Evaluating the Effectiveness of State Toward Zero Deaths Programs

Nam Nguyen
Research Assistant, Center for Excellence in Rural Safety (CERS)
University of Minnesota

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Motor Vehicle Deaths

~27,000 fatalities in the U.S. in 2011.
Decreasing trend but uncertain future.

What is an acceptable goal?
Toward Zero Deaths

What is Toward Zero Deaths (TZD)?

§ Zero deaths is the only ethically acceptable goal.
§ Promoted as a national strategy by a coalition of transportation and safety groups.
§ Data-driven, interdisciplinary approach.
§ Integrated application of education, enforcement, engineering, and emergency medical and trauma services (the “4Es”).

Objectives

1. Examine the characteristics of TZD programs in the U.S.
2. Empirically evaluate the effectiveness of these programs.
History

1997: Vision Zero in Sweden

§ Designers of the road network are responsible for the safety of the network.
§ Human error and driver behavior as the primary cause of crashes.
§ Solutions lie in better engineering.

Zero Fatality Goal in the U.S.

Washington State (2000) and Minnesota (2003) were the first to adopt.
1998: Strategic Highway Safety Plan (SHSP)$^3$

$\S$ Developed by the American Association of State Highway and Transportation Officials (AASHTO).

$\S$ Required in 2005 by Safe Accountable Flexible Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).

$\S$ Comprehensive statistical approach to pre-existing plans.
States with Zero Fatality Language

States with Zero Fatality Commitments
Source: CEIRS
TZD Characteristics

Objective 1: Examine the characteristics of TZD Programs in the U.S.

Elements of Successful TZD Programs

1. Ambitious Goal of eliminating traffic fatalities and serious injuries
2. High levels of inter-agency cooperation
3. Comprehensive strategy addressing all 4 E’s
4. Performance-based, data-driven system of targeting resources and strategies
5. Policy leadership from relevant entities
1. Ambitious goal of eliminating fatalities and serious injuries.

§ Goal setting has a positive effect on safety increases.\textsuperscript{4,5}
§ Injects a new-decision making progress.
§ Goals-setting proceeds trade-offs and compromises.\textsuperscript{6}
TZD Characteristics

2. High levels of inter-agency cooperation in pursuit of their goal, generally occurring among the state DOT’s, DPS’s, Health and other relevant agencies.

§ Primary contributor to fatalities and serious injuries are behavioral.
§ TZD is an umbrella covering SHSP and relevant agencies. ⁷

3. Comprehensive and address the 4 E’s of traffic safety: engineering, enforcement, education, and EMS.
TZD Characteristics

4. TZD states operate on a performance-based, data-driven system of targeting resources and strategies where they will have the greatest impact in reducing traffic fatalities.

§ SHSP’s require a state-wide data-driven approach to countermeasure deployment.
§ TZD states take the requirements beyond SAFETEA-LU.
5. Clear policy leadership from relevant entities, including the Governor, the state legislative, and heads of state agencies.

§ Clear leadership is necessary for enforcement.
§ Clear leadership supports collaboration.
Evaluating TZD Programs

Objective 2: Evaluate the effectiveness of TZD Programs in the U.S.

Methodology

§ Identify TZD states (Idaho, Minnesota, Utah, and Washington)
§ Fatality Rate (fatalities/100 MVMT) from Fatality Analysis Reporting System (FARS)
Evaluating TZD Programs

Methodology (Continued)

§ Linear Regression for Exploratory Data Analysis
§ Two-factor ANOVA for TZD effect
§ ANCOVA for Temporal Effect
Exploratory Data Analysis

Idaho

Washington

Utah

Minnesota
Exploratory Data Analysis

[Graph showing a comparison of Fatalities Rate (100 MVMT) over Years with and without TZD treatment.]

- **Years:** 0, 2, 4, 6, 8, 10, 12, 14, 16, 18
- **Fatalities Rate (100 MVMT):** 1.9, 1.8, 1.7, 1.6, 1.5, 1.4, 1.3, 1.2, 1.1, 1.0, 0.9, 0.8

- **Graph Elements:**
  - **With TZD (treatment):** Cross (X)
  - **Without TZD (comparison):** Circle (O)
### TZD Effect

| STATE       | Estimate | Standard Error | DF  | t Value | Pr>|t| |
|-------------|----------|----------------|-----|---------|------|
| Intercept   | 1.9269   | 0.05173        | 764 | 37.25   | <.0001 |
| Idaho       | 0.03487  | 0.07448        | 764 | 0.47    | 0.6398 |
| Minnesota   | -0.6627  | 0.07714        | 764 | -8.59   | <.0001 |
| Utah        | -0.4401  | 0.07448        | 764 | -5.91   | <.0001 |
| Washington  | -0.5384  | 0.08108        | 764 | -6.64   | <.0001 |
| TZD         | -0.3495  | 0.05593        | 764 | -6.25   | <.0001 |

Fatality Rate\(_{ijk}\) = \(\mu + State_i + TZD_j + \varepsilon_{ijk}\)

where \(i=1, 51\), representing 51 states including District of Columbia and \(j =1,2\), representing the treatment factor (i.e. with or without TZD), and \(\varepsilon_{ijk}\)’s are independent and normally distributed with mean 0 and variance \(\sigma^2\).
## Temporal TZD Effect

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Recommendations

Implementation

§ TZD strategies can be used to reduce rural fatalities.
§ TZD designation could be accomplished through certification process.

Research

§ Employ a more rigorous empirical analysis (Empirical Bayes before-and-after study).
Conclusions

§ TZD programs exhibit five key elements.
§ Fatality rates decreased faster in TZD states.
Acknowledgements

§ Department of Civil and Environmental Engineering at South Dakota State University
§ Center for Excellence in Rural Safety (authorized by Congress in SAFETEA-LU in 2005 and funded through the Federal Highway Administration)
§ AASHTO and TRB
Questions?
(1) http://www.minnesotatzd.org/whatistzd/


(8) http://www-fars.nhtsa.dot.gov/Main/index.aspx