



# Information Discovery Support for the Translation Approach Using the Critical Analysis Reporting Environment CARE

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## Overview

The Critical Analysis Reporting Environment (CARE) system incorporates an information discovery engine that searches through databases discovering information that is critical to an effective translation approach toward the identification and development of injury reduction countermeasures and treatments. CARE's integrated Geographical Information Systems (GIS) capability enables visualization of potential problem areas or specific locations. Many of these crash data analysis results have been translated into traffic safety countermeasures, but the full benefits of these types of tools throughout the injury control community have yet to be realized.

<http://care.cs.ua.edu>

**CARE's Objective:** to automatically generate useful information to support the translation approach directly from available data with a minimum of user effort.

### CARE's Method:

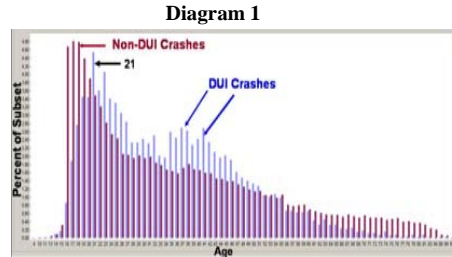
- Easily define data subsets directly from frequency and cross-tabulation outputs;
- Compare any two subsets of the data (e.g., alcohol vs. non-alcohol crashes);
- Statistically analyze the results to identify critical differences in attributes;
- List all results in a "worst first" priority ordering;
- Apply GIS methods for geographic visualization.

**RESULT:** a prioritized listing of over-represented attributes that enables injury control practitioners to translate data directly to countermeasures and treatment development.

## Example 1

Diagram 1 is an example of the information that is automatically produced from CARE. These findings resulted from a comparison of alcohol-related (blue bars) with non-alcohol related crash records. An output like this was automatically generated for every variable in the database and arranged in order of maximum significance to produce a wealth of information to support countermeasure development.

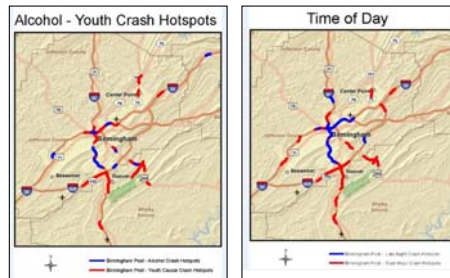
The following information can be observed from the CARE output shown in Diagram 1:



From Rhodes From: Rhodes, Brown and Edison; The National Injury Prevention and Control Conference. Denver, CO. May, 2005.

- Overall, young (16-20) drivers cause about three times the number of crashes when compared to the average proportion of crashes for all driver ages.
- However, young drivers are dramatically under-represented in alcohol crashes compared to their otherwise high crash causal rate.
- There is an approximate linear growth in alcohol related crashes with age among young causal drivers from 16 through 20, and then at age 21 they become dramatically over-represented (see the blue bar for age 21).
- Ages 21-35 show an over-representation that is most likely attributable to social drinking in this age group.
- A second over-represented age group shows a peak at around age 40; at this age many if not most of these drivers would be classified as problem drinkers.
- The older ages are dramatically under-represented in alcohol crash causation.

## Example 2



The tactical approach to alcohol selective enforcement must be quite different from that applied to young drivers if optimal results are to be attained.

The two CARE GIS outputs in the previous column enable officers to visualize both the *locations* and the *times* that are optimal for alcohol and youth (age 16-20) selective enforcement effectiveness.

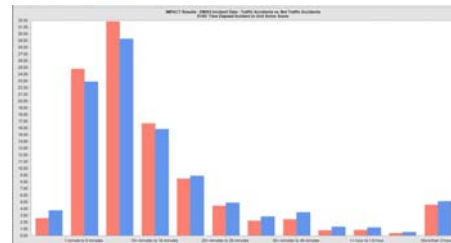
The figure on the left contrasts the locations of alcohol crashes (blue lines) with that of youth crashes (red lines). Since young people are under-represented in alcohol crashes, we expect these locations to be different.

The figure on the right contrasts where late night crashes (blue lines) occur with where rush hour crashes (red lines) occur. Young people tend to have their crashes before and after school, as opposed to late night.

The commonality of the red and blue lines in the two diagrams demonstrates the correlation of alcohol crashes with the late night hours, while youth driver caused crashes tend to occur at rush hours (before and after school).

## Example 3

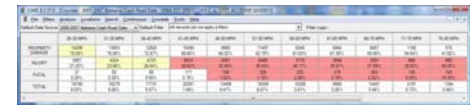
CARE can be applied to all types of databases. The following example is from the Alabama Emergency Medical Services Incident Data.



The example output above is a comparison of emergency medical response times of arrival to the scene of the incident. The comparison is between service calls for traffic crashes (red bars) and all other types of calls (blue bars). This demonstrates that generally calls to traffic have a shorter response time, especially in the one to five, five to ten and ten to 15 minute categories. Similar geographical comparisons are being performed to determine optimal regionalization of EMS resources.

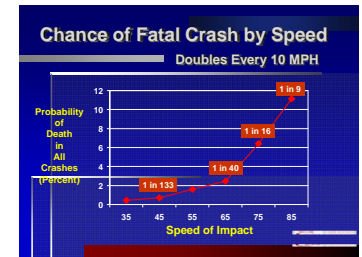
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## Example 4



CARE's cross tabulation capability enables any two variables in the database to be analyzed for correlation at any time in the analysis process without disrupting existing output flow. In this case a cross tabulation between the crash severity and the speed at impact was of interest. This cross tabulation enables the calculation of the probability that any given crash will cause a fatality as predicted by the speed of impact.

**Observed results: the probability of a fatality doubles (approximately) for every 10 MPH increase in speed above 45 MPH.**



## About the Authors

### David B. Brown, PhD, P.E.

Dr. Brown has over 35 years of experience in the design and development of computerized systems to facilitate safety and injury reduction. Dr. Brown is a UAB-ICRC Senior Scientist and the Immediate Past Director of the UAB-ICRC's Preventing Transportation-Related Injuries Research Domain. As a Professor of Computer Science and the Deputy Director of the CARE Research & Development Laboratory at The University of Alabama, he designed and managed the development of the Comprehensive Analysis and Reporting Environment (CARE), which has been implemented in several states.

### Dana Steil

Dana Steil is a PhD graduate student in the Computer Science Department at the University of Alabama. With a specialty in GIS systems design, he has developed a number of systems in support of the CRDL traffic safety efforts. In addition to the CARE GIS component illustrated here, he recently developed a system called MapClick that enables police officers to enter accurate and reliable location information into an electronic crash reporting form in a matter of a few mouse clicks within a GIS-map based environment.

**CARE won the National Highway Traffic Safety Administration award for innovation in 1995 as well as a National Association of Traffic Safety Information Professionals award in 2005.**