Fatigued and Drowsy Driving
Attitudes, Concerns and Practices of Ontario Drivers
The Traffic Injury Research Foundation

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Fatigued and Drowsy Driving

Attitudes, Concern and Practices of Ontario Drivers

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Executive Summary

♦ This report summarizes the results from a public opinion poll, developed and carried out by the Traffic Injury Research Foundation (TIRF), to examine the extent and nature of the issue of fatigued and drowsy driving in the province of Ontario. It is part of a larger study about this problem in Ontario, which is intended to provide the foundation for establishing evidence-based practices to deal with fatigue and drowsiness among Ontario drivers.

♦ The survey showed that the problem of driving while fatigued or drowsy in Ontario is a serious one:

  - nearly 60% of Ontario drivers, corresponding to some five million, admit that they have driven while fatigued or drowsy at least sometime;
  - 14.5% of Ontario drivers, or 1,280,000, say they actually fell asleep or nodded off while driving at least once in the past year;
  - among those 1,280,000 drivers who fell asleep or nodded off while driving, about 105,000 of them did so on numerous occasions (more than five times);
  - collectively, these drivers account for about 5.5 million trips in Ontario during which they fell asleep or nodded off;
  - during 573,000 of these trips the driver had to brake or steer to avoid being in a collision; and
  - the total number of Ontario drivers who were involved in at least one crash in the past year due to fatigued or drowsy driving may be as high as 167,000.

♦ Not surprisingly, the findings suggest that driving while feeling fatigued or drowsy increases the chances of falling asleep or nodding off at the wheel. However, even those drivers who state they never or rarely drive while feeling fatigued or drowsy are at risk (6.6% of them report they have actually fallen asleep or nodded off at the wheel), probably because it is difficult for them to recognize the symptoms.

♦ In light of the findings, recognizing the onset of fatigue or drowsiness and taking a break before you start to feel fatigued or drowsy are especially important; failing to recognize onset may seriously increase the chances of falling asleep or nodding off while driving because once you start to feel fatigued or drowsy it may be particularly difficult to assess when you will actually fall asleep.

♦ The challenge is to make drivers understand how difficult it is to assess when they will fall asleep once they start to feel fatigued or drowsy and to convince them to take breaks before onset of fatigue or drowsiness.

♦ The challenge is heightened by the fact that Ontario drivers are less concerned about fatigued or drowsy driving than they are about other traffic safety issues: although 59.6% think fatigued or drowsy driving is a serious or extremely serious problem, between 65.4% and 82.2% think other issues are of concern. Possible explanations are:
• the majority of Ontario drivers believe that others are not concerned about it, confirming their belief that fatigued or drowsy driving is not as important as other traffic safety issues;

• most Ontario drivers think that others are more likely to engage in other risky behaviours – e.g., driving while distracted and speeding excessively – than driving while fatigued or drowsy;

• the majority of Ontario drivers are convinced that fatigued or drowsy driving is less likely to result in a crash than other risky behaviours;

• most Ontario drivers think fatigued or drowsy driving leads to less severe crashes than other risky behaviours; and/or

• Ontario drivers believe they can control the dangers imposed by fatigued or drowsy driving because they think there are several effective ways to overcome fatigue or drowsiness at the wheel.

◆ The lack of concern about fatigued or drowsy driving, relative to the other probed traffic safety problems, appears somewhat incongruous with what is known about it as a cause of road crashes. Ontario drivers do not appear to appreciate the seriousness of the problem and, perhaps of greater importance, believe they can control the risks associated with it.

◆ In this regard, generally speaking, the most effective tactic for overcoming fatigue or drowsiness (stop to nap or sleep) is not the most popular one among Ontario drivers. Conversely, and unfortunately, tactics used most often by Ontario drivers are the ones that are the least effective or not effective at all. This disparity needs to be addressed.
Introduction

This report summarizes the results from a public opinion poll, developed and carried out by the Traffic Injury Research Foundation (TIRF), to examine the extent and nature of the issue of fatigued and drowsy driving in the province of Ontario. It is part of a larger study about this problem in Ontario, which is intended to provide the foundation for establishing evidence-based practices to deal with fatigue and drowsiness among Ontario drivers.

The public opinion poll included a set of questions to provide information on attitudes, opinions and behaviours about fatigue or drowsiness at the wheel. The survey\(^1\) required an average of approximately 15 minutes to complete. It was administered by telephone to a random sample of Ontario drivers, by Opinion Search Inc., in November 2006. A total of 750 drivers completed the interview. Based on a sample of this size, on average, the results can be considered accurate within 3.6%, 19 times out of 20.

The background section of this report provides a brief overview of the literature relevant to fatigued and drowsy driving, including a discussion of what these conditions mean, i.e., how they are defined. The next section examines the extent of this problem as revealed by the survey, along with the profile of drivers who admit to driving while fatigued or drowsy. The nature of fatigued or drowsy driving trips is investigated as well. Also examined is concern about this issue among Ontario drivers – levels of concern as well as possible reasons for being concerned are discussed. Data about tactics used by Ontario drivers to deal with feelings of fatigue or drowsiness at the wheel are described. Finally, conclusions are summarized in the last section of the report.

\(^{1}\) The survey can be downloaded from: www.trafficinjuryresearch.com/publications/PDF_publications/Fatigued_Driving_in_Ontario_Questionnaire.pdf
Background

Despite a relatively extensive body of research on fatigue and drowsiness in relation to driving, their impact on traffic safety is not well understood today. This is at least partly due to difficulties associated with defining fatigue or drowsiness and relating them to the risk of collision.

Although fatigue and drowsiness have different causes and are governed by different processes, they are usually considered together because the results are the same – the person suffering from fatigue or drowsiness becomes less alert or attentive and can, in the extreme, fall asleep.

Drowsiness or sleepiness normally refers to “the urge to fall asleep” (Beirness et al. 2005: p. 6) as the result of a biological need; it is a physiological state of the body that is irreversible in the absence of sleep. It is governed by a circadian sleep-wake cycle that makes most people feel sleepy twice a day – at night and in the afternoon (Dement and Vaughan 1999). Fatigue, on the other hand, has been defined as a “disinclination to continue performing the task at hand” (Brown 1994: p. 239), caused by physical labour or repetitive and monotonous activities, such as monitoring a display screen or driving long distances (Stutts et al. 1999).

As noted above, despite the different causes of drowsiness/sleepiness and fatigue, the effects on traffic safety can be the same in that they can compromise the ability to drive safely. They both lead to impaired performance at the wheel and can ultimately result in falling asleep at the wheel (Brown 1994). Furthermore, “…for most individuals, the distinction between the two is often subtle and of little importance” (Beirness et al. 2005: p. 6). It is for this reason that the terms fatigue and drowsiness were used interchangeably in the public opinion poll that provided the empirical data for this study.

How Big a Problem Is Fatigued or Drowsy Driving?

According to estimates from a previous public opinion poll – the 2004 edition of TIRF’s Road Safety Monitor – 20% of drivers in Canada admitted to falling asleep or nodding off at least once while driving in the past 12 months. This corresponds to an estimated 4.1 million Canadian drivers (Beirness et al. 2005).
Other estimates, although quite variable, suggest at least that the problem is anything but unimportant. The 2002 “Sleep in America” survey found that 51% of drivers admitted to driving while drowsy, 17% admitted to dozing off while driving, and 1% reported having been involved in a crash due to dozing off or fatigue (National Sleep Foundation 2002). Comparable figures have been found in other studies. For example, in a study about factors associated with falling asleep at the wheel among long-distance truck drivers, 47.1% of the respondents stated they had fallen asleep at the wheel of a truck, and 25.4% had fallen asleep at the wheel in the past year (McCartt et al. 2000).

Fatigued or drowsy drivers would not constitute a major problem if few of these drivers crashed, which is suggested by the “Sleep in America” survey that reported only 1% did so. Other studies suggest differently. In the United States (U.S.), it is believed that up to 20% of serious crashes may be due to fatigued or drowsy driving (Horne and Reyner 1995; Horne 2000). Knipling and Wang (1995) estimated that fatigue likely contributes to 79,000-103,000 collisions and 1,500 fatalities annually in the U.S. These might well be underestimates, given the difficulties in identifying fatigue or drowsiness as a factor in crashes.

In summary, the available data, although limited and variable, do suggest that fatigued or drowsy driving is a significant problem, albeit further research is needed to better establish its magnitude.

**Variables Associated with Fatigued or Drowsy Driving**

In addition to estimating the extent of the problem, some researchers have attempted to identify the characteristics of the problem. It has been suggested that the profile of a sleep-related crash is different from that of other crashes. For example, sleep-related crashes are more likely to (Stutts et al. 1999: p. 9):

- occur at night or in mid afternoon, when people have a natural propensity to sleep;
- involve a single vehicle running off the roadway, or rear-end and head-on collisions;
- occur on higher-speed roadways;
- involve only the driver as occupant, who is young and male; and,
- result in serious injuries.
Research has also attempted to identify populations at risk for involvement in crashes due to fatigued or drowsy driving. These include:

- young males (Wang et al. 1996; Pack et al. 1995), because they are more likely to drive late at night and to be sleep deprived;
- persons with sleep disorders (Findley et al. 1989; Cohen et al. 1992; Young et al. 1997), because they are more likely to suffer from acute and/or chronic sleep deprivation;
- drivers under the influence of alcohol (Horne et al. 2003; Lumley et al. 1987), because of the sedating effects of alcohol and because of its exacerbating effects on performance deficits due to fatigue or drowsiness;
- drivers under the influence of certain medications (Ray et al. 1992; Ceutel 1995) with side-effects known to enhance drowsiness;
- night or rotating shift workers (Dalziel and Job 1997; Marcus and Loughlin 1996; McCartt et al. 1996), because they are more likely to get inadequate sleep or experience poor quality sleep; and
- commercial vehicle operators (McCartt et al. 1997; Wylie et al. 1996) who often spend long hours driving, and likely experience both fatigue and drowsiness.

Summary

There is evidence suggesting that the problem of fatigued or drowsy driving is anything but insignificant. However, estimates of the magnitude of the problem are rather variable, making it difficult to determine where the issue sits as a road safety priority. Moreover, little is known about the attitudes, opinions and practices of drivers regarding fatigued and drowsy driving. For example, the public might believe this is an unimportant issue; they might believe they can overcome fatigue or drowsiness using certain prevention tactics. The purpose of this study was to help fill such information gaps, specifically with reference to the problem of fatigued or drowsy driving in Ontario.
Extent of the Problem

This section investigates the extent of the problem of driving while fatigued or drowsy in Ontario, based on self-reported frequencies of driving while feeling fatigued or drowsy and the number of drivers admitting to falling asleep or nodding off at the wheel. The profile of people falling asleep or nodding off and trips during which drivers fall asleep or nod off is described as well.

How Often Do Ontario Drivers Drive While Fatigued or Drowsy?

Respondents were asked to use a six-point scale to indicate how frequently they drive while fatigued or drowsy; one on this scale means never and six means very often. The results are shown in Table 1.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Never</td>
<td>309</td>
<td>41.4</td>
</tr>
<tr>
<td>2</td>
<td>286</td>
<td>38.3</td>
</tr>
<tr>
<td>3</td>
<td>92</td>
<td>12.3</td>
</tr>
<tr>
<td>4</td>
<td>29</td>
<td>3.9</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>2.1</td>
</tr>
<tr>
<td>6 – Very often</td>
<td>15</td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>746</td>
<td>100</td>
</tr>
</tbody>
</table>

As can be seen, 41.4% of the respondents indicated they never drove while fatigued or drowsy. However, the balance, and the majority (58.6%), admitted that they had done so at least occasionally. When this percentage is converted to absolute numbers, it means that 5,174,114 Ontario drivers admit to driving fatigued or drowsy at least sometime. Furthermore, 8% of the respondents indicated they drove while fatigued or drowsy often, quite often, or very often (4, 5, or 6 on the scale). Some five million Ontario drivers admit to driving while fatigued or drowsy at least sometime; about 706,000 Ontario drivers drive while fatigued or drowsy often, quite often or very often.

Some five million Ontario drivers admit to driving while fatigued or drowsy at least sometime; about 706,000 Ontario drivers drive while fatigued or drowsy often, quite often or very often.
the rating scale). This converts to 706,364 drivers who admit to driving while fatigued or
drowsy often, quite often or very often.  

Respondents were also asked how often they had actually fallen asleep or nodded off, even
for a moment, while driving in the past year. Table 2 contains the
results, in four categories. As can be seen, 14.5% of Ontario drivers
admit that they fell asleep or nodded off while driving on at least one
occasion in the past year. This percent corresponds to 1,280,284
drivers in Ontario. A small percentage (1.2%; 105,955 drivers)
admitted that they fell asleep or nodded off on numerous occasions
(more than five times).

Table 2: How many times Ontario drivers fell asleep or nodded off while driving in the
past year

<table>
<thead>
<tr>
<th>Number of times</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>629</td>
<td>85.5</td>
</tr>
<tr>
<td>1 to 5, inclusive</td>
<td>97</td>
<td>13.2</td>
</tr>
<tr>
<td>6 to 10, inclusive</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td>more than 10</td>
<td>5</td>
<td>0.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>736</td>
<td>100</td>
</tr>
</tbody>
</table>

It is also possible to estimate the total number of trips taken in Ontario in the past year during
which the driver fell asleep or nodded off by multiplying the
number of times drivers fell asleep or nodded off by the
corresponding number of drivers. This shows that there were
5,527,296 fatigued or drowsy driving trips in Ontario in the past
year.

**How Many Drivers Are Involved in Crashes Caused by Fatigued or Drowsy Driving?**

The estimated number of people involved in crashes caused by fatigued or drowsy driving
can also be calculated from the survey results. Respondents were asked if they were
involved in a crash when they fell asleep or nodded off and also if they were involved in a

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2 These absolute numbers are based on an estimated total of 8,829,547 Ontario drivers in the
possession of a valid driver’s license in 2006. This estimate was obtained by increasing the 2004
number of 8,655,597 (Ontario Road Safety Annual Report 2004) with an anticipated growth of 1% per
year.

About 1,280,000 Ontario drivers fell asleep or nodded off while driving at least once in the past year. Some 105,000 of them did so on numerous occasions.

There were about 5.5 million trips in Ontario in the past year during which the driver fell asleep or nodded off.
crash caused by another driver who was fatigued or drowsy – 0.6% said they were involved in a crash when they fell asleep; 1.3% said they were in a fatigue-related crash caused by another driver. This corresponds to 1.9% or 167,761 Ontario drivers who were involved in at least one crash in the past year due to fatigued or drowsy driving.

It is instructive to compare these figures to the official collision statistics reported by the Ministry of Transportation, Ontario. According to the Ontario Road Safety Annual Report of 2004 the total number of drivers involved in collisions (personal injury and property damage collisions) was 411,271. The figure from the opinion poll (167,761) seems high when compared to this total – i.e., the survey results suggest that almost 41% of Ontario drivers involved in collisions would have been involved in fatigue related collisions. However, it is well known that official statistics understate the number of collisions – particularly property damage, but even injury collisions (Pack et al. 1995).

An additional explanation for this disparity may be the uncertainty of the survey results because of the sampling design. A 95% confidence interval for the percent of drivers involved in a fatigue related crash (1.9%) is [1.12%-3.25%]. According to the lower bound of this interval, 98,891 Ontario drivers were involved in such crashes, corresponding to 24% of all Ontario drivers. The disparity may therefore be more apparent than real.

It is evident that the proportion of people involved in fatigue related crashes is high, regardless of what measure is used. Incidentally, crash data analysis shows that 26.4% of all fatal and injury crashes in Ontario (excluding property damage collisions) are fatigue related (Elzohairy 2007).

**Who Falls Asleep or Nods Off While Driving in Ontario?**

The survey also provided insights into the characteristics of those who are most likely to fall asleep or nod off at the wheel. The data were subjected to a multivariate analysis that controlled for a variety of confounding factors. The analysis showed that three variables in particular were associated with falling asleep at the wheel or nodding off even for a moment.
First, and not surprisingly, there is a positive relationship between the frequency of driving while fatigued or drowsy and falling asleep or nodding off at the wheel. Respondents who report driving more often while fatigued or drowsy are more likely to fall asleep at the wheel or nod off even for a moment. This relationship can be seen in Table 3. Of all those respondents who never drive while feeling fatigued or drowsy, only 6.6% say they have fallen asleep at the wheel. This row-percentage generally increases with an increasing frequency of driving while feeling fatigued or drowsy.³

Table 3: Relationship between the frequency of driving while fatigued or drowsy and falling asleep or nodding off at the wheel

<table>
<thead>
<tr>
<th>Frequency of driving while fatigued or drowsy</th>
<th>Has not fallen asleep or nodded off at the wheel</th>
<th>Has fallen asleep or nodded off at the wheel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – Never</td>
<td>93.4%</td>
<td>6.6%</td>
<td>100%</td>
</tr>
<tr>
<td>2</td>
<td>84.2%</td>
<td>15.8%</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>69.6%</td>
<td>30.4%</td>
<td>100%</td>
</tr>
<tr>
<td>4</td>
<td>66.1%</td>
<td>33.9%</td>
<td>100%</td>
</tr>
<tr>
<td>5</td>
<td>92.9%</td>
<td>7.1%</td>
<td>100%</td>
</tr>
<tr>
<td>6 – Very often</td>
<td>74.1%</td>
<td>25.9%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>85.4%</strong></td>
<td><strong>14.6%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

The second variable associated with falling asleep at the wheel was gender – women were found to have a much smaller chance of falling asleep (see Table 4), even when controlling for such confounding variables as mileage, frequency of driving while fatigued or drowsy, age, household income, family status, and, body mass index (BMI)⁴. It is important to note that the difference between males and females cannot be explained by the fact that women drive less because the analysis controlled for exposure, using self-reported mileage and frequency of driving while fatigued or drowsy as proxies.

Table 4: Relationship between gender and falling asleep or nodding off at the wheel

<table>
<thead>
<tr>
<th>Gender</th>
<th>Has not fallen asleep or nodded off at the wheel</th>
<th>Has fallen asleep or nodded off at the wheel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>79.6%</td>
<td>20.4%</td>
<td>100%</td>
</tr>
<tr>
<td>Female</td>
<td>90.3%</td>
<td>9.7%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>85.5%</strong></td>
<td><strong>14.5%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

³ It should be noted that the pattern is a bit distorted for respondents who answered 5 or 6 on the frequency scale because the corresponding row-percentages decrease again (7.1% and 25.9% respectively). However, while the overall pattern is significant, the result for 5 on the frequency scale was not found to be significant in the logistic regression analysis, indicating that this local distortion does not necessarily detract from the validity of the overall pattern.

⁴ BMI serves as a proxy for obstructive sleep apnea (OSA), a main predisposing factor of excessive daytime sleepiness (EDS), which can increase the risk of road crashes (Dagan et al. 2006).
Finally, reasons for taking a break while driving also differentiate people who fall asleep or nod off at the wheel from those who do not. Respondents were asked if they typically take a break because they feel fatigued or drowsy when they drive a long distance. Those who answered they typically do not take a break because they feel fatigued or drowsy have a much smaller chance of falling asleep at the wheel compared to those who do take a break for that reason (see Table 5).

Table 5: Relationship between reasons for taking a break and falling asleep or nodding off at the wheel

<table>
<thead>
<tr>
<th>Reasons for taking a break</th>
<th>Has not fallen asleep or nodded off at the wheel</th>
<th>Has fallen asleep or nodded off at the wheel</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Because of feeling fatigued or drowsy</em></td>
<td>77.1%</td>
<td>22.9%</td>
<td>100%</td>
</tr>
<tr>
<td><em>Not because of feeling fatigued or drowsy</em></td>
<td>88.5%</td>
<td>11.5%</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>85.4%</strong></td>
<td><strong>14.6%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

This finding may seem counterintuitive, as one would expect people who take a break because they are feeling fatigued or drowsy to be better protected against the risk of crashing, compared to those who take breaks for other reasons. However, this finding might suggest that it is beneficial to stop and take a break before feeling fatigued or drowsy, rather than waiting until you actually feel fatigued or drowsy. In this regard, research has shown that people are not good at judging how likely it is they will fall asleep (FHWA 1998; Brown 1993). If you take a break before you become fatigued or drowsy it does not really matter how good you are at judging your chances for falling asleep. On the other hand, if you wait until you start feeling fatigued or drowsy before taking a break it may already be too late in that your chances of falling asleep at the wheel may have increased considerably.

Additional data from this survey seem to be in line with this hypothesis. For example, drivers who typically take a break because they feel fatigued or drowsy wait significantly longer before taking a break when driving a long distance, compared to drivers who typically take a break for other reasons (average time of 201 minutes compared to 167 minutes before taking a break).

Given these dynamics, recognizing the onset of fatigue and drowsiness becomes particularly relevant for drivers.
What Happened During Trips When the Driver Fell Asleep or Nodded Off?

The sub sample of respondents who said they fell asleep or nodded off while driving even for a moment in the past year was examined in more detail. The majority of respondents in this sub sample (79 respondents out of 105; 75% of total) said they never had to brake or steer to avoid being in a collision when they fell asleep at the wheel or nodded off. However, about 15% answered that they had to do so once and 7% said they had to do so twice. One respondent indicated he had to brake or steer on three occasions and another on 15 occasions. Collectively, this corresponds to 573,441 trips in Ontario in the past year during which a driver who fell asleep or nodded off at the wheel had to brake or steer to avoid being in a collision5.

About 4% of the drivers who fell asleep or nodded off actually had an accident. The majority of those accidents involved property damage only; one accident with injuries was reported.

With regard to alcohol consumption, 6% of the sub sample who fell asleep or nodded off said they had consumed alcohol before driving. The average time of driving without taking a break the last time they fell asleep or nodded off was three hours; the maximum was 15 hours.

Falling asleep was also less likely to occur in the morning hours from 7 a.m. until noon and more likely at other times – a pattern somewhat consistent with the circadian rhythm that results in sleepiness in the afternoon and early morning hours. About 63% of all trips were not work-related.

Finally, respondents were provided with a variety of reasons that could have caused them to fall asleep or nod off and asked to indicate if they believed these might have contributed. Table 6 lists the reasons and the percent (along with a 95% confidence interval) of respondents confirming they believed these reasons actually caused them to fall asleep at the wheel. The number one reason is lack of sleep the previous night or nights; about 52.2% of respondents think this caused them to fall asleep at the wheel. Driving after a long, stressful work day (38.5%), driving continuously for an extended period without a break (33.5%), and driving at night (29%) were the next most common reasons. Making too many

5 It should be noted that this sub sample is considerably smaller than the total sample (105 vs. 750). Caution is warranted when interpreting these results; the estimated number of trips is not as reliable as previous comparable estimates that were based on the total sample.
driving trips over the course of the day was rated as a reason by 15.5%. Only about 1% said they thought impairment by medication caused them to fall asleep or nod off while driving.

**Table 6: Perceived reasons for falling asleep or nodding off at the wheel**

<table>
<thead>
<tr>
<th>Possible reason for falling asleep or nodding off at the wheel</th>
<th>% and 95%-CI who believes reason has caused falling asleep or nodding off at the wheel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of sleep the previous night or nights</td>
<td>52.2%, [41.6%-62.8%]</td>
</tr>
<tr>
<td>Driving after a long, stressful work day</td>
<td>38.5%, [28.2%-48.9%]</td>
</tr>
<tr>
<td>Driving continuously for an extended period without a break</td>
<td>33.5%, [23.2%-43.7%]</td>
</tr>
<tr>
<td>Driving at night</td>
<td>29.0% [19.5%-38.6%]</td>
</tr>
<tr>
<td>Making too many driving trips over the course of the day</td>
<td>15.5%, [7.8%-23.1%]</td>
</tr>
<tr>
<td>Impairment by medication</td>
<td>1.0%, [0.0%-2.6%]</td>
</tr>
</tbody>
</table>

**Summary**

The survey showed that the problem of driving while fatigued or drowsy in Ontario is a serious one:

- nearly 60% of Ontario drivers, corresponding to some five million, admit that they have driven while fatigued or drowsy, at least sometime;
- 14.5% of Ontario drivers, or 1,280,000, say they actually fell asleep or nodded off while driving at least once in the past year;
- among those 1,280,000 drivers who fell asleep or nodded off, about 105,000 of them did so on numerous occasions (more than five times);
- collectively, these drivers account for about 5.5 million trips in Ontario during which they fell asleep or nodded off;
- during 573,000 of these trips the driver had to brake or steer to avoid being in a collision; and
- the total number of Ontario drivers who were involved in at least one crash in the past year due to fatigued or drowsy driving may be as high as 167,000.

The findings also suggest that driving while feeling fatigued or drowsy increases the chances of falling asleep or nodding off at the wheel. However, even those drivers who state they never or rarely drive while feeling fatigued or drowsy are at risk – 6.6% of them report they have actually fallen asleep or nodded off at the wheel – probably because it is difficult for them to recognize the symptoms.
It was also found that women seem to have a smaller chance of falling asleep, even when a variety of confounding variables, including exposure, are controlled.

Paradoxically, the findings suggest that respondents who typically do not take a break because they feel fatigued or drowsy have a much smaller chance of falling asleep at the wheel than those who do take a break for that reason. In light of these findings, recognizing the onset of fatigue or drowsiness and taking a break before you start to feel fatigued or drowsy appear especially important; failing to recognize onset may seriously increase the chances for falling asleep or nodding off while driving because once you start to feel fatigued or drowsy it may be particularly difficult to assess when you will actually fall asleep. The challenge is to make drivers understand how difficult it is to assess when you will fall asleep once you start to feel fatigued or drowsy and to convince them to take breaks before onset of fatigue or drowsiness.

Finally, respondents indicated the number one reason that could have caused them to fall asleep was lack of sleep the previous night or nights.
Concern About Fatigued or Drowsy Driving

The previous section showed that fatigued or drowsy driving occurs frequently enough to pose a major risk on the highways. The survey also sought to determine how concerned Ontario drivers are about this issue and reasons for their concern. It is generally accepted that the level of public or individual concern about an issue is relevant to prevention. Concern can motivate an individual to take personal action by changing their behaviour or incite them to demand that action is taken by government or other responsible agencies.

How Concerned Are Ontario Drivers About Fatigued or Drowsy Driving?

Respondents were presented a list of traffic safety problems and asked to indicate how concerned they were about each of them by giving a number between one and six, where one means “not a problem at all” and six “an extremely serious problem”. Figure 1 shows the percent who answered five (serious problem) and six (extremely serious problem).

Figure 1: Percent who think the listed problems are serious or extremely serious

<table>
<thead>
<tr>
<th>Problem</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking drivers</td>
<td>82.2</td>
</tr>
<tr>
<td>Drivers using illegal drugs</td>
<td>71.9</td>
</tr>
<tr>
<td>Drivers who speed excessively</td>
<td>69.2</td>
</tr>
<tr>
<td>Distracted drivers</td>
<td>65.6</td>
</tr>
<tr>
<td>Drivers using cell phones</td>
<td>65.4</td>
</tr>
<tr>
<td>Fatigued or drowsy drivers</td>
<td>59.6</td>
</tr>
</tbody>
</table>

Note that “Drivers using cell phones” in all figures refers to both hand-held or hands free use of cell phones while driving.
As can be seen, nearly 60% of Ontario drivers think fatigued or drowsy driving is a serious or extremely serious problem. Although this is a substantial proportion, concern about fatigued or drowsy driving is significantly less than it is for several other issues, including drivers who use cell phones, distracted driving, speeding, and impaired driving from drugs or alcohol.

**Why Are They Concerned?**

The level of concern itself is influenced by a number of factors and this section probes what those determining factors are. In particular, it examines five possible factors:

- **Level of concern of others**: if others are concerned about fatigued or drowsy driving, this could heighten an individual's level of concern;

- **Magnitude of the problem**: if a person believes fatigued or drowsy driving is prevalent, their level of concern will increase;

- **Level of risk that comes with the problem**: if a person believes that driving while fatigued or drowsy is dangerous, they may be more concerned;

- **Severity of injuries**: if a person is convinced that fatigued or drowsy driving typically leads to crashes with more severe injuries then their level of concern about it may increase.

- **Belief that the level of fatigue or drowsiness and chances of falling asleep can be controlled (locus of control; see Wåhlberg 2001)**: if a person believes they cannot control their level of fatigue or drowsiness, and, as such, risk of falling asleep or nodding off at the wheel, this will increase their level of concern.

To measure these factors a series of questions were asked. First, respondents were asked how concerned they thought others were about each of the listed problems. The results are shown in Figure 2, which displays the percent who answered that they thought others think it is a serious (5) or extremely serious (6) problem.

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7 The data obtained from these questions were analyzed using a multivariate approach. More precisely, two techniques were used to examine the relationships between the different factors included in this study, i.e., logistic regression analysis and multidimensional scaling. Univariate figures are presented to illustrate the main findings from these multivariate analyses (Figures 1-6).
The rank order of issues is similar to the one elicited by asking how personally concerned the respondent was about those issues. However, and of greatest importance, only 40% of Ontario drivers believe others think fatigued or drowsy driving is a serious or extremely serious problem. This contrasts sharply with how concerned they think their fellow drivers are about issues such as drug use or drinking and driving.

The second issue involves the prevalence of the problem – in particular how often respondents believe that others drive while fatigued or drowsy. Respondents were asked how many drivers they thought actually engaged in the six behaviours (e.g., drinking and driving; driving while distracted; etc.). Figure 3 contains the average for all respondents for each of the surveyed traffic safety issues. On average, survey respondents believe that over 1/3 (38.6%) of drivers in Ontario are driving while fatigued or drowsy at any given time. This is significantly less than the average percent of drivers that is believed to be speeding excessively (47.5%) but significantly more than the average percent of drivers that is believed to be drinking and driving (30.3%).

Of some interest, if these data are compared to the self-reported frequencies of driving while fatigued or drowsy (see Table 1), survey respondents seem to underestimate the actual frequency of this behaviour (they estimate that 38.6% of Ontario drivers operate their vehicles when fatigued or drowsy, but 58.6% of Ontario drivers admit to doing so).
Respondents were also asked to indicate, on a scale from one to six, how likely they think it is for drivers engaging in each of the listed behaviours to cause a crash. Figure 4 shows the percent of respondents who indicated a certain behaviour is likely (5) or very likely (6) to cause a crash.

Figure 4: Percent who think the behaviours are likely or very likely to cause a crash
It is evident that nearly half of Ontario drivers (47.5%) believe fatigued or drowsy drivers are likely or very likely to cause a crash. By contrast, the majority believes that those who drink and drive pose a very significant risk – over 80% believe drinking drivers are likely or very likely to cause a crash.

The last question regarding possible reasons for concern about certain traffic safety problems asked whether crashes caused by other risky behaviours are likely to be less severe, equally severe, or more severe than crashes caused by fatigued or drowsy driving. Figure 5 shows the results. The majority of respondents believe drinking and driving, speeding excessively and driving while using illegal drugs lead to more severe crashes than those caused by fatigued or drowsy drivers. By contrast, a minority think that crashes caused by cell phone use or distraction are more severe than crashes caused by fatigued or drowsy driving. Not shown in Figure 5, but implied, the majority believes fatigued or drowsy driving leads to equally severe crashes as those caused by drivers using cell phones or being distracted.

**Figure 5: Percent saying crashes caused by the listed behaviours lead to more severe crashes than those caused by fatigued or drowsy driving**

Finally, information about whether or not the problem of fatigued or drowsy driving can be controlled was gathered by asking respondents how effective they thought a variety of tactics are. Figure 6 shows how effective Ontario drivers believe each of these tactics are, on a scale from one (not effective at all) to six (very effective).
Several tactics are perceived by Ontario drivers as effective in overcoming the dangers imposed by fatigued or drowsy driving. Stopping to nap or sleep (4.91), and, asking a passenger to take over driving duties (5.06) were seen as the most effective. Others included drinking caffeine or taking caffeine pills (3.64), opening windows or turning on AC or fan (3.71), talking to passengers (3.92), and stopping to eat, exercise, relax but without napping/sleeping (4.03).

**Figure 6: Average rating of perceived effectiveness of a variety of tactics to overcome feelings of fatigue or drowsiness**

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Perceived Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ask passenger to drive</td>
<td>5.06</td>
</tr>
<tr>
<td>Stop to nap or sleep</td>
<td>4.91</td>
</tr>
<tr>
<td>Stop</td>
<td>4.03</td>
</tr>
<tr>
<td>Talk to passengers</td>
<td>3.92</td>
</tr>
<tr>
<td>Open windows/AC/fan</td>
<td>3.71</td>
</tr>
<tr>
<td>Caffeine</td>
<td>3.64</td>
</tr>
<tr>
<td>Sing along to music</td>
<td>3.40</td>
</tr>
<tr>
<td>Radio/CD loud</td>
<td>3.38</td>
</tr>
<tr>
<td>Eat/Drink</td>
<td>3.36</td>
</tr>
<tr>
<td>Stimulant</td>
<td>3.05</td>
</tr>
<tr>
<td>Move/shake head</td>
<td>3.02</td>
</tr>
<tr>
<td>Water on face</td>
<td>3.00</td>
</tr>
<tr>
<td>Change radio/CD</td>
<td>2.98</td>
</tr>
<tr>
<td>Talk on cell phone</td>
<td>2.60</td>
</tr>
</tbody>
</table>

**Summary**

Collectively, the data suggest that Ontario drivers are less concerned about fatigued or drowsy driving than the other probed traffic safety issues: although 59.6% think fatigued or drowsy driving is a serious or extremely serious problem, between 65.4% and 82.2% think other issues are of concern. Possible explanations are:

- the majority of Ontario drivers believe that others are not concerned about fatigued or drowsy driving, confirming their belief that fatigued or drowsy driving is not really an issue, relative to other issues;
most Ontario drivers think that others are more likely to engage in other risky behaviours — e.g., driving while distracted and speeding excessively — than driving while fatigued or drowsy;

the majority of Ontario drivers are convinced that fatigued or drowsy driving is less likely to result in a crash than other risky behaviours;

most Ontario drivers think fatigued or drowsy driving leads to less severe crashes than other risky behaviours; and

Ontario drivers believe they can control the dangers imposed by fatigued or drowsy driving because they think there are several adequate ways to overcome them.

The lack of concern about fatigued or drowsy driving, relative to the other probed traffic safety problems, appears somewhat incongruous with what is known about it as a cause of road crashes. Ontario drivers do not appear to recognize the seriousness of the problem and, perhaps of greater concern, believe they can control the risks associated with it.
In the previous section it was argued that drivers are less concerned about safety issues if they believe they can control the risks. In this regard it was shown that, generally speaking, Ontario drivers believe there are several effective ways to deal with fatigue or drowsiness. In this section, tactics to overcome fatigue or drowsiness while driving are examined in further detail.

**What Tactics Do Ontario Drivers Use to Overcome Fatigue or Drowsiness While Driving?**

A list of 14 possible tactics to cope with fatigue or drowsiness while driving was presented to respondents. They were asked to indicate whether they had used any of them in the last 12 months. Table 7 shows the results in terms of the percent of respondents who indicated they had used the tactic (95% confidence intervals are given in parentheses).

<table>
<thead>
<tr>
<th>Tactic to overcome fatigue or drowsiness while driving</th>
<th>Percent and 95%-CI saying they used tactic to overcome fatigue or drowsiness while driving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opened windows or turned on AC or fan</td>
<td>43.7%, [39.8%-47.5%]</td>
</tr>
<tr>
<td>Talked to passengers</td>
<td>34.2%, [30.5%-37.9%]</td>
</tr>
<tr>
<td>Stopped to eat, exercise, relax but without napping/sleeping</td>
<td>31.0%, [27.5%-34.5%]</td>
</tr>
<tr>
<td>Changed radio station or CD</td>
<td>30.4%, [26.8%-34.0%]</td>
</tr>
<tr>
<td>Turned radio or CD on loud</td>
<td>30.1%, [26.5%-33.7%]</td>
</tr>
<tr>
<td>Drunk caffeine/taken caffeine pills</td>
<td>29.5%, [26.1%-33.0%]</td>
</tr>
<tr>
<td>Sung along to music</td>
<td>28.7%, [25.2%-32.3%]</td>
</tr>
<tr>
<td>Eaten/drunk something</td>
<td>27.9%, [24.5%-31.3%]</td>
</tr>
<tr>
<td>Asked a passenger to take over driving duties</td>
<td>27.8%, [24.3%-31.2%]</td>
</tr>
<tr>
<td>Moved around or shook your head</td>
<td>26.0%, [22.6%-29.4%]</td>
</tr>
<tr>
<td>Stopped to nap or sleep</td>
<td>14.8%, [12.1%-17.5%]</td>
</tr>
<tr>
<td>Talked on cell phone</td>
<td>11.8%, [9.1%-14.4%]</td>
</tr>
<tr>
<td>Poured water on face or neck or slapped/hit/pinched yourself</td>
<td>6.6%, [4.7%-8.5%]</td>
</tr>
<tr>
<td>Taken a stimulant (e.g., No-doze)</td>
<td>1.6%, [.7%-2.5%]</td>
</tr>
</tbody>
</table>
Opening windows or turning on the AC or fan is the most popular method for overcoming fatigue or drowsiness – a total of 43.7% of Ontario drivers state they used this tactic in the last 12 months to overcome the feeling of fatigue or drowsiness while driving. This approach is used significantly more often than any of the other tactics.

Of interest, only 14.8% report that they stopped to nap or sleep – the most effective tactic to overcome fatigue or drowsiness. Ironically, the most effective tactic is not the most popular one.

On a positive note, while Ontario drivers may not actually use the most effective means for addressing fatigue, they seem to recognize that stopping to nap or sleep is an effective way of dealing with it – Figure 6 showed they rated this tactic at 4.91 on a scale from one (not effective at all) to six (very effective).

Who Uses These Tactics?

Ontario drivers who drive while feeling fatigued or drowsy. Generally speaking, those who drove more often while fatigued or drowsy were more likely to use tactics to overcome fatigue or drowsiness. This pattern emerged with most of the listed tactics. This means that Ontario drivers who drive more often while feeling fatigued or drowsy are more likely to use a variety of tactics to overcome the problem. This may add to their belief of being in control of the problem.

Ontario drivers who fell asleep or nodded off while driving. Several tactics are popular among Ontario drivers who said they fell asleep or nodded off while driving. These include turning on the radio or CD loud, opening windows or turning on the AC or fan, changing the radio station or CD, pouring water on their face or neck or slapping/hitting/pinching themselves, and, moving around or shaking their head. However, these drivers, who are most at risk, seem to use the least effective tactics while ignoring the most efficient one for dealing with fatigue or drowsiness, i.e., stopping to nap or sleep.

8 It could be argued that taking a stimulant is effective as well. However, in addition to possible negative side-effects of driving under the influence of drugs (see Simpson et al. 2006 for an overview), taking a stimulant simply postpones the inevitable; only getting some sleep will solve the problem of feeling fatigued or drowsy. Furthermore, it could also be argued that asking a passenger to take over driving duties is effective. This is, however, contingent on a passenger being available, well rested and fit to drive.
Ontario drivers who believe in the effectiveness of these tactics. Not surprisingly, a stronger belief in a tactic’s effectiveness to overcome fatigue or drowsiness is associated with an increased likelihood that the tactic will be used. Despite this positive relationship between believing in the effectiveness of a tactic and actually using it, the most effective tactic (stopping to nap or sleep) is not the most popular one (see Table 7).

Male Ontario drivers. Male drivers are more likely to use the following tactics: drinking caffeine or taking caffeine pills; stopping to eat, exercise, relax but without napping or sleeping; stopping to nap or sleep; pouring water on face or neck or slapping/hitting/pinching yourself; and, moving around or shaking head.

Younger Ontario drivers. Younger Ontario drivers are more likely than older drivers to use one of the following tactics: turning on the radio or CD loud; opening windows or turning on the AC or fan; changing the radio station or CD; talking to passengers; singing along to the music; using their cell phone; and, asking a passenger to take over driving duties.

Summary

Generally speaking, the most effective tactic for overcoming fatigue or drowsiness – stop to nap or sleep – is not the most popular one among Ontario drivers. Conversely, and unfortunately, tactics used most often by Ontario drivers are the ones that are the least effective, or not effective at all. This disparity needs to be addressed. The challenge is to find effective ways to communicate with Ontario drivers so that effective prevention methods are used more often.
The survey showed that the problem of driving while fatigued or drowsy in Ontario is a serious one:

- nearly 60% of Ontario drivers, corresponding to some five million, admit that they have driven while fatigued or drowsy at least sometimes;
- 14.5% of Ontario drivers, or 1,280,000, say they actually fell asleep or nodded off while driving at least once in the past year;
- among those 1,280,000 drivers who fell asleep or nodded off while driving, about 105,000 of them did so on numerous occasions (more than five times);
- collectively, these drivers account for about 5.5 million trips in Ontario during which they fell asleep or nodded off;
- during 573,000 of these trips the driver had to brake or steer to avoid being in a collision; and
- the total number of Ontario drivers who were involved in at least one crash in the past year due to fatigued or drowsy driving may be as high as 167,000.

Not surprisingly, the findings also suggest that driving while feeling fatigued or drowsy increases the chances of falling asleep or nodding off at the wheel. However, even those drivers who state they never or rarely drive while feeling fatigued or drowsy are at risk (6.6% of them report they have actually fallen asleep or nodded off at the wheel), probably because it is difficult for them to recognize the symptoms.

It was also found that women seem to have a much smaller chance of falling asleep, even when controlling for a variety of confounding variables, including exposure.

Paradoxically, the findings suggest that respondents who typically do not take a break because they feel fatigued or drowsy have a much smaller chance of falling asleep at the wheel compared to those who do take a break for that reason. In light of these findings, recognizing the onset of fatigue or drowsiness and taking a break before you start to feel fatigued or drowsy are especially important; failing to recognize onset may seriously increase the chances for falling asleep or nodding off while driving because once you start to feel fatigued or drowsy it may be particularly difficult to assess when you will actually fall asleep. The challenge is to make drivers understand how difficult it is to assess when you will fall asleep.
asleep once you start to feel fatigued or drowsy and to convince them to take breaks before onset of fatigue or drowsiness.

Respondents indicated the number one reason that could have caused them to fall asleep was lack of sleep the previous night or nights.

Collectively, the data show that Ontario drivers are less concerned about fatigued or drowsy driving than they are about other traffic safety issues: although 59.6% think fatigued or drowsy driving is a serious or extremely serious problem, between 65.4% and 82.2% think other issues are of concern. Possible explanations are:

- the majority of Ontario drivers believe that others are not concerned about it, confirming their belief that fatigued or drowsy driving is not really an issue, relative to other issues;
- most Ontario drivers think that others are more likely to engage in other risky behaviours – e.g., driving while distracted and speeding excessively – than driving while fatigued or drowsy;
- the majority of Ontario drivers are convinced that fatigued or drowsy driving is less likely to result in a crash than other risky behaviours;
- most Ontario drivers think fatigued or drowsy driving leads to less severe crashes than other risky behaviours; and
- Ontario drivers believe they can control the dangers imposed by fatigued or drowsy driving because they think there are several adequate ways to overcome fatigue or drowsiness at the wheel.

The lack of concern about fatigued or drowsy driving, relative to the other probed traffic safety problems, appears somewhat incongruous with what is known about it as a cause of road crashes. Ontario drivers do not appear to appreciate the seriousness of the problem and, perhaps of greater importance, believe they can control the risks associated with it.

Generally speaking, the most effective tactic for overcoming fatigue or drowsiness (stop to nap or sleep) is not the most popular one among Ontario drivers. Conversely, and unfortunately, tactics used most often by Ontario drivers are the ones that are the least effective or not effective at all. This disparity needs to be addressed. Incidentally, it seems that this paradox cannot simply be solved by educating people about the effectiveness of certain tactics. While a positive relationship was found between believing in the effectiveness of most preventive measures and relying on them, stopping to nap or sleep still is the least popular tactic, despite its high average perceived effectiveness. The challenge is to find
effective ways to communicate this information to Ontario drivers so that effective prevention methods are used more often.

Closing the gap between perception of the problem of fatigued or drowsy driving and reality may hold promise since it may serve as a wake-up call for the majority of Ontario drivers. Appreciating the extent of this problem may motivate them to actually turn to more effective ways of overcoming fatigue or drowsiness while driving as opposed to merely feeling in control. Simply put, to protect against dangers associated with fatigued or drowsy driving it is not sufficient for drivers to know about effective preventive measures, they must also use them.
References


