Abstract

The California Department of Transportation (Caltrans) deployed an Icy Curve Warning System (ICWS) on a four-mile section of State Route (SR) 36 in Lassen County over Fredonyer Pass. This section of roadway had a history as a high-crash location, with multiple fatal crashes. The vast majority of these accidents occurred when the pavement was icy, despite static signage that Caltrans had installed to increase motorist awareness. This study presents the results of research that investigated safety effects of the ICWS. An observational before-after study method with Empirical Bayes (EB) technique was used to determine the effect the ICWS on crash frequencies.

Background

The Fredonyer Pass ICWS consists of ten identical but separate warning systems: Fredonyer Summit ICWS and Fredonyer East ICWS. The location of the Fredonyer Pass ICWS is shown in the figure. The technology consists of using pavement sensors to detect icy conditions, in combination with dynamically activated signage. The motivation for real-time warning when icy conditions are present.

Results

The predicted number of crashes in the after period without the ICWS: $N_{expected} = 14.08$ (crashes)

The number of reported crashes in the after period with the ICWS present: $N_{actual} = 12$ (crashes)

The results revealed that the deployment of the ICWS reduced the number of annual crashes by 18%. The use of ICWS has been beneficial.

Conclusions

The system has potentially provided safety benefits of $1.17$ million dollars per winter season during the “after deployment” study period.

Limited after deployment data collected to make any results definitive.

Data will continue to be collected to update the analysis over the next several years.

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Methodology

This study used observational before-after with empirical Bayes (EB) to evaluate the safety effects of ICWS. The following Safety Performance Function (SPF) for rural two-lane, two-way roadway segments provided in the Highway Safety Information System (HSIS) for the study period. Crash information included date and time, post-mile, road surface condition, type of accident, etc., as summarized in the following table.

<table>
<thead>
<tr>
<th>Period</th>
<th>No of Months</th>
<th>Crashes</th>
<th>PDO (in-vehicle)</th>
<th>Injury (in-vehicle)</th>
<th>Fatality (in-vehicle)</th>
<th>Fatality (PDO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>12</td>
<td>17</td>
<td>8 (5)</td>
<td>8 (5)</td>
<td>1 (1)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>After</td>
<td>12</td>
<td>9</td>
<td>7 (5)</td>
<td>7 (5)</td>
<td>2 (2)</td>
<td>0</td>
</tr>
</tbody>
</table>

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