Status Summary: Using Wireless Communication Devices While Driving

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Status Summary:
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I. General Conclusion:

The experimental data indicates that, with the exception of the consequences of manipulating a wireless communications device, there are negligible differences in safety relevant behavior and performance between using hand-held and hands-free communications devices while driving from the standpoint of cognitive distraction. Specifically, the experimental data reveal observable degradations in driver behavior and performance and changes in risk-taking and decision-making behaviors when using both hand-held and hands-free mobiles phones, and the nature of those degradations and changes are symptomatic of potential safety-related problems.

II. Experimental Data:

A. Hand-held vs. Hands-free mobile phones

1. **Evidence (e.g., Patten et al., in press; Consiglio et al., 2003; Greenberg et al., 2003; Direct Line Insurance, 2002; Ishida & Matsura, 2001; Strayer & Johnston, 2001; Haigney et al, 2000; Lamble et al, 1999; RoSPA, 2002) of general delay in information processing and degradations in driving performance (e.g., variations in speed, decrement in driver responsiveness to traffic conditions and delayed reactions) regardless of mobile phone platform – hand-held or hands-free, and that those degradations are equivalent for hand-held and hands-free cell phone users.**
2. Research (e.g., Briem & Hedman, 1995) suggests that a difficult conversation may have an adverse effect of driving, and any prolonged manipulation of a mobile phone is likely to impact driving performance, particularly under conditions that place heavy demands on the driver's attention and skill.
3. **While it is not possible to make a direct connection to crash risk from experimental results, the nature of driving performance degradations measured in relation to the presence of a phone conversation task are associated with subjective risk manipulation and crash involvement and are symptomatic of potential safety-related problems associated with such things as mobile phone use while driving, even if such use does not involved physical manipulation of the device (ICBC, 2001; Haigney et al, 2000).**
4. *Hands-free phones*

   - Evidence (e.g., Harbluk et al, 2002) of changes in driver behavior (narrowed visual scanning behavior and reductions in vehicle control) under real-world driving conditions due to increase in cognitive demands associated with mobile phone usage, including hands-free phones Even simple conversation can disrupt attentive scanning and information processing of the visual scene. Researchers believe that changes in these behaviors are indicative of the extra demands placed on the driver by cell phone usage, and that these demands contribute to late detection, reduced situation awareness and a reduced margin of safety.
   - Evidence (e.g., ICBC, 2001) of increases in cognitive demand due to listening to complex messages via hands-free phone results in degraded driving performance (e.g., reductions in margin of safety and significantly riskier decision-making, such as shorter accepter gaps), and that adverse driving conditions (i.e., slippery or wet road) aggravates the problems.

- Evidence from simulator studies (e.g., Parkes & Hooijmeijer, 2001) of significant deterioration in situational awareness (of the surround traffic environment) when drivers are engaged in cognitively demanding conversation using a hands-free phone. In addition, evidence of longer reaction times and increased mental workload associated with engaging in hands-free conversation, and that neither younger nor elderly drivers adapted headway (or following distance) to account for increase risk due to increased reaction time (Alm & Nilsson, 1995).

5. *Hand-held phones*

- Evidence from simulator-based studies (e.g., Patten et al., in press; Graham & Carter, 2001; Strayer & Johnston, 2001) indicates that tracking performance and peripheral event detection are worse when using a mobile phone than when not, and that performance is worse when manually dialing a hand-held phone while driving than when using a voice-dialed hands-free phone.
- Evidence from on-road and closed-course studies (e.g., Tokunaga et al, 2000; Ishida & Matsura, 2001) that both simple and complex conversations using a hand-held mobile phone are associated with greater reactions times than driving alone, that braking reaction times are longer than when not using a phone, and that delays are longer when using hand-held phones than when using hands-free phones.
- Evidence from closed-course and simulator-based studies (e.g., Ishida & Matsura, 2001; Haigney et al, 2000; Parkes & Hooijmeijer, 2001) that driving speed tends to be lower and headway distance increases – suggesting a "process of risk compensation," and that drivers are slower to react to specified speed changes.
- Evidence from simulator-based studies (e.g., McKnight & McKnight, 1991) of significant delays in response to or failure to respond to traffic events, a relative increase in chance of a highway-traffic situation going unnoticed ranging from 20% to 29% for placing a call in simple conversation to complex conversations, and that this behavior is twice as likely in older drivers. Greenberg et al. (2003) found that hands-free and hand-held dialing resulted in significantly more missed front events than the control condition, as did the hands-free incoming call and hand-held voicemail retrieval.

  Researchers noted that while a cellular telephone conversation may be no more distracting than a conversation of the same intensity with a passenger, the availability of a cellular phone likely significantly increases the number of conversations in general and the more 'distracting, intense, business conversation' in particular. They also noted that older drivers in particular should be cautioned against using hand-held phones while driving. (McKnight & McKnight, 1991)

B. Cognitive Demand while Driving

- Evidence from closed-course and simulator-based studies (e.g., Irwin et al, 2000; Lee et al., 2001; Hancock et al., 2003) revealed longer reaction times when a driver is engaged in conversation using a mobile phone or other cognitively demanding task (e.g., simulated electronic mail).
- Evidence (McCarley et al, in press) that simple conversations can disrupt attentive scanning and representation of a visual scene (or situation awareness).

C. Epidemiological Data

- Evidence (e.g., Laberge-Nadeau et al, 2001; Sagberg, 2001; Violanti & Marshall, 1996; Redelmeier & Tibshirani, 1997) of an increased risk of collision when using cellular telephones in a motor vehicle. Studies have found that:
  - Risk of all accidents and of accidents with injuries increases by 38% for cell phone users, and heavy cell phone users are exposed to more than twice the risk as normal users, taking into account age, exposure to risk and driving habits (Laberge-Nadeau et al, 2001).
  - While some crashes during telephone use are expected based on exposure to driving alone, the actual number of crashes is about 72% higher than the expected number, as estimated by the method of induced exposure. Increased risk is likely the consequence of telephone use per se and is not attributable to differences in risk-related behavior between users and non-users of mobile telephones (Sagberg, 2001).
  - Talking more that 50 minutes per month on cellular phones in a vehicle was associated with an increase of more than five times the risk of traffic collision (Violanti and Marshall, 1996).
  - It cannot be concluded from the data that hand-held phones lead to higher risk than hands-free phones (e.g. Sagberg, 2001; Redelmeier & Tibshirani, 1997).

  Authors of these epidemiological studies have stated that their data revealed statistical associations, not causal relationships, and that their data do not necessarily indicate that talking on cellular phones while driving is inherently dangerous.

III. Other Laws, Policies and Recommendations from Around the World Against Cell Phone Use While Driving

- At least 42 countries restrict or prohibit use of cell phones and other wireless technology in motor vehicles, and several more are considering legislation. Israel, Portugal and Singapore prohibit all mobile phone use while driving. Drivers in France and United Kingdom may use cell phones but can be fined if involved in crash while using the phone. Drivers in United Kingdom and Germany can lose insurance coverage if involved in crash while talking on the phone. Countries that prohibit the use of hand-held mobile phones while driving include:

Australia	Hong Kong, China	Malaysia	South Korea
Austria	Hungary	Netherlands	Spain
Belgium	India (New Delhi)	Norway	Switzerland
Brazil	Ireland	Philippines	Taiwan
Chile	Isle of Man	Poland	Thailand
Czech Republic	Italy	Romania	Turkey
Denmark	Japan	Russia	Turkmenistan
Egypt	Jersey	Slovak Republic	Zimbabwe
Germany	Jordan	Slovenia	
Greece	Kenya	South Africa	

- **Transport Canada** – "Recommends against using cell phones while driving. It is distracting and increases the risk of collision. Your primary concern is the safe operation of the vehicle. To avoid collisions arising from the use of cell phones: Turn the phone off before you start driving. Let callers leave a message. If there are passengers in the vehicle, let one of them take or make a call. If you're expecting an important call, let someone else drive. If you have to make or receive a call, look for a safe opportunity to pull over and park." [Transport Canada Fact Sheet RS200-06 (TP2436E, December 2001)]

- **United Kingdom – The Highway Code** – "You MUST exercise proper control of your vehicle at all times. Never use a hand held mobile phone or microphone while driving. Using hands-free equipment is also likely to distract your attention from the road. It is far safer not to use any telephone while you are driving – find a safe place to stop first." (Department for Transport, Local Government and the Regions, 1999; Tunbridge, 2001).

  The Department of the Environment, Transport and the Regions in the United Kingdom recommends to employers that they not ask staff to "carry out two demanding tasks at the same time" – that employees should not be expected to use a phone while driving. "If you or your customers need to contact staff while they may be driving, ensure that you provide hands-free equipment with voicemail or call divert facilities and encourage your staff to stop regularly to check for messages and return calls."

- **National Safety Council** – "...a driver's first responsibility is the safe operation of the vehicle and that best practice is to not use electronic devices including cell phones while driving. When on the road, drivers shall concentrate on safe and defensive driving and not on making or receiving phone calls, delivery of faxes, using computers, navigation systems, or other distracting influences."

  National Safety Council "supports restrictions that prohibit all non-emergency use of electronic devices including cell phones by teenage drivers during their graduated licensing period."

  National Safety Council recommends that employers assess whether to allow employees to use such devices while driving, and if so, what sensible restrictions should be followed.

- **Royal Society for the Prevention of Accidents** (RoSPA, UK) – "No *driver* should use a mobile telephone or any similar piece of telecommunications equipment (whether hand-held or hands-free) while driving."

  RoSPA recommends that employers "incorporate this policy within their own rules governing company drivers. Vehicles are intended to transport their occupants and good to their destination(s) and any temptation to turn vehicles into 'mobile offices' should be resisted." RoSPA also recommends that employers "never 'require' staff to be available on mobile phones while they are driving" and to "consider carefully before fitting and requiring drivers to use 'hands-free' kits."

- **Swedish National Road Administration (SNRA)** – "...the results of some 80 studies show that using a mobile phone in a car while driving impairs driving performance significantly. This is because a driver's attention to traffic and traffic information is impaired and the control of the car becomes less precise and smooth when talking over a phone. Not only the motor activities needed for phoning disturb driving, but also the conversation in itself and, in particular, demanding communications impair both attention and manoeuvring performance significantly. Therefore, hands-free mobile phones will not solve the safety problem of phoning and driving. Analyses of accidents have shown that the impairment of driving while phoning leads to an increased risk of having an accident both for hand-held and hands-free phones. One important characteristic of a phone conversation in relation to most other in-car activities is that the pace and content of the phone conversation cannot be controlled as well by the driver. This makes a phone conversation more distracting than other equally demanding in-car activities that can be distributed in time and adapted to prevailing traffic and driving conditions." [Swedish National Road Administration (Svensson, and Patten, in press)]

  Some recent recommendations from the SNRA, as reported by Svensson, and Patten (in press), include the following:
  1. "...it is not justifiable to introduce legislation that only forbids the use of mobile phone systems that require the use of the driver's hands" because research clearly shows that conversation and its complexity are a greater burden on the driver.
  2. In the future study of fatal crashes, SNRA should look into the pre-crash phase for causes.
  3. "The Police and SNRA's in-depth study programme be given the authority and opportunity to more easily check whether a mobile phone has been used in a fatal accident."
  4. SNRA recommends that using a mobile phone while driving be defined in legal terms as an activity on par with the effects of tiredness or alcohol.
  5. Drivers should be informed of the effects of mobile phone use on driving performance.

- **General Recommendations in the Literature**
  - Governments should develop educational materials that cell phones should not be used while driving, to advise the public that hands-free phones are not risk-free, and to provide important safety tips for drivers to consider if they intend to continue their use of phones while driving (Harbluk et al, 2002). Driver-related safety measures should be encouraged, including training and education campaigns (LaBerge-Nadeau et all, 2001; National Safety Council, 2002; Joint State Government Commission, 2001).
  - Need for further research to determine need for regulating original equipment (Harbluk et al, 2002).
  - Need for further study into the nature and duration of typical car phone conversations (Parkes & Hooijmeijer, 2001).
  - Need for further study on issue of using hands-free phones while driving (Direct Line Insurance plc, 2002).
  - Use voice-activated hands-free cell phones in order to "minimize handling and keep both hands on the steering wheel" (LaBerge-Nadeau et all, 2001).
  - Develop vehicle-related safety devices for improved hazard warning and driver assistance (LaBerge-Nadeau et all, 2001; Hahn et al, 2000).
  - Government should contribute to consistent collection of reliable crash data nationally, which should include more detailed information regarding crashes associated with driver distraction (Joint State Government Commission, 2001; Jackman, 2000; Hahn et al, 2000).

IV. Activity at the State Level

As reported by the National Conference of State Legislatures, few states specifically regulate wireless phone use in motor vehicles. In particular (as of June 2003),

- New York prohibits drivers from talking on hand-held cell phones while driving.
- California requires that rental cars with cellular telephones must included written operating instructions for safe use of the phone.
- Florida and Illinois allow cell phone use in the car as long as sound to both ears of the driver is not impaired.
- Arizona, Illinois, Massachusetts, New Jersey, Rhode Island, and Tennessee have enacted legislation that prohibits the use of cell phones while operating a school bus.
- Massachusetts also requires that all drivers have at least one hand on the steering wheel at all times while using a cell phone.
- New Jersey enacted legislation in 2002 that prohibits the holder of a driver examination permit from using any interactive wireless device while operating a motor vehicle, with emergency use exceptions.
- Maine enacted legislation in 2003 that requires persons under 21 to obtain an instruction permit and receive education and training prior to obtaining a driver's license. This legislation also prohibits drivers with only an instruction permit from using a mobile telephone while driving.
- Legislation that would prohibit the use of hand-held cell phones while driving was passed by the California State Assembly on May 29, 2003, and has been passed to the State Senate for consideration.

In addition,

- Delaware, Louisiana, Virginia, New Jersey, New Mexico, and Pennsylvania have approved resolutions to study the risks associated with cell phones and driving.
- New Jersey passed a measure to provide for data collection and also prohibits drivers with learner's permits from using a cell phone while driving.
- Illinois allows the use of one-sided hands-free headsets with cell phones.
- Florida, Kentucky, Mississippi, Nevada, Oklahoma and Oregon are preventing local jurisdictions from enacting ordinances regarding cell phone use while driving.
- At least 16 states – California, Florida, Iowa, Maryland, Massachusetts, Montana, Michigan, Minnesota, Nebraska, New Jersey, New York, Oklahoma, Oregon, Pennsylvania, Tennessee, and Texas – collect information on crash report forms about cell phones and driver distractions.

V. Sample of Corporate Policies and Guidance

- **Direct Line Insurance plc** – "Putting safety first... Talking on the phone distracts your attention from the road and can lead to an accident. Never use a mobile phone. Even using a hands-free phone is distracting."

  Direct Line Insurance strongly believes that all employers have a responsibility to offer clear instructions to their staff not to use hand-held or hands-free phones when using company vehicles.

- **Farmers Insurance Group** – "While Farmers Insurance Group promotes the idea of drivers carrying a cell phone while in their car in case of emergencies, we don't recommend people use a phone while they are driving." (As quoted by the Auto Channel, 2000).

- **Praxair (Connecticut-based industrial gas maker)** - banned cell phone use while driving in 1999. (As noted by the Associated Press, 2001)

- **Wilkes Artis (Washington, D.C. -based law firm)** - "Our policy is that personnel are not to conduct business while suing cell phones, unless they pull over and stop or use a hands free device." (As quoted by the Associated Press, 2001)

VI. FMR Bulletin B-2 (Wireless Phone Use in U.S. Government Vehicles)

General Services Administration (2002). FMR Bulletin B-2: Motor Vehicle Management.

To Heads of Federal Agencies
Regarding Use of Hand-held Wireless Phones while Driving Motor Vehicles Owned or Leased by the Federal Government

Effective March 1, 2002

Recommended policy when issuing guidance on the use of wireless phones while driving motor vehicles owned or leased by the Federal Government
Federal agencies should:

6. Discourage the use of hand-held wireless phones by a driver while operating motor vehicles owned or leased by the Federal government.
7. Provide a portable hands-free accessory and/or hands-free car kit for government owned wireless phones.
8. Educate employees on driving safely while using hands-free wireless phones.

Attachment A - Cellular Phone Safe Driving Tips (Source: NHTSA: *An Investigation of the Safety Implications of Wireless Communications in Vehicles November 1997*)

- Safe driving is your first priority. Always buckle up, keep your hands on the wheel and your eyes on the road.
- Make sure that your phone is positioned where it is easy to see and easy to reach. Be familiar with the operation of your phone, so that you're comfortable using it on the road.
- Use a hands-free microphone while driving. Make sure your phone is dealer-installed to get the best possible sound.
- Use the speed-dialing feature to program in frequently called numbers. Then you can make a call by touching only two or three buttons. Most phones will store up to 99 numbers.
- When dialing manually without the speed-dialing feature, dial only when stopped. If you can't stop, or pull over, dial a few digits, then survey the traffic before completing the call. (Better yet, have a passenger dial.)
- Never take notes while driving. Pull off the road to jot something down; if it's a phone number, many mobile phones have an electronic scratchpad that allows you to key in a new number while having a conversation.
- Let your wireless network's voicemail pick up your calls when it's inconvenient or unsafe to answer the car phone. You can even use your voice mail to leave yourself reminders.
- Be a cellular Samaritan. Dialing 9-1-1 is a free call for cellular subscribers; use it to report crimes in progress or other potential life-threatening emergencies, accidents or drunk driving.

VII. Summary of Positions Against Restrictions on Use of Wireless Communication Devices While Driving

The information cited argues for sensible driving behavior relative to cellular phone use while driving and the use of hands-free phones (or speakerphones) if drivers feel compelled to engage in phone conversation while on the road. These organizations argue that while there is evidence that using a cellular phone while driving does pose risks to both the driver and other road users, however, the crash data are insufficient to necessitate an all out ban on phone use while driving. They encourage further research and educational campaigns to ensure responsible behavior on the road.

In particular, the National Conference of State Legislatures adopted a resolution in August 2001 that opposes restricting cell phone use while driving.

In addition, the National Association of Governors' Highway Safety Representatives (NAGHSR) opposes federal legislation that would penalize states for not restricting the use of cell phones or other electronic devices while driving. However, the NAGHSR discourages use of cell phones and other electronic devices while driving.

And related to the issue of crashes?

A July 2000 article for Drivers.com quoted Csaba Csere, editor in chief of *Car and Driver* magazine, as saying, "The safety experts tell us that half the accidents are caused by drunk driving, 70 percent are caused by aggressive drivers, 30 percent are caused by speeding. All of a sudden, you know, we've got more causes than accidents, and it's very, very difficult to decide exactly whet the causes are." Csere was further quoted as saying, "We currently have the safest driving in the United States we've ever had. That National Highway Traffic Safety Administration just released the preliminary statistics for 1999 that said that the traffic death rate was 1.5 deaths per 100 million vehicle miles traveled. That's one-third of what it was 30 years ago. So whatever problem we have with distracted drivers, it's can't be too bad." (Source: Drivers.com (2000). Distracted drivers: are car phones guilty? Online at www.drivers.com)

However..."The crash death rate dropped or remained at the same level throughout the 1990s in response to a number of factors. Motor vehicles are now safer because of design improvements; air bags and seat belts provide greater crash protection; the driving population is more mature; and most states have enacted laws to restrict young drivers, screen elderly drivers, and deter drunk driving. Drivers have contributed to the reduction in fatalities by demanding vehicles with good safety ratings." (Source: Gastel, R. (2002). Auto Safety and Crashworthiness. In *III Insurance Issues Update* Insurance Information Institute. Online at www.nexis.com/research/pnews)

Finally, from the Harvard Center for Risk Analysis

The Harvard Center for Risk Analysis (Lissy, Cohen, Park, and Graham, 2000) reported that: "The weight of the scientific evidence to date suggests that use of a cellular phone while driving does create safety risks for the driver and his/her passengers as well as other road users. The magnitude of these risks is uncertain but appears to be relatively low in probability compared to other risks in daily life. It is not clear whether hands-free cellular phone designs are significantly safer than hand-held designs, since it may be that conversation per se rather than dialing/handling is responsible for most of

the attributable risk due to cellular phone use while driving." The authors concluded that "it may be premature to enact substantial restrictions at this time."

In an update of the analysis above, Cohen and Graham (2003) note that "Although the CE ratios for other injury prevention programs are also highly uncertain, they suggest that there are actions that could betaken that would save lives lost in motor vehicle crashes at a lower economic cost than a ban on cell phones. This finding is consistent with the conclusion reached by Redelmeier and Weinstein that '*Regulations restricting cellular telephone usage while driving are less cost-effective for society than other safety measures.*' The fact that the net benefits of the ban are close to zero and yet there are other more efficient motor vehicle safety measures that are not yet implemented indicates that as a society, we are under investing in motor vehicle safety."

VIII. NTSB Safety Recommendations To the National Highway Traffic Safety Administration (June 3, 2003):

1. Develop in conjunction with The Advertising Council, Inc., a media campaign stressing the dangers associated with distracted driving.
2. Develop in conjunction with the American Driver and Traffic Safety Education Association a module for driver education curriculums that emphasizes the risks of engaging in distracting behavior.
3. Determine the magnitude and impact driver-controlled, in-vehicle distractions, including the use of interactive wireless communication devices on highway safety and report your findings to the United States Congress and the States.

NTSB Safety Recommendations to the 49 States that do not have legislation prohibiting holders of learner's permits and intermediate licenses from using interactive wireless communication devices:

4. Enact legislation to prohibit holders of learner's permits and intermediate licenses from using interactive wireless communication devices while driving.

NTSB Safety Recommendations to the 34 States that do not have driver distraction codes on their traffic accident investigation forms:

5. Add driver distraction codes, including codes for interactive wireless communication device use, to your traffic accident investigation forms.

NTSB Safety Recommendations to the American Driver and Traffic Safety Education Association:

6. Develop in conjunction with the National Highway Traffic Safety Administration a module for driver education curriculums that emphasizes the risks of engaging in distracting behavior.

NTSB Safety Recommendations to the Advertising Council, Inc.:

7. Develop in conjunction with the National Highway Traffic Safety Administration a media campaign stressing the dangers associated with distracted driving.

Appendix: Detailed Summary -Using Wireless Communication Devices While Driving

Note: The following citations are listed in descending chronological order, and alphabetically by first author within each publication year.

Research		
Svensson, O., and Patten, C. (in press). Information Technology in the Car: Mobile Phones and Traffic Safety A Review of Contemporary Research. (Swedish National Road Administration)	Reviewed research on the effects of using a mobile phone when driving. Includes seven (7) recommendations.	▪ Results from some 80 studies show that using a mobile phone in a car while driving impairs driving performance significantly. This is because a driver's attention to traffic and traffic information is impaired and the control of the car becomes less precise and smooth when talking over a phone. Not only the motor activities needed for phoning disturb driving, but also the conversation in itself and, in particular, demanding communications impair both attention and manoeuvring performance significantly. ▪ Therefore, hands-free mobile phones will not solve the safety problem of phoning and driving. ▪ Analyses of accidents have shown that the impairment of driving while phoning leads to an increased risk of having an accident both for hand-held and hands-free phones. ▪ Recommendations: 1. "it is not justifiable to introduce legislation that only forbids the use of mobile phone systems that require the use of the driver's hands" because research clearly shows that conversation and its complexity are a greater burden on the driver. 2. In the future study of fatal crashes, SNRA should look into the pre-crash phase for causes. 3. "The Police and SNRA's in-depth study programme be given the authority and opportunity to more easily check whether a mobile phone has been used in a fatal accident." 4. SNRA recommends that using a mobile phone while driving be defined in legal terms as an activity on par with the effects of tiredness or alcohol. 5. Drivers should be informed of the effects of mobile phone use on driving performance. 6. Position equipment such as DVD, TV and other visual information be positioned where the driver cannot be visually distracted while driving. 7. Further support for the development of intelligent driver-support systems.

Strayer, D., and Drews, F. (under review). Effects of cell phone conversations on younger and older drivers. Accessed on June 19, 2003 from: http://www.psych.utah.edu/AppliedCognitionLab/Aging.pdf	This study examined the effects of hands-free cell phone conversations on simulated driving performance for older and younger drivers. Participants then drove four ten-mile sections on a multi-lane highway. The participant's task was to follow a pace car that was driving in the right-hand lane of the highway. When the participant stepped on the brake pedal in response to the braking pace car, the pace car released its brake and accelerated to normal highway speed. The dual-task condition involved the participant and the research assistant discussing topics that were identified in the questionnaire as being of interest to the participant Participants used a hands-free cell phone and the call was initiated before participants began the dual-task scenarios. Therefore, any dual-task interference that they observed must have been due to the cell phone conversation itself, because there was no manual manipulation of the cell phone during the dual-task portions of the study. Context ▪ Driving simulator Independent variables ▪ Age group (18-25 yrs vs. 65-74 yrs) ▪ Single vs. Dual task conditions (no conversation vs. conversation) Dependent variables ▪ Brake onset time ▪ Following distance ▪ Speed ▪ Half-recovery time (time to recover 50% of speed lost during braking)	▪ We found that driving performance of both younger and older adults was impaired by cell phone conversations. ▪ Compared to single-task conditions, cell-phone drivers' reactions were 18% slower, their following distance was 12% greater, and they took 17% longer to recover the speed that was lost following braking. ▪ **These cell-phone induced impairments were equivalent for younger and older adults, suggesting that older adults do not suffer a significantly greater penalty for talking on a cell phone while driving than their younger counterparts.** ▪ Interestingly, the net effect of having younger drivers converse on a cell phone was to make their braking reactions equivalent to those of older drivers who were not using a cell phone. ▪ **"In sum, our research found that the driving performance of both younger and older adults is significantly impaired when they are conversing on a hands-free cell-phone. These dual-task impairments were equivalent in magnitude for younger and older adults."** ▪ **Note:** This report is still under peer review and therefore should be considered with caution.

Glassbrenner, D. (in press). Cell Phone Use on the Roads in 2002 (Technical Report DOT HS 809 580). Washington, DC: NHTSA.	NHTSA 2002 NOPUS results relevant to the cell phone issue.	▪ In 2002, the portion of drivers estimated to be using a hand-held phone at any given time during daylight hours increased to 4%. ▪ An estimated additional 2% use hands-free equipment. ▪ **In total, at least 6% of drivers are using some kind of wireless phone at any given time** ▪ Significant increase in urban areas from 2000
Lesch, M., and Hancock, P. (in press). Driving performance during concurrent cell-phone use: are drivers aware of their performance decrements? *Accident Analysis and Prevention.*	This study examined the extent to which different driver groups are aware of their associated performance decrements. Subjects' confidence in dealing with distracters while driving and their ratings of task performance and demand were compared with their actual driving performance in the presence of a cell-phone task. Context ▪ Test track Independent variables ▪ Age group (25-36 yrs vs. 55-65 yrs) ▪ Gender Dependent variables ▪ Confidence ratings ▪ Brake response time ▪ Stopping time ▪ Stopping distance ▪ Stopping accuracy	▪ For males, as confidence ratings increased, the effect of the cell phone task on BRT and stopping distance was diminished. ▪ This trend was also true for older males, despite a general decrease in confidence with age. ▪ For older females, as confidence increased, performance decreased ▪ When drivers were matched in terms of confidence level, brake responses of older females were slowed to a much greater extent (0.38 s) than were brake responses of any other group (0.10 s for younger males and females and 0.07 s for older males). ▪ Females rated the driving task as less demanding than males, despite the fact that their performance was more greatly affected by distraction. ▪ **"These results suggest that many drivers may not be aware of their decreased performance while using cell-phones and that it may be particularly important to target educational campaigns on driver distraction towards female drivers for whom there tended to be a greater discrepancy between driver perceptions and actual performance."** ▪ **CAUTION:** The authors note that because of the relatively small number of participants (36) the results should be taken with caution. There was also some acknowledgement of differences in cell phone ownership and how this may or may not have affected the data.

Patten, C., Kircher, A., Östlund, J., and Nilsson, L. (in press). Using mobile telephones: cognitive workload and attention resource allocation. *Accident Analysis and Prevention.*	Forty participants completed an on-road driving course characterized by a low level of road complexity in the form of vehicle handling and information processing. A peripheral detection task (PDT) was employed to gauge mental workload. They compared effects of conversation type (simple versus complex) and telephone mode (hands-free versus handheld) to baseline conditions. The simple conversation was repeating single digits, whereas the complex conversation involved adding another digit to the second of a pair of presented digits. Context ▪ On-road driving Independent variables ▪ Conversation type (simple vs. complex) ▪ Phone architecture (hands-free vs. hand-held) ▪ Baseline condition (no phone) Dependent variables ▪ Peripheral detection task reaction times ▪ Vehicle speed	▪ **Reaction times increased significantly when conversing but no benefit of hands-free units over handheld units on rural roads/motorways were found.** ▪ The reaction times for the simple and complex conversations were both significantly longer than the no-conversation baseline condition, and the complex conversations resulted in significantly longer reaction times than the simple conversation. ▪ The content of the conversation was far more important for driving and driver distraction than the type of telephone when driving on a motorway or similar type of road. The more difficult and complex the conversation, the greater the possible negative effect on driver distraction. ▪ Whereas phone architecture had no effect on peripheral detection performance, it did have an effect on mean speed. Mean speed for hand-held condition was slower than the hands-free and baseline conditions. The authors note that further research is required to explain this effect. ▪ CONCLUSIONS: "When driving on motorways and larger rural roads, the mobile telephone modality would appear to be of little consequence when solely considering the conversational aspect of telephoning. Far more important for driver distraction, in regard to mobile telephones, is the content and the complexity of the conversation per se. Note that even simple conversations may distract the driver, however, the more difficult and complex the conversation, the greater the negative affect on the drivers' ability to allocate or direct their attention."

Cohen, J.T., and Graham, J.D. (2003). A revised economic analysis of restrictions on the use of cell phones while driving. *Risk Analysis, 1*, 5-17.	Revised estimate of previous Harvard study (Lissy et al., 2000). They updated estimated number of cell phones users, revised the assumed amount of time spent on the phone while driving based on 2000 NOPUS results, and increased assumed consumer surplus value of the calls made while driving from $25 billion to $43 billion annually.	▪ They conclude a best estimate of zero for the net benefit of cell phone use while driving. ▪ **"Although the CE ratios for other injury prevention programs are also highly uncertain, they suggest that there are actions that could betaken that would save lives lost in motor vehicle crashes at a lower economic cost than a ban on cell phones. This finding is consistent with the conclusion reached by Redelmeier and Weinstein that '*Regulations restricting cellular telephone usage while driving are less cost-effective for society than other safety measures.*' The fact that the net benefits of the ban are close to zero and yet there are other more efficient motor vehicle safety measures that are not yet implemented indicates that as a society, we are under investing in motor vehicle safety."** ▪ Note: the authors acknowledge that both the "benefit cost estimate and the CE ratio are very uncertain (net benefits ranging from a loss of $142 billion annually to a gain of $175 billion annually, and CE ratio ranging from as high as $13 million per QALY saved to negative values indicating savings of both resources and QALYs)."

Consiglio, W., Driscoll, P., Witte, M., & Berg, W. (2003). Effect of cellular telephone conversations and other potential interference on reaction time in a braking response. *Accident Analysis and Prevention, 35,* 495-500.	Study compared the effects of cell phone conversations and passenger conversations on driver braking response time. Context ▪ Lab response time part-task simulation Independent Variables ▪ Conversation with hands-free, hand-held, passengers vs. no-conversation Dependent Variables ▪ Braking response time	▪ A simple reaction time experiment similar to Irwin, Fitzgerald, and Berg (2000) showed that **braking responses to a brake-light signal were significantly longer when engaged in conversations (passenger, hand-held, and hands-free headset) than a control condition (no conversation or task) and a radio listening condition.** ▪ The conversations were scripted questions intended to simulate naturalistic 'getting to know you' type questions. The passenger conversation condition resulted in significantly longer reaction times than the control condition, but the phone-based conversation conditions (hand-held and hands-free) resulted in even longer reaction times. Subjects were instructed not to look at the passenger during their conversation. ▪ There was no difference in reaction times between the hand-held and hands-free conditions. ▪ **LIMITATIONS**: This was a lab-based study where subjects simply made a braking foot pedal response to the onset of a red light, the sole focus of attention. There was no attempt to simulate any other aspect of the driving task, including steering (or the presence of a steering wheel).

Glaze, A.L., and Ellis, J.M. (2003). Pilot Study of Distracted Drivers. Richmond, VA: Virginia Commonwealth University, Center for Public Policy.

A statewide pilot study to test a standard list of distracted driving behaviors used in crash investigations was conducted for the Virginia Department of Motor Vehicles by Virginia Commonwealth University in 2002 to investigate driver distraction. The study involved completion of a supplemental survey for each distraction crash; the surveys were submitted for review as a part of this study.

All seven VA state police divisions, four selected counties, and 14 independent cities were requested to participate in the pilot study of distracted drivers. All localities participated in the study with varying degrees of success. State troopers submitted the majority of the surveys received (75%). All counties in Virginia were represented in the pilot study data with the exception of Alleghany County, Cumberland County, and Lunenburg County.

The survey contained questions regarding the MAIN driver distraction and did not address other additional contributing factors.

- Of the crashes reported, 63% occurred in rural areas.
- Surveys were received on 2,792 crash scenes that involved 4,494 drivers including 2,822 distracted drivers.
- Half of the crashes that were reported involved only a single driver and of all the crashes reported, 98% involved a single distracted driver.
- Troopers and officers wrote over 1,400 open-ended responses to indicate the MAIN distraction in each crash. Approximately 250 of the open-ended responses were coded into existing categories. The remaining open-ended responses were classified into new categories.
- Overall, the results indicated that 13% of traffic crashes in Virginia are due to driver distraction. Various distractions inside the vehicle accounted for 62% of the distractions reported, distractions outside the vehicle accounted for 35% of the distractions reported, and 3% of the distractions were unknown or not marked on the survey form.
- Driver fatigue or a driver that was asleep accounted for 17% of the specific distractions reported. Looking at crashes, other roadside incidents, traffic, or other vehicles accounted for 13% of the distractions reported. Looking at scenery or landmarks accounted for 10% of the distractions reported. A distraction caused by passengers or children in the vehicle accounted for 9% of the distractions reported. No other cause accounted for more than 7% of the distractions reported.
- Cell phones accounted for about 5% of the reported distractions associated with these distraction crashes.

General recommendations from the Virginia Pilot Study:

- *Collect information at the driver level rather than the crash level.*
- *Reconsider and standardize the framework and terminology used to categorize distractions and driver inattention*
- *Conduct focus groups and training for troopers and officers regarding collection of distraction and inattention-related crash information.*

Continued –

Glaze, A.L., and Ellis, J.M. (2003). Pilot Study of Distracted Drivers. Richmond, VA: Virginia Commonwealth University, Center for Public Policy.

Notes:

- Only police-reportable crashes were included in the survey. 75% of data came from State Troopers, and only 24% of data came from city or county police departments. In addition while the survey was statewide, law enforcement agencies responded with varying levels of success.
- One main distraction was listed as cause of the crash. Phone use was only cited in the survey if identified as main cause of the crash, and information was not generally collected regarding whether phones were otherwise present or in use by involved parties (or if phone was an additional contributing factor).
- 63% of the reported crashes occurred in rural areas. The report notes that implementation problems may have contributed to the low number if urban crashes because the locations of the agencies reporting implementation difficulties were urban.
    - **Recall that data from North Carolina show cell phone crashes to be mostly rear-end crashes and that more than two-thirds of cell phone crashes occur on local streets.**

Greenberg, J., Tijerina, L., Curry, R., Artz, B., Cathey, L., Grant, P., Kochhar, P., Kozak, K., and Blommer M. (2003). Evaluation of driver distraction using an event detection paradigm. In *Proceedings of the TRB 2003 Annual Meeting CD-ROM*. Washington, DC: National Academies of Science, Transportation Research Board.	The effects of eight in-vehicle tasks (hand-held and hands-free versions of phone dialing, voicemail retrieval and incoming calls were compared to manual radio tuning and climate control adjustment) on driver distraction were measured in Ford's VIRTTEX simulator. During the drive the participants were asked to respond to an event detection task where the vehicle in front of the lead vehicle swerved to the left or right. Similar events occurred to the rear of the vehicle, requiring participants to monitor the forward and rear views of the vehicle. Context ▪ High fidelity motion-base driving simulator Independent variables ▪ Eight in-vehicle tasks Dependent variables ▪ Proportion of events detected	▪ **Hands-free and hand-held dialing resulted in significantly more missed front events than the control condition, as did the hands-free incoming call and hand-held voicemail retrieval.** ▪ Curiously, incoming hand-held calls corresponded with very few missed front events (same control). This effect was dramatically pronounced for the teen drivers who missed 54% of the front events when dialing with the hand-held phone. ▪ Overall, the number of missed rear events was much greater than the front events, but the hand-held dialing, hand-held incoming calls, hands-free incoming calls, and hvac adjustments resulted in significantly more missed rear events than the control condition. ▪ This study has additional value because it included a teenage driver condition (16-18 yrs). **Compared with the adults, the teens were found to choose unsafe following distances, have poor vehicle control skills and to be more prone to distraction from hand-held phone tasks.** ▪ **CONCERN**: the rear event detection task probably artificially increased the amount of mirror checking, which also may have affected the front event detection task. There were some curious patterns in the data that invites caution when interpreting the results of this study. For example, the hand-held incoming calls task actually resulted in fewer missed front events than the control (no task) condition. However, the authors report that an analysis of the video data shows that some front detection events were missed despite forward visual fixations, thus supporting the inattention blindness phenomenon discussed in Strayer et al. (2003).

Hancock, P., Lesch, M., and Simmons, L. (2003). The distraction effects of phone use during a crucial driving maneuver. *Accident Analysis and Prevention, 35*, 501-514.	Hancock et al. performed a test-track study on the *effects of phone use* while encountering a critical event while driving. They compared younger (25-36 yrs) and older drivers (55-65 yrs) and gender for brake response behavior when using a phone in coincidence with a critical driving maneuver. Subjects were required to maintain a consistent speed throughout a test-track lap and to brake to a stop as quickly as possible before the intersection line in one third of the trials. The trials included a number memorization and recall loading task, a cell phone task on one third of the trials (answering with digit recognition task on phone display – no conversation), and the stopping task on one third of the trials. Context ▪ Test track Independent variables ▪ Age group (25-36 yrs vs. 55-65 yrs) ▪ Gender Dependent variables ▪ Brake response time ▪ Stopping time ▪ Stopping distance ▪ Stopping accuracy	▪ **Without the distraction, the overall compliance rate to stopping task was very close to 95%. However, when the phone distraction task was added, compliance rate dropped to 80%, a highly significant 15% reduction in stopping response.** ▪ Older subjects had a lower compliance rate with the distractor task present. ▪ There was also an interaction with the gender of the driver. Female drivers are more compliant than their male peers in the baseline (non-distraction) situation. However, with the distractive phone task, female drivers were complied less than their male counterparts. ▪ BRT was slower in the presence of the distraction as compared to its absence. However, like the measure of compliance, there was an interaction with the age of the individual. ▪ Consistent with the compliance findings, older drivers were at a greater disadvantage in the presence of the distractive phone task compared to their younger counterparts who were little affected by such distraction. ▪ **Drivers exhibited a 24% decrease in safety margin stopping distance when driving with the distractor task.** ▪ Study postulates that use of cell phones would increase the number of rear-end collisions by forcing drivers behind the cell phone user to react faster, however this would be difficult to determine because, according to Dr. Hancock, "rear end is the no. 1 form of accident, and it has a lot of different causes."

Kircher, A., Tornros, J., Vogel, K., Nilsson, L., Bolling, A., Patten, C., Malmstrom, T., and Ceci, R. (2003). Mobile telephone simulator study. VTI/Swedish National Board and Transport Research Institute.	Four experiments investigating the effects of mobile phones (hand-held and hands-free), DVD players, and SMS on simulated driving performance in the VTI driving simulator in Sweden. The different distractions were tested separately, resulting in four experiments (with the fourth being a dialing study). The DVD and SMS studies had small sample sizes (low n's) and are to be interpreted with caution. This summary focuses on the phone studies. Context ▪ Driving Simulator Independent Variables ▪ Mobile phone (hand-held vs. hands-free) ▪ DVDs ▪ SMS ▪ Traffic environment (rural, urban simple, urban medium, urban complex) Dependent Variables ▪ Speed and speed variance ▪ Peripheral detection task (PDT) ▪ Lateral position variance ▪ Traffic event (stop lights, bus, cyclist)	▪ For both phone conditions, speed was reduced while talking on the phone. This could be a compensatory strategy to deal with additional workload resulting from conversations. ▪ Across all four traffic environments, hand-held phone use led to greater slow-down effect than hands-free. ▪ The speed variability results were difficult to interpret because speed variability was smaller for hand-held phones in some traffic conditions and smaller for hands-free phones in other conditions. ▪ The PDT performance was reduced significantly (slower reaction time and higher miss rates) for both hand-held and hands-free mode in all traffic environments. ▪ For the rural environment, the lateral position variance decreased as an effect of phone use for both hands-free and hand-held phones. ▪ For the dialling study, the results for hand-held and hands-free phones were similarly negative in terms of PDT performance. Speed reduction was greater for the hand-held condition, though.

Matthews, R., Legg, S., and Charlton, S. (2003). The effect of cell phone type on drivers' subjective workload during concurrent driving and conversing. *Accident Analysis and Prevention, 35,* 451-457.	Study that compared the subjective workload for hand-held, speaker-based hands-free, and headset-based hands-free phone architectures during real-world driving. Subjects drove a familiar route during non-rush hour traffic in a clear daytime rural setting. Subjects completed trials in the modified rhyming task (MRT) where they repeated back a list of aurally presented words that had alternative interpretations (e.g., tip could be repeated as lip, sip, dip, rip or hip). They completed the NASA-TLX subjective workload index after each set of MRT trials. Context ▪ On-road driving study Independent Variables ▪ Hand-held, speaker-based hands-free, and headset-based hands-free phones. Dependent Variables ▪ NASA-TLX subjective workload ratings.	▪ The authors found that the headset hands-free phone was "associated with the lowest total subjective workload, followed by the hand-held phone, while the hands-free speaker phone was associated with the highest total subjective workload." ▪ All phone conditions resulted in significantly higher workload ratings than the no-phone control condition. Phone intelligibility and frustration were significant sources of variance. ▪ **CONCLUDED** that "drivers using a [hands-free] phone will be rewarded with the benefits of hands free and high intelligibility, making for safer driving while conversing." ▪ **LIMITATION**: this is strictly a subjective workload study; no driving performance measures were collected.
Royal, D. (2003). *National Survey of Distracted and Drowsy Driving Attitudes and Behaviors: 2002, Volume I – Findings Report* (NHTSA Research Note, DOT HS 809 566). The Gallup Organization.	The data come from two surveys undertaken by National Highway Traffic Safety Administration (NHTSA) to better understand drivers' behaviors and attitudes regarding speeding, unsafe driving, distracted (including cell phone use) and drowsy driving, each conducted among nationally representative samples of drivers during the Spring of 2002. Interviews were conducted with a total of 4,010 drivers in the U.S.	▪ A reported mean of 4.5 minutes per call while driving ▪ 58% report they rarely or never make outgoing calls ▪ 18% report they make calls on 25% of trips per week (5-6 trips per week) ▪ 10% report they make calls on 50% of trips (11 trips per week) ▪ 13% report they make calls on 75% or more trips (20-30 trips per week) ▪ 88% of all drivers support increased public awareness of the risks of wireless phone use while driving. ▪ 57% of all drivers support a ban on all wireless phone use while a car is moving (except for 911 calls). About one-fourth of drivers who use cell phones support such a ban compared to 69% of drivers who do not use cell phones. ▪ 62% support increased fines for traffic violations involving cell phone use. About 40% of drivers who use cell phones support such fines compared to about 70% of drivers who do not use cell phones. ▪ **NOTE: This data should be interpreted with caution.**

Strayer, D., Drews, F., & Johnston, W. (2003). Cell phone-induced failures of visual attention during simulated driving. *Journal of Experimental Psychology: Applied. 9(1),* 23-32.	Study to investigate potential for inattention blindness as a result of cell phone conversations while driving a driving simulator. Context ▪ Driving simulator Independent Variables ▪ Naturalistic casual conversation vs. no conversation Dependent Variables ▪ Recognition memory for targets on billboards ▪ Eye-tracking data	▪ In a series of four experiments, the authors replicated findings from Strayer and Johnston (2001) that conversations impaired driver reactions to lead vehicle braking in a driving simulation context. ▪ **They also demonstrated that explicit recall of billboard information is reduced when engaged in naturalistic casual conversation (hands-free).** ▪ In addition, **eye-tracking data showed that this recall is diminished regardless of whether or not the target information was fixated or not.** In other words, it isn't only the narrowing of visual attention that is responsible for reduced recognition and signal detection, but the interference of the conversation task on the processing of the fixated information (look but did not see phenomenon). ▪ In addition, they showed that hands-free conversations impaired implicit perceptual memory for items presented at fixation. ▪ Together, this series of experiments provides compelling evidence that naturalistic casual conversation while driving significantly interferes with attention to external visual inputs. ▪ **NOTABLE**: Previous research has shown that visual attention narrows with cell phone use (Recarte & Nunes, 2000; Harbluk, Noy, & Eizenman, 2002), but this study also demonstrates that in addition to the reduction of scanning behavior, people experience inattention-blindness for the objects that they do attend to. In other words, cell phone conversations result in increased "looked-but-did-not-see" type phenomena.
Stutts, J.C., Hunter, W.W., and Huang, H.F. (2003). Cell Phone Use While Driving: Results of a Statewide Survey. In *Proceedings of the TRB 2003 Annual Meeting CD-ROM.* Washington, DC: National Academies of Science, Transportation Research Board.	A statewide telephone survey of licensed North Carolina drivers, ages 18 and older, was conducted during the summer of 2002. The purpose of the survey was to provide current information on cell phone use while driving and to learn drivers' perceptions of cell phone safety and their opinions regarding regulation. The survey targeted 500 users and 150 non-users of cell phones.	▪ Estimated that 58.8 percent of the state's licensed drivers have used a cell phone while driving. ▪ Use levels were highest among younger drivers. ▪ 1 in 4 users reported having a hands-free device, although they did not always use the device. ▪ Users generally perceived talking on cell phones while driving to be less distracting and less of a safety concern than did non-users. ▪ Users were also less likely to support legislation that would prohibit anything other than use of a hand-held phone, and less likely to support stricter penalties for cell phone users involved in crashes.

Wilson, J., Fang, M., Wiggins, S, and Cooper, P. (2003). Collision and violation involvement of drivers who use cellular telephones. Traffic Injury Prevention, 4, 45-52.	Observational study designed to "measure and understand the relationship between the use of cellular telephones while driving and collision risk." Cell phone users [hand-held] were compared to non-users for a variety of "indices of driving risk" including: at-fault collisions (as identified by insurance claim records), traffic violations associated with inattention, and contributing factors to crashes. After the observation stage, the license numbers were used to retrieve driving records for the observed phone users and non-users. Appropriate screening and matching of vehicle registrations and observed drivers was undertaken to result in a sample of 3,869 cases with matched driving records (for the preceding 5 years).	▪ **"Drivers that have been observed using cell phones while driving have a higher risk of an at-fault collision than do drivers observed not using cell phones."** ▪ The risk was found to be higher for females than males. ▪ The relationship between cell phone use and violations such as red light running, failure to yield right-of-way, disobeying traffic signals, and improper turning is unclear. ▪ Cell phone users (while driving) take more risks than non-users (or low-frequency users), including more violations for speeding, impaired driving, seat belt nonuse, aggressive driving, and nonmoving violations. ▪ Analysis of police reported crashes indicated that cell phone users may have been over represented in rear-end collisions, relative to other collision type; "however, this finding is very preliminary due to the small number of cases and the lack of adjustment for sample differences." ▪ **Results indicated that the increase in risk associated with cell phone use while driving was1.16 for all drivers; 1.12 for males; and 1.31 for females.** ▪ **NOTE:** It is likely that there were actual users among the non-user group that were not observed using a cell phone while driving during the observational phase. This underestimation of users is a flaw in the study (acknowledged), but it does not completely invalidate the findings.

Wisconsin State Patrol. (2003). *Cell Phone Use in Motor Vehicle Crashes (Data from Wisconsin Motor Vehicle Accident Report Form MV4000, May – October 2002).* Wisconsin Department of Transportation, Division of State Patrol, Division of Motor Vehicles, and Bureau of Transportation Safety.

"The Wisconsin State Patrol (State Patrol), in conjunction with the Department of Transportation's Division of Motor Vehicles (DMV) and Bureau of Transportation Safety (BOTS) and at the request of Wisconsin State Representative Jerry Petrowski, surveyed a limited number of crashes in Wisconsin in an attempt to determine if there was any relation between the use of cell phones by drivers involved in crashes and the crashes themselves."

"The survey conducted by the Wisconsin State Patrol for six months during the summer and autumn of 2002 [May 1, 2002, and October 31, 2002] focused on the use of cell phones during motor vehicle crashes. Information was obtained at the crash site by noting motorist cell phone use by the drivers involved in the crash. The data collected was recorded as driver "self-reporting" responses and categorized on the *Wisconsin Motor Vehicle Accident Report* form known as the **"MV4000"** in the data fields titled "Special Study"."

"The State Patrol completed 2,691 MV4000 reports (i.e. 2,691 crashes) during the six-month survey time period. Over 96% of the completed reports included the required cell phone use information."

The authors noted that "Within the State Patrol's 4% of the statewide crashes that occurred between May and October of 2002, the *State Patrol's survey does not indicate a definable relationship between cell phone use and motor vehicle crashes.* The total survey numbers reporting cell phone use are not significant enough to make a determination that cell phone use is a *major* contributing factor in motor vehicle crashes, or if hands-free cell phones are safer to use than hand-held cell phones."

The authors concluded that "While the Department of Transportation and Wisconsin State Patrol survey did not provide a definitive conclusion on the relationship of cell phone use to motor vehicle crashes, it did provide a first step in a review of the issue. The lack of striking data that points unquestionably at cell phone use as the cause of crashes leads us to believe that there are many more variables that must be discussed before any decisions are made on how best to either limit motorist cell phone use or enhance safety for cell phone users. The data indicates that cell phone use is indeed a contributing factor to motor vehicle crashes, as are other reasons for "inattentive" or "distracted" driving, and that, in itself, is an important finding."

They also stated, "...taking into consideration the limited scope of the survey and after reviewing the studies conducted by other agencies and institutions on cell phone use, it is clear that there are many variables involved and alternative approaches for alleviating the problem. The Wisconsin legislature, law enforcement community and safety professionals must take this "first step" survey data and use it to encourage further consideration of alternative ways to ensure the safe, and perhaps limited, use of cell phones on Wisconsin's highways."

Some limitations of the study:

- "The results of this survey are limited by the detail of the queries, the number of the crashes queried, and the types of highways on which the crashes occurred, as well as the fact that just one law enforcement agency, the Wisconsin State Patrol, conducted the survey. Those limitations do not diminish the reliability of importance of the survey data, but they do caution the overall applicability of the results."
- "It is important to note that the results of the survey may have

Continued –

Wisconsin State Patrol. (2003). *Cell Phone Use in Motor Vehicle Crashes (Data from Wisconsin Motor Vehicle Accident Report Form MV4000, May – October 2002).* Wisconsin Department of Transportation, Division of State Patrol, Division of Motor Vehicles, and Bureau of Transportation Safety.

lower total numbers for cell phone use than previously expected. That may be partially due to the fact that the survey relied on a "self-reporting" procedure that gave the motorists at the crash site the responsibility to answer questions posed by the State Patrol officer about her/his cell phone use rather than relying on the officer's own observations. Similar to questions about seat belt use, the answers to questions about cell phone use rely on the honesty and memory of the motorists involved."

Burns, P.C., Parkes, A., Burton, S., Smith, R., and Burch, D. (2002). How dangerous is driving with a mobile telephone? Benchmarking the impairment to alcohol. TRL Report TRL547, Crowthorne, UK.	This study aimed to quantify the impairment from hands-free and handheld phone conversations in relation to the decline in driving performance caused by alcohol impairment. Twenty healthy experienced drivers were tested in the TRL Driving Simulator on two separate occasions. The drivers were aged 21 to 45 years (mean = 32, SD = 7.8) and were split evenly by gender. Before starting the test drive, participants consumed a drink, which either contained alcohol or a similar looking and tasting placebo drink. The quantity of alcohol was determined from the participant's age and body mass using the adjusted Widmark Formula (the UK legal alcohol limit 80mg / 100ml). There were four conditions on the test route: 1) motorway with moderate traffic, 2) car following, 3) curving road 4) and dual carriageway with traffic lights. During each condition the drivers answered a standard set of questions and conversed with the experimenter over a mobile phone. Context ▪ Driving simulator Independent Variables ▪ Normal driving, alcohol impaired driving, and driving while talking on Hands-free or Hand-held phone. Dependent Variables ▪ Driving performance measures such as lane position variability and speed ▪ Reaction time to traffic event ▪ Subjective workload ratings ▪ Conversation task performance	▪ Results showed a tendency for drivers to slow down when talking on handheld or hands-free phones, even when they were specifically instructed to maintain a set speed. ▪ Alcohol tended to have the opposite effect such that drivers drove faster than normal when under the influence of alcohol. ▪ The standard deviation of speed and speed error measures indicated that drivers' had significantly poorer speed control when using the handheld phone than during the other three conditions. ▪ When drivers were under the influence of alcohol, they were significantly worse at driving smoothly. ▪ Reaction times were significantly slower for drivers using phones in comparison to when they had alcohol. ▪ Drivers missed significantly more warnings when they were using a phone. ▪ Drivers found driving while using a hand-held phone to be the most difficult. The easiest task was the normal driving without any phone conversations. Hands-free was easier than handheld. ▪ **Drivers found it easier to drive drunk than to drive while using a phone, even when it was hands-free.** ▪ Hands-free phones were worse than handheld phones for the repeating sentence tasks (time and number of pauses). Hand-held phones were worse than hands-free phones for the verbal puzzles (errors) and monologues (number of pauses). ▪ **"Driving while intoxicated is clearly dangerous and this study further confirmed that alcohol impairs driving performance. However, this study also found that certain aspects of driving performance are impaired more by using a phone than by having a blood alcohol level at the legal limit (80mg/ 100ml)."**

California Highway Patrol (2002). Driver distractions and inattention data summary. Sacramento, California: Assembly Bill 770, Chapter 710.

California Highway Patrol (2002). *Provisional 2001 Statewide Collision Totals and Selected Inattentions.* Sacramento, California: CHP Office of Public Affairs.

Department of California Highway Patrol (CHP) recently completed a special study of crash data from April 1, 2001, to June 30, 2002.

A 2001 state law requires that the CHP note distractions that may have contributed to a crash. California crash statistics were examined for cell phone involvement for the six-month period between January 1, 2000 and June 30, 2000.

- CHP reported the following:
  - 491,083 reported parties involved in traffic collisions
  - 2,952 crashes that resulted in Fatalities
  - 190,701 crashes that resulted in Injuries
  - 297,430 crashes that involved Property Damage Only
  - 5,677 of these drivers were classified as "inattentive" in one of several categories (eating, smoking, cell phone, etc.)
  - Of these 5,677 inattentive drivers, 11% were attributed to cell phone use

Status	Parties
Cell phone in use	3,927
Cell phone not in use	98,876
Cell phone None/Unknown	175,790
Total Parties	278,593

The CHP analysis does not include all crashes in which cell phones may have been in use and a contributing factor. The report noted, "officers statewide often failed to document on the [crash] report whether a cellular telephone was in use, present, or unknown."

LIMITATIONS: There was potential confusion of where on the reporting form the Officers should indicate distraction sources. Also, Officers were only allowed to select one distraction source when more than one is commonly encountered.

Of the 13,637 inattention-related crashes, cell phone use accounted for 11% of inattention-related crashes, more than any other specific inattention factor ("Other" accounted for 66%). The results also indicated that cell phones accounted for 11% of fatalities and total inattention crashes between April 1, 2001, and June 30, 2002.

While cell phone use accounted for 11% of total inattention crashes between January 1, 2002, and June 30, 2002, cell phones use while driving contributed to 20% of inattention-related fatalities during that period. This data revealed that a cell phone was known to be in use by at least 12,733 parties involved in crashes during the 18-month period.

The CHP concluded that driver distraction is the issue, not the particular device, and it suggested, given the crash data collected, that any action regarding cell phones should also address issues related to other distracting activities (e.g., car radio/CD player).

Recommendations from the California Highway Patrol:
- Continue collection and reporting of collision data related to driver distraction.
- Consider whether to require use of the hands-free option when using a cellular telephone while driving.
- Improve consumer education.
- Add an "Inattentive Driving" section to the Vehicle Code.
- Continue training law enforcement agencies statewide on the proper documentation of inattention factors, if the requirement for inattentive driver data collection is extended.

It is also important to note the following about the Traffic Collision Coding form: Information on whether driver inattention contributed to the crash is only collected under "Other Associated Factors" for the involved party cited for having caused the crash. Officers check the box "F" indicating "Inattention" and note the cause next to it (e.g., officer must write in "P-Cell Phone").

Information on Cell Phone Use by involved parties is specifically requested under the section entitled, "Special Information." Use or non-use is indicated for all parties involved. No distinction is made between condition in which no phone is present and condition in which the officer is unable to determine presence/use of phone.

Direct Line Insurance plc (2002). *The Mobile Phone Report: A report on the effects of using a 'hand-held' and 'hands-free' mobile phone on road safety.* (Online at www.directlinegroup.com). Surrey, UK.	Study to quantify the impairment from hands-free and hand-held mobile phone conversations in relation to the decline in driving performance caused by alcohol impairment. Included 20 drivers aged 21 to 45 years. Context ▪ Driving simulator featuring a standard road layout. Study employed a modified grammatical reasoning test to replicate demands of verbal comprehension. Independent Variables ▪ Hands-free vs. handheld phone compared to Alcohol vs. placebo condition. Dependent Variables ▪ Driving performance measures such as speed and headway ▪ Reaction time to traffic event	▪ **Found that drivers' reactions times were significantly slower (up to 0.5 sec) when using a mobile phone versus normal driving.** ▪ Found that use of hands-free phones was "safer" than use of hand-held mobile phones. However, the conversation itself was a major [mental] distraction "carrying hidden dangers" regardless of hand-held or hands-free mode. ▪ **Found that using a mobile phone when driving significantly impairs the driver's attention to potentially hazardous situations, including a greater lack of judgment in the use of speed, an inability to recognize hazards on the road and difficulty maintaining headway.** ▪ ***Authors emphasize the need for further [Government] research on the issue of using hands-free phones while driving.***

Hahn, R.W., and Dudley, P.M. (2002). *The Disconnect Between Law and Policy Analysis: A Case Study of Drivers and Cell Phones (Working Paper 02-7).* Washington, DC: The AEI-Brookings Joint Center for Regulatory Studies.	Purpose of the working paper is to "assess the policy response to the use of cellular phones while driving from a legal, economic and political perspective." The authors argue, "there is a fundamental disconnect between law and policy analysis. The disconnect arises largely because the political process is more responsive to the public's perception of risk than the scientists' risk assessments and the economists' policy analyses."	The authors reviewed epidemiological studies, experimental studies, and data on the possible cause of automobile crashes. They state (p. 14) that, taken together, "the evidence clearly shows that using a cell phone while driving increases the risk of an accident." **"The primary reason hands-free phones will not reduce risk significantly is because conversation, on any type of device, is a significant distraction. Conversation impairs driving performance, apparently by reducing the driver's ability to fully comprehend visual information. Since hands-free phones will still allow conversation, a major part – if not *the* major part – of the risk associated with calling and driving will remain." (p. 35)** The authors noted (p. 1) that there are over 135 million cellular subscribers in the United States today, compared to fewer than 100,000 subscribers in 1985. The authors also noted that current industry revenues were almost $60 billion in 2001, compared to less than $1 million in 1985. The authors noted study (p. 3) estimates **ranging from 10 to 1000 fatalities per year in cell phone-related crashes in the United States.** Estimates cited from: • Redelmeier & Weinstein (1999): estimates **730 annual fatalities.** A cell phone ban would cost $300,000 [range $50k - $700k] per quality-adjusted life year saved. 600,000 collisions annually due to cell phone use. 115,000 injuries annually. $1.8 billion in health care costs and property damage annually. Estimate the annual costs of a ban at $12 billion of "foregone welfare." • Hahn & Tetlock (1999): estimates **100 annual fatalities** • Hahn, Tetlock & Burnett (2002): calculates 10 to 1000 annual fatalities with a best estimate of **300 annual fatalities.** *No cell phones at all => $25 billion in cost - $4.6 billion in net benefit = $20 billion in net costs annually.* A hands-free policy would still result in negative net benefits under most circumstances -- *Estimates $1.4 Billion in cost - $690 Million in net benefit = $710 Million In net costs annually* • Harvard Center for Risk Analysis (Lissy, Cohen, Park, and Graham, 2000): estimated $23 billion annually in net cost. A cell phone ban would cost $700,000 per quality-adjusted

Continued –

Hahn, R.W., and Dudley, P.M. (2002). *The Disconnect Between Law and Policy Analysis: A Case Study of Drivers and Cell Phones (Working Paper 02-7).* Washington, DC: The AEI-Brookings Joint Center for Regulatory Studies.

life year saved.

The authors stated that a review of recent economic analyses suggests that a ban on cell phone use while driving "would not be appropriate at this time." They also noted that **"...the current literature strongly suggest that a total ban on using cell phones while driving would be a rather expensive way to save lives."**

"A good policy should pass a broadly defined benefit-cost test. (When the economic benefits of a policy exceed the economic costs, that policy is said to increase efficiency or economic efficiency.) In this case, that means analyzing the benefits of a ban, which includes the reductions in fatalities and property damage, and the costs of a ban, which means measuring how much drivers value the unregulated use of their phones while driving." (p. 18)

Authors state that there is "no strong empirical justification at present for the enactment of a policy or legislation that differentiates between the use of hand-held and hands-free sets in motor vehicles." (p. 38) "All the evidence suggests that hands-free devices are barely, if at all, safer than hand-held ones. The experimental and epidemiological studies show that manual dialing is distracting, but no more so than conversation. Other physical distractions, such as holding the phone, do not appear to be significant." (p. 40)

Author Footnote #260: "...there are positive externalities associated with driving and calling, such as reporting accidents and drunk drivers. These benefits, which have not been adequately studied or quantified, may be lost if drivers carry their phone less often or fear being ticketed."

Authors suggest consumer information campaign, stricter enforcement of reckless driving laws, and stricter penalties for crashes when a cell phone is involved.

Harbluk, J.L., Noy, Y.I., and Eizenman, M. (2002). *The Impact of Cognitive Distraction on Driver Visual Behaviour and Vehicle Control (TP# 13889 E).* Transport Canada.	Study to examine the impact of internal distraction created by the processing of information in the course of interacting with or conversing over a hands-free in-vehicle device. **Also documents recommendations to the Canadian Federal government.** Subjects were asked a series of questions over the cell phone; responses were made verbally. The phone task consisted of easy and difficult arithmetic operations. Study included 21 drivers – 9 women and 12 men ages 21 to 34 yrs old (Mean = 26.5 yrs) Context ▪ On-Road, conducted in the city under normal traffic conditions. Independent Variables ▪ Level of complexity of cell-phone interactions (cognitive operations). Dependent Variables ▪ Visual scanning patterns ▪ Driving performance measures such as braking and longitudinal deceleration. ▪ Subjective evaluations of workload, safety and distraction	▪ **Concluded that significant changes in driver behavior (narrowed visual scanning behavior and reductions in vehicle control) under real-world driving conditions may result due to the cognitive distraction associated with the use of in-vehicle, hands-free devices, and that these changes support the idea that these extra demands on the driver contribute to late detection, reduced situation awareness and a reduced margin of safety.** ▪ Recommend that "during a casual conversation drivers can adapt by pausing during the conversation or ending the call should the demands of driving increase." ▪ Notes that "business is commonly conducted using cell phones… however, an intense business conversation could divert a driver's attention away from the task of driving. ▪ ***Recommends that the Canadian Federal Government develop public education materials to recommend to the public that cell phones should not be used by drivers while driving, to advise the public that hands-free phones are not risk-free, and to provide important safety tips for drivers to consider if they intend to continue to use their phones while driving.*** ▪ Concluded that there is a need continued research to determine the need for regulating original equipment.

Jennes, J., Lattanzio, R., O'Toole, M., and Taylor, N. (2002). Voice-activated dialing or eating a cheeseburger: which is more distracting during simulated driving? In the *Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting (pp. 592-596).* Santa Monica, CA: HFES.	Twenty-six participants drove a fixed distance while continuously eating a cheeseburger, operating an automobile CD player, reading directions, or using a voice-activated dialing system to place calls on a mobile phone. Performance was measured while participants drove without doing other tasks (baseline). Context ▪ Part-task driving simulation (lab) Independent Variables ▪ Type of distraction (eating, CD player, reading directions, voice-activated dialing. Dependent Variables ▪ Driving errors ▪ Driving times ▪ Glances away from the road	▪ **Participants made the most lane-keeping errors, minimum speed violations, and glances away from the road while reading and while operating the CD player.** ▪ They made significantly fewer driving errors and glances while voice-dialing the mobile phone or eating, although in both of these conditions they made more driving errors and glances than they did when driving without doing any other activity (baseline). ▪ **CONCLUSIONS: "We conclude that for simulated driving, placing calls using a voice-activated dialing system is as distracting as eating a cheeseburger, but both of these activities are less distracting than continuously operating a CD player or reading directions."** ▪ Authors acknowledge that two factors may have influenced the voice-activated dialing performance: signal problems with the phone and participants' lack of experience with the voice-activated system. Indeed, 10 of the 26 participants had difficulty with the voice-activated interface.
Lyda, L., Osborne, V.M., Coleman, P., and Rienzi, B. (2002). Age and distraction by telephone conversation in task performance: Implications for use of cellular telephones while driving. *Perceptual and Motor Skills, 94(2),* 391-394.	A laboratory experimental was conducted to investigate the performance by age group on a simple automatic task with no distraction and on the same task during a telephone conversation. Participants were timed as they pointed to letters in alphabetical sequence on one of two matrix conditions (alphabetized and random ordering). Two factors were predicted to diminish task performance: distraction by telephone conversation and older age. Participants included 38 subjects (23 Females and 15 Males), ages 18 to 75 years, divided into three age groups. Context ▪ Lab experiment, desk telephone. Independent Variables ▪ No-distraction and Distraction (i.e., telephone conversation with open-ended questions) Dependent Variables ▪ Performance times (sec)	▪ Found that presence of the distraction task led to significant increases in the alphabet matrix performance times for both the alphabetized and random ordering conditions. ▪ Reported that "telephone conversation as a limited distraction is consistent with previous studies (e.g., Redelmeier & Tibshirani, 1997; Jones, 1999). However, our results are inconsistent with findings that cellular telephone conversations do no affect motor activity (e.g., Redelmeier & Tibshirani, 1997)." ▪ Authors noted that "A variety of factors associated with cellular telephones and driving performance were not addressed" – conversation intensity (simple & casual versus emotional and problem solving), equipment variables, important situations that are experienced by drivers (e.g., "dire consequences for errors"), phone type (cellular phone versus desk telephone). Authors also noted small sample size in this study.

McCartt, A.T., Braver, E.R., and Geary, L.L. (2002). *Drivers' Use of Hand-Held Cell Phones Before and After New York State's Cell Phone Law.* Arlington, Virginia: Insurance Institute for Highway safety.	Reports the findings of an observational study to examine the rate of hand-held cellular telephone use among drivers of passenger vehicles in New York (and compared with drivers in Connecticut) prior to and following the implementation of a 2001 state law banning the use of such phones. Daytime cell phone use was observed at controlled intersections in four metropolitan areas in New York and two metropolitan areas in central Connecticut, an adjacent state when no such ban was in place. The law: Apprehended violators received warnings beginning Nov 1, 2001 and could receive fines beginning Dec 1, 2001. Until March 1, 2002, violators could have fines waived if the court was shown proof of purchase of hands-free accessories. Observations included 37,462 vehicles in four New York metropolitan areas – 11,768 at baseline (pre-law); 12,732 in Dec 2001; and 12,962 in Mar 2002. Observations included 21,315 vehicles in two Connecticut metropolitan areas – 7,110 at baseline; 6,817 in Dec 2001; and 7,388 in Mar 2002.	▪ Found that "Cell phone use decreased significantly in New York but not in Connecticut during the first few months after the law became effective." ▪ Found that Hand-held cell phone rate in New York decreased significantly, from 2.3% one month before the warning period took effect to 1.1% immediately after the fine-with-waiver phase took effect on December 1, 2001. ▪ Found that Hand-held cell phone rate in New York remained at 1.1% following the expiration of the waiver provision of the law on March 1, 2002. ▪ Found that Hand-held cell phone rate in Connecticut was 2.9% and that use did not change significantly during the observation periods. ▪ Found that in both states, cell phone use was higher among drivers of sport utility vehicles. ▪ Found that in both states, cell phone use was virtually nonexistent among drivers estimated to be age 60 and older. ▪ Found that in New York, cell phone use declined significantly for both males and females, for drivers estimated to be younger than 25 or ages 25-59, and for drivers of cars, SUVs, and vans/minivans. Concluded that "Results from this study suggest that passing a law restricting use of hand-held cell phones while driving, even in the absence of vigorous enforcement campaigns, has a strong effect on driver behavior when accompanied by publicity about the law."

Nowakowski, C., Friedman, D., and Green, P. (2002). An Experimental Evaluation of Using Automotive HUDs to Reduce Driver Distraction while Answering Cell Phones. In the *Proceedings of the Human Factors and Ergonomics Society 46th Annual Meeting*. Santa Monica, CA: Human Factors and Ergonomics Society, CD-ROM	To examine strategies for reducing driver distraction while answering the phone, 24 participants answered calls while driving in a simulator. Calls were answered using a center-console-mounted phone or one of several phone designs that utilized a HUD to display the caller ID and steering-wheel-mounted buttons to activate the phone. Driving workload was manipulated by varying the curve radius and by varying the timing of the call, either 1 second before or 5 seconds after the start of a curve. Context ▪ Driving simulator Independent variables ▪ Phone interface type and location (HUD center with ring, HUD center without ring, HUD right, and console) Dependent variables ▪ Call answering response time ▪ Lane position variability ▪ Line-crossing rate ▪ Speed loss	▪ **The HUD-based phones resulted in response times that were 39 percent faster than the conventional center-console phone, and they resulted in up to 62 percent fewer line crossings.** ▪ When using the center-console phone, road curvature had a large influence on response times and driving performance; however, the HUD-based phone were less sensitive to increased road curvature or driving workload. ▪ The mean response times favored the HUD-based phones by 1.46 seconds over the head-down, center-console location. ▪ Additionally, the **driving performance measures indicated that there was significantly more variability in lane keeping and more line crossings while answering the head-down, center-console-mounted phone as compared to the HUD-based phones.** ▪ "Admittedly, by requiring the driver to read the caller ID before answering, the task favored the use of the HUD and response times increased as HUD eccentricity increased." ▪ There was no indication that the presence or absence of a ring had any influence on driving performance. There was evidence that some drivers may have waited for the completion of a ring before answering.

Nunes, L. and Recarte, M. (2002). Cognitive demands of hands-free-phone conversation while driving. Transportation Research Part F, 5, 133-144.	In a series of four on-road eye-glance experiments, the authors replicated the pattern of reduced visual scanning behavior found in Recarte and Nunes (2000). Participants drove an instrumented car provided with a hands-free phone and performed several cognitive tasks while driving including phone conversations. The study focused the cognitive component of the conversations, excluding dialing. The cognitive demands of the conversations were varied and in two of the experiments the same tasks had two versions: by phone and in live conversation with the experimenter in the car. Context ▪ On-road Independent variables ▪ Hands-free phone conversation vs. passenger conversation Dependent variables ▪ Eye-glance behavior ▪ Visual search behavior ▪ Driving speed ▪ Visual detection and response selection capacities	▪ Claim to show that wireless phone conversations (hands-free) were no different than live [passenger] conversations in terms of visual attention reduction, but it was the content and complexity of the conversation that caused the effects. They used a detection task where subjects responded when seeing flashing lights in their visual field (implementation of this method is unclear). They also collected eye-tracking data. ▪ **PROBLEMS: No description of the driving task or routes other than "real traffic and normal daylight conditions." Also, in the first experiment, the tasks for the phone and live conversations were different, which is a serious methodological confound.** The subsequent three experiments seem to eliminate this problem, but overall there is not enough detail (any detail for that matter) given regarding the 27 cognitive tasks used in these studies. ▪ The results of the third and fourth experiments may be noteworthy, as they show that visual behavior for both phone and live conversation conditions were narrowed, but there was no difference between these two conditions. ▪ **Because so little methodology information is presented, it is not recommended that these results and conclusions be cited.**

Reimer, B., Sodhi, M., and Llamazares, I. (2002). Glance Analysis of Driver Eye Movements (Report Dated March 15, 2002). Kingston, RI: The University of Rhode Island. See also… **Sodhi, M., Reimer, B., and Llamazares, I. (2002).** Glance Analysis of Driver Eye Movements to Evaluate Distraction. *Behavior Research Methods, Instruments and Computing, 34(4)*, 529-538.	Study investigating drivers' eye movements and glance patterns (via eye tracking methods) when performing secondary tasks while driving. Presents some metrics on the impact of secondary tasks occurring separately on driver performance. The tasks were radio tuning, answering a hand-held call and completing a computational task, describing vehicle through rear-view mirror, answering a hands-free call and completing a memory task, reading the odometer, responding to a startling phone ring, and noting the gas prices of approaching fuel stations. Context ▪ Unspecified driving task Independent variables ▪ Different secondary tasks (hands-free vs. hand-held phone answering and conversation tasks). Dependent variables ▪ Eye-glance behavior	▪ **NOTE: the description of the methods is incomplete. The driving task and context are not specified in the write-up.** ▪ Eye movements for the radio, rearview mirror, and odometer tasks all showed a time-sharing pattern where visual attention was divided between the driving scene and the secondary task. ▪ The often-cited 1.6-second single glance duration upper bound was corroborated by this data as only 4 glances in 208 were over 1.6 seconds (however this is a small sample). ▪ Glance data between the tasks didn't differ much, but both the hand-held and hands-free phone conditions were significantly different from the control in terms of task performance. ▪ **NOTE: the hand-held and hands-free conditions had different conversation tasks, which was a confounding factor within this study.**
Salvucci, D. D., & Macuga, K. L. (2002). Predicting the effects of cellular-phone dialing on driver performance. *Cognitive Systems Research, 3*, 95-102.	This paper demonstrates how cognitive modeling can aid in understanding these effects by predicting the impact of cell-phone dialing in a naturalistic driving task. Working within the ACT-R cognitive architecture, the authors developed models of four methods of cell-phone dialing and integrated these models with an existing driver model of steering and speed control. By running this integrated model, they generated a priori predictions for how each dialing method affects the accuracy of steering and speed control with respect to an accelerating and braking lead vehicle. They attempted to validate several of the model's predictions with an empirical study in a fixed-based driving simulator.	▪ **The model predicted that the largest effects on driver performance arose for dialing methods with high visual demand rather than methods with long dialing times.** ▪ "The model's predictions suggested that total dialing time does not seem to be a good indicator of the effects of a given dialing method on driver performance (as measured by lateral and speed deviations): although voice dialing required the most time, it produced the smallest deviations, while two faster methods, speed and menu dialing, produced larger deviations. Instead, visual demand as measured by phone gazes *does* seem to be a good indicator of the effects of a method on driver performance: the methods with the least visual demand resulted in the smallest deviations and vice-versa."

Salzberg, P. (2002). Cell Phone Use by Motor Vehicle drivers in Washington State. Olympia, Washington: Washington Traffic safety Commission.	Presents the results of an observational study to examine the incidence of cell phone use by drivers in Washington State in 2001. Observational study of 18 counties in the state of Washington; nine from western Washington and nine from eastern Washington. The observations were made in 80-minute blocks at 402 roadway sites between the hours of 8AM and 5PM. Observations were made only for hand-held phones used by drivers of passenger vehicles.	▪ 2,781 out of 78,754 observed drivers were using a hand-held phone, which is makes for an overall state rate of 3.53%. ▪ The rate was higher for the western Washington counties, especially those along the Interstate 5 corridor. ▪ The rate also tended to be higher for the more urban counties (e.g., King (Seattle), Pierce (Tacoma), and Snohomish (Everett) counties). ▪ The highest cell phone rate was in Whatcom County, which borders BC, Canada (5.27%). ▪ SUVs and vans had the highest rate (4.59% and 4.23%, respectively), whereas the lowest rate was for passenger cars (2.91%). ▪ The authors note that these results are limited to drivers of passenger vehicles during daytime hours in the state of Washington. ▪ "The findings of this study (3.53% use rate) indicate that at any given time during daylight hours approximately 3 or 4 out of every 100 drivers of passenger vehicles will be using a cell phone while traveling on Washington roadways."
Sodhi, M., and Cohen, J. (2002, work in progress). Kingston, RI: University of Rhode Island Transportation Center.	Study investigating "tunnel vision" effects when using cell phone while driving. Context ▪ Instrumented vehicle with head-mounted, eye-tracking device Independent Variables ▪ Dependent Variables ▪ Eye movements	▪ Preliminary results of analysis of the eye movements of automobile drivers using cell phones found that the drivers have a reduced field of view – tunnel vision. ▪ Concluded that the alertness of drivers decreased considerably when they were conducting cognitive tasks, such remembering a list of items, calculating in one's head, or using a cell phone. ▪ Found that the tunnel vision caused by cell phone use continues well after the conversation ends, perhaps because drivers are still thinking about the conversation. ▪ Found that even when drivers do tasks that require brief glances away from the roadway, like adjusting the radio, wide-ranging eye movements suggest a higher level of alertness than when speaking on a cell phone. ▪ Found that most drivers seldom look away from the road for more than about 1.6 seconds when doing such tasks, a result that corresponds with previous research.

Wilson, J., et al. (May 2002). Collision and Violation Involvement of drivers Who Use Cellular Telephones. As cited on page 8 of Safety Canada (Vol. XLVI No. 3, July 2002), the member newsletter of the Canada Safety Council.		• "According to a British Columbia study, individuals who use cell phones while driving are inherently riskier drivers. They have more violations for speeding, impaired driving, seat-belt non-usage, aggressive driving and non-moving violations than drivers who refrain from cell phone use in vehicles, or have low usage. This indicates differences in lifestyle, attitude and personality that need to be considered in the design and targeting of public awareness campaigns."
Boyle, J.M., and Vanderwolf, P. (2001). *2000 Motor Vehicle Occupant safety Survey Volume 4 Crash Injury and Emergency Medical Services Report* (DOT HS 809 459). Washington, DC: NHTSA.	As part of the Motor Vehicle Occupant Safety Survey's volume on crash injury and emergency medical services, respondents were asked about cellular telephone use while driving.	• The proportion of drivers who have a car or cellular phone with them when they drive has continued to increase in all community types (urban, suburban and rural). • Having a car or cellular phone was related to education level with 39% of those who did not graduate from high school, 48% of high school graduates, 58% of those with some college, and 62% of college graduates having a car or cellular phone. • Nearly three-quarters (73%) of those who usually have a car or cellular phone in their vehicle reported a tendency to hold the phone with their hand. 22% reported a tendency to use hands-free phones. • More than half reported talking on the phone during fewer than half of their trips. In total, 73% reported using their phone, at least on occasion, while driving. 26% said they never talk on the phone while driving.
Crawford, J.A., Manser, M.P., Jenkins, J.M., Court, C.M., and Sepúlveda, E.D. (2001). Extent and effects of handheld cellular telephone use while driving (Report No. SWUTC/01/167706-1). College Station, TX: Texas A&M University System, Texas Transportation Institute	This research assessed handheld cellular telephone use among drivers on highways during the afternoon peak period in Dallas County, Texas. Use was measured through visual data collection methods.	• **5% of drivers were observed using a handheld cellular telephone.** • Use was lower in less dense urban areas than in more dense urban areas. • The maximum proportion observed was slightly over 8% – driving in the peak direction in a dense urban area. • Interactions were found among site location, time of day, and travel direction. • **These estimates are conservative in nature because they do not include the use of either handheld cellular telephones with hands-free adapters, or in-vehicle, installed hands-free cellular telephone systems**

Graham, R., and Carter, C. (2001). Voice dialing can reduce the interference between concurrent tasks of driving and phoning. *International Journal of Vehicle Design, 26(1),* 30-47.	A laboratory experiment was conducted to test two variations of speech interface against a standard manual telephone interface. Participants carried out driving-related tasks while simultaneously dialing familiar telephone numbers. The primary hypothesis of this study was that speech recognition would reduce the interference between concurrent tasks of driving and phone dialing, compared to manual input. The level of interference was assessed through measures of tracking-task (driving) error, "collisions", reaction times to peripheral targets, phone transaction times, number of dialing errors, and perceived mental workload with NASA-TLX. Context ▪ Part-task driving simulation (tracking task) Independent Variables ▪ Phone interface (manual, speech recognition with auditory feedback, speech recognition with auditory and visual feedback) ▪ Concurrent task (driving only, phoning only, driving and phoning) ▪ Increased speech recognition error (0%, 3%, 6%) Dependent Variables ▪ Tracking performance error – mean RMS of "lane" position ▪ Reaction time (RT) to peripheral targets ▪ "Collisions" – defined as lane departures ▪ Phone performance (task times, errors) ▪ Perceived mental workload (NASA-TLX)	▪ Overall, tracking performance, "crashes", and peripheral target detection were worse when dialing and driving compared to driving alone. ▪ Tracking performance was significantly worse in the manual dialing condition than the two speech recognition conditions. ▪ There were significantly more "crashes" in the manual dialing condition compared to the two speech recognition conditions. ▪ Peripheral target detection was significantly slower in the manual dialing condition compared to the two speech recognition conditions. ▪ **Note:** the location of the phone in the manual dialing condition was NOT controlled: some participants kept it in the cradle, some held it in the air, some leaned it against the steering wheel, etc. ▪ Speech recognition dialing required significantly more time than did the manual dialing interface. ▪ Dialing accuracy was also significantly more accurate in the manual condition. ▪ Participants felt that speech recognition dialing was less mentally demanding than the manual dialing. ▪ There were significantly more tracking errors and "crashes" when the speech recognition dialing included visual feedback in addition to auditory feedback, compared to the auditory feedback alone. ▪ The speech recognition had little effect on performance (dialing time was the only factor affected). ▪ **Authors concluded "The present study lends some support to the previous findings that hand-held mobile phone use while driving has the potential to adversely affect driving safety. Voice dialing may be considered as an extension to the hands-free concept. There are, however, a number of reasons why we should not recommend that legislation be changed to allow the use of voice-activated phone functions while driving."**

Green, P. (2001). Safeguards for on-board wireless communications. Presentation at the 2nd Annual Plastics in Automotive Safety Conference. Troy, Michigan.	According to Green, in contrast to the optimistic market projections the safety picture is less positive for telematics as these systems could distract drivers to a significant degree, making driving less safe rather than safer. This paper identified (1) the problems associated with telematics use (especially for navigation systems and phones), (2) the factors contributing to driver overload (visual demand, cognitive demand, immediacy), (3) why safety initiatives are needed, (4) ongoing safety rulemaking (by organizations such as SAE and ISO) and (5) why a workload manager may be the best solution to safety concerns.	▪ "Recognizing the crash risk due to visual demands, cognitive demands, and the immediacy of in-vehicle tasks, numerous bodies are developing guidelines, recommended practices, and safety standards affecting interface design. [Then] current activities of SAE and ISO are most important." ▪ "Some believe that rather than focusing on regulations, simply making all driver interfaces voice based will solve the overload problem and provide the desired levels of safety. Voice interfaces can be beneficial, but only in some circumstances." ▪ "In the long run, the ultimate solution is to develop workload managers that regulate information flow to the driver in response to the driving situation. However, both short-term activities to develop standards and long-term activities, such as the development of workload managers, are hampered by a lack of a research basis for decisions." ▪ "There are no signs that the funding necessary, an order of magnitude increase over the current situation, will occur, and this should be a significant concern to organizations that see a future in telematics."

Haigney, D., and Westerman, S.J. (2001). Mobile (cellular) phone use and driving: a critical review of research methodology. *Ergonomics, 44(2),* 132-143.

Abstract:
"Studies have examined possible effects of concurrent mobile phone use on driving performance. Although interference is often apparent, determining the implications of such findings for 'real-world' driving is problematic. This paper considers some relevant methodological issues including the definition of procedures and terms, operationalization of task elements, sampling of task components, and the provision of experimental controls. Suggestions are made about how methodological rigor could be improved."

Topics include:

- Models of time-sharing performance
- Mobile phones and accident reports
- Influence of mobile phone type
- Influence of vehicle transmission type
- Measuring distraction
  - Eye movements
  - Comparison with radio use
  - Comparison with passenger conversation
- Ethical and legal considerations

The authors concluded:
"It is argued here that there is a need for greater operational clarity in experimental reports in order to facilitate comparisons between studies. In many instances, more detailed description of phone type, task demands and vehicle transmission would be useful. In the UK consideration of driver performance while using a manual transmission is a particularly important and generally neglected area of research.

The ecological validity of tasks used during laboratory-based studies is a matter of some concern. It is debatable whether the range of tasks investigated accurately reflects the range and balance of cognitive processes involved when concurrently using a mobile phone and driving.... In summary, the demands of driving and phone use are varied, and a more detailed understanding of the ways in which mobile phones are used in this context is required in order to improve estimates of interference.

Insurance Corporation of British Columbia (2001). *The Impact of Auditory Tasks (as in hands-free cell phone use) on Driving Performance.* (Online at *www.icbc.com*). North Vancouver, British Columbia: ICBC.	Investigated the impact of in-vehicle telephone use on driving performance using closed course driving experiments. Simulated hands-free cell phone use using a sequence of verbal messages to which the driver would respond. Included 41 subjects – 30 men and 11 women. Seven were aged 19-24, 25 were aged 25-44, and 9 were aged 45-70. Context ▪ On-road, conducted on a closed-course test track. Independent Variables ▪ Presence or absence of messages. ▪ Traffic event (traffic signal light, pop-up target, left turn task) Dependent Variables ▪ Driving performance variables such as braking and acceleration behavior ▪ Reaction time to traffic event	▪ Found that listening and responding to relatively complex messages resulted in significant degradation of driving performance in a series of driving tasks. Results indicated a relationship between extent of degradation and the complexity of the required driving maneuver. ▪ Authors concluded that study provides evidence that the problems associated with divided attention (driving and message attention/response) were aggravated by adverse driving conditions, such as slippery road conditions. ▪ Authors concluded that "While it was not possible to make a direct connection to crash risk from the experimental results, the nature of the driving performance degradations measured in relation to the presence of the message task clearly point to potential safety related problems associated with such things as phone use while driving – even if such use does not involved physical manipulation of the device."
Ishida, T., and Matsuura, T. (2001). The effect of cellular phone use on driving performance. *IATSS Research, 25(2),* 6-14.	The purpose of this study was to investigate the influence of operating a cellular phone and of the phone call itself on driving performance during a controlled on-road experiment, and to examine whether hands-free phones are an effective safety countermeasure. The location of the hands was an important factor in this study, with a single hand on the steering wheel condition for the hand-held phone, and both hands on the steering wheel for all other conditions. Participants followed a lead car on a test track while performing the in-vehicle tasks as cued. They performed addition problems while driving. Context ▪ Test-track study Independent Variables ▪ Hands-free vs. Handheld phone, car radio Dependent Variables ▪ Driving performance measures such as braking, headway distance, and lanekeeping ▪ Eye movements	▪ The mean glance duration when manipulating the hand-held phone was longer than when manipulating a hands-free set or car stereo. ▪ Braking reaction time delay increased in the following order: driving only, car radio, hands-free phone, and hand-held phone. ▪ **Driving speed was lowest when drivers used the hand-held phone, and the headway distance was the longest.** ▪ Some indication that processing of the addition task was worse for the hand-held condition compared to the hands-free condition. ▪ **Despite the different in-vehicle device modalities, a general delay in information processing was found when using the in-vehicle devices while driving compared to driving only.** ▪ **Conclusion: use of hands-free phones is effective to an extent (as compared to hand-held phones), but that driving performance was worse when using a phone (either type) than when only driving.**

Just, M.A., Carpenter, P.A., Keller, T.A., Emery, L., Zajac, H., and Thulborn, K.R. (2001). Interdependence of Nonoverlapping Cortical Systems in Dual Cognitive Tasks. *NeuroImage, 14,* 417-426.

(Center for Cognitive Brain Imaging, dept of Psychology, Carnegie Mellon University)

Describes a study that used functional magnetic resonance imaging (fMRI) to measure cortical activation during the concurrent performance of two high-level cognitive tasks that involve different sensory modalities and activate largely nonoverlapping areas of sensory and association cortex.

Involved participation of 18 right-handed native English speakers (6 females), aged 18-32

Context

- Two tasks performed both alone and concurrently - Auditory sentence comprehension task combined with mental rotation of visually depicted 3-D objects.

- Found that the behavioral measures indicated that the dual tasks were performed without compromising accuracy in either task. Although both tasks were performed at a high absolute level of accuracy, the behavioral performance was reliably poorer in the dual task conditions.
- Found that in the dual task, the activation in association areas (primarily temporal and parietal areas of cortex) was substantially less than the sum of the activation when the two tasks were performed alone, suggesting some mutual constraint among the association areas. In other words, the activation volume in the cortical systems underlying the two tasks is not independent, but decreases relative to the single task conditions. A similar result was obtained for sensory areas aw well.
- **One interpretation of results – "there is a limit on how much attention is available to distribute over more than one task." In this context, the word *attention* refers to a limited cognitive commodity that can be distributed over tasks, such as divided attention.**
- Concluded that if either task had imposed more computational demand per unit time, then deterioration in accuracy would probably have been more noticeable in the dual task. In other words, the constant co-processing may apply not to the number of tasks that can be performed simultaneously, but to the amount of computation performed per unit time in each task.
  - Suggests that this may explain why it is increasingly possible to concurrently perform multiple tasks, such as driving and conversing, as one or both become automated and less resource demanding.
  - **"However, even for an experienced driver, a sudden, computation-demanding complexity in traffic events can put an end to conversation, and a complex conversation may put an end to careful driving."**

Laberge-Nadeau, C., Maag, U., Bellavance, F., Desjardins, D., Messier, S., and Saïdi, A. (2001). *Wireless telephones and the risk of road accidents (Final report, CRT-2001-16).* Montreal, Canada: Laboratoire sur la sécurité des transports, Université de Montreal.

An epidemiological study that attempted to "verify whether an association exists between cell phone use and accidents, with a distinction made between accidents with injuries and accidents with property damage only."

Considered survey data from 36,079 respondents. Collected data on driver demographics, cell phone usage, driving and crash history in recent 24 months. Also obtained cell phone activity records.

- **Found that relative risk of all accidents and of accidents with injuries is higher for users of cell phones than for non-users – relative risks for accidents is 38% higher for cell phone users than for non-users.**
- Found that relatives risks calculated in this study are "much lower than those described by Redelmeier and Tibshirani (1997)," and that the method used in the previous study is "responsible for overestimation."
- Found an association between the risks of accidents with property damage only and risk of accidents with injuries for cell phone users compared with nonusers.
- **Found that heavy cell phones users are exposed to twice the risk as normal users, taking into account age, exposure to risk and driving habits.**
- ***Recommendations: Concluded that driver-related safety measures should be encouraged, including training and education campaigns. Encouraged use of voice-activated hands free cell phones in order to "minimize handling and keep both hands on the steering wheel." Encouraged development of vehicle-related safety devices for improved hazard warning and driver assistance.***
- Suggested that future road safety perspectives should consider "the association between frequency of calls and the risk of accident."

Recommendations to the driver:

- *Avoid intensive and unnecessary phone use, keep conversations short and **avoid this form of communication, especially in situations requiring that they pay particular attention to the road.***
- *When using the phone while driving is unavoidable, drivers should remain at a considerable distance from other vehicles and driver at moderate speeds, preferably in the slow lane.*
- *The use of voice-activated or hands-free cell phones is encouraged in order to minimize handling and to keep both hands on the steering wheel.*
- *If manual dialing is necessary, the driver should safely move towards the shoulder of the road or dial the number while the vehicle is stopped.*

See also
Bellavance, F., Bourhattas, M., Lapierre, S., Laberge-Nadeau, C., and Messier, S. (2003). Misclassification bias in the case-crossover design applied to wireless telephones and the risk of road crashes. Presentation at the Statistical Society of Canada 2003 Annual Meeting. Retrieved on June 12, 2003 at : http:/ /www.ssc.ca/main/meetings/halifax_e.html

See also
Angers, J.-F., Courchesne, S., Poirier, L.-F., Bellavance, F., and Laberge-Nadeau, C. (2003). Cell phone and car accidents: a Baysian approach. Presentation at the Statistical Society of Canada 2003 Annual Meeting. Retrieved on June 12, 2003 at : http:/ /www.ssc.ca/main/meetings/halifax_e.html

Continued...

Laberge-Nadeau, C., Maag, U., Bellavance, F., Desjardins, D., Messier, S., and Saïdi, A. (2001). *Wireless telephones and the risk of road accidents (Final report, CRT-2001-16).* Montreal, Canada: Laboratoire sur la sécurité des transports, Université de Montreal.

- *The telephone should always be firmly attached and located within the driver's field of vision, making it unnecessary to search for the phone.*

Other recommendations:

- *Cell phone companies could intensify information campaigns, which now include advertising and advice provided with products and bills. Cell phone companies should be supportive and assist in other technical, ergonomic and epidemiological research efforts.*
- *The automobile industry could work to reduce the risk of crashes linked to cell phones by developing technology to provide the driver with information or to help the driver remain at an optimal distance from other vehicles.*

Lee, J.D., Caven, B., Haake, S., and Brown, T.L. (2001). Speech-based interaction with in-vehicle computers: The effect of speech-based e-mail on drivers' attention to the roadway. *Human Factors, 43(4)*, 631-64.	This study used a car-following task to evaluate how a speech-based e-mail system affects drivers' response to a periodically braking lead vehicle. A baseline condition with no e-mail system was compared to a simple and a complex e-mail system in both simple and complex driving environments. The e-mail system was simulated and an experimenter, who gave the system 100% speech recognition accuracy, simulated speech recognition. The simple e-mail system consisted of three levels of menus with two options for each menu. The complex system consisted of four to seven options for each menu. Traffic density, intersection density, and the scenery (houses, barns, fences, and animals) defined the complexity of the driving environment. The e-mail system was either available or not. Sample e-mail task: "Read a new message from your boss concerning the project budget. Also, read messages containing vendor estimates for the project. Correctly reply to your boss. The task is completed when you have gone through all messages and you have exited the system." Context ▪ Driving simulator (Hyperion) Independent Variables ▪ E-mail system availability (available or not) ▪ E-mail system complexity (simple vs. complex) ▪ Driving environment Dependent Variables ▪ Driving performance (RT to lead vehicle slow-down) ▪ Subjective workload (NASA-TLX) ▪ Perceived distraction (subjective rating modeled after NASA-TLX)	▪ Overall, drivers responded more slowly when the e-mail system was available versus not, with a mean Reaction Time (RT) of 1.32 seconds compared to 1.01 seconds (a 30% increase). ▪ The driving environment complexity also increased reaction time from 1.00 to 1.32 seconds. ▪ The complexity of the e-mail system did not have an effect on RTs. ▪ The availability of the e-mail system had a large impact on the NASA-TLX scores, a rating of 47.0 when the system was available and 27.1 when it was not. ▪ The subjective ratings were greater for the complex e-mail system (53.3) compared to the simple system (40.7). ▪ The complexity of the driving environment did not have an effect on subjective ratings of workload. ▪ The authors conclude with a discussion how a RT latency of 310 msec in a crash situation does in fact impact driving safety.

McCarley, J.S., Vais, M., Pringle, H., Kramer, A.F., Irwin, D.E., and Strayer, D.L. (2001). Conversation disrupts visual scanning of traffic scenes. *Presented at Vision in Vehicles 9.*	Investigated the effects of naturalistic conversation on observers' scanning and consequent representation of traffic scenes. Utilized a *change detection* task. Observers were required to perform the change detection task while conversing with a confederate. The confederate was located in a separate room to discourage discussion of the stimulus or modulation of behavior. Conversations "were casual, covering topics such as television shows and hobbies." The authors equate this task to hands-free wireless phone use. Context ▪ Lab: Observed traffic scene images Independent Variables ▪ Conversation vs. no conversation, older (mean of 68 yrs) vs. younger (mean of 21 yrs) Dependent Variables ▪ RTs and accuracy for reported change detection in traffic scenes ▪ Eye-movement data with an eye-tracker.	▪ Error rates were significantly higher for older observers than younger ones. ▪ Error rates were significantly higher under the conversation condition. The majority of the errors were misses, where the observer failed to notice the change at all. ▪ RTs for older observers were significantly longer than for younger observers. ▪ There was no difference in RT between the conversation and no-conversation conditions, nor did it interact with the age factor. ▪ Observers made significantly more eye fixations per trial under the conversation condition compared to the no-conversation condition, but the fixation durations were also significantly shorter than in the no-conversation condition. This may be the reason for the lack of difference in RT. ▪ They interpret this to indicate less efficient visual search while conversing. ▪ **Concluded that even simple conversations can disrupt attentive scanning and representation of a visual scene.**

Parkes, A.M., and Hooijmeijer, V. (2001). *Driver Situation Awareness and Carphone Use* (paper submitted for publication in July 2001). Crowthorne, England: Transport Research Laboratory.	Examined the influence of hands-free cell phone use on driver situational awareness while driving on a simulated route. Driving performance of 15 subjects, aged 22-31, (both with and without a hands-free telephone) was assessed while conversing on a cell phone. Subjects were asked a series of questions over the cell phone; responses were made verbally. The phone task consisted of memory, arithmetic and reasoning operations. Unexpected events (presentation of visual stimuli) requiring choice reactions were also included in the scenario. Context ▪ Static simulator study featuring a motorway with low traffic volume, varied weather conditions and curves in the road. Independent Variables ▪ Access to hands-free cell phone (with vs. without phone conversation) ▪ Location of unexpected events in relation to tasks and environment. Dependent Variables ▪ Situational awareness measured using probe questions (e.g., describe traffic around you, color of car in rearview mirror, relative speed of car in rearview mirror compared to your car) ▪ Reaction time to unexpected events. ▪ Lane keeping ▪ Speed and braking behavior	▪ **Found significant deterioration in situational awareness across the phone and no-phone conditions. Drivers engaged in phone conversations had significantly fewer correct answers in response to situational awareness questions. In other words, drivers demonstrated decreased awareness of traffic movements around them (i.e., could not report on presence of actions of traffic around them) due to level of concentration demanded by the carphone conversation.** ▪ Some evidence suggests that drivers are slower to react just after the start of the conversation, but the effect is minimized over time. ▪ Drivers were found to be slower to adapt to a change in speed from 80 to 50 km/h when engaged in a conversation. ▪ Authors highlight the need for further study into the nature and duration of typical car phone conversations. ▪ Authors noted, "This experiment has attempted to focus on those elements that can reasonably be addressed in a medium fidelity simulator: speed choice, lane tracking, reaction times and situation awareness. All of these measures have shown that the concurrent engagement in a hands-free carphone task directly influence performance in a direction associated with a decrease in safety."

Reinfurt, D.W., Huang, H.F., Feaganes, J.R., and Hunter, W.W. (2001). *Cell Phone Use While Driving in North Carolina.* Chapel Hill, NC : University of North Carolina Highway Safety Research Center.	Describes a study that: (1) reviewed recent research – epidemiological studies, case analyses of cell-phone-related crashes, and driver performance studies; (2) reports on recent legislative activity regarding the use of cell phones while driving; (3) analyzed data from an observational study of cell phone use while driving in North Carolina; (4) pilot-tested the use of a supplemental data form by the N.C. Highway Patrol to report additional information on crashes when a cell phone was involved; and (5) analyzed police narratives for crashes where the use of a cell phone by the driver was indicated by the investigating officer.	• Observational Study in North Carolina to determine characteristics of drivers who use hand-held phones while driving revealed that: - 1,070 drivers were using cell phones among the 14,059 vehicles observed; - Cell phone usage was associated with front seat occupancy, vehicle type, and driver age, ethnicity and restraint usage; - Drivers who were using a cell phone while driving were more likely to be driving without a front seat passenger, driving a sport utility vehicle, younger, white, and using seat belts; - Cell phone prevalence rate is 3.1%, which is consistent with recent studies carried out nationally by NHTSA (3.0%) and by researchers in Texas (~5%). • The results of a pilot study with the NC State Highway Patrol where investigating Troopers completed a special cell phone-related form for crashes where a cell phone was being used indicated that about one in 600 crashes appeared to involve the use of a cell phone while driving. • Analysis of crash narratives for crashes occurring in North Carolina between 1/1/96 and 8/31/00 revealed that there has been "exponential growth" in frequency with which cell phone is mentioned in police narratives. - 22 in 1996; 35 in 1997; 53 in 1998; 111 in 1999; and 231 in first eight months of 2000 - Most common driver action was "talking on the phone" (46%) followed by "answering the phone" (15%) and "reaching for the phone" (10%). • Concluded that there is a "critical need for better information if the risk of crashing while talking on a cell phone is to be appropriately estimated."

Sagberg, F. (2001). Accident risk of car drivers during mobile telephone use. *International Journal of Vehicle Design, 26(1),* 57-69.	Describes a survey study of 9000 Norwegian drivers who had recently reported a crash to their insurance company. Drivers responded to questionnaires about mobile telephone use and other distractors during the latest crash incident.	• Found that 0.66% of guilty drivers and 0.30% of innocent drivers reported using the mobile telephone during the accident. Found that mobile telephones were used in 0.86% of accidents, which is 72% higher than expected proportion based on "induced exposure." • Found that the number of accidents during telephoning was too low for significant differences between hands-free and hand-held telephones to appear. • Found that rear-end collisions were the most frequent accident type when mobile phones were involved during an accident. • Found that both radios and CD players cause more accidents than the mobile telephone. • Found that about 50% of drivers reported using a mobile phone in the car at some time. Found that 28.6% of those drivers use hand-held phones, 11.2% use dash-mounted telephones (dialing without holding phone but hand-held conversation), and 10.8% of drivers used hands-free telephones. • Found that 27.4% of drivers with hands-free telephones receive or place calls more than three times per day, whereas 9.7% of those with hand-held telephones receive or place calls more than three times per day. • Found that mobile telephone use during driving is a "significant risk factor." • Found that while some accidents during telephone use are expected based on exposure [to driving] alone, the actual number of accidents is about 72% higher than the expected number, as estimated by the method of induced exposure. Concluded that increased risk most likely is the consequence of the telephone use *per se*, and is not attributable to differences in risk-related behavior between users and non-users of mobile telephones. • Found that the risk increase was statistically significant only for hand-held phones, however, it cannot be concluded from the data that hand-held phones entail a higher risk than hands-free phones, since no statistically significant difference was demonstrated.

Strayer, D.L., and Johnston, W.A. (2001). Driven to distraction: Dual-task studies of simulated driving and conversing on a cellular phone. *Psychological Science, 12 (6),* 462-466.

A set of two experiments designed to contrast the effects of hand-held and hands-free wireless phone conversations on a simulated driving task (visual pursuit tracking). While performing the tracking task, a green or red light would appear at points. Subjects were to respond to the red light by pressing a "brake" button on a joystick as quickly as possible. They performed the tracking task alone, and while engaged in a naturalistic conversation task with a confederate using either a hand-held or hands-free phone. The authors performed an "additional control condition" where they required subjects to listen to a book on tape as the dual-task. The second experiment incorporated differences in the difficulty of the simulated driving task, as well as verbal tasks for two dual-task conditions (no naturalistic conversations). One task was a shadowing task where subjects were required to repeat aloud words they heard read from a list at a rate of one word for every 3 seconds. The second dual-task was a word generation task, where subjects were required to respond with a new word beginning with the last letter of the word read by the experimenter.

Context
- Part-task driving simulation (tracking task only) – dual-task study

Independent Variables
- Two types of phones: Hand-held vs. hands-free
- Conversation vs. no-conversation
- Exp. 2: the two dual-tasks vs. the single task

Dependent Variables
- Response times
- Probability of a miss

- "Principle findings are that (a) when participants were engaged in cell-phone conversations, they missed twice as many simulated traffic signals [response cues] as when they were not talking on the cell phone and took longer to react to those signals that they did detect; (b) **these deficits were equivalent for handheld and hands-free cell phone users**; and (c) tracking error increased when participants used the cell phone to perform an active, attention-demanding word-generation task but not when they performed a shadowing task."
- The largest performance decrements were associated with the word-generation conversation task, but there were also decrements under the listening condition.
- Listening to radio broadcasts or listening to a book on tape did not disrupt simulated driving performance.
- Continuous shadowing of a verbal list using a handheld phone was also not disruptive, ruling out the dual-task interpretations associated with holding the phone, listening, or speaking.
- **Concluded that cellular phone conversation – handheld or hands-free – leads to significant degradation of simulated driving performance.**

Stutts, J.C. (2001). *Testimony for Presentation at the Subcommittee on Highways and Transit hearing on Driver Distractions: Electronic Devices in the Automobile (May 9, 2001).* Online at www.aaafoundation.org

See Also
Smith, E. (2001). *University of North Carolina Highway Safety Research Center Study on Distracted Driving : Outline of Results, Methodology, and Data Limitations (May 8, 2001).* **Online at www.aaafoundation.org**

Describes highlights and recommendations of study, awarded to be University of North Carolina Highway Safety Research Center by the AAA Foundation for Traffic Safety, to examine the role of driver distraction in traffic crashes. The goal was to identify (using both crash and field data) the major sources of distraction to drivers and the relative importance of the distractions as potential causes of crashes.

Work included analysis of five years of Crashworthiness Data System (CDS) data, made available by NHTSA's National Center for Statistics and Analysis. Also included analysis of crash narrative data from two years of both CDS and North Carolina data.

Limitations of the study:

- The study analyzed data from the CDS. "This data includes only information on crashes in which at least one vehicle was damaged severely enough to require towing from the scene.... It is important to note that the CDS data for this study was vehicle-based rather than crash-based, and thus almost certainly understates the role of driver distraction in crashes."
- Missing data: The CDS data has a high percentage if either missing, unknown, or other data. Driver attention status is unknown for almost 36% of the drivers, and the exact nature of distracted for 34% of the distracted drivers was not recorded. Thus, present estimates for ***known*** distracting events probably understate their true magnitude.
- Limited Sample Size: data may have large standard errors when weighted to reflect national estimates. The estimates for cell phone use are based on only 42 reported cases.
- Exposure Data: Cannot determine relative risk since it is unknown how much time drivers

- Found that while 8.3% of drivers were identified as distracted at the time of the crash. Of that number, found that 1.5% of distracted drivers were using or dialing a cell phone.
- Found that younger drivers (under 20 years of age) were the most likely to be involved in distraction-related crashes.
- Note "Our analysis was not intended to provide definitive answers as to which distractions pose the greatest risk to drivers."
- **"It is also important to consider the limitations of the CDS data. Despite the in-depth nature of the data collection activities, there is potential underreporting of distracted driving in general, as well as differential underreporting of specific distracting events. Crashes involving cellular phones offer a good example. Given the huge increase in reported ownership and use of cellular phones nationwide, one might expect an increase in the reported number of crashes involving cell phones over the five years covered by the analysis. No such increase occurred, however. The actual recorded number of cases involving cellular phones was 8 in 1995, 10 in 1996, 8 in 1997, 10 in 1998, and 6 in 1999. It may be that as more attention has been drawn to the potential role of cellular phone in unsafe driving and crashes, drivers have become less willing to reveal this information when involved in a crash. People may believe that admitting to cell phone use at the time of their crash put them in more legal or financial (insurance) jeopardy than admitting to spilling a cup of coffee or dropping a CD."**

Recommends "better crash data are needed to clarify and quantify the magnitude of the driver distraction problem and the relative contributions of different sources of driver distraction. Equally important, however, are empirical data on how often drivers engage in potentially distracting behaviors and what it is about these behaviors that increases crash risk. For example, does a particular distraction lead to reduced vehicle control (in the form of lane wandering, reduced headways, lower speeds, braking, etc.), reduced situational awareness (measured by eye gaze direction, longer response times, fewer mirror checks to monitor surrounding traffic, etc.), or both? To date, these kinds of data have primarily been collected in laboratory settings, but there is growing recognition that they also need to be collected in real-world driving environments,

Continued...

engage in various distracting activities.

with people driving their own vehicles."

Stutts, J.C. (2001). *Testimony for Presentation at the Subcommittee on Highways and Transit hearing on Driver Distractions: Electronic Devices in the Automobile (May 9, 2001).* Online at www.aaafoundation.org

Recommends that "More research is needed to document frequency, intensity, and consequences of real-world driver distraction. Understanding driver distraction is especially important in light of new in-vehicle technologies."

See Also

Stutts, J.C., Reinfurt, D.W., Staplin, L., and Rodgman, E.A. (2001). *The role of driver distraction in traffic crashes. Phase I Final Project Report.* Chapel Hill, NC : University of North Carolina Highway Safety Research Center.

- Found that for the overall 1995-1999 CDS data, 8.3% of the drivers were identified as distracted, 5.4% as "looked but did not see," and 1.8% as sleepy or asleep. 35.9% were coded as either unknown or no driver present. The remainder was classified as attentive at the time of their crash. Without the unknowns, 12.9% of drivers were identified as distracted, and the percentage of actual crashes involving distractions would be higher.
- Found that among the specific sources if distraction among distracted drivers, 1.5% of crashes were caused specifically by Using/Dialing a cell phone. Another 34.2% of distracted drivers were classified as "other" or "unknown" distraction.
- Found that younger drivers (under 20 years of age) were the most likely to be involved in distraction-related crashes.

Utter, D. (2001). *Passenger Vehicle Driver Cell Phone Use Results from the Fall 2000 National Occupant Protection Use Survey* (NHTSA Research Note DOT HS 809 293). Washington, DC: NHTSA.	This Research Note presents results based on the Controlled Intersection Study conducted in the Fall (October - November) 2000. Data collection for the Controlled Intersection Study consists of observing shoulder belt use in passenger motor vehicles. Observers were stationed for 45 minutes at each observational site. Shoulder belt use and other demographic information (age group, sex, and race) were obtained for drivers and passengers in passenger cars, pickup trucks, vans, minivans, and sport utility vehicles (SUVs). Additionally, the driver's use of a cell phone at the time of observation was also recorded. Only use of hand-held cell phones was included. Commercial and emergency vehicles were excluded. Every day of the week and all daylight hours (8 a.m. to 6 p.m.) were covered.	▪ **Nationally, overall hand-held cell phone use by drivers of passenger vehicles (Table 1) was estimated at 3 percent. This means that at any given time during daylight hours, about 3 percent of drivers of passenger cars, vans, SUVs, and pickups are actively using a cell phone.** ▪ The 2000 Motor Vehicle Occupant Safety Survey also estimated that 73% of drivers who said they usually have a wireless phone in their vehicle with them use a hand-held cell phone and an additional 22% use "hands-free" equipment. Extrapolating this result to the NOPUS hand-held cell phone observations results in **an additional 0.9 percent of drivers using "hands-free" cell phones for a total of 3.9 percent (or more than 600,000) of drivers actively using cell phones at any one time.**
Woo, T.H., and Lin, J. (2001). Influence of mobile phone use while driving. *IATSS Research, 25(2)*, 15-19.	A study initiated by the **Ministry of Transportation and Communications in Taiwan** to examine and investigate the influence of mobile phone use while driving in order to determine the legislation needs. Data were collected in four areas: driving reaction test using a simulator, accident reports, questionnaires to drivers involving an accident, and a general public opinion survey.	The authors reported the following: ▪ Results from the driving simulator test indicated that reaction times for drivers using mobile phones are significantly longer. Age and gender were found to affect reaction time. ▪ Results from the analysis of accident reports revealed: o 3,075 accident reports, of which either driver involved in the crash carried a mobile phone in 676 cases, and either driver involved in the crash was using the phone in 133 cases. ▪ Results from the questionnaires and public opinion surveys show that drivers who do not own mobile phones are more inclined to support the ban of using mobile phones while driving. However, whereas the majority of the general public is aware of the adverse effects of using a mobile phone while driving, only 44.2 percent of the responders supported a legislative ban. "Based on the conclusions from this study, the Legislative Yuan of Taiwan passed a law to ban the use of handheld mobile phones while driving in January 2, 2001. For a compulsory three-month campaign, the regulation will be in force from September 1, with a violation fine of NT$3,000 (approximate to US$90) for drivers and NT$1,000 for motorcyclists."

Hahn, R.W., Tetlock, P.C., and Burnett, J.K. (2000). Should you be allowed to use your cellular phone while driving? *Risk, 23(3),* 46-55. **See Also** **Hahn, R.W., and Tetlock, P.C. (1999).** *The Economics of Regulating Cellular Phones in Vehicles (Working Paper #99-9).* Washington, DC: The AEI-Brookings Joint Center for Regulatory Studies.	Economic analysis of regulatory options for addressing cellular phone usage by drivers.	• Concluded "banning drivers from using cellular phones is a bad idea." Also concluded that less intrusive regulation, such as requiring the use of a hands-free device that would allow a driver to use both hands for steering, is unlikely to be economically feasible. Authors base these conclusions on the following: – Estimate that costs of a ban are likely to exceed benefits. – Estimates of accidents and fatality reductions do not take into account how drivers would alter their behavior in response to regulation, which has implications for net reductions in accidents and fatalities. – Technology is moving toward voice activation, which is likely to reduce risks. • Recommends further research and collection of more systematic information regarding relationship between cellular phone use and crashes. • Also recommends research into how new technologies could reduce crash risks associated with drivers' using cellular phones.

Haigney, D.E., Taylor, R.G., and Westerman, S.J., (2000). Concurrent mobile (cellular) phone use and driving performance: task demand characteristics and compensatory process. *Transportation Research Part F, 3*, 113-121.

See Also
Haigney, D., and Taylor, R.G. (1998). *Mobile Phone use Whilst Driving: Phone Operation vs. Vehicle Transmission*. (Online at www.rospa.co.uk). Birmingham, UK: Royal Society for the Prevention of Accidents.

Investigated the effects of mobile phone use (handheld vs. hands-free) on driving performance in a simulator-based study with simulated vehicles featuring *manual* and *automatic* transmissions. Included 30 drivers – 13 men and 17 women. Mean age was 26.93 yrs old. Sixty-three percent of the subjects had previous experience using a mobile phone. The conversation task consisted of a modified version of the Baddeley grammatical reasoning test in which the subject is presented with 5 stimulus letters, followed by a statement regarding the relative ordering of two pseudo-randomly selected letters. The subjects were then asked to indicate if the statement was true or false.

Context
- Driving simulator featuring a standard road layout. Study employed a modified grammatical reasoning test to replicate demands of verbal comprehension.

Independent Variables
- Handheld vs. hand-free phone
- Manual vs. Automatic transmission

Dependent Variables
- Driving performance measures including acceleration, speed, braking, steering, following distance, number of gear changes, number of overtakes, number of off-road excursions, and number of collisions. In this study, as in other referenced research, speed and acceleration measures were associated with "risk acceptance" behaviors.
- Physiological measures such as heart rate.
- Found that changes in heart rate indicated increase in cognitive demand experienced by drivers when using mobile phones. Authors argue that the increases in cognitive demand lead to reductions in safety margins.
- Concluded that participants engaged in a "process of risk compensation, with driving speed being slower at times of mobile phone conversation while the number of off-road excursions (OFFS) and collisions remained stable."
- Found that using a phone, either hands-free or handheld – leads to variations in driver behaviors, which are strongly associated with subjective risk manipulation and crash involvement. Results showed significant variations in vehicle speed, decrement in driver responsiveness to traffic conditions, and decreased driver responsiveness following a phone call.
- Found no perceptible difference in attention deficit generated by drivers using handheld or hands-free phones – both seriously affected the driver's ability to consistently attend to the driving task.
- Found no identifiable difference in attention deficit between use of mobile phones with manual or automatic cars.
- **Concluded that "Whilst the emergency use of mobile phones is recognized as a significant benefit, the position stated in RoSPA (1997b) is maintained – namely that such calls do not need to be made whilst actively engaged in the driving task – and that it can only be recommended that drivers do not engage in polychronic phone use." Authors concluded that it is impossible to use a mobile phone while driving without being significantly distracted and without increasing the risk of a crash.**

Irwin, M., Fitzgerald, C., and Berg, W.P. (2000). Effect of the intensity of wireless telephone conversations on reaction time in a braking response. *Perceptual & Motor Skills, 90,* 1130-1134.	Using a laboratory based driving buck to mimic the foot activity in driving, 16 adults were instructed to release the accelerator pedal and depress the brake pedal as quickly as possible following the activation of a red brake light. The mean response time (RT) was measured for five (5) conversation conditions, ranging in conversation intensity, conducted on a wireless phone. The five conditions were: (1) no conversation (control); (2) listening to a weather report; (3) responding to questions with simple one or two word responses (e.g., what is your name); (4) responding to questions of greater depth of thought and use of memory (e.g., describe the rout to your residence from your current location; (5) responding to inquiries of personal opinions regarding emotionally charged issues (e.g., what are your views about abortion rights?). Context ▪ Simulated driving foot controls in a Lab Independent Variables ▪ Five conversation conditions listed above, including a control no-conversation condition. Dependent Variables ▪ RTs for foot-brake pedal response to a red-light stimulus onset while conversing.	▪ The mean RTs for the four conversation conditions was 98msec longer than the control condition. ▪ There were no significant differences for RT between the four conversation intensity conditions ▪ However there was a slight trend for longer RTs under the two more demanding conditions compared to the two less demanding conditions. ▪ The lack of an effect for the conversation intensity may reflect an inadequate manipulation of naturalistic conversations, or the laboratory setting.

Lissy, K.S., Cohen, J.T., Park, M.Y., and Graham, J.D. (2000). *Cellular Phone Use While Driving: Risks and Benefits.* Boston, MA: Harvard Center for Risk Analysis, Harvard School of Public Health.	Study to assess the risks and benefits associated with cell phone use while driving.	• The weight of the scientific evidence to date suggests that use of a cellular phone while driving does create safety risks for the driver and his/her passengers as well as other road users. The magnitude of these risks is uncertain… • Found that "It is not clear whether hands-free cellular phone designs are significantly safer than hand-held designs, since it may be that conversation *per se* rather than dialing/handling is responsible for most of the attributable risk due to cellular phone use while driving. • Found multiple benefits of using this communications device while driving – to users, households, social networks, businesses and communities. Benefits include public health and safety considerations. • Found that while cellular phone use while driving should be a concern of motorists and policymakers, and that there is evidence that using a cellular phone while driving poses risks to both the driver and others, it may be premature to enact substantial restrictions at this time. • Their review of international, state, and local legislative activity revealed uncertainty among policymakers about whether legislation should be passed to restrict or prohibit use of cellular phones while driving. Claim that the scientific evidence regarding risks is weak, and that benefits outweigh the risks. Claim that compared to other highway safety policies, a prohibition on the use of cellular phones while driving does not appear to be a relatively efficient way to save lives and prevent injuries. Note that this finding is preliminary since underlying database on costs, risks and benefits is weak and uncertain. • Recommended better crash data collection and education public programs on the prudent use of cellular phones while driving in order to enhance transport safety.

NHTSA Driver Distraction Internet Forum (2000). The site remains available as an information repository and can be accessed at http://www-nrd.nhtsa.dot.gov/driver-distraction/Welcome.htm	The National Highway Traffic Safety Administration (NHTSA) sponsored a virtual conference on the Internet (held July 5- August 11, 2000) to understand the risks from distraction associated with the explosive growth of in-car electronics. The Internet Forum provided an opportunity for technical experts and the public (both in the U.S. and internationally) to download research papers, ask questions, and share experiences regarding the use of in-vehicle devices (cell phones, navigation systems, wireless Internet, information & entertainment systems, night vision systems, etc.). Content on the site was organized into two basic areas: (1) Experience with technologies, and (2) Technical issues. The former provided opportunities for the driving public to share their experience with specific technologies in the context of driving and to provide their perspectives on basic issues related to their use. Discussions emphasized use of cell phones, navigation systems, night vision systems, wireless Internet, and information and entertainment systems. The "Technical Issues" section was devoted to general cross-cutting issues related to the safety impacts of in-vehicle technologies; five separate discussion areas were provided: Defining benefits and safety risks, Technical challenges associated with measuring distraction, Equipment design features and design solutions, Regulations, guidelines, and enforcement, and Safety campaigns and public education surrounding the safe use of in-vehicle technologies.	▪ In all, the site received over 23,000 hits with over 9,500 unique users and 2,600 registered guests. Discussions emphasized use of cell phones, navigation systems, night vision systems, wireless Internet, and information and entertainment systems. General crosscutting issues related to the safety impacts of in-vehicle technologies (benefits & risks, measuring distraction, equipment design features, regulations, guidelines and enforcement, safety and educational campaigns) were also discussed. ▪ Informal polls addressing a variety of issues were also used to stimulate discussion on key topics and provide a sense of the general feelings of Forum participants – results are not scientific and should not be interpreted as representatives of drivers in general. ▪ Nearly half of the comments posted on the site (46%) related to cell phones. Comments reflected perspectives from drivers impacted by others using cell phones, as well as from technology users themselves describing their own experiences with operating cell phones while driving. According to poll results, the overwhelming majority of participants (75%) felt it was not safe to talk on a cell phone while driving; indeed 74% of the poll respondents felt local governments should enact laws to restrict the use of these devices while driving. Even a majority of experienced cell phone users agreed that some form of restriction or regulation governing cell phone use while driving was needed. ▪ Many also felt that hands-free technology is not sufficient to address the safety concerns while driving, arguing that the conversation itself (or cognitive distraction) contributes to the underlying problem. Some even felt that hands-free technology could exacerbate the problem by encouraging cell phone use while driving. ▪ There was considerable disagreement, however, on what particular actions or steps are needed in order to preserve the benefits of cell phones without causing unsafe driver distraction. Education and safety campaigns, better equipment designs, standards, requirements for hands-free devices, bans on cell phone use while driving, and enforcement of existing laws were among the solutions proposed to address the distraction problem. ▪ Similar poll results are available for navigation systems, night vision systems, and other telematics.

Recarte, M., & Nunes, L. (2000). Effects of verbal and spatial-imagery tasks on eye fixations while driving. *Journal of Experimental Psychology: Applied, 6 (1),* 31-43.	Recarte and Nunes (2000) performed an on-road study that looked at the distribution of visual attention while performing verbal and spatial-imagery tasks. Recarte and Nunes (2000) used a head-free eye-tracker to measure visual attention, which they assumed reflected attentional states and changes. The verbal task was a word generation task and the spatial-imagery task involved mental rotation of letters and decisions about those rotated letters.	▪ The results showed that the spatial-imagery task resulted in longer fixation durations, or an 'eye-freezing' effect. Fixations were longest in the spatial task, followed by the no-task condition, and finally the verbal task condition. ▪ **The key result of the Recarte and Nunes (2000) study was the reduction of gaze variability with the spatial and verbal tasks. In other words, the 'attentional window' defined by the range of gaze fixations (both horizontally and vertically) was smaller when performing the secondary tasks. These reductions were on the order of 25% to 60%.** ▪ Recarte and Nunes (2000) also found a sharp reduction in mirror checking with the verbal and spatial tasks. ▪ Recarte and Nunes (2000) conclude that the differences between the verbal and spatial tasks support the multiple resource model of attention (Wickens, 1984). ▪ **CONCLUSIONS: Recarte and Nunes (2000) found a reduction in the 'visual inspection window' when drivers performed a verbal or spatial task while driving.**
Tokunaga, R.A., Hagiwara, T., Kagaya, S., and Onodera, Y. (2000). Cellular telephone conversation while driving: Effects on driver reaction time and subjective mental workload. *Transportation Research Record, 1724,* 1-6.	Investigated effects of handheld cellular telephone conversation on driver reaction time and subjective mental workload while following a lead car. Thirty-one Japanese drivers. Nineteen were young (mean age, 23.95 years; 16 male, 3 female) and 12 were elderly (mean age, 62.75 years; all male). All had a minimum of three years of driving experience, and experience using a cellular phone. Context ▪ On-Road, conducted on an expressway in Japan. Independent Variables ▪ Conversation Complexity (Simple vs. complex) ▪ Age (old vs. young) Dependent Variables ▪ Reaction time to lead car activating its hazard lights ▪ Subjective mental workload as determined by the NASA Task Load Index	▪ **Both simple & complex conversation while driving was associated with greater reaction times than driving alone.** ▪ No differences were found between age groups in terms of reaction time. ▪ Subjective mental workload was higher when receiving a call than when solely driving ▪ Subjective mental workload was similar for receiving a call and engaging in simple phone conversation, and was higher for complex vs. simple conversation. ▪ Subjective mental workload interacted with age and conversation complexity. For complex conversation, young drivers indicated a larger increase in workload than did older drivers.

Reed, M. and Green, P. (1999). Comparison of driving performance on-road and in a low-cost driving simulator using a concurrent telephone dialing task. *Ergonomics, 42(8),* 1015-1037.	The primary purpose of the Reed and Green (1999) study was to compare the driving performance results of the UMTRI driving simulator with those of an instrumented vehicle. Subjects drove on a route in the Ann Arbor area and then drove a simulation of the same route several weeks later, both while dialing a phone number and listening to a message. Therefore, the results of this study pertain more to the manual act of dialing than the cognitive load of conversation. Context ▪ Driving simulator and on-road Independent Variables ▪ Manual dialing vs. no-dialing (control) ▪ Age (old vs. young) Dependent Variables ▪ Lane-keeping ▪ Speed ▪ Steering measures (variability)	▪ **In general, subjects exhibited greater mean lateral speed and steering variability when dialing a phone compared *to* simply driving.** ▪ This effect was even greater for older compared to younger subjects. ▪ The comparison of the simulation to the on-road conditions revealed that the simulator results were much more variable in the phone condition compared to the on-road condition. ▪ **CONCLUSIONS:** lane keeping and speed control were less precise when dialing a phone compared to driving without dialing. These effects were amplified with older subjects and in the simulator compared to the instrumented vehicle. ▪ **This study is the only one to directly compare cell phone and driving performance in a simulator and on-road.**

Hancock, P., Simmons, L., Hasemi, L., Howarth, H., & Ranney, T. (1999). The effects of in-vehicle distraction on driver response during a crucial driving maneuver. *Transportation Human Factors, 1 (4),* 295-309.	Test-track study on the effects of phone use while encountering a critical event while driving. There were four tasks in this study, the first was a number memorization and recall task where subjects were required to memorize a seven-digit phone number presented on a simulated phone and then recall the number at the end of the trial (a lap on the track). This task was used to load working memory. Regarding the driving task, subjects were to maintain a consistent speed throughout the test-track lap (trial). Subjects were required to brake to a stop as quickly as possible before the intersection line in one third of the trials. Finally, subjects were required to perform a distractor task that involved responding to digits displayed on the phone as either a match or mismatch with the first number of the seven-digit number memorized before the trial. All combinations of driving without tasks, the distractor task, and the stopping tasks were included to constitute four conditions. There were two different track speed conditions as well, 20mph and 30mph. Context ▪ Test track Independent variables ▪ Distractor task (cell phone task) vs. control ▪ Track speed (20mph and 30mph) Dependent variables ▪ Brake response time ▪ Stopping time ▪ Stopping distance ▪ Stopping accuracy	▪ Found that subjects responded later when driving in the presence of the distractor task, but sooner when driving 30mph compared to 20mph. ▪ Subjects were able to stop faster when driving in the higher speed condition. ▪ Drivers exhibited a 24% decrease in safety margin stopping distance when driving with the distractor task. ▪ **CONCLUSIONS: Hancock et al. (1999) found that in the presence of a working memory distractor task, drivers braked harder and faster than when driving without the distractor task.**

Lamble, D., Kauranen, T., Laakso, M., and Summala, H. (1999). Cognitive load and detection thresholds in car following situations: safety implications for using mobile (cellular) telephones while driving. *Accident Analysis and Prevention, 31*, 617-623.	Evaluated drivers' abilities to detect lead vehicle deceleration while engaged in distraction tasks. After a desired headway of 50 m was attained, both vehicles proceeded on cruise control at 80 km/hr. Deceleration of the lead vehicle, at about 0.47 m/s^2, was achieved by releasing the cruise control, so presumably no brake signal was presented. The three in-vehicle tasks were a control task (watch vehicle ahead), a numeric keypad entry task (divided visual attention), and a cognitive task involving mental addition of verbally presented digits (non-visual attention). Nineteen subjects, aged 20-29 years old, drove a 30 km roadway section near Helsinki, Finland, while engaging in the three tasks (30 repetitions of each, in blocks of 10). The subject drove with the foot positioned over the brake and was to hit the brake as soon as deceleration of the lead vehicle was detected. Context ▪ On-Road study Independent Variables ▪ Distraction task: control (watch vehicle ahead), "phone dialing" (keypad entry), cognitive (mental arithmetic) Dependent Variables ▪ Response time (brake response) to detect lead vehicle deceleration ▪ Time-to-collision at detection of lead vehicle deceleration ▪ Lateral lane position (standard deviation of lateral acceleration) ▪ Performance on distraction tasks	▪ **Both the visual/motor task of "dialing" (keypad numeric entry) and the non-visual cognitive task (mental arithmetic with a memory component) significantly delayed recognition of the lead vehicle slowing.** ▪ The magnitude of the effects for the two distraction tasks did not significantly differ from each other. Recognition time (brake response time) increased by about 0.5 seconds and TTC at recognition decreased by 0.67 s for phone dialing and 0.95 s for the cognitive task (not significantly different). ▪ There was no significant effect of either task on lateral lane position. However, some "very noticeable" lateral movements occurred for some subjects; the authors suggest that individual differences may be important and should be studied regarding lane position. ▪ **The authors conclude that neither a hands-free phone option nor a voice-controlled interface would remove the impairment (or safety problems) when using a mobile phone in a car.**

Goodman, M., Bents, F.D., Tijerina, L., Wierwille, W., Lerner, N., and Benel, D. (1997). *An Investigation of the Safety Implications of Wireless Communications in Vehicles* (DOT HS 808-635). Washington, DC: NHTSA.	Comprehensive review of the cellular phone use while driving literature up to its publication. The report addressed four specific questions as follows: • Does use of cellular telephone technology while driving increase the risk of a crash? • What is the magnitude of the traffic safety problem related to cellular telephone use while driving? • Will crashes likely increase with increasing numbers of users of cellular telephone technology in the fleet? • What are the options for enhancing the safe use of cellular telephones by drivers?	▪ **"Based on the information collected it can be concluded that in some cases, the inattention and distraction created by the use of a cellular telephone while driving is similar to that associated with other distractions in increasing crash risk. Both the research studies and crash data reviewed in this report highlight several factors by which cellular telephone use while driving can increase the risk of a crash. Among these, conversation appears to be most associated with the crashes reviewed."** ▪ "Furthermore, it is clear that at this time there are insufficient data to indicate the magnitude of any safety-related problem associated with cellular telephone use while driving." ▪ "The data also suggest that as the use of in-vehicle wireless communications technology increases there will be an associated increase in related crashes if little changes. However, the accuracy of this prediction in either direction (i.e., increase or decrease in crashes) is uncertain, given the pace at which cellular telephone designs and the functions they can perform are changing. Such changes, along with state legislative initiatives and changes in wireless subscriber characteristics, virtually ensure that usage patterns will change over time and thus influence associated crash trends." ▪ The report offers a number of recommendations for addressing the broad range of issues identified: ▪ Improving data collection and reporting. ▪ Improving consumer education. ▪ Initiating a broad range of research to better define and understand the problem. ▪ Addressing issues associated with use of cellular phones from vehicles to access emergency services. ▪ Encouraging enforcement of existing state laws to address inattentive driving behavior. ▪ Working with states on legislative options. ▪ Using the National Advanced Driving Simulator (NADS) and instrumented vehicles to study optimal driver/vehicle interfaces. ▪ Developing a sound basis for carrying out cost benefit analyses.

Redelmeier, D.A., and Tibshirani, R.J. (1997). Association between cellular-telephone calls and motor vehicle collisions. *The New England Journal of Medicine, 336(7),* 453-458.	An epidemiological study that attempted to determine "whether using a cellular telephone while driving increases the risk of a motor vehicle collision." Considered survey data from 669 drivers who had cellular telephones and suffered substantial damage but no personal injury from a motor vehicle collision occurring between 1994-1995 in Ontario. Over the 14-month study period a total of 26,798 cellular-telephone calls were examined. They collected data on use of cellular phones, time of motor vehicle collisions, driver demographics, and recent history of cell phone activity. NHTSA found substantial flaws in the case-crossover analysis methodology used, including the implication of causality based on relative risk metrics. It is also noted that their study did not account for crashes involving injuries or fatalities, nor did their study account for drivers who had never experienced a crash while talking on a cellular telephone.	▪ Study reported an association between the use of cellular telephones in a motor vehicle and a quadrupled risk of collision during the call (i.e., relative risk of crash for users when on the phone versus not on the phone was reported to be 4.3). ▪ Authors "observed no safety advantage to hands-free as compared to hand-held unit telephones." ▪ Authors concluded that the associated, increased risk "appeared to be stronger for collisions on high-speed roadways than for collisions in … low-speed locations…" ▪ Report suggested that one possible explanation for collisions was result of driver's limitations with regard to attention rather than dexterity. ▪ Authors suggested that existing evidence supports policies that restrict use of both hand-held and hands-free telephones while driving, however, authors cautioned against interpreting *their* data as "showing that cellular telephones are harmful and that their use should be restricted."

Violanti, J.M., and Marshall, J.R. (1996). Cellular phones and traffic accidents: An epidemiological approach. *Accident Analysis and Prevention, 28(2),* 265-270.	Study that used epidemiological case-control design and logistic regression techniques to examine the association of cellular phone use in motor vehicles and motor vehicle crash risk. Data were obtained from 100 randomly selected [New York State] drivers involved in crashes within last 2 years and from a control group of 100 randomly selected [New York State] drivers not involved in crashes in last 10 years. Context ▪ Epidemiological case-control design, including use of official driving records and mail surveys – focus on presence or absence of factors rather than outcomes. Independent Variables ▪ Amount of time per month spent talking on the phone and 18 other driver inattention factors Dependent Variables ▪ Risk factors such as frequency of attention-diverting driving behaviors and other factors that might affect the association between cellular phone use and crashes.	▪ Found that talking more than 50 minutes per month on cellular phones in a vehicle was associated with an increase of 5.59 times the risk of traffic collision (i.e., odds ratio = 5.59). ▪ Found that the combined use of cellular phones and motor (e.g., drinking a beverage) and cognitive (e.g., watching the scenery) activities while driving were also associated with increased risk of traffic collision. ▪ Found that subjects who had been in crashes had spent twice the number of minutes per month talking on their cellular phones while driving, and that they appeared to engage in considerably more business and intense business calls. ▪ **Found that "cellular phone use as a single behavior may affect accident risk to a greater degree than many other in-car activities while driving."** ▪ Authors caution that study consists of small sample size, reveals statistical associations but not causal relationships, and does not conclude that talking on cellular phones while driving is inherently dangerous.

Alm, H., and Nilsson, L. (1995). The effects of a mobile telephone task on driver behavior in a car following situation. *Accident Analysis and Prevention, 27(5),* 707-715.	Study to investigate the effects of hands-free mobile telephone use on driver behavior in a car-following situation. Included 40 drivers – 30 men and 10 women. Two age groups - younger drivers (<60 years of age) with mean age of 29.3 yrs and elderly drivers (>60 yrs of age) with mean age of 67.6 yrs. Context ▪ Simulator (with moving base) study using a two-lane straight, asphalt road. Independent Variables ▪ With or without Conversation (Baddeley et al, 1985, Working Memory Span Test) ▪ Age (old vs. young) Dependent Variables ▪ Reaction time to lead car activating its brake lights ▪ Driver performance measures such as headway and lateral position ▪ Subjective mental workload as determined by a modified NASA Task Load Index ▪ Communication measures based on the telephone conversation	▪ **Found that drivers experienced longer reaction times and increased mental workload when using a hands-free mobile phone.** ▪ **Found that the headway (or following distance) of both younger and elderly drivers was not large enough to account for the increased risk caused by an increased reaction time.** ▪ Found that using a hands-free mobile telephone while driving in a car-following situation may increase the risk of an accident if something unexpected happens.

Brlem, V., and Hedman, L.R. (1995) Behavioral effects of mobile telephone use during simulated driving. *Ergonomics, 38(12),* 2536-2562.	The effects on driving performance of using a hands-free telephone were investigated in a pursuit-tracking task that simulated driving. Subjects drove for 20 min in each of three secondary task blocks with (1) a simple phone conversation about a familiar topic, (2) a difficult conversation incorporating a test of working memory, and (3) car radio tuning and listening. Half of the driving was performed with a slippery road surface for the simulation dynamics; the other half was on with a firm surface simulation. Driving behavior was classified into four activities: (1) driving on a clear road; (2) driving with obstacles; (3) driving with a secondary task – conversation; and (4) driving with a secondary task - device manipulation (both the radio and hands-free phone). Context ▪ Low-fidelity driving simulation (tracking task) Independent Variables ▪ Secondary task (radio, simple phone conversation, difficulty conversation) ▪ Road surface (firm and slippery) ▪ Activity (driving only, obstacles, communication, manipulation) ▪ Gender and age groups (19-26 and 40-51) Dependent Variables ▪ Road position (tracking accuracy) ▪ Number of collisions with obstacles (barriers off the path) ▪ Driving speed	▪ Overall, the slippery surface resulted in lower driver performance than any other factor. ▪ For driving on the slippery surface, driving performance deterioration was especially marked during device manipulation, the radio in particular compared to the hands-free phone. ▪ Driving during an easy phone conversation was associated with the least performance decrement. ▪ In general, male drivers exhibited better control while driving under difficult conditions. ▪ Age was not a contributing factor to any results. ▪ The authors conclude that "simply conversing over a hands-free telephone while driving does not in itself impair performance. However, **a difficult conversation may affect the driving adversely, and any prolonged manipulation of the telephone is liable to produce a performance decrement, particularly under conditions that put heavy demands on the driver's attention and skill."**

McKnight, A.J., and McKnight, A.S. (1991). *The effect of cellular phone use upon driver attention.* Online at www.aaafoundation.org. **See Also** **McKnight, A.J., and McKnight, A.S. (1993).** The effect of cellular phone use upon driver attention. *Accident Analysis & Prevention, 25(3),* 259-265.	Examined the effect of cellular phones on driver performance in a simulator study using a 25-minute video driving sequence containing 47 situations to which drivers would be expected to respond. Included 151 subjects who performed three cell phone tasks (placing a call, carrying on simple and complex conversations), as well as a radio tuning task and a baseline-driving task. Context ▪ Simulator study. Independent Variables ▪ Type of phone task ▪ Age - younger drivers aged 17-25, middle drivers aged 26-49, and older drivers aged 50-80 Dependent Variables ▪ If driver responded and Response time	▪ **Found that all of the distractions led to significant increases in both the number of situations to which the drivers failed to respond and the time it took to respond to them.** ▪ **Found that greatest level of distraction due to complex conversation.** ▪ Found that smallest level of distraction due to simple conversation. ▪ Found that there were no significant differences in performance between placing a phone call and carrying on simple conversation, but placing a call resulted in delayed responses to the same degree as carrying on complex conversation. ▪ **Found that relative increase in chances of a highway-traffic situation going unnoticed ranged from approximately 20% for placing a call in simple conversations to 29% for complex conversations.** ▪ **Found that older drivers were twice as likely to fail to notice some highway-traffic situation while calling or conversing on a cellular phone.** ▪ Concluded "while a cellular telephone conversation is no more distracting than a conversation of the same intensity with a passenger, the availability of a cellular phone is almost certain to increase significantly the number of conversations in general and the more distracting, intense, business conversation in particular. Older drivers should be cautioned against placing calls."

Transport Canada (2002). Strategies for Reducing Driver Distraction from In-Vehicle Telematics Devices: A Discussion Document. Report No. TP 14133 E, Ontario, Canada. Retrieved on June 19, 2003: http://www.tc.gc.ca/roadsafety/tp/tp14133/en/menu.html	Report discussion the telematics issue (including other telematics than just cell phones) and potential regulatory and non-regulatory approaches to dealing with the issue. The focus was to obtain detailed information on what industry is currently doing or planning and to understand what federal interventions are feasible, appropriate and expected by Canadians. *"A number of complementary efforts are envisioned, including the publication of this discussion document defining the problem and outlining possible regulatory and nonregulatory responses. The status quo may not be viable since there appears to be insufficient effort on the part of the industry to manage the risk."*	"Non-regulatory approaches could include public awareness initiatives and a Memorandum of Understanding (MOU) between government jurisdictions and industry. An MOU might require manufacturers to implement a driver-system integration design process to minimize the potential adverse safety consequences of in-vehicle telematics. Alternatively, the Department could publish an advisory outlining the driver-system integration design process that manufacturers should adopt." "Regulatory initiatives could include requiring the disabling of access to entertainment systems (e.g., DVDs), telecommunication or other telematics devices in moving vehicles, having safer limits on visual distraction, and prohibiting open-architectures that would allow the use of untested after-market 'plug-and-play' type applications."
Alberta Motor Association. (2002). *Hands-free cell phones as dangerous as hand-held for drivers (News Release dated 8 April 2002).* Available at http://www.ama.ab.ca.	Press release citing dangers of cell phone use while driving, whether hand-held or hands-free. Includes brief summary of policy statement of the Alberta Motor Association regarding use of cell phones while driving.	**"AMA policy recommends that you pull off the road to a safe place such as a parking lot or roadside turnout to take or make a call. Leave your cell phone turned off while driving and use a messaging service to ensure important calls are not missed. Check for calls the next time you stop."** ***Notes that the AMA has not taken a position on a legislated ban.***

National Safety Council (2002). Multitasking Statement. Online at *www.nsc.org/news/policy/multitasking.htm*	**Policy and recommendations regarding cell phone use while driving.**	**The policy of the National Safety Council regarding multitasking while driving:** **"The National Safety Council acknowledges that states have laws that prohibit distracted driving and that no one has a right to put others at risk."** **"The Council recognizes that electronic devices such as cell phones provide extraordinary benefits to public safety and productivity. However, a driver's first responsibility is the safe operation of the vehicle and that best practice is to not use electronic devices including cell phones while driving. When on the road, drivers shall concentrate on safe and defensive driving and not on making or receiving phone calls, delivery of faxes, using computers, navigation systems, or other distracting influences. When a driver decides that it is safe to use such a device while driving, it should be with the understanding that negligent drivers be held accountable when distracted driving results in the injury or death of others."** ***"Furthermore, the National Safety Council supports restrictions that prohibit all non-emergency use of electronic devices including cell phones by teenage drivers during their graduated licensing period."*** ***"The National Safety Council calls on producers and providers of electronic devices and services to undertake a substantial educational campaign to inform the public of the safe operation of electronic devices, emphasizing both the risks and the benefits. The Council also recommends that employers assess whether to allow employees to use such devices while driving, and if so, what sensible restrictions should be followed."***
Department of the Environment and Local Government (2002). *Statutory Instruments No, 93 of 2002: Road Traffic (Construction, Equipment and Use of Vehicles) (Amendment) (No. 2) Regulations, 2002.* (Online at www.environ.ie/press/si93of2002.pdf). Republic of Ireland: Government Supplies Agency.	**Regulation** on use of mobile phone while driving – bans use of mobile phones while driving in Ireland. Applies to handheld mobile phones and does not extend to fixed hands-free mobile phones.	**"The driver of a mechanically propelled vehicle that is in a public place, shall not hold or have on or about their person, a mobile phone or other similar apparatus while in the said vehicle, except when it is parked."**

Direct Line Insurance plc (2002). *The Mobile Phone Report: A report on the effects of using a 'hand-held' and 'hands-free' mobile phone on road safety.* (Online at www.directlinegroup.com). Surrey, UK.	**Provides policy statement.**	**Direct Line 'Drive Safely' policy – putting safety first** ▪ **"Although you may think that a hands-free phone allows you to keep in control of your vehicle your mind may not be fully on driving. It is not like talking to a passenger who will be more aware of traffic conditions and can see what is happening while you are driving."** ▪ **"Talking on the phone distracts your attention from the road and can lead to an accident. Never use a mobile phone. Even using a hands-free phone is distracting."** **Direct Line strongly believes that all employers have a responsibility to offer clear instruction to their staff not to use hand-held or hands-free phones when using company vehicles.**
Illinois Department of Transportation (2002). *May I have your attention please: The dangers of distracted driving and how to prevent them.* State of Illinois: Division of Traffic Safety, Illinois Department of Transportation. www.cyberdriveillinois.com	**Recommendations to driver.**	***Recommendations to driver.*** ***If you need to use your cell phone when driving, pull off the road and stop in a safe place before using your phone.*** *How to avoid being distracted – Stay focused, Pay attention.* *Limit interaction with passengers: avoid talking while driving; avoid taking your eyes off the road; and keep both hands on the wheel.* *Don't drive when angry or upset – Emotions can interfere with safe driving. Wait until you have cooled down or resolved problems to drive.*
Insurance Information Institute (2002). Cell Phones & Driving. New York, NY. Online at *www.iii.org/individuals/auto/lifesaving/cellphones/.*	**Recommendations to driver.**	***Recommendations to driver.*** ***"If you must talk while you drive, the safest way is to have a hands-free cell phone cradle installed in your car so you can speak while driving with two hands. Even so, remember to stay aware of what is going on around you on the road. It's easy to get so engrossed in conversation that you miss exists or don't notice what other drivers are doing. Better yet, wait until you have arrived at your destination or pull over to the side of the road to begin your cell phone conversations."***

Royal Society for the Prevention of Accidents (RoSPA, 2002). *Mobile Phones and Driving Fact Sheet.* (Online at www.rospa.co.uk). Birmingham, UK: RoSPA.	Describes current RoSPA policy and **recommendations for drivers and employers** regarding cell phone use while driving and 1997 RoSPA international review of research about effects of using mobile phones while driving.	**"RoSPA Policy"** **"No *driver* should use a mobile telephone or any similar piece of telecommunications equipment (whether hand-held or hands-free) while driving."** **"Such use is likely to distract the driver from the main task of managing the vehicle in a safe and competent manner and be prejudicial to road safety. Calls should not be made or received while on the move. Ideally, an interlock should be integral in all such equipment so that it is rendered inoperable while the vehicle is moving. Where this is not possible, it is recommended that all telecommunications equipment is switched off while the driver is driving."** **"Employers are recommended to incorporate this policy within their own rules governing company drivers. Vehicles are intended to transport their occupants and goods to their destinations(s) and any temptation to turn vehicles into "mobile offices" should be resisted."** **Recommends that employers should** ▪ ***"Never 'require' staff to be available on mobile phones while they are driving*** ▪ ***Provide clear guidelines about how, when and where it is appropriate (and safe) to use mobiles (this should include the elements detailed below under 'drivers')*** ▪ ***Make sure all equipment issued by the company has 'message facilities"*** ▪ ***Consider carefully before fitting and requiring drivers to use 'hands-free' kits*** ▪ ***Carry out regular checks to ensure compliance with company policies and practices*** ▪ ***Risk-assess driving and vehicle use; and check for and limit the tendency toward the 'mobile-office.'"*** **Recommends that drivers** ▪ ***Make sure you have activated the 'message facility' on you mobile phone*** ▪ ***Switch off the phone before you start the engine*** ▪ ***Never make or receive calls while driving***

Continued –

Royal Society for the Prevention of Accidents (RoSPA, 2002). *Mobile Phones and Driving Fact Sheet.* (Online at www.rospa.co.uk). Birmingham, UK: RoSPA.

See Also

Royal Society for the Prevention of Accidents (RoSPA, 1999). *Mobile Phones and Road Safety.* Birmingham, UK: RoSPA.

- ***Check for messages and deal with any calls once you are parked***
- ***Asks questions about safety and risk before accepting and using a 'hands-free' phone***
- ***Guard against the distraction of your vehicle becoming a 'mobile office'***

RoSPA states that it has "never suggested that mobile phones should be banned from vehicles, that they should never be used in vehicles, nor that passengers should not use them. The only caveat to this last element is the degree of driver distraction which the passenger's use of the phone might generate. The Society's stance is, and has always been, that they should never be used by the driver when driving."

The 1997 RoSPA review revealed that when using either a hands-free or handheld phone, drivers "fail to maintain touch with traffic conditions and

- Significantly vary their road speeds – out of sync with prevailing traffic,
- Fail to maintain headway, and
- Wander in their lane."

Review also indicated "while making or receiving a call, drivers attempt to maintain a 'normal telephone conversation' to the detriment of their driving. They frequently do not admit that they are driving, and the caller may not realize where they are or what they are doing."

In addition, review found that "even using a hands-free phone while driving an automatic car significantly distracted the driver."

Transport Canada (2002). *Fact Sheet RS 2001-06 (TP 2436E, Dec 2001).* Online at *www.transportcanada.com.*	Describes current Transport Canada policy and recommendations for drivers regarding cell phone use while driving.	**Policy - "Transport Canada recommends against using cell phones while driving. It is distracting and increases the risk of collision. Your primary concern is the safe operation of the vehicle."** ***Recommendations to drivers:*** • ***Turn the phone off before you start driving. Let callers leave a message.*** • ***If there are passengers in the vehicle, let one of them take or make the call. If you're expecting an important call, let someone else drive.*** • ***If you have to make or receive a call, look for a safe opportunity to pull over and park.*** ***If for some reason you have no alternative but to use a cellular phone while driving, here are some tips:*** • ***Use only a speakerphone or a hands-free phone. Make sure you put on the hands-free accessories before you start driving. But be aware: hands-free is not risk-free.*** • ***If you must use a hand-held phone, place it where it will be readily accessible. Trying to retrieve a phone from a briefcase, handbag or pocket can be especially dangerous.*** • ***Don't answer the phone until you have checked that it is safe to do so.*** • ***Use speed dial options. If you know you will need to call an unprogrammed number, dial the number before starting off and send the call at your convenience.*** • ***Driving and talking on a phone at the same time is difficult. Don't make it worse by trying to read or take notes. Do pull over and stop.*** • ***Keep calls short and factual. Emotional or thought-provoking conversations are distracting. Recent research suggests that decisions made while driving and talking on a cell phone are not always good decisions.*** • ***It's good etiquette to ask a caller to hold until you can park, or to say you'll return the call as soon as it's safe to do so.*** • ***Stay in the right-hand lane, where driving may be less demanding.*** • ***When reporting an emergency situation from a cell phone, pull over and ensure you are not in the flow of traffic. If you must keep driving, remember your primary concern is to avoid causing another emergency.***

Canada Safety Council (2002). *Driven to Distraction* (on CD-ROM). Ontario, Canada: Canada Safety Council. (Available on-line from *www.safety-council.org)* **See also** **Burns, P.C. (2003, May).** Driver Distraction from Cell Phones and Other Devices. Presented at AIM 2003 – Emerging Trends (Automotive Insurers and Manufacturers Forum), Toronto, Canada.	CD-ROM with 10-minute video message providing guidance to drivers on driving and driver distraction. Discusses "driver inattention" and "distraction or distractibility." Identifies three types of distractions – Environmental, Situational, and Psychological. "Driven to Distraction reminds all drivers – novice to experienced – that behind the wheel, safety is the number one priority."	The goal of the program is to help people avoid traffic collisions. "By recognizing when the are distracted, they can better manage and minimize potential distractions." *"Driven to Distraction* is designed to draw attention to one of the major causes of traffic collisions – driver inattention or distraction. The program has been reviewed by a technical advisory panel made up of leading experts and researchers in the field of highway safety and is designed to help drivers: ▪ Recognize when and how frequently they are distracted while driving; ▪ Identify sources of routine driver distractions; ▪ Understand that behind the wheel, safety is the first priority; ▪ Develop techniques and strategies to manage distractions." Environmental Distractions: Passengers "Any passenger can be a distraction for a driver, especially for novice drivers. For them, everything about the driving task is distracting because it is new." "In the case of more experienced drivers, however, passengers can either be a distraction or a help, i.e., assisting with directions or placing phone calls. The trick is to realize when the passenger – any passenger is a distraction and do something about it." Situations Distractions: Talking on a cell phone "…using cellular phones can be as distracting as other activities while driving. However, many may not be aware that the mechanical issues of cell phone use – i.e., dialing, holding a phone, etc. – are not the only element of distraction. The nature of the conversation is also an issue. Intense, complex, and emotional conversations take the driver's mind off the road. Drivers should learn to use their cell phone's safety features such as voice-activated dialing and hands-free devices, and also to use sound judgment on when to make or take a call."

Continued -

Canada Safety Council (2002). *Driven to Distraction* (on CD-ROM). Ontario, Canada: Canada Safety Council. (Available on-line from *www.safety-council.org)*

Psychological Distractions: Coping with Anxiety and Mental Stress
"… as they [drivers] get stressed, they are less likely to pay attention to even the basic steps of driving."
"The greater the levels of anxiety and stress, the more likely we are to become aggressive behind the wheel or to take shortcuts."
"In each instance, letting stressful activity control your actions increases the risk of an accident."

Guidance to the driver:

- *Keep your focus on driving and don't let passengers become a distraction;*
- *Postpone intense, emotional or complicate cell phone calls until the car is stopped. If you need to use your cell phone while driving, make sure conditions are safe and keep your conversations brief;*
- *By recognizing and eliminating common distractions, we can better manage and minimize the potential for collisions;*
- *Driver distractions affect everyone. This is not something that happens with new or "reckless" drivers.*

See also

Canada Safety Council (March 7, 2002). *Opinion Letters – Banning cell phones would be irresponsible (signed Emile-J. Therien, President).* (Available on-line from *www.therecord.com)*

Opposes ban on cell phone use while driving.

"The inappropriate use of cell phones by drivers is part of a serious traffic safety problem – distractions can be dangerous for anyone behind the wheel. **Some say the solution is to ban drivers from using cell phones. The Canada Safety Council disagrees."**

"A cell phone ban would be counterproductive, irresponsible and unenforceable."

Canadian Wireless Telecommunications Association (2002). *Safety: Your most important call.* (Online at www.driveresponsibly.ca)	Pamphlet to provide guidance on driving and using a wireless phone. Also packaged with the *Driven to Distraction* CD-ROM available from the Canada Safety Council.	Guidance to the driver: ▪ *Safe driving is your first priority.* ▪ *Use a hands-free device to make it easier to keep both hands on the wheel.* ▪ *When dialing manually, dial only when stopped. Or, have a passenger dial for you.* ▪ *Do not engage in stressful of emotional conversations that may divert your attention from the road.* ▪ *Program frequently called numbers into the speed dial feature of your phone for easy, one-touch dialing, or use auto answer or voice-activated dialing services (when available).* ▪ *Never take notes while driving.* ▪ *Let voice mail pick up your calls when it's inconvenient, unsafe to answer the phone or driving conditions become hazardous.* ▪ *Be a Wireless Samaritan. Call 9-1-1 to report any crimes, life-threatening emergencies, accidents or drunk drivers.*
Tunbridge, R. (2001). Mobile phones and driving – the UK perspective on government policy. *International Journal of Vehicle Design, 26 (1),* 96-99.	Overview of a 1998 review study conducted by the Transport Research Laboratory (TRL) in the UK to look at the evidence for any road safety risk of the use of mobile phones within vehicles, with special attention to the comparison of hand-held and hands-free equipment. The article also includes a discussion of the Great Britain Policy on the use of mobile phones and driving.	▪ The 1998 TRL study concluded, "The use of hand-held mobile phones whilst driving was widely regarded as unsafe. Studies into the road safety implications of using hands-free phones whilst driving suggested that the distraction effect reduced as they were made easier to use. However, distraction caused by the mental effort of the telephone was present." ▪ **The GB policy states: "Never use a hand-held phone while driving" and "It is safer not to use a hands-free phone while driving."**

Department for Transport, Local Government and the Regions (1999). *The Highway Code* (Online at *www.roads.dltr.gov.uk/roadsafety/hc*). United Kingdom.	Describes the rules for all road users in the United Kingdom: pedestrians, horseriders and cyclists, as well as motorcyclists and drivers.	**General rules, techniques and advice for all drivers and riders: General Advice** **127. "You MUST exercise proper control of your vehicle at all times. Never use a hand held mobile phone or microphone when driving. Using hands free equipment is also likely to distract your attention from the road. It is far safer not to use any telephone while you are driving – find a safe place to stop first.** ***Laws RTA 1988 sects 2 & 3 & CUR reg 104.***
Department for Transport as cited in **Farrell, N. (2002).** *Drivers face mobile phone ban.* Available on www.aaafoundation.org. Original source VNUNet.com.		***"The UK Government is considering banning motorists from using mobile phones while driving.*** ***The Department for Transport may permit the use of hands-free kits, as well as the use of mobile phones by passengers, but drivers would not be able to use hand-held phones even while stopped at a traffic light or in a traffic jam.*** ***Although drivers who use hand-held phones can already be prosecuted for failing to have proper control of their vehicle, the Government believes that a specific law against using a cell phone while driving should be introduced.*** ***Road safety minister David Jamieson is seeking views from interested parties before 25 November."***

Department of the Environment, Transport and the Regions (1998). *Mobile Phones and Driving* (online at www.dtlr.gov.uk/campaigns/mobile.index.htm). United Kingdom.	**Provides guidance to the driver and employers regarding use of mobile phones while driving.**	Guidance to the driver: ▪ *"It is unsafe for a driver to use a hand-held mobile phone."* ▪ *"Making or receiving a call, even with a hands-free phone, can distract your attention from driving and could lead to an accident."* ▪ *"Responsibility for the safe control of a vehicle always rests with the driver."* ▪ *"Never use a hand-held phone while driving."* ▪ *"It is safer not to use a hands-free phone while driving. Conversations using hands-free equipment can distract your attention from the road."* Guidance to the employer: ▪ *"Do not ask your staff to carry out two demanding tasks at the same time – your employees should not be expected to use a phone while driving."* ▪ *"If you or your customers need to contact staff while they may be driving, ensure that you provide hands-free equipment with voicemail or call divert facilities and encourage your staff to stop regularly to check for messages and return calls."* ▪ *"The emergency services, taxi drivers and couriers often need to be contacted while on the road. Where contact is unavoidable, it is safer if the vehicle is fitted with hands-free equipment and communication is kept to a minimum."*

AAA (2002). AAA promotes cellular phone safety. Online at *www.aaamidatlantic.com/*	**Recommendations** regarding cell phones while driving.	***"Cellular phones provide a wide range of safety benefits for traveling motorists. Whether requesting emergency road service or reporting a dangerous driver, cellular phones provide a large measure of safety and security, comfort and convenience.*** ***"But with that convenience comes added responsibility. Safe driving requires caution, courtesy, common sense, and alertness under any conditions.*** ***"'For most drivers, anything that is a distraction – a passenger, the radio, or your cellular phone – can get in the way of your concentration," said Melissa O'Neill Walczak, spokesperson, AAA Mid-Atlantic. 'But there are ways to minimize the distraction.'*** ***"To help increase concentration while driving with a cellular phone:*** • ***Place calls while stopped or have someone dial for you.*** • ***Use the cell phone in the 'hands-free' mode.*** • ***Avoid intense or complicated conversations.*** ***"Some other useful safety tips for cellular phone users:*** • ***Always buckle up.*** • ***Always assess traffic conditions before placing a call.*** • ***Give driving your full attention.*** • ***Ensure that the phone is within easy reach.*** • ***Use 'memory dial' to minimize dialing time.'"***

Curry, D.G. (2002). In-Vehicle Cell Phones: Fatal Distraction? Real or potential problem? *Transportation Safety, March 2002*. Available online at www.asse.org/cellfatal.htm.	Article that proposes alternative solution to the problem, and cites publicly available facts and figures in order to place the problem in perspective.	• Concludes that "while some degree of risk is associated with in-vehicle cell phone use, the current state of knowledge regarding its level does not indicate that it is significantly greater than that experienced during the course of normal driving while performing other socially acceptable in-vehicle tasks." • Further research comparing spectrum of distracting activities. • Suggests caution in considering legislation, especially in light of developing technologies such as adaptive cruise control, lane departure warning systems, and forward collision warning systems. Notes that such devices address the primary effects of driver distraction – lane position variability, speed variance, and failure to detect forward obstacles. Questions whether it is "reasonable" to "forbid drivers to operate cellular or other devices in vehicles that are equipped to compensate for driver distraction regardless of its cause". • Suggests program of education combined with vigorous enforcement of existing laws in order to combat distracted driving.

Verizon Wireless (2002). *Safety Tips.* Online at *www.verizonwireless.com.*

Recommendations for cell phone use while driving.

Your safety is our first priority.

For your well-being and the well-being of those around you, please follow these simple safety recommendations while driving. Some of these safety tips are not only sensible, but mandatory. Before using your wireless phone, please familiarize yourself with the regulations in your area.

1. ***When behind the wheel, safe driving is always your first responsibility.***
2. ***Dial your phone when your car is not in motion.***
3. ***Always use hands-free when driving and talking. When you turn your phone on, make sure your hands-free device is on and working.***
4. ***Pre-program important and frequently-dialed numbers, including home and babysitter, so you can dial them by pressing only a few buttons.***
5. ***Never take notes or write down phone numbers while driving. Rather, pull off the road to a safe spot or leave yourself a message on your voice mail system.***
6. ***Know your wireless phone number so emergency personnel can call you back. You may want to write it down and keep it in your car for quick reference.***
7. ***If traffic conditions warrant your undivided attention, turn your phone off, and let calls go to Voice mail or activate Call Forwarding.***

American Society of Safety Engineers. (2001). *American Society of Safety Engineers Position Statement on the Use of Electronic Devices in Motor Vehicles and Safe Driving Practices (October 25, 2001).* Online at www.asse.org/ngposi9.htm.

ASSE's position on legislating the use of cellular phones while driving.

"The Society's view is that operating a vehicle while using a cellular phone is a potentially unsafe act. All drivers should be cognizant of the hazards associated with such behaviors."

"ASSE's view is that specifying cellular phones in legislation and regulation may not be the best route to take in addressing this issue. For example, the same argument against cellular phones also holds true for a vehicle operator who drives in an unsafe manner while eating, drinking, putting on makeup, reading a newspaper, operating any other electronic device, or some other type of distracting activity where the driver's mind, eyes, and hand(s) are engaged elsewhere than the road ahead and the steering wheel."

"Clearly better crash data are needed to clarify and quantify the magnitude of the driver distraction problem and the relative contributions of different sources of driver distraction."

Makes following recommendations:

- "More public outreach to reinforce to the public that a driver's first responsibility is the safe operation of a vehicle. This includes school-based driver education."
- "Examination of state driver licensing processes to ensure all applicants understand the tenets of safe driving in addition to understanding state driving regulations."
- "Evaluation of employers' current practices; creation and enforcement of written guidelines addressing employee use of electronic devices while driving."
- "Proactive training of employees about appropriate operation of electronic devices."
- "Increased research by the automotive industry and the manufacturers of electronic and other devices that are routinely used in vehicles to improve designs and functions to eliminate driver distractions."
- "One of the tenets of the ASSE position for traffic safety is the need for improved driver education. This is a significant component in securing safety on the highways and in addressing the hazards of using cell phones while driving. Driver education should include training about elimination, or at least minimizing, driver distractions."

Cellular Telecommunications & Internet Association (2001). *Testimony of Tom Wheeler before the U.S. House of Representatives Transportation and Infrastructure Highways and Transit Subcommittee (May 9, 2001).* Washington, DC.CTIA. See Also **CTIA (2001).** CTIA's position on reinforcing the responsible use of wireless phones while driving. Online at *www.wow-com.com/consumer/issues/driving*	CTIA's position on reinforcing the responsible use of wireless phones while driving.	"Wireless phones are the greatest safety tools invented since the creation of 911 itself." "A wireless phone out of all potential driver distractions is the only one that could possibly save your life or the life of another." "Today in the United States there are over 100 million wireless users making over 120,000 emergency calls a day. That's one every 1.4 seconds." "These calls ensure that emergency responses to life-threatening accidents are expedited and that drunk, impaired and aggressive drivers are reported to the police and taken off of America's streets and highways." "The wireless telephone industry believes that education is key in addressing the issue." ***"CTIA encourages Congress to take a three-pronged approach in addressing the inattentive driving issue: 1) additional [crash] data collection [on any in-vehicle distraction], 2) enforcement of current reckless and careless driving laws, and 3) education."***

Cellular Telecommunications & Internet Association (2001). *The wireless telephone industry recognizes that drivers face many distractions in the car; Please don't let your wireless phone be one of them* (pamphlet). Online at *www/wow-com.com.*

Tips for drivers

The Cellular Telecommunications & Internet Association's Ten Tips to using Your Phone Responsible and Safely While Driving

Safe driving is your first responsibility. Always buckle up and keep your hands on the wheel and your eyes on the road. ***The wireless industry encourages callers to use a hands-free device or speakerphone while driving.*** *Users are also encouraged to keep their calls brief and to employ the memory dialing function on their phones to minimize the potential distraction. Remember that state laws already prohibit distracted driving!*

1. *Get to know your wireless phone and its features such as speed dial and redial.*
2. *When available, use a hands-free device.*
3. *Position your wireless phone within easy reach.*
4. *Let the person you are speaking with know you are driving if necessary, suspend the call in heavy traffic or hazardous weather conditions.*
5. *Do not take notes or look up phone numbers while driving.*
6. *Dial sensibly and assess the traffic; if possible, place calls when you are not moving or before pulling into traffic.*
7. *Do not engage in stressful or emotional conversations that may divert your attention from the road.*
8. *Dial 9-1-1 or other local emergency numbers to report serious emergencies – it's free from your wireless phone!*
9. *Use your wireless phone to help others in emergencies.*
10. *Call roadside assistance or a special non-emergency wireless number when necessary.*

Joint State Government Commission, General Assembly of the Commonwealth of Pennsylvania (2001). *Driver Distractions and Traffic Safety (2000 Senate Resolution No. 127, Printer's No. 1935).* Harrisburg, PA: Joint State Government Commission	Study into recent research surround issue of driver distraction and traffic safety, includes recommendations to the General Assembly.	▪ Cites statistics that indicate "Of all distractions identified as primarily or contributorily causing a crash in Pennsylvania during 1999 and 2000, cell phones represented 5.2 percent of those distractions." ▪ Suggests "According to crash statistics from Pennsylvania during 1999 and 2000, other occupants caused approximately twice as many distractions leading to crashes as cell phones so that a ban of wireless conversations doesn't seem promising when personal conversations with other occupants would presumably remain unabated." ▪ ***Based upon it's review of the current state of research, the Joint State Government Commission for the General Assembly of Pennsylvania made the following recommendations:*** – ***"A statutory or regulatory restriction on specific driver distractions does not yet appear to be warranted based upon available data. Should future data demonstrate the necessity of a restriction, its application and enforcement should be uniform statewide."*** – ***"To contribute to consistent collection of reliable crash data nationally, Pennsylvania's Department of Transportation should adopt the voluntary criteria known as Model Minimum Uniform Crash Criteria, which are expected to be revised next year."*** – ***"Pennsylvania's Department of Transportation should routinely collect and annually publish data specifying distractions that contributed to motor vehicle crashes in our Commonwealth. A corrective policy has the best chance to succeed if it is based upon reliable data to best assure that any regulatory response actually increases safety."*** – ***"The public and private sectors should continue to increase drivers' awareness of distractions through training, educational materials and publicity designed to emphasize the importance of suitably attentive driving."*** – ***"While the public and private sectors must encourage and require safe driving, there is no substitute for a suitably attentive and cautious driver. Ultimately, motorists are individually responsible to carefully attend to their primary task, driving."***

National Association of Governors' Highway Safety Representatives (2001). *Membership Adopts New Policies at Annual Meeting (October 14, 2001) – N.6 Distracted Driving.* Online at *www.naghsr.org*	**Policy statement *and recommendations.***	**"NAGHSR opposes federal legislation which would penalize states for not restricting the use of cell phones or other electronic devices, particularly since many have life-saving benefits. Rather, the federal government should fund considerably more research to determine the scope and nature of the distracted driving problem and the effect of telematics on driving behavior. Further, the federal government should fund a comprehensive media campaign to educate the public about the dangers of distracted driving and the way to manage driver distractions."** ***"Producers and providers of electronic devices should also undertake a major public educational campaign to inform the public about the proper use of these devices."*** ***"As part of a company or agency's employment policies, employers should discourage the use of cell phones and other electronic devices when driving except in emergency situations."*** ***"As part of a state's graduated licensing law, young drivers should be discouraged from using cell phones and other electronic devices for non-emergency purposes while driving until they are fully licensed."*** **"NAGHSR believes that, when on the road, drivers should not use cell phones, faxes, computers, or other distracting devices except to report a crash to emergency responders. If a driver must use such devices, he/she should drive into a parking lot or other protected area."**

National Conference of State Legislatures (2001). Federal Mandates on Cell Phones While Driving. *Action Resolution from the Commerce and Communications Committee & Energy and Transportation Committee.* Washington, DC: NCSL. Online at www.ncsl.org/statefed/cellphoneres.htm

Resolution regarding legislation on cell phone use while driving; adopted August 15, 2001.

Whereas, according to the Cellular Telecommunications Industry Associated (CTIA), more than 120 million Americans subscribe to wireless telephone service; and

Whereas, the National Highway Traffic Safety Administration (NHTSA) estimates that 83 percent of those subscribers use their phones while driving to report emergencies, conduct business, stay in touch with family and friends, call for assistance, and report aggressive or drunk driving; and

Whereas, the proliferation of cell phones in cars and their potential for distracting drivers has attracted the attention of state and local policy makers, media, the federal government and the general public; and

Whereas, state and local policy makers are weighing the advantages of wireless technology against potential problems; and

Whereas, in 2001, state legislatures proposed approximately 140 bills regarding cell phones and driving in 43 states, the Distract of Columbia and Puerto Rico; and

Whereas, these 140 bills included measures to prohibit the use of hand-held cell phones while driving, improve data collection about cell phone involvement in auto accidents, increase the penalties or responsibilities of drivers who crash while using a cell phone; to prohibit school bus drivers from using cell phones while operating a school bus; restrict or prohibit phone use by teenage drivers; and

Whereas, eight states this year passed legislation regarding cell phone use while driving; and

Whereas, legislation has been introduced in Congress to mandate that states restrict cell phone use while driving or face the loss of a portion of the $30 billion in federal highway funds allotted to the states;

Whereas, if a state fails to enact the federal mandate contained in S. 927 or H.R. 1837, that state would lose five percent of its highway trust funds allotment the first year and ten percent for each year after;

Continued ...

National Conference of State Legislatures (2001). Federal Mandates on Cell Phones While Driving. *Action Resolution from the Commerce and Communications Committee & Energy and Transportation Committee.* Washington, DC: NCSL. Online at www.ncsl.org/statefed/cellphoneres.htm

Now, therefore be is resolved, that the National Conference of State Legislatures does not advocate any position with regard to state legislative consideration of cell phone use while driving; and

Be it further resolved, that NCSL believes the decision with regard to cell phone use while driving is best decided by policymakers at the state and local level in response to unique state and local issues; and

Be it further resolved, that the National Conference of State Legislatures will oppose any congressional legislation, such as S. 927 and H.R. 1837, that mandates states to restrict cell phone use while driving or preempts state laws and regulations, which place restrictions on cell phone use while driving, as a preemption of state sovereignty and as an unfounded mandate on the states; and

Be it further resolved, that copy of the resolution be forwarded to all members of the 107th Congress and the President of the United States.

See Also

National Conference of State Legislatures (2002). *Along for the Ride: Reducing driver distractions – Final Report of the Driver Focus and Technology Forum.* Washington, DC: NCSL.

Final Report of the Driver Focus and Technology Forum

- States that driver behavior is a state issue, and that states should decide whether to regulate the use of wireless telephones and other communications, information and entertainment technology in motor vehicles.
- States that no regulation should prevent a driver's use of hand-held and hands-free wireless telephones in emergency situations. Emergency situations are circumstances where the driver is using a mobile telephone or other telematic device for the sole purpose of communicating with an emergency response operator; a hospital, physician's office or health clinic; an ambulance company or corps; law enforcement personnel; or a fire department, distract or company. Emergency situations also include communications by police officers or peace officers; members of a fire department, district or company; or operators of an authorized emergency vehicle in the performance of official duties.
- States that any restrictions on wireless communication use should not impede emergency response technology.
- Recommends driver education, better crash data collection and further research.

Network of Employers for Traffic Safety (2001). Campaign Targets Distracted Driving & safety Belt Use. In *NETS Factsheet September 10, 2001.* Washington, DC: NETS. Online at *www.trafficsafety.org/newsroom/091001.*	**Brief Recommendations to Employers/Employees.**	"The U.S. department of Transportation estimates that driver distraction is a factor in 25 to 50 percent of all crashes or 4,000 to 8,000 crashes per day. Yet, motor vehicles crashes that are a result of inattentive behavior are predictable, preventable and within the driver's control. NETS advises employers that distracted driver crashes are no accident." *"The latest [NETS] survey results emphasize the need for employers to take a more proactive approach and implement workplace traffic safety programs for all employees."* *"...the survey found that drivers who routinely engage in distracting activities view these activities as less dangerous than the general public. Only 46% of the adults who have prepared for work while driving believe this is a dangerous activity compared to 79% of the general public."* *As part of the Drive Safely Work Week campaign, NETS recommends that employees manage distractions safely. The only specific advice regarding cellular phones while driving is to "pre-program cell phones with commonly called number.*

Network of Employers for Traffic Safety (2001). Programs: Distracted driver. Washington, DC: NETS. Online at *www.trafficsafety.org/distracted.asp*	NETS survey – poll of 1013 drivers surveyed August 16-19, 2001, by Pacific Data Development Corporation.	**Based on the 94% of Americans who ever drive distracted…** 96% have talked with a passenger while driving; 89% have adjusted vehicle's stereo/climate control while driving; 74% have eaten a meal/snack while driving; **51% have used a cell phone while driving;** 41% have tended to children while driving; 34% have read a road map/publication while driving; 19% have applied makeup, shaved, or combed hair while driving; and 11% have prepared for work while driving. The survey results indicated that 56% of the Total Public believes that using a cell phone while driving is "very dangerous." The survey results indicated that only 38% of those who have engaged in the use of cell phones while driving actually believe that using a cell phone while driving is "very dangerous." The survey results indicated that only 4% of the Total Public believe that talking with a passenger while driving is "very dangerous," whereas only 2% of those who have engaged in conversation with a passenger while driving actually believe that engaging in that activity is "very dangerous."
Network of Employers for Traffic Safety (2001). Safety NETS Newsletter (Fall 2001, A quarterly newsletter of the Minnesota Network of Employers for Traffic Safety). Minnesota: Minnesota Safety Council, State of Minnesota Department of Public Safety, and the Network of Employers for Traffic Safety.	**Presents "Tips to Manage Potential Distractions"**	*Pull off the road to make calls. Pre-set your cellular phone with commonly called numbers and allow voicemail to handle your calls when possible.* Notes that, "Drivers to Distraction" include "Engaging in intense or emotional conversations with other passengers or on the phone." Notes that, "Driver instructors estimate that a driver makes an average of 200 decisions during every mile they drive. This leaves no room for multi-tasking while behind the wheel."
Network of Employers for Traffic Safety (2000). Leading Employers Join to Combat Distracted Driving. In *NETS Factsheet June 27, 2000.* Washington, DC: NETS. Online at *www.trafficsafety.org/newsroom/06272000.*	NETS survey – poll of 1026 respondents conducted June 16 - 19, 2000 by Wirthlin Worldwide.	"Just under a fifth (19 percent) of drivers say they talk on the phone [while driving]…"

Jackman, K.W., III. (2000). Warning: using a cellular phone while you drive may be hazardous. *Hinckley Journal of Politics, 2(1),* 41-46.	Discusses the association between cellular phones and motor vehicles accidents (including a review of the relevant literature to date), analyzes the steps that have been taken by lawmakers, and makes strategy **recommendations** for lawmakers to follow as they attempt to deal with the increasing complex problem of cellular phone use while driving.	▪ **Concluded that, based on the research and evidence available, cellular phone use while driving is hazardous.** ▪ Concluded that more data is needed in order to determine the magnitude of the problem. ▪ Concluded that relevant information is too limited and that lawmakers should not ban all cellular phone use by people while they are driving. ▪ ***Recommended that lawmakers should mandate accurate police reporting and assist researchers as they develop a better understanding of the safety implications of cellular phone use.***

Alston, H. (1999). A Risky Call: Employer Limitation of Employee Cell Phone Use. Management Update, 22(1). Atlanta, GA: Ford & Harrison LLP. Online at *www.fordharrison.com.*	Ford & Harrison Atlanta, GA	"Companies that rely on wireless communication should heed the warning of the Smith Barney settlement. Management might consider implementing policies that prohibit cellular phone use while driving on company business. If the company provides employees with wireless communication devices, it could require, as a condition of receipt, that the employee sign an acknowledgement that these devices are not to be used while operating automobiles or other equipment. Company owned cell phones could carry a sticker warning expressing that using the phone while driving is dangerous and should be done only in an emergency. Even those companies that do not provide wireless communication devices but support or promote use of cell phones may wish to study dependence on this technology in order to avoid claims that dangerous behavior was tacitly approved."
Farmers Insurance Group as cited in **The Auto Channel (May 4, 2000).** New survey shows drivers have had 'close calls' with cell phone user. Online at *www.autochannel.com.*	Farmers Insurance Los Angeles, CA	▪ Kenneth Adams – "While Farmers Insurance Group promotes the idea of drivers carrying a cell phone while in their car in case of emergencies, we don't recommend people use a phone while they are driving." ▪ Farmers Insurance offers the following safety tips: – If possible, use a hands-free device. – Do not take notes or look up numbers while driving. – Place calls when you are not moving or before pulling into traffic. – Keep conversations short and sweet. Don't use the phone for social visiting while you drive. – Suspend the call in heavy traffic, hazardous weather conditions or stressful situations. You can explain later, because you will still be alive.
Praxair, a $5-billion industrial gas maker (Associated Press, Aug 26, 2001). Firms craft cell phone policies. Online at www.wired.com.	Praxair, Inc., Worldwide Headquarters 39 Old Ridgebury Road, Danbury, CT 06810 USA	Banned cell phone use on 1999

State Farm Insurance Cos. as cited in **The Journal Star, Peoria, Illinois (August 13, 2002)** on the AAA Foundation for Traffic Safety Website under Traffic Safety News. Some Illinois Companies Create Policies on Cell Phone Usage while Driving at *www.aaafoundation.org*	State Farm Insurance Cos. Bloomington, Illinois	"Since using a cellular phone, two-way radio or wireless device may become a distraction while driving, using any of these devices is discouraged when the car is in motion. If it is absolutely necessary to us one of these devices while driving, the vehicle should be equipped with equipment that allows the individual's hands to remain on the steering wheel."
U.S. Cellular Co. as cited in **The Journal Star, Peoria, Illinois (August 13, 2002)** on the AAA Foundation for Traffic Safety Website under Traffic Safety News. Some Illinois Companies Create Policies on Cell Phone Usage while Driving at *www.aaafoundation.org*	U.S. Cellular Co. Chicago, Illinois	Mandates hands-free equipment for employees who drive on company business. From the company's cell phone policy statement: "Stopping on the side of the road is not acceptable. It is encourage that associates exit the roadway and find a proper parking space prior to using their cellular phone."
Wilkes Artis, Washington DC-based law firm (Associated Press, Aug 26, 2001) Firms craft cell phone policies. Online at *www.wired.com*.	Wilkes Artis 1150 18th St, NW, Suite 400, Washington, DC 20036-3841	David Fuss - "Our policy is that personnel are not to conduct business while using cell phones, unless they pull over and stop or use a handsfree device."