

**Distracted Driving: The New Alcohol.  
A Case Study of a Rising Public Health Issue in  
British Columbia**

by

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## Abstract

In the risk society, the public mobilization around emerging environmental and health risks associated with new technologies become the central challenge for a sustainable and healthy democracy. Ulrich Beck defines reflexive modernization as the ability of democratic societies to develop scientific understandings of emerging risks associated with new industrial technologies. Reflexive modernity is galvanized by progressive eco-politics that guide better ways of managing and mitigating systemic environmental and health risks. This thesis examines evidence of the growing scientific understanding of health risks associated with distracted driving-caused road accidents as a case study exploring Canada's ability to translate this risk science into progressive public policy that improves road safety. The study starts by exploring historical risk communication strategies and their role in altering drivers' behaviours and compliance with legislations limiting speed, impaired driving, and seatbelt use. It then reviews evidence of the new risks associated with using electronic communication devices while driving which has resulted in legislation prohibiting the use of hand-held devices by drivers across Canada and in BC. Three years into the legislation, this study found that at the very least 1.7% of all drivers are currently distracted behind the wheel. Through surveys and focus groups, the thesis explores why drivers are not willing to give up their communication habits despite existing legislations and sanctions. Recent crash data demonstrated that deaths attributed to distracted driving declined more slowly in British Columbia than from drinking, speeding, and non-use of seatbelts. The research concludes with a discussion of the importance of the lifestyle risk communication for a healthier reflexive modernity in British Columbia.

Keywords: Distracted driving; risk society; British Columbia; observational road survey; legislation; risk-taking

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## List of Acronyms

<b>BCAA</b>	British Columbia Automobile Association
<b>CAA</b>	Canadian Automobile Association
<b>DWI/DUI</b>	Driving while Impaired/ Driving Under Influence
<b>GHSA</b>	Governor's Highway Safety Administration
<b>HLDI</b>	Highway Loss Data Institute
<b>ICBC</b>	Insurance Corporation of British Columbia
<b>IIHS</b>	Insurance Institute for Highway Safety
<b>IOS</b>	International Organization for Standardization
<b>IRTAD</b>	International Road Traffic and Accident Database
<b>MADD</b>	Mothers Against Drunk Driving
<b>NHTSA</b>	National Highway Traffic Safety Administration
<b>NOPUS</b>	National Occupant Protection Use Survey
<b>TIRF</b>	Traffic Injure Research Foundation
<b>WHO</b>	World Health Organization

## Introduction

The automobile provides an excellent example of technological innovation for undertaking a case study of the role of risk communication in reflexive modernization. Why? Because cars are regarded as the quintessential consumer technology in the formation of mass society. The cultural impact of cars has been unprecedented: from an early 20<sup>th</sup> century culture of public transportation with its infrastructure of railroads, trolleys, and naval travel, the 20<sup>th</sup> century saw a shift to a car culture which became addicted to privatized automobile use (Packer, 2008, p.2).

Ford Motor Company's moving assembly line transformed the automobile into a product of mass consumption. The assembly line permitted a sharp increase in productivity and promoted price drops, making cars available to anyone willing to purchase one (Bardou et al, 1982, p. 61). The Automobile Revolution had a profound impact economy, culture, urban landscapes as well as individual lifestyles. For example, in Canada, cars became the second largest expense of Canadians costing approximately \$9,500 in annual maintenance costs (CAA, 2013). The authors of special report on automobile and society report on the cars' transformation into mobile offices, dining halls, sound environment, and a place for socializing (Featherstone, 2004).

For these reasons, the automobile has been called an icon of social status and customized lifestyle (Jacobs, 1989, p.xiv) and a symbol of national identity, as well as individualism – in short “a fascinating and contested symbol of modernism, [...] and consumerism” (Featherstone, 2004, p.7). Yet the automobile has always been more than an ordinary consumer good. John Urry coined the term *automobility culture* to describe the current state of human affairs based on the dependence of Western populations on their vehicles (2004, p. 26). For example, Dant reported that while in 1960 the major share (71%) of households in Britain did not have a car, by 1999 of 72% of all homes did (2004, p. 61). In Canada, vehicle ownership changed even more strikingly from 5.3 million in 1960 to 18.2 million in 2002 (Dargay et al, 2007, p.20). *Automobility culture* combines entitled individuals with self-directed movement, unrestrained and surveillance-free. It allows challenges of traditional time-space relationships, and constitutes the realization of imagined utopic freedom (Featherstone, 2004, p.2).

Miller, in his book *Car Cultures* (2001), demonstrated the automobiles' connection to social, emotional, and cultural dimensions of human experience in the modern period. Building on Miller's work, Sheller suggested that the present car culture

stimulated development of *automotive emotions* (2004, p. 223). Automotive emotions include the feelings of individual empowerment associated with owning a vehicle, or a collective security for one's family (Sheller, 2004). Miller suggested that vehicles serve as an extension of human habitus (2001, p.3); Laurier applied this idea and explores the vehicle as an extension of work environment, a mobile office where work-related calls are made, emailed answered, and paper work completed (2004, p. 269). More recently, Gunster (2007) presented a thematic taxonomy of car commercials offering insight into the valorization of automobility. The taxonomy included speed-related narratives of escape, passing time, and freedom of mobility and presents the automobile as a quintessential object of post- modernity's utopic progressive rhetoric of neo-liberal market culture.

However, the social history of cars has a negative trajectory as well. The most conventional car history approach includes the analysis of negative externalities associated with automobiles (Miller, 2001). Foremost among these are the risks associated with exhaust from internal combustion engines. Chanaron suggests that, since 1960, traffic in both urban and rural areas increased dramatically, consequently causing an unprecedented concentration of air pollutants. Air pollutants include everything from carbon monoxide and lead, to nitrogen oxides to aldehydes which are toxic and capable of seriously damaging organic life (Chanaron, 1982, p. 277). For instance, infamous Los Angeles smog is caused by organic vapors and oxide of nitrogen (that mostly come from car exhausts) reacting under the sunlight; the pollutants mixing with different atmospheric layers create a toxic, photochemical smog dangerous to living organisms (Blumentha et al, 1977, p. 906). Historically, Los Angeles smog was responsible for thousands of cases of eye irritation, lung disease, throat and brachial cancers, and respiratory illness among infants (Chanaron, 1982, p. 278). The environmental risks of air pollution have received widespread attention in the press recently based on numerous medical studies published by the WHO that claimed that up to 7 million premature deaths can be attributed to air pollution worldwide (WHO, 2014). In the wake of Al Gore's *An Inconvenient Truth*, the gas-guzzling car was not only responsible for smog, but figured increasingly in debates about global warming, ozone depletion, acid rain, soil contamination, and pollution of waterways. Other major externalities include city traffic congestion, noise pollution, rising rates of insurance, changing urban landscape, and trauma to vulnerable road users (Miller, 2001).

Another clear externality is the financial loss associated with accidents. The total financial costs of injuries, emergency care, hospitalization, labour loss, property damage, and other accident-related expenses amount to 5% of the total Canadian Gross Domestic Product (GDP) (WHO, 2013, p.83). This approximately equates to a loss of \$91 million USD or \$258 per person annually. For this reason, critical accounts of the car-dependent culture have also focused on the health risks associated with air pollution, technological failure, speeding, and various kinds of impaired driving. Although emerging lifestyle risks associated with automobility – from drunk driving to obesity -- have received considerable attention in literature, the following case study will focus on the most recently evolving health risk in our car-dependent culture: the use of cell phones behind the wheel.

## Overview of Thesis

Chapter one starts with a discussion of Ulrich Beck's theory of risk society and explores the core tenets of his theory as they pertain to the growing scientific and public awareness of the hazards associated with *automobility*. Clearly, the emergence of car culture provides an excellent opportunity for understanding the role of communication in the risk society. The role of new risk sciences is to identify, evaluate, and offer mitigation strategies to limit the rising environmental and health hazards unwittingly forged in modernization (Beck, 1996). The role of risk communication is to attract attention to emerging risks created by technological progress itself and to galvanize a progressive, discursive politics of risk mitigation (Kline, 2011). Under conditions of reflexive modernity, the risk sciences and risk communication take complementary roles in ensuring our sustainable development.

The second half of the chapter will present arguments about the roles of accident science, mediated communication, and advocacy groups in the attempts to increase road safety during the post-war years. A review of the road safety literature since the war outlines how successive public health policies have reduced the health and safety risks that accompanied late modernity's embrace of automobility by improvements to the technology (such as road design, signage, seat belts, roll bars, catalytic converters, lead-free gasoline, airbags, and child seats), as well as imposing speed limits, and by restricting driver behaviours (impaired driving, fatigue). The section will discuss car-

related issues in a historical perspective by presenting earlier driving-associated risks such as speeding, seat belts, impaired driving, and outlining subsequent wider lessons of non-compliance, community outrage, and poor enforcement. Accident data in both Canada and the USA show that, although the number of cars has increased from 1,622,463 in 1946 to 31,718,809 in 2014 (Statistics Canada, 2014), the number of deaths has fallen significantly from 25 deaths per 100,000 in 1979 to 9 deaths per 100,000 in 2004 (Ramage-Morin, 2008, p.1). This development suggests that public policy makers have successfully improved road safety.

Chapter two suggests that, in the 1980s, the widespread diffusion of mobile phones and their use in the car presented policy makers with a new threat to safety on the roads. The first commercial mobile phones were introduced in 1979; over the next forty years the technology underwent a major transformation resulting in a dramatic increase in mobile coverage, unprecedented drop in prices, change in size and capabilities, as well as a high level of adaptation (Kalba, 2008, p.11). In Canada the coverage rose from 6,000 users in 1985 to 27,863,660 in 2014 (CWTA, 2014). Approximately 83% of Canadians owned a cell phone by 2013 (CWTA, 2014). Although mobile technology itself poses health risks associated with electromagnetic radiation (i.e. cancer, genetic mutations, as well as surveillance), this work will only be concerned with risks associated with the combined use of these two mobile technologies: an automobile and a cell phone. Among other possible activities (i.e. eating, talking to passengers, regulating climate control, reading billboards), the combination of these activities was captured by a term –distracted driving.

The chapter reports on the growing scientific evidence of the hazards associated with the use of cell phones by drivers. Reviewing over thirty years of research, this thesis points to the emergence of a behavioral science of distracted driving which clearly demonstrates the negative effects of divided attention on both vehicle control and situational awareness which has motivated and justified the passage of laws restricting cell phone use by drivers. The psycho-social dynamics of distracted driving with its complex and varying approaches, methodology, and results are reviewed. The overview of the main actors in the field (i.e. governmental research bodies, non-profit think-tanks, individual researchers) analyzes the major findings to date and informs readers about general agreements and limitations of the field. The discussion will include studies conducted in naturalistic settings, on research tracks, and studies conducted using driving simulators. The emphasis is on identifying the factors associated with driving

performance degradation during cell phone use. The chapter concludes with an in-depth discussion of the cognitive processes behind human multitasking and the limitations of the human capacity for parallel task execution.

Chapter three, sets out to explore the impact of this emerging risk science on both public policy makers and the general public. The chapter will include early history of the policy debate, early legal tests, as well as a content analysis of local news stories published around this risk. The chapter also presents the current state of awareness about distracted driving in Canada and the public policy formed around the issue. The first legislations banning the use of hand-held electronic devices was passed in New York, NY in 2001, in Newfoundland and Labrador in 2003, and in BC in 2010 (CAA, 2014). Yet despite the legislation restricting the use of hand-held technologies by drivers in BC, and publicity of the risks in the media, the rate of compliance with the ban is limited. Reporting on a recent observational survey of car drivers in Vancouver, it is estimated that at any given moment at least 1.35% of drivers are using a hand-held device. This suggests that compliance with the legislation is marginal.

Chapter four therefore presents recent findings from a survey and focus groups conducted in Vancouver that explore why legislation, awareness of risks, and police enforcement are currently not sufficient for reducing the use of cellphones by drivers. The survey demonstrates that distracted driving is not viewed as a policy priority by Canadians and is not perceived as having the potential to impact the respondents. Qualitative data gathered from focus groups indicated that even BC drivers who were aware of the risks were not willing to give up their phone-behind-the-wheel habits. Additionally, the data indicated that BC drivers did not believe that distraction-related laws are adequately enforced.

The conclusion explores the implications of the BC case study for lifestyle risk communication strategies. The good news generally seems to be that strategies of risk communication can be effective in reducing the risks associated with using phones in the car. Yet an ICBC study also indicates that fatal accidents attributed to distracted driving have declined more slowly than those associated with speeding and impaired driving, despite the 2010 BC Act banning the operation of hand-held communication devices while driving a car. The bad news is that distracted driving may be a unique kind of risk taking behaviour that resists the kinds of social communication campaigns successfully used with speeding, seat belts, and impaired driving. This work will culminate in an application of new findings to the design of a strategy to curb distracted

driving. The conclusion would argue that while historically legislation and enforcement strategies were successful in alleviating road trauma, in risk society these strategies might be futile. Risk communication programs would be suggested as a necessary element of a risk mitigation strategy in reflexive modernity.

## Chapter 1: Reading Automobility in the Context of the Risk Society

### Risk Society Intro

In 1986, Ulrich Beck published his groundbreaking book, *Risk Society: Towards a New Modernity*. He posits a concept of risk at the core of emerging social order. Beck argues that from a system of wealth distribution that served as an organizing principle of the industrial society, we moved into a system organized around risk allocation (Draper, 1993, p. 641). The shift from wealth to risk distribution transformed traditional social structures. Beck asserts, “just as modernization dissolved the structure of feudal society in the nineteenth century and produced the industrial society, modernization today is dissolving industrial society and another modernity is coming into being” (Beck, 1992, p.10). Late modernity thus created a distinct social organization: the risk society.

Under the new risk system, the life of the society revolves around the distribution of risk, individualization of responsibility, and the heightened importance of the media (Beck, 1986). From a system where risks existed as residual externality, uninteresting and hidden from the public eye, risks moved to the core of public debate, politics, and media (Adam et al, 2000). The media are playing a key role in risk society, as they become a platform where experts, politicians, and citizens can engage in a dialogue about controversial implications surrounding these uncertainties in risk science.

The most prominent theorists of risk also note that risks cannot be understood outside of the cultural and social structures that they develop and exist within (Douglas, 1992, p. x). In her book, *Risk and Blame*, Douglas suggests that even when risks are individualized, broader decision-making processes are still happening in social and cultural environments that cannot be ignored (Douglas, 1992). Arnoldi developed the idea of cultural filtering via shared values and norms, and concluded that these variables can influence risk perception and awareness (Arnoldi, 2009, p.106). Cultural amplification is one of the reasons why some risks gain prominent attention, while equally important others do not inspire public imagination. Additionally, researchers emphasize human dependency on groups, communities, and values not reducible to culture only. Most importantly, scientists, politicians, and media are also affected by values and dominant culture (Arnoldi, 2009).

Douglas and Kline agreed that risks are always culturally situated; they are both “politicized and moralized” (Kline, 2004, p.4) by risk communication because blame is a pivotal part of risk reduction and prevention. In his most recent work, *Globesity*, Kline

presented a case study of the discursive politics of obesity as a lifestyle risk galvanized by the growing concerns about fast food culture in which fast food marketers and advertising became implicated in a moral panic. Kline emphasizes three separate dimensions of mediated risk communication controversies in the risk society which contribute to the historical formation of public policy for risk mitigation. The first is the publicity gained by the emerging risk sciences (in his case, epidemiology) in setting the broader health care agenda. The second is the formations of advocacy (including corporate PR, advertising, and public relations) that emerges around environmental and health issues. And the third is the manifestations of the public's growing awareness of the new risks, and their willingness to support policy change mobilized around media risk controversies by advocacy groups, whistle-blowers, think-tanks etc. (Kline, 2011, p. 6). My case study is modeled on Kline's risk communication approach to the discursive politics of emerging, though this work is concerned with the lifestyle risks arising from the tandem use of two of modernity's most cherished technologies, namely cars and mobile phones.

### **New Science in Risk Society**

The notion of risk is not new. Rather it is embedded in the unpredictability of hazards of many kinds. Pre-industrial and industrial societies dealt with famines, floods, pandemics, and other unpredictable hazards for centuries (Beck, 1996, p.30). These risks were considered external, unpredictable, and environmental; they were not a product of modernity per se, but of the conditions of unpredictability of the natural world. Arnoldi suggests that it was the Enlightenment that transformed human perception of risk by making them a subject of human knowledge through scientific study. He states that hazards could no longer be attributed to unpredictable nature or divine punishment, instead "the source of uncertainty was incomplete human knowledge" (Arnoldi, 2009, p.30) in the process of empirical research.

Enlightenment's thesis led to the accumulation of observations of unexpected, rare, individual events and thus to the understanding of patterns and the science of prediction based on the probability theory (Giddens, 1998, p.27). The risks were now about calculation, probability, insurance, and therefore, control (Boyd, 1994, p. 160; Giddens, 1998). Calculable and insurable risks are now known as "old risks".

The industrial society also developed systematic mechanisms for dealing with uncertainties "induced and introduced by modernization itself" (Beck, 1992, p.21).

However, these mechanisms were based on three assumptions: risks have to be known, effective amelioration strategies have to be available, and precautionary communication has to be possible (Kline, 2004, p.3). Under the conditions of the second modernity, the nature of risks has changed (Franklin, 1998, p.1). New risks are characterized by unpredictability, invisibility, disregard for spatial and temporal location, potential catastrophic effect on the grand scale, and non-discriminatory nature (Beck, 2006; Cottle, 1998, p.8). Systemic risks are produced by modernization processes and the development of technology; they escape full understanding and control because their impact is on the environment as a whole (Loyal, 2003, p.157). In his writing, Beck lists examples manufactured environmental risk (carcinogens, CFCs, radiation, toxic waste) depletion as well as global terrorism, economy, and other ecological risks. All of these risks share a single characteristic: scientists have yet to understand the full extent of their impact on both the environment and humans (Giddens, 1998 in Chalaby & Segell, 1999, p. 354; Loyal, 2003, p.157).

#### **Elements of Discursive Politics: Contested Sciences**

Beck states, “there are always competing and conflicting claims, interests and viewpoints of the various agents of modernity and affected groups” (Beck, 1992, p.29). As a result, society is forced to live in a context of “conflicting, changeable scientific and technological information” (Giddens, 1998, p.32). In a world of scientific uncertainty, experts and scientists lose their truth-granting authority (Clarke, 1994, p.328). Three key challenges for reflexive modernity are the overwhelming amount of new scientific information that is made available, the contradictory qualities of evidence produced by competing scientific groups, and the inability of scientists to arrive at conclusive proof given the probabilistic nature of risk assessment methodology.

In the current media environment, something called a “risk information vacuum” develops. Leiss and Powell coined the term to signify the growing mistrust between experts and the public caused by the differences in perceptions of risks by these two parties (1997). This mistrust grew because the information is presented to the public at a level of complexity that the lay audience cannot grasp, and because experts are unwilling to look at the risk beyond technological assessments (Leiss & Chociolko, 1994, p.35).

Information quality, trust and credibility of experts plays a central role in mediated risk communication. With the exponential spread of information, it is getting very difficult

for both journalists and audiences to evaluate the validity of claims (Arnoldi, 2009, p.127). Just like other institutions of risk society, the media are dealing with issues regarding the contradictory scientific findings and the truthfulness of information. For example, Leiss & Powell site an instance of the media's coverage of dioxins, in which journalists mistakenly projected the harmful effects of a substance on humans as a result of animal testing (Leiss & Powell, 2004, p. 57), negatively impacting public opinion. Kline also concludes, "in spite of often intense news coverage, the general public is poorly informed and cannot always grasp the complexity of risk issues" (Kline, 2004, p.3).

Clearly, the media in risk society are not free from power struggles between public interest advocates and corporate flacks. For this reason, the media's coverage is subject to conflict over risk definition, blame, and responsibility for mitigation efforts. As in the case of obesity, risk producers (fast food outlets) want to hold individuals (mainly parents) accountable for the hazards, while the lay audience seeks to attribute the blame to the highly profitable corporate actor, including their extensive advertising of risky products (Kline 2011). Some researchers suggest that the way out of this information vacuum is to create a long-term communication strategy to promote accountability and transparency between scientists, communication experts, and audiences (Ali, 2003, p.4). Social marketing and responsible corporate advertising has therefore become a method for addressing the misunderstandings of the extent and factors associated with risks perceptions (Potter, 1998, p. 162)

### **Elements of Discursive Politics: Risk Agenda Setting**

In his early work, Beck states, "risk society is also science, media and information society" (1992, p.46). Indeed, in risk society, the media become the platform for information distribution and public contestation of new hazards (Arnoldi, 2009, p. 175). Mass media have the power to make risks visible and known to the public (Cottle, 1998). Beck suggests that the media, mainly through news, have the power to minimize, amplify, dismiss or dramatize particular hazards (Beck, 1992, p. 23). He states, "expensive and extensive scientific investigations are often not really noticed in the agency that ordered them until television or a mass-circulation newspaper reports about them" (Beck, 1992, p.197). Yet the media tend to concentrate on risks that are easy to present visually, that have high impact consequences, that injure or kill many people at once, and that are short-lived (Cottle, 1998). Kline (2011) analyzed the role of media in setting risk agendas, framing policy debate and raising public awareness of risks

concluding that the news agenda is not just dictated by the scientists' establishment of the prevalence of a new risk and its impact, but rather by their sensational nature, its "dread factor" and by the framing of blame and responsibility (Kline, 2011, p. 26).

Kitzinger points out that risks persistent overtime are downplayed by the media because they tend to become "old news"; reporting also tends to be event- rather than issue-oriented; and, risks that can be presented with personal stories and celebrities tend to dominate media coverage (Kitzinger, 1999, p.62). Lastly, news stories revolve around issues of blame and responsibility, and in the light of the changing nature of risk, it is getting harder and harder to report hazards. In other words, the need to compete for audiences and time constrains force media professionals to present risks according to their spectacular appeal rather than scientific evidence. In the risk society, media play an important role in determining discursive politics by amplifying and playing down various new risks as the filter into the risk agenda (Kline, 2011, p. 34). Clearly, such selectivity in risk reporting might result in biased risk perceptions from the audience (Kline, 2011).

#### **Elements of Discursive Politics: Social mobilization around scientific controversy.**

According to Kline, this but is compounded by the fact that experts, whistle-blowers, and risk advocates play a significant role in mobilizing public opinion and policy response around an already controversial science (Kline, 2011). Kline goes on to explain how advocacy organizations (for example, Green Peace and anti-tobacco lobby groups) learned the commercial art of public relations and successfully used media-spinning strategies to their ends. Kline coined the term 'advocacy science' to describe the mobilizations by special interest groups struggling to bring attention to various risks (ibid, 2011, p. 9). In the case of road safety, advocacy scientists include Mothers Against Drunk Driving and Remove Intoxicated Drivers groups, as well as the Insurance and Automobile Industry groups. In the case of road safety, such groups used media for outreach, but also performed intoxicated drivers' trial supervisions, provided counseling services, and increasingly conducted their own research.

Advocacy groups used media platforms to engage in contestation and debate with experts, professionals, lay audiences, and politicians (Kline, 2004). Cottle suggests that the media become a place where social and scientific rationalities meet (1998, p.19). For example MADD's founder (Candy Lightner) conducted her advocacy work by

addressing TV audiences of *Good Morning America* and *Nightline* shows, the US Congress, as well as various professional and business groups. Indeed, Lightner served on multiple governmental commissions, including the major panels – the Presidential Commission on Drunk Driving (Hanson, 2014).

## **Part II: Road Safety: A Historical Perspective**

This thesis attempts to understand road safety science in relation to distracted driving, that emerge as a new risk in early 1990s. Researchers of road safety have recently suggested four successive ways of thinking about road accidents and their causes: starting with viewing accidents as an inevitable event, then focusing on driver error, increasing blame of the industry, and ending with a holistic road safety approach which strives to accommodate human error, make roads safer, build safer vehicles, and enforce legislation that promotes safety (Johnston, Muir & Howard, 2013).

In the early 1900s, up until the 1930s, motor vehicle crashes and accidents were viewed as an unavoidable price of progress – or alternatively as an unpredictable act of God. However, a critical discourse on motor safety emerged from the early days of the road safety paradigm. The early deaths from road crashes were often attributed to malfunctions of the vehicles and their design (Mashaw & Harfst, 1990, p.40). This model was challenged in the late 1930s, when the focus of the research shifted from the road as an unpredictable environment, to the model in which the individual drivers, and their behaviors were considered faults (Johnston, Muir & Howard, 2013, p.69). Responsibility for crashes was put on individuals as a discourse on "human error" (Hemel, 1988, p.1) emerged; accidents were attributed to "a nut behind the wheel" (Nader, 1965). Thus, the solutions for road safety developed during this time period were inspired by ideals of personal responsibility; for example, training programs, personality tests, exclusion of potentially unfit drivers from the road, and ridged sanctions aimed at individuals (Helund, 2007, p. 26). Until the 1950s little attention was paid to transportation systems, infrastructure, safer roads, nor safety features for motor vehicles (Johnston, Muir & Howard, 2013).

The following review of historical literature on road safety sets out to demonstrate the increasing importance of communication strategies for mitigating the risks associated with road transportation since the 1950s. Technological deficiencies, impaired driving, speeding, and the use of the seatbelts will be discussed in turn as evidence of this trend towards the blending of accident science with risk communication. Four different lessons

regarding the discursive politics of road safety will be highlighted in this discussion, namely 1) the contested development of accident science arising from Nader's focus on the GM Corvair's technological failures provoking improvement in safety features in cars; 2) the importance of media campaigns for enforcing seatbelt use compliance; 3) the growing importance of social marketing in addressing behavioural factors like speeding; and 4) the active role of advocacy groups in combating the issue of impaired driving.

### **Lesson 1: Technology and Car Design**

While politicians and experts spoke about car safety design as the responsibility of the auto industry, their concerns went unheard until Ralph Nader's book, *Unsafe at Any Speed*, in 1964 (Jacobs, 1989). Nader was one of the first road safety advocates who challenged the traditional thinking of road crashes as simplistic human error. He did so by demonstrating that General Motors' defective auto designs resulted in multiple accidents and deaths. The Harvard-trained lawyer, Nader brought to light documentation that Corvair engineers were aware of the limitations of that particular car model (i.e. the rear-engine vehicle had instability associated with over-steering), but still released the design into production, while silencing board members' concerns about car safety (Nader, 1965, p.36). Nader also demonstrated that from 1960 to 1963, GM received hundreds of complaints about cars swerving out of control, but the company did nothing to improve the design. Indeed, GM ordered their employees to replace defective parts during routine maintenance without informing the owners (Mashaw & Harfst, 1990, p.56) nor notifying drivers of defective cars.

Nader's struggle with GM probably would not have had as much success as it had if the company had not hired a private investigator to investigate the background of the lawyer (Mashaw & Harfst, 1990). The bizarre "routine investigation" into the life-choices and sexual preferences of Nader framed the problem in a populist, melodramatic manner and attracted global attention to the cause (Jacobs, 1989). After Nader suggested that "the prevailing view of traffic safety is much more a political strategy to defend special interests, than it is an empirical program to save lives and prevent injuries" (Nader, 1965, p.236), both the motor industry and public policy makers found themselves in the spotlight for ensuring road safety. Class action law suits have been long used to attract public attention to various risk issues.

Nader showed that the auto industry does not bear any costs of injuries and fatalities on the road, and forever challenged the classical paradigm of thinking about road safety (Arason, 2014, p.182). Soon after, the auto industry was forced to pay close attention to safety and was mandated to design safety features including seat belts, collapsible columns, padded interiors, airbags, and rollover protection (Aarson, 2014, p.ix).

Aarson pointed out that Nader's effort result not only in improved vehicle safety, but gave a rise to the whole auto risk momentum (2014, p.180). In his book, *No Accident*, Aarson describes the attention that followed GM's embracement as the Nader Effect. After the court case, the auto industry and auto lobbyists, traditionally strong in Washington, faced fierce resistance from the general public, progressive politicians, and safety experts (Mashaw & Harfst, 1990 p.57). The rise of advocacy for automobile risks can be clearly viewed via the changing mandate of NHTSA that shifted from rule-making to the power to force recalls of vehicles that did not meet safety standards. Mashaw and Harfst suggested that some of these changes could be explained by the public interest in automobile safety issues and a number of high-profile court cases (including Nader versus GM).

## **Lesson 2: Speeding and Enforcement**

In 2013, a BC coach bus was impounded for traveling 110 km/h in a construction zone (Aarson, 2014, p. 86). Speeding is one the issues ignored even by drivers whose livelihood depends on being able to drive. Johnston and colleagues analyzed a set of US and Canadian car commercials (1998-2002) and found that almost half of the ads presented an unsafe speed message (2013, p.108). One of the most prominent road safety researchers concluded that "speeding is so entrenched in driving culture, there's little perceived legitimacy in efforts to control speeding" (Hedlund, 2007, p.8).

In 1835, English Highway Law postulated that the maximum speed of horse-drawn traffic should not exceed 4mph (Elias in Featherstone, 2004, p. 4). The legislation was put in place to protect vulnerable road users. However, in 1920, Great Britain abandoned speed limits due to their unpopularity among vehicle owners. The limits were reintroduced only in 1934 (Johnston, Muir & Howard, 2013, p.127). Mass production of automobiles gave birth to new car culture: a culture fascinated with speed, power, and the masculinity of vehicles (Featherstone, 2004). Reviewing the history of speed limits

worldwide, Johnston and his colleagues concluded that speed limits are consistently too high for the levels of protection offered by different designs of automobiles (ibid, 2013, p.127).

Both natural and pre-designed experiments demonstrated that decreasing speed limits was associated with fewer traffic fatalities and injuries as higher speeds increase both the severity of crashes and the likelihood of being involved in a crash (Aarts & Schagen, 2006, p.218). One famous natural experiment happened in 1973 resulting in the US being forced to reduce speed limits from 65 to 55 mph. This change resulted in approximately 2,000 to 4,000 lives saved and two billion dollars in financial savings. In 1987, when speed limits went up again fatalities attributed to speeding skyrocketed (Johnston, Muir & Howard, 2013, p.121). Similarly, a classic study conducted by Nilsson in Sweden (1982) demonstrated that “a speed limit reduction was accompanied by a reduction in average speed as well as a reduction in the number of crashes” (Aarts & Schagen, 2006, p. 218). One of the leading road safety researchers, Elvik, re-analyzed 115 speed-exploring studies and concluded that there is a clear link between speed limits and the number of fatalities on the road (2009).

Speed affects reaction time and stopping distance, and therefore the severity of car crashes. Johnson and colleagues concluded that the risks associated with speeding grow exponentially. They suggested that by driving 10 km/h over a speed limit, a driver doubles his risk of a serious crash, at 15 km/h over, the risk increases four-fold, and 25 km/h over, ten-fold (2012, p.120).

Despite a clear increase in the probability of crashes, enforcement of speed limits ran into two major issues. First, was the problem of consistently high ticketing procedures to ensure behavior change (Aarson, 2014). The solution to increase the number of tickets was found in electronic speed cameras and photo radars that can automatically identify and ticket speeding drivers. Unfortunately, in Canada, drivers viewed speed cameras as a way to generate revenue for the government instead of improving road safety (Aarson, 2014). In BC, the photo radar program was shut down in 2006, as it lacked credibility and lost public support. Johnson and colleagues suggested that the situation could be improved by ensuring transparent revenue allocation (2013, p. 140).

The second major issue of speed limits is the enforcers, the police. Traffic forces have been historically reluctant to enforce unpopular laws, because police officers “in

their capacity as ordinary drivers, tend to share the view of everyone else that low-level speeding is not dangerous behaviours” (Johnston, Muir & Howard, 2013, p.131).

Fortunately, the issue is not without success stories. For example, Davis and colleagues described a successful, large-scale enforcement program in Fresno, California, in 2003. The program consisted of quadrupling the number of responsible officers, a fleet of twenty special motorcycles for radar, and speed guns. As a result, the number of citations went from 6% to 17% of the population, thus decreasing speed-related fatalities three-fold and saving two million dollars in hospital and insurance charges (Davis et al, 2006, p.972).

### **Lesson 3: Seat Belts & The Problem of Compliance**

One of the most successfully mitigated road safety issues is the high use of seatbelts. In 2012, in BC, the use of seatbelts reached 96.9%; before first legislation, in 1977, the initial seat belt use varied from 14% to 28% (Waters et al, 1966, p.1343). In the early 1970s, observational studies found that only 21% of drivers in Canada used their seatbelts (Robertson, 1978, p. 154).

By the late 1960s, seatbelts had become a standard mandatory feature of every car (TIRF, 2007, p.1). Seatbelts work by restraining a person inside the vehicle, and thus reducing the impact of the secondary collision with the interior of the car and the resulting injuries (Information Canada, 1974, p.ii). Most importantly, seatbelts prevent the occupant’s ejection from the car. Statistics show that 75% of people ejected from their vehicles do not survive (TIRF, 2007, p. p.1). With respect to efficacy, seatbelts surpass airbags as the policy makers favoured way to forestall death on the roads (Nichols & Ledingham, 2008, p.4).

There are two major lessons from the history of seatbelt enforcement: first, high visibility enforcement combined with sanctions and legislations are successful in addressing road-safety issues; second, no road safety promotion strategy is effective immediately and steadily. The seatbelt enforcement campaigns demonstrated that pattern of usage increases and declines in waves, making repeated enforcement efforts vital (Nichols et al, 2014, p. 641).

According to Tison and Williams, Canada was at the forefront of the offense on seatbelt use. A number of provinces including British Columbia, Quebec, and Ontario launched campaigns with varied programs, and “they all had the same core components: increased publicity about the importance of using seat belts, greatly

increased law enforcement, and publicity aimed at heightened visibility and awareness of the enforcement” (Tison & Williams, 2010, p.1). One of the earliest programs was held in Ottawa and consisted of four weeks of intense enforcement and additional police training. An example from Quebec saw ticketing increase three to four times. Meanwhile, Nova Scotia concentrated on nighttime enforcement and patrolling near drinking establishments (Nichols & Ledingham, 2008). Canadian campaigns were so successful in increasing seatbelt use that high visibility wave enforcement became synonymous with Canadian-style enforcement (Tison & Williams, 2010). Nichols and Ledingham pointed out that the American Click It or Ticket campaign was inspired by similar Canadian efforts (2008, p.21).

Most importantly, a review of successful campaigns demonstrated that repeated waves of enforcement, primary legislation and sanctions, are vital in creating deterrence on the roads (Nichols et al, 2014).

#### **Lesson 4: Impaired Driving, Publicity & The Importance of Community Support**

Drinking and driving is an issue older than the car itself. For instance, in 1843 the New York Central Rail Road prohibited drunk employees to appear for duty, as the intoxicated railroad engineers created hazards on the road (Jacobs, 1998). Schmidt suggested that even forty years ago the issue was not even discussed, and drinking was viewed as a part of social and business norms (Schmidt, 2014, p.239). Drinking and driving was not at the forefront of public concern in the 1960s because of high rates of other crimes (Jacobs, 1989). In the 1970s, the issue gained prominent attention in the news and salience with the public.

The most notable lesson learned from the struggle against impaired driving is the importance of community support and special risk interest groups. Without the lobbying efforts of Mothers Against Drunk Driving, the creation of progressive legislations, enforcement of stricter sanctions, and the growth of public outrage might have taken much longer (Schmidt, 2014). MADD was established in 1981 by Candice Lightner after her teenaged daughter was killed by Clarence Busch, a drunk driver with a record of six DWI convictions, resulting in two victims (Robyn, 1991). The organization had one clear goal: to prevent impaired driving. Starting in California, the US organization today has over 600 chapters worldwide (Alcohol Alert, 2014).

The organization was successful for two reasons. First, it was based on a punitive ideology and not high moral grounds. One of the early functions of MADD

members was court monitoring. Schmidt suggested that before MADD's court watching crusade, impaired drivers often got away with a warning, probation, or a light fine (as opposed to mandatory jail sentence and progressive fines for repeat offenders) as prosecutors and judges were reluctant to sentence them (1989, p. xvi). Robyn cites a court case where a drunk driver, on his third DWI probation, killed a fifteen-year-old and was merely charged a \$200 fine and a two-year probationary period, while a car thief was incarcerated for two years (1991, p.10). Court watchers brought pressure on the community. MADD's efforts resulted in The Presidential Commission on Drunk Driving (1982). The Commission enabled stricter enforcement of impaired driving, and financed both research and anti-impaired driving activities (Robyn, 1991, p. 13).

Second, MADD created individual-as-collective trauma experiences where any driver can be both a perpetrator and a victim, and where impaired driving is about a single decision, not a history of criminality (Schmidt, 2014, p 248).

Supported by MADD, The Presidential Commission on Drunk Driving was appointed by Ronald Reagan. The Commission made thirty-nine recommendations resulting in widespread anti-impaired driving improvements: a legal limit for alcohol in blood, sobriety tests (including breathalyzers), and media campaigns. Most notably, MADD helped establish an environment of deterrence and an expectation of punishment. For example, sobriety check-points served as a systematic and highly visible enforcement; unfortunately, they were not an efficient use of limited resources as only 1% of all DWI charges was given out at a stop (Robyn, 1991, p.39). Alcohol warning labels and passive breath tests are among other achievements of MADD (Saltz et al, 1995).

Australia stands out as a country with one of the most progressive legislations and extremely successful risk communication campaign aimed at impaired driving. The BAC of 0.05 was introduced in the State of Victoria as early as 1976 and was adopted countrywide by 1994 (Beirness & Simpson, 2002, p. 54). Unlike Canada and the US, Australian road safety agencies chose random breath testing (RBT) and police checkpoints as the main measure to counter impaired driving (WHO, 2013, p.61). RBT is not allowed in Canada; a police officer is required to have a reasonable suspicion (clear signs of intoxication in driving behaviour) prior to stopping a vehicle for further investigation. Therefore, most drivers in Canada have never received a breath test; while three in ten of Australian drivers get to take the test every year (Aarson, 2014, p. 59). The high rate of RBT creates environment of deterrence on the roads (WHO, 2013).

ITARD reported that recently Australian road safety bodies have introduced random roadside drug testing in addition to alcohol (2013, p.60).

Since the late 1960s, Canadian policy-makers chose the general deterrence model as a main way to combat impaired driving (Liban et al, 1986, p. 159). The deterrence model of road safety includes three main elements: legal threat, severe punishment, and media coverage. A correlational study conducted in British Columbia found that when the number of cars checked by police and media coverage increased, the number of alcohol-related accidents decreased (Mercer, 1985, p.469). However, a consistent number of roadblocks and stable level of enforcement in the absence of sufficient media coverage did not result in decreased number of impaired driving accidents (ibid, 1985). The study concluded that a media blitz was a mandatory element of successful deterrence for impaired drivers. Since 1977, BC police have organized an annual roadblock strategy (CounterAttack) that aims to catch and punish impaired drivers (Ministry of Justice, 2014). The main idea behind the strategy is to inform the drivers that the impaired driving legislation is enforced and the penalties for breaking the law are tough.

British Columbia is known for its “most immediate and severe alcohol-related roadside administrative sanction” starting with a BAC limit of 0.05% (Arason, 2014, p.57). The province is outstanding in that local policy makers did not follow the international BAC limit of 0.08% but used empirical research to guide their policy. The TIRF reported that at BAC as low as 0.02-0.04% clearly impairs driving abilities (2012, p.48). From 1976, a year prior the CounterAttack campaign, to 2007 the number of deaths from impaired driving accidents reduced by 120 annually (ICBC, 2008). The sanctions currently in place are so strict that as many as 38,000 drivers a year receive road-side suspensions, and almost 10,000 get a 90-day administrative driving probation (ICBC, 2008, p.2). Lastly, ICBC took additional steps to reduce the number of drunk drivers on the road by providing designated driver banners and education for event organizers.

### Lessons Learned

Three main lessons for risk communication can be learned from this discussion of road safety policy making: community support, highly visible enforcement, and sound legislation are all necessary for successful compliance. More importantly, the researchers of road safety named public communication campaigns as a key part of a “twin engine” approach (i.e. media and enforcement) (Tison & Williams, 2010, p.14).

The importance of the media as a part of high visibility enforcement is evident from its roles in the programs against impaired driving, seatbelt use, and speeding. For example, the prototype of the Click It or Ticket program in Elmira, New York used a week-long publicity event to promote upcoming enforcement and direct publicity paralleled the enforcement events (Willaims et al, 2000, p. 197). Paid and free media spots with newspapers, radio, signs, and TV were used as a part of the Elmira project.

DeJong and Hingson suggested, “mass media campaigns, primarily on television, have long been a central part of the US effort to prevent alcohol-related death” (1998, p.369). Most successful anti-drunk-driving campaigns included not fear-based, but positive behaviour messages. For example, Montana’s campaign Most of Us emphasized the positive behaviours of the majority, thus disseminating accurate norms (Perkins et al, 2010, p. 868). The main aim of the campaign was to correct young drivers’ perception of the prevalence of drunk driving in the United States using a high-intensity social marketing campaign and a positive message (i.e. 4 out of 5 don’t drink and drive). The researchers concluded that the campaign was successful across the board; it increased the support for lowering BAC, decreased the percentage of self-reported drivers taking the wheel impaired, and increased the proportion of people who accurately perceived that the majority of Montana drivers does not drink and drive (Linkenbach & Perkins, 2005, p.1). Canada has been on the forefront of the road safety issues and currently provides the largest number of social marketing campaigns against drunk driving (Cismaru et al, 2009, p.305). Unfortunately, having an extremely successful enforcement history and tools to address the issue of distracted driving in BC is still lagging behind.

## Chapter 2: Distracted Driving and the Psycho-social Dynamics of Driving

### History of Traffic Safety Science

Ralph Nader's book and his highly publicized court case, had significant implications for the development of road safety science. Road crashes were no longer just a problem of an individual "nut behind the wheel" but also a responsibility of governmental, auto-industry and insurance organizations that had the 'emerging risks' spotlight cast upon them. The need to address road safety concerns in this new framework of blame forced governments in the US and Canada to pass their first comprehensive vehicle safety regulations re-focusing policy makers on safety equipment like air bags, seatbelts and interior padding (Aarson, 2014). Thus out of private profit-based actuarial studies of accidents road safety research developed into a robust accident prevention and mitigation 'safe system' science discussed by Johnson, Muir & Howard (2013). Thus a more comprehensive risk science grew out of this initial risk controversy.

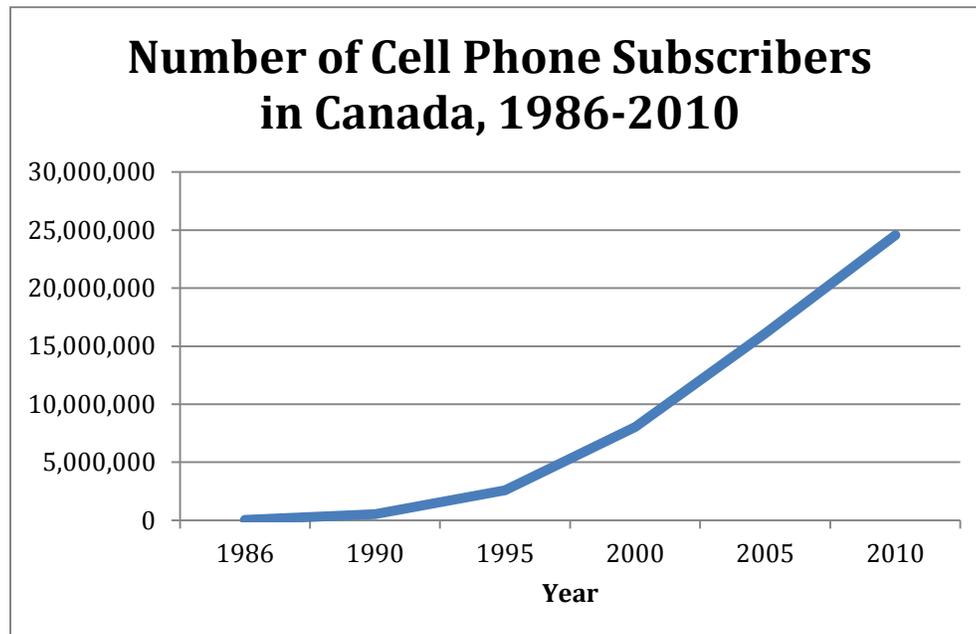
A complex multi-disciplinary research infrastructure has developed to address road safety concerns of the public. Organizations originally established to address specific issues (ex. impaired driving, driver education) subsequently transformed into research institutes with risk communication mandates. In Canada, the Traffic Injury Research Foundation (TIRF) was established in 1964 becoming the first independent Canadian road safety research institute. The organization is funded by research grants, donations and public funds. TIRF is not affiliated with any governmental ministry and is governed by a board of directors comprised by public and business representatives. Initially, TIRF's mandate was to address the issue of impaired driving, though the organization's expertise expanded to include aggressive driving, protection of vulnerable road users, anti-distraction and anti-fatigue research. Today TIRF conducts and disseminates high-quality scientific research on key issues on road safety (TIRF, 2013). The Canadian Council of Motor Transportation Administration (CCMTA) is the non-profit organization that ensures communication between various levels of governance on issues of road safety. The CCMTA operates through collective and consultative processes; the organization also accumulates expertise of independent bodies. Most importantly, CCMTA maintains communication network for government, expert and business representatives interested in road safety. Along the lines of research, the

CCMTA develops strategic, nationwide safety-promoting programs such as the Road Safety Strategy 2015 (CCMTA, 2013). Currently, these organizations not only conduct research, but are in charge of public outreach and lobbying for various road safety issues.

The Automobile Association of America (AAA) Foundation for Traffic Safety was founded in 1947. The Foundation is an industry wide non-profit advocacy organization which is based in Washington, DC. Initially established as a body for driver education, over time the organization expanded its mandate to include diverse functions related to the road safety including research and public advocacy. Currently the Foundation identifies road safety concerns, conducts independent research and analysis, creates strategies for addressing road safety issues and disseminate educational materials. The Foundation spotlights road safety issues, conducts research, and seeks solutions to raising issues related to the promotion of safety (AAA Foundation for Traffic Safety, 2013).

In the US, the Governors Highway Safety Administration (GHSA), a non-profit research body, was established in 1966 to coordinate state based collation of research into traffic safety. The organization has played a key role in ensuring collaboration between federal, state and local governments on issues regarding road safety. The GHSA continues to allocate research grants and conducts research on issues of road safety in the US (GHSA, 2013). The National Highway Traffic Safety Administration (NHTSA) has similarly operated under the US Department of Transportation since 1970 as a clearing house for road safety research. The NHTSA is responsible for “reducing deaths, injuries and economic losses” on the roads as well as for researching traffic safety and ensuring road safety improvements (NHTSA, 2013). By the 1990s, traffic safety sciences were well established in the public policy arena guiding, implementing and regulating car safety technologies and educating the public about seatbelts, speed limits and impaired driving policies. Together the aforementioned organizations provided a panoply of research initiatives spearheading the collection of systematic empirical evidence about behavioral issues, driver error, road traffic patterns and car design.

## Developing Scientific Focus: Early Research into Cell Phones and Driving



Despite this attention, the mobile phone did not at first draw the attention of these organizations despite the fact that mobile phones and automobiles were inseparable, as cell phones were not transportable otherwise (Kalba, 2008). Yet the early cell phone technology was used exclusively by businessman and small businesses (Agar, 2004). But during the 1990s the technology changed. By 1997 “a prospective adopter no longer needed a car to use a mobile handset” (Kalba, 2008). Subsequent changes in the technology which followed not only broadened the base of users, but also diversified the users. With falling prices younger people began to use the phone as well as adults generally – often justified as a safety feature when teenagers went out on dates in the car. The figure above demonstrates the extent of the exponential growth of cell phone subscribers in Canada. Starting from just 42,000 subscribers in 1985, users skyrocketed to over 8 million at the start of the millennium tripling to a over 24,5 million of users in 2010 (CWTA, 2014).

Since its rise the cell phone has ceased to be a simple object of consumption. The idea that the cell phone has become ingrained in the cultural fabric of our society is extensively discussed in communication literature and is probably best summarized by Sherry Turkle (2011) in her book *Along Together*. Turkle suggests that as a society we are obsessed with connectivity; cell phone, and especially text messaging, became a

link of choice. Turkle traces stories of cell phone separation anxieties, frustration of constant connectivity and our inability to re-imagine the world without our electronic devices. Cell phone-obsessed culture is probably best summarized by one of Turkle's respondents who claimed that "I live my life on my BlackBerry" (2011, p.8). Cell phones indeed became inseparable from work, leisure, study entertainment, and even relationships.

Today 99% of Canada is covered by wireless carriers and more than 83% of the household are register as cell-phone owning (CWTR, 2014). Thirty four billion dollars were invested on the development of mobile services infrastructure since 1985. Owning a phone crosses the age spectrum, with under 30s high intensity users. Indeed, in 2013 21% of all households were mobile only, this is 8 percent increase from 2010 (Statistics Canada, 2014).

In 1997 two researchers published one of the earliest and best recognized studies of cell phone distraction while driving. The study conducted by Donald Tibshirani and Robert Redelmeier in Toronto in 1997 caused an outburst of public attention to distracted driving. The researchers used epidemiological method to study 699 cell-phone using drivers who were involved in motor vehicle collisions. The study lasted for 14 month and included analysis of 26, 798 cell phone calls. The study is highly regarded because of its cross-over design. Cross-over design allows a to match and directly compare time-periods of the day of collision and an identical time period a day prior to collision; therefore the analysis would identify an increase in risk associated with the phone keeping all the other variables constant (Tibshirani and Redelmeier, 1997, p. 454). The study matched time of the crash by using call-phone billing records with police reports. The researchers found a four-fold increase in relative risks associated with cell phone use. The study was so highly-profiled in the media that four years later the researchers were forced to publish a commentary on their work. In their commentary the authors reported that following the publication of the research each of the authors participated in up to 50 media interviews weekly.

Despite being conducted in 1997, when cell phone distribution in Canada was at about 35%, Tibshirani and Redelmeier's findings (a quadrupled risk of crash associated with cell phone use) are still the most cited distraction effect in the field (McCartt et al, 2010, p.133). McCartt and colleagues attribute this to the high scientific standards established by this epidemiological approach. In the follow up letter the authors stated that while they feel obliged to communicate their findings to the general public they "[...]

are not activists on a public crusade. [...] are not lobbyist with a mission” (Redeleier & Tibshirani, 2001, p. 1581). This statement was caused by misuses and misunderstanding of their findings; these misunderstandings were mostly caused by audiences inability to grasp the difference between relative and an absolute risk.

### **The Accidental Sciences**

Based on this evidence other agencies began to ask about cell phone use in their nationwide surveys and accident attribution studies. In the US, the Motor Vehicle Occupant Safety Survey first conducted in 1944, and continues to be administered by the National Highway Traffic Safety Administration. The survey of 12, 000 Americans randomly selected from a nation-wide sample has undergone changes in both topics of research and method of delivery (NHTSA, 2013). The survey began to include cell phone use in 2000, after two epidemiological studies published in late 1990s estimated that 11% of all fatal and up to 30% of injury crashes were attributed to distraction (Utter, 2001, p.1).

Some cell phone researchers therefore began focusing on driver errors leading to accidents. One of the leading contributors to research on distracted driving is the Highway Loss Data Institute (HLDI), a non-profit industry organization (funded by auto-insurers) that conducts studies on collisions, road safety, and crash avoidance among other research areas. The institute is an affiliate of the Insurance Institute for Highway Safety (IIHS). Its mission is to be a scientific and educational body that also conducts comprehensive research by collecting crash data from multiple insurance firms that overall process 80% of all collision data in the US (HLDI, 2013). One of the specific areas of the IIHS research is human factors (i.e. alcohol, fatigue, distraction influenced drivers) in road collisions (IIHS, 2013). Some researchers claim that, despite their affiliation, the two aforementioned organizations have the best crash data available to researchers (Lafleur, 2012, p.3).

### **Approaches to Research**

The 21st century saw a surge in insurance data studies, crash-reports analysis, attitudinal and behavioral surveys, naturalistic and simulator studies, and on-road observations forging accident science into a multi-disciplinary approach forging accident

science into a multi-disciplinary approach. The international research community has approached the problem of distracted driving from multiple angles using different research approaches highlighting various dimensions of distracted driving from risk perception, to frequency of phone use, to mitigation strategies, to distracted driver profiling. The following section aims to overview the research designs used by the various researchers to shed light on the problem of distracted driving. Each sub-section will describe an individual research method, evaluate its relative validity, highlight limitations, and outline consensus in the findings. Clearly, it is only in their combination that the role of divided attention while driving became appreciated as a complex problem.

### *Surveys*

In studies of drivers' distraction surveys are particularly useful. There are two types of surveys used: observational surveys of drivers' behaviours and self-reported risk taking surveys. Observational surveys are unobtrusive roadside observations conducted by trained observers. Observations are conducted discretely; hence drivers are not likely to change the behavior as a result of being observed (Ranney, 2008, p.4). Simpson pointed out that observational roadside surveys are most valuable because they allow for direct collection of rich data from a real life environment (2005, p.4).

As with regular surveys, longitudinal observational surveys are particularly beneficial since they are conducted annually, on a large scale, using standardized procedures. These conditions assure comparability of results from different years. For example, in the US, the NHTSA conducts National Occupants Protection Use Surveys (NOPUS) that investigate frequency of seat belt, helmets, child restraint, and cell phone use (NHTSA, 2013). NOPUS is conducted annually nationwide to monitor and investigate patterns of cell phone use by time of the day, road types, vehicle category, race, age, gender, and other identifying characteristics (NHTSA, 2010, p.6). The survey began to include observation of electronic device use (i.e. "hand held cell phone") in 2000. In 2004 the survey was expanded to include a new category ("using headset") to register drivers using hands-free devices. In 2005 a new category "visual manipulating a hand-held device" was added to better capture distractive activities beyond cell phone calls, such as video games, GPS locators and texting (Pickrell, 2010, p.3). The results are generalizable from complex multi-stage probability samples to the general population (NHTSA, 2010, p.2). The results have mapped the increasing use of cell phones by drivers in the US.

In Canada, similar information is gathered supplementary to other road safety information through the National Occupant Restraint Program. Trained observers collect information on over 250 sites annually on both rural and urban roads across all provinces and territories (Burns et al, 2008, p.3). First available data on cell phones use is dated back to 2006. However, classification categories for electronic devices remain unclear. In 2009-2010 an observational survey of young drivers in three provinces (British Columbia, Ontario, Nova Scotia) in Canada was conducted. The researchers found that at least 16% of young drivers were somehow distracted. While listening to music (54%) was the first on the list of secondary tasks performed by the drivers, the cell phone use followed close second (44%). Vancouver, BC had the highest proportion of cell phone using drivers; 76% of observed youngsters were using their electronic devices at the moment of observation (Pike & Macpherson, 2011, slide 11).

The data collected by the most recent NOPUS indicates that in 2010 at least 5% of American drivers used hand-held devices and another 4% of drivers used their headsets. The survey also found that the prevalence of cell phone use was the highest in "16 to 24" age group and decreased with age. Additionally, the percentage of drivers registered visually manipulating an electronic device increased significantly from 0.6% in 2009 to 0.9% in 2010 (NHTSA, 2010, p.2). Canadian observational data indicate that as of 2013 percentage of drivers observed using their cell phones fell from 5.9% in 2010 to 3.3% (IRTAD, 2013, p. 107).

The advantage of observational surveys are that they tend to be relatively cheap, easy to execute, use a greatly desired random sampling procedure, and reach a diverse audience. According to Simpson, surveys are efficient in obtaining estimates of prevalence of certain behaviors (2005, p.4). McCartt and colleagues pointed out that surveys not only help to build a profile of typical cell phone user, but also allow a search for patterns in phone use (McCartt et al, 2006, p.90). Unfortunately, observational studies' power is limited. They are only able to capture a snapshot in time. Observational surveys are unable to provide data on duration or frequency of distraction or to evaluate the likelihood of getting into an accident with the occurrence of a competing activity (McEvoy & Stevenson, 2009, p.76). Moreover, to the author's knowledge only one observational study was conducted during nighttime, therefore, if there is a difference in cell phone use between dark and light hours, most observational findings would be non-generalizable.

Additionally, observational surveys are likely to underestimate prevalence of cell phone use due to observational difficulties. For example, a person who just placed a call, but is not currently talking, will not be recorded; so won't a driver who at the moment of observation was listening to the other party; or a driver whose headset is obscured by hair. On the opposite side, some of the drivers will be coded as talking on their cell phone, while in reality she was interacting with the voice activated in-vehicle system or conversing with a passenger (NHTSA, 2010). Lastly, naturalistic observations are usually conducted during light hours, on safe stops, on roads with lower speed limits and provide no information on distractions on highways or complex intersections (Regan & Lee, 2009, p.322)

### *Surveys II: Public Perception of the Risks*

Both the United States and Canada also conduct annual statewide surveys of drivers to explore drivers' driving practices, attitudes towards road safety, and perception of policy priorities. In Canada, the major survey, titled The Road Safety Monitor has been conducted annually by Traffic Injury Research Foundation since 2001. Every year the survey reaches about 1, 200 Canadians (Beirness, 2005, slide 9). The Road Safety Monitor probes drivers' views on a variety of driving-related issues and attitudes, behavior, knowledge, and opinion (TIRF, 2013). Importantly, anonymity of surveys permits respondents to talk about potentially illegal behaviors without fear of repercussions. Surveys probe into drivers' own perception of their behavior that is otherwise periodic, brief, and hard to capture (McEvoy & Stevenson, 2009, p.73).

In North America gathering of comprehensive information on risk perception by the general public and on self-reported trends of drivers' cell phone use in cars began in the mid- 2000s. These surveys included the Traffic Safety Culture Index in the US and the Road Safety Monitor in Canada. Both surveys use probabilistic samples, are conducted annually, reach their participants online or via phone and are concerned with self-reported data. The surveys aim to evaluate risk perception, driver attitudes, priorities, and risk-taking behaviors on the roads. The first set of questions regarding distraction was included in survey in the US in 2008 when as the researchers suggested "driver cell phone use has become emblematic of driver distraction—or arguably even of traffic safety— in the eyes of the public" (AAA Foundation, 2008, p.3). In Canada first survey

that included a section on the perceived risks associated with distraction was conducted in 2006 (TIRF, 2007).

### Risk Perception

The American Traffic Culture Survey is a nation-wide, representative phone survey that evaluates drivers' and non-drivers' perceptions and attitudes toward road safety. Data from the 2009 survey suggests that 34% of drivers felt less safe on the roads than 5 years before, and 31% of these drivers cited distracted driving as their main reason of feeling less safe (AAA Foundation for Traffic Safety, 2009, p.3). The survey concludes that, while the American public recognizes traffic safety as an important issue, “traffic safety tends to lag behind many other issues and priorities” (AAA Foundation for Traffic Safety, 2009, p.3). With regards to texting, the survey found that while “most people view text messaging and emailing while driving as a very serious threat to their own personal safety and consider it completely unacceptable”, many drivers do not perceive these behaviors as condoned by others (AAA Foundation for Traffic Safety, 2009, p.5). Interestingly, while 82% of respondents believe that texting makes them more likely to be involved in a crash, and 90% confirm that texting is a very serious threat to their safety, only a little over half of respondents consider texting unacceptable on the roads (AAA Foundation for Traffic Safety, 2009, p.6).

With regards to phoning, the same survey finds that there is a moderate level of social disapproval towards conversations on hand-held devices, but hands-free devices are widely accepted. 67% of respondents admit to talking on their cell phone while driving, while half of respondents also believe that talking on a cell phone makes them prone to getting into an accident (AAA Foundation for Traffic Safety, 2009, p.6). Less than one in three believes that any kind of cell phone communication is unacceptable (AAA Foundation for Traffic Safety, 2009, p.7). Overall, while drivers believe that talking on a cell phone and/or texting makes them a more dangerous driver, and recognize moderate disapproval from others, only 46% of respondents support laws against cell phone usage while driving (AAA Foundation for Traffic Safety, 2009, p.11). Similarly, Cosgrove and colleagues find that 8 in 10 drivers support an idea that social norms are shifting towards finding driving while on the cell phone unacceptable (2010, p.11).

A more recent study found that 84% of drivers are aware that their driving performance decreases when they are on a phone (Young & Lenné, 2010, p.329). They

notice that they drive less safely, miss hazards, stop signs, and turns, they react slower and change following distance regarding other cars. Indeed, a study by the TIRF found that by 2010 texting and driving is the most important road safety issue for the Canadian public (2010, p.37).

An interesting study by Lerner & Boyd reveals that drivers show “little reluctance to engage in most cell phone activities in any situation” (2005, p.1-1). The study probed willingness to engage with a cell phone under different conditions, from simple driving tasks to situations with enhanced dangers such as making a U-turn, driving with passengers or small children, and night conditions. Drivers were even more willing to engage in risky behaviors when stopped at a red light (Lerner & Boyd, 2005, p.3-1). However, not everyone in the field agrees with the aforementioned findings. Young and Lenné find that studied drivers report not engaging in cell phone conversations while driving in poor weather conditions, school zones, and heavy traffic, as well as on windy and unfamiliar roads (2010, p.331). Generally, researchers are shocked by the “lack of appreciation of the risk associated with basic cell phone tasks” (Lerner & Boyd, 2005, p.4-11).

### **Distracted Driving & Public Agenda**

While being a leading cause of death, road crashes are clearly underappreciated both by the government and the general public. Most road safety scholars agree that road safety issues are currently not prioritized adequately, therefore it doesn't receive necessary funding nor attention and is grossly underestimated (Roberts, Mohan & Abbasi, 2002, p. 1107). Johnson and colleagues suggested that even expenditures on dental research exceed that of road safety research. The researchers cited a ratio of spending of 36:1 on HIV/AIDS to the road safety issues; cancer research received four times the funding of road safety (Johnston, Muir & Howard, 2013, p.3). Arason argued that with the current number of deaths on the road would be tolerated if attributed to any public health issue would be tolerated (2014). Yet the estimates of what is actually going down on the roads and how big the risks are seemed contradictory depending on location age and methodology.

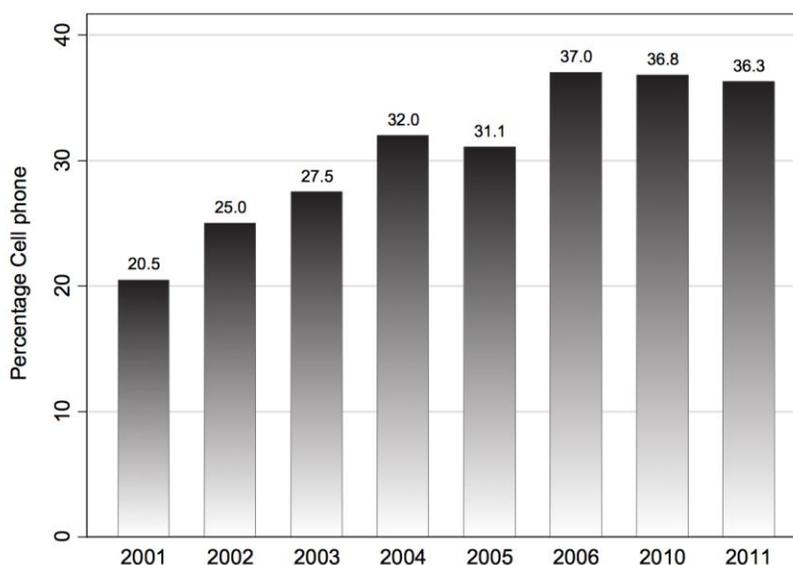
As with any research problem, surveys have limited explanatory power in the realm of distracted driving. McEvoy & Stevenson pinpointed a few important limitations such as self-reporting bias, low response rates, and pressure of social desirability (as cited in Young et al, 2009, p.75). The random sampling procedure is often skewed by

non-random self-selection participation patterns. A potential issue with self-selection is that those drivers who are involved in illegal manipulation with electronic devices are more likely to decline participation. Non-respondent bias again skews data towards underestimation of the problem (Simpson, 2005, p.4). Lennè & Young pointed out that some studies falsely generalize findings to the population from a qualitatively different sample (such as undergraduate students) (2010, p.331)

A rephrased popular saying, “A dull pencil is better than the sharpest memory” is ostensibly relevant to the researchers of distracted drivers. Human memory is fallible. It is highly unlikely that survey respondents keep track of their actual distraction patterns, therefore, when it comes to estimation of cell phone use, researchers are faced with problems of recall, as well as issues with over- and under-estimation (Beirness, 2005, slide 5). Lastly, surveys are very vulnerable to poor conceptualization, weak operationalization and deficient question design (McCartt, 2006, p.90).

Yet longitudinal data, even if it is a “dull pencil”, can also provide a sense of changing behavior as cell phones diffused rapidly throughout North American populations. As far as prevalence of use statistics are concerned, in 1997 only 35% of Canadians owned a cell phone (CWTR, 2014). That year 16% of all drivers used their cell phones behind the wheel (Beirness, 2005, slide 13). In 2011, cell phone penetration reached 80% Canada-wide and self-reported survey data indicate that 36.3% of people use their phones while driving (Marcoux et al, 2012, p.2). The graph below (TIRF, 2011, p.2) presents a rising trend of cell phone use while driving since 2001 (4 years after mobile phones became portable). TIRF Road Safety Monitor report indicated that there is no evidence of reversed trend to date.

**Figure 2: Percentage of Respondents Using a Cell Phone while Driving by Year**



### *Naturalistic and On-track Studies*

Naturalistic studies on effects of distraction are conducted using instrumented vehicles. Automobiles get equipped with multiple cameras and driving parameter measuring technologies prior the beginning of a study (McCartt, et al, 2010, p.134). Naturalistic studies have the best absolute and external validity (Simpson, 2005, p.10). They allow researchers to generalize findings to real everyday driving scenarios. Naturalistic studies allow collection of real world rich data. Naturalistic studies allow continuity of data by “record [ing] behavior of drivers engaged in everyday driving over an extended period of time” (McCartt et al, 2006, p.90). While naturalistic data are not biased by self-reporting, purposive sampling might potentially influence findings (NHTSA, 2009, p.3).

To date, the most recognized naturalistic research is The 100-Car Naturalistic Driving Study completed in 2010. The study was conducted under auspices of NHTSA. The main purpose of the study was to understand factors contributing to crashes in naturalistic conditions. The researchers collected data for a little over a year with specially equipped vehicles (five unobtrusive cameras and kinesthetic sensors in each) collecting 43,000 hours of data. The main value of the study is detailed behavior of drivers captured by video recording, naturalistic environment and the multiplicity of risk-taking behaviours captured. The study captured 69 crashes, 761 near-crashes and 8,

295 incidents in duration of a year. The study found that cell phones are by far the most frequently performed secondary task performed prior to the crash, near-crash and incident with almost 700 occurrences. The second most popular distraction is passenger-related activities with a little less than 400 cases. Interestingly, cell phone use did not contribute to any lead vehicle conflict crashes, but manifested in following vehicle conflict, running off the road and single vehicle accidents (Neale et al, 2010, p. 9). In such cases accidents are more likely to cause injury and property damage rather than fatalities. Due to the huge amount of data generated by the study as well as time and financial constraints raw data would be posted for researchers to draw their own conclusions for the variables of their interest. Data is currently collected in Canada; the study is set in Saskatchewan and is expected by completed in 2015 (Arason, 2014).

The main value of studies similar to 100-car study is that they allow studying configuration of crashes, calculating time for glances off of the road and estimating precisely drivers' reaction time. For example, one of the earlier studies estimated an approximate duration of glances of the road and concluded that 88% of all glances away are less than 1.6 seconds (Ducik et al, 2005). Precise time measurements allow to classify difficulty of various types of distraction (Kircher, 2008)

Despite multiple benefits, naturalistic studies have inevitable faults. Collection and reduction of naturalistic data are very expensive and time-consuming. Naturalistic studies collect a very large volume of data that is hard to store, process, and analyze (Young et al, 2009, p.87). A naturalistic environment does not allow for control of compounding factors, sometimes making comparison impossible. McEvoy and Stevenson also point out that naturalistic studies usually use small, non-representative samples of volunteers and do not have a capacity to measure proxies such as "a level of attention" (2008, p.81).

### *Insurance Data & Crash Data Reports Studies*

Crash and insurance data are used to make sense of real life accidents using information from accident protocols and other statistics gathered in the reporting of accidents (Svenson & Patten, 2005, p.191). Insurance and crash data are gathered post-factum and often derived from narratives of police reports (NHTSA, 2009 p.2).

Insurance data are used because insurance claims outnumber police reports in ratio of 5 to 1 since not all crashes involve presence of police (Wilson et al, 2004, p.28).

This type of data are usually accurate with respect to time and damage done in the accident (Simpson, 2005, p.9), but might be imprecise since it can be potentially skewed by self-reporting (NHTSA, 2009, p.2). The presence of official reports permits random sampling of the crash cases, as well as comparison of compounding factors (Kircher, 2007, p.30). Additionally, recorded population parameters allow for analysis of different demographics (HLDI, 2010, p.9).

While insurance and crash data have a great potential for providing researchers with the most accurate and rich information, the quality of data currently collected does not withstand rigorous empirical demands (Stutt, 2005, slide 6). For example, crash data revolves around the event of a crash itself, but neglects events immediately preceding the crash (Lee et al, 2009, p.36).

According to NHTSA data reporting procedures are not consistent across jurisdictions and are often based on a narrative. Since reports are narrative-based, the presence of distraction is hard to confirm considering that drivers are not likely to report illegal behaviors, such as texting while driving (NHTSA, 2009, p.2). Additionally, even if police reports guarantee consistency of reporting in a given jurisdiction, these reports are biased towards distractions that are not illegal (Gordon, 2009, p.293). As with all secondary data, police reports do not have all information necessary, such as exposure data, to calculate additional risks associated with different types of distractions (Simpson, 2005, p.6).

Police reports do not tend to distinguish between different types of distraction. Therefore, accurate investigation into distractive crash-triggering is not possible (HLDI, 2010, p.9). For example, while unlikely, it is possible that phone use by a driver decreases while other sources of distraction rapidly increase (HLDI, 2010, p.9). Jacobson and colleagues raise a similar point in their study, stating that overall accident rates data tend to be used for estimation of cell phone distraction. Therefore, the effectiveness of laws regarding distracted driving might be overestimated (Jacobson et al, 2010, p. 1591). Additionally, Regan et al point out that “technological change introduces new distractions at great rate and makes crash data lagging and inefficient indicator of the distraction problem” (2009, p.622).

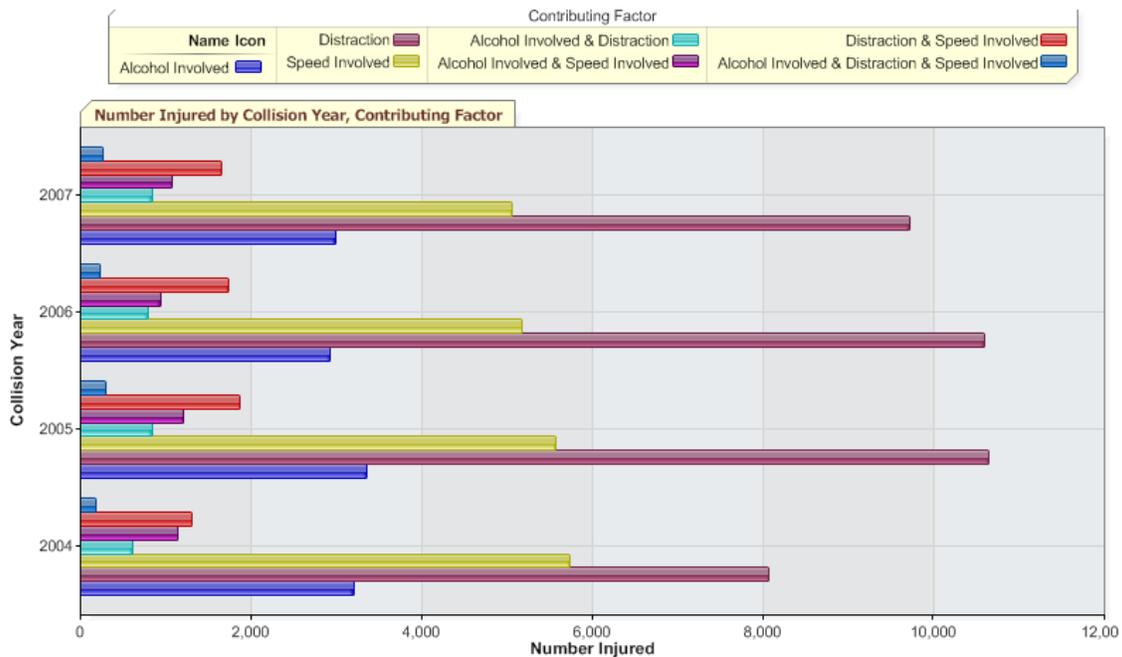
Police, hospital, and insurance data have a great potential for uncovering information regarding crashes attributed to distracted driving. Currently, police data are

biased towards specific types of crashes and do not report enough information on severity of injuries (IRTAD, p.8). Hospital data are hard to access and do not have reporting standardization needed for comparisons (IRTAD, p.15). Insurance data are also hard to access and interpret (IRTAD, p.50). Combining the three different sources of data might provide a better picture with information about the driver, vehicle damage, risk factors, and crash causes. The hardest part is to establish linkages and gain access to the three differed types of data. In order for that be achieved, manual, probabilistic, and deterministic methods of data matching need to be perfected (IRTAD, p.50).

In British Columbia Traffic Accident System (TAS) is used for collisions reporting and is available online at <http://www.injuryresearch.bc.ca/?idot=traffic-accident-system-tas-data-tool>. The data for TAS is obtained from the Insurance Corporation of British Columbia and police reports. TAS provides information on factors contributing to collision as well as general information of the accidents (i.e. collision type, speed zone, vehicle information, severity of injury). Until 2007 BC's law enforcement units were required to attend every crash scene. However, this policy was abandoned in 2008. Therefore, the data available in TAS information system after 2008 might not always be representative of the actual number of injury and accidents (BC Injury Research and Prevention Unit, 2014). Additionally, as of August 2014 TAS only contains injury data up to 2007.

The graph below demonstrates a number of injuries attributed to three major injury-contributing factors: drinking, speeding and distraction from 2004 (when information on distraction was first collected) to 2007. From the data presented it is clear that distraction claims twice as many injuries as speeding and three times that of impaired driving. Distraction is indeed leading cause on injuries in BC.

**Figure 3: Number of Injured in Crashes by Contributing Factors & Years**



Additionally the graph demonstrates decreasing number of accidents attributed to speeding and drinking from 2004 to 2007; yet the accidents attributed to distraction stay the same in 2005 and 2006 and decrease only slightly by 2007. Indeed, ICBC’s most recent report suggests that death from speeding, drinking and non-use of seatbelts as well as the total number of accidents are going down (2012). Death count attributed to distraction is also on a decline yet as a proportion of all accidents the fraction of crashes attributed to distraction is growing (ICBC, 2012).

In Canada, very few jurisdictions include a driver’s distraction checkbox in the police reports, or else distraction is classified under a general category of inattention (Robertson et al, 2010, p.20). Since the crash data are primarily collected for different purposes, they yield no baseline for comparison and does not provide the frequency of distraction occurrences (Kircher, 2007, p.30).

**Simulators**

Driving simulators are by far the most popular approach to studying the effects of distraction on driving. Simulators vary in their design, costs, and measuring attributes (McCartt et al, 2006, p.90). To date, a number of studies have tried to establish differences between distraction indicators obtained from simulators and real world driving situations. Young and colleagues point out that studies that examine driving simulators generally found them to be poor in absolute validity (completely identical

measurements with actual vehicles), but high in relative validity (similar magnitude and direction of effects). Reed & Green concluded, as early as 1999, that while the values of the performance measures might be different between real world and simulator studies, identical direction of effects make them comparable (p.1017). Young et al state that relative validity of driving simulators have been well demonstrated (2009, p. 291). Driving simulators have been improving rapidly and the more costly simulators with moving bases and synchronized 3D sound reaches very high sensitivity that allows to measure effects of distraction on driving performance, even when the effects are small (Young et al, 2009, p.87). Driving simulators originated as a means to test road design, vehicle interfaces, and influence of various human factors on driving. Distracted driving research distinguishes simulators by their fidelity. The higher a simulator's fidelity, the more it is able to respond as a real life vehicle. High-fidelity simulators are able to provide higher levels of environmental, objective, equipment, and perceptual validities that result in a more authentic reproduction of the world, better synchronization and haptic response, and general believability of the driving scenario (Young et al, 2009, p. 89). Simulators with the highest fidelity will use advanced computer graphics for visual display, 3D sound, moving base, and synchronous interaction between suspension and steering system (Reed & Green, 1999, p. 1016). Due to their moving base and high resolution, high-fidelity simulators will be able to provide haptic and motion feedback to drivers, making the experience life-like (Young et all, 2009, p. 91). High-fidelity simulators will often be integrated into a body in a real car advancing the naturalism of the experience.

Simulators with lower fidelity use a fixed base and less advanced audio and visual systems. However, the range of low-fidelity stimulators is vast from a monochrome image of only road-marks to a PC with joystick to a combination of multiple screens with a life-like response system. Overall, low-fidelity stimulators are less precise in terms of lane-keeping and speed control. The sensitivity of the measures is diminished but the lack of motion cues from the fixed-base (Reed & Green, 1999, p.1016). Being less realistic, low-fidelity simulators are also more likely to exaggerate the effects of distraction since the absence of immediate haptic clues makes a higher demand on the driver causing them to react more pronouncedly (Young at al, 2009, p. 94).

Simulators have a lot of advantages in studies of distracted driving. Simulator studies are a safe, ethical alternative to the on-road experiments. Simulators made possible studies of such distractions as texting, drinking, and medical conditions, or

workload that otherwise might have not been possible due to the extremely hazardous nature (Reed & Green, 1999, p.1016).

Simulators allow control over compounding factors; hence multiple conditions might be separately or simultaneously applied in a distraction study. The ability to control compounding factors permits the evaluation of other contributors, including weather, road design, and nighttime, and how they influence, exacerbate, or mitigate the effects of distracted driving (Simpson, 2005, p.10). Simulator studies subject all participants to the same conditions, making research outcomes comparable (Kircher, 2007, p.15). Simulators are cost-efficient since, while they do need to be realistic, they do not need to be road-worthy possible (Reed & Green, 1999, p.1016). Additionally, simulators allow for multiple indicators to be measured simultaneously, thus collecting rich data.

Interestingly, comparison results of low- and high-fidelity simulators are consistent in concluding that the two types of simulators demonstrate almost no difference (Reeds & Green, 1999, p.1027). Young and colleagues conclude that “the low-fidelity simulators offer a similar level of sensitivity and validity as high-fidelity simulators for evaluating the effects of secondary task on driving performance” (2009, p.94). Therefore, cheaper simulators can be used without a significant sacrifice in sensitivity measures. The only major difference found between low- and high-fidelity simulators is the effects of visuals on steering angle (Young et al, 2009, p.91). Both types of simulators demonstrate good relative validity and poor absolute validity, making lane-keeping measures less precise compared to an on-road naturalistic study (Reed & Green, 2009, p.19). In 1999, Reed & Green hope that the realism of simulators will be further improving and will include such effects as gusts or realistic vehicle noises.

Despite being cost-efficient, relatively cheap, and safe, simulators are prone to vulnerabilities by their physical design. Responses characteristics and realism are inevitably affected on simulators (Reed & Green, 1999, p.19). Kircher and colleagues suggest that the lack of motion cues and artificial environment might also affect driving behavior (2007, p.327). The safe environment created by simulators skews findings of distraction effects by allowing drivers multiple mistakes without punishing them for carelessness (Reed & Green, 1999, p.1032). Therefore, in simulator studies, steering behavior is exaggerated by high error tolerance (Young et al, 2009, p.93).

McCartt and colleagues also point out that modification of behavior due to a presence of an experimenter and learning effects are rarely accounted for (2006, p.92). Kircher points out that, unlike real life, distraction is induced artificially at specific time-

points leading to a decreased ecological validity (Kircher, 2007, p.15). Artificial conversations are additionally unrealistic, have unnatural flow or recall exercises, and have little emotional content (McCartt et al, 2006, p. 92). Ranney points out that simulator studies do not “provide direct information about the real-world risk of a given secondary task, only the level of primary (driving) task degradation when performed in a given setting” (2008, p.5). Most importantly, the researcher community suffers from a lack of standardized methods and operational clarity. These factors prohibit comparison across the studies and make replication of results almost impossible (McCartt et al, 2006, p.92).

### *Eye-gaze Studies and Lane-change Tests*

Eye-gaze studies and lane-change tests are the newest approaches for evaluating an impact of a distraction on driving performance made possible by recent development of technologies. Eye-gaze studies evaluate frequency and duration of gazes off the road towards various objects, as well as dwelling and transition times. Scientists were recently enabled to conduct eye-gaze studies by automated eye-tracking devices. Prior, such studies were hard to conduct as data collection and analysis were done manually. Technology nullified the need of expert data reductionists and shorten the time needed for experiments (Kircher, 2007, p.5).

The lane-change test (LCT) helps to quantify drivers' performance degradation by combining the reaction time paradigm with simulation approach. The task is simple, under the condition of a single- or dual-task, a driver is required to make lane changes following the signs indicating lane-number along the roadway (Mattes & Hallen, 2009, p.121). Quantified degradation of driving performance is used to compare various driving activities to each other. At this point, the LCT is in its nascent state of development (Mattes & Hallen, 2009)

Ablaßmeier and colleagues suggest that gaze studies are a valid measure of the visual demands associated with secondary tasks (2007, p.2251). Indeed, the International Organization for Standardization (IOS) created guidelines for in-vehicle device manufactures using glance-length analysis. Kircher finds that most glances are under 2 seconds long and take on average 0.7 to 1.0 seconds. The IOS recommends devices that allow users to perform a task under 15 seconds with glances away for no longer than 2 seconds each (2007). Current research suggests that repeated shorter

glances away have a graver degrading effect on drivers' performance than a single glance of the same duration (Kircher, 2007, p.5). Kircher concludes that: "by looking back on the road briefly between glances away from the road, the driver cannot fully update his mental image of the situation enough in order to be fully back in the loop" (2007, p.41).

### Attention to the Road

Driving is an attention-demanding task (National Safety Council, 2010, p.10). Operating under this assumption, researchers found that drivers distracted by cell phones commit more traffic violations compared to those who are not distracted (Beede & Kass, 2005, p.418). An early study used incidental memory as a proxy to measure attention, because attention is required for creating long-lasting explicit memories (Strayer et al, 2003, p.26). Researchers asked participants to discriminate between billboards that were present during their driving task versus those that were not, under both single- and dual-task conditions. Scientists hypothesized that if a difference occurs between dual- and single-task conditions, then it is likely that attention is inhibited by cell phone conversation (Strayer et al, 2003). The team found that "recognition was greater in single-task conditions than in dual-task conditions" (Strayer et al, 2003, p.27) and concluded that cell phones disrupt driving by diverting attention into the internal context of a conversation.

A follow-up study by Strayer and colleagues confirms that participants are less likely to create a memory of an object when conversing on a phone regardless the salience of the object to driving (2004, p.2216). They proposed an inattention blindness hypothesis suggesting that drivers look, but fail to see stimuli relevant to safe driving due to their attention being directed elsewhere (Strayer et al, 2004, p.2213). Researchers found no difference in relevance or salience of stimulus to driving. The findings regarding salience are important because they demonstrate that drivers do not have a high-level control over information processing. Drivers endanger themselves while conversing on the phone by missing highly relevant information from the driving scene (Strayer et al, 2004, p.2216).

Some scholars argue that eye movement patterns are "among the best performance metrics for measuring distraction and workload" (Victor et al, 2009, p.142). While previously eye movement patterns were hard to evaluate and map out, recent

developments in technology have helped scientists to gain a highly sensitive measures of distraction in drivers. Eye movement equipment can capture anything from glances away from the road, to fixation pattern, to drifts, and head movements (Victor et al, 2009). Recent research studies find that cell phone induced distraction causes drivers to decrease time paid to instruments and mirrors, impair scanning patterns, and produce a tunnel effect. In a test-track study conducted in 2002, drivers also “made significantly fewer saccades (high-speed eye movements facilitating the exploration of the visual field) per time unit as the phone task increased complexity” (Svenson & Patten, 2005, p.189).

The tunnel vision phenomenon is not well understood. However, research shows that, while distracted, drivers tend to focus on the visual field in front of their vehicle, ignoring the periphery. A gaze of 100 milliseconds is considered a fixation (Strayer et al, 2008, p.28). While tunnel vision has no costs to lateral control (i.e. lateral control is guided by central vision), drivers are not able to detect hazards until they are dangerously close to the vehicle (Ranney, 2008, p.7). More importantly, “even when the participant’s eyes were directed at objects in the driving environment, they were less likely to remember them” (Strayer et al, 2003, p.28) under a dual-task conditions.

Situation awareness is another proxy measured in distracted driving research. Svenson and Patten point out that “when drivers [are] phoning they become much less aware of the traffic environment and the traffic situation” (2005, p.188). Wickens and Horry point out that safe driving is impossible without correct detection, identification, assessment, and action upon demands of the hyper-dynamic environment (2009, p.65). The term "situation awareness" comes from military research concerned with complex tasks in aviation studies. Situation awareness involves identification of stimuli in the environment, their analysis, and retrieval of appropriate behavior and action (Kass et al, 2007, p.322). Being aware of the traffic environment and perceiving driving clues are crucial for anticipation of future unexpected events (Tasca, 2005, slide 13).

Earlier studies found that situation awareness tends to decrease under conditions of cognitive distraction. Beede & Kass suggest that a lack of situation awareness can partially explain the absence of difference between hands-free and hand-held devices (2005, p.419). Drivers are not able to process information from the driving scene. Strayer and colleagues suggest that a cell phone impairs drivers’ ability to detect changes in the traffic environment (2003,p.23). Using the detection task paradigm, Lee and Reyes undertook a study asking participants to detect a hazard. Interestingly,

multiple hazard misses happen when a driver conversing on a cell phone, has his gaze directed to the part of the scene with the distraction (2008, p.397).

Surprisingly, when it comes to collisions, researchers found that cell phone using drivers are prone to more collisions than both non- distracted and drunk drivers (Strayer et al, 2006, p.388).

### Multi-tasking and Divided Attention

Multitasking is a complex cognitive phenomenon. No single measure can capture all effects of simultaneous phone use behind the wheel (Foley, 2009, p.125). This subsection will discuss the most popular proxies that are used to measure the effects of cell phone distraction on driving. Some researchers use speed to estimate effects of cell phone conversation on driving. The researchers found that drivers tend to drive slower while on the phone. They uncovered no difference between experienced and novice drivers on this proxy (Smahel et al, 2008, p.1912). However, researchers found that under a dual-task condition older drivers took longer to recover their initial speed (Strayer et al, 2006, p.386).

Speed recovery was also affected by a cell phone conversation. Recovery to initial speed took drivers engaged in a conversation 19% more time, compared to those who were driving under a single-task condition (Strayer et al, 2006, p.386). A comparison of drunk drivers to cell phone conversing drivers revealed that while the former braked harder, the latter exhibited slower braking reaction (Strayer et al, 2006, p.386).

Following distance is the distance between a participant's car and a pace car used by experimenters (Strayer et al, 2003, p.24). Researchers find that, in general, the following distance increases under a dual-task condition for all drivers regardless their age or experience (Strayer & Drews, 2004, p.647). Additionally, more recent research finds that variability in the following distance increases by 24% under a dual-task condition (Strayer et al, 2006, p.386). Smahel and colleagues find an average speed reduction of 1.27 km/hr for drivers conversing on a cell phone (2008, p.1913). This small, but significant reduction might serve as a mitigation strategy that helps drivers to cope with increased mental workload, decreasing the need to process new information. An

increase in following distance and a decrease of speed is currently considered a self-induced distraction mitigation strategy.

The lane-keeping ability of drivers involved in a cell phone conversation suffers much less in comparison to their reaction time (National Safety Council, 2010, p.10). Smahel and colleagues' study concerned with lane-keeping, reports that "there were no center line crossings or near encroachments" for drivers under a dual-task condition (2008, p.1912). Rakauskas and colleagues state that little change in lane-keeping results from the fact that a cell phone conversation does not strongly influence steering abilities of a driver. A recent study explains the nuances of relationships between cognitive distraction and vision. Humans are served by two different types of vision: focal and ambient. Focal vision is served by fovea and is used for object recognition, focus, and attention. Ambient vision is served by retina and is used for peripheral detection of objects (Wickens & Horrey, 2009). Wickens & Horrey pinpoint that focal vision, affected by distractions, is not necessary for the process of lane-keeping. Lane-keeping is served by retina that is not affected by distractions. Therefore, even when cell phone distracted drivers receive and process feedback, s/he needs to keep a car in the correct lateral position without interruption (Wickens & Horrey, 2009, p.63).

The most consistent finding among various types of research is distractions' effects on reaction time. Scientists agree that drivers' reaction time is greatly affected by interactions with their cell phones (Ranney, 2008, p.13). A meta-analysis of 18 studies shows that both hand-held and hands-free cell phones increase reaction time to critical events by 0.23 seconds (AAA Foundation for Traffic Safety, 2008, p.4). A literature review of 125 studies produced by McCartt and colleagues supports the idea cell phone distraction increases drivers' reaction time (2010, p.134).

Studies show that brake-offset time, speed recovery, and other reactions requiring activities are performed sluggishly while conversing on a cell phone compared to a single-task condition (Kass et al 2007). Reaction time is important because it allows drivers to respond promptly to sudden events, but reduction in data-driven processes results in a sluggish reaction to a potentially dangerous situation (Strayer et al 2003, p.30). A study conducted by Drews and Strayer finds that reaction time to braking slowed down by 18% of the speed under a single-task condition (2004, p.645). Smahel and colleagues find that both novice and experienced drivers tend to miss more near-hazards (i.e. objects that are less than 5 seconds away from the vehicle). This is likely to happen because hazard identification requires immediate attention, but slowed down

reaction time prevents drivers from on-time hazard identification (2008, p.1912). Strayer and Drews point out that slower reaction response could increase the severity of a collision (2004, p. 648).

#### Distracted Driver Profiling

Overall distraction inhibits drivers' performance and vehicle control skills (Jacobs et al, 2012, p.1587). Cell phone induced distraction leads to inattentive blindness, traffic violations, increases in reaction time, decreases in visual scanning patterns, inhibits situation awareness, causes variation in speed and following distance, and has multiple other negative effects on driving performance (Finch & Hanowski 2011, p.3). While current research makes it impossible to create a profile of an average distracted driver, conclusions about gender, age, experience levels are inconsistent. The single point of consensus among the scientific community is that there is no difference between the effects of hand-held and hands-free phones (McCartt et al, 2010).

Findings regarding age are inconsistent. Some studies found that older drivers suffer from a larger decrement in proxies used to measure driving skills. Younger drivers seem to handle double-task conditions better (Reeds & Green, 1999, p.1031). This difference held in both simulator studies and on the road test. One of the theories suggests that older and younger drivers have different cognitive abilities, attention spans, as well as depth and contrast perception (Koopel et al, 2009, p.356). Proponents of the theory suggest that the age-related decline of cognitive capacities "leave[s] relatively spare capacity to deal with competing activities" (Koppel et al, 2009, p.259). Therefore, dual-task conditions are more distracting for older drivers and their performance deteriorates to a greater extent.

Alternatively, studies find that younger drivers lack experience and practice and are less capable dealing with secondary tasks (Young & Lennè, 2010, p.330). Younger drivers perceive distracting activities less cognitively demanding and report higher willingness to engage with various distractions than older drivers (Young & Lennè, 2010, p. 327). One of the newer studies, by Strayer and Drews, found no significant difference in reaction time decrement between younger and older drivers (2004, p. 645).

The one point of consensus is that age affects the rates of technology adoption and use. For example, an Australian survey study found that only 27.8% of older drivers admitted to conversing while driving, while 69% of younger driver stated that they practice this activity (Young & Lennè, 2010, p.328). When it comes to texting 87% of younger drivers admitted to sending or reading a text, while only 5% of older drivers did

(Young & Lennè, 2010, p.328). A nation-wide American survey found that the proportion of drivers admitting to texting decreases with age from 51% of 16 to 19 year olds, to 22% of 35 to 44 year olds, to 3% of these over the age of 75 (AAA Foundation for Traffic Safety, 2009, p.5).

Overall, while some researchers believe that older drivers experience greater performance decrement under dual-task conditions (Nelson et al, 2009, p.439), others found no significant difference between age groups (McCartt et al, 2010).

One major issue comes into play of age and distraction. It seems that the field lacks standardized age bracketing and every researcher uses his/her own ordinal categories (i.e.18-30 versus 16-25) (Robertson et al, 2010, p.14). Indeed, some studies divide drivers between “younger” and “older” without providing age ranges at all. This disconnection makes it difficult to draw generalizable conclusions based on multiple studies (Young et al, 2009, p.343).

Researchers did not reach an agreement regarding gender differences when it comes to driving while using a cell phone. Reed & Green, in an earlier study, found no gender-related significant effects of distraction (p.1025).

An earlier case-crossover study of almost 2, 000 drivers conducted in Vancouver, Canada found that, out of all cases of at-fault crashes, young male drivers represented the highest percentage (Wilson et al, 2004, p.49). More recently, the Road Safety Monitor reports that males are more likely to use cell phones while driving (as cited in Beirness, 2005, slide 14). The Traffic Safety Culture Index of 2007 also reports that males are more likely to report using cell phones while driving (AAA Foundation for Traffic Safety, 2008, p.1).

One of the recent studies states that men are more willing to take a risk and engage in a conversation (Lerner & Boyd, 2005, p.3-1). However, both of the aforementioned studies are based on self-reporting. Therefore, the difference between genders might have occurred from the nature of self-reporting.

The most recent self-reported data out of Canada revealed that 43% of males versus only 35% of females report using a phone while driving (Robertson et al, 2010, p.14). However, some studies from the US suggest that the actual rate of use is indeed higher for females (Young & Regan, 2009, p.323). Other observational studies report more males using cell phones (Young & Lennè, 2010, p.331). McCartt and colleagues summarize field findings by stating that risk of crashes and rates of use do not differ significantly between genders (2010, p.133).

Differences between novice and experienced drivers are also unclear. Svenson & Patten find that novice drivers tend to have longer and more varying glances away from the road while on the cell phone (2005, p.190). A different study demonstrated that experienced drivers are able to answer more questions on situation awareness correctly (Kass et al, 2007, p.325). Overall, studies illustrate that novice drivers are also less capable to follow directions while distracted and miss more turns under a dual-task condition (2007, p.325). Kass and colleagues argue that while novice drivers might demonstrate less situation-awareness, both groups “suffered similar decrement in performance during the cell phone conversation” (2007, p.321). Additionally, Svenson and Patten argue that all drivers are aware of increased mental workload under a dual-task condition (2005, p.190).

Crash profiling shows that distracted drivers are more likely to have a rear-end collision than drunk drivers (Strayer et al, 2003). Results of a well-designed Canadian study that involved cross-matching analysis of police reports, insurance claims and naturalistic observations suggest that drivers using cell phones are over-involved in a rear-end collision comparatively to other collision configurations (Wilson et al, 2004, p.51). Later research by Strayer and colleagues is in line with the idea that the relative risk of being in an accident while using a cell phone is similar to the risk associated with driving with a blood alcohol level at the legal limit (2006, p.381). Dildy realistically concludes that cell phone use is a bigger problem than drinking and driving, because “there are many more cell phone using drivers than there are drunk drivers” (2012, p.86).

Lastly, findings regarding relations between levels of conversation difficulty and levels of performance deterioration are mixed. Some studies find that both simple and complex conversations have comparable effects on driving skills, since similar cognitive recourses are involved in both tasks (Kircher, 2007, p.10). On the other hand, more recent studies find that as difficulty of a cell phone conversation increased, driver performance deteriorated further (Drews & Strayer, 2009, p.196; McCartt et al, 2006, p.94). For example, Rakauskas and collaborators find that drivers engaged in a more complex conversation demonstrated “higher variation in acceleration pedal position, drive more slowly with more variation in speed, and report a higher level of workload regardless of conversation difficulty level” (2004, p.452).

There are might not be specific differences between genders, ages, or experience levels when it comes to effects of distraction; however, some of the researchers suggest that not all drivers are equal when it comes to willingness to

engage in distraction. Rakauskas and his research team state that cell phone use might go hand-in-hand with other risk-taking behaviors such as drunk driving, non-use of seat belt, aggressive driving, etc. (2004, p.452). A factor analysis by Wilson also reveals that there is a place for a specific category of “risk takers” (Wilson et al, 2004, p.52). Wilson and associates conclude “the violation pattern of cell phone users suggests that they are, in general, riskier drivers” with the difference likely to be seen through attitudes and personality (Wilson et al, 2004, p.52).

### **Risk Perception**

Research shows that 84% of drivers are aware that their driving performance decreases when they are on a phone (Young & Lenné, 2010, p.329). They notice that they drive less safely, miss hazards, stop signs, and turns, they react slower and change following distance regarding other cars. Indeed, a study by the TIRF found that texting and driving is the most important road safety issue for the Canadian public (2010, p.37). Additionally, the Traffic Safety Culture Survey of 2009 suggests that 34% of drivers felt less safe on the roads than 5 years before, and 31% of these drivers cited distracted driving as their main reason of feeling less safe (AAA Foundation for Traffic Safety, 2009, p.3).

The regularized and standardized execution of large-scale surveys over time provides researchers the kind of longitudinal data that tracks changes in risk awareness and attitudes. In the US and Canada surveys can help us understand how public attitudes and relative risks have changed over years as some traffic safety issues rise up the risk agenda while others fade away. For example, in 2005 only 40% of Canadian drivers believed that the cell phone is a “serious” or “extremely serious” threat to road safety (Beirness, 2005, slide 10). By 2010, in just 5 years, this number grew to 85% (TIRF, 2010, p.16)! If surveys are correct, in the past 2 years, texting while driving surpassed drunk driving as the main road safety concern of the Canadian public (Vanlaar et al as cited in TIRF, 2010, p.16). The same year, the Canadian Automobile Association reported that distracted driving is believed to be one of the most “unreported traffic safety problems facing Canadians” (CAA, 2014).

## Chapter 3: From Science to Public Policy

### Legislation

As evidence accumulated in the files of insurance companies and traffic safety researchers, so too calls for action began to be heard in the press. Growing concern with the negative impact of cell phones on driving performance burst into the public domain in 1999 when policymakers in the US started to consider a ban on hand-held devices (Nikolaev et al, 2010, p. 182). Early news stories reported the issue of distracted driving as a recent scientific discovery and speculated of the future actions by industry and policy makers; for example, in 1998 one of the Missouri reporters wrote “researchers have discovered that cellular phones are a distraction that cause an increase in the number of accidents on our nation’s roads” (Potochny, 1998). The speculation revolved around mandatory industry labels and possible types of legislation and enforcement. In December 2000 The New York Times published a lengthy piece discussing effectiveness of legislation and explaining why cell phones and not other distractive behaviours would be targeted, the journalists concluded by quoting pro-legislation lobbyist stating that: “Technology has not yet allowed us a hands-free way to eat a hamburger, tune a car radio or turn around and yell at our kids in the back seat. But we can do it with cell phone.” (Kilgannon, 2000).

The first ban on electronic devices while driving was passed in New York, NY in 2001. The ban exclusively covered hand-held electronic devices. The legislation was implemented in three stages. During the first month police officers were only issuing verbal warnings to drivers. In the months to follow judges and enforcers were able to waive citations for law-violating drivers if the individual purchased a headset. In 2002 the law went into full effect and tickets were no longer waived. (McCartt & Geary, 2004, p.11).

Given the publicity generated by this legislation news stories about distracted driving began to occur in other jurisdictions across the US. A search for the term “distracted driving” in the LexisNexis database containing articles from all major American newspapers reveals that the issue gained prominence by 2001. A search reveals total number 2, 330 articles concerned with distracted driving in 1998-2005 period; only 50 of these articles were published in 1998. Early articles discussing the issue questioned effects of cell phone as drivers’ distractor; for example, Daily News

Special Report stated that eating, drinking and manipulation with climate control top cell phone use as a cofounding factor of the accidents and concluded that “distracted-driving researchers all say they need more data to draw more definitive conclusions. And the data are not easy to obtain” (Sherman, 2001). By 2001 the number of articles concerned with distraction quadrupled; at least 419 of the articles concerned with distracted driving were published in 2001. By 2005 the number of articles increased by another 25%, reaching 664 items.

A variety of full and partial bans were implement across the US between 2001 and 2014 (GHSA, 2014). To date, eleven American states, Puerto Rico, Guam, DC, and the Virgin Islands imposed some kind of legislation prohibiting use of a hand-held cell phone while driving. However, not all legislations allow primary enforcement and ticketing (McCartt & Hellinga, 2007). The legislation varies from state to state: Iowa and Florida, for example, only allow for secondary enforcement for texting and hand held electronic devices use violations; Louisiana and Oklahoma only regulate behaviour of new and novice drivers. Currently, a number of states are enhancing existing legislations to allow primary enforcement (i.e. allowing to stop drivers for cell phone use without any other violations present). Thirty-seven states as well as DC prohibit use of a hand-held cell phone to novice drivers. Legislation prohibiting texting while driving is in place in more than 40 states (GHSA, 2013). No state bans all types of cell phone use for all drivers. Additionally, American states tend to specifically regulate the most vulnerable categories of drivers such as novice drivers and school bus drivers (GHSA, 2010, p.48).

In Canada too, the pressure to regulate phone use in cars gained traction. In 2003 Newfoundland and Labrador became the first Canadian province to pass laws limiting cell phone use by drivers. The early legislation prohibited the use of electronic hand-held devices and imposed mild fines of \$45-180 dollars. The legislation was amended and enhanced in 2010; a set of sticker fines reaching \$400 was introduced.

The first international conference with a focus on distracted driving was hold in Toronto, Canada in 2005. The sole purpose of the conference was to define what exactly does distracted driving entails. The rise of academic interest in the issue was accompanied by mounting press coverage of the issue throughout the first decade of the millennium. Over twenty different news outlets, including major publications such as The Vancouver Sun, The Toronto Star and The Gazette published thirty new stories covering the 2005 International Conference on Distracted Driving. While the journalists pitted different points of view on the issue against each other (ex. anti-legislation, pro-

legislation, extent of negative effects of distraction and comparison to other road safety issues) yet almost every article referred to, quoted and cited “experts”, “leading researchers”, “road safety professionals” present at the conference. Indeed, in 2009, the Webster dictionary named “distracted driving” as its word of the year (Robertson, 2011, p.11). As cell phone use rose up to displace drunk drivers as the number one traffic safety issues of Canadians in 2010 a legislation to curb the problem appeared as a logical next step to politicians, public health practitioners and policy makers.

Nova Scotia and Quebec followed the lead set in Newfoundland in 2008. Prince Edward Island initially regulated only behavior of young drivers, but by 2010 switch to a more inclusive legislation. In British Columbia the law banning use of hand-held electronic devices for all drivers was introduced in January 2010. The legislation regulates behaviour of novice drivers more strictly by enforcing complete ban of all devices, including hands-free sets. Talking on a hand-held phone was now punished by a fine; dialing, emailing and texting drivers also receive tree demerit points.

The remaining provinces passed a legislation between 2010-2011. Today, Northwestern Territories have the strictest financial sanctions in the country. Law violating drivers are required to pay over \$300-dollar fine. The only province to have progressive fine system for multiple-time offenders in Nova Scotia with fines increasing from \$164 dollars for the first offence to fines over \$337 dollars for subsequent violations. British Columbia punishes violators with one of the most modest financial sanction (i.e. a fine of \$167 Canadian dollars) (CAA, 2014). Three provinces explicitly prohibit texting and emailing while driving, while other judiciaries prohibit hand manipulation with electronic devices (Transport Canada, 2012). Novice drivers of British Columbia, Saskatchewan, and Yukon are prohibited to use any hand-free means of communication as well, while other provinces do not have any specific legislation aimed at novice drivers (Transport Canada, 2012). As of January 2012, all Canadian provinces (except Nunavut) have some kind of law addressing distracted driving in place.

In 2012, Atchely and his team replicated an experiment conducted in 1970 to understand blame attribution and sanctions choice for drunk driving. In the later version of the experiments, Atchley’s team kept the same baseline accidents with no specific cause, but added distracted driving to the exploration list. The researchers gave their participants a number of road crash scenarios and asked them to ascribe an appropriate punishment (i.e. jail time, fines, etc.) for the accident, as well as to attribute a portion of blame to the driver(s) (Atchley et al, 2012). The researchers concluded that texting

drivers were viewed as the most responsible for the accidents, and drunk drivers received the highest level of punishment. Furthermore, they concluded that while recognizing the risks associated with distracted driving, this risk-taking behaviour was perceived as normative, and so did not receive higher level of punishments relative even to the baseline (Atchley et al, 2012, p.280). The team concluded that there is a clear “disconnect between knowledge of how risky the behaviours is, and the willingness to find people at fault for violating rules against it” (Atchley et al, 2012, p.281).

White et al suggested that such disconnect might be explained by the way we think about regulations. Our decisions affect our preferences in policies in two ways. First, research clearly demonstrated that people are more concerned with regulations of uncontrollable risks (White et al, 2007, p.743). For example, an individual would be more likely to support stricter regulations on air travel over road transportation. The preference is explained by the fact that air travel is perceived as being outside of individual control and legislations as having a huge social benefit. Thus, the general public is likely to support action on a societal level (Slovic et al, 1982, p.91). Unfortunately, when it comes to driving, the activity is experienced individually, and is perceived as being under one's own control.

Second, earlier studies demonstrated that individuals tend to evaluate policies in terms of comparative utility for themselves (White et al, 2007). Thus, the more benefits of mobile phones experienced by a driving individual, the less likely they would want to see the action regulated. Johnston, Muir, and Howard concluded that if we want to change such attitudes, the public health message should be that “the societal risks of daily road use remain in the top rank of public health problems” (2013, p.145).

Historical lessons learned from enforcement of impaired driving, seatbelt use and speeding demonstrated that legislation banning an activity is not enough to produce substantial behavior change. In order to shift drivers behavior and public perception of risk a set of more comprehensive communication strategies as developed in both the US and Canada. Comprehensive strategies for behavior change included a combination of driver education, safer technology and social marketing strategies. The strategies to promote road safety in the wake of driver distraction are discussed in sub-sections below.

## *Education & Media*

As far as education is concerned, 23 states in the US have a special Distracted Driving section included into their learners' guides (GHSA, 2010, p.9). In 2003, this section existed in only 5 states (GHSA, 2010, p.9). Regan and colleagues consider the fact that the driving public knows little about the relative risks associated with different distracting activities (2009, p.560). Cosgrove and colleagues point out that public education and community outreach will help to create social norms that support an idea that "using cell phones and texting while driving are unacceptable" (2011, p.9). Reinfurt warns that experiences from earlier programs demonstrate that education does not work (2004, p.181). Celebrities, like Oprah Winfrey and Karl Lagerfeld, attract a lot of attention to the issues of road safety and they might be the best way to reach specific audiences.

Allsop suggests that values are central for human decision-making since they motivate and endure over time (2012, slide 5). Using a media campaign to create an idea that driving should be done in a certain way might help to promote attentive driving over its distracted alternative. If we seek a solution to the problem of distracted driving, building on the TPB, then media campaigns that disabuse drivers of false norms, while simultaneously emphasizing the costs of distraction, seem like a good option (Riquelme et al, 2010, p.127). In order to change, normative endorsement media campaigns should not only target drivers but their families, peers, and friends (Riquelme et al, 2010, p.131). Reinfurt suggests that innovative media and persuasive messages are needed for the successful enforcement of attentive driving (2004, p.181). As in the HVE discussed above, paid TV commercials and public announcements are likely to pay off in a proportion of less distracted drivers. According to Neale and his research team, education is needed alongside the laws to solve the problem of distracted driving in Canada (2006, p.2).

Research suggests that the perception of norms can affect drivers' actual behaviors. Robertson and colleagues conclude that "people are more concerned about unsafe driving behavior when they believe others are concerned. Thus, through social marketing and focusing on feelings of concern, a bandwagon effect can be created that could help rectify this false norm" (2010 p.19). Inspired by the TPB, Nemme and White suggest using a multi-strategy approach targeting attitude norms and intentions simultaneously. Nelson et al argue that risk perception might have little impact on drivers who mentally justify the safety of a cell phone, therefore the media should convince them

of the detriments of the conversation on their safety (2009, p.442). In comparison to laws, education and media campaigns can be implemented on a shorter timescale.

## *Technology*

Ranney suggests that environmental factors, such as rumble strips, can serve as reminders of distraction (2008, p. 21). Driver assistance technologies have a role to play in curbing distraction. Current engineering progress allows multiple strategies to mitigate distraction from locking the phone in a moving vehicle to alerting a driver when s/he is distracted without taking any actions themselves. Various auto companies have come up with different solutions to countermeasure distraction from blinking diodes that are aimed to attract drivers' attention back to the road, to filtering strategies that only allow certain information though. These systems can be integrated together and work according to different situations (Kircher, 2007, p. 46).

Regan and colleagues create a taxonomy of distraction countering mechanisms starting from real-time distraction prevention and information scheduling, to adaptation of information format (such as, outputting a map or text message via voice system) and cell phone function lockouts (2009). Engstrom & Victor discuss a real-time distraction countermeasure (RDC) as a prevention strategy that can prioritize and schedule information for a driver according to the driving situation. The RDC can help drivers to manage their workload by making less distracting information available, redirecting drivers' gazes, and limiting functionality of devices, thus making driving safer (2009, p. 469). The RDC causes LEDs, sounds, voice messaging, and vibrations to redirect drivers' attention and help them to realize they are being distracted. Such companies as Volvo and SAAB are working on anti-distraction assistants that would analyze drivers' scanning behavior and, upon detecting that scanning patterns are low, will alert the driver through auditory content (Regan et al, 2009, p.590).

Unfortunately, all technological help comes with a usability paradox: the driver might be giving in more to a distraction by relying on a device for help (Ranney, 2008, p.21). Technologies need to try to avoid drivers' becoming dependent on a concurrent feedback by anti-distraction systems (Donmez et al, 2009, 529).

## *Enforcement*

The researchers suggest seeking distraction-curbing strategies in earlier road safety campaigns that dealt with the issues of seat belts and driving while intoxicated. Campaigns launched to address these safety concerns were similar in that they employed “widespread, methodological, and sustained application of enforcement programs” (Williams & Wells, 2004, p.175). Researchers argue that, while the public needs to be educated about the dangers of distracted driving, people often already have all the necessary information to make an informed decision (Williams & Wells, 2004, p. 175), but they are not convinced that they might end up in an accident due to the use of a cell phone. The struggle against this belief is hard because the audience already knows that they should not be using their cell phones, but “people tend to minimize the possibility of bad outcomes; the tendency to minimize risks that are supposed to be under their control” (Williams & Wells, 2004, p. 175). Therefore, McCartt and colleagues suggest that “vigorous, well-publicized enforcement campaigns are needed” to curb distracted driving (2010, p. 139).

Another dimension of enforcement needed to curb distracted driving is the development of a traffic safety culture. Some researchers believe that reprobating distracted driving as we did drunk driving would be an effective strategy (Betkey as cited in GHSA, 2010, p.5).

Enforcement efforts are also vital to the sustainability of the law. Williams and Wells state that “if people believe they are not going to be detected and meaningfully punished for violations, they will be more likely to comply” (2004, p.176). Pencheon points out that, after a brief period of compliance, risk perception of getting caught diminishes, when not supported by high publicity. Without high publicity and visible enforcement, people tend to downplay the risk of being caught breaking the law (Pencheon, 2006, p.395).

Clayton and colleagues suggest that positive reinforcement will have an effect on drivers’ behavior as much as putative campaigns through fines. Their research finds that drivers are receptive to signs such as “Please Hang Up-I Care” that will change to “Thank You” as soon as driver obeys the law (2006, p.347). A different research camp suggests that demonstrating how responsibility and danger come together with the right to drive, will be more effective than taking an optimistic approach (Allsop, 2012, slide 6). Allsop posits that drivers should be “persuaded by reason” and “motivated through emotion”. She proposes to target drivers via messages of people just like them who

have been impacted by distracted driving, as well as causing people to feel the emotion of guilt associated with taking a life or injuring another person (Allsop, 2012, slide 28).

Between the two aforementioned camps there is a group of scholars who saw through the complex nature of multitasking and offered a practical solution to the problem of distracted driving. Hancock and colleagues suggest that the international community should stop playing “the blame game” (2009, p.24). They point out that, in blaming drivers for being distracted, we fail to realize that distraction is an inevitable consequence of being human and that drivers are facing thousands of distracting cues such as billboards, signs, LED lights, and pedestrians, during their every trip. Additionally, presenting distraction as a single task irrelevant to a driving activity can oversimplify the problem because drivers have to engage in secondary and tertiary driving related activities (Lee et al, 2009, p.36).

One of the recent articles explains that our ability to be distracted and easily reallocate attention is an attribute of earlier human survival strategies that helped us identify immediate dangers (Regan, 2009). Researchers state that “there is a biological advantage in having the human mind unwittingly orient itself towards objects, events, and activities that signify danger [...] or to those that might be instrumental in perpetuating the species” (Regan et al, 2009, p.3). While understandable from the position of law enforcement and their need to find someone to take responsibility for the crash, looking to find a guilty driver will not make roads safer since you cannot prohibit drivers’ exposure to distracting events and objects (Regan et al, 2009, p.548).

A far more rational approach is to recognize that the human ability to process information and pay attention is limited (Regan et al, 2009 p.3). Indeed, Victor and colleagues point out that it is impossible to attend to all the information you receive while driving (2009, p.135). Regan points out that distractions cannot be completely eradicated (2009, p.621). Therefore, instead of looking to achieve perfect attention from drivers, we should be seeking to minimize the possibility of distraction. This assumption opens a completely different perspective on ways to solve of the issues related to distracted driving.

### *Comprehensive Strategies*

To improve the quality of laws, education, and media campaigns aimed at risk mitigation, the research community first needs to gather more reliable data. For example, the state of Florida has introduced new crash reporting forms in 2011. Florida’s forms

include a specific subsection for distracted driving that allows police officers to tick one of 8 distraction categories (GHSA, 2010, p.8). Implementing similar data gathering in Canada and throughout the US would allow for a more precise and generalizable data set. Regan points out that we need to improve not only the reporting of data, but also the processing of raw data via means of training experienced coders (Regan et al, 2009, p.538). Lastly, existing distraction prevention strategies, legislation, and enforcement practices need to be evaluated and measured (Regan et al, 2009, p.533). Ranney points out that the analysis of the willingness to engage in distracting activities will benefit the future of the field (2008, p.22). Analyzing the effectiveness of the legislations also remains a priority.

With this in mind, Canada recently launched its third nationwide Road Safety Strategy 2015 (RSS 2015). The ultimate goal of this national strategy is to reduce injuries and fatalities on Canadian roads to 0. A more realistic goal of the campaign is to achieve demonstratable downward trends in fatality and injury on Canadian roads, as well as improve education, communication, research, and public awareness regarding road safety issues (CCMTA, 2011, p.1). The RSS 2015 slogan is “Rethink Road Safety” and it is partly aimed at younger drivers, as well as vulnerable road users (Road Safety Canada Consulting, 2011, p.3).

The AAA Foundation for Traffic Safety in the US has been working on safety culture research since 2006, hoping to create a “social climate in which traffic safety is highly valued and rigorously perused”(AAA Foundation for Traffic Safety, 2009, p.1). National traffic safety organizations suggest that federal governments should be funding more road safety research, as well as media campaigns targeting distracted driving (GHSA, 2012, p.26).

On a provincial level, High Visibility Enforcement (HVE) campaigns demonstrate positive effects. The HVE campaigns include a combination of a strict enforcement period, paid media messages, and an emphasis on education (Cosgrove et al, 2010, p.1). Successful HVE campaigns were conducted in the states of New York and Connecticut. More than 121,000 vehicles were observed on four sites (2 control, 2 experiment). The sites were observed before and after the campaign and compared to each other, as well as to themselves. Control sites did not receive any paid advertisement or special wave of enforcement. On the opposite side, experimental sites were inundated with anti-distraction ads on digital billboards, easy to remember tag lines on the radio, extra coverage on the news and outreach materials available through the

DMV (Department of Motor Vehicles). Media time included earned as well as paid time on both national and local channels (Cosgrove et al, 2010, p.2). The main aim of the campaign was not to issue tickets, but to create an environment in where there is “a high certainty that [if drivers violate a particular law] they will receive a ticket” (Cosgrove et al, 2010, p.7). Both experiment sites in New York and Connecticut saw a significant drop in use of hand-held phones, 15% and 32% respectively. In Canada, the province of Alberta presents a great example of enforcement. The whole month of February is dedicated to specific campaigns targeting distracted drivers (Hammond, 2012, slide 16).

The HVE campaigns popularize the issue via national news coverage. The reports on distracted driving find their ways onto news channels and newspapers such as Good Morning America, ABC News, Boston Globe, the New York Times, Fox News, CBS and the Oprah Winfrey Show. The study shows that the recognition of such slogans as “No Phone Zone”, “Hang Up or Pay Up”, “A Phone in One Hand, Ticket in Another”, and issue familiarity increased from 31% to 71% in Connecticut, and from 5 to 29% in New York (Cosgrove et al, 2010, p.7). The authors of the research suggest that “high public awareness most likely reflects the influx in media discussing the issue” (Cosgrove et al, 2010, p.9). Media campaigns also seem to provide an effective, though brief, public awareness raising instrument.

On a corporate level, some firms prohibit their employees from using electronic devices while operating a company vehicle. Some companies do not discriminate between hand-held and hands-free devices, and urge their employees from initiating or receiving calls and text messages (GHSA, 2010, p.42). Regan and colleagues indicate that private organizations can also help mitigation by providing educational recourses, strict enforcement, and training (2009, p.548).

### **A Reflection on the Role of Legislation in Risk Agenda Setting**

In order to understand more completely how the risk agenda changed in the lower mainland a news analysis was conducted on print media in the Lower Mainland. Different combinations of the following search terms "public health", "transportation", "driving" were used for article selection. A corpus of 425 articles was obtained referring to both transportation and health. Major provincial and local newspapers were included in the search (ex. Burnaby Now, The Province, The Tri City News). Articles from May 2004 up to May 2014 were reviewed and coded according to a protocol developed for a study of public health coverage of transportation health related issues. The time frame

was further delineated into four separate three-year periods (i.e. 2004-2006, 2007-2009, 2010-2012, 2013-2014).

The content analysis of stories about health issues associated with transportation between 2004 and 2014 suggests increasing reporting of cell phone distraction as a cause of death and injury on the road- especially after the legislation banning electronic devices was passed in 2010.

After the articles were collected, a set of pre-determined codes was applied to every item in the population. The codes covered various issues of concerns such as a spin of the story (positive or negative coverage), issue discussed (ex. impaired driving, distracted driving, speeding), agencies involved (ex. public health authorities, the government, non-for-profit organizations), and statistics reported (ex. costs, number of injuries, fatalities). The coding was completed by four trained undergraduate research assistants.

A software program for mixed method analysis (Dedoose) was used to interpret the data. After the coding was completed, duplicate and irrelevant articles were deleted, leaving a population of 271 articles for analysis.

Of all transportation-related health issues, an equal number of stories had positive and negative spins. The public health perspective was applied to only 0.04% of articles in the population. And, 88% of the articles were at least partly concerned with legislation and policy making. In short blame and mitigation had replaced risk assessment as the primary agenda framing element.

The table below presents the number of stories by theme. Approximately 80% of all stories reported on one of these six issues. Clearly, drinking and

weather/environment related driving stories dominate in the discussion. The issue of distracted driving ranked third on the list with 16% of stories in the population discussing the issue. Interestingly, within the distracted driving stories, reports on food consumption behind the wheel dominated the coverage. Only 4% of all stories discussed cellphone use as distraction.

**Table 1: Number of Stories per Driving Safety Issue**

Issue	Number of Stories	
<b>Weather/ Environment</b>	59 (21%)	
<b>Drinking &amp; Driving</b>	53 (19%)	
<b>Distracted Driving</b>	45 (16%)	
	Eating or Drinking	17
	Cell & Texting	11
	Other Distraction	8
<b>Age/Disability</b>	36 (13%)	
<b>Speeding</b>	18 (6%)	
<b>Technology</b>	5 (1%)	

As pointed out by Kline, the extent of coverage does not always reflect the magnitude of the problem (Kline, 2011, p.25). This is clearly evident in the proportion of stories dedicated to impaired driving (19%) versus distracted driving (cell phones, 4%), while the number of deaths from the causes are almost identical on average, with 96 attributed to former and 91 to latter, annually (ICBC, 2014).

The issue of cell phone as a distractor for drivers was not present on public agenda until 2006. Three distraction-related articles in the time frame of 2004-2006 present distracted driving as a driving error (i.e. just a confounding crash factor) and discussed distraction as a human condition rather than drivers' action. For example, one of the journalists suggests: "Now, Canada's crash rate cannot be blamed entirely on substandard highways. Driver error, distractions, impairment and unsafe speed also play a big part" (Acres, 2005).

A total of eleven distraction related articles appeared in the data set in 2007-2009 window. Interestingly only two of these articles referred to the cell phone as a distractor. In this time period calling while driving was initially described in terms of rising road safety science. For example The Province reported: " You don't need a lab coat to know that a distracted driver is more likely to overlook the yield sign. Studies confirm the connection between cellphone use and inattentive driving. That's why more and more jurisdictions are making it illegal to yak on the phone while driving."(Macpherson, 2008). The rest of the articles referred to distracted driving as one of the problems public health professions would be facing in the future. Distracted driving was presented in this set

both as road safety risk (along with impaired driving, seat belts and speeding) and as a lifestyle risk (on par with smoking and unprotected sex).

Almost half of all distraction-related stories were published between 2010 and 2012 –that is after the law was passed. A review of 16 TV news stories sampled from local CBC and CTV newscasts between 2010 and 2013, the moral framing of the distracted driver issue became more apparent. Moral framing ascribed blame exclusively to phone users. The media presented them as irresponsible, young, and cell phone dependent.

For example, CTV news story presented distraction as an issue affecting young drivers. Much of the concern was focused on the young drivers involved in fatal crashes. As CTV news story develops: “ they [teens] are already inexperienced and more likely to cause an accident. Now there is new evidence that young drivers in our province are doing something that makes them even more dangerous. John Woodward reports on the alarming number of young drivers who don’t put down their cell phones when they get behind the wheel”. The sentiments of print media are similar: “Well, moms and dads, you need to say a few choice words to your newly licensed teens about the perils of dialing, texting or doing anything else besides driving when they are behind the wheel [...] That behaviour is particularly devastating for new drivers: They increase their risk of crashing or having a near-miss seven-to eightfold when reaching for a phone (or other object) or dialing, and quadruple it if they’re texting [...] explain to them why distracted driving is reckless” (The Province, 2014). The issue of a distracted generation of youthful multitaskers speaks of a minor moral panic that galvanized the issue.

A second frame justifying the legislation and promoting enforcement penalties and shame for non-compliance were also in evidence. For example, after the state of New York banned hand-held phone use The Province published an editorial applauding new American legislation and asking for public support for the pro-law lobby effort initiated by BC doctors (The Province, 2001). The articles concluded that: “the prospect of a stiff fine or driving ban can sure get the attention of the average cell phone delinquent” (The Province, 2001, p.16). Similar sentiments can be found in later articles: “ICBC is wrong in stating that cell-phone use while driving should be dealt with by education, not legislation. Some people cannot and will not be educated. So the only way to deal with them is with legislation.”(The Province, 2001, p.33)

A total of twenty-one press articles were included in the analysis for 2001-2012 period. The articles from this period have clear legal framing. Five articles discuss

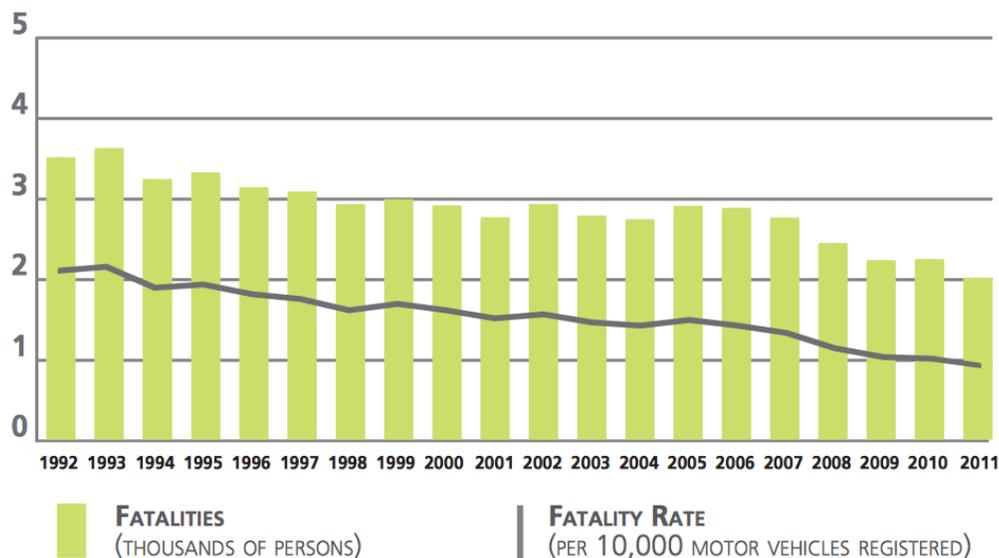
legislation in different provinces of Canada directly. As the Vancouver Sun reports: “Alberta is currently working on a law very similar to B.C.’s -- it calls for a \$172 fine for talking, texting or engaging in several other distracting behaviours behind the wheel, such as grooming, reading and writing. However, Alberta’s bill still allows motorists to talk on hands-free phones while driving.” (Rassel, 2010). The media artifacts of this time period also emphasized recent scientific discoveries related to distracted driving, quality of the legislation and costs of enforcement. During this time period other distracting activities are downplayed and cell phone as distraction emphasized. The increase is likely associated with the anti-distracted driving legislation that was passed in BC in 2010 and established the legitimacy of the issue. Increased reporting of cell phone distraction as a cause of fatalities and injuries after the legislation suggests that the legislation might have been used by the media as a form of blame legitimization. As a part of reflexive modernization risk of distracted driving was individualized rather than attributed to a specific insurer (Beck, 1996).

From the content analysis it is evident that there is a bias in the coverage of “distraction and inattention” as a cause of accidents. Cell phones were identified as the major problematic activity of drivers and strict enforcement of the law as the central means of encouraging compliance.

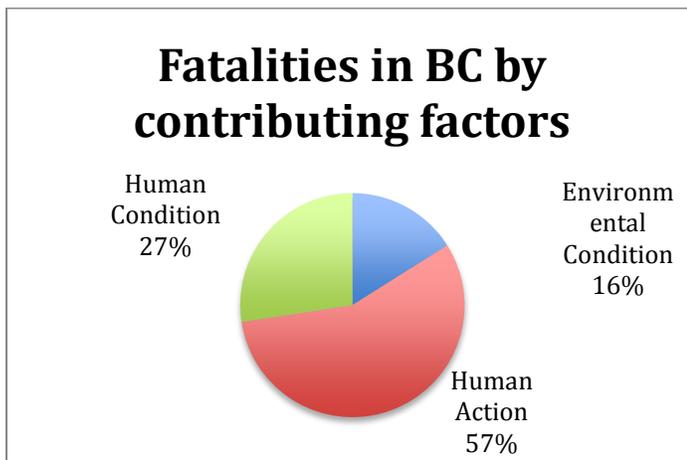
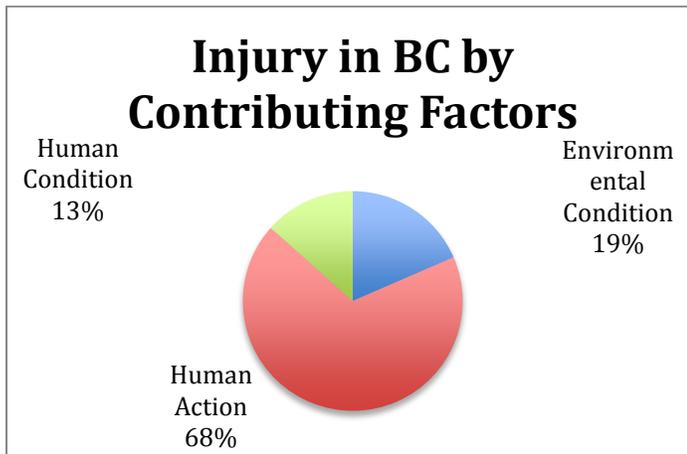
### *Laws That Don’t Work*

A major assumption under any legislation is that the law will address an issue deemed important by the public. Operating under this assumption, multiple road safety laws, including the aforementioned ones were introduced – and in reducing the number of accidents and injuries on the road—were largely successful. Unfortunately, the laws do not seem to fulfill their safety promises all the time.

**Figure 4: Fatality rates between 1992 - 2011**



It is wrong to assume that with the increasing number of cell phones, and increasing numbers of cars in the road, that the number of injury crashes or deaths on the road also increases. But the reality is to the contrary, as crash rates have been falling for the past two decades. Data from the US demonstrate that from 2004 to 2008 the number of crashes went down from 38,444 cases to 34,017 cases (GHSA, 2010, p.11). A similar trend is present in Canada. For example, recent Canadian Motor Vehicle Traffic Statistics (graph above) report suggests that both fatalities and injuries have been declining annually. The graph above demonstrates a clear downwards trend: if in 1992 a reported number of death was at 3,073 and the number of collisions was 249,823 by 2001 the number of death fell to 2,413 and injuries to 216,463. In 2011 the number of death and harms reached its historic low claiming 1,834 lives and resulting in 166,725 cases of injuries (Transport Canada, 2013, p.3). British Columbia shows similar trends in the number of fatalities that decreased from 385 in 2001 to 291 in 2011 (ICBC, 2012, p.5).



Using BC data set on fatalities and injuries we can calculate the proportions of death and injuries attributed to three major contributing factors (human action, human condition, environmental condition). Accidents due to Human Error consistently account for about 68% of all motor vehicle accidents causing injury and 57% of all death from motor vehicle accidents in BC (BC Injury Prevention, 2014). Driver distraction (that can be classified as both human action and human condition) therefore can potentially contribute to 80% of all deaths and injuries on the road.

However, the number of crashes attributable to distraction is increasing. The GHSA's statistics show that, while in 2004 only 11% of all the crashes were attributed to distraction, the percentage rose to 16% in 2008 (2010, p. 18). A study out of Canada points out that if laws were working, we would expect to see a reduction in traffic collisions and fatalities attributed to distracted driving (Lafleur, 2012, p.2). Lafleur makes an interesting discovery studying crash data from Manitoba. He points out that while

fatalities associated with drinking and driving, speeding, and non-use of a seatbelt went down from 2009, the collision and fatalities attributed to distracted driving are still climbing up (2012, p.2). In British Columbia the proportion of injuries due to distraction increased from 35% in 2003 to 48% in 2007, despite overall decrease in the number of injuries in the province (BC Injury Prevention, 2014). The data on injury attribution is not available in BC after 2007 as the legislation mandating obligatory presence of the police on a crash scene was abolished in 2008. On the bright side, the number of deaths attributed to distraction is declining from the peak with 115 death in 2005 to 101 lives lost in 2010 (the year legislation went into effect) to its historical low of 81 death in 2012 (TAS, 2014).

Multiple research bodies find that laws banning cell phone use while driving are inefficient to achieve the goal of eliminating the risk taking behaviour. For example, the Highway Loss Data Institute's study in 2010 concludes that there is no reduction in crashes after cell phone laws go into effect (2010, p.1). Most of the distracted driving legislation related studies coming out of the US. Some of the studies were conducted over a span of ten years, giving a great longitudinal perspective on the effectiveness of the laws.

The earliest observational studies associated with cell phone bans were conducted by McCartt and colleagues in New York. The ban on hand-held phones was introduced in that state in 2001, and it was the very first ban to be introduced in the US. The ban immediately halved the use of hand-held devices in comparison with the control state (Connecticut). However, in just twelve months, rates of cell phone use climbed back up in NY, and the differences with Connecticut completely disappeared (McCartt et al, 2010, p. 134). A similar study in DC indicates that after the introduction of a ban in 2004, the use of hand-held devices fell. After 12 months, some parts of the decrease were sustained, but only due to strict enforcement (McCartt et al, 2010, p.134). A more encompassing study of texting, by the HLDI, compares insurance claims from 2007-2009 from a dozen of states. Researchers conclude that the pattern of frequency of claims fluctuations in states with a ban was almost identical to that in control states (2010, p.3). The overall conclusion for the law studies is that "after a brief period of compliance with the ban the drivers return almost completely to their pre-law period behavior" (Jacobson et al, 2012, p.1587). While effectiveness of laws is more than dubious, we must consider that laws take years to establish, and paying attention to only short-term findings might be short-sighted. The HLDI report concludes that month-to-

month fluctuations in collision claims for study sites with a cell phone ban do not differ from those of jurisdictions without a ban. Additionally, researchers find that fluctuations in rates of collision claims do not change after the law is established (HIDL, 2010, p.1). Studies by the IIHS find that laws regarding texting might have an opposite effect.

In general, legislation evaluation studies tend to draw conclusions by comparing observational data from two study sites. These sites usually share major demographic, economic, and geographic characteristics but differ in legislation status (i.e. sites with a cell phone ban vs. sites without a cell phone ban). For example, the state of California is compared to Arizona, Nevada, and Oregon; while the state of New York is compared to neighboring Connecticut, Pennsylvania, and DC. The best existing studies are far from perfect. Most of the studies do not account for unknown compounding factors, do not have a longitudinal dimension to them, and mostly do not consider population density (Jacobson et al 2012, p.1587). But these studies are the best currently available to evaluate the effectiveness of the laws for road safety.

### **Observational Road Survey BC**

In order to establish a prevalence of distracted driving in British Columbia three and a half years after the legislation was passed, a roadside observational survey was conducted in June 2014. During the observation period 8,332 cars were examined in three separate locations during three time slots in the City of Vancouver.

Procedure

Figure 7: Filming Location Day 1

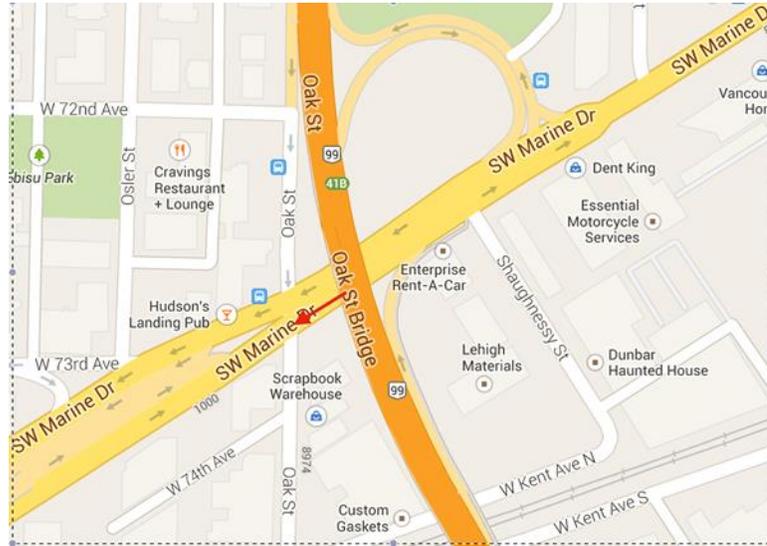
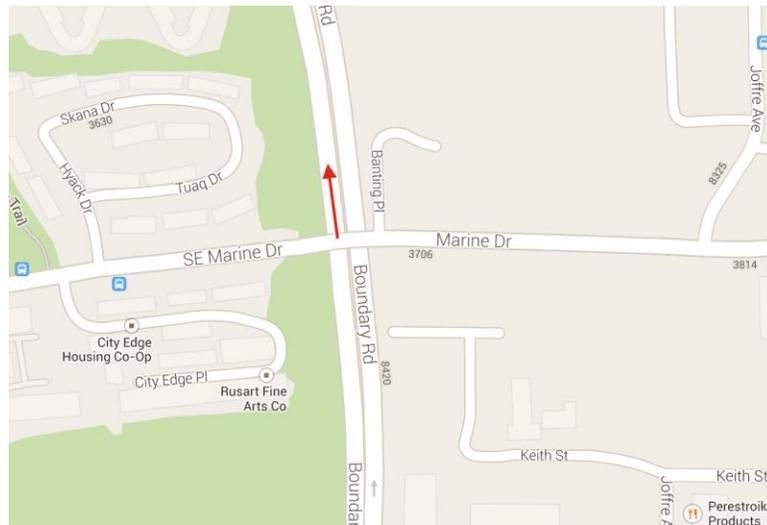


Figure 8: Filming Location Day 2



**Figure 9: Filming Location Day 3**



A trained observer gathered nine hours of video recording from three vantage points on roads' overpasses. The observations were conducted on three consecutive weekdays (Wednesday, Thursday, and Friday) in three separate time slots. The time slots were selected to maximize the flow of traffic. Thus, morning rush hour (8:00-9:00 am), an hour in the afternoon (noon to 1:00 pm) and evening rush hour (4:00-5:00 pm) were recorded. The times were the same for all three locations in order to observe both peak and non-peak traffic flows (Sullman, 2012, p. 273). The observations took place at two major intersections along SW Marine Drive (at Oak St on day 1, Knight St, day 2) and an uninterrupted, straight stretch of road (Boundary Rd, day 3) (Young et al, 2010). These locations were chosen because they are major arterial routes in Vancouver with relatively high traffic flows. Each observational session lasted for about an hour. For every location, all lanes of traffic in one direction were recorded. For the analysis, drivers were observed from a fixed point by the researcher. For the purpose of this study, any hand manipulations of an electronic device were coded as "handheld phone" (including GPS, texting, and any other phone manipulations); and every other type of distraction was coded as "other". The "other" category included such activities as eating, drinking, putting make up on, changing clothes, and reading maps; however, conversations with passengers were not recorded as a distraction (Townsend, 200, p. 749). All moving vehicles excluding public busses were observed. The observer was located on the overpass of the road in order to maximize the researcher's safety, reduce potential distraction to drivers, and maximize visibility inside cars.

All phone use was recorded when the observer could see clear a cell phone device in the drivers' hands; drivers who were otherwise distracted were recorded into the category of "other". Cases where it was hard to see if the driver was on the phone were marked as "not distracted" (Young et al, 2010, p.556).

### *Results*

Of the 8,332 drivers observed, a total of 122 (1.35%) were seen using their handheld devices. Another 111(1.24%) drivers were engaged in other distracting activities. Table 1 presents the number of observed drivers per day and hour of observation. Many more distracted drivers were observed during day 1 (1.75%) and day 2 (1.66%) relative to day 3 (0.64%). Such drastic difference in observational count can potentially be attributed to two different factors.

**Table 2: Number of Distracted Drivers per Day for Every observation Window**

	Day 1 – AM	Day 1 - Noon	Day 1 - PM	Day 2 - AM	Day 2 - Noon	Day 2 - PM	Day 3 - AM	Day 3 - Noon	Day 3 - PM	Average
Observation Length (min)	60	56	30	53	43	58	60	60	21	49.00
Cars Count	1378	1029	986	726	756	1639	744	806	268	925.78
Number of drivers on held hand cells	33 (2.39%)	17 (1.65%)	12 (1.22%)	11 (1.52%)	18 (2.38%)	18 (1.10%)	7 (0.74%)	5 (0.62%)	1 (0.37%)	13.56 (1.35%)
Drivers otherwise distracted	35 (2.54%)	19 (1.85%)	4 (0.41%)	12 (1.65%)	13 (1.72%)	16 (0.98%)	3 (0.40%)	7 (0.87%)	2 (0.75%)	12.33 (1.24%)
Combined %	68 (4.93%)	36 (3.50%)	16 (1.62%)	23 (3.17%)	31 (4.10%)	34 (2.07%)	10 (1.34%)	12 (1.49%)	2 (1.12%)	25.89 (2.59%)

**Table 3: Summary of Averages for Phone Use and Other Distractions per Day**

	Day 1	Day 2	Day 3	Total
Phone (%)	1.75	1.66	0.64	1.35
Other (%)	1.6	1.45	0.67	1.24
Total (%)	3.35	3.11	1.32	2.59

First, on day 3, the observer was forced to move to the roadside for recording, as the overpass position did not work due to weather conditions. Consequently, drivers could have confused the researcher with a police officer on a raid for distracted drivers. A few drivers were clearly seen on the recording dropping their phones at the sight of the observer.

Second, unlike the observer's position of the two previous days, the location of observations was not in the vicinity of a traffic light. A presence of a regulating light affects the patterns of traffic flow. As pointed out by previous studies, drivers are more likely to use their phones in heavy, slow traffic and red lights, rather than in free-flowing traffic (Young & Lenné, 2010). Thus, is it likely that, in free-flowing traffic, drivers naturally engage in fewer distracted activities. Very few studies to date have examined the difference between rates of phone use at traffic lights and away from traffic lights. Existing studies demonstrated the former receiving higher rates than the latter (Drury et al, 2012, p.8).

### **Discussion**

The prevalence of handheld phone use was found to be 1.35% and distraction from other causes about 1.24%. Combined about 3% of drivers in BC are somehow distracted on the road at any point in time. The rate of phone use observed by the researcher differs greatly from averages provided by official statistics, but are similar to other studies. For example, Sullman (2010), who observed 7,168 vehicles, reported distraction by mobile phone at 2.2% and distraction from other factors at 3.1% (p.274). Other observational studies out of the United Kingdom and Australia suggested that the range of distracted drivers falls between 1.5% to 1.9% (Horberry et al, 2001; Taylor et al, 2007). However, in this study, the rate of distraction is almost two times lower than the

most recent global report which stated the rate of distracted driving at 3.3% of drivers Canada-wide (IRTAD, 2013, p.107).

The data also indicate that handheld cell phones might not be the primary source of distraction among drivers, as the category of "other distractions" demonstrates a very similar percentage of activities. In order to account for observer error a parameter for observational accuracy was calculated. The researcher observed a 100 cars randomly estimating that the number of drivers that were not clearly visible because of obstructed view were 7 out every 100 cars establishing 0.93 accuracy of observations. The differences between this recent BC estimate and Canada-wide data may arise from the way the data for this study were gathered and the where survey was conducted. It is unclear how IRTAD gathered the data, but if it was a survey at controlled intersections, it might mean that most of the cars were stationary (when drivers are more likely to be on the phone), thus we can expect to see fewer distracted drivers in the moving vehicles (Johnson et al, 2004, p.6).

When different times of day were compared for the rate of distraction, Sullman found a significant difference: in his study, more people talked on the phone in the morning compared with other time periods (2012, p. 272). Current observations did not indicate such a difference. The difference for people talking on the phone during different times of day was not statistically significant at any conventional significance level [chi-squared (8, 332)=6;  $p=0.199$ ]. The non-phone related distraction did not vary significantly either ( $p >0.1$ ).

As reported by one of the largest naturalistic 70-car studies out of the United States, as well as Johnson's et al study of 2004 (who collected 40,000 digital images of drivers), activities including eating, drinking, and smoking might surpass the rate of cell phone use as the number one distraction behind the wheel. In Stutts and colleagues' study, 71.4% of drivers were seen eating or drinking, while less than half of the observed (34.3%) were using their phones (2005, p.1096). Unfortunately, studies of other types of distraction that drivers engage in regularly are largely absent from the literature (Stutts et al, 2005, p. 1093).

## *Limitations*

There are clear limitations to the roadside observational survey. First, the quality of video recording wasn't able to record inside some vehicles, thus increasing the chance of uncounted distracted drivers. Additionally, the observational power was obstructed by tinted windows (Taylor et al, 2007, p.433) and sunny weather conditions that created reflections on windshields. Second, the study does not record any socio-economic indicators of drivers, thus the roadside survey presents very limited data on the distracted drivers (Townsend, 200, p. 750). Third, the observation is not generalizable to any other part of the province, namely the less populous and rural parts of BC (Young et al, 2010).

Most importantly, the researcher was not able to account for drivers using headset devices, as a momentary recording is not likely to capture talking drivers because at the moment of observation a driver might be listening to the other speaker. Young, Lee and Regan pointed out that “hands-free phones can not be adequately quantified using roadside observations, with the likelihood that the observations could underestimate or overestimate exposure because it is often not possible to tell if a driver is using a hands-free device or not” (Young, Lee & Regan, 2008, p.76). Therefore, there is a possibility that a number of drivers on headsets is underestimated in this study as well.

Lastly, a major issue on day 3 of observations was when the observer had to change positions and move into the visibility of the drivers. Simpson pointed out that observer has to be unobtrusive “otherwise, the process of measuring the behavior can itself change the behavior” (2005, p.6). On the footage, a few drivers clearly confused the researcher with a police officer and were observed dropping their phone. Such incidents indicate that the drivers' behavior was affected by the process of observation.

The benefit of an observational roadside survey is that it provides a realistic picture of behavior patterns which is not distorted by self-reporting (Simpson, 2005, p.5). Additionally, to the researcher's knowledge, this is the first time a roadside observational survey was carried out in BC. There are number of ways the study can be improved in the future, including longer hours of observation, multiple locations, better camera positioning, and an increased number of data coders (Drury et al, 2013). A general criticism is that the observations “solely concentrated on the prevalence of one type of

distracter, the mobile phone” (Sullman, 2012, p. 272). As of 2012, there were only two studies available for other types of distraction (Sullman, 2012, p. 272).

### *Why Aren't Laws Working?*

As in other jurisdictions, these observations of Vancouver drivers suggest the ineffectiveness of a law banning cell phone use while driving. In the literature one finds numerous reasons why current legislation is failing to produce a more significant impact on drivers' behavior from lack of knowledge about the risks to a belief in individual vulnerability. Some studies have also found that drivers do not feel that the law is really being enforced (HLDI, 2010, p.4). For example, a study out of Northern Carolina where young drivers, aged 18-21, are prohibited from using any form of electronic devices, the law seems not to have an effect because only 22% of teenagers and 13% of their parents believe that they actually will be caught and punished for the offence (McCartt et al, 2010, p.134). A more recent study finds that drivers believe that, on a scale of 1 to 5, they are "unlikely" or "somewhat likely" (3.39 on average) to be caught by the police (Young & Lenné, 2010, p.329).

A further reason why the law is ineffective is a phenomenon of false compliance. False compliance manifests itself in drivers who try to hide their devices further under the dashboard or their laps to avoid punishment (Jacobson et al, 2012, p.1588).

Additionally, “drivers perceive hands- free sets to be far less dangerous than hand-held phones” (Riquelme et al, 2010, p.128). However, experiments find no difference between hand-held and hands-free devices. Unfortunately, currently existing legislations only target hand-held devices. Therefore, even if drivers switch from hand-held to hands-free devices, the law is inefficient because the effects of cell phone conversations come from the internal cognitive contest associated with conversation, not the manual component of distraction (Strayer et al, 2003, p.31). Therefore, legislations that discriminate between forms of electronic devices are useless in increasing road safety.

For the rate of actual compliance to go up, two things are missing: a good data set to evaluate rates of phone use before and after the law; and, visible enforcement campaigns. According to the most prominent figures in road safety research, the main

jurisdictions in the US and Canada lack “well-publicized, sustained enforcement campaigns directed at cell phone violations” (McCartt et al, 2010, p.139). The earlier study that compares the rate of compliance between New York and DC after 12 months of the law's being in effect attributed differences to enforcement and number of citations given per 10,000 drivers (McCartt et al, 2010, p.139).

Jacobson and colleagues point out that the effectiveness of the laws must be evaluated over time by monitoring a gradual drop of rates in fatality and collision claims. Therefore, it is possible that the effects will be seen only over a longer time frame (2012, p.1591). A follow-up study in New York, conducted by McCartt and colleagues, uses Poisson regression to compare estimated differences between actual observed rates of cell phone use with those that would have been expected without a ban (2010, p.133). The time span they studied was from 2001 to 2009. The researchers conclude that, for DC, after five years with the ban, the rate of cell phone use is 43% lower than it would have been without a ban in place. For New York, the phone usage was 47% lower immediately after the ban, and 24% lower within 7 years after the ban. For Connecticut, the usage rate would have been 65% lower compared with no ban in place (McCartt et al, 2010, p.133). So too, the Highway Loss Data Institute's study in 2010 concludes that there is no reduction in crashes after cell phone laws go into effect (2010, p.1). Most of the distracted driving legislation related studies coming out of the US. Some of the studies were conducted over a span of ten years, giving a great longitudinal perspective on the effectiveness of the laws. The overall conclusion is that if there were no law banning cell phone use while driving, the rate of observed cell phone use would have been higher for all three studied states. So, while the laws might not ban use of cell phones once and for all, they might have been efficient for preventing usage rates from blooming.

According to many researchers, currently existing legislations might not only fail to have a positive effect, but actually deteriorate safety even further. For example, Lafleur states that making an activity illegal is not the same as stopping the activity at all. He states that it is likely that drivers just hide their activities further, making cell phones even more dangerous to driving (Lafleur, 2012, p.2). If this is true, Lund's dilemma of observed hand-held phone-use reduction, coupled unreasonably with no reduction in crash rates, would be explained (as cite in HLDI, 2010, p.1). A 22-month study of the state of New York finds an increase in collision frequency claims when the law banning texting went into effect (Jacobson et al, 2010, p.1588). A study by the HLDI suggests

that insurance data do not show a decline in collision claims associated with the texting ban because drivers responded to the law by hiding their devices further down the dashboard, making driving even more dangerous (2010, p.8). McCartt and colleagues also suggest that passing laws which prohibit only hand-held communication might be sending the message that hands-free communication is safe, while empirical evidence screams that this distinction is not true (2006, p.90). As of today, it is necessary to continue to monitor and evaluate the effectiveness of legislations regarding distracted driving.

## Chapter 4

### Lifestyle Risks and the Lessons of Distracted Driving in BC

A recent ICBC report indicates that deaths on the road due to traffic accidents have steadily decreased in the last five years, continuing the downwards trend started in the 1950s when the scientific study of accidents began being applied to the development of policies that could reduce the harm associated with automobility. Deaths on the road have dropped by 30 % since the 1975s due to improvements to safety technology and road engineer, speeding enforcement and impaired driving campaigns (Transportation Canada, 2013). The good news story implicit in this thesis then is that science and risk communication combined should be an effective method of reducing the risks associated with distracted driving too. Yet the ICBC study also indicates that fatal accidents attributed to distracted driving have declined more slowly over the last five years than those associated with speeding and impaired driving, despite the 2010 BC Act banning the operation of hand held communication devices while driving a car. This suggests that distracted driving may be a unique kind of risk taking behaviour that resists the kinds of social communication campaigns successfully used with speeding, seat belts and impaired driving.

Aarson estimated that, over the past ten years in Canada, the combined number of people who were killed from assaults, wars, and acts of terrorism would only make up 15% of the lives lost in land-based transportation accidents (Arason, 2014, p.3). The risks of automobility are considerable. Moreover Robertson pointed out that by 2010 distracted driving has become a 'perceived risk' over the past decade across Canada: in 2002, only 40% of respondents believed distraction to be an issue for road safety; in 2006, the issue gained prominence with 69% of respondents identifying it as a pressing concern; the issue peaked in 2010, as it was named the most important road safety issue of the year (Robertson, 2010, p.7).

Unfortunately, research also shows that, despite the self-awareness of performance decrement, prohibitions, and dangers associated with distracted driving, drivers still make calls and send text messages. A recent research report, for example, indicates that young drivers in Vancouver are twice as likely to be distracted than an average Canadian counterparts (Pike & Macpherson, 2011, slide 10). The study found that 25% of all high school age drivers were engaged with at least one distractor (ibid,

2011, slide 11). This subchapter will explore the current attitudes of young BC drivers towards texting and phoning behind the wheel. It will go on to explore the reasons drivers still choose to engage in these behaviors as well as the problems of communicating the risks associated with using the cell phone in cars.

### **Survey: Objectives & Procedures**

Growing awareness of a new risk by the general public is a part of reflexive modernization. In order to gain insights on how British Columbians perceive distracted driving and the associated risks and the impact that it has on behaviours, a survey was designed using Simon Fraser University's web-survey tool. The questionnaire was posted online and the invitation to participate was distributed via social media platforms as well as SFU's webmail. The survey was active for three weeks from June 4th until June 25th, 2013. No personal identifiers nor contact information was collected from the respondents. However, basic demographic information was gathered as part of the analysis. Throughout the three weeks, 104 responses were collected. Out of 104 submissions only a hundred were deemed worthy for analysis. The other four responses only provided demographic data, and left the majority of questions unanswered, thus were excluded from the analysis.

The aim of the survey was three-fold. First, to gain insight on how road safety issues are ranked among other lifestyle and environmental risks. Second, to explore where the issues of road safety stand on the public agenda. Third, to identify the prevalence of various risk-taking behaviours in everyday life. Since the first objective of survey was to gather data about roads safety risks relative to other risks, road safety issues were presented as just-another-risk-among-multiple- other-issues. The general categories of risk-taking behaviours included nutrition (“I eat five fruit and vegetable servings a day”, “I buy genetically modified foods”), hygiene (“I was my hands before cooking and eating”), safe sex practices (“I have unprotected sex”) as well as financial, online, and narcotics related risks. Out of nineteen possible risk-taking behaviours, a quarter were related to road safety issues. For each issue, four possible responses were listed, as well as a non-applicable option.

## Analysis & Discussion

One of the objectives of the survey was to explore the views of Canadians on risk perception and policy priorities. Three matrix questions were constructed in order to explore these issues. The first question dealt with likelihoods of various risks impacting respondents and their families. The second question explored the views of Canadians on the policy priority of the country. The third question inquired about the likelihood of different global risks in the next twenty-five years. The participants were asked to evaluate a total of twenty-three potential risks including environmental, health, and behavioral. Respondents prescribed a numerical score from one (low) to ten (high) for every risk in the three questions. The table below summarizes the opinions of the 100 respondents. The data are analyzed and discussed separately for each question.

**Table 4: Average Score for Health, Environment and Behaviours Risks**

	<b>Potential Risk</b>	<b>Increasing Likelihood in Next 25 Years</b>	<b>Could Significantly Impact Me</b>	<b>Should be Policy Priority</b>
<b>1</b>	Climate Change	8.83	8.00	8.58
<b>2</b>	Major Earthquake	7.45	6.91	6.84
<b>3</b>	On-Line Fraud	7.40	6.20	6.81
<b>4</b>	Food Born Illness	6.84	5.43	6.60
<b>5</b>	Skin Cancer	6.81	5.60	5.71
<b>6</b>	Obesity	7.40	5.08	6.70
<b>7</b>	Depressions and Suicide	7.11	5.95	6.83
<b>8</b>	Food Shortages	7.72	6.84	7.50
<b>9</b>	Bicycle Travel Accidents	4.85	3.93	4.21
<b>10</b>	Diabetes	6.78	4.95	6.35
<b>11</b>	Motor Vehicle Accidents	6.16	5.61	5.50
<b>12</b>	Viral Epidemic	6.80	5.34	6.13
<b>13</b>	Antibiotic Resistant Bacteria	7.88	5.98	7.04
<b>14</b>	Online Prescription Drug Purchasing	6.51	4.41	4.68

<b>15</b>	Sleeping Disorders	6.52	5.30	4.81
<b>16</b>	Radiation Exposure	6.20	4.91	5.19
<b>17</b>	Smoking	5.49	4.86	5.85
<b>18</b>	Air Pollution	7.80	6.79	7.26
<b>19</b>	Narcotic User and Addiction	6.50	3.99	6.17
<b>20</b>	Oil Pipeline Leaks	7.40	5.32	7.51
<b>21</b>	Drinkable Water Shortage	8.00	5.91	7.73
<b>22</b>	Wildlife Attacks	4.33	3.52	3.46
<b>23</b>	Birth Control Pill Risks	5.38	3.75	4.97

The data from the survey demonstrates that in terms of relative risks, environmental disasters such as climate change and major earthquakes top the list as priorities, whereas lifestyle risks generally take lower positions. At 6.16, motor vehicle accidents were ranked low on the lifestyle risk scale too, as 17 out of the 23 risk issues below risk of skin cancer, but above risks associated with the birth control. Interestingly, most of the respondents feared being affected by major earthquakes and climate change. However, in 2011 accidents were ranked as the leading cause of death for people 25 to 44 years old and the fifth leading cause of death among all age categories (Statistics Canada, 2014). According to Statistics Canada, the other top causes of death included heart disease, strokes, and cancer. In this case, risk perception and the actual chances of being affected by a particular risk do not correlate. Johnston and colleagues pointed out that “our daily road use is overwhelmingly accomplished without adverse events” (Johnston, Muir & Howard, 2013, p.143). Therefore, our risk perception of road accidents might be subjected to low-probability event bias (Slovic et al, 1982, p.84). Hence, driving is perceived and experienced as an activity where errors do not necessarily result in an adverse life-threatening event. When perceived as a low-probability event, the risks associated with driving tend to be disregarded and underestimated by individuals. Young people seem to be buffered from the risks regardless of their presence in the media.

Table Presents the Difference in Risk Perception when Evaluated to Self versus to Others

**Table 5: Average Score for Health, Environment and Behaviors Risks**

	Potential Risk	Difference
1	Major Earthquake	0.54
2	Motor Vehicle Accidents	0.55
3	Smoking	0.63
4	Wildlife Attacks	0.81
5	Climate Change	0.83
6	Food Shortages	0.88
7	Bicycle Travel Accidents	0.92
8	Air Pollution	1.01
9	Depression and Suicide	1.16
10	On-Line Fraud	1.2
11	Skin Cancer	1.21
12	Sleep Deprivation	1.22
13	Radiation Exposure	1.29
14	Food Born Illness	1.41
15	Viral Epidemic	1.46
16	Birth Control Pill	1.63
17	Diabetes	1.83
18	Antibiotic Resistant Bacteria	1.9
19	Oil Pipeline Leaks	2.08
20	Drinkable Water Shortage	2.09
21	Online Prescription Drugs Purchasing	2.21
22	Obesity	2.32
23	Narcotic Use and Addiction	2.51

### Risk to Self

When asked about the likelihood of the impact of various road risks on individual drivers and their family, motor vehicle accidents received an average score of 5.61. This ranks the risk of motor vehicle accidents ninth among various risks to self, including depression and suicide, shortages of drinking water, and skin cancer. The table above demonstrates that the difference between relative risk perception and immediate self-risk assessment. Yet regardless of the relative risk it is noted that the difference between the general risk percept and immediate self-risk, road accidents are among the least different right behind earthquakes – which are expected in Vancouver. The other side of the scale are risks associated with obesity, shortage of drinking water and oil pipeline

leaks – risks that however likely many people are unlikely to impact them or their families significantly. These risks have higher prevalence, but young individuals see themselves as personally protected from obesity and oil pipeline leaks in some ways – certainly less so than from accidents. This suggests that the psychological distancing from driving accidents is not based on a ‘blanket immunity’

### Where Does the Issue Rank as a Policy Priority?

One of the most interesting findings of the survey is the rank of motor vehicle accidents on the policy priority list. When asked how important it is to prioritize policy for addressing road safety risks, respondents agreed on an average score of 5.5 out of possible 10. Motor vehicle accidents are thus number 17 out of the 23 risks explored in the survey. Supporting findings of Johnston, Muir & Howard, (2013), the survey indicated that motor vehicle accidents are not perceived as as a global priority for the future.

While being a leading cause of death, road crashes are clearly underappreciated both by the government and the general public. Most road safety scholars agree that road safety issues are currently not prioritized adequately, therefore it doesn't receive necessary funding nor attention and is grossly underestimated (Roberts, Mohan & Abbasi, 2002, p. 1107). Johnson and colleagues suggested that even expenditures on dental research exceed that of road safety research. The researchers cited a ratio of spending of 36:1 on HIV/AIDS to the road safety issues; cancer research received four times the funding of road safety (Johnston, Muir & Howard, 2013, p.3). Arason argued that with the current number of deaths on the road would be tolerated if attributed to any public health issue would be tolerated (2014).

In 2012, Atchely and his team replicated an experiment conducted in 1970 to understand blame attribution and sanctions choice for drunk driving. In the later version of the experiments, Atchley's team kept the same baseline accidents with no specific cause, but added distracted driving to the exploration list. The researchers gave their participants a number of road crash scenarios and asked them to ascribe an appropriate punishment (i.e. jail time, fines, etc.) for the accident, as well as to attribute a portion of blame to the driver(s) (Atchley et al, 2012). The researchers concluded that texting drivers were viewed as the most responsible for the accidents, and drunk drivers received the highest level of punishment. Furthermore, they concluded that while

recognizing the risks associated with distracted driving, this risk-taking behaviour was perceived as normative, and so did not receive higher level of punishments relative even to the baseline (Atchley et al, 2012, p.280). The team concluded that there is a clear “disconnect between knowledge of how risky the behaviours is, and the willingness to find people at fault for violating rules against it” (Atchley et al, 2012, p.281).

White et al suggested that such disconnect might be explained by the way we think about regulations. Our decisions affect our preferences in policies in two ways. First, research clearly demonstrated that people are more concerned with regulations of uncontrollable risks (White et al, 2007, p.743). For example, an individual would be more likely to support stricter regulations on air travel over road transportation. The preference is explained by the fact that air travel is perceived as being outside of individual control and legislations as having a huge social benefit. Thus, the general public is likely to support action on a societal level (Slovic et al, 1982, p.91). Unfortunately, when it comes to driving, the activity is experienced individually, and is perceived as being under one's own control rather than an abstract risk that impacts others.

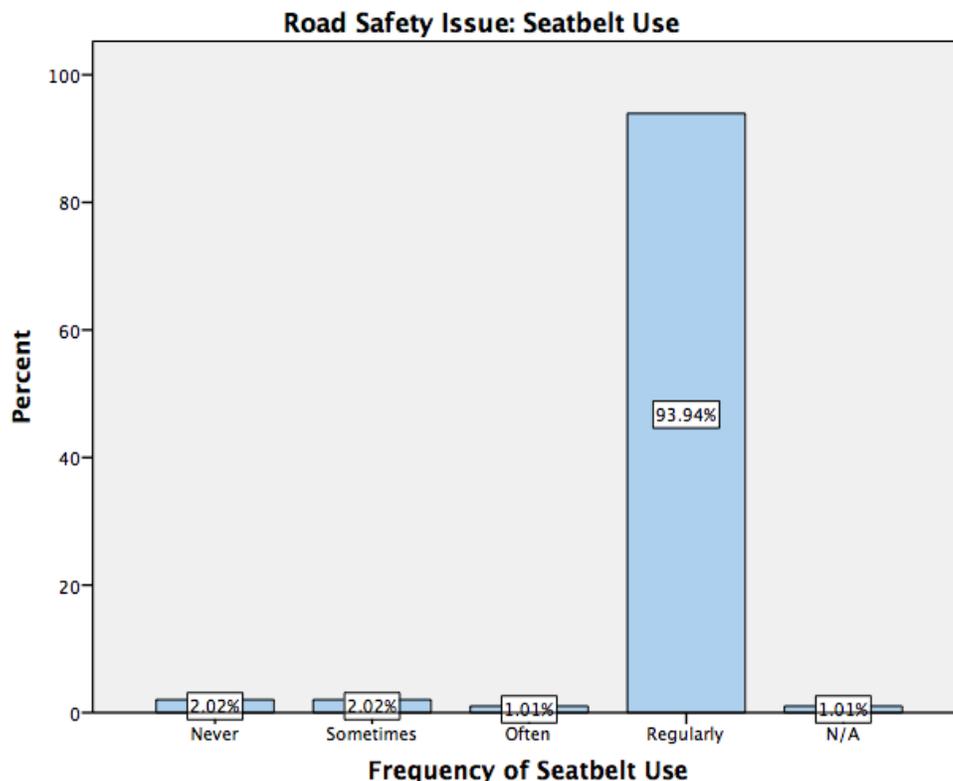
Second, earlier studies demonstrated that individuals tend to evaluate policies in terms of comparative utility for themselves (White et al, 2007). Thus, the more benefits of mobile phones experienced by a driving individual, the less likely they would want to see the action regulated Johnston, Muir, and Howard concluded that if we want to change such attitudes, the public health message should be that “the societal risks of daily road use remain in the top rank of public health problems” (2013, p.145).

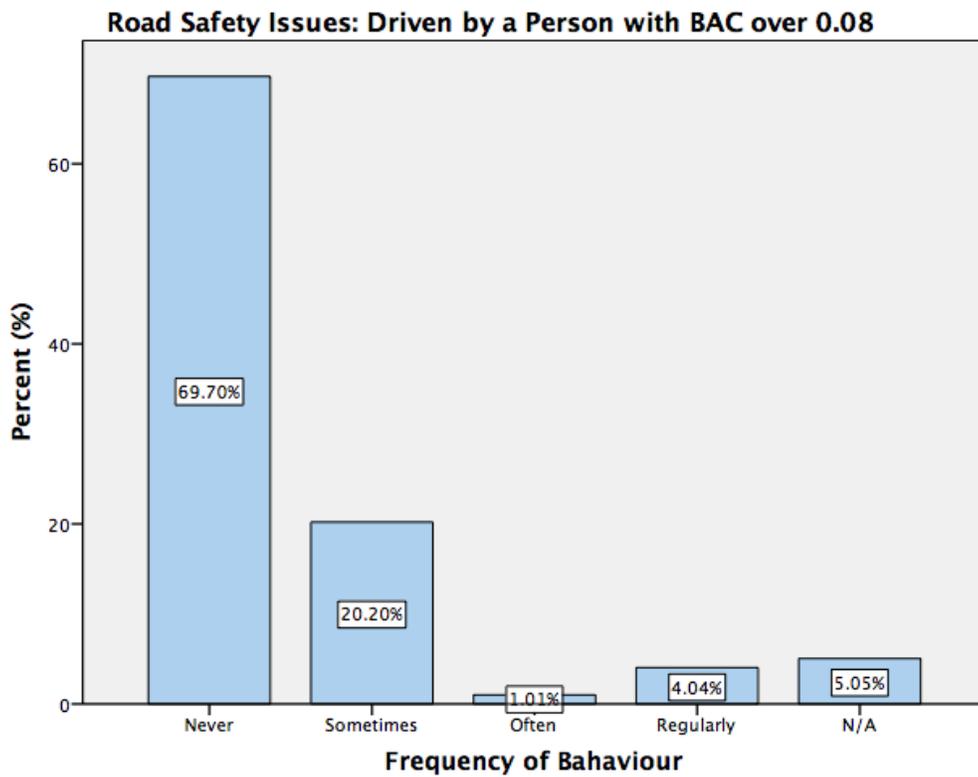
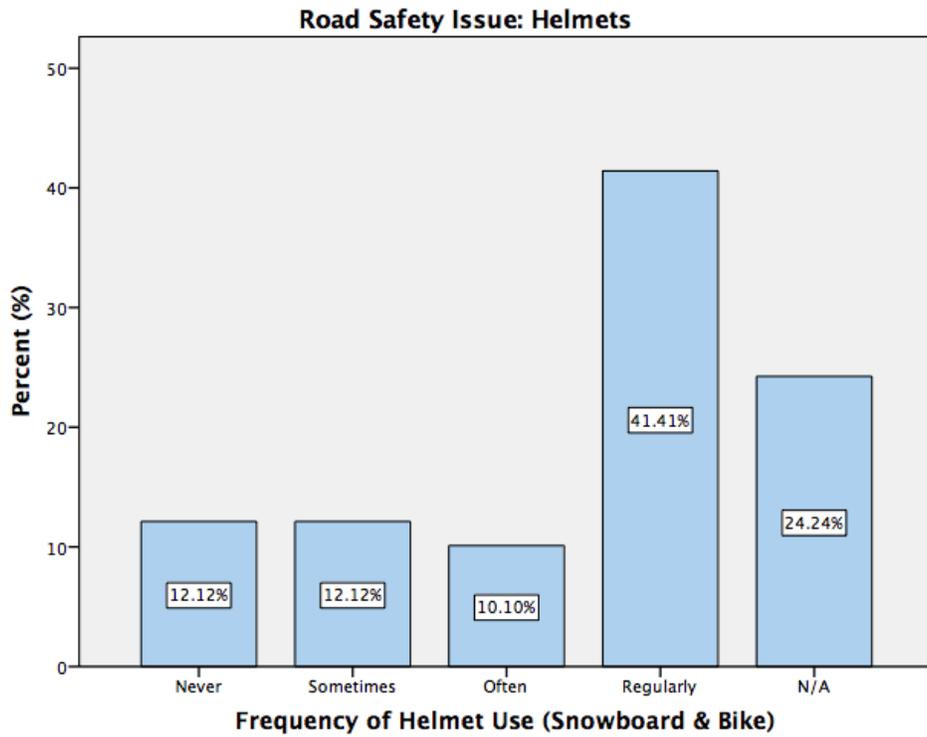
## **Part II: Self-reported Risk-taking**

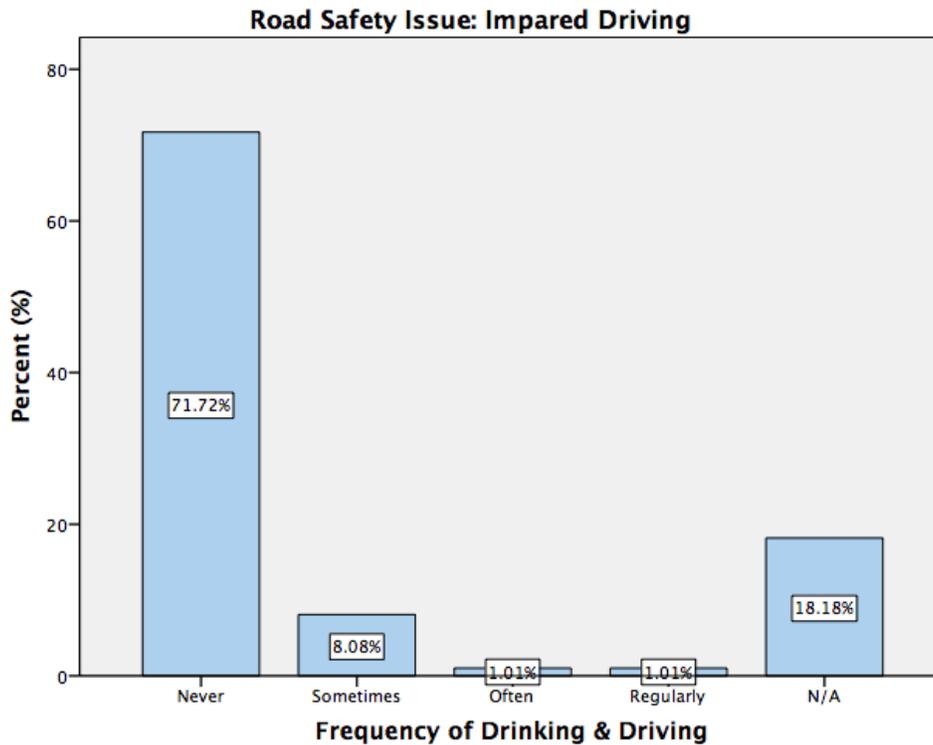
In 2010, as a part of their regular Road Safety Monitor survey, the TIRF conducted a poll of public opinion of Canadian drivers on distracted driving. Overall 73.5% of Canadians reported that distracted driving is either a very or extremely serious problem for road safety (TIRF, 2011, p.5). Indeed, distracted driving changed its position on the public agenda relative to other road safety risks surpassing impaired driving by 6 percentage points (ibid, 2011, p.5). However, compared to other lifestyle risks the ranking of distracted driving on policy priorities and likelihood of future impact seems to be quiet low. The mismatch between risk perception and risk mitigating priority might indicate that while public is aware of that risks exists, in the aftermath of legislation is that they see little reason for further regulate and police it.

Robyn Robertson, the CEO of the Traffic Injury Research Foundation identified the three main issues contributing to Canadian road deaths as alcohol, accounting for 30-40% of road fatalities; non-use of seatbelts, 35-40%, and speed, amounting to 20% of all fatalities (Robertson, 2010, p.5). Two of these three issues were explored in the survey, alcohol and seatbelts.

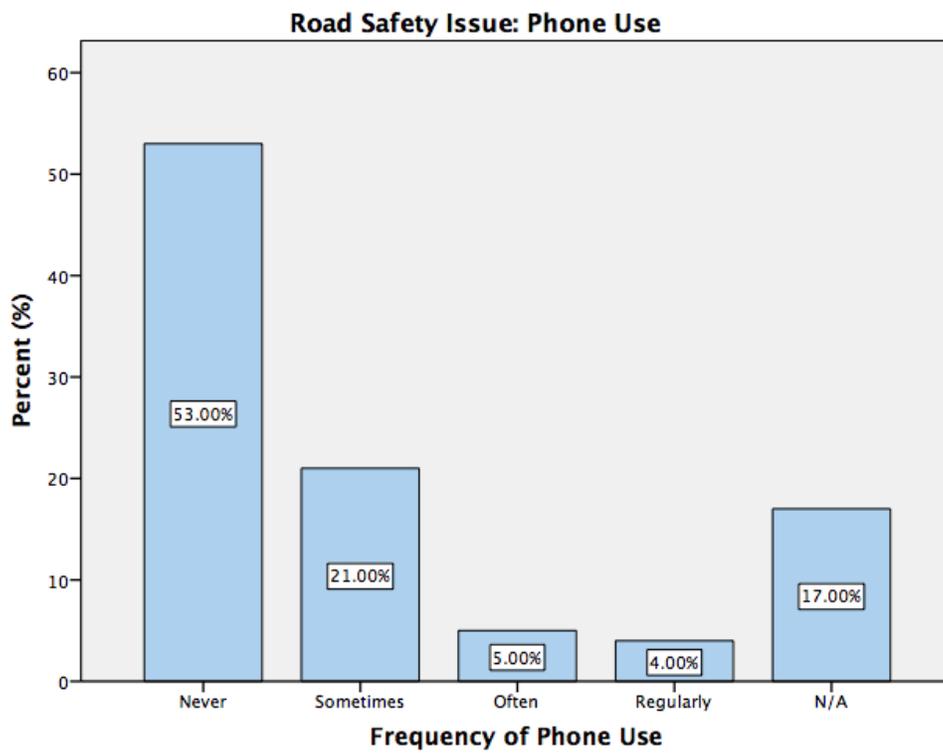
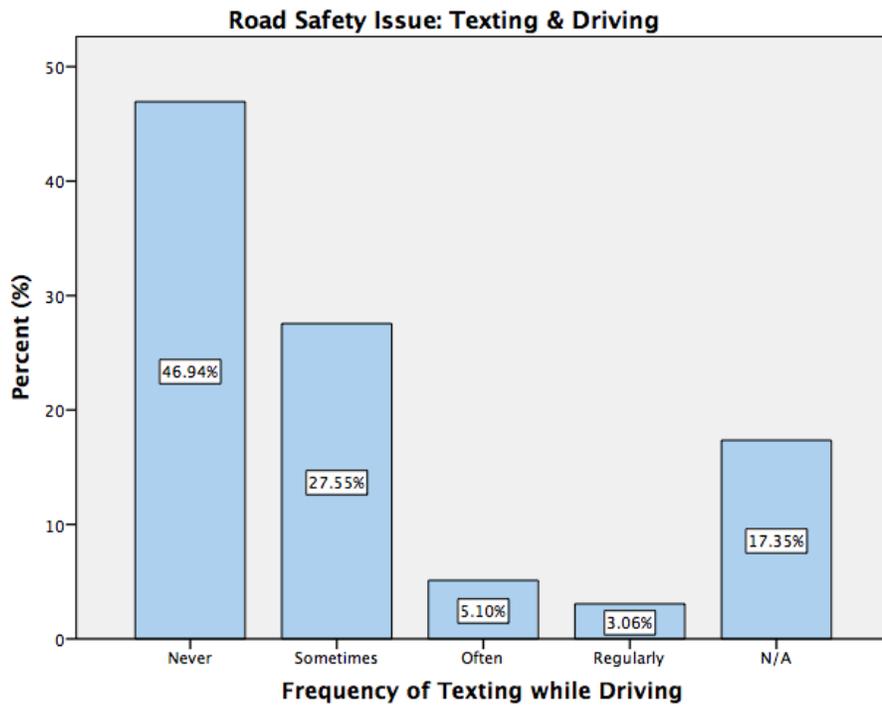
Question twelve of the survey was concerned with the prevalence of various types of risk-taking behaviours in daily life. The question inquired how frequently different activities were performed by the respondents. The bar graphs below present the frequency of self-reported behaviour of the road safety issues. When it comes to protective safety precautions, the use of seatbelts resulted in the highest self-reported score of regular users. Indeed, 93.9% of respondents reported using their seatbelt regularly and only 4% of drivers suggested that they use seatbelts rarely or never. The response on other mandated safety equipment is more heterogeneous, with 43% of respondents wearing a helmet regularly while biking or snowboarding. Equal proportions of respondents totaling to 24% reported never using helmet or using it only on some occasions.







Another set of risk behaviours on the road explored issues around impaired driving. While 72% of respondents reported that they never drive impaired, just 2% reported doing so often or regularly. When asked how often a respondent would agree to be driven by a driver with a blood alcohol concentration over 0.08% the picture changes drastically. One in five reported agreeing to a ride with a legally impaired driver sometimes, while one in twenty respondents accepted such rides often or regularly. With fifty-six BC lives taken in impaired driving accidents, the number of people agreeing for a ride with a legally drunk driver is worrisome (ICBC, 2012, p.1).



For the purpose of this survey, talking on the phone and texting while driving were separated into two individual questions. When asked about talking and driving habits, only 53% of people reported not using their cell phone while driving. This is ten percentage points lower than the data gathered in a Canada-wide survey on distracted driving (TIRF, 2011, p.1). Almost one in ten respondents reported using their cellphones often or regularly.

Interestingly, when asked about texting and driving, almost 27% of people reported engaging in texting behind the wheel at least sometimes. This result is 7 percentage point that reported cell phone use for calls. The number of occasional texting drivers is higher than the number of drivers occasionally talking on their cellphones. Approximately 9% of drivers reported texting often or regularly. These findings are quite similar to the TIRF's 2010 and 2011 surveys of texting drivers (2011, p.1).

Table 3 presents the frequency of using a mobile phone (calling) while driving with similar percentages of males (50%) and females (54.7%). A slightly higher percent of females reported using the phone at least sometimes; the difference between genders is a mere 2.5 percentage points. Interestingly, when it came to regular use of a phone, five times more men admitted to the behavior compared to women. However, chi-squared test indicated that men are no more likely than women to engage with the phone while driving ( $\chi^2=2.83$ , d.f.=4,  $p=0.585$ ). The age of respondents was coded as a categorical variable with six response categories from 18 to over 61 years old. The analysis shows that age and cell phone use was statistically independent for respondents in our sample ( $\chi^2=18.49$ , d.f.=20,  $p=0.555$ ). Although majority of the respondents were young than 35 years old.

**Table 6: Frequency of Cellphone Use while Driving Conditioned on Gender**

**Gender \* phone Cross tabulation**

			phone					Total
			Never	Sometimes	Often	Regularly	N/A	
Gender	Male	Count	18	7	2	3	6	36
		% within Gender	50.0%	19.4%	5.6%	8.3%	16.7%	100.0%
	Female	Count	35	14	3	1	11	64
		% within Gender	54.7%	21.9%	4.7%	1.6%	17.2%	100.0%
Total	Count		53	21	5	4	17	100
	% within Gender		53.0%	21.0%	5.0%	4.0%	17.0%	100.0%

Table 4 presents the conditional percentages of frequency of texting for both genders. When it came to texting, women were less likely to never engage in texting compared to men (53.2% of females versus 36.1% of males reported “never”). Males were more likely to engage in texting sometimes and often (33.3% males versus 24.3% females; 8.3% males versus 3.2% females). Non-applicable response option was kept, as some of the participants might have used N/A category when they did not want to give an answer. However, chi-squared analysis revealed that there is no statistically significant difference between texting drivers of different genders ( $\chi^2=3.43$ , d.f.=4,  $p=0.448$ ). Therefore, the data reveal no association between the frequency of texting behind the wheel and gender ( $\chi^2=21.4$ , d.f.=25,  $p=0.67$ ).

**Table 7: Conditional Percentages of Phone Use Behind the Wheel for Males and Females**

**Gender \* Texting Crosstabulation**

			Texting					Total
			Never	Sometimes	Often	Regularly	N/A	
Gender	Male	Count	13	12	3	1	7	36
		% within Gender	36.1%	33.3%	8.3%	2.8%	19.4%	100.0%
	Female	Count	33	15	2	2	10	62
		% within Gender	53.2%	24.2%	3.2%	3.2%	16.1%	100.0%
Total	Count		46	27	5	3	17	98
	% within Gender		46.9%	27.6%	5.1%	3.1%	17.3%	100.0%

## Limitations

A word of caution generalizing from this modest survey is advised of course, as some of the tests' assumptions have been violated namely response counts for individual cells. However, the more general assumptions of the chi-squared tests are met: for every analysis all variables are categorical and of an appropriate level of measurement (pragmatically, the level of measurement does not play a role in cross tabulation analysis) (Kuha, 2013).

The major limitation of the survey was the number of responses. The sample size of a 100 is also appropriate, as it is over thirty responses and large enough for an appropriate sampling distribution of the chi-squared (Stares, 2014). The limited number of responses made some analysis possible (i.e. descriptive statistics, chi-squared). From more specific assumptions, only gender-conditioned behaviours meet stricter assumptions of the test. As it is evident from the tables, the number of cells with counts lower than five is less than 20% of the overall cells. Cell counts of age-conditioned behaviours violate the most lenient rules of the test by having at least one cell with a count of zero (Stares, 2014).

However, the most interesting types of inferential analysis were not feasible, as the data did not meet the minimum assumptions of interference tests. For example, a comparison of perceived importance for the state's policy of distracted driving compared to other risks between non-users, occasional users, and frequent users was not possible, because the number of cells with counts lower than five exceeded the maximum allowed threshold (20%) reaching 45% of the table. Such comparison would be interesting as some studies found that "frequent and infrequent users significantly differed on half of the normative beliefs" (White et al, 2010, p.22). Second, if the survey were to be used on a larger scale, it would be helpful to add a number of prominent risks, such as financial debt, stroke, respiratory diseases, and risks associated with air travel for comparison. Third, a better way to reach older participants should be used as the age category of fifty and over was underrepresented. This shortcoming can be attributed to the online platforms used for the recruitment of participants. This strategy attracted mainly younger people (65% versus 29% middle aged, and 6% older adults), thus making age-related interferences and comparison difficult.

## Why Engage: Choice or Lack Of Awareness

There are multiple reasons of why drivers choose to engage in distracting activities, despite knowing the risks. One very controversial study out of Harvard University lists the potential benefits of using a cell phone while driving. These benefits include personal, community, household, and security gains. Indeed, cell phones allow for better emergency responses, save time in geographical orientation, might expand both privacy and productivity, help to accomplish errands easier, and permit leaving the work place earlier. They also help to identify and report drunk drivers and criminals (Lissy et al, 2000, p.47). Drivers choose to text and call because they perceive their personal benefits as greater , and the risks lower than those of other drivers.

Optimism regarding personal driving skills is one of the other reasons why drivers engage in cell phone conversations and texting behind the wheel. The problem can be summarized by an old joke: every day more than 9 out of 10 drivers consider themselves above average drivers. The Traffic Safety Survey finds that 65% of the drivers believe that their driving ability is above average or much better than that of other drivers; 75% of interviewees report that they are more careful than other drivers; 66% of informants are also sure that they are a much safer driver than other drivers on the road (AAA Foundation for Traffic Safety, 2009, p.4).

In 1997, drivers ranked the risks associated with cell phones on the roads as 2 out of 10, 1 being not dangerous at all. While today there is an observable shift in risk perception, drivers still believe that “it is safer for them to talk on the cellular phones while driving than for others to talk on the cellular phone while driving” (Nelson et al, 2009, p. 431). Willingness to engage in a cell phone conversation while driving decreases with age while perception of risk increases (Lerner & Boyd, 2005, p.3-1) Much too often drivers are overly optimistic about their own driving skills and about the risks associated with distracted driving (Svenson & Patten, 2005, p.193).

The second reason for drivers to engage in distracting activities is the forgiving nature of driving coupled with the increased utility of technologies.. Hancock, Mouloua, and Senders brilliantly point out that our social existence attributes us with multiple roles. The role of a driver does not require an individual to be “perfect”; indeed, most of the time being just “good enough” will suffice (2009, p.14). Our other social roles are more demanding, therefore drivers are likely to use a chance to talk while driving as a productivity-enhancing, time-saving opportunity (Riquelme et al, 2010, p.129).

Additionally, Nelson and colleagues find that even if drivers recognize the risk of driving distracted, s/he is likely “to initiate a cellular conversation if [s/he] believe[s] that the call is important” (2009, p.438). Rakauskas and colleagues state that in order to cope with the extra workload of secondary tasks, drivers usually reduce their performance goal. Their tolerance of performance decrement results in higher risk acceptance (2004, p. 460). Nelson and his team also suggest that risk perception is simply outweighed by the perception of the importance of a call (2009, p. 442).

Another reason why drivers opt to engage in an obviously risky behavior is explained by the Theory of Planned Behavior (TPB) in combination with rates of social acceptance around this particular risk. The TPB determines an individual’s chance of engaging in risky behaviors. According to Nemme and White, behaviors are determined by attitudes (ex. favorable/unfavorable), subjective norms (ex. social pressure), and behavior control (i.e. how easy/difficult is the performance of a task) (2010, p.1258). The study concludes that group norms and past behaviors were the strongest predictors of engagement in a behavior.

The TPB, when applied to distracted driving, states that drivers are more likely to engage in texting or phoning behind the wheel if they consider this behavior accepted by their closest friends and family (Nemme & White, 2010, p.1265). Similar findings derive from an earlier study. Drivers show more willingness to engage with a phone in the presence of peers and rate distraction risks as the lowest in their presence (Lerner & Boyd, 2005, p.3-18). Riquelme et al elegantly summarize findings from multiple studies by stating that “the greater the perceived social approval (normative beliefs), the greater the likelihood of engaging in the behavior” (Riquelme et al, 2010, p.129).

However, there is an alternative explanation to why drivers engage with their cell phone. It might be that drivers actually fail to see the performance decrement associated with driving distracted. Participants of some studies report that they did not find it harder to drive while on a cell phone, and that they did not notice any decrement in their driving performance. Strayer and colleagues suggest that distracted drivers do not have a capacity to process information that “would provide evidence that their driving is impaired” (2003, p.31). Lee et al posit that feedback on poor driving performance is not evident to drivers because distraction rarely materializes in the form of harm, and having a cell phone conversation has no immediate consequences. The forgiving nature of driving and poor feedback perception result in perpetuation of risky behavior (2009,

p.53). In other words, drivers are not sensitive to their own impairment, and so dangerous driving habits continue.

### Focus Groups Data

As part of an exploration into British Columbia drivers' knowledge and perception of distracted driving, three mixed-gender focus groups were conducted. All of the focus groups investigated four separate aspects of the issue: 1) attitudes towards distracted drivers, 2) knowledge and stance on the current BC anti-distraction legislation, 3) individual motivation for using the phone behind the wheel, and 4) individual distraction mitigation strategies.

Focus groups were chosen over other inquiry methods as they allow the qualitative researcher to explore the topic in a less pre-determined way and to gather in-depth insights about informants' attitudes (Furlham, 2002, p. 42). Focus groups were preferred to individual interviews because they access collective memory not accessible otherwise (Fontana & Frey, 2005, p.696) and bring out issues that might not emerge from individual discussions (van Zyl et al, 2013, p. 479).

Focus group research has been previously used to study transportation road safety related issues. For example, NHTSA explored older drivers' beliefs about seat belt use via focus interviews, and TIRF talked to groups of female impaired drivers (Levi & De Leonardis, 2008; Robertson et al, 2013). Unfortunately, the researcher was able to locate only two studies that employed focus groups for the exploration of distracted driving. One such study is American Teens and Distracted Driving Research conducted by Pew Research Center in 2009, the other is a study done by Donmez and his colleagues in 2006.

### Procedures

Eleven young people (5 females and 6 males) were recruited to participate in three separate focus groups. The participants' age ranged from 22 to 28 years old. Two individuals were self-identified as non-phone-users behind the wheel, while the rest of the participants admitted to using their electronic devices while driving. Purposive sampling strategy was used to recruit the participants for the study because the

researcher was looking for informants who are open about their experiences of driving distracted, as well as their attitudes towards this risk-taking behavior (van Zyl et al, 2013). The only other criterion for selection was a valid driver's license and some driving experience in BC. Each of the focus groups ran for approximately forty minutes. The interviewees were given a participation incentive of free dinner and drinks. An option to receive a final version of this paper was also presented to all participants. Each of the groups met only once.

The discussions were moderated by a semi-experienced facilitator who received training in focus group moderation, as well as gained experience through past group facilitation. The moderator completed ORE's graduate students ethics training and was versed in ethical dimensions of qualitative research. The conversations were recorded using a Zoom H4n device with multi-dimensional microphones. The high sensitivity of the microphones, as well as the 360-degree recording coverage were vital to ensuring that, even when participants talked simultaneously, individual utterances remained distinguishable (Liamputtong, 2011, p.84).

Both the consent form and the pre-session briefing stressed the voluntary nature of participation and provided the study's details in full (Christians, 2005, p.144). The form stated that the participants' data will be anonymized and stored on an encrypted hard-drive and would not be accessible to anyone but the researcher (Carey & Asbury, 2012, p.48).

In the beginning of each focus group, the moderator explained the purpose of the study and explicitly stressed the voluntary nature of participation (Morgan, 1998). The facilitator also emphasized the participants' right to withdraw from the study at any time without repercussions. The moderator then discussed issues of data protection and storage and explained the planned confidentiality protecting procedures. Additionally, to ensure internal confidentiality, the researcher strongly urged participants to not disclose opinions and stories raised during the discussion to the outsiders (Carey & Asbury, 2012). After the study briefing, the participants were asked for consent to being interviewed.

After the focus groups were completed, the participants were debriefed to reduce any possible discomfort and offered refreshments. The debriefing included a second round of discussion of the data protection. The recordings were later transcribed by the researcher. Thematic coding was applied to every transcript (Gullifer & Tyson, 2010). Six

main themes emerged from these discussions. Each of the themes is discussed separately below.

## Discussion

### Perception & Behaviour

Multiple studies and several meta-analytical articles confirmed that distracted driving is associated with slower reaction time, reduced situational awareness, and increased braking time, among other things (Jacobson & Gostin, 2010; Horrey & Wickens, 2004; McCartt et al, 2006). Interestingly, a survey conducted in 2007 revealed that 84% of drivers are aware that their driving performance deteriorates when engaged in a distracting activity (Young & Lenné, 2010). A team of Australian researchers suggested that drivers self-report slower reaction to events, missing hazards, changing speed, another driving behaviour changes (Lenné & Young, 2010, p. 329).

The findings from the focus group similarly indicate that every driver interviewed was aware of his/her own performance depreciation and reported its manifestation. For example, some participants reported missing road signs, not looking around, braking much slower. Three of the participants reported personal accidents attributed to slower reaction time while on the phone. In their own words:

Don: *I was driving to meet somebody I was suppose to hire...I was texting them to let them know that I am gonna be late. I was looking at the phone...I was approaching a stop sign, I saw that the car in front of me was slowing down, so I was also slowing down. I looked to read the text message from them...when I looked up the car in front of me has already stopped. I hadn't. So, I hit the break, but I was too slow and I ended up rear-ending it [the car]*

Donna: *This is how three of us- two of my bosses and myself- got in an accident. We were driving to have lunch with our client and so we just crossed the street and the guy was making a U-turn in the middle, literally- middle of intersection! And he was on his phone...Younger guy with an N [new drivers stickers for drivers with less than 2 years of road experience], so making a U-turn, so he crashing into us and I saw him, I saw that look in his eyes, in his face where he wouldn't even drop his phone and he was just going "No, noooo". Like he wouldn't let go of the phone! That*

*guy! I saw that! And then he turns around with his left hand and drives away! Still holding the phone!*

While the interviewees with accidents and near-accidents reported being both mentally distressed and even treated for light physical injuries, none of them was willing to give up their phone-behind-the-wheel habits.

*Don: After that I stopped looking at my phone while moving, because keeping eyes on the road is important, but talking on the phone...I still do, it is just like talking to passenger.*

Nelson and colleagues pointed out that often drivers criticize others for engaging in distracting behaviours, yet they “underestimate the degree of distraction imposed by the devices” on themselves (Nelson et al, 2009, p. 438). For example, Donna admitted to regular cell phone use behind the wheel and praised her multitasking abilities. Interestingly, while viewing her own distractions as beneficial to her driving, she questioned other drivers’ skills to engage in the same behaviours:

*Donna: I feel like I am actually being extra careful because [...] I need to listen to the conversation and also need to concentrate, and so it actually focuses my mind. So... I would say I believe, I can...I don't know about everyone, but I can certainly multitask when I am driving.*

Ironically, Donna also reported being ticketed for distracted driving on two separate occasions. Overall, while acknowledging the risk of distracted driving, the participants showed little regard and fear for potential accidents.

## **Motivation**

In a recent study, Nelson and colleagues (2009) found that people tend to initiate and answer phone calls behind the wheel if they perceived them as being important. The researcher also pointed out that drivers who consider distraction risky might choose not to answer calls perceived as less important. When asked about preferences for call making and taking, one of the participants stated jokingly:

*Donna: I take ALL calls unless it is 1-800 number...I'll not take that, otherwise I will take them ALL [emphasis from intonation]*

Other participants reported initiating phone calls depending on the mood or need. Another pointed out that her partner would only take phone calls from family and a small group of friends and only calls he expects. Unlike participants of the Pew Institute study, the participants did not have specific motivations like searching for directions, keeping in touch, nor appearing cooler (Madden & Lenhart, 2009, p.5).

While 9 out of 11 participants found it very acceptable to engage with their phone themselves, when asked “how do you feel seeing fellow drivers engaging in conversations/texting while driving?”, most of the participants reported that they feel unsafe, act more cautiously around people on the phone, and try to see if the drivers' eyes are on the road. Still, others suggested that they feel anger and disrespectful – morally condemning other drivers for behaviours they themselves do:

*Donna: I feel...I am very curious... I am always always very curious about what they are talking about and who are they talking to and why is that so important to talk to that person RIGHT NOW [intonation stressed]; you know, when you are in the middle of the intersection turning left. You know it is very difficult, right, there is no like green arrow pointing , so you have to wait for everybody to pass. So why is it that you think that it is very important to talk to someone else?*

*Jack: So if you take yourself completely out of that [situation on the road] by putting your head down and looking on at your phone, focusing on something else, as oppose to [gestures of looking around] You now are the only person out of that group of people who have the same common goal, but who says “You know what, Fuck You guys! I am taking a second here, I am just going to take care of my own stuff and then I will get to doing whatever else I was doing”*

When, it comes to being driven by someone who is texting or talking on the phone, some teens in a Madden & Lenhart study reported being “adamant and angry” (2006, p. 9). The participants of this research also indicated that being driven by a distracted driver causes some tension. For example, one of the participants acknowledged getting annoyed at her partner’s habit of talking behind the wheel:

*Claudia: My partner is really bad in multitasking so when he is on the phone. I start looking at his driving just to make sure that he is not doing anything stupid. And I get annoyed and if it is his friend*

*I say “just hang up because that call can last from 30 minutes to an hour & you are driving”. So I get annoyed when my partner does that, because he can’t... for some reason he can’t multitask*

Overall, none of the participants indicated any selective priority decision making in their choices of answering or initiating phone calls. Even though the participants, themselves, were not hesitant to take the calls, they expressed mixed feelings about other drivers’ performance while engaged with their phones.

## Legislation

Unlike the participants of an earlier Donmez et al study, drivers of BC indicated that they are not willing to give up their phone-behind-the-wheel habit even when required by law (2006, p.396). The interviewees’ opinions seem to be clustered into three separate categories: these who think that the law is appropriate, these who think that current legislation is a stunt that benefits government and big business, and these who would like to see tougher regulations on the issue.

The members of the first camp pointed out that they think that the law is appropriate. They perceived the present sanctions and the legislation as being “reasonable” and stated that if distraction was not a real issue, the government would not have implemented a law against it. For example,

*Harold: I like the legislation we had right now, I think it is decent. People get tickets, fines and they are reasonable, I think its 140 [dollars], right? It is a reasonable fine.*

Members of the second camp fell into a “nanny state” line of thinking. This view of the legislation as being overly protective was typical of anti-legislation advocates for earlier road safety issues, such as seat belt enforcement. As predicted by earlier literature, they ridiculed regulations and cried out for more personal responsibility (Johnston et al, 2013, p. 69). One of the participants declared his disdain with the law, stating:

*Pete: I don’t think it should be enforced. [...] I disagree with the government being this controlling in terms of what you are allowed to use in the car or outside the car, or whatever...I actually think that the whole thing- control of devices- to degree it only benefited people selling the hands free...whatever,*

*speakers... cause all sales made thought the roof.[...] If anything it is just a marketing thing, a way to make money.*

*Claudia: Umm, I think.. what ever happened to giving people a discretion to make their own decisions, right? [...] It should be up to drivers digression...*

*Donna: Yes! And it [the law] is stupid! But you can talk to your passengers, right?! And engage in whatever the conversation the hell you want, right!*

Anti-legislation views sprang from the idea that the legislation was passed not in order to protect road users, but to make money that goes into government pockets and benefits big corporations. Additionally, road users fairly pointed out that other distracting activities, such as eating, reading maps, and using entertainment systems are not prohibited by law and suggested that the exclusion of other distraction is arbitrary and inadequate. Reportedly upset drivers of the anti-legislation camp saw their fellow drivers eating wonton soup with chopsticks, studying maps, and even reading books while driving!

The last category consists of more conservative drivers, including a professional bus driver. While drivers in this category seemed to agree that the legislation is not strict enough, they did not agree on the legislation's advancement. While some of the interviewees proposed to give permission to use all electronic devices depending on ones' driving experience or age, others proposed to fully ban all electronics from vehicles. Most originally, Jack the professional driver, suggested:

*Jack: In my opinion, there should be a restriction on the license. Which, with additional situational awareness training and additional driving lessons and stuff like that , were you can get a higher level license that allow you to use your devices under certain conditions.[...] That's exactly what they do for police, firefights and ambulances- they go though training, so that they are able to drive and use radio at the same time... and laptops*

Interestingly, some of the information regarding legislation presented by the participants was inaccurate. Misperception of the current legislation demonstrates that more work is required to inform British Columbians about distracted driving.

## Mitigation Strategies

Young & Lenné (2010) pointed out that drivers develop various distraction mitigation strategies to outweigh possible driving performance losses. Their informants listed increasing following distance, reducing speed, and pulling over as some of the most popular strategies, but about quarter of all respondents did not change their driving behavior in any way (p.329). The participants of my focus groups reported similar strategies, as well as some innovative solutions. For example, some of the drivers have their friends look out for the police, pull over, and leave their phone on the dashboard for better visibility. As one of the participants reported:

*Claudia: when my partner is stuck on the [phone] I am on a look out. I put on my glasses, and I m on the look out. [the group laughs] And if I see a white car that kinda resembles a cop cars, he puts his hand down. But now we are smarted we got like a stand thing for the phone...*

A few participants stated using only voice-controls while driving, such as Siri or in-car voice systems, as it was perceived as a safer way to communicate, as well as being legal in British Columbia. All but three interviewees suggested that the best mitigation strategy is to only use their phone when their vehicle is fully stopped at a red light. As one of the respondents states:

*Harold: Though if you are seeing a red light...I can still somehow justify it in my head. Ok, so you are on the red light, for example, it just changed, and you know that it takes a minute to change it...Nothing absolutely nothing is going to happened within this minute. So you are fully stopped, you can actually change your gear from drive to parking and then, you know, quickly reply to a text if you need to or quickly do whatever you need to and then just keep going...*

Of the people who reported to use their phone at red lights, only John did it as a way to not get caught by the police. He urged the group:

*John: So you guys use your phones at red lights? [group agrees] You know, that this is THE MOST [stress with intonation] effective way to catch you guys! I specifically don't use it at red lights*

*because I know that police use them specifically to catch you people! Because it is the easiest way to catch...*

While other studies available to the researcher did not cite any anti-phone-behind-the-wheel proponents, a focus group member revealed that he does not pick up his phone while driving and alleviates the pressure of answering calls by informing his relatives and friends that he will not do so:

*Jack: All my friends and relatives know that I am not going to answer the phone if I am driving, so I don't feel guilty if somebody is calling me, because I have voice mail and they can leave me a text message, and I will get back to them.*

Overall, as suggested by earlier studies, every driver has a distraction mitigation strategy. Unfortunately, as predicted by the Highway Loss Data Institute some of the strategies were aimed at not getting caught, rather than behaving safer on the road (2010, p.8). For example, two informants reported hiding their phones under the dashboard in order to avoid tickets. As pointed out by both the participants and academics, such behaviours usually result in longer glances away from the road, as well as complete loss of peripheral road vision (Lafleur, 2012).

### **Fines & Demerits**

When asked about methods to prevent drivers from engaging with their phones while driving, the participants offered multiple solutions. One of the most prevalent suggestions was to increase fines. For example, a participant suggested:

*Donna: I think it should be the first strike should be free of charge so to say... just a notice, a warning, you know strong warning, then the second strike a definite of a heavy fine, now it is what? 159 dollars, I think...or a 169*

*Claudia: But you got it TWICE [accented by intonation], but it is still not enough*

*Donna: Yeah*

*Claudia: But if it was a 300bucks fine, you would probably have stopped*

Donna: *If it was the first time- they warn me, the second time they caught me and it is a 500 dollar charge...I would be like the hell no, I am not doing it anymore! It is a worthless investment. [...]It is cheap, honey, it is cheap! [...] I am afraid of the money charge, not because it is illegal.*

The arguments about higher fines stands perfectly in line with a lesson learned from seatbelt enforcement. A summary report on sanctions, HVE, and legislations suggest that increasing fines, especially if publicized, leads to increased impact of the legislation (NHTSA, 2008, p.45). At the same time, the participants honestly pointed out that it is not the letter of the law that scares them, but the monetary punishment. Others suggested that accumulating demerit points as well as progressive financial sanctions might sude more drivers to put down their phones. Only one driver would agree to comply with the legislation knowing that his car might be towed for breaking the law. More realistic drivers maintain that

Betty: *With increased fines I would still use it...*

Moderator: *What would it take for you to stop using the phone?*

Betty: *Nowadays, NOTHING! [stressed by intonation]*

One of the radical opponents of legislation in general and current BC law in particular proclaimed:

Pete: *No I would not stop [if you were to get a 600 fine]. It is hard to catch me, so good luck!*

One of the most innovative enforcement/education ideas came from an informant with a long ticketing record. She pointed out that drivers don't learn from books or stories, but from experiences and suggested that:

Donna: *Another thing that can be done is when you take the test [driving text], and most of the tests, like 99% are digital. You just stand there in front of the kiosk and punch in the numbers. So I think they should give you a headset and in that headset one particular exercise or a couple should be done when somebody is talking to you...and you are trying to solve your thing, and you will be absolutely distracted by all that shit that is being told to you. And you ill be like "Fuck, I cant, like, clearly concentrate!" That should trigged something in you...*

Ultimately, the members of the focus group agreed that it is not the fines or enforcement but the possibility of being “ratted out” by other drivers that would discourage them from using their phones behind the wheel. To the researcher’s knowledge, none of the studies explored this method of social norm change, however in an in-person interview, a representative of ICBC pointed out that the organization was hoping to create an environment where other drivers are able to call on each other, just like it happened with smoking. ICBC hopes that a critical mass of drivers would be able to say “we don’t want you doing that around us” (ICBC Personal Interview, June 6th, 2013).

### Enforcement

A lot of focus group time was dedicated to the discussion of enforcement of the distracted driving laws by both the RCMP and municipal police departments. Vancouver police forces. As pointed out by an ICBC representative the corporation hopes to make enforcement as visible as possible to create an environment where drivers can feel that punishment will follow if the law is broken (Personal Interview, June 6th, 2013). In general, the participants reported that they feel that little is currently being done to enforce the law. Their attitude towards enforcement can be summed up as:

Don: *With the current level of enforcement it feels like you can quiet easily get away with it!*

Harold: *Never seen that [enforcement], never experienced that, none of my friends got any tickets...While in Canada we are all suppose to be super safe, but then there is absolutely no enforcement*

While only one of the participants received tickets for using a cell phone while driving, a few reported that they had seen other people being ticketed or had heard stories from their friends. For example, the professional driver reported specific places in the city where motorcycle police fine drivers from particular gas stations, while pointing out that only some places in the city receive such treatment.

The most fascinating finding comes from a female informant who received two tickets for driving distracted:

Donna: *Yeah, and they still bust me! Still bust me! No, one time, [...] I was talking to my mom actually on the phone. And she was telling me a story about my grandma [the mother] was almost tearing up and I was in the middle of the intersection, but I was just going straight in my commute from work to home. And so it is just straight, you know, and down one pass and I don't have to turn anywhere and I don't even have to turn or change lanes, so it is all super safe and I am well aware of my surroundings...but I was just at the stoplight and there was a little mall and cops were hiding behind trees around that mall. And so they saw me...*

When asked by another participant if she regrets getting ticketed, Donna said that she is not, because fines are cheap and a conversation with her family is worth a lot more to her than monetary punishment.

When it came to mass media and enforcement campaigns only four participants were able to recall any anti-distracted-driving commercials. Interestingly, only two people cited a local BC's Give Them The Thumbs campaign, others referred in high regard to Australian ads. Two thumb-givers pointed out that they mock texting drivers every time they see them. Surprising was a number of references made to the popular culture situated around the practice of distracted driving. One of the participants cited a film starring Will Smith; the plot of the movie revolves around the protagonist trying to make up for the seven lives he took in a texting and driving accident.

## Reflections

While the overall focus group strategy for the exploration of beliefs and attitudes can be considered a success from the richness of the data collected, some improvements might be necessary for a larger study. First, the moderator should receive additional training in focus group facilitation as she was inexperienced with periodic silences. As a result, the facilitator tried to fill pauses with possible answer options or moved the discussion along in an expedited manner. As recommended by the literature, a five-second pause rule should be adopted in order to elicit additional opinions without rushing or pressuring the participants (Kruger, 1998, p.28).

Second, commenting on evaluation of the data, Fern suggested that a group's composition and cohesion might directly affect the quality of discussion (Fern, 2001, p.14). Some aspect of focus group composition can be improved by grouping dominant

participants together, and keeping shy interviewees in a separate discussion. In the course of the conversations, it became clear that individuals like Donna or Pete tended to dominate the discussion, thus discouraging quiet respondents from talking. Otherwise, the similar ages and social demographics of the participants mixed amiably and did not appear to be intimidating for anyone.

Third, the locations of the focus groups could have been improved. They were held at a participant's house. A special "research party" was organized for the interviewees. During the night the participants were asked to join the researcher in a special room for a group chat. While "research party" created an relaxed aura of engagement and curiosity (Morgan, 1998), the party's distractions, such as music or momentary interruptions, influenced the flow of the discussions. If further research is to be conducted, a designated location with a private, quiet space and comfortable furniture in order to ensure conversation flow, would be necessary (Carey & Asbury, 2012).

Finally, a printed version of the Interviewees Guide might be beneficial for directing the flow of the focus group discussion. While the facilitator consistently used a structured question guide from one group to another (Morgan, 199, p.47), the participants in every group asked for written topics or a question outline to aid them with the structure of the exercise and discussion.

### **Summary of Qualitative Findings**

The focus group methodology allowed the researcher to gather in-depth insights about peoples' controversial attitudes towards distracted driving. Inconsistencies in comments clearly indicate "the other drivers' problem" mentality among interviewed BC drivers. To summarize then, this qualitative data indicated that current enforcement strategies and legislation are not very effective as deterrents for distracted drivers. Only two of the eleven are willing to abstain from cell use in the car. The majority have developed a rationale for a managed risk approach to phone use in the car. The justifications for a managed risks strategy are various: Both sanctions and fines were considered by some as a ploy to benefit rich corporations and the government, while others viewed the current levels of fines and enforcers as arbitrary and weak. Every participant suggested an alternative anti-distraction strategy including heavier fines, vehicle impounding, and social shaming. Even though they suggested alternative enforcement strategies, the participants indicated that it is unlikely that they would be giving up their phone behind-the-wheel habits. The participants, that did not use cell

phones while driving, were better informed about current legislation and more critical of distracted drivers. However, the majority of the participants concluded that individual benefits of using the cellphone behind the wheel outweigh public health risks. The researcher regards the focus groups as being successful because group members engaged in the process of collective sense-making and, instead of complying with one another, “constructed, expressed, defended and occasionally modified” their own opinions (Furnham, 2002, p.43).

## Chapter 5

### Conclusion: The Road Ahead?

Approximately a hundred lives a year are currently lost due to driver distraction on British Columbian roads (ICBC, 2014). The extensive review of observational and epidemiological studies, cognitive experiments, and observational and self-reported surveys demonstrated that multitasking behind the wheel leads to slower reaction time, loss of situational awareness, and decreased driving performance. A roadside survey of 8,332 cars in Vancouver found that at minimum 1.35% of all observed drivers were using their phone behind the wheel, and another 1.33% of people were distracted otherwise.

The data gathered from focus groups clearly demonstrated a mismatch between risk perception and risk-taking, as the majority of the drivers was aware of driving performance decrement and yet chose to engage with their phones. Interviewees reported that while aware of risks, they justify using their devices, as personal benefits from using a cell phone behind the wheel outweighed the perceived risks. Even the drivers with distraction-attributed accidents reported not changing their cell phone and driving habits. The drivers reported that current legislations and sanctions are too mild to prevent them from engaging with their phones. The failure to enforce the legislation might potentially result in two serious issues: first, poor enforcement sends the message that legislation is not important; second, inconsistent enforcement might be perceived as a waste of resources that could have gone to other road safety campaigns (GHSA, 2011, p. 5).

### The Canadian Policy in the Context of Risk Reduction

While the RSS 2015 has the noble aim of making Canadian roads the safest in the world, the program is highly problematic. Unlike previous RSS plans, the new program leaves every Canadian province to battle distracted driving with its own means. The nationwide RSS 2015 plan does not provide hard targets for provinces to meet in terms of casualties reductions, leaves provinces to operate within a short timeframe (5 years), and proposes no national solutions on how to curb the problem of distracted driving (CCMTA, 2011, p.1).

Under a slogan of flexibility and holistic approach, the RSS 2015 is vague and utterly useless. The RSS 2015 speaks the language of “best practices”, “own frameworks”, and “local responsibility”. The bottom line of the RSS 2015 is that every jurisdiction “will have the responsibility for their respective plans and also have the option of developing their own quantitative targets for specific casualty reduction during the five-year time-frame, if they wish to do so” (CCMTA, 2011, p.7).

Additionally, the RSS 2015 is concerned with multiple road safety issues; however, distracted driving does not even receive its own category! According to the program, distracted driving is classified under impairment, in line with driving under the influence. Such treatment of distracted driving contradicts general research paradigms around the problem. It does not emphasize the causes of distraction. Considering that distracted driving affects every group of road users, the author of this thesis finds the Canadian RSS 2015 highly problematic.

Unfortunately, the RSS 2015 is not the only program that is dysfunctional due to a lack of hard commitment from federal governments. Wilson and colleagues suggest that “we live in an era where there is pressure on government to deregulate” (2005, p.45) and deregulation obviously shapes governmentally mandated programs. Unfortunately, it is not realistic to fight deregulation quickly and successfully, therefore the program has to be supplemented with elements that can make the RSS a success.

Some researchers suggest that “good laws coupled with tough enforcement can reduce deadly distracted driving behavior” (LaHood in Cosgrove, Chaudhary & Regan, 2011, p.1). Others argue that laws and enforcement are not enough and that legal strategies have to be supplemented with education, public awareness campaigns, and a cultural shift in perspective on distraction (Cosgrove et al, 2011). Roy LaHood, Director of the IIHS, voices the research community’s general consensus of methods of curbing distracted driving: “decades of experience with drunk driving have taught us it takes consistent domination of education, effective enforcement, a committed judiciary, and collective efforts in local state and national advocates to put a dent in the problem” (as cited in GHSA, 2010, p.5). Cosgrove and colleagues suggest that 20 citations per 10,000 drivers are needed for a campaign to be effective. They argue that drivers will change their behavior only by seeing that “motorists will receive a ticket when they violate a traffic law” (2010, p.10). HVE comes in handy when enforcement wants to take advantage of the fact that people will try to avoid citations and demerits by complying with the law. More recently, Hammond concludes that, “internationally, these

jurisdictions who continue to run post-legislation public awareness campaigns and who have strict, publicized enforcement campaigns tend to have better, long-term compliance” (2010, slide 5).

The international community has recognized that distracted driving is a problem worldwide and the most important challenge we are currently facing is the fact that drivers who are aware of the risks and supportive of anti-distraction laws are still willing to engage in texting and phoning because they see themselves as safer drivers. Cosgrove, Chaudhary & Regan summarize the problem: “changing driver’s assessment of the risk associated with their own behavior presents a challenge” (2011, p.10).

### On the Down Road

There are three possible steps to take in order to improve curbing distracted driving on the roads. First, the legislation and sanctions need to be more stringent. Currently, BC has one of the weakest legislations and the third lowest fine (\$167) after Quebec (\$115) and the Northwest Territories (\$100). Further, the province should follow Nova Scotia’s lead with progressive fines and demerit points (CAA, 2014). Unfortunately, as of 2010, BC had not considered re-evaluation of distracted driving laws, nor used targeting enforcement, nor conducted observational road surveys, nor examined the efficacy of the legislation (Robertson, 2011, p.7).

The second step in addressing the issue is to overcome a mismatch between risk-awareness and risk-taking behaviours. In the context of risk society where risk communication plays a major role this problem is best addressed by the change of social norms which guide risk-taking behaviours (Atcheley et al, 2012). Social marketing campaigns are one of the ways that can affect normative behaviours directly. A lesson to address the issue might be learned from a similar road safety issue: drunk driving. Social marketing campaigns were part of the tremendous effort that moved impaired driving from being perceived as an aspect of modern life (DeJong & Hingson, 1998) to being understood as irresponsible, unacceptable behaviour. Successful strategies from the past should be used to transform social norms around distracted driving.

A number of major internal barriers would have to be considered when developing the social marketing campaigns. For example, gathered data indicated that “the other-guys-problem” type of thinking is currently prevalent among drivers in BC. The

AAA Foundation for Traffic Safety summarized the well-known problems as: “many drivers discount their own behavior and view distraction as a significant problem that applies to other people” (2011, p.1). The campaigns would also have to address external barriers to behavior change including clear lack of balance between social costs and personal benefits of phone use (ex. time-saving, convenient, being connected) (Norman et al, 2005, p.83).

Social marketing campaigns have two additional benefits: fiscal efficiency and sustainability. For example, evaluating a road safety campaign against impaired driving in Kansas City, Tay found that a \$322,660 investment in social marketing saved approximately \$3,676,399 in costs of medical bills, emergency care, property damage, days of lost labour, and other negative externalities of the crashes (Tay, 2009, p.26). The sustainability aspect of social marketing was demonstrated by seatbelt use enforcement, where the pattern of change demonstrated wave patterns, increasing with every repeated media effort (Tison & Willians, 2010, p.23).

These social marketing successes might be applied to anti-distraction campaigns. For example, alternative action messages rather than fear messages should be preferred, as fear-based approaches can potentially cause message rejection, avoidance, or dismissal (Tay, 2005, p. 25). Perkins and his team suggested that fear-based approaches also tend to create a misperception about the prevalence of the problem (2010, p.867). Cismaru and colleagues suggested that “higher level of self-efficacy and response efficacy and lower level of perceived costs can produce a significantly greater change in protection motivation and persuasion” (2009, p. 297). The researchers cite designated driver campaigns that instead of moralizing drinking behaviours, suggested a low-cost, easy-to-administer solution.

The third step towards curbing distracted driving is high-visibility enforcement. Most of the drivers in the focus groups pointed out that they do not feel that the present legislation is adequately enforced. Historically, high-visibility enforcement was applied to impaired driving (road blocks, checkpoints, impairment testing), seatbelt use (roaming patrols, high visibility ticketing), and speeding. Especially outstanding is Fresno’s high-intensity enforcement experimental project that quadrupled the number of enforcement officers, and thus decreased speed related fatalities three-fold (Davis et al, 2006).

In short, best practices demonstrate that road safety issues are more likely to be heard and respected by drivers through a combination of legislation, enforcement, and repeated media campaigns. The problem of distracted driving in BC is no exception. The

author of the study hopes that the project might initiate a conversation about this issue, so vital to the livelihood of British Columbians.

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