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Distracted Driving-A Review of Relevant Research and Latest Findings

Cell Phone Use Attributable Risk Model

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Overview

- NSC Mission and Impact
- Cell Phone Research
- Attributable Risk Model

THE NATIONAL SAFETY COUNCIL SAVES LIVES BY PREVENTING INJURIES AND DEATHS AT WORK, IN HOMES AND COMMUNITIES, AND ON THE ROADS THROUGH LEADERSHIP, RESEARCH, EDUCATION AND ADVOCACY.


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Mission and Impact




NSC Mission

The National Safety Council saves lives by preventing injuries and deaths at work, in homes and communities, and on the roads, through leadership, research, education and advocacy.

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NSC Impact

By 2014, NSC is going to save an additional 10,000 lives and prevent 1 million injuries by helping people live safer lives through leadership, research, education and advocacy.

- In the workplace, we will maximize the value employers receive through their investment in safety and help them and their employees take safety home.
- On the roads, we will dramatically reduce the use of cell phones while driving and focus on keeping teens safe in cars.



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Cell Phone Research




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Cell Phone Research Approaches

- Case – Crossover Studies
- Randomized Lab/Simulation Studies
- Naturalistic Studies

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Case – Crossover vs. Other Approaches

- Case-Crossover – Large samples are well suited to estimate relative risk.
- Naturalistic – Are potentially powerful but have so far been:
 - Too small
 - Non-representative samples
 - Includes “near crashes” in the relative risk estimate
- Lab/Simulations – Difficult to accurately represent the actual driving environment

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Case Crossover Cell Phone Studies

- “Association between cellular-telephone calls and motor-vehicle collisions.” (Redelmeier & Tibshirani, 1997)
 - 699 drivers in Toronto Canada
 - Includes property damage only crashes
 - Relative risk: 4.3
- “Role of mobile phones in motor-vehicle crashes resulting in hospital attendance: a case-crossover study.” (McEvoy, Stevenson, McCart, Woodward, Haworth, Palamara, & Cercarelli, 2005)
 - 456 Drivers in Perth, Western Australia
 - Includes crashes resulting in emergency department visits
 - Relative risk: 4.1

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Potential Limitations of Case – Crossover Design

- Incomplete data
- Overestimating cell phone calls prior to the crash
- Distortions from sample selection
- Extrapolation to different outcome severities
- Retrospective identification of outcomes

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National Occupant Protection Use Survey (NOPUS)

NOPUS provides probability-based observation data on driver electronic device use.

- The NOPUS is conducted annually by the National Center for Statistics and Analysis (NCSA) of the National Highway Traffic Safety Administration.
- 2008 results:
 - Estimated 11% of the vehicles whose drivers were using some type of phone (hand-held or hands-free) in the typical daylight moment.
 - Estimated 1% of the vehicles whose drivers were visibly manipulating of hand-held devices (includes text messaging)

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Text Messaging

Little research regarding the relative risk of text messaging while driving.

- "Driver distraction in commercial vehicle operations." (Olson, Hanowski, Hickman, & Bocanegra, 2009) – Naturalistic Study
 - Naturalistic study of commercial truck drivers
 - Small sample: 203 drivers/55 trucks
 - Relative risk: 23
 - Includes non-crash events
- "Text messaging during simulated driving." (Drews, Yazdani, Godfrey, Cooper, & Strayer 2009) – Simulation Study
 - Simulation study
 - Small sample: 20
 - Relative risk: 6

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A Lack of Direct Crash Data


- Poor surveillance data for all forms of distracted driving.
- NHTSA estimated 5,870 fatalities in 2008 from distracted driving.
 - Estimate based on crash report data.
 - Not all police reports include distracted driving.
 - Under reporting is a problem – distraction must be observed or self-report

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Attributable Risk Model




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Common Epidemiologic Metric

- Attributable risk has been used across a broad set of studies to quantify a population's risk.
 - Cost effectiveness of cell phone regulations
 - Risk of myocardial infarction
 - Risk of child hood injuries

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Attributable Risk Estimate Model

Goal - Fill the data void by developing an estimate of the number of crashes likely caused by cell phone use.

- Based on two factors
 - Prevalence of drivers using cell phones
 - Relative Risk

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Attributable Risk Estimate

Step #1

$$R_{dp} = DP_o + DP_e \times RR$$

Driver Population Relative Risk is the weighted average of the relative risks for the two groups comprising the driving population.

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Attributable Risk Estimate

Step #1

$$R_{dp} = DP_o + DP_e \times RR$$


Driver Population Relative Risk

Proportion not using cell phones

Proportion using cell phones

Relative risk of crashing while using a cell phone

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Attributable Risk Estimate

Step #2


Driver Population Relative Risk

$$A_{dp}\% = \frac{(R_{dp}-1)}{R_{dp}} \times 100$$

Driver Population Attributable Risk

The relative risk of driving is 1. By subtracting 1 the difference represents the excess relative risk attributable to cell phone use.
 Dividing by Driver Population Relative Risk provides the proportion of excess relative risk to total risk.

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Attributable Risk Estimate Example

Assumptions:

- % Cell phone drivers at any given time = 11%
- % Non-cell phone drivers at any given time = 89%
- Relative risk when using a cell phone while driving = 4
- Relative risk when not using a cell phone while driving = 1

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Step #1: Driver Population Relative Risk

$$R_{dp} = DP_o + DP_e \times RR$$

$$R_{dp} = .89 + .11 \times 4$$

$$R_{dp} = 1.33$$

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Step #2: Population Attributable Risk Percent

$$A_{dp}\% = \frac{(R_{Dp}-1)}{R_{Dp}} \times 100$$

$$A_{dp}\% = \frac{(1.33-1)}{1.33} \times 100$$

$$A_{dp}\% = 25\%$$

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Population Attributable Risk Table

POPULATION ATTRIBUTABLE RISK PERCENT OF CRASHES ESTIMATE TABLE USING PERCENT PREVALENCE AND RELATIVE RISK

Percent Prevalence	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
1%	0%	0%	1%	1%	2%	2%	3%	3%	4%	4%	5%
2%	0%	0%	1%	2%	3%	4%	5%	6%	7%	8%	9%
3%	0%	0%	1%	3%	4%	5%	7%	8%	10%	11%	13%
4%	0%	0%	2%	4%	6%	7%	9%	11%	12%	14%	16%
5%	0%	0%	2%	5%	7%	9%	11%	13%	15%	17%	19%
6%	0%	0%	3%	6%	8%	11%	13%	16%	17%	20%	22%
7%	0%	0%	3%	7%	10%	12%	15%	17%	20%	22%	25%
8%	0%	0%	4%	7%	11%	14%	17%	19%	22%	24%	27%
9%	0%	0%	4%	8%	12%	15%	18%	21%	24%	26%	29%
10%	0%	0%	5%	9%	13%	17%	20%	23%	26%	28%	31%
11%	0%	0%	5%	10%	14%	18%	21%	25%	28%	30%	33%
12%	0%	0%	6%	11%	15%	19%	22%	26%	30%	32%	35%
13%	0%	0%	6%	12%	16%	21%	25%	28%	31%	33%	36%

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Resources

- http://www.nsc.org/news_resourcees/news/Pages/NSC_News.aspx (attributable risk model)
- http://www.nsc.org/safety_road/Distracted_Driving/Pages/distracted_driving.aspx (general distracted driving information)

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