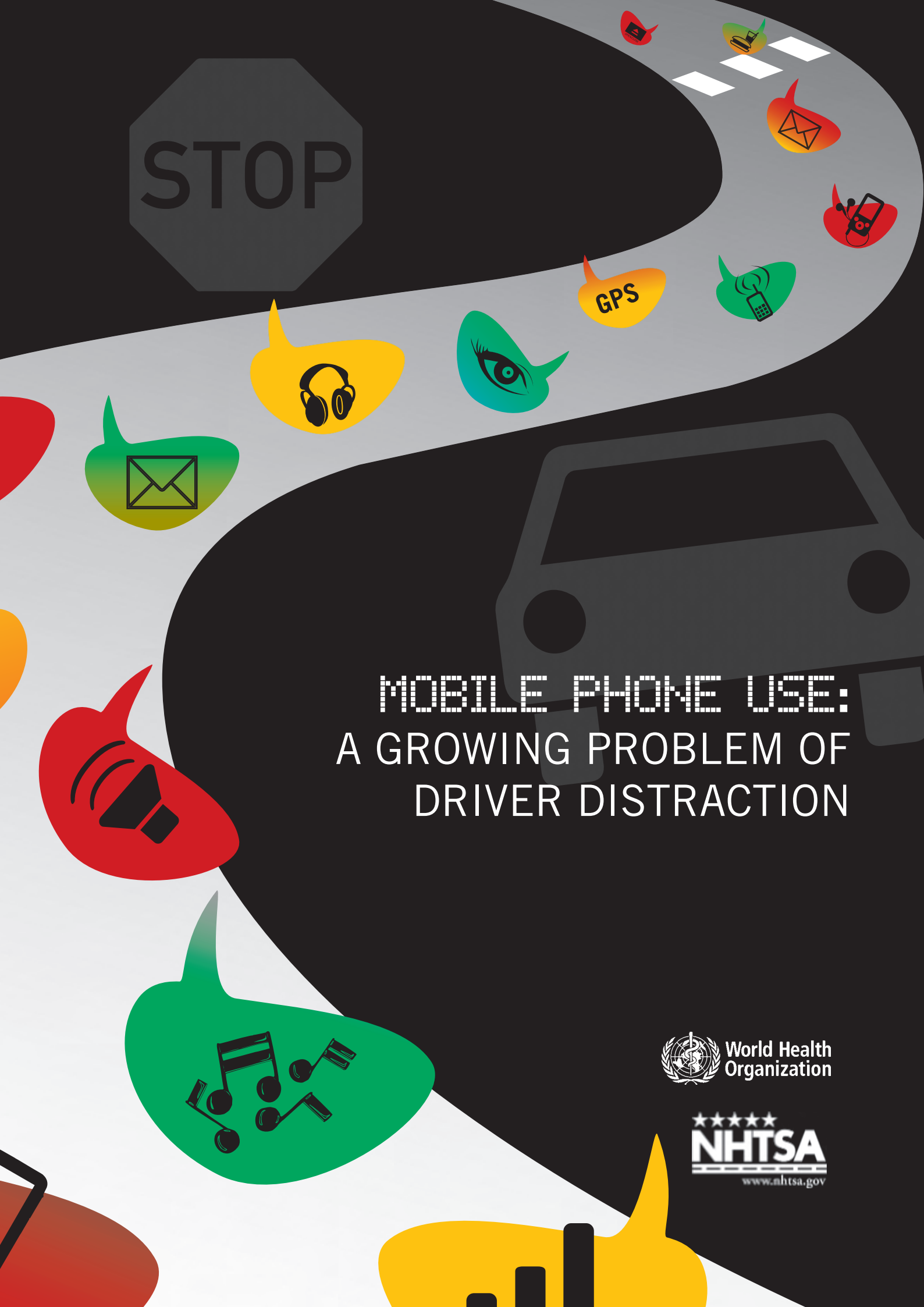


MOBILE PHONE USE:
A GROWING PROBLEM OF DRIVER DISTRACTION

World Health Organization

NHTSA
www.nhtsa.gov

MOBILE PHONE USE:
A GROWING PROBLEM OF DRIVER DISTRACTION

2011

World Health Organization

NHTSA

www.nhtsa.gov

WHO Library Cataloguing-in-Publication Data

Mobile phone use: a growing problem of driver distraction.

1.Accidents, Traffic. 2.Automobile driving. 3.Cellular phone - utilization. 4.Safety. 5.Attention. 6.Risk-taking. I.World Health Organization. II.NHTSA (U.S.).

ISBN 978 92 4 150089 0 (NLM classification: WA 275)

Suggested citation: *Mobile phone use: a growing problem of driver distraction.* Geneva, Switzerland, World Health Organization, 2011 (http://www.who.int/violence_injury_prevention/publications/road_traffic/en/index.html).

© World Health Organization 2011

All rights reserved. Publications of the World Health Organization can be obtained from WHO Press, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel.: +41 22 791 3264; fax: +41 22 791 4857; e-mail: bookorders@who.int). Requests for permission to reproduce or translate WHO publications – whether for sale or for noncommercial distribution – should be addressed to WHO Press, at the above address (fax: +41 22 791 4806; e-mail: permissions@who.int).

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

This publication solely reflects the views of the Department of Violence and Injury Prevention and Disability of the World Health Organization and does not necessarily reflect the position of institutions or organizations that have made financial contributions making this publication possible.

Printed in Belgium.
Designed by L'IV Com Sàrl.

Contents

Acknowledgements 2

Executive summary 3

Introduction 5

1. Defining driver distraction 7
1.1 Sources of driver distraction 8
1.2 Prevalence of driver distraction 10
1.3 The magnitude of the crash problem resulting from driver distraction 10

2. Mobile phone use 13
2.1 Trends in possession and use of mobile phones 13
2.2 Estimates of levels of mobile phone use while driving 15
2.3 Estimates of levels of text messaging while driving 17

3. Effects of mobile phones on driving behaviour and crash involvement 18
3.1 The impact of mobile phone use on driving performance 18
3.1.1 Methodological issues associated with assessing impact 18
3.1.2 Areas of driving behaviour affected by the use of mobile phones 19
3.1.3 Hand-held versus hands-free 22
3.1.4 Compensatory behaviour when using mobile phones 23
3.1.5 Effect of text messaging on driving behaviour 23
3.2 The impact of using a mobile phone while driving 24
3.3 Other road users 25

4. Interventions to address mobile phone use while driving 27
4.1 Legislation and policies 27
4.1.1 Legislation on mobile phone use in vehicles Enforcement 28
4.1.2 Effectiveness of legislation 31
Mixed messages: banning hand-held versus hands-free mobile phones 33
4.1.3 Policies on data collection 34
4.1.4 Employer policies 36
4.2 Public awareness campaigns on mobile phone use while driving 38
4.3 Technological developments 40
4.4 Training and licensing 41
4.5 The need for evidence 42

5. Conclusion 44

References 48

Acknowledgements

The World Health Organization (WHO) gratefully acknowledges the contributions made to this publication by the following:

WHO: Coordination for the development of this Report was provided by Margie Peden. The publication was written by Tami Toroyan. Other WHO staff who contributed technical and/or administrative support to its development were: Alison Harvey, Melecki Khayesi, Etienne Krug, Pascale Lanvers-Casasola, Eugenia Rodrigues, Dinesh Sethi, Tom Shakespeare, Laura Sminkey, Jelica Vesic and Francesco Zambon.

The following provided comments on the draft and contributions to the text: Matts Åke-Belin, Paul Boase, Peter Burns, Aline Chouinard, Ann Dellinger, Cheng-Min Huang, Brian Jonah, Susan Kirinich, Brian Lawton, Kate MacMahon, Dinesh Mohan, Stephanie Pratt, Gary Ronald, Teresa Senserrick, David Sleet, Hamid Soori, Virginia Tanase, Claes Tingvall, Maria Vegega, Pieter Venter and Fred Wegman.

Thanks are also due to the following:

- Angela Burton who edited the Report;
- The graphic designers from L'IV Com Sàrl who designed and typeset the Report;
- All the translators who prepared various language versions of this Report.

Finally, the World Health Organization wishes to thank United States National Highway Traffic Safety Administration for co-funding this publication.

Executive summary

Driver distraction is an important risk factor for road traffic injuries. There are different types of driver distraction, usually divided into those where the source of distraction is internal to the vehicle – such as tuning a radio, or using a mobile phone, and those external to the vehicle – such as looking at billboards or watching people on the side of the road. This document focuses on the use of mobile phones while driving, in response to concern among policy-makers that this potential risk to road safety is increasing rapidly as a result of the exponential growth in the use of mobile phones more generally in society. It aims to raise awareness about the risks of distracted driving associated with mobile phone use, and to present countermeasures that are being used around the world to tackle this growing problem.

Studies from a number of countries suggest that the proportion of drivers using mobile phones while driving has increased over the past 5–10 years, ranging from 1% to up to 11%. The use of hands-free mobile phones is likely to be higher, but this figure is more difficult to ascertain. In many countries the extent of this problem remains unknown, as data on mobile phone use is not routinely collected when a crash occurs.

Using mobile phones can cause drivers to take their eyes off the road, their hands off the steering wheel, and their minds off the road and the surrounding situation. It is this type of distraction – known as cognitive distraction – which appears to have the biggest impact on driving behaviour. There is a growing body of evidence that shows that the distraction caused by mobile phones can impair performance in a number of ways, e.g. longer reaction times (notably braking reaction time, but also reaction to traffic signals), impaired ability to keep in the correct lane, shorter following distances, and an overall reduction in awareness of the driving situation. Using a mobile phone for text messaging while driving seems to have a particularly detrimental impact on driving behaviour. Text messaging is often a low-cost form of communication, and the increasing use of text messaging services among drivers is likely to make this an important road safety concern. Young drivers are more likely to be using a mobile phone while driving than older drivers, and are particularly vulnerable to the effects of distraction given their relative inexperience behind the wheel.

The impact of using a mobile phone on crash risk is difficult to ascertain, but studies suggest that drivers using a mobile phone are approximately four times more likely to be involved in a crash. This increased risk appears to be similar for both hand-held and hands-free phones, suggesting that it is the cognitive

distraction that results from being involved in a conversation on a mobile phone that has the most impact upon driving behaviour, and thus crash risk.

While the body of research looking at the risk associated with using a mobile phone while driving is growing rapidly, there is much less known about the effectiveness of interventions to address this issue. As a result, a number of countries are following approaches that has been known to be successful in addressing other key risk factors for road traffic injuries, such as in increasing seat-belt use, or reducing speed and drink-driving.

This includes:

- collecting data to assess the magnitude of the problem and identify where and among whom it is most prevalent;
- adopting and enforcing legislation relating to mobile phone use;
- supporting this legislation with strong enforcement and public awareness campaigns to emphasize the risk of the behaviour and the penalties associated with transgression of the law.

Other measures that offer potential reduction in risk include:

- technological solutions, for example, applications that detect when the phone is in a moving car and direct in-coming calls to a voice messaging service;
- company policies that regulate employees' use of mobile phones while driving.

Nonetheless, to date the effectiveness of any of these measures on mobile phone use while driving – and more importantly, on crashes and injuries – has yet to be adequately documented. While there is some research on the effectiveness of legislation on the use of mobile phones, the ability to sustain reduced levels of mobile phone use needs to be assessed. In addition, the possibility that laws banning only hand-held mobile phones may actually increase the use of hands-free sets phones needs to be evaluated, particularly as based on the available evidence, using a hands-free phone while driving appears to have a similar risk to using a hand-held one.

Although the evidence around mobile phones as a risk factor for road traffic injuries is in its infancy compared to other aspects of road safety, this issue is likely to become a growing concern globally. Furthermore, while this report focuses on mobile phone use, it is important to recognize that mobile phone services are increasingly integrated with other applications (e.g. e-mail and Internet access via "smart phones"), and that information on the risks of such devices for road traffic crashes, as well as on potential countermeasures, is therefore likely to evolve alongside the rapid technological changes taking place in this area. Governments need to be proactive now, and put in place measures to address mobile phone use among drivers, while simultaneously monitoring and evaluating the effects of these interventions. In this way the body of evidence in this area will grow, allowing future policy decisions to be grounded firmly in science.

Introduction

Every year nearly 1.3 million people die and 50 million are injured as a result of road traffic crashes *(1)*. These deaths and injuries have an immeasurable impact on families and communities as they tragically and irrevocably change people's lives. In addition to the huge emotional toll these injuries exact, they also cause considerable economic loss to casualties, their families and nations as a whole.

Road traffic injuries affect all age groups, but their impact is particularly striking among the young – they are the leading cause of death worldwide among those aged 15–29 years *(2)*. Trends suggest that between now and 2030, road traffic injuries will rise from being the ninth leading cause of death globally to become the fifth. This rise is particularly driven by the dramatic increase in motorization in a number of low- and middle-income countries – an increase that now demands improved road safety strategies and land-use planning.

A number of factors have been identified as affecting the likelihood of a road traffic injury, and limiting the exposure to these risk factors is critical to the success of efforts to reduce road traffic injuries. For example, there is now a large body of scientific research showing the increased risk of road traffic fatalities and injuries resulting from excessive or inappropriate speed, drink–driving, and non-use of seat-belts, child restraints or motorcycle helmets *(3,4)*. Over the past few decades, evaluation of programmes around the world has helped provide a solid foundation of evidence-based solutions that policy-makers can draw upon in efforts to improve road safety within their countries.

Distraction in traffic is another risk and is becoming an increasing concern among policy-makers. Most research and attention in this area relates to driver distraction, largely because of drivers' increasing use of mobile phones and other technologies. However, the extent of the problem of driver distraction

– including that created by mobile phones – and its contribution to risky driver behaviour and road traffic crashes is not very well known, even in countries with a good road safety record.

This report aims to raise awareness about distracted driving and to promote research and action related to it. It summarizes what is known about the extent of the problem of driver distraction, the risk to safe driving behaviour and what can be done to reduce it. The focus is on mobile phone use among drivers, reflecting the emphasis of the available research, but it is important to note that other sources of distraction are also causes of risk. With this in mind, mobile phone use may be considered an example of the broader problem of driver distraction. Distraction among road users such as pedestrians and cyclists is also potentially an important issue.

This document is not intended to be a comprehensive scientific document, but rather to raise awareness of driver distraction among policy-makers and present examples of action already taking place around the world to tackle the problem.

iStockphoto.com /D.Wilkie

1 Defining driver distraction

Driver distraction remains a poorly and inconsistently defined concept. For the purposes of this document we use the following definition: *Distraction is the diversion of attention away from activities critical for safe driving towards a competing activity (5).*

When drivers are distracted, their attention is temporarily divided between what is often referred to as the "primary task" of driving and "secondary tasks" not related to driving (Box 1). For example, during a mobile phone conversation a driver's cognitive (i.e. thinking) resources are being used to analyse both the driving situation (the primary task) and the conversation taking place (the secondary task). As a result, the driver's situational awareness, decision-making and driving performance are impaired.

Driver distraction can be one of four types:

- visual (e.g. looking away from the road for a non driving-related task);
- cognitive (e.g. reflecting on a subject of conversation as a result of talking on the phone – rather than analysing the road situation);
- physical (e.g. when the driver holds or operates a device rather than steering with both hands, or dialling on a mobile phone or leaning over to tune a radio that may lead to rotating the steering wheel);
- auditory (e.g. responding to a ringing mobile phone, or if a device is turned up so loud that it masks other sounds, such as ambulance sirens) *(5)*.

More than one of these categories of distraction may occur at one time, depending on the particular trigger.

BOX 1: Driver distraction and driver inattention

Driver *distraction* is generally thought to be different from driver *inattention,* or poorly allocated attention. *Distracted* driving occurs when some kind of triggering event external to the driver results in the driver shifting attention away from the driving task (e.g. a ringing mobile phone). Thus, the diversion in attention occurs because the driver is performing an additional task or is temporarily focusing on an object, event or person not related to primary driving task *(6)*. *Inattention* while driving applies to any state or event that causes the driver to pay less attention to the task of driving – the inattention can be present without necessarily having been triggered by an event, for example, day dreaming *(5,7)*. The diversion of attention that occurs in distracted driving is also distinct from those impacts on driving performance that are attributable to a medical condition, alcohol or drug use, and/or fatigue (although these factors may compound the effects of distraction).

1.1 Sources of driver distraction

Driver distraction can result from a number of sources that are internal or external to the vehicle.

In-vehicle (internal) distractions include eating, smoking, talking, "grooming" as well as using "in-built" entertainment systems (use of radio, CDs, DVD players), and talking with passengers (Box 2), *(8,9)*. However, it is the growing number of new electronic devices that are of most concern to those involved in road safety: these include systems that are not integrated into the car, also called "portable" or "nomadic devices", such as mobile phones, laptops, portable music or information devices (e.g. iPods, Blackberrys), and non-integrated navigation (Global Positioning Systems). While some of these systems, such as navigation systems and intelligent speed adaptation (ISA) systems, have the potential to help drivers in unfamiliar settings (e.g. using a GPS system may be safer for drivers than using printed maps), they may also be a source of driver distraction *(7,10)*. Internal sources of distraction also include the growing number of communication technologies that are now integrated into vehicles – for example, the Bluetooth[1] technologies and those that allow drivers to access their e-mails and Internet.

There is very limited data available on the extent of use of these in-vehicle sources of distraction while driving, or on their effects on driving performance. Some studies show that using in-vehicle entertainment systems has detrimental effects on driving performance *(8)*. Indeed, adjusting a radio, CD or cassette player was found to be one of the major causes of distraction-related crashes in the United States and while information on newer technological sources of distraction is lacking, it is likely that negative effects on safety

1 Bluetooth is an wireless technology that uses short wavelength radio transmissions from fixed and mobile devices, such as mobile phones. Many vehicles now come equipped with "Bluetooth" car kits which allow hands-free calls to be made.

UNC / A. Villavaces

would be expected. This area will probably be the target of more research in the future *(9,10)*.

Thus, some of the main internal sources of driver distraction are:

- adjusting temperature controls
- adjusting radio, CD
- dialling or texting on a mobile phone
- eating or drinking
- moving an object in the vehicle
- talking to other vehicle occupants
- smoking
- talking on a mobile phone
- using a device or object integral to the vehicle (e.g. speed adaptation system)
- using a device or object brought into the vehicle (e.g. Blackberry, iPod, laptop computer, etc. *(9)*.

BOX 2: Is a conversation on a mobile phone any different from conversing with a passenger in the vehicle?

Some research suggests that the impact on driving performance of talking on a mobile phone is similar to that of holding a conversation with a passenger. However, other more recent studies suggest that there is a significant difference between these two situations, with a higher risk of distraction and effect on driving behaviour for those using a mobile phone compared to those conversing with a passenger. Studies have shown that reaction times are slower among drivers talking on a phone than among those talking to a passenger *(11)*. This appears to be because the passengers are more aware of the driving situation and road environment, and can moderate, adapt or delay the conversation during challenging driving circumstances, a phenomenon that does not occur during phone conversations *(12,13)*. However, this does not mean that a conversation with a passenger does not have distraction potential too. Various studies have shown that young drivers' crash risk is significantly increased by the presence of similarly aged passengers in the vehicle *(12,14)*.

External distractions may arise when the driver looks at buildings, people or situations outside the vehicle, as well as at billboards and other roadside advertising. Adverts that are "successful" from a marketing perspective may be those that pose the most threat to driving behaviour. Interest in this area has increased recently because of pressure from advertisers on road authorities to allow video advertising *(15.16)*. A study comparing the distraction to drivers caused by static versus video billboard advertising found that video adverts had a more detrimental effect on driving performance, suggesting the increased risk of this form of external distraction to safe driving *(17)*.

1.2 Prevalence of driver distraction

As the use of technologies while driving grows, so too does the body of research on the extent of driver distraction. Distractions while driving are shown to be common, based on data where respondents report engaging in distracting activities. For instance, in one survey in Australia, about a quarter of drivers admitted to using a hand-held phone while driving *(5)*.

In addition to knowing the *proportion* of drivers who engage in a distracting activity while driving, it is important to know how *frequently* these distractions occur, and their duration. One study in the United States, where drivers in real-world settings were observed at the wheel, found that drivers engaged in potentially distracting secondary tasks approximately 30% of the time while driving, with eating and drinking contributing most to this figure *(18)*. However, the ability to generalize the result of this study more broadly is limited by its design and small sample (70 participants), and by the fact that, since the study was conducted, the rapid expansion of the use of in-vehicle communications is likely to have altered the figures. Assessing the *exact* extent to which drivers are distracted by possible sources of distraction is particularly difficult. In most countries – even high-income ones – the extent of this problem is not well known, partly due to the fact that data on the wide range of possible sources of distraction are not routinely collected.

1.3 The magnitude of the crash problem resulting from driver distraction

Police in most countries do not systematically report the use of a particular distracting activity, such as using a mobile phone, in crash reports, and thus it is difficult to estimate the contribution distraction makes to road traffic crashes, and the consequent danger it poses on the world's roads. Where police do include distraction in crash reports, drivers are less likely to disclose their use of mobile phones as it can indicate fault, and thus data are likely to be underreported. Witness statements may also be unreliable *(9)*. However, a selection of studies highlighted below indicates a growing body of evidence suggesting that distraction is an important contributor to road traffic crashes.

iStockphoto.com/G. Jones

- An Australian study examined the role of self-reported driver distraction in serious road crashes resulting in hospital attendance, and found that distraction was a contributing factor in 14% of crashes *(19)*.

- In New Zealand, research suggests that distraction contributes to at least 10% of fatal crashes and 9% of injury crashes, with an estimated social cost of NZ$ 413 million in 2008 (approximately US$ 311 million). Young people are particularly likely to be involved in crashes relating to driver distraction *(20)*.

- Insurance companies in Colombia reported that 9% of all road traffic crashes were caused by distracted drivers in 2006. Of all cases where pedestrians were hit by cars, 21% were caused by distracted drivers *(21)*.

- In Spain, an estimated 37% of road traffic crashes in 2008 were related to driver distraction *(22)*.

- In the Netherlands, the use of mobile phones while driving was responsible for 8.3% of the total number of dead and injured victims in 2004 *(23)*.

- In Canada, national data from 2003–2007 show that 10.7% of all drivers killed or injured[1] were distracted at the time of the crash *(24)*.

- In the United States, driver distraction as a result of sources internal to the vehicle was estimated to be responsible for 11% of national crashes that occurred between 2005 and 2007, although a smaller study involving 100 drivers found that driver involvement in secondary tasks contributed to

1 These figures include those fatally injured, those with major, minor or minimal injuries, and those where the severity of injury was unknown. Data from Quebec are excluded.

22% of all near crashes and crashes *(25,26)*. In 2008, driver distraction was reported to have been involved in 16% of all fatal crashes in the United States *(27)*.

- In Great Britain, distraction was cited as a contributory factor in 2% of reported crashes. The difficulty for the reporting officer to identify driver distraction is likely to have led to an under-representation of this proportion, which is considered a subjective judgement by the police. In addition, contributory factors are disclosable in court and police officers would require some supporting evidence before reporting certain data, a factor likely to lead to an under-representation of the problem *(28)*.

Estimating the *relative* contribution of different forms of distraction to road crashes is difficult. One study in New Zealand found that passenger distraction accounted for the highest number of collisions involving driver distraction: in fact, passenger distractions ranked higher than those related to telecommunications and entertainment systems combined *(29)*. Similarly, it is important to consider both the effect of the source of distraction upon driving behaviour, as well as the frequency and duration of the behaviour. Thus, while using a mobile phone for conversation may have a less detrimental impact on driving behaviour (i.e. may be a less risky driving behaviour) than text messaging, some studies in the United States suggest that the frequency and duration of mobile phone conversations that take place while driving lead to a larger overall impact in terms of crashes: an estimated 1.4 million crashes result from mobile phone conversations relative to approximately 200 000 crashes that are believed to involve text messaging or sending e-mails *(30,31)*. However, it should be noted that the difficulty of collecting data on text messaging may also mean these estimates are underreported.

To date, the emphasis of global research on distracted driving – the extent of the problem, the impact on driving performance, the existing evidence on interventions, and most of the policy discussions relating to this area – is on the use of mobile phones. This is, in part, in recognition of the increasing use of mobile phones generally, and the trend towards fitment in vehicles, both of which will encourage use in vehicles. Similarly, while the information presented in this document focuses on mobile phones as they are used for conversing and text messaging, it is important to be aware of the rise in use of powerful "smart phones"[1] that allow access to e-mail the Internet, films and games, and the implications for their risk to driving behaviour.

Thus, while remaining aware of the broader problem of driver distraction and its potential effect on global road safety, the remainder of this document focuses primarily on mobile phone use while driving.

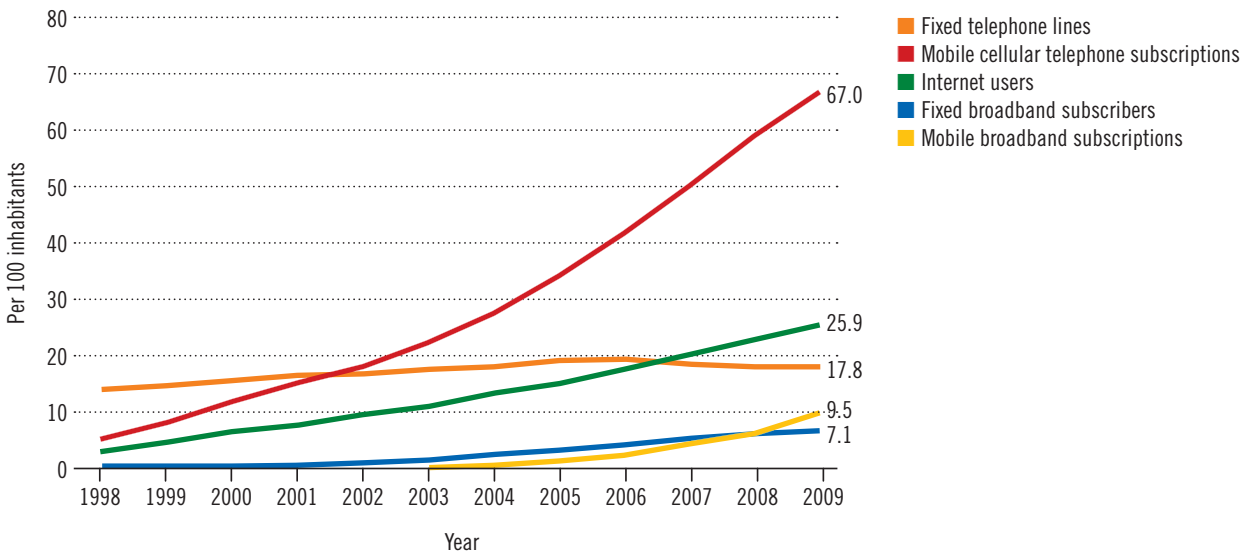
1 "Smart phones" include i-Phones, Blackberrys and other android phones, which provide a range of e-mail and Internet services, while 3G and 4G are the newer "generation" of wireless mobile phones whose services include wide-area wireless voice telephone, mobile Internet access, video calls, streaming movies, downloading applications or games.
Note that "while driving" is considered to mean while the car's engine is in motion, even if the vehicle is stationary (e.g. if stopped at traffic lights).

2 Mobile phone use

2.1 Trends in possession and use of mobile phones

Levels of ownership and use of mobile phones has risen exponentially over the past decade in all parts of the world. Figure 1 shows the steady growth in the number of mobile phone subscriptions globally, reaching 67 per 100 inhabitants at the end of 2009.

FIGURE 1: Global information and communication technology developments, 1998–2009



Source: *(32)*.

Luminaphoto /Martin Lukersmith

Growth in mobile phone subscriptions is fastest in low- and middle-income countries where there are now twice as many mobile phone subscriptions as in high-income countries, reflecting the relative size of these markets. In contrast to most high-income countries, many low- and middle-income countries are going directly to the use of wireless technology for phone services, rather than to landlines first. Between 2008 and 2009 the use of mobile phones in developing countries exceeded 50% of the global population, reaching an estimated 57 per 100 inhabitants, while in high-income countries use has largely exceeded 100% (i.e. there is more than one mobile phone subscription for every inhabitant). The relatively low cost of mobile phone services and related devices in many parts of the world is likely to continue to drive the global market in mobile phone growth. Mobile phone use is greatest among the young, especially the 15–24 age group, while data suggest that those in the younger age group are also driving the demand for text messaging services *(12)*. One study in Canada found that young people spend more than an hour every day talking on their mobile phones (compared to a global average of 27 minutes), with 49% using text messages on a weekly basis *(12)*. It important to note that the frequency of text messaging is likely to increase as it is cheaper than talking on the phone.

The increasing use of mobile phones is part of the broader integration of information and communications technology worldwide, allowing an instant and continuous flow of information and social networking. Increasingly pervasive hand-held devices such as mobile and smart phones, MP3 players, i-Pods, and applications such as Facebook and Twitter, are, in many societies, drawing users into ever-deeper engagement. This trend is particularly prevalent among young people, but the distraction associated with continual use of such devices has led to discussion about whether this excessive use

is an addiction. Research suggests this behaviour is similar to a compulsive-impulsive disorder, whereby an inability to access the services are associated with negative health consequences, including withdrawal and depression and other negative repercussions such as social isolation and fatigue *(33)*. It is evident that such excessive use and the potential dependency associated with these devices could compound their potential to be a source of distraction at the wheel, with a potentially detrimental effect upon driving behaviour.

Road traffic deaths have been steadily increasing in many low- and middle-income countries, particularly where rapid motorization has not been accompanied sufficiently by improved road safety strategies. While better communication could, in theory, result in a reduced need for road travel, and thus lower the exposure to risk of road traffic injuries, in practice the combination of increased road transportation and better and continuous forms of communication may be detrimental to the global road safety picture.

2.2 Estimates of level of mobile phone use while driving

As mobile phone ownership rises rapidly worldwide, the use of mobile phones in vehicles is also increasingly common. As well as the growing use of hand-held mobile phones, new vehicles are being equipped with Bluetooth technology, facilitating voice activation and hands-free phone use.

A number of studies have tried to determine how many drivers use mobile phones while driving. For example, in a number of high-income countries (e.g. the United States of America, New Zealand, Australia and some European countries), 60–70% of drivers report using a mobile phone at least sometimes while driving *(12,23,34,35)*. Some studies also try to assess the use of mobile phones at any given moment because it is not only *use* while driving, but also the *length of use* that impacts upon risk – the longer the use, the greater the risk. Most of these are self-reported or observational studies, or police records. These include:

- Between 1–7% of drivers have been observed using mobile phones at any given moment during the day in Australia, the Netherlands, the United Kingdom and other European countries *(12,23,34,35)*. In the United States, 11% of vehicles observed had drivers using a mobile phone *(7,36)*.

- A study in Canada found that 2.8% of drivers were using mobile phones at any given moment while driving in rural areas, but this figure was much higher (5.9%) in urban areas *(37)*.

- Police crash reports in one state in the United States suggest that mobile phone use while driving more than doubled between 2001 and 2005, from 2.7% to 5.8% *(38)*.

- In Great Britain in 2008, hand-held mobile phone use was observed to be 1.1% for car drivers and 2.2% for other drivers (e.g. vans and lorries) *(39)*.

- A survey study among Swedish drivers showed that mobile phone use while driving has increased heavily in the past 10 years: 30% of all drivers with mobile phones reported using them daily while driving *(40)*.

Case study:
A rapid assessment of mobile phone use in Johannesburg, South Africa

Using a hand-held mobile phone while driving is illegal in South Africa. To assess the magnitude of the problem, the Automobile Association of South Africa undertook an observational study in the northern suburbs of Johannesburg. A total of 2 497 drivers were observed during a one-hour study at a busy intersection during peak time. During the survey, 196 drivers (7.8%) were seen holding a mobile phone – either talking or texting. Many drivers were also seen eating, drinking, smoking, putting on make-up or reading newspapers, but these were not included in the analysis. This result is higher than the 5% seen in Australia and some European countries, but this is probably because it was conducted during peak traffic hours. Nevertheless, this case study indicates that the problem of distracted driving is not restricted to high-income countries and that action needs to be taken globally.

Source: *Personal communication with Mr G. Ronald, AA South Africa*

While there is clearly a growing body of evidence on the extent to which hand-held mobile phones are used while driving, there is very little data available on the prevalence of hands-free phones. Two studies that do provide these type of data are shown below:

- A self-reported study in the Netherlands found that 2% of drivers reported frequently using hand-held phones, compared to 14% who reported using a hands-free phone while driving *(12)*.

- An observational study in London, UK, found that while 2.8% of car drivers were using hand-held phones, this figure was much higher (4.8%) for hands-free phones.[1] Use of hands-free phones had increased more than use of hand-held phones when compared to previous years. The proportion among taxi drivers and van drivers using hands-free phones was considerably higher, at 14.3% and 9.9% respectively *(35)*. However, national

1 Survey staff detected hands-free phone use through the use of specialised electronic equipment to help detect mobile phones, in combination with visual observation to check whether phones were being used by drivers.

data from Great Britain suggest that the rates of mobile phone use outside the capital are lower than in London: in 2008 1.1% of car drivers, 2.2% of van drivers and 1% of lorry drivers were classified as using hand-held mobile phones while driving, while the respective figures for hands-free phones were 0.5%, 0.8% and 0.5% *(28)*. This may reflect lower speeds in the capital that result from relative congestion of traffic, leading drivers to assess the risks of using their mobile phones as lower than where speeds are higher.

Young and/or novice drivers (below the age of 25 years) are a high-risk group for road traffic injuries and are greatly overrepresented in crash and traffic fatality statistics. For instance, within the Organisation for Economic Co-operation and Development (OECD) countries, young drivers typically represent between 18% and 30% of all drivers killed, although people in the same age group only represent between 9% and 13% of the total populations in their countries *(14)*. Studies from the United Kingdom, Australia and New Zealand show that male drivers under the age of 30 years – a group particularly likely to exhibit other high-risk behaviours – are also more likely to use mobile phones while driving *(12,13)*. The United Kingdom study cited found that drivers under the age of 30 were almost twice as likely to use a mobile phone as drivers over the age of 30 years *(39)*. Heavy use of mobile phones could increase the high crash risk for these young drivers, who are likely to be more vulnerable to the effects of distraction given their relative inexperience behind the wheel.

2.3 Estimates of levels of text messaging while driving

There is limited information available on the extent of text messaging while driving, in part due to the difficulty in observing this behaviour in vehicles.

- A study in the United Kingdom found that 45% of drivers reported text messaging while driving *(41)*.
- Australian research suggests that one in six drivers report regularly sending text messages while driving *(42,43)*.
- A study in the United States found that 27% of American adults report having sent or read text messages while driving *(44)*.

The proportion of drivers using text messaging while driving appears to be higher among young and/or inexperienced drivers: the Australian study (cited above) showed that 58% of drivers aged 17–29 years regularly read text messages while driving, and 37% sent text messages *(40,42,43)*.

3 Effects of mobile phones on driving behaviour and crash involvement

As mentioned earlier, certain tasks considered essential for safe driving are referred to as "primary tasks". Others, such as using a mobile phone, constitute "secondary" tasks. Studies show that it is hard for drivers to carry out the primary tasks essential to driving a vehicle safely when they are involved in a secondary task. The result is that their driving performance deteriorates in a number of ways. Most of the research on how distraction leads to deteriorated driving behaviour relates to the use of mobile phones, although other sources of distraction also impact on driving behaviour.

3.1 The impact of mobile phone use on driving performance

3.1.1 Methodological issues associated with assessing impact

The effects of mobile phone use on driving behaviour are relatively well researched, but the accuracy of studies varies considerably, and depends on the methods used and the conditions under which the studies were performed (see Box 3).

Each of these approaches provides a slightly different perspective on the problem and no single approach can provide all the information needed to make policy decisions. It is the weight and convergence of the evidence from various approaches that provide the basis for informed decision-making.

BOX 3: Different types of studies and their relative advantages and disadvantages

	Methodology	Advantages	Disadvantages
Experimental	Takes place in controlled settings, e.g. simulators, test tracks, or sometimes on roads.	What driver is doing can be closely monitored.	Not very realistic. Expensive, so small number of participants generally involved. Given small size, difficult to generalize results.
Observational studies			
Fixed observational studies	Stationary observer records information about drivers as they pass a selected location.	Provides direct information about the types and incidence of secondary tasks that drivers attempt while driving.	Information limited by how accurate observer is at recording behaviour as car goes by (limited time and potentially limited visibility), and by representativeness of observation sites. Studies only provide a snapshot assessment.
Naturalistic studies	Volunteer participants allow their driving behaviour to be recorded during a period of normal driving (vehicles equipped with sensors and cameras).	Studies usually conducted on public roads, therefore more validity than experimental studies.	Drivers are aware that vehicles are monitored, which can affect driving behaviour. Studies are costly and are less controlled – confounding factors may explain the results. Datasets resulting from studies are usually very large and can be challenging to analyse and interpret.
Crash-based studies	Real-life crashes are examined to determine whether a distracting activity was involved in the crash.	Provide the most direct information about the safety implications of carrying out secondary tasks while driving.	Difficult to determine whether driver distraction was a contributing factor in a crash: police reports do not usually include occurrence of a distracting activity, while drivers may have a vested interest in not reporting the truth about their own distraction. Very likely that the incidence of distraction is under-reported in crash studies.

Sources : *(7,9,45)*

3.1.2 Areas of driving behaviour affected by the use of mobile phones

Using mobile phones can cause drivers to take their:

- eyes off the road (visual distraction);
- minds off the road (cognitive distraction);
- hands off the steering wheel (physical distraction) *(13)*.

Auditory distraction, in the form of responding to a ringing phone, can also occur, although the duration of this distraction is likely to be shorter than for other forms of distraction.

The use of a mobile phone can impair performance on a number of driving tasks, leading to:

- longer reaction times to detect and respond to unexpected driving-related events;
- impaired ability to maintain correct lane position;
- slower braking reactions with more intensive braking and shorter stopping distances;
- impaired ability to maintain an appropriate speed (i.e. usually driving slower);
- slower reactions to traffic signals/missed signals;
- reduced field of view (i.e. drivers more likely to look straight ahead and not at periphery or in mirrors);
- shorter following distances;
- accepting gaps in traffic streams that do not give sufficient time for the driver to safely manoeuvre the vehicle into the traffic flow;
- increased mental workload, resulting in higher levels of stress and frustration;
- reduced driver-awareness of what is happening around them *(5,23)*.

The danger of distraction impacting a driver's performance depends on a number of factors that include:

- the complexity of the distracting task;
- its duration;
- its frequency;
- the situation on the road.

The complexity of the distracting task and its cognitive demands in particular seem to be important factors in determining the extent to which it affects driving behaviour. For example, while typing a text message or dialling a phone number into a hand-held phone clearly leads to visual distraction at the time that the task is being conducted, there is strong evidence to suggest that the cognitive distraction caused by engaging in a phone conversation is the main cause of a deterioration of driving behaviour *(12,46)*.

A number of driver characteristics may also be important in determining the degree to which distraction affects driving behaviour. These include:

Age

The effects of mobile phone conversations on driving performance are more extreme for both younger and older driver. Younger drivers with less experience on the roads find it more difficult to divide their attention appropriately between driving and the secondary task of talking on the phone. Older drivers[1] have decreased visual and cognitive capacities which also makes it more difficult for them to conduct two tasks concurrently, as manifested by an increased reaction time while driving *(13,47,48)*.

1 Aged 50–75 years, depending on the study.

BOX 4: Mobile phone use and drink-driving

Some studies have found that the impairments to driving behaviour associated with mobile phone use are as profound as those associated with drink-driving. Indeed, one study in the United Kingdom concluded that driving behaviour is impaired more during a phone conversation than by having a blood alcohol level at the United Kingdom's legal limit (80 mg/100 ml) *(49)*. However, the impairments to driving that result from mobile phone use are transient and result in temporary distraction of attention from the driving task, while it should be noted that the effect of alcohol persist for much longer periods. Furthermore, drivers using mobile phones have some kind of control (e.g. pausing the conversation), while drivers who are intoxicated cannot do much to control their performance. Alcohol also impairs drivers' judgement, while mobile phone use does not impair judgement, although it may delay it *(13,23,50)*. Thus, the cumulative risks associated with intoxication are greater than those associated while driving with mobile phones *(51)*.

Sex

Most research shows that men are more likely to engage in mobile phone use while driving, but the impact of this distraction upon driving behaviour is unclear. Some studies suggest the mobile phone use may have a greater impact upon female driving behaviour, particularly young female drivers, but others show no differences: this may be a result of age-related differences in the samples used in different studies *(13,52)*. A study on the effects of text messaging while driving found that male drivers were more likely to text while driving, but that impairment caused by text messaging was far more significant among female than male drivers. Male drivers were also less likely to reduce their speed while text messaging and driving *(53)*.

Driver experience

Since many novice drivers are also young drivers, it is difficult to separate out the effects of age and experience on driving ability while using a mobile phone. However, younger inexperienced drivers appear to be more susceptible to effects of distraction on their driving performance: a new phase of cognitive development that takes place during adolescent years makes young drivers more prone to distraction, potentially resulting in greater impacts on driving performance than for mature drivers *(13)*.

Risk taking

Those that engage in other high-risk behaviours such as drinking and driving (Box 4), speeding, or not wearing a seat-belt are more likely to use mobile phones while driving, which exacerbates the impacts of any crash *(35,37,54)*.

iStockphoto.com / S. Locke

Commercial drivers

There is a lack of data on driver distraction in the public and commercial transport sectors, but some studies suggest that bus and heavy vehicle drivers, required to take on multiple and at times competing roles while driving, are particularly vulnerable to the effects of distraction. One study among commercial vehicle operators in the United States examined "safety-critical events" (i.e. crashes, near crashes, events that required a "crash avoidance manoeuvre" and unintentional lane deviations), and found that drivers were distracted in 81% of these events, although not necessarily by mobile phone use *(55)*.

BOX 5: Distraction in commercial trucks and buses

A recent study among commercial drivers in the United States looked at mobile phones and the risk of a "safety critical event" (events that include crashes, near-crashes or other events considered to be relevant to a near crash). Interestingly, they found that talking or listening on a mobile phone (hand-held or hands-free) did not impact significantly the risk of a safety-critical event (and was even found to decrease the risk in some cases), while other tasks, such as testing or dialling were found to increase the risk of a crash. This study suggests an increase in risk is more a result of physical distraction than cognitive distraction among these drivers. The results are in contrast to the studies and reviews that were reviewed earlier: this may be a result of the different methodological approaches used, or due to the different group of drivers (commercial drivers of buses and trucks) among whom this study was conducted, but suggest that further research is needed in this area *(56)*.

What is clear is that while the relative impacts of distraction on driving ability may vary, using a mobile phone while driving increases the absolute likelihood of a collision for all drivers, regardless of gender, age or driving experience *(57,58)*.

3.1.3 Hand-held versus hands-free

As the mobile phone market expands and technology becomes increasingly sophisticated, hands-free phones and other aids, such as voice activation and speed dialling, are being developed to reduce physical distraction associated with mobile phone use. Whether or not hands-free phone devices have less impact on driving behaviour than hand-held phones has become the subject of increasing investigation. While hand-held phones have the physical distraction of holding the phone to their ear, a number of studies show that using hands-free phones also has negative impacts on various aspects of driving behaviour (notably, an increased reaction time) that are similar to using a hand-held phone.

Using hands-free phones while driving has been shown to lead to reduced visual monitoring of instruments in the car and the general traffic situation, and negatively impacts on vehicle control *(59)*. This evidence suggests that hands-free phones are not safer to use than hand-held phones in terms of driving performance *(12,13,47,60-62)*. Although this may seen counterintuitive, evidence showing that it is the cognitive distraction that has the most impact upon driving performance may explain why using a hands-free mobile phone may be as likely to cause a crash as using a hand-held mobile phone *(12,13,51,60,63-65)*. These conclusions are derived from epidemiological studies, meta-analyses, simulator studies and reviews of the literature *(12,13,45,47,51,60,63,66,67)*.

3.1.4 Compensatory behaviour when using mobile phones

There is some evidence to suggest that drivers may exhibit what is termed "compensatory behaviour" while they are distracted. For example, they may slow their average driving speed while using a hand-held phone and/or increase following distances, both of which could reduce the risk of a crash *(10)*. Interestingly, some limited evidence suggests that drivers using hands-free phones are less likely to show such compensatory behaviour compared to those who drive and use hand-held phones *(64)*. This may be because the physical presence of a hand-held phone acts as a reminder to the driver of the potential safety threat posed by the use of the phone *(47,64)*.

3.1.5 Effect of text messaging on driving behaviour

The effects on driving behaviour of sending or receiving text messages are potentially very important. While there is still a lack of research in this area, existing studies (mostly experimental) suggest that text messaging leads to increased cognitive demands in order to write text messages, physical distraction resulting from holding the phone, and visual distraction that results from creating or reading messages: these in turn impact on critical driving tasks. For instance, one experimental study found these results among drivers who were text messaging:

- The amount of time that drivers spent with their eyes off the road increased by up to 400% when retrieving and sending text messages.
- Drivers made 28% more lane excursions and 140% more incorrect lane changes when sending and receiving text messages; texting drivers did attempt to compensate for distraction by increasing their following distances or reducing their speed *(42)*.

While the design of this study (a simulator study involving 20 participants) cautions against widespread generalisation of the results, similar findings are starting to emerge from other studies. In another recent simulator study carried out in the United Kingdom, reaction times of young drivers (aged 17–24 years) who used their mobile phones to send and read text messages showed a decreased ability to stay in the correct lane, a reduced ability to maintain a safe distance from the vehicle ahead and an increase in reaction time. In particular, sending text messages was found to reduce reaction time by 35%. The American study referred to in Box 5 found that drivers of commercial vehicles who were text messaging while driving were 23 times more likely to be involved in a "safety-critical event" (i.e. an event leading to unintentional lane deviations, a crash-avoidance manoeuvre, a near crash or a crash), compared to a situation where they were not text messaging while driving *(55)* .[1]

3.2 The impact of using a mobile phone while driving

Assessing the causal relationship between mobile phone use and crash risk is not easy. Part of the difficulty relates to the fact that information on whether or not drivers were using mobile phones at the time of a crash is rarely recorded. In addition, the danger of confounding may make causal inferences impossible (for example, if mobile phone users were also more likely to be speeding, the mobile phone use may not be the cause of the crash). This means that very few studies which allow causal statements to be made about the link between the use of the mobile phone and the crash have been conducted.

Nonetheless, the studies that have been conducted to estimate crash risk show that drivers who use a mobile phone while driving have a higher crash risk than those who do not. The estimated increased risk varies by study, from between two to nine *(51,60,68,69)*. Some reviews that examine the positive and negative aspects of each of the studies relating to this issue have been conducted *(12,13)*: based on an assessment of how robust the study methodologies are, these suggest that mobile phone use increases a driver's crash risk by a factor of four, with the same risk associated with the use of hand-held phones as for hands-free devices *(12,51,60)*. The effects of sex and age on crash risk were unclear, despite research suggesting that these factors do affect driving behaviour.

1 Note that these safety-critical events included: 21 crashes, 197 near crashes, 3 019 crash-relevant conflicts, and 1 215 unintentional lane deviations *(55)*.

iStockphoto.com /jabejon

Research showing the effects of text messaging on driving behaviour suggest that this behaviour would translate into an increased crash risk. Since text messaging involves both lengthy periods of visual distraction as well as cognitive distraction, it has the potential to be a particularly dangerous behaviour to engage in while driving. Nonetheless, while the study referred to earlier among commercial drivers (Box 5) suggest that text messaging led to an increase in the risk of "safety-critical events" – including but not limited to crashes – there is a need for more research into this area and the establishment of a clear link between text messaging and crashes *(55)*.

3.3 Other road users

The focus of research on distraction to-date has been on drivers, but distracted walking and distracted riding (on bicycles or motorcycles) are also potential areas of concern that are relatively unresearched. There is evidence that mobile phone use while on the roads will lead to cognitive and physical distraction, suggesting they could have a detrimental effect on these road users too: for example, one study found that cognitive distraction among pedestrians resulting from mobile phone use reduces situation awareness and increases unsafe behaviour, putting pedestrians at greater risk of a road traffic injury *(70,71)*. This may be especially important in many low- and middle-income countries where such "vulnerable road users" are the group most

WHO/ J. Passmore

likely to be impacted by a road traffic crash, and where mobile phone use is rapidly approaching levels seen in high-income countries. The relatively low cost of motorized two-wheelers makes them a popular choice of transport in many low- and middle-income countries, suggesting that mobile phone use among this group of road users is likely to become an increasing area of concern. More work is needed to identify the sources of distraction for these road users and assess the impacts on the risk of a crash *(5)*.

4 Interventions to address mobile phone use while driving

Despite a rapidly expanding body of research on the impact of distraction on driving behaviour – notably on the use of mobile phones – the lack of evidence regarding intervention effectiveness has so far made it difficult to make scientifically based policy decisions. As a result, even within high-income countries, there is a wide range of policies in place that address this issue, some of which are presented below.

4.1 Legislation and policies

Setting specific legislation relating to particular road traffic injuries has been shown to be a highly effective measure for reducing road traffic injuries *(4)*. However, for compliance with laws to be achieved, levels of enforcement must be high and maintained over time, thereby increasing the perceived risk of being caught, while penalties for transgression should be stipulated and publicized so that they act as a deterrent. In such a way, legislation can also become an important tool for shaping behaviour and fostering a culture of road safety that results in sustained reductions in road traffic injuries – or at least prevent the level of safety from degrading in the future *(5)*.

In many countries, legislation already plays an important role in addressing driver distraction. While there is no feasible way to ensure that drivers' attention remains sufficiently focussed on the primary task of driving, there are a number of ways that legislation can be used to discourage drivers from engaging in behaviours that potentially distract them from driving.

In some countries, driver distraction is addressed by general laws relating to safe driving. For instance, the police in some Australian states may reprimand drivers for driving "carelessly" or "dangerously", including careless driving that results from driver distraction. Similarly, all provinces in Canada and a number of

Wikimedia Commons

European countries have general laws that target driving "without due care and attention" *(63)*. Thus, for example, while hands-free mobile phones are not included within specific mobile phone laws in the United Kingdom, their use – and that of a number of other potential sources of distraction – can be addressed through legislative measures on careless driving.

However, there is also an increasing move towards development and adoption of more specific legislation relating to particular sources of driver distraction, notably the use of mobile phones, as described in the next section.

4.1.1 Legislation on mobile phone use in vehicles

At a national level, there are increasing efforts to implement more specific laws relating to mobile phone use *(5)*. However, even among high-income countries where policies related to other road safety risk factors tend to be similar across countries, there is a wide range of policies relating to mobile phone use while driving. Some examples follow:

- Policy-makers in some countries consider a complete ban on mobile phone use in vehicles to be unrealistic, in part because of difficulties related to enforcement of hands-free phones. For instance, Sweden, a country with a good road safety record, does not ban the use of mobile phones while driving, but focuses initiatives on raising public awareness of the risk of distracted driving.
- Many countries have passed legal measures to ban hand-held phones while driving. For example, most European countries now have legislation banning hand-held devices. While most countries apply fines for transgression of these laws, in many places they are now accompanied by penalty or demerit points: for instance, in 2007 the United Kingdom increased the penalty for using a hand-held mobile phone while driving to £60 (US$ 94), and made it an endorsable offence with three penalty points added to the driver's licence[1]. Similarly, in October 2010 a new law in Morocco increased the penalty associated with use of hand-held phones, a fine now the equivalent of $US 60.
- A few countries, such as Portugal, have extended bans on mobile phones to include hands-free kits. Such bans have also been applied at a sub-national level. For example, the state of New Delhi has extended the ban on mobile phones when driving to include use with a hands-free unit and text messaging. The fine, currently Rs 1 000 (US$ 21) may be increased in 2010 to Rs 2 000, or 6 months imprisonment *(72)*.

1 If 12 penalty points are accumulated within a 3-year period, the driver is disqualified from driving. However, if a novice driver accumulates six penalty points in the 2 years after passing their first practical test, their licence is revoked.

- Some countries and jurisdictions ban all young or inexperienced drivers from mobile phone use. In the United States, 28 of 50 states prohibit all mobile phone use (hand-held and hands-free) among novice drivers while driving *(73)*. In addition to a general law that relates to hand-held mobile phones, some Australian states also prohibit use of hands-free phones among novice drivers as part of their graduated licensing systems.
- Some states in the United States have bans that apply to specific driver groups. For instance, in 18 states school bus drivers are prohibited from all use of mobile phones (including hands-free sets) when passengers are present *(73)*.
- While many countries address mobile phone use within legislation pertaining to driver distraction more generally, specific legislation banning text messaging is becoming more common. For instance, in Buenos Aires, Argentina, a law was passed in 2007 banning writing or reading text messages while driving, with a penalty of between 200 and 2 000 pesos (US$ 50–500) for violation. In 2009 the penalty was amended to add five points to the driver's licence for use of a mobile phone or texting (licences are revoked after 20 points are accumulated).
- As mobile phones become increasingly integrated with other applications, such as the use of e-mail, Internet access, and ability to play films and music, many countries are broadening the scope of legislation on mobile phones to include prohibitions on many of the applications currently provided by integrated phone systems. For instance, the Canadian province of Alberta has recently proposed a new bill with some of the country's most comprehensive distracted driving legislation. The new amendment prohibits drivers from holding or using hand-held mobile communication or entertainment devices, such as mobile phones, laptops or MP3 players while driving. The legislation also extends to other sources of distracted driving, including reading and writing, personal hygiene and grooming *(74)*.

This list shows only select examples, but illustrates the lack of consistency in measures being applied to address the issue of mobile phone use. Indeed, this inconsistency can be seen within individual countries where laws are set at a state or provincial level: at the time of writing this report, only eight American states had banned the use of hand-held mobile phones completely while driving, while 30 US states specifically ban text messaging *(73)*.

At an international level, there are also a number of measures coming into effect that aim to guide Member States on how to address mobile phone use. For example, Article 8.6 of the Vienna Convention on Road Traffic, 1968, was amended in 2006 to include a ban on the use of mobile phones while driving, stipulating:

> *A driver of a vehicle shall at all times minimize any activity other than driving. Domestic legislation should lay down rules on the use of phones by drivers of vehicles. In any case, legislation shall prohibit the use by a driver of a motor vehicle or moped of a hand-held phone while the vehicle is in motion.*
>
> Source: *Article 8.6, Vienna Convention on Road Traffic, 1968.*

Several resolutions of the United Nations General Assembly have encouraged Member States to adhere to its regulations in order to ensure greater uniformity in the rules governing road traffic in the Contracting Parties to it, resulting in improved road safety.

Enforcement

Key to the success of legislative measures is the ability to maintain and sustain high levels of enforcement, and the ability to maintain a high perception of enforcement among the general public.

In some countries, particular enforcement efforts relating to mobile phone use have been intensified in the last few years. For instance, in Norway since 2009 police have been reported to have intensified their routine vehicle checks and now use binoculars to see if drivers are using mobile phones, resulting in a considerable increase in the number of fines handed out. This is particularly challenging with regard to the use of hands-free phones, and to a lesser degree text messaging. Enforcement of laws on distracted driving is also difficult at night, in heavy traffic, or in vehicles with heavily tinted windows *(5)*. A key challenge to the success of legislation will remain the ability of such laws to keep up with rapidly advancing technological changes in the design and functionality of the mobile phone, particularly as they increasingly become a multi-media platform allowing many levels of interaction.

A practical trial undertaken in Surrey, United Kingdom, aimed to investigate the relationship between police enforcement and road casualty rates. "Operation Radar" was designed to increase the visible presence of police on a stretch of road in the county. Two teams were deployed in two shifts per day to the six-mile route, concentrating on mobile phone, seat-belt and speed offences, for

TRL / L. Walter

four weeks. A mixture of police enforcement methods were used including mobile motorcycle patrols. A media campaign including on-route advertising and press coverage was mounted to warn motorists of the increased presence of police officers. Mobile phone use was measured at numerous sites on and near the road, both before, during and after the operation was completed. Use of mobile phones off the route was approximately twice that on the route. The findings support the theory that increased enforcement does influence driver behaviour in a way that would lead to fewer casualties *(75)*.

4.1.2 Effectiveness of legislation

Despite increasing action taken by many countries to limit the use of mobile phones in vehicles through legislative measures, there is very little data on the effectiveness of such countermeasures on crash rates. In most of the evaluation studies carried out in this area, the proportion of drivers using mobile phones after the legislation has been implemented is reported as an indicator of effectiveness, compared to the proportion before the law was enacted. Indeed, these data suggest that in many countries, legislative effects have *not* been very successful in sustaining reduced mobile phone use rates and that the passage of legislation is not sufficient by itself to have an impact on use of mobile phones by drivers.

- Although all states and territories in Australia now ban the use of mobile hand-held phones while the vehicle is moving (or stationary, but not parked), studies suggest that almost a quarter of drivers (23%) continue to use mobile phones while nearly a third (30%) of young drivers continue to send text messages while driving *(76)*.

Case study:
Using technology to enhance enforcement of distracted driving laws, New South Wales, Australia

Recognizing the role of law enforcement in effectively reducing mobile phone use and the inherent difficulties facing enforcement of hands-free and voice-activated mobile phone use in vehicles, the Traffic Service Branch of the police in New South Wales has developed an innovative approach. Their high-visibility operation, known as Operation Compliance, requires all police, regardless of duty type, to target specific traffic safety offences such as the use of mobile phones. To this end, resources are used to maximize effect – e.g. the use of motorcycle units to detect the use of hand-held phones by drivers – where the elevated position of the rider allows for the interior of the vehicle to be more clearly observed, and texting drivers to be detected. The role of this enforcement in sustaining a high perception of enforcement among the public is also critical *(77)*.

- A study in London, United Kingdom showed a 40% decrease in hand-held phone use four months after a law banning their use came into effect. However, subsequent data suggest that the proportion of drivers using hand-held phones has increased considerably since increased penalties were introduced in 2007, with greater increases seen among the use of hands-free phones. The effects of the ban on road crashes remain unknown *(35, 78)*. The increased penalties came into effect in February 2007, but a study showed that between October 2007 and October 2009, hand-held use increased from 1% to 1.4% for car drivers and from 1.9% to 2.6% for van and lorry divers. Hands-free use also increased over this period (0.6% to 1.4% among car drivers, 1.% to 2.4% among van and lorry drivers) *(28)*.
- Studies from the United States suggest that the effects of legislation may differ in the immediate period after laws have been passed, relative to longer term effectiveness. For instance, a ban on hand-held mobile phone use in New York state – accompanied by considerable publicity – led to a decline from 2.3% to 1.1% in the use of hand-held phones the month after the law was passed, and this decline lasted at least four months *(79)*. However, longer term effects were less positive: one year after the law took effect, when there was little publicized, targeted enforcement, use of mobile phones had risen to 2.1%, i.e. a similar level to the pre-law rate *(80)*.
- The need for sustained, publicized, targeted enforcement to achieve longer term compliance is supported by a study that examined the effects of a ban on mobile phone use in Washington, D.C., USA. This led to a reduction in mobile phone use of around 50% (from 6.1% to 3.5%) immediately after the ban, while a reduced level of use (4%) was sustained for a year after the ban came into place. This may reflect tougher enforcement, although this has not been scientifically documented *(81)*.
- A more recent follow up study to the two studies mentioned above looked at current observed hand-held mobile phone use rates in New York, Washington D.C and Connecticut, where laws on mobile phone use have now been in place between five and eight years: their results suggest that

Case study:
Casualty savings if mobile phone use while driving were eliminated

A study in London estimated that if hand-held mobile phone use was eliminated completely, 609 serious injuries and fatalities, and 4 256 minor injuries could have been averted in 2008 *(35)*. However, this may be an overestimation as elimination of hand-held phones may be accompanied by an increase in hands-free sets, which are also distracting and would not eliminate the risk.

Case study:
Case study: Awareness of hazards of using mobile phones, Nigeria

In Ilorin, Nigeria, 267 randomly selected non-commercial drivers were interviewed using a structured questionnaire. More than 90% of respondents were aware that mobile phone use while driving increases the risk of a road traffic collision, but over a quarter of respondents (27.5%) admitted to phoning while driving. Appropriate legislation and enforcement, together with continued public education, is required to reduce the risk among drivers *(82)*.

usage in these states is lower than would have been expected without a ban and that bans appear capable of maintaining reductions in usage of hand-held phones. However, it is unclear whether phone use is lower in these jurisdictions as many drivers may have switched to hands-free devices, while the effects on crashes is unknown *(83)*.

- One study in North Carolina, USA, examined the effects of a law regulating teenage drivers' mobile phone use while driving. Results suggested that the law had not reduced self-reported use of mobile phones approximately five months after the law took effect. However, one explanation for this may be the lack of well-publicized enforcement to discourage mobile phone use while driving *(84)*.
- One study looked at insurance collision claims to see if the enactment of laws banning hand-held mobile phone use led to reductions in claim frequency in three American states, but results do not suggest any significant change *(85)*.

Mixed messages: banning hand-held versus hands-free mobile phones

To date there is a lack of research that looks at the effects of banning hands-free mobile phone use in vehicles to assess whether such measures lead to any reduction in their use, or on rates of road traffic crashes. The difficulty of enforcing bans on hands-free mobile phones has led many countries to ban only hand-held phones. However, since studies demonstrate that there are similar effects on driving performance with both types of phones, laws that only prohibit drivers from using hand-held devices could be interpreted to mean that the use of hands-free mobile phones is safe, and convey a false sense of security to those using such devices. Indeed, a study carried out in London, United Kingdom suggests that tougher enforcement on the use of hand-held phones was followed by a quick rise in the use of hands-free phones *(35)*. Laws limiting the use of all electronic communications devices by drivers may make the most sense based on the research, but such laws

are difficult to enforce. Police officers can see whether a driver is holding a phone to the ear, but it is much harder to determine if a driver is sending a text message or talking on a hands-free phone.

Acceptance of legislation by the public is also integral to the success of public health legislation. While several surveys about public opinion and attitudes towards legislation suggest that there is an understanding of the risks of using hand-held phones while driving and the need to restrict use, they also suggest that there is a strong misconception by the public that the use of hands-free phones is risk free *(12)*. However, it is possible that this opinion has been formed as a consequence of current mobile phone laws that legislate only against hand-held sets.

Laws that prohibit driver exposure to distracting activities and events may be effective in changing societal judgement of what constitutes acceptable risk and safe driving. Based on experience in other areas of road safety, laws are likely to be important in developing social norms that foster a perception of distracted driving as taboo, and in this way may be used to shape behaviour. Such laws and penalties will also help shape behaviour adaptation: slowing down, parking temporarily while talking, or refusing to take a call. However, experience from the United States and the United Kingdom suggests that sustained, publicized and targeted enforcement is essential to achieving longer term compliance. There is a need for enforcement efforts to be evaluated not only in terms of levels of use of mobile phones, but also in terms of the effect on injury and crash rates.

4.1.3 Policies on data collection

In view of the increasing body of evidence on the risk of mobile phone use while driving, a number of countries are introducing legislation or policies that require data to be collected on distraction (Box 6). For instance, some provinces in Canada have implemented changes to their police collision reports to include information on driver distraction – including the use of mobile phones – and there are now efforts in place towards increasing the consistency of the data collected relating to this issue across the country's provinces and territories *(86)*. Similarly, many US states now require law enforcement officials to collect information about mobile phone use in a crash. There is need for governments in other countries to encourage modification of existing collision reports, such that the prevalence of crashes caused by mobile phone use can be measured, and that a better understanding of the circumstances surrounding collisions associated with mobile phone use can be reached. Prevention measures can then be targeted appropriately. This policy is being implemented in a number of countries: for example, New Zealand's long-term road safety strategy aims to measure the magnitude and distribution of the distracted driving problem, and use this data to inform policy. To achieve this, the government is investing in improving the crash information needed to ascertain the prevalence of distraction in crashes. This research, along with evaluation of the information and education campaigns conducted on distracted driving, will be used to improve the national response to distraction *(20)*.

BOX 6: Assessment of distracted driving: select country examples

A recent survey was conducted among 29 member countries who belong to the International Road Traffic and Accident Database (IRTAD) group. Only 16 member countries completed the questionnaire, for which data on distracted driving are only collected in 11 countries. The table below shows which countries identify distraction for all types of crashes, fatal crashes, and injury crashes, although the USA has been added to this table. In some countries, such as Austria, Sweden, and the United States, information on distraction is not recorded in a systematic manner across the country. The survey also served to highlight differences in the terms used by countries to define distraction: for example, some of the responding countries include emotional distress as a distraction, while others do not. These definitional issues make comparing this issue between countries a challenge.

Country	Total crashes	Fatal crashes	Injury crashes	Does not report
Australia				✘
Austria		✘		
Belgium				✘
Canada	✘	✘	✘	
Finland		✘		
France		✘	✘	
Germany				✘
Great Britain	✘	✘	✘	
Greece				✘
Hungary		✘	✘	
Israel				✘
Japan	✘	✘	✘	
New Zealand	✘	✘	✘	
Spain		✘	✘	
Sweden		✘		
Switzerland	✘	✘	✘	
United States	✘	✘	✘	

Source: *(87)*

iStockphoto.com / T. Bryngelson

Nonetheless, the difficulties for police officers in identifying distraction is still likely to lead to underreporting of these figures, while the need for supporting evidence for cases that go to court are likely to mean that the figures on distraction as a contributory factor are likely to remain underreported.

4.1.4 Employer policies

Motor vehicle crashes are the leading cause of occupational fatalities in most countries for which statistics are available, leading to substantial human and economic losses for companies and organisations *(88-90)*. In response, a growing number of companies and organisations have adopted fleet safety policies addressing a number of road safety risk factors, including distracted driving.

Employers are in a powerful position to limit their employees' exposure to distractive activities while using company vehicles through a number of mechanisms: firstly, by purchasing safe vehicles (Box 7) they can reduce the outcomes that result if a crash does occur as a result of distracted driving. Secondly, through training and implementation of regulations they can control exposure to risky behaviour (e.g. by banning mobile phone use, or mandating seat-belt or helmet use). In many companies, fleet safety programmes are introduced under safety and health measures and/or improving corporate social responsibility.

Many companies and organizations now address driver distraction specifically within such fleet safety policies. Some have stipulated policies targeting a particular aspect or a range of distractions: for instance, as a result of an Executive Order issued by United States President Obama in October 2009, all government employees in the United States are banned from text messaging while driving on official business or while using a government-issued mobile phone.

BOX 7: Non-governmental coalition campaigns to address mobile phone use while driving

A non-governmental coalition started in 2005 by a group of graduate students at the University of Alberta, Canada, led by an emergency room doctor and supported by a provincial public health association, promoted a message of 'no mobile phone use while driving'. The organization targets employers and provides guidelines and resources on developing distracted driving policies for employees. It also provides educational material to the general public and has become a strong advocate pushing for government and private sector involvement in changing policy on mobile phone use while driving *(91)*.

Some private companies ban only the use of hand-held mobile phones, while providing hands-free kits to enable staff to make conversations while driving, while others have imposed a comprehensive ban on the use of mobile phones while driving *(48)*. The possibility that employers may be liable for motor vehicle collisions involving employees who were using mobile phones while driving is a strong incentive towards encouraging a policy on mobile phone use. For example, in the United Kingdom the Department for Transport's campaign against mobile phone use while driving specifies that employers should not ask staff to make or receive calls on any mobile phone while driving, and that they could be liable for prosecution if they 'cause or permit' employees to use one while driving *(92)*.

To the extent that driver distraction is a problem for commercial drivers, employer policies may also be a viable approach, similar to efforts to combat driver drowsiness and fatigue among these groups.

Case study:
UN addresses distracted driving among staff

In May 2010 the UN Secretary General Ban Ki Moon issued an administrative instruction to all (approximately 80 000[1]) UN staff on road and driving safety. The directive addresses a number of key risk factors, such as the mandatory use of seat-belts and motorcycle helmets, excessive speed and prohibiting drink–driving, but also prohibits the use of mobile phones (including text messaging) or any other electronic devices while driving UN vehicles.

1 This includes those employed by the United Nations and its affiliated programmes as of December 2009. See http://icsc.un.org/about4.asp

4.2 Public awareness campaigns on mobile phone use while driving

Progress made around the world to tackle speed, alcohol impairment, seat-belt and helmet use has shown the importance of laws, enforcement and sanctions in changing behaviour on the road, and in reducing road traffic injuries. Experience from a number of countries suggests that even with sustained enforcement, legislation alone may be ineffective in addressing distracted driving. One reason for this may be that distracted driving is more than just a driving issue, but is a societal issue that results in part from lifestyle patterns and choices, with strong social factors governing what the public think of as acceptable levels of risk (for example, eating or listening to music while driving is generally considered acceptable). In addition, there are a number of positive aspects associated with the use of mobile phones (Box 8) that make resisting the use of a phone in the car a broader and more complicated issue.

BOX 8: The value of a mobile phone in your car

Despite increasing concern about the effects of mobile phone use on driving behaviour, possession of a mobile phone in a vehicle also affords benefits to drivers. As well as the personal communication and business benefits of having a phone in the car while driving, there are also security benefits. They help drivers get help following a breakdown, or alert rescue services in the event of a crash: one Swedish study showed that 100 000 drivers each year use mobile phones to contact police or call an ambulance after a crash. Similarly, mobile phones have been used by commercial drivers for years to help keep them awake *(5)*. Such concerns need to be taken into consideration when strategies to address mobile phone use while driving are being developed.

In other areas of road safety, public awareness campaigns have played an important role in both publicising legislation and enforcement (and increasing the perception that levels of enforcement are rising) and in building an increased awareness among the public of the risks of particular behaviours while on the road. Given the difficulty in removing the causes of distraction, such as the use of mobile phones, and in enforcing laws related to particular sources of distraction, it is likely that behavioural strategies to address this issue will need to involve strong campaigns to promote awareness of risk.

Creating social norms that make driving while using the phone socially unacceptable – and also prohibited by law – may be a powerful way of shaping behaviour and changing society's judgement of what constitutes acceptable risk *(5)*. Such a shift in cultural acceptance has been achieved in many countries with regard to drink–driving and has contributed to the success in reducing the incidence of this behaviour. An important factor in the increased public support

for anti-smoking laws and (in some countries) drink-driving laws, has been the awareness of the risk of this behaviour to others. With tobacco control, an increasing focus on the harm that passive smoking could inflict upon others was a powerful factor in driving legislation and social change, while in some countries campaigns on drink–driving have also used messages highlighting the potential damage that impaired drivers can inflict on unimpaired drivers to advocate for stronger legislative controls.

There is potential for such approaches to be used in distracted driving campaigns. Indeed, studies suggest that in many countries the public does not have a clear understanding of the effects of mobile phone use on driving behaviour, consistently underestimating the risk, and that laws that prohibit only hand-held use are misleading in suggesting that the hands-free alternative is less risky. This suggests that public awareness campaigns will be integral to the success of prevention measures in this area *(6)*. While manufacturers of vehicles and mobile phones have taken many rapid steps to increase the ease of communication while driving, those responsible for campaigns on this issue must work to induce behavioural changes such that drivers will choose *not to* have or use some of these devices in their vehicles, in recognition of the risk they incur.

TRL / L. Walter

Given the likely increased prevalence of young people using mobile phones while driving, a number of campaigns are aimed at increasing awareness of the risks among young drivers. The use of appropriate media, such as social networking sites, for these groups has begun in many countries. For instance, a public service announcement developed by police in Gwent, Wales, warned young people about the dangers of texting while driving. The

4-minute film clip showed a fictional 17-year-old girl who, distracted by her mobile phone while text messaging, causes a devastating crash. After the film was posted on the Internet site "YouTube", the film became an international Internet phenomenon, seen by millions of viewers on other websites and on television. While there has been criticism of the graphic depiction of the crash and much debate around whether or not it is appropriate for public television, the film has fuelled debate on the issue of distracted driving in a number of countries around the world.

However, evaluation of campaigns such as this in terms of their ability to raise awareness and change behaviour at the wheel (and subsequent crash outcomes) is lacking. For other road safety areas, such as drink–driving or speed enforcement, research suggests that public awareness campaigns alone have a limited impact on behaviour *(4)*.

4.3 Technological developments

Technological measures are also being employed in some countries to minimize driver distraction. For instance, current technology can restrict the use of mobile phones and other types of technology while vehicles are moving, and safety warning systems can produce warnings depending on drivers' state and task demand, particularly for young drivers *(93)*. For example, some manufacturers have developed "smart keys" that allow a young novice driver and parents to share a car, but each with their own keys: the young driver's key is computer coded and allows parents to set particular maximum speed limits, limit maximum stereo volume and block mobile phone reception. However, evaluation of such technologies has yet to be conducted.

There are also moves towards better hands-free design of mobile phones by telephone manufacturers, while some vehicle manufacturers have been proactive in commissioning research to understand issues relating to distraction and developing tools to limit it. For example, voice-activated dialling is less physically distracting than manually dialling the same numbers. However, such measures may falsely lead drivers to believe that using hands-free devices instead of hand-held ones can lower the risk of crash involvement. Indeed, most vehicle manufacturers are working hard to integrate mobile phones into their vehicles – features that have become so ubiquitous that eliminating them from telematics systems[1] would probably put any automobile maker at a serious competitive disadvantage. Given the research evidence on the cognitive effects of hands-free use this could have a serious effect on road crashes.

1 This is used to refer to automobile systems that combine global positioning satellite (GPS) tracking and other wireless communications for automatic roadside assistance and remote diagnostics, including making phone calls.

In addition, there are more sophisticated in-vehicle technologies that show potential to address driver distraction, but these have yet to be fully evaluated. These include the following:

- The "workload manager" – an on-board technology using vehicle sensors to estimate driver workload and suppress mobile phone calls and other sources of distraction until driver workload reduces *(7, 94)*. For example, some cars now come equipped with an "intelligent driver information system", which delays incoming phone calls if the driver situation is busy (e.g. during acceleration), while others are fitted with a camera that can monitor the driver's face and detect if the driver is not looking ahead when an in-built radar detects a potential crash. However, while this technology is on the market in some countries, it is unlikely to become available on a global scale for some time.
- Crash avoidance features such as lane departure warning and forward collision warning can also reduce distraction-related crashes. These address all kinds of distractions, not just mobile phones, by bringing drivers' attention back to the road *(36)*.
- Technologies also exist that prevent mobile phones being used when vehicles are in motion. These applications detect when the phone is in a moving car and direct calls to a voice messaging service, while also preventing text messaging and Internet access while the driver is driving the vehicle. However, extending this type of technology to make it more widespread would require cooperative government-industry efforts *(95)*.

Motor vehicle companies in Europe, Japan and North America have developed guidelines for the design and display of electronic and telematic devices that may be used while driving, for instance, on how devices should be placed in order to be easily visible by the driver. Although this is a positive step, these guidelines are not requirements – compliance is only voluntary, while similar guidelines need to be extended beyond automobile manufacturers to include manufacturers of portable electronic devices *(6, 12)*.

4.4 Training and licensing

The licensing system provides an important tool for addressing levels of driver distraction. Licensing handbooks and driving schools need to provide learner drivers with information on how to manage distraction safely, including:

- information on the relative risks associated with engaging in distracting activities and their effects on driving performance;
- factors that make them more vulnerable to effects of distraction;
- practical strategies to reduce the effects of distraction;
- advice on technology features and ways to use technologies that minimize distraction *(5)*.

The Graduated Driver Licensing (see Box 9) should explain to young drivers the risks of distracting activities that are known to compromise safety, as well as test their ability to manage them *(5)*. Whether licensing will have a further effect on crash risk beyond what could be achieved by enforcement of laws and raising public awareness is unclear.

iStockphoto.com / C. Yeulet

BOX 9: Graduated Driver Licensing (GDL) and the use of mobile phones

In response to data showing the high proportion of drivers engaging in distracted driving, and the even higher extent of distraction among inexperienced drivers, a number of countries have introduced measures relating to distracted driving as part of Graduated Driver Licensing approaches. For example, a ban on all mobile phone use (including hands-free devices) among learner drivers exists in a number of Australian and American states *(95)*. In a number of Canadian GDL programmes, this ban is extended further to other distractions, including MP3 players, while some Australian states, such as Queensland, extend to banning passengers of novice drivers from using these devices where the speakers are activated *(96)*.

4.5 The need for evidence

The development of countermeasures to address driver distraction is a field in its infancy compared to other road safety issues, even in countries with a good road safety record *(5)*. This is in part related to the lack of data on the extent and types of distraction and their role in crashes: governments must make policy decisions based on sound scientific evidence and must know where to target their resources. Prevention strategies that relate to driver distraction need to be

Case study:
Evaluating enforcement of mobile phone laws, Connecticut and New York

The National Highway Traffic Safety Administration (NHTSA), an agency of the United States Department of Transportation, has launched pilot programmes in Connecticut and New York to test whether increased law enforcement efforts can help combat distracted driving.

The enforcement campaigns, known as "Phone in one hand. Ticket in the other", are the first federally funded efforts in the country to focus on the effects of increased enforcement and public advertising on reducing distracted driving. Drivers caught talking or text messaging on a hand-held mobile phone will be pulled over and given a fine.

Both programmes started with 7–10 days of high visibility enforcement in metropolitan areas. Subsequent enforcement waves in both states are to be conducted throughout the course of the year-long programme. Each pilot programme is supported by federal funds and matched by state-level resources. Researchers will study changes in attitudes and behaviour from beginning to end, and the results will serve as a model for employing high visibility enforcement, education and outreach to reduce distracted driving behaviours in other cities and states across the country.

based on an understanding of the risks associated with particular distractions, as well as have a mechanism to evaluate the results.

With regard to mobile phone use, evidence suggests a four times higher risk of crash involvement for those driving and using a mobile phone compared to those not using a phone. However, there is a lack of data on the effectiveness of countermeasures. The limited data that do exist relate to laws banning hand-held mobile phones while driving. What is needed is for countries to ensure that the prevention strategies they implement to reduce mobile phone use are well evaluated – both in terms of intermediate outcomes such as the use of mobile phones, as well as in terms of crashes and injuries, so that future policy decisions in this area can be increasingly based on sound evidence. This is already beginning to happen in some countries: the case study above describes continuing efforts to evaluate mobile phone laws in the United States. In other countries, such as Canada, opportunities are taken to collect data on mobile phone use while undertaking regular surveys on other risk factors: for instance, since 2008 the survey on mobile phone use among drivers has been conducted during the annual national seat-belt surveys. This allows collection of data that can be used to monitor and evaluate the impact of legislative and other countermeasures put in place to address mobile phone use by drivers *(37)*.

5 Conclusion

Distracted driving is a serious and growing threat to road safety. With more and more people owning mobile phones, and the rapid introduction of new "in-vehicle" communication systems, this problem is likely to escalate globally in the coming years, and also to evolve as technologies alter. The convergence of the evidence clearly shows that driver distraction is an important issue for road safety. At the same time, the quality and quantity of existing evidence is insufficient to state with confidence how risky distracted driving is, and among the many distractions, which pose the greatest risk, and under what circumstances.

While the problem of distracted driving may have many causes both internal and external to the vehicle, this document has focused on the risk associated with use of mobile phones while driving. It has summarized what is known about interventions, and tried to draw some preliminary recommendations. The demands of a phone conversation compete with the demands of driving the vehicle safely. Mobile phone use, and other in-vehicle telematics, require more interaction than other more "traditional" sources of distraction, that may be "self-paced" behaviours such as drinking coffee or eating a sandwich. Phone use by drivers is more driven by the technology itself – the driver is expected to react to a ringing phone, regardless of the traffic or driving conditions at that particular moment.

Using a mobile phone while driving has been shown to have a number of detrimental effects on driving behaviour. This is because drivers are not only physically distracted by phoning and driving simultaneously, but they are also cognitively distracted by having to divide their attention between the conversation they are involved in and tasks relating to driving. At the time of writing this report there is no conclusive evidence to show that hands-free phoning is any safer than hand-held phoning, because of the cognitive

distraction involved with both types of phones. Studies suggest that the use of mobile phones – regardless of whether hand-held or hands-free – while driving leads to an increased crash rate compared to when a driver does not use a mobile phone. What is clear is that while the *relative* impacts of distraction on driving ability may vary by type of phone, age, or sex, using a mobile phone while driving increases the *absolute* likelihood of a collision for all drivers.

An increasing body of research suggests that text messaging also results in considerable physical and cognitive distraction, and reduced driving performance. Young drivers are more likely to use mobile phones while driving, and seem to be at particular risk of the effects of distraction resulting from this use. Text messaging also appears to have a particularly detrimental impact upon driving behaviour, and is a problem that is likely to increase in prevalence, given that it is usually cheaper than talking on a mobile phone

There are a number of challenges to effectively addressing the use of mobile phones while driving. Firstly, more work is needed to improve the systematic collection of mobile phone use in crash data to assess the extent of the problem in individual countries and to understand more about the distribution of the problem – for example, which groups are most affected, in which geographic areas, at which time periods. These data will allow prevention efforts to be effectively targeted.

Furthermore, although the available evidence suggests that mobile phone use negatively impacts upon a number of areas of driving performance, more research is needed to better understand the impacts of different forms of mobile phone use – for instance, conversation, sending or receiving text messages – on driving behaviour and crash risk in real-life settings. It will also shed light on the overall contribution of mobile phone distraction in road traffic crashes relative to other risk factors.

With other risk factors, such as the non-use of seat-belts or drink–driving, progress to reduce road traffic injuries has been made through a combination of legislation, strong and sustained enforcement, and continuing campaigns to support enforcement and increase public awareness of risks and of the penalties associated with breaking the law. A similar approach that combines these measures is likely to be effective in tackling mobile phone use as well, and has begun in many countries.

A number of countries have taken steps to legislate on mobile phone use, and a wide range of laws are being adopted. Whether or not laws prohibiting the use (and type of use) of mobile phones should be introduced, and who they should apply to, are decisions to be taken by national, state or provincial policy-makers, and will depend in part on the ability for enforcement to be continuous. Indeed, data that exist suggest that detecting and maintaining compliance with mobile phone laws is difficult, particularly with the increasing use of hands-free mobile phones that are more difficult to detect. This may explain the variation in laws thus far in place, with some countries focusing on

particular high-risk groups, such as young drivers, others applying a blanket ban on use and still others taking the decision not to legislate at all on this issue. Policy decisions on legislation should be based on the best scientific evidence available: to date, there is a lack of research that examines the effectiveness of legislation in sustaining reduced levels of use of mobile phones and even less evidence on the effects of these laws in reducing road traffic injuries or fatalities.

The health sector has an important role to play in this area – as it has in efforts to address other key risk factors – by monitoring and evaluating the effectiveness and cost-effectiveness of such legislation, so that a sound body of scientific evidence can be developed to inform decision-making.

Public awareness campaigns to increase public understanding of driving while distracted and encourage safe driving actions are important in tackling mobile phone use when used as part of a comprehensive strategy. Mobile phones have become increasingly integrated into all aspects of our business and personal lives, making it harder to achieve the essential cultural shift towards accepting the dangers of using mobile phones when driving. Lessons can be learned from the success of road safety efforts to address drink–driving in a number of countries, which have resulted in this behaviour becoming considered socially unacceptable, and from other areas of public health – such as the increased public support for anti-smoking legislation. Indeed, public awareness campaigns must strive to increase awareness of risk, so that manufacturers and consumers are not pushing the demand for increased in-vehicle technologies which result in an increased risk for a road traffic crash. Banning only hand-held mobile phones does not fully address the problem, and may even make it worse by fostering the erroneous perception that hands-free devices are safe. Thus, if users switch to hands-free sets, the effect of any legislation is reduced. The public should be informed that, for drivers, hands-free phones may be as distracting as hand-held phones.

Although the focus of this document has been primarily on the distraction resulting from mobile phone use, technological systems within vehicles can also be used to protect against distraction. Several new technologies exist that may reduce injuries related to distraction. For example, warning features that alert the driver to sudden lane departures, or technologies that use vehicle sensors to estimate driver workload and divert mobile phones calls may serve to reduce injuries related to distraction. Nonetheless, at this point in time the global relevance of such high-end measures remains limited.

While the distraction resulting from mobile phone use is a growing concern and likely to become an issue to road safety efforts around the world, it is also important to keep in mind that other key risk factors, such as drink–driving, speeding and the non-use of seat-belts, child restraints and motorcycle helmets, as well as poor road infrastructure, continue to be major sources of road traffic crashes and deaths in many countries. There is a need to maintain a comprehensive approach to all key risk factors.

Integral to the success of road safety initiatives is the understanding of distracted driving as a shared responsibility, with governments, industry, non-governmental organizations, health and education professionals and other agencies taking on different roles to deal with the issue.

Mobile phones have immense public utility, improving communication in social and commercial interactions. Their relatively low costs have resulted in their rapid and extensive spread, making an enormous difference to communications around the world, particularly in regions where fixed-line telephone services are unavailable, inefficient or prohibitively expensive. Nonetheless, their role in driver distraction and consequently in road traffic crashes means that some measure of "reining in" their use while driving is required. This will require legislative measures, creative ways of enforcement, some degree of cooperation or regulation of industry, and a shift in societal perceptions about what behaviour is "acceptable" at the wheel. While this report has focused on the use of mobile phones while driving, it is presented as just one example of the broader issue of driver distraction. Indeed, given the increasing integration of other communications applications – and thus sources of distraction – with mobile phone systems, both the data relating to risk as well as the potential countermeasures that can be applied to tackle this issue are likely to evolve in the near future.

Although work to generate evidence in this area is in its infancy relative to other aspects of road safety, it is important for governments in particular to be proactive now, using the current state of knowledge, and be guided by lessons learnt from other road safety intervention areas until a larger evidence base exists upon which to act. Considerable gains have been made in the area of road safety in many countries in the past few decades. If we are to maintain and improve on these gains, then managing the risks and benefits of technologies that are used while driving will be critical. Failure to act now could not only make it more difficult to address the issue at a later date, but would also lead to many more preventable traffic injuries and deaths on roads around the world.

References

References may be downloaded from the following URL: http://www.who.int/violence_injury_prevention/publications/road_traffic/distracted_driving/en/index.html

DECADE OF ACTION FOR ROAD SAFETY
2011-2020

ISBN 978 92 4 150089 0