Multiple research studies have found that the use of cell phones while driving increases the risk of crashes. The approximate percent of drivers who use cell phones at any given time can also be estimated using NHTSA's NOPUS results. However, there is no national surveillance program that tracks the number of crashes involving drivers on cell phones. Fortunately, using the estimates of the percent of drivers on phones and the relative risk of this activity it is possible to estimate the number/proportion of crashes caused by cell phone use.

As the number of drivers using cell phones has increased the total driving population has started to exhibit higher risk. The amount of the increase depends on the proportion of the driving population using cell phones at any given time and the relative risk of cell phone use while driving. The average proportion of the driving population using cell phones at any given time can be estimated using NOPUS results. The relative risk of both cell phone use and non-use can also be estimated. Drivers not using cell phones have a relative risk of 1 while the relative risk of cell phone use has been estimated by a number of studies. The DRIVER POPULATION RELATIVE RISK is determined as the weighted average of the relative risks for the two groups comprising the driving population:

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

where R_{dp} = driver population relative risk
DP_o = proportion of the driver population not using a cell phone
DP_e = proportion of the driver population using a cell phone
RR = relative risk of crashing while using a cell phone while driving

Similarly looking at only the cell phone using portion of the population the EXPOSED DRIVER RELATIVE RISK is:

$R_e = DP_e \times RR$

where R_e = exposed driver relative risk – Note: this is only self exposure not the risk cell phone drivers pose to others.

Using the above two formulas the percent of crashes involving cell phones or the PERCENT OF EXPOSED DRIVER RELATIVE RISK can be estimated as:

$R_e\% = R_e / R_{dp} \times 100$

where $R_e\%$ = percent of exposed driver relative risk

The percent of exposed driver relative risk is the percentage of crashes involving cell phone use.

However, the percent of exposed driver relative risk reflects all crashes in which cell phone use was present. This estimate does not address whether cell phone use was a contributing factor in the crash. To estimate the percent of crashes that can be attributed to cell phone use, the excess relative risk associated with cell phone use must be addressed. Excess relative risk is the segment of relative risk among cell phone drivers which exceeds the risk among non-cell phone drivers. Since relative risk reflects total risk, expressing cell phone driver's excess relative risk as a percentage of its relative risk yields the attributable risk percent. By subtracting 1 from the population relative risk, it is converted to the population excess relative risk. The POPULATION ATTRIBUTABLE RISK PERCENT can then be determined using the following formula:

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

where $A_{dp}\%$ = driving population attributable risk percent

The above formula estimating the population attributable risk percent is mathematically equivalent to formulas used in many epidemiologic studies, as well as naturalistic studies, including the 100-Car Naturalistic study (Klauer, 2006).

The Population Attributable Risk Percent of Crashes Estimate Table presents the estimated population attributable risk of crashes for cell phone use by varying levels of relative risk and percent prevalence (number of drivers on cell phones at any given time). The estimates in this table represent the percent of crashes that are attributable to cell phones.

Example

Assumptions

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

DRIVER POPULATION RELATIVE RISK

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

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

$R_{dp} = 1.33$

EXPOSED DRIVER RELATIVE RISK

$R_e = DP_e \times RR$

$R_e = .11 \times 4$

$R_e = .44$

PERCENT OF EXPOSED DRIVER RELATIVE RISK

$R_e\% = R_e / R_{dp} \times 100\%$

$R_e\% = .44 / 1.33 \times 100\%$

$R_e\% = 33\%$

Thus 33% of the crashes involve a driver using a cell phone.

POPULUATION ATTRIBUTABLE RISK PERCENT

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

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

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

Thus 25% of the crashes can be attributed to cell phone use.

Sources:

Cole, P. & MacMahon, B. (1971). Attributable risk percent in case-control studies. *British Journal of Preventive & Social Medicine*, *24*, 242-244.

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