Distracted Driving and Crash Responsibility in Fatal Collisions

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Distracted Driving

What is it?

A secondary activity or behaviour that affects the performance of the primary task of driving.
Associated Factors

- Mixed evidence for sex
- Younger age, more distraction

Distraction

Age
Negative Effects

- Longer response time
- Errors in lane keeping
- Stopping Errors
Negative Effects

- Longer hands off the wheel time
- Longer time with eyes off the road
- Higher risk of collisions
Distraction & Fatalities

3,450

- Deaths associated with distracted driving 2016
- = 6.5 Boeing 747s
Distraction & Fatalities

3% • Studies in distracted driving meta-analysis focused on fatalities
Objectives

- Examine prevalence of distraction & cell phone distraction
  - Over time, and by age, sex
- Examine the role of driver distraction and crash responsibility in fatal crashes
Methods
Methods – FARS

- Fatality Analysis Reporting System (FARS)
- Census level USA data
- Fatal crashes
- National Highway Traffic Safety Administration (NHTSA)
- FARS Analysts
Methods – Data

Distraction Prior to 2010

| Inattentive/Careless | Cellular telephone in use in vehicle (2002) |

2010 – Present: Distract Data File

19 Distractions
Analysis – Prevalence

▶ Sample
  ▶ 1991 – 2015
  ▶ Aged 16+
  ▶ Passenger type vehicles
▶ Descriptive Statistics
Results

Prevalence
Percentage of Drivers Involved in Fatal Collisions who were Distracted 1991 - 2015

Percentage of Drivers

Any Distraction  Cell Phone Distraction


Any Distraction

Cell Phone Distraction
Distraction 1991 - 2015

Cell Phone Distraction 2002 - 2015

Distracted (%)

Age

Distracted (%)

Age

Male
Female
Most Prevalent Distraction

- 2010 – 2015
- Cell Phones = 14.6%
  - Talking or listening: 4.2%
  - Manipulating: 3.4%
  - Other cell phone related: 7.0%
Methods
Crash Responsibility
Methods – Variables

- Dependent Variable: Crash Responsibility
  - Unsafe Driver Actions (UDAs)
  - 0 UDAs – Not contributed to crash responsibility [Controls]
  - 1 + UDAs – Contributed to crash responsibility [Cases]
- Exposure: Distracted Driving
Analysis – Crash Responsibility

- Sample
  - 2010 – 2015
  - Aged 20 years and older
  - Passenger type vehicles
  - Exclusions: BAC>0, tested positive for illegal drugs
Case-Control Design

- Cases: 1 or more UDAs
- Controls: 0 UDAs

Adjusted (sex, age, age^2, age*distraction, age^2*distraction, driver history) odds ratios (OR) via logistic regression
Results
Crash
Responsibility
Adjusted Predicted Odds of Crash Responsibility

Predicted Odds (95% CI)

Driver Age

Distraction
- Distracted
- Not Distracted
Adj. Odds Ratio of Crash Responsibility on the Log Scale
Conclusions

- Most coded distraction 2010 – 2015: Cell Phone
- Being distracted approx. doubles the odds of being responsible for the crash after adjustment
Conclusions

- Poor driving behaviours leading to crashes/fatalities
- Health and safety issue
- Danger to all road users
- Preventable
Conclusions

- USA
  - Texting & driving banned in 47 states
  - Talking & driving banned in 16 states

- Canada
  - All provinces/territories have cell phone legislation except Nunavut
  - Nothing against hands-free cell phone
Conclusions

- Legal = Safe
  - No
- Update laws and regulations
- Rapid development of technology
Conclusions

- Phone apps
- Insurance discount
- Education
- Public Service Announcements
In honour of the Humboldt Broncos and their families
Questions?

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References


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- Dr. Lynn Martin, Committee Member
- Bruce Weaver, Statistician
Secondary tasks while driving 1968 – 2012

- 350 analyses from 206 studies
- 47% cell phone distraction
- 80% of studies found detrimental relationship
- Cell phone studies more likely to find harmful relationship
Methods – FARS

- FARS Analysts
- Over 100 FARS data elements
- Police Accident Reports and other documents (Death Certificates, State Vehicle Registration Files, Coroner/Medical Examiner Reports, State Driver Licensing Files, State Highway Department Data, Emergency Medical Service Reports, Vital Statistics and other State Records)
Methods – FARS

- FARS established in 1975
- Original Data Files
  - Accident (environment and crash)
  - Vehicle (each vehicle and its driver)
  - Person (drivers, passengers, pedestrians)
Methods – Data

- Distraction data file added in 2010
- 19 distractions
  - Talking/listening to cell phone
  - Manipulating cell phone
- Eating/drinking
- Smoking related
- Adjusting controls
- Moving object in vehicle, etc.
- Not Distracted, Not Reported, Unknown if distracted
Percentage of Distracted Drivers Without Passengers in Fatal Crashes 1991 - 2015

- All Distractions
- Cell Phone Distraction
Percentage of Distracted Drivers Involved in Fatal Crashes Occurring on Rural Roadways 1991 - 2015

Percentage on Rural Roads

- All Distractions
- Cell Phone Distraction
<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distracted</td>
<td>-0.40</td>
<td>(-0.96; 0.17)</td>
</tr>
<tr>
<td>Sex, male</td>
<td>0.15</td>
<td>(0.09; 0.20)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.06</td>
<td>(-0.07; -0.06)</td>
</tr>
<tr>
<td>Age²</td>
<td>0.00</td>
<td>(0.00; 0.00)</td>
</tr>
<tr>
<td>Distracted*Age</td>
<td>0.05</td>
<td>(0.03; 0.08)</td>
</tr>
<tr>
<td>Distracted*Age²</td>
<td>-0.00</td>
<td>(-0.00; 0.00)</td>
</tr>
<tr>
<td><strong>Previous Driving History</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crashes = 1</td>
<td>-0.02</td>
<td>(-0.11; 0.07)</td>
</tr>
<tr>
<td>Driving While Intoxicated = 1</td>
<td>0.00</td>
<td>(-0.27; 0.28)</td>
</tr>
<tr>
<td>Speeding = 1</td>
<td>0.01</td>
<td>(-0.08; 0.09)</td>
</tr>
<tr>
<td>Suspensions = 1</td>
<td>0.26</td>
<td>(0.14; 0.39)</td>
</tr>
<tr>
<td>Other Convictions = 1</td>
<td>0.12</td>
<td>(0.03; 0.21)</td>
</tr>
</tbody>
</table>
## Adjusted Odd Ratios – Crash Responsibility

<table>
<thead>
<tr>
<th>Age</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>1.53</td>
<td>[1.26, 1.86]</td>
</tr>
<tr>
<td>25</td>
<td>1.76</td>
<td>[1.52, 2.03]</td>
</tr>
<tr>
<td>30</td>
<td>1.97</td>
<td>[1.75, 2.21]</td>
</tr>
<tr>
<td>35</td>
<td>2.15</td>
<td>[1.92, 2.40]</td>
</tr>
<tr>
<td>40</td>
<td>2.28</td>
<td>[2.02, 2.56]</td>
</tr>
<tr>
<td>45</td>
<td>2.35</td>
<td>[2.06, 2.67]</td>
</tr>
<tr>
<td>50</td>
<td>2.36</td>
<td>[2.06, 2.71]</td>
</tr>
</tbody>
</table>
### Adjusted Odd Ratios – Crash Responsibility

<table>
<thead>
<tr>
<th>Age</th>
<th>Odds Ratio</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>2.31</td>
<td>[2.02, 2.65]</td>
</tr>
<tr>
<td>60</td>
<td>2.21</td>
<td>[1.93, 2.53]</td>
</tr>
<tr>
<td>65</td>
<td>2.05</td>
<td>[1.80, 2.34]</td>
</tr>
<tr>
<td>70</td>
<td>1.85</td>
<td>[1.61, 2.13]</td>
</tr>
<tr>
<td>75</td>
<td>1.63</td>
<td>[1.39, 1.91]</td>
</tr>
<tr>
<td>80</td>
<td>1.40</td>
<td>[1.14, 1.71]</td>
</tr>
</tbody>
</table>
Strengths and Limitations

Strengths
- Real-life crashes
- Census level data
- Controlled for driving history

Limitations
- Case-control design
- Proxy measure of responsibility
- Not generalizable to non-fatal collisions
<table>
<thead>
<tr>
<th>Distractions</th>
<th>Details Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Distracted</td>
<td>No Driver Present/Unknown if Driver Present</td>
</tr>
<tr>
<td>Looked But Did Not See</td>
<td>Distraction/Inattention</td>
</tr>
<tr>
<td>By Other Occupant(s)</td>
<td>Distraction/Careless</td>
</tr>
<tr>
<td>By a Moving Object in Vehicle</td>
<td>Careless/Inattentive</td>
</tr>
<tr>
<td>While Talking or Listening to Cellular Phone</td>
<td>Distraction/Inattention, Details Unknown</td>
</tr>
<tr>
<td>While Manipulating Cellular Phone</td>
<td>Distraction (Distracted), Details Unknown</td>
</tr>
<tr>
<td>While Adjusting Audio or Climate Controls</td>
<td>Inattention (Inattentive), Details Unknown</td>
</tr>
<tr>
<td>While Using Other Component/Controls Integral to Vehicle</td>
<td>Not Reported</td>
</tr>
<tr>
<td>While Using or Reaching For Device/Object Brought Into Vehicle</td>
<td>Inattentive or Lost in Thought</td>
</tr>
<tr>
<td>Distracted by Outside Person, Object or Event</td>
<td>Lost In Thought/Day Dreaming</td>
</tr>
<tr>
<td>Eating or Drinking</td>
<td>Other Distraction</td>
</tr>
<tr>
<td>Smoking Related</td>
<td>Unknown if Distracted</td>
</tr>
<tr>
<td>Other Cellular Phone Related</td>
<td></td>
</tr>
</tbody>
</table>
Relative Risk

- Typically used with cohort studies or clinical trials
- Binary outcome variable
- Ratio of two probabilities
- Relative Risk = \( \frac{\text{Risk of event in Tx group}}{\text{Risk of event in Control group}} \)
  = \( \frac{\frac{A}{A+B}}{\frac{C}{C+D}} \)
Odds Ratios

- Typically used with case control studies
- Ratio of two odds
- Odds = \( \frac{\text{# of Events}}{\text{# of Non-Events}} \)
- Odds Ratio = \( \frac{\text{Odds of Distraction in Cases}}{\text{Odds of Distraction in Controls}} \) = \( \frac{A/B}{C/D} \)

<table>
<thead>
<tr>
<th></th>
<th>Distraction</th>
<th>No Distraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case</td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>Control</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>