost-saving** means the expected resource cost savings (not including quality of life savings) exceed the cost of the intervention. The **cost/QALY** <0.

**Discount rates** are used because money earns interest. If you have to pay \$10 five years from now, you could put less money in the bank today and have \$10 when the bill comes due. The discount rate essentially is the inflation-free interest rate. With the discount rate, we calculate the present value of future costs. A 2.5% to 3% discount rate is recommended for health policy.

**Medical costs** include averted emergency medical care, acute care (in hospital, clinic, and office settings), rehabilitation, follow-up care (including physician, allied health, and mental health care), long-term medical and institutional care, prescriptions, ancillary expenses, coroner services, and the costs of health insurance claims processing.

**Other resource costs** include direct nonmedical costs for police, fire services, criminal adjudication and sanctioning, property damage or loss, and travel delay.

**QALY** stands for quality adjusted life years. QALYs are a health outcome measure that assigns a value of 1 to a year of perfect health, a 0 to death, and some value in between to impaired health (e.g., from injury). Preventing injuries saves fractions of QALYs and preventing a death saves a lifetime of QALYs. QALYs for different injuries were calculated based on physician ratings of loss of function for victims of injury, probability of permanent work-related disability, and values from surveys of the general population for different functional losses. QALYs are routinely used to evaluate the outcomes of clinical trials and preventive health interventions.

**Quality of life costs** place a dollar value on the pain, suffering, and lost quality of life that children and their families experience due to death and injury.

**Resource costs** include medical and mental health, property damage, police and fire services, victim assistance, insurance claims processing, litigation, incarceration and other sanctioning, and other out of pocket costs resulting from injury.

**Total benefits** reported in this Fact Sheet Series are the amount these interventions saved by preventing injuries. These benefits to society include medical costs, other resource costs, work loss, and quality of life costs.

**Unit cost** is the cost of the intervention for a single individual.

**Work Loss** (productivity) includes wages, fringe benefits and household work for adults. It includes short-term work loss and the present value of a lifetime's worth of wage and household work that a child or adult will be unable if he or she is killed or permanently disabled.

## Benefit-Cost Ratios of Motor-Vehicle Injury and Pedestrian Safety Intervention Programs (2013 dollars)

		Cost per Unit	Total Benefits	Benefit Cost Ratio	Cost/ QALY
<b>Driver and Pedestrian Safety Interventions</b>					
1	Pass Child Safety Seat Law, Ages 0-4	\$63/new user	\$2,400	38	<\$0
2	Child Safety Seat Distribution, Ages 0-4	\$57/seat provided	\$2,400	42	<\$0
3	Pass Booster Seat Law, Ages 4-7	\$42/new user	\$2,700	63	<\$0
4	Booster Seat, Distribution, Ages 4-7	\$38/seat	\$2,700	71	<\$0
5	Pass Safety Belt Law	\$374/new user	\$6,600	18	<\$0
6	Upgrade Secondary Belt Law to Primary	\$374/new user	\$6,600	18	<\$0
7	Enhanced Belt Law Enforcement	\$386/new user	\$6,600	17	<\$0
8	Driver Airbag	\$467/bag	\$2,100	4.4	\$14,700
9	Passenger Airbag	\$241/bag	\$490	2	\$72,000
10	Pass Motorcycle Helmet Law	\$2,270/new user	\$6,600	2.9	\$49,000
11	Voluntary Motorcycle Helmet Use	\$107/helmet	\$6,600	62	<\$0
12	Pass Bicycle Helmet Law, Ages 3-14	\$14/new user	\$630	45	<\$0
13	Pass Bicycle Helmet Law, Ages 15 & Over	\$442/new user	\$310	0.7	\$309,000
14	Bicycle Helmet Distribution, Ages 3-14	\$13/helmet	\$630	48	<\$0
15	Voluntary Bicycle Helmet Use, Ages 15 & Over	\$21/helmet	\$310	15	<\$0
16	Voluntary All-Terrain Vehicle Helmet Use	\$57/helmet	\$620	11	\$11,000
17	Install Bridge-End Guardrail	\$12,215/bridge	\$459,000	38	<\$0
18	Install Median Barrier (1-12 foot median)	\$25,684/mile	\$660,000	2.6	\$60,000
19	Install Median Barrier (>13 foot median)	\$25,684/mile	\$154,000	0.6	\$336,000
<b>Vehicle Design Safety Research and Regulation and Road Design and Upgrading</b>					
20	Federal Traffic Safety Programs	\$4/driver	\$200	55.3	<\$0
21	Federal Vehicle Safety Program	\$71/vehicle	\$400	5.6	\$8,000
22	Federal Road Safety Program	\$7/driver	\$200	35.2	<\$0
23	Mobile Speed Camera	\$801,940/camera-year	\$15,200,000	19	<\$0
24	Red Light Camera	\$12,545/camera-year	\$53,690	4	<\$0
25	Striping / Painting Lines on Roads	\$290/mile	\$19,500	67.3	<\$0
26	Post-mounted Reflectors	\$405/reflector	\$45,000	111.1	<\$0
27	Flatten Crest Vertical Curves	\$349,296/curve	\$250,000	0.7	\$250,000
28	Flashing Beacons on Hazardous Curves	\$22,885/beacon	\$365,000	15.9	<\$0
29	Side Impact Protection	\$401/vehicle	\$1,200	3	\$38,000
30	Automatic Daytime Vehicle Lights	\$87/vehicle	\$300	3.8	\$23,000
31	55MPH speed limit	\$9.61/added travel hour	\$26	2.7	\$24,000
32	Child Pedestrian Safety Program	\$2,044/child	\$18,400	9	<\$0
33	Safety Belts, Front Seat	\$83/vehicle	\$4,500	53.6	<\$0
34	Shoulder Belts, Rear Seat	\$30/vehicle	\$13	0.4	\$434,000
35	Child Seat Misuse Reduction & Redesign Improvement	\$6.60/seat in use	\$600	81.2	<\$0
36	Livestock Control, Native America	\$53,703/impound vehicle	\$91,292	1.7	<\$0
37	Livestock Control, Native America	\$9.11/grate	\$16	1.8	<\$0
38	Provisional Licensing + Midnight Driving Curfew	\$91/driver	\$730	8	<\$0
39	Change Driving Curfew to 10 PM	\$176/driver	\$440	2.5	\$41,000

### Benefit-Cost Ratios of Impaired Driving Prevention Programs (2013 dollars)

		Cost per Unit	Total Benefits	Benefit Cost Ratio	Cost/QALY
<b>Impaired Driving Prevention Programs</b>					
40	.08% Driver Blood Alcohol Limit	\$4/driver	\$59	15	<\$0
41	Zero Alcohol Tolerance, Drivers Under 21	\$42/driver	\$1,030	25	<\$0
42	Sobriety Checkpoints	\$13,086/checkpoint	\$89,000	6.8	<\$0
43	Administrative License Revocation (ALR)	\$3,851/ALR	\$65,000	17	<\$0
44	ALR with Per Se Law	\$3,616/ALR	\$77,000	21	<\$0
45	Alcohol-Testing Ignition Interlock	\$1,282/vehicle	\$8,800	6.8	<\$0
46	DWI Offender Auto Impoundment	\$1,097/vehicle	\$5,900	5.4	<\$0
47	DWI Offender Electronic House Arrest	\$1,920/arrestee	\$6,500	3.4	<\$0
48	DWI Intensive Probation + Treatment	\$1,714/arrestee	\$6,500	3.8	<\$0
49	Australia-Style Anti-DWI Media Campaign	\$947/million population	\$13,400	14.2	<\$0
<b>Impaired Pedestrian Harm Reduction</b>					
50	Streetlights at Bars, Native America	\$493/light	\$4,200	8.4	<\$0

### Benefit-Cost Ratios of Open-Flame Burn Prevention Programs (2013 dollars)

		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
51	Childproof Cigarette Lighter	\$0.05/lighter	\$3.8	77	<\$0
52	Less Porous Cigarette Paper	\$0.0001/pack	\$0.08	809	<\$0
53	Pass Smoke Alarm Law	\$53/new user	\$880	17	<\$0
54	Alkaline-Battery-Operated Smoke Alarm Voluntary Use	\$48/home	\$880	18	<\$0
55	Lithium-Battery Smoke Alarm Installation & Fire Education (SAIFE) Program	\$335/home	\$1,640	5	\$24,000
56	Sprinkler System: Colonial	\$2,475/home	\$6,000	2.5	\$56,000
57	Sprinkler System: Townhouse	\$2,261/home	\$6,000	2.7	\$50,000
58	Sprinkler System: Ranch House	\$988/home	\$6,000	6.2	\$14,000
59	Require Sprinkler System, New Colonial House	\$2,673/home	\$6,000	2.3	\$62,000
60	Require Sprinkler System, New Townhouse	\$2,441/home	\$6,000	2.5	\$55,000
61	Require Sprinkler System, New Ranch House	\$1,068/home	\$6,000	5.7	\$16,000
62	Mattress Flammability Standard	\$29/mattress	\$80	2.7	\$53,000

### Benefit-Cost Ratios of Violence / Crime Prevention Programs (2013 dollars)

		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
<b>Nonoffender Programs</b>					
63	Perry Preschool Program (includes home visitation)	\$21,814/child	\$107,000	4.9	<\$0
64	Nurse-Family Partnership 2-Yr Home Visits	\$11,628/child	\$56,000	4.8	<\$0
65	Syracuse Family Development Research	\$71,247/child	\$65,000	0.91	\$158,000

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	Program (includes 5-Yr home visitation)				
66	Parent Training (child behavior monitoring)	\$5,016/child	\$20,000	3.9	\$30,000
67	Big Brothers/Big Sisters Mentoring Cost	\$5,193/child	\$9,200	1.8	\$25,000
68	Financial graduation incentives & intensive counseling for disadvantaged youth	\$26,210/child	\$12,900	0.5	\$331,000
	<b>Youth Offender Programs</b>				
69	Multi-Systemic Therapy	\$7,106/client	\$275,000	39	<\$0
70	Functional Family Therapy	\$3,237/client	\$103,000	32	<\$0
71	Multidimensional Treatment Foster Care	\$3,004/client	\$197,000	66	<\$0
72	Delinquency Supervision	\$16,774/child	\$31,200	1.9	\$80,000
	<b>Adult Offender Programs</b>				
73	Drug Courts	\$3,133/client	\$12,800	4.1	<\$0
74	In-Prison Substance Abuse Therapy	\$8,616/client	\$25,000	2.9	<\$0
75	Post-release Substance Abuse Treatment	\$3,356/client	\$0	Infinite	Infinite
76	Optimized Sentencing	\$18,076/crime	\$39,000	2.2	\$68,000
77	3 Strikes & You're Out	\$24,364/crime	\$39,000	1.6	\$94,000
78	Job Search/Counseling @Release	\$843/client	\$9,000	11	<\$0
79	Financial Assistance @ Release	\$3,867/client	\$12,200	3.2	<\$0
80	Subsidized Jobs, Age < 27	\$14,353/client	\$0	Infinite	Infinite
81	Subsidized Jobs, Age >+27	\$14,353/client	\$40,000	2.8	<\$0
82	Work-Release Programs	more than \$0/client	\$0	Infinite	Infinite
83	In-Prison Vocational Education	\$2,937/client	\$25,400	8.6	<\$0
84	In-Prison Adult Basic Education	\$2,956/client	\$19,000	6.4	<\$0
85	In-Prison Life Skills Programs	\$1,266/client	\$0	Infinite	Infinite
86	Moral Reconation Therapy	\$447/client	\$14,000	31	<\$0
87	Reasoning & Rehabilitation	\$463/client	\$4,300	9.4	<\$0
	<b>Crime Prevention, Narrowly Targeted</b>				
88	20-Bed Domestic Violence Shelter	\$19,485/bed	\$217,000	11.1	<\$0
89	Monitored Burglar and Fire Alarms	\$993/home/year	\$1,060	1.1	\$132,000
90	Aggression Replacement Training (Youth Offender)	\$632/client	\$57,000	90	<\$0
91	Lansing Adolescent Diversion	\$2,363/client	\$93,000	39	<\$0
92	Intensive Probation Supervision, Youth	\$2,350/client	\$10,400	4.4	<\$0
93	Intensive Probation Supervision, Adult	\$5,236/client	\$7,100	1.4	\$48,000
94	Scared Straight Type Programs (Young Offenders)	\$0/	\$0	Infinite	Infinite
95	Young Offender Boot Camp	\$3,074/client	-\$34,000	-0.09	Infinite
96	Cognitive-Behavioral Sex Offender Treatment	\$10,081/client	\$21,000	2.1	\$28,000



**Benefit-Cost Ratios of Substance Use/Abuse Interventions (2013 dollars)**

		<b>Unit Cost</b>	<b>Total Benefits</b>	<b>Benefit Cost Ratio</b>	<b>Cost/QALY</b>
<b>Substance Use/Abuse Interventions</b>					
97	20% Alcohol Tax	\$12/drinker/year	\$111	9.3	<\$0
98	30% Alcohol Tax	\$23/drinker/year	\$140	6.3	\$7,800
99	21 Minimum Legal Drinking Age	\$221/youth 18-20	\$780	3.5	\$24,000
100	Mandatory Server Training	\$63/driver	\$211	3.4	\$29,000
101	Enforce Serving Intoxicated Patron Law	\$0.50/driver	\$34	71	<\$0
102	TV Alcohol Advertising Ban	\$6,680/M population	\$60,900	9.1	<\$0
103	10% Outlet Density Reduction	\$1,717/M population	\$15,200	8.9	<\$0
104	10 Fewer Sales Hours/Week	\$4,202/M population	\$38,100	9.1	<\$0
105	Retain PA's State Run Wine & Spirits Retail Store Monopoly	\$0.49/drink foregone	\$6.0	12.2	<\$0
106	Communities That Care	\$725/youth	\$12,600	17.4	<\$0
107	Team Awareness, Retail Workers	\$220/participant	\$1,850	8.4	<\$0
108	Team Resilience, Restaurant Workers under Age 26	\$183/participant	\$2,710	14.8	<\$0
109	Prime Life	\$14/participant	\$310	21.9	<\$0
110	PREVENT for Young Workers	\$389/participant	\$20,000	51.5	<\$0
111	Workplace Peer Support + Drug Testing*	\$82/employee	\$1,900	24	<\$0
112	*Add Alcohol Testing to Peer Support	\$14/employee	\$840	30	<\$0
113	Brief Alcohol Intervention	\$133/lecture	\$3,900	30	<\$0
114	Substance Abuse Treatment	\$16,877/abuser	\$801,000	47	<\$0
<b>Youth Development Programs</b>					
115	Across Ages	\$2,255/pupil	\$3,000	1.3	\$137,000
116	Adolescent Transitions	\$1,566/pupil	\$12,900	8.3	\$11,800
117	CASASTART (National Center on Addiction and Substance Abuse, Striving Together to Achieve Rewarding Tomorrow)	\$7,277/pupil	\$7,300	1	\$213,000
118	Child Development Project	\$299/pupil	\$2,300	7.8	<\$0
119	Good Behavior Game	\$79/pupil	\$3,900	50	\$400
120	Guiding Good Choices (formerly Preparing for the Drug Free Years)	\$919/family	\$5,700	6.2	<\$0
121	Project PATHE	\$1,063/pupil	\$0	0	infinite
122	Seattle Social Development Program-Parent-Teacher Training/SOAR (Skills Opportunity and Recognition)	\$4,124/child	\$5,000	1.2	\$145,000
123	Social Competence Promotion	\$456/pupil	\$4,300	9.5	<\$0
124	Strengthening Families	\$1,138/family	\$14,600	13	<\$0
<b>Youth Substance Abuse Prevention Programs</b>					
125	All Stars	\$182/pupil	\$6,800	37.1	<\$0
126	DARE	\$132/pupil	\$0	0	infinite
127	Family Matters	\$204/family	\$3,200	15.9	\$1,900
128	Keepin' It Real	\$165/pupil	\$4,700	28.6	<\$0
129	Life Skills Training	\$289/pupil	\$7,100	24.6	<\$0
130	Project ALERT (Adolescent Learning Experience in Resistance Training)	\$150/pupil	\$1,400	9.4	<\$0
131	Project Northland	\$516/pupil	\$10,700	20.7	<\$0
132	Project STAR (Students Taught Awareness and Resistance, Midwest Prevention Program) aka MPP	\$516/pupil	\$6,600	12.7	<\$0
133	Project Toward No Drugs (TND)	\$233/pupil	\$1,920	8.2	<\$0
134	STARS for Families	\$157/family	\$1,130	7.2	<\$0

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		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
135	Other Social Influence/Skills Building	\$202/pupil	\$2,600	13.1	\$5,600
136	Other Risk & Protective Factors	\$532/pupil	\$10,100	18.9	\$0
<b>Youth Tobacco Programs</b>					
137	Know Your Body (smoking)	\$184/pupil	\$10,400	56.7	<\$0
138	MN Smoking Prevention Program	\$122/pupil	\$8,200	67.3	<\$0
139	Project Toward No Tobacco (TNT)	\$232/pupil	\$4,400	19	\$6,500
140	Youth Anti-smoking Mass Media Campaign	\$482/pupil	\$3,900	8	\$20,000
<b>Tobacco Cessation Programs</b>					
141	Stop Smoking Mass Media Campaign	\$1,366/quitter	\$84,000	61.4	<\$0
142	Reduce Cessation Program Prices	\$284/quitter	\$93,000	328.6	<\$0
143	Minimal Tobacco Counseling	\$8,517/quitter	\$93,000	11	\$11,000
144	Add Nicotine Patch	\$5,894/quitter	\$93,000	15.8	\$6,800
145	Instead Add Nicotine Gum	\$11,147/quitter	\$93,000	8.4	\$15,000
146	Brief Tobacco Counseling	\$7,244/quitter	\$93,000	12.9	\$8,900
147	Add Nicotine Patch	\$5,217/quitter	\$93,000	17.9	\$5,800
148	Instead Add Nicotine Gum	\$9,177/quitter	\$93,000	10.2	\$12,000
149	Full Tobacco Counseling	\$3,602/quitter	\$93,000	25.9	\$3,200
150	Add Nicotine Patch	\$3,411/quitter	\$93,000	27.4	\$2,900
151	Instead Add Nicotine Gum	\$5,330/quitter	\$93,000	17.5	\$5,900
152	Individual Intensive Tobacco Counseling	\$4,404/quitter	\$93,000	21.2	\$4,500
153	Add Nicotine Patch	\$3,615/quitter	\$93,000	25.8	\$3,300
154	Instead Add Nicotine Gum	\$4,509/quitter	\$93,000	20.7	\$4,700
155	Group Intensive Tobacco Counseling	\$2,582/quitter	\$93,000	36.1	\$1,600
156	Add Nicotine Patch	\$2,890/quitter	\$93,000	32.3	\$2,100
157	Instead Add Nicotine Gum	\$5,558/quitter	\$93,000	16.8	\$6,300

**Benefit-Cost Ratios of Health Services Interventions and Miscellaneous Injury Prevention Programs (2013 dollars)**

		Unit Cost	Total Benefits	Benefit Cost Ratio	Cost/QALY
<b>Health Services Interventions</b>					
158	American Academy of Pediatrics TIPP Injury Prevention Counseling, Ages 0-4	\$12/child	\$106	8.8	\$6,300
159	Poison Control Center Services	\$46/call	\$360	7.8	<\$0
160	Regional Trauma System Services	\$2,082/admit	\$5,600	2.7	<\$0
161	Tetanus-Diphtheria-Pertussis Vaccination, Ages 0-6	\$101/child	\$2,500	24.5	<\$0
<b>Miscellaneous Injury Prevention Programs</b>					
162	Youth Suicide Prevention, Native America	\$233/youth	\$8,200	35	\$3,570
163	Baby Walker Redesign to Prevent Stairway Falls	\$4/walker	\$200	50	<\$0
164	Impact-Absorbing Playground Surfacing	\$15,585/playground	\$30,930	2	\$37,830
165	Winter Coats that Float Drowning Prevention, Native Alaska	\$0.13/person	\$270	2092	<\$0
166	Harlem Hospital Injury Prev. Program	\$81/child	\$4,100	51.2	<\$0
167	Fall Prevention: Hi Risk Elderly	\$1,539/person	\$13,200	8.6	<\$0
168	Fall Prevention: Low Risk Elderly	\$1,315/person	\$800	0.6	\$289,000

Note: If the cost/QALY is <\$0, the intervention is effective and cost saving. If the cost/QALY is infinite, the intervention is not effective (i.e., an infinite number of dollars can be spent on the intervention without improving health outcomes),

Questions about methods and data in this Fact Sheet Series should be referred to:

Children's Safety Network Economics and Data Analysis Resource Center

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