Drowsy Driving Advisory System in Alabama
Crash Analysis & Safety Campaigns

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Project Objectives
- To reduce crashes involving drowsy driving in Alabama interstate highways
- To help road users establish a strong safety culture

Why Drowsy Driving Crashes?
- Alabama SHSP & Federal TZD strategy
  - Reducing highway fatalities by 50% within 20 years
- Alabama SHSP focuses on reducing driver behavioral crashes

Drowsy Driving Crashes → High Fatalities or Serious injuries
about 50%

Engineering Countermeasure
Rumble Strips
Cable Barriers

Countermeasures Dedicated to Reducing DD Crashes
Australia
Rest Area Signage with Drowsy Driving Safety Messages

Survive This Drive
Rest if Sleepy
Rest and Stay Alive
Take a Rest and Refresh

Contributing in Reducing Drowsy Driving Crashes
Rest Areas
Not Particularly for Prevention of Such Crashes Needs Huge Investment

(Photos by Min-Wook Kang 2014)
Countermeasures Dedicated to Preventing DD Crashes

Australia

DRIVER REVIVER with Drowsy Driving Safety Messages

Countermeasures Dedicated to Reducing DD Crashes

Utah

Drowsy Driving Safety Signage

Countermeasures Dedicated to Reducing DD Crashes

China

Drowsy Driving Safety Signage

Countermeasures Dedicated to Reducing DD Crashes

Alabama

Drowsy Driving Advisory (DDA) System

DDA Signage Dimensions

Retro-reflective Sheeting

12" high letters for 360° Legibility Distance

Gate Post, DDW or DDA Messages

DDA System in Alabama

Implemented upstream of Rest Area No. 2 on I-65 SB 35 miles south of Birmingham
Crash Analysis

✓ To Find Appropriate Locations for DDA System implementation

- Used 12 Yr AL Police-Reported Crash Data (2001 - 2012)
- Used CARE Software
- Focused on AL Interstates
- Focused on Drowsy Driving/Fatigued Crashes
- Considered Density of Existing Signs and Interchanges

Deadlines 

Crash Analysis

Drowsy Driving Crashes in Alabama

Over last 12 years (2001 – 2012)

- AL police-reported crash (CARE) data:
  Account for ONLY 1.0 - 2.0% of Total Crashes

- 45% Drowsy Driving Crashes
  Analyzed or Serious Injuries

Important Fact

- Drowsy driving crashes are under-reported due to:
  Difficulty of attributing crashes to drowsy driving

Significantly more than what we see in the crash report

Recent studies

10% of total crashes would be involved in drowsy driving
(2007 Utah study; 2010 CA study)

21% fatal crashes in the US would be drowsy driving involved
(2014 AAA study)

Three Drowsy Driving Crashes Definitions

Adapted/customized a concept developed in a Californian study (Banerjee et al. 2010)

- Strict Definition (SDD)
  - Crashes primarily caused by or involving drowsy driving, directly from CARE
  - Crashes possibly involving drowsy driving with satisfaction all of the following criteria:
    - Single-vehicle crashes,
    - Run-off-road or fixed-object crashes,
    - Non DUI crashes,
    - Crashes not related with veh. defects, unusual weather/road cond's
    - Crashes neither caused by nor involving speeding, aggr've driving

- Expanded Definition (EDD) = SDD + PDD

- Possible Definition (PDD)

Drowsy Driving Crashes in Alabama

Over last 12 years (2001 – 2012)

- 6.0 - 6.5% of Total Crashes in AL
- Drowsy Driving-Related

- 9.3% of total crashes on AL interstates are drowsy driving related
**Drowsy Driving Crash Profiles**

- I-65 Southbound

**Statistical Analysis**

**Hypotheses**

1. Drowsy driving crash rates are higher at rural interstate sections than those at urban.

   - **H0:** \( X_R = X_U \)
   - **H1:** \( X_R > X_U \)
   - **P-value:** 2.200E-16

2. Rest areas are effective in reducing drowsy driving crashes.

   - **H0:** \( X_{20} = X_{20} \)
   - **H1:** \( X_{20} > X_{20} \)
   - **P-value:** 0.006

**Site Selection Criteria for DDA System Implementation**

1. Crash analysis results
   - Rural interstate sections
   - Upstream of rest areas
2. Density of on/off-ramps
3. Existing roadside signs

**Safety Campaigns + Public Survey**

- **Onsite Safety Campaign & Survey** at two rest areas:
  - RA #5 (Butler Co.): June 5th, 2014
  - RA #3 (Chilton Co.): June 6th, 2014

- **Online Survey** via Internet:
  - AL + Outside AL
    - Early June to mid-July, 2014

**Objectives**

- To help people be aware of the risk of drowsy driving and to take appropriate actions to prevent drowsy driving crashes
- To collect data (road users’ preference) for DDW & DDA messages

**Public Survey**

**Survey Questionnaire**

1. Driver’s basic info
   - Demographics and rest area usage
2. Reasons to stop at roadside rest areas
3. Common behaviors when drowsy
4. Significance of safety messages in affecting drivers’ decision to stop and rest when drowsy

**Popularly Used Safety Messages, Including New by the USA Research Team**

1. Drowsy Drivers–Die,
2. Drowsy Driving–Death Gamble,
3. Drowsy Driving–Risking Your Life,
4. Driving With Your Full Attention,
5. Drowsy Drivers–Open Your Eyes,
6. Drowsy Drivers–Stay Alive,
7. Drowsy Drivers–Eyes On The Road,
8. Eyes On The Road–Save Your Life,
9. Sleep But Not At The Wheel,
10. Not To Drive–When Drowsy,
11. Break The Drive–If Sleepy,
12. Tired?–Take A Break,
13. Drowsy Drivers–Break The Drive,
14. Take A Break–Stay Alive,
15. Take A Break–Stay Awake,
16. Drowsy Drivers–Use Next Exit,
17. Drowsy Drivers–Take A Break,
18. Feeling Tired?-Time To Break,
19. Difficulty Focusing–Take A Break,
20. Frequent Blinking–Break The Drive,
**5 Message Selection Criteria for DDA System**

- **Message simplicity**
  - As simple as possible
  - Comprised of easy words
  - No more than 2 UIs in a single line (FHWA)

- **Message clarity**
  - Clear to understand
  - Only one message at a time

- **Message independency**
  - Can be used independently without any clues from other messages displayed in advance

- **Message consistency**
  - Multiple signs with different safety messages would be used in a sequence (but should convey a consistent meaning)

- **Other considerations**
  - Should attract drivers’ attention

**Selected Safety Messages for DDA System**

**Survey Results: Driver’s Responses to Six DDW Messages**

- How much the DDW messages would affect your decision to stop and rest roadside?

**Survey Results: Driver’s Responses to Four DDA Messages**

- How much the DDA messages would affect your decision to stop and rest roadside?

**Survey Results: For Driver’s Behaviors to Drowsy Driving**

- Do you generally stop and rest when drowsy?
- Would you consider stopping and resting when you see the messages?

**Survey Results: For Driver’s Behaviors to Drowsy Driving**

- What actions typically try to overcome drowsiness?

(Choose all that apply)

- Listen to music
- Open the window
- Lower temperature
- Stop at a roadside
- Talk to someone in the car
- Drink coffee
- Talk to someone on the phone
- Other
Survey Results For Driver's Basic Information

315 Samples

Drowsy Driving Safety Flyers

Future Work in reducing drowsy driving crashes and severity of these crashes
- A comprehensive before/after crash analysis 3 to 5 years after the system implementation
- 10 year crash data (2011 – 2020) from CARE
- Onsite safety campaigns and public surveys

Outreach
- Example human errors
  - Testing while Driving
  - Drowsy/Diverted Driving

Questions?
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