

Smartphone-based Technology Designed to Help Teens be Safer Drivers

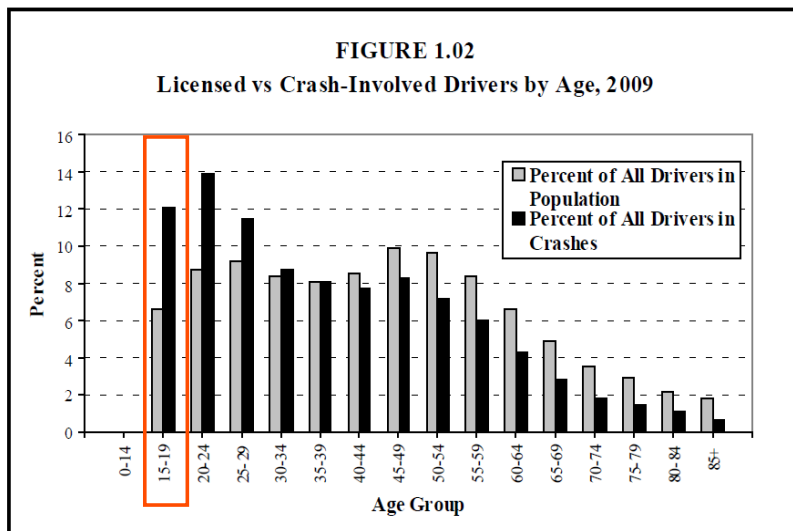
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TZD Meeting, Rochester, MN
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Teen Driver Crash Statistics

- ◆ Nationally, teens (16-19 years old) make up only 4.5% of all licensed drivers, but are involved in **8.4% of all fatal crashes** (2009)... higher fatality risk than any other driver age group on the road. (Highway Statistics 2009, FHWA and FARS 2009)
- ◆ In MN, teens (15-19 years old) represent under 6.7% of licensed drivers, but over 12.1% of crash-involved drivers. (Minnesota Crash Facts, 2009)

Minnesota Statistics (All Crashes)



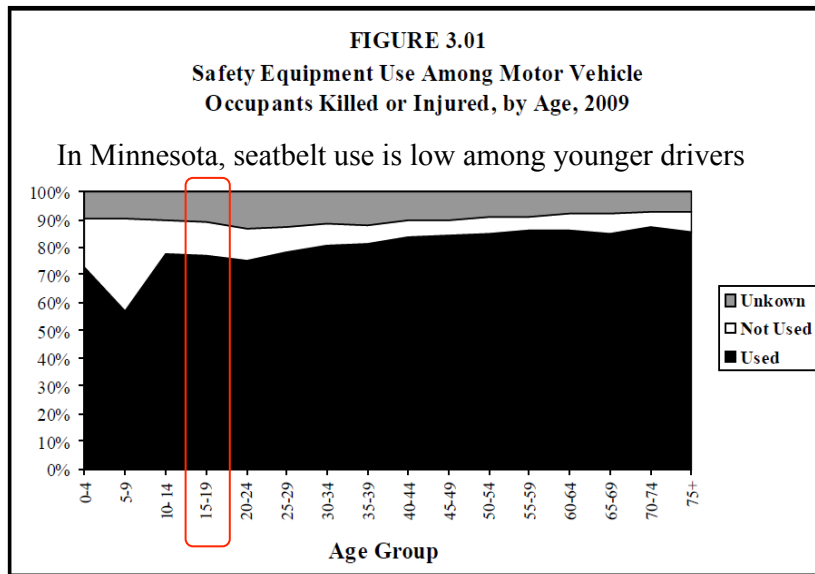
◆ Teen drivers represent most crashes and years of lost productive life.

◆ Changing teen behavior **early** may improve their behavior later.

Factors that Can Increase the Fatality Risk of Teen Drivers

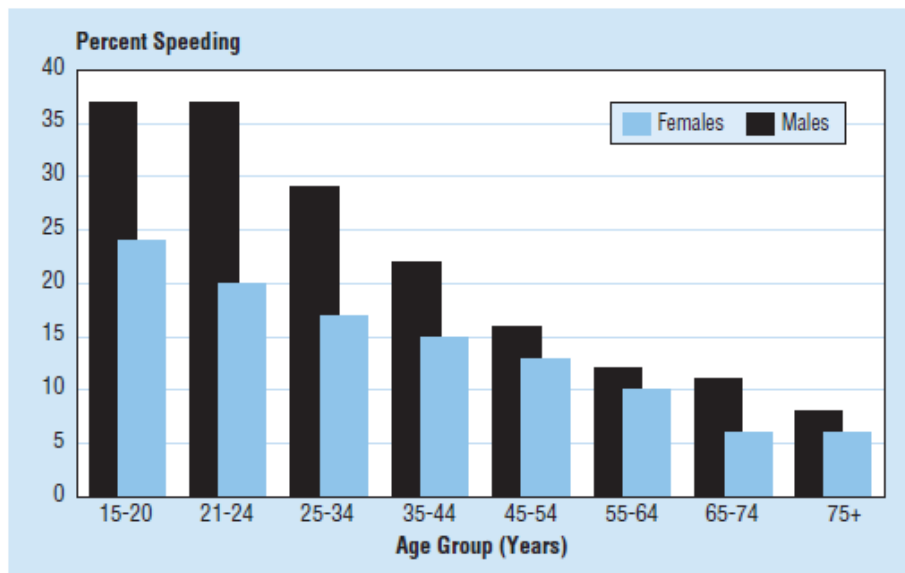
- ◆ Speeding
- ◆ Lack of seat belt use
- ◆ Presence of other teen passengers in the vehicle
- ◆ Distracted driving (calling/texting while driving)
- ◆ Aggressive driving
- ◆ Alcohol

Teen Fatality Contributing Factors: Seatbelt Use



Speeding Drivers in Fatal Crashes by Age and Gender, 2008

(Source: Traffic Safety Facts 2008 Data , NHTSA - DOT HS 811 166)



Simple solutions don't work

- “Aldermen want texting shut-off switch for teens”

... Chicago Tribune, May 4, 2011

Teen Driver Support System (TDSS) Functionality

- Uses “smartphone” as a platform
- Monitor teen driving behavior to identify risky driving behaviors
- Provide **real-time** feedback to improve learning; reduce risky driving
- **Monitor adherence** to GDL provisions
- Facilitate teen-parent communications regarding driving via real-time* feedback (“**reporting**”) and weekly summary reports to parents
(*within minutes)

Graduated Driver Licensing summary: Minnesota (Took effect in August 2008)

- **To get learners license:**
 - ◆ Minimum age: 15
- **Before getting license or restricted license:**
 - ◆ Mandatory holding period: 6 months
 - ◆ Minimum supervised driving time: 30 hours; 10 at night
 - ◆ Minimum age: 16
- **Restrictions during intermediate or restricted license stage:**
 - ◆ Nighttime restrictions: 1st 6 months — midnight-5 am
 - ◆ Passenger restrictions:
 - ◆ 1st 6 months — no more than 1 passenger younger than 20
 - ◆ 2nd 6 months — no more than 3 passengers younger than 20

“Smartphone” As a Platform for TDSS



Speed and Curve Notifications and Warnings

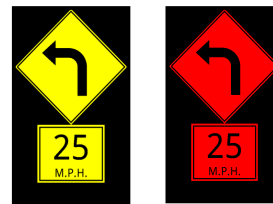
Speed

- Advance notification speed limit changes
- Graduated speeding warning



Curves

- Advance notification of upcoming curves
- Notification of excessive curve speed to driver only



Seat belt, Stop Sign & Excessive Maneuvers

Seat Belt

- Vehicle cannot be put into drive unless seat belt is fastened (transmission interlock)
- Visual & auditory warning if seat belt removed while driving
 - ◆ Text sent if not refastened



Stop Signs/ Excessive Maneuvers

- In-vehicle notification and,
- Text to parents

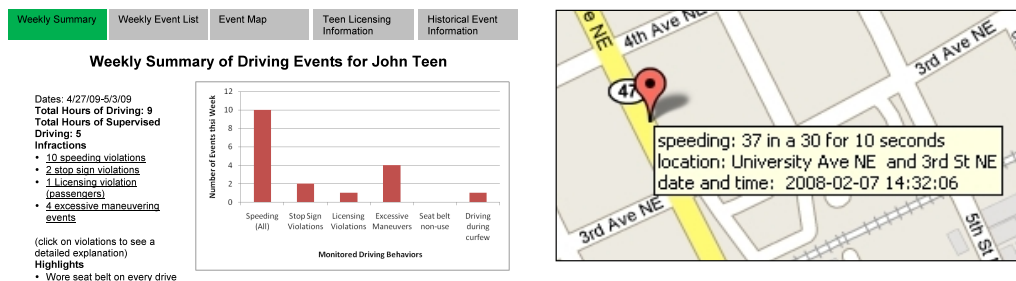


Cell Phone Calls & Texting

- The TDSS:
 - ◆ Automatically sends incoming calls to voicemail
 - ◆ Holds text messages until driving is finished
 - ◆ Would allow calls to 911 while driving if needed (not functional in prototype)
- Under MN Graduated Driver Licensing, teens are not allowed to make cell phone calls while driving
- Under MN Law, no driver is allowed to text while driving

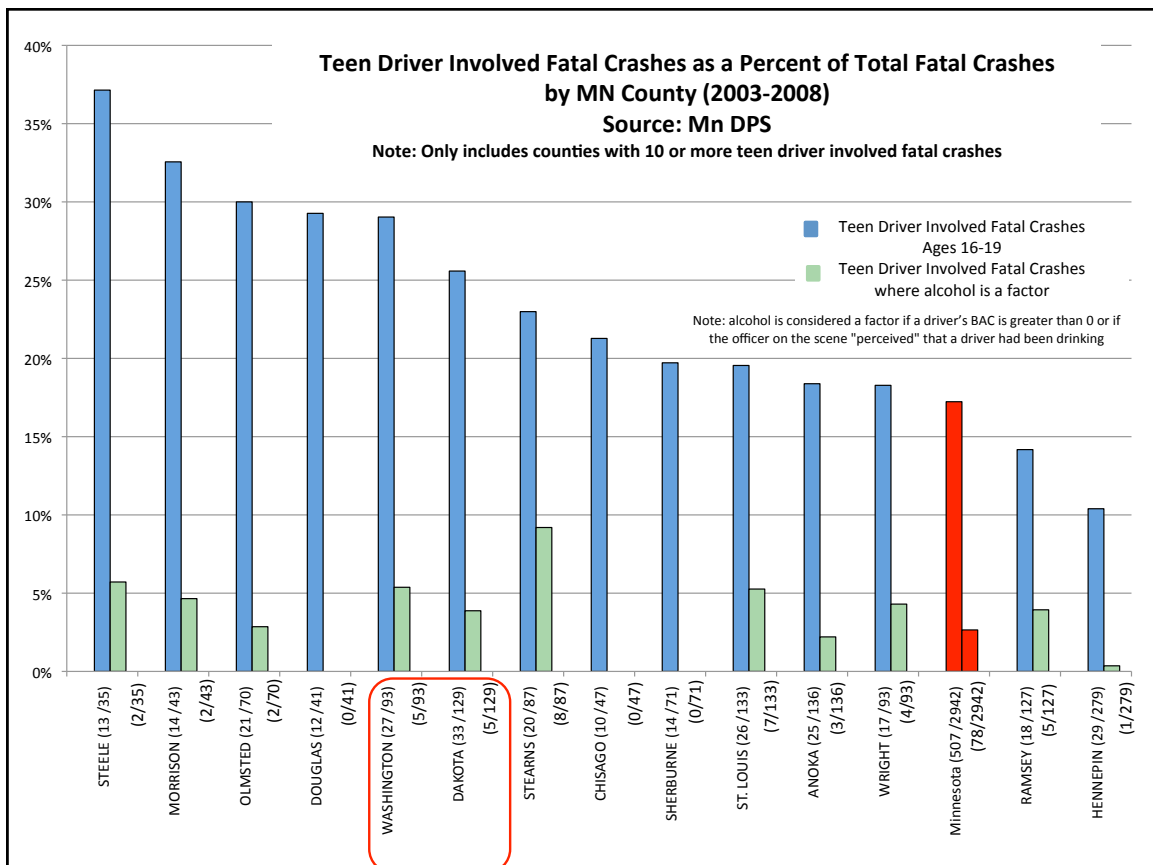
Parental Feedback

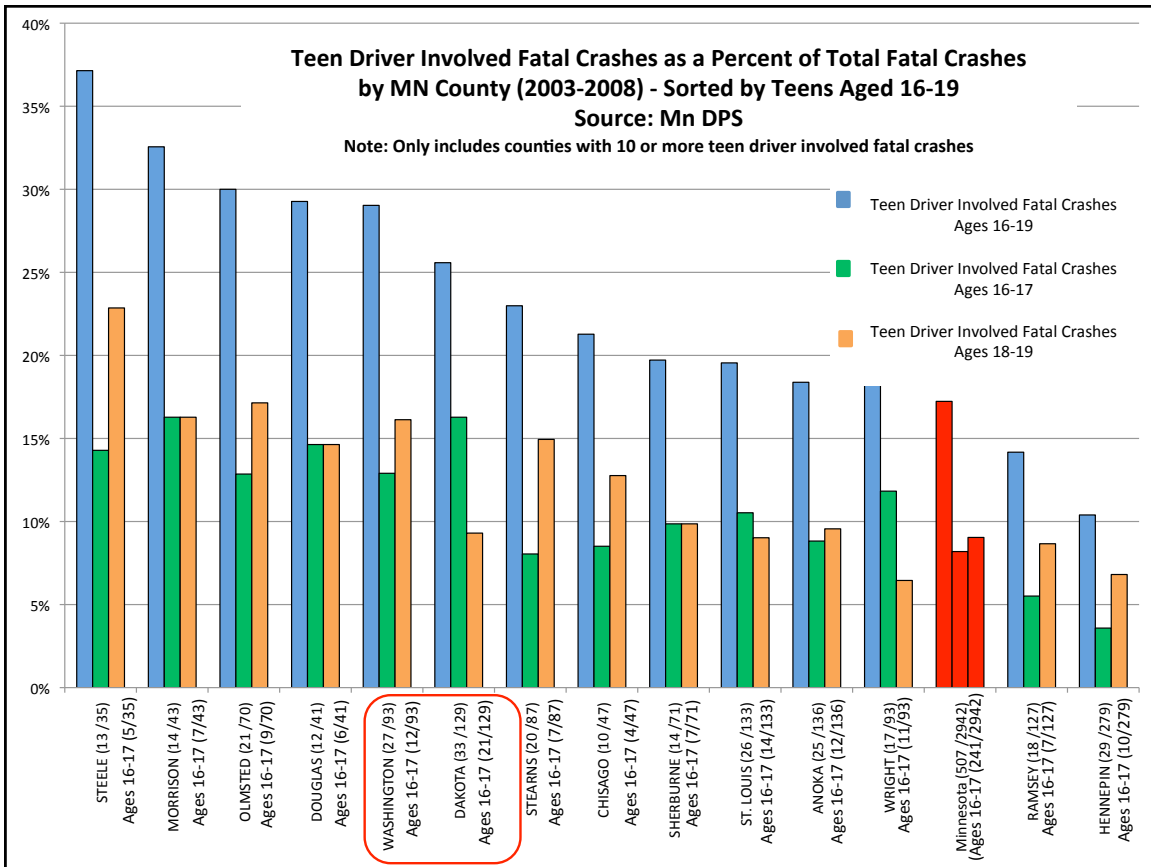
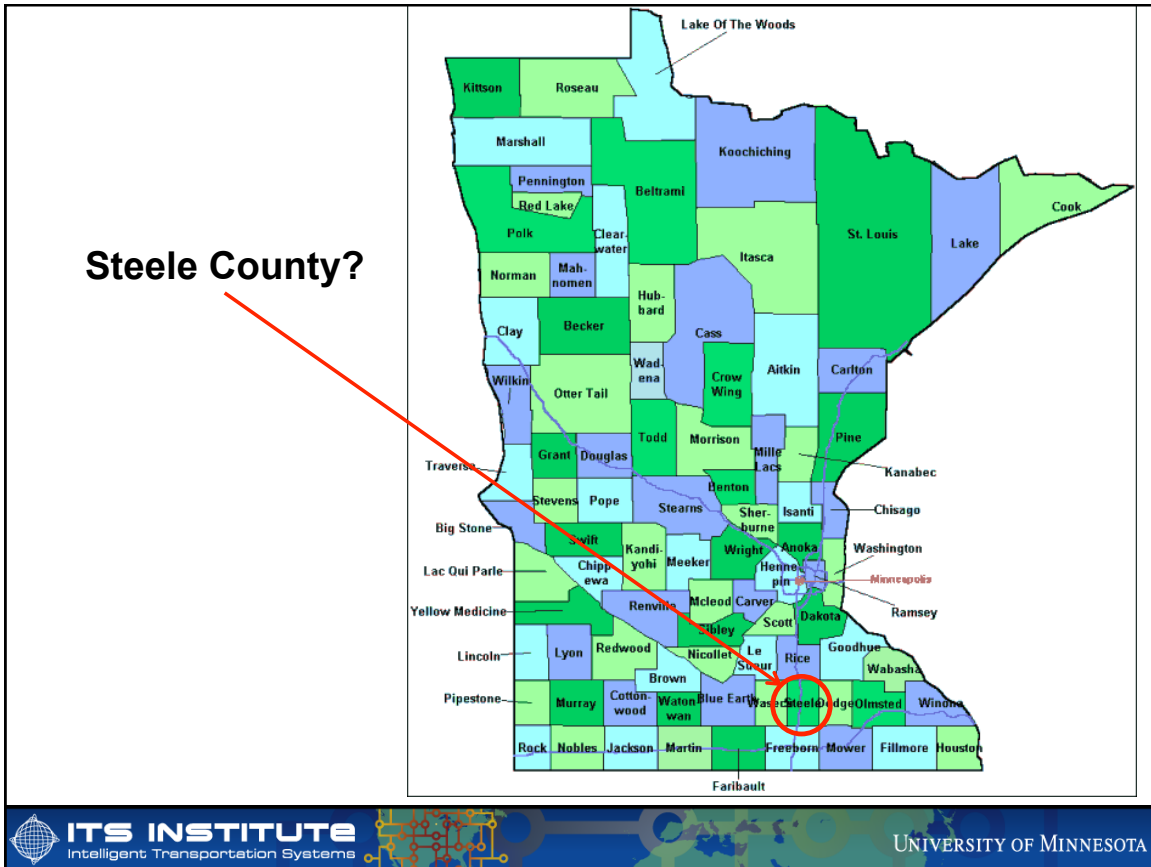
- Text message sent to parent 'soon' after warning provided to driver about violation
- Web-based summary report (for later review)



TDSS Usability Study

- 30 teen / parent “dyads” from Washington County (rural and suburban)
 - ◆ Parents and teens shown full demonstration of the system (researcher driving)
 - ◆ Teens drove the vehicle without parent present and experienced the TDSS warnings; parents waited for potential text messages to arrive
 - ◆ Parents reviewed online summary information
 - ◆ Interviews and questionnaires used to gather feedback



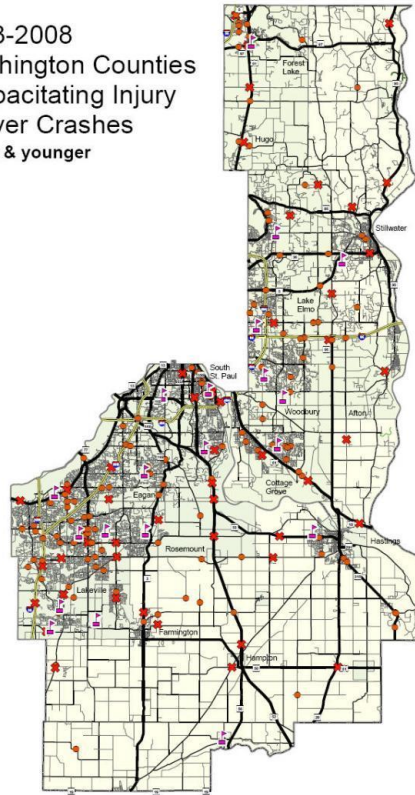


Teen Driver Crashes

18 years and younger

Fatal & Incapacitating injury only

2003-2008 Dakota & Washington Counties Fatal & Incapacitating Injury Teen Driver Crashes 18 Years & younger

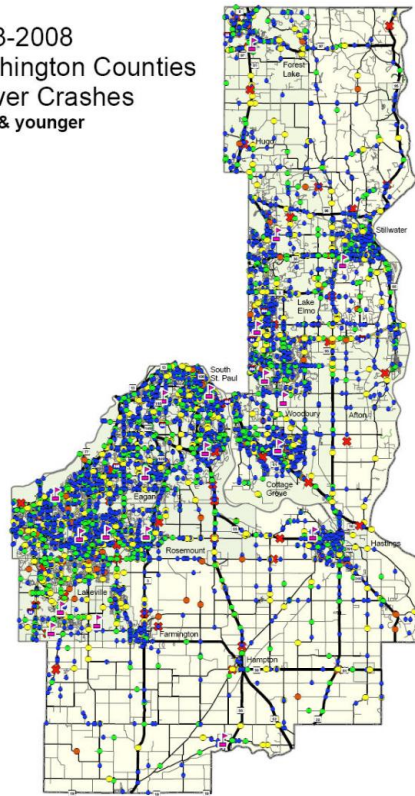


Teen Driver Crashes

18 years and younger

All crashes

2003-2008 Dakota & Washington Counties Teen Driver Crashes 18 Years & younger



The Teen Drivers

Males (N=14)

- Mean age = 17.68 years
- Mean GPA = 3.44
- Miles driven per week (avg.): 142.79.
- Years licensed: 1.34 avg.
- # at fault crashes: 7
- Speeding tickets: 2
- 85.7% reported always wearing seat belt

Females (N=16)

- Mean age = 17.49 years
- Mean GPA = 3.35
- Miles driven per week (avg.): 86.66
- Years licensed: 1.45 avg.
- # of at-fault crashes: 6
- # of other crashes: 1
- Speeding tickets: 1
- 100% reported always wearing seat belt



Key Findings for In-Vehicle Warnings - Teens

- Teens felt the in-vehicle warnings would help them:
 - ◆ Comply with the seat belt law (90%)
 - ◆ Comply with passenger restrictions (90%)
 - ◆ Comply with stop signs in the future (83%)
 - ◆ Comply with speed limits (93%)
 - ◆ Reduce excessive maneuvers in the future (76.7%)
- Overall, teens felt most of the warning were useful and would help them comply with certain driving requirements
 - ◆ Curve warnings were perceived as the least useful warnings



Key Findings for Notifications to Parents - Teens

- **Alerting parents of violations would help teens:**
 - ◆ With seat belt compliance in future (66.7%)
 - ◆ With passenger restrictions (76.7%)
 - ◆ Comply with legal speed limit in future (96.7%)
 - ◆ Comply with stop signs in future (83.4%)
 - ◆ Avoid excessive maneuvers in future (90%)
- Overall, teens felt the system warning their parents about driving behaviors would encourage them to adhere to certain driving requirements

Key Findings for Overall System - Teens

- **Teens agreed** (reported) that driving with the system:
 - ◆ Made them a **safer** driver (93.4%)
 - ◆ Was **more stressful** than without it (73.3%)
 - ◆ Helped them **feel more confident** as a driver (53.3%)
 - ◆ Helped them **pay more attention** to the driving task (76.6%)
 - ◆ **Changed the way they drove** the day of the study (83.3%)
 - ◆ Would **result in permanent changes** in their driving behavior during the first 2 years of driving (93.3%)
 - ◆ Was perceived as less useful as a tool for GDL compliance (50%) compared to using it to improve their skills as a beginning driver (73.4%)

Key Findings for Overall System - Teens

- Overall, **teens were satisfied** with the system (86.7%)
- Overall, **teens felt it would have a somewhat positive effect on their interactions with their parents** (56.7%)
- Overall, teens felt it would have a positive effect on their parents' expectations of their driving behavior (76.6%)
- However, 43.3% of teens felt using the system would be an invasion of their privacy

The Parents

Mothers (N=26)

- Mean age = 48.2 years
- Average weekly mileage: 176.53
- Education: all had some college or higher
- # Speeding tickets: 7
- **At-fault crashes (in past 5 years): 3**
- Total crashes (in past 5 years): 9

Fathers (N=4)

- Mean age = 54.5 years
- Average weekly mileage: 343.75
- Education: all had some college or higher
- 1 minor crash reported

Key Findings for Parents – Text Messages

- Overall, the information content of the text messages was rated good, very good or excellent for each warning type (75% agreement or greater)
- Overall, **parents preferred text messages (70%+) and the web-based parental report (80%+)** over other forms of communication (e.g., email, paper report)
- Overall, parents rated their attitude towards the text messages as “very positive” (80%)

Key Findings for Parents – Cell Phone Use

- 100% of the parents agreed that blocking cell phone calls and texting would make driving safer for their teens
- However, **several parents wanted to be able to call their teen while their teen was driving** but wanted all other calls blocked
 - ◆ This seemed to indicate that some parents felt talking to a parent while driving was safe or safer than talking to someone else
 - ◆ However, all calls are likely to distract a teen driver to some degree, even a call from parents

Key Findings for Parents – Web-based Summary Report

- Overall, parents rated all components of the summary report to be good, very good or excellent (85%+)
- Overall, parents rated their attitude towards the summary report as “very positive” (80%)

Key Findings for Parents – Overall Opinion of TDSS

- Overall, parents felt the TDSS would probably improve (40%) or definitely improve (40%) their teens' driving behavior
- Parents also felt the TDSS would probably (46.7%) or definitely (30%) improve their own interactions with their teens with respect to driving
- 97% of parents would recommend TDSS to other parents
- 93% of parents would recommend TDSS to their teen or another teen

Key Findings for Parents – Overall Opinion of TDSS

- 93% of parents felt the TDSS was **not an invasion of their teen's privacy**
 - ◆ Note: about half of the teens felt it would be an invasion of their privacy
- Overall, parents were either somewhat satisfied (43.3%) or completely satisfied (43.3%) with the TDSS
- Most parents (73%) would pay a monthly fee of \$40 or less for the TDSS services

General Conclusions

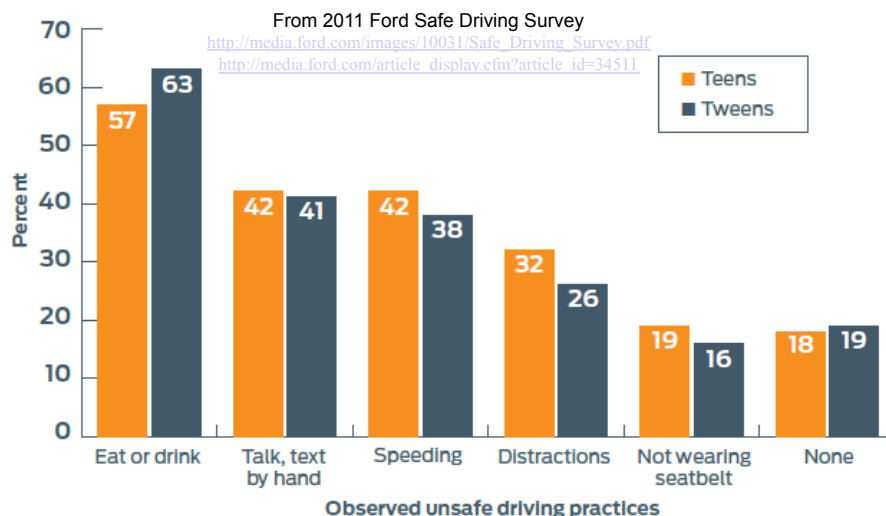
- Overall, the TDSS functions were perceived positively by both teens and parents
 - ◆ However, teens reported that driving with the system was more stressful than driving without it
 - ◆ Teens' comments indicated that the frequent warnings were annoying and some felt the pressure to "please the system" and "avoid warning their parents" was stressful
 - ◆ **Yet, despite this perception, teens also reported that they felt it made them a safer driver and that it would help them avoid getting pulled over for speeding or other infractions**
- **Teens and parents felt it might improve the teens' driving behavior when used regularly**

General Conclusions

- Teens and parents felt it might improve the teens' driving behavior when used regularly
- Parents did not view the TDSS as an invasion of their child's privacy; however, half the teens did perceive it to be an invasion of privacy
 - ◆ Negotiating the use of such a device in a manner that is acceptable to teens will be critical to successful use of the system

Other concerns:

Teens, Tweens Give Parents Driving Report Cards



According to a national survey commissioned by Ford Motor Company (April 26, 2011 press release)

- U.S. teens and tweens say their parents are riskier drivers than they claim.
- While nearly all parents say they are safe drivers and good role models for their kids, more than half (51%) admit their teens and tweens have asked them to slow down, stop talking or texting by hand, or practice other safe driving behaviors.
- An even larger number (80 %) of teens and tweens have seen their parents engage in risky actions behind the wheel while looking to their elders as driving role models.
- Meantime, 78% of tweens say their mothers and fathers have “a lot of influence” on the way they will drive and 66% of teenage drivers say their parents’ actions influence their driving.

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