Motor vehicle crashes are a leading cause of death in the United States. In 2013, 32,719 deaths and 2.3 million nonfatal injuries occurred. Crashes are also expensive; in 2010, according to a 2015 study, they resulted in more than $836 billion in economic loss and societal harm. Property damage, medical expenses, emergency services, and other fees related to crashes cost taxpayers over $242 billion—which is equal to about $765 for each person living in the United States.
Fortunately, state health, transportation, and safety officials can choose from a wide range of evidence-based interventions to reduce the social and economic harms related to motor vehicle crashes. Interventions include policies and programs, including primary enforcement seat belt laws and alcohol ignition interlock enforcement. Policies and programs cost money to implement, however, and state implementation budgets are limited. Consequently, decisionmakers need to prioritize and choose interventions that will reduce the greatest numbers of injuries and deaths for the implementation dollars available in their state.

Although there is much information on the effectiveness and costs of various interventions in places where interventions have already been implemented, little information is available about the potential effectiveness and costs for individual states.

A new interactive online tool, the Motor Vehicle Prioritizing Interventions and Cost Calculator for States (MV PICCS), enables policymakers to compare 14 traffic crash intervention policies and programs by effectiveness and implementation cost and by state. The free tool, created by the RAND Corporation with funding and technical support from the Centers for Disease Control and Prevention (CDC)’s National Center for Injury Prevention and Control and the Robert Wood Johnson Foundation, is available at the CDC website: www.cdc.gov/motorvehiclesafety/calculator.

This brief describes how policymakers can use MV PICCS to make cost-effective traffic safety policy decisions. It also describes the data and methods that inform the tool, including 14 effective traffic safety interventions and the cost-effectiveness analysis that compares the cost of implementation and the anticipated benefits.

Key Findings

- Different states have different needs when it comes to traffic crash prevention.
- A new interactive tool, Motor Vehicle Prioritizing Interventions and Cost Calculator for States, can help decisionmakers measure the cost and effectiveness of crash intervention policies in particular states.

MV PICCS has five capabilities that enable state policymakers to:

- **Find the most cost-effective way to spend limited dollars on traffic safety.** MV PICCS compares the costs and effects of specific policies. If two policies have similar costs, the tool will identify the one that is most effective in saving lives and reducing injuries.
- **Review state-specific annual estimates for costs and effectiveness of policies and programs.** MV PICCS expresses effects in terms of the number of lives saved and injuries prevented, as well as a monetized value of those two things. This effect is the sum of the costs avoided when a life is saved (such as cost savings for medical care, emergency services, and so forth). This is important because both costs and effects vary across states. Police wages and the number of patrols put in place, for instance, affect the cost of the labor-intensive policy of having sobriety checkpoints. The effect of using sobriety checkpoints varies too, because some states have more drunk driving deaths than others.
- **Analyze any combination of policies.** MV PICCS has a feature called portfolio analysis that adjusts the effects downward if a state implements two related policies (such as primary seat belt enforcement and high-visibility seat belt enforcement) at the same time. As there is some overlap in the effects of the two policies, analysts would not get the true picture from simply adding the effects together.
- **Assess the potential revenue to the state from fines and fees.** This feature allows policymakers to see whether those payments might partially or fully defray the costs incurred.
- **Adjust according to state-specific information.** MV PICCS users can adjust the costs to see different results, thus conducting a sensitivity analysis. For example, if a state uses a particular estimate of the value of a life lost, a user can input that estimate and the tool will generate new results that reflect the state’s estimate. Similarly, a user can adjust costs of implementing a policy if they seem too high or low for a specific state. Finally, a user can adjust the ratios of lives saved and injuries prevented if he or she believes that a policy or program is more or less effective than the default programmed in the tool.
The Motor Vehicle Prioritizing Interventions and Cost Calculator for States considers 14 interventions. To focus on the interventions that can yield the largest benefit nationwide, MV PICCS considers interventions that have not yet been widely implemented across states. The selected interventions are also related specifically to driver and passenger behavior, can be implemented at the state or local level, and are proven to be highly effective. The tool does not account for every possible policy or program. These are the 14 selected:  

1. **Automated red-light enforcement**  
   Automated red light enforcement, more commonly called red-light cameras, is used to capture images of vehicles whose drivers fail to stop for red lights. Tickets are generally sent to offenders by mail.

2. **Automated speed camera enforcement**  
   Similarly, automated speed camera enforcement captures images of vehicles whose drivers are driving in excess of the posted speed limit. Unlike red-light cameras, which are deployed only at intersections, mobile speed cameras are often used to cover multiple road segments.

3. **Alcohol interlocks**  
   An alcohol interlock, also called an ignition interlock, is a device that prevents a vehicle from starting until the driver has blown into a tube and the device determines that the driver’s blood alcohol concentration (BAC) is below the allowable level (0.02 in most jurisdictions). This intervention calls for interlocks to be installed on the vehicles of convicted repeat driving while intoxicated (DWI) offenders.

4. **Sobriety checkpoints**  
   At a sobriety checkpoint, teams of police officers stop cars at a specific location to check drivers for alcohol levels. States generally publicize such events to discourage drivers from drinking, particularly during times when drunk driving is more common than usual (such as holiday weekends).

5. **Saturation patrols**  
   Saturation patrols consist of an increased police presence in selected locations, where officers patrol the area looking for suspicious driving behavior in an attempt to identify alcohol-impaired drivers. In contrast to sobriety checkpoints, police do not stop every vehicle.

6. **Bicycle helmet laws**  
   Bicycle helmet laws mandate that children riding bicycles use helmets to reduce the likelihood of trauma to the head and its related consequences.

7. **Universal motorcycle helmet laws**  
   This law requires all motorcyclists, regardless of age or experience level, to wear a helmet that meets safety standards set by the U.S. Department of Transportation. These laws differ from partial helmet laws, which typically apply to only riders below a certain age.

8. **Primary enforcement of seat belt use laws**  
   States with seat belt laws vary in their enforcement. A primary-enforcement law allows police to ticket an offender exclusively for not wearing a seat belt. A secondary-enforcement law allows police to write someone a ticket for not wearing a seat belt only if the officer has pulled the driver over for a separate offense.

9. **High-visibility enforcement for seat belts and child restraint and booster seat laws**  
   High-visibility enforcement is a technique that combines intense enforcement over a fixed period (for example, one or two weeks) with a publicity campaign. A campaign focused on restraint use generally includes all forms of restraints: seat belts, child safety seats, and booster seats.

10. **License plate impoundment**  
    This intervention requires a driver who has been convicted of DWI to surrender the vehicle’s license plate, which is either impounded or destroyed. In some jurisdictions, the license plate is not physically removed; rather, the officer places a sticker on the license plate to indicate that it is invalid. The stickers are designed such that, if someone tries to remove them, they leave a visible pattern on the plate. Because it is relatively easy for police to observe that a vehicle is missing a license plate or the sticker, this intervention deters convicted DWI offenders from driving that vehicle.

11. **Limits on diversion and plea agreements**  
    Although all states have penalties for DWI, many states have additional programs that allow some offenders to be diverted out of the normal procedures or to plead guilty to a lesser offense and receive a lighter sanction. These programs more often target first-time offenders, with the goal of reducing the DWI caseload by diverting people who are thought to be unlikely to reoffend. Limits on diversion and plea agreements would increase the number of DWI arrestees convicted of more-serious DWI-related charges.

12. **Vehicle impoundment**  
    This intervention results in vehicles of DWI offenders being confiscated for a period of time and stored in a public impound lot. The offender can either reclaim or surrender the vehicle when the impoundment period ends.

13. **In-person license renewal**  
    This intervention requires all drivers over age 70 to renew their drivers’ licenses in person at a department of motor vehicles, instead of using mail-in or online renewal.

14. **Higher seat belt fines**  
    This intervention adds $75 to a state’s existing fine. This is a significant increase over existing seat belt fines in most states.
Saving Lives and Reducing Injuries

In MV PICCS, “effects” are the lives saved and injuries prevented by a policy or program. For each policy, estimates of the percentage reduction in those two aspects were developed based on previous research. For example, a review of motorcycle helmet studies found that motorcycle deaths declined by 29% due to a motorcycle helmet law. Other interventions include:

- Vehicle impoundment: decrease in crashes by 30%
- License plate impoundment: decrease in recidivism by 27%
- Bicycle helmet law: decrease in crash-related juvenile bicyclist deaths by 15%
- Speed cameras: decrease in speed-related crashes by 12%
- Limits on diversion and plea agreements: decrease in recidivism by 11%
- In-person license renewal: decrease in fatal crash involvement rates for drivers ages 70+ by 9%
almost 29 percent when states implemented mandatory helmet laws. The number of people killed in motorcycle crashes in each state was multiplied by 29 percent to estimate how many lives the law would save.
MV PICCS Estimating Costs at the State Level

The tool estimates costs borne by the state (such as costs of police time and department of motor vehicle staff time). Some costs were scaled to each state based on wage rates. A “most common cost” was developed and used across all states. For example, the researchers looked at the actual per-camera costs for speed cameras in different cities. The costs of upfront items, such as passive alcohol sensors, were spread over five years. In some state-specific cases, assumptions needed to be developed.

Cost-Effectiveness Analysis Considers Dollars Saved by Saving Lives and Reducing Injuries

The information on implementation costs and potential lives saved and injuries averted is used to create cost-effectiveness ratios for each intervention in each state. The cost-effectiveness ratio compares the effects and costs of implementing each intervention. Comparing the cost-effectiveness ratio for each intervention determines which policy would achieve the largest reduction in injuries and deaths for each dollar spent.

Examples of How MV PICCS Works

The data described above were used to program the tool. Users must tell the tool what to do by providing five pieces of information, as shown in Table 1.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>The tool can analyze only one state at a time.</td>
</tr>
<tr>
<td>List of interventions to analyze</td>
<td>The user can investigate any combination of the 14 interventions.</td>
</tr>
<tr>
<td>Analysis type</td>
<td>The user must select one of two analysis types. The cost-effectiveness analysis looks at each policy separately, while the portfolio analysis takes overlapping policies into account.</td>
</tr>
<tr>
<td>Run type</td>
<td>The user can include as revenue the fines and fees that offenders pay to the state.</td>
</tr>
<tr>
<td>Budget</td>
<td>The user must tell the tool how much money is available to implement new policies.</td>
</tr>
</tbody>
</table>

Example 1: MV PICCS Basic Sample User Inputs, Cost-Effectiveness Analysis

We use Georgia here to demonstrate how the tool works. On the opening page, the user selects Georgia from the drop-down menu of states, chooses Basic Cost-Effectiveness Analysis from a radio-button list, and then clicks Submit. On the second page, the user would choose the interventions, run type, and budget. Table 2 shows these sample inputs.

![Figure 1. Screenshot of MV PICCS: Georgia, Basic Cost-Effectiveness Analysis](image-url)
Example 2: MV PICCS Intervention Portfolio Analysis

Table 3 captures the inputs for Georgia, and the screenshot in Figure 2 shows how the tool treats interactions between interrelated policies and programs that make up a portfolio. Here, the type and cost of the 12 interventions are the same as in the basic cost-effectiveness example. These are shown in green. However, there is no cumulative cost or individual cost-effectiveness ratio, as in Figure 1. This is because the portfolio analysis assumes some interdependencies between interventions and thus does not assess them on an individual basis.

Table 3. MV PICCS User Inputs for Georgia, Intervention Portfolio Analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>User Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>State</td>
<td>Georgia</td>
</tr>
<tr>
<td>Interventions to analyze</td>
<td>12</td>
</tr>
<tr>
<td>Analysis type</td>
<td>Cost-effectiveness analysis</td>
</tr>
<tr>
<td>Run type</td>
<td>Without fines</td>
</tr>
<tr>
<td>Budget</td>
<td>$25,000,000</td>
</tr>
</tbody>
</table>

As the MV PICCS screenshot in Figure 1 shows, Georgia can implement eight of 12 selected interventions with a $25 million budget. The selected interventions are highlighted in green, above the bold line. The total cost to implement these eight interventions is $19.8 million, which means the state is unable to fund any additional interventions with the remaining $5.2 million ($25 million – $19.8 million). The interventions shown in pink, below the bold line, are either not selected (bicycle helmet) or their cost exceeds $5.2 million.

This cost in dollars per year for this run type excludes any fines and fees paid by offenders, so the costs listed in Figure 1 are those that would be incurred by the state for implementation. Had we selected a run with fines included, some of these costs would be offset.

Implementing these eight interventions would result in 287 lives saved and 28,939 injuries averted.

Because of the interdependencies between two of the seat belt-related interventions and two of the DWI-related interventions, fewer lives are saved and fewer injuries averted. This option provides a more realistic estimate of the overall effects. This makes MV PICCS a powerful tool for allowing decisionmakers to analyze many combinations of interventions in their states.

Table 2. MV PICCS User Inputs for Georgia, Basic Cost-Effectiveness Analysis

<table>
<thead>
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About the Motor Vehicle Prioritizing Interventions and Cost Calculator for States

MV PICCS brings together, in one place, a wealth of information on the costs and effects of 14 traffic crash interventions. Users can change a variety of parameters: the state, the interventions to analyze, the type of analysis (looking at each intervention individually or using "portfolio analysis" to account for related interventions), the use of fines and fees to offset costs, and the budget. A built-in sensitivity analysis tool allows changes to the percentage reduction in injuries and deaths, the estimated monetary value of saving a life, and the total cost per intervention.

www.cdc.gov/Motorvehiclesafety/calculator