Sleep, work schedules and accident risk in South African long-haul truck drivers

C.C. Maldonado†*, D. Mitchell†, S.R. Taylor‡ and H.S. Driver†,‡

Falling asleep at the wheel has been implicated in 24% of heavy-vehicle road accidents in South Africa. We compiled a questionnaire relating driving, sleep, and social habits with accident reports. In total, 102 male truck drivers aged 43 ± 8 years (mean ± s.d.) with 16 ± 8 years of professional driving experience participated in the study. Three-quarters of the drivers reported being tired at work because of working long hours (93 ± 50 hours/week) and half reported insufficient sleep (5.4 ± 5.3 hours/day) as a reason for their tiredness. While sleeping in their truck berth, almost eight out of 10 drivers reported that their sleep was interrupted, mostly due to noise. Sixty-two percent of truck drivers admitted to nodding off at the wheel, which was associated with interrupted sleep. Drivers who reported signs of sleep-disordered breathing or other sleep complaints had an increased likelihood of having a sleep-related accident. These drivers also were more likely to have a body mass index greater than 25 kg/m², and have a collar size larger than 40 cm. In common with drivers elsewhere, many South African long-haul drivers work illegally long hours, often to supplement their income and meet company deadlines; thus their sleep is restricted and they feel sleepy while driving, all factors associated with increased accident risk. Driving deprived of sleep poses a danger to all on the road; responsible trucking companies should ensure that drivers have adequate rest times to appreciate the imminence of actually falling asleep at the wheel.\(^{11,12}\)

Sleeping as a co-driver in a moving truck, or in a stationary truck at truck stops, where there is excessive outside activity and noise, is not conducive to good sleep. Drivers can improve their sleep efficiency by sleeping in quiet rooms near their travel routes,\(^{9,10}\) or in a comfortable truck berth.\(^{13}\) However, neither special accommodation nor comfortable berths are available to the average South African truck driver, where sleep also may be compromised by extreme ambient conditions, poor timing of trips and unsafe social circumstances.

The deleterious effects of fragmented sleep combined with prolonged wakefulness interact and accumulate,\(^{14,15}\) and impact negatively on alertness, mood, cognition, motor performance,\(^{16,17}\) and driving efficiency.\(^{18}\) When sleep duration is reduced to about five hours or less, the negative effects on alertness and vigilance,\(^{19,20}\) and cognitive function and mood\(^{21}\) become evident. Drivers need a consolidated bout of sleep before beginning a journey,\(^{22}\) particularly since fatigue onset is largely determined by the level of fatigue before starting a trip.\(^{23}\) Besides the inevitable decline in alertness which follows hours of continuous work,\(^{24,25}\) the time of day at which the work is performed affects the rate of decline in vigilance\(^{26}\) and driving performance.\(^{27}\)

The highest incidence of sleep-related vehicle accidents occurs between midnight and 06:00, coinciding with the circadian nadir in alertness and a high propensity for sleep.\(^{2,28}\) Most sleepy drivers are aware that they could be falling asleep at the wheel, but they have only a modest ability to appreciate the magnitude of their impairment\(^{29}\) and fail to appreciate the imminence of actually dropping off to sleep.\(^{30}\)

According to the South African Labour Relations Act, amended in 1996 and currently under review, truck drivers are required to take at least half an hour’s rest after five hours of driving, and must have a minimum of nine consecutive hours off per day. The Act also restricts working to 71 hours per week including overtime. However, this restriction is not enforced. Truck drivers are under pressure to drive excessively in order to supplement their income,\(^{31}\) and to meet company expectations. The problem is not unique to South Africa: an Australian survey reported that 38% of truck drivers exceed 14 hours of driving per day on one or more days and close to one third work in excess of 72 hours a week.\(^{32}\) About 17% of Scandinavian truck drivers exceed the maximum daily driving limit of 9 hours per day, as stipulated by the European regulation.\(^{33}\)

Thus, lack of time-off, and consequently less time for sleep, is a large-scale problem in the trucking industry.

Poor sleep hygiene and long work hours are compounded by sleep disorders, such as sleep apnoea and snoring, which have an unusually high prevalence in long-haul truck drivers.\(^{29,34}\) Sleep-disordered breathing and the associated sleepiness have been correlated with a high accident frequency in long-haul truck drivers\(^{35,36}\) and automobile drivers.\(^{37,38,39}\) Furthermore, snoring, resulting in excessive daytime sleepiness and often related to obesity, also has been correlated with a higher subjective sleepiness\(^{40}\) and accident liability.\(^{41,42,43}\)

Finally, unlike their colleagues in Europe, North America, or Australia, South African truck drivers routinely have to contend with hijacking, diesel or cargo theft, and sex workers who frequent truck stops. Also, inadequate facilities at truck stops and inferior truck berths are not conducive to sleeping. Given the problems that confront all long-haul truck drivers, the lack of data regarding driving schedules, sleep, accident risks and the

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additional circumstances faced by truck drivers in South Africa, we developed a questionnaire aimed at identifying problems related to sleep in a sample of long-haul truck drivers. We believe that our study will be the forerunner of further research on sleep-related attributes of truck drivers in South Africa; other studies on driver sleepiness have been confined to more affluent societies.

**Methods**

We randomly selected 33 out of 218 long-haul trucking companies in and around Johannesburg and discussed the aims of this project with depot managers. Nine companies agreed to allow us access to drivers in their employ who were available at the time of the interviews, which took place between December 1996 and May 1997.

**Ethics.** All the drivers and depot managers who were interviewed gave their informed verbal consent and were assured of total anonymity. Each interview was conducted privately without interference from management or other drivers.

**Pilot study.** A pilot survey of 22 drivers from two companies was conducted to assess the feasibility of the study and develop the questionnaire. Many of the truck drivers interviewed were not fully literate in English. To improve the accuracy of the responses, we reformatted some of the questions, made translators available at interviews, and personally assisted drivers to complete the questionnaire, where necessary.

**Procedure.** Drivers were met at their company depot before they went on a trip or after they had returned. The interview included measures of collar size, body mass and height. We handed questionnaires to the drivers, which they subsequently completed, either alone, in a driver training class organized by the company, or with our assistance.

**Questionnaire.** The final questionnaire contained 41 questions, subdivided into four categories, as outlined below. Descriptive questions were structured such that the driver had to select answers from a list. More than one answer was possible and drivers were given the opportunity to include unlisted answers, where appropriate.

**Driving habits.** Drivers were asked how long they had been driving professionally. They also gave details of their weekly work duties and schedules, including average daily distances driven, number of days off work in a typical month, and whether they drove alone or with a co-driver.

**Diet and health.** We asked drivers about tobacco and alcohol use, and whether they were taking prescribed medication, recreational drugs, stimulants and/or sleeping tablets. They were asked if they drank coffee, tea or cola drinks to stay awake, or if they ate sweets, potato crisps or chocolates often.

**Sleep habits.** Quality of sleep during time off work was rated on a face-scale using five elements, depicting someone looking very sleepy to wide-awake. The faces on the extremities were assigned word anchors, from no sleep to excellent sleep. The same scale was used to assess the level of sleepiness at the start and at the end of a shift — the anchors used were from not tired to extremely tired. Drivers were asked if they were aware of having any sleep problems or if their bed partner/s complained about their sleep, including snoring and signs indicative of sleep apnoea, such as witnessed apnoeas or waking up gasping for breath. Other questions relating to sleep habits included the amount of time slept each night during a long-haul, where they slept and whether their sleep was interrupted. If their sleep was interrupted, drivers were asked to identify what adversely affected their sleep, and which disturbance they regarded as the biggest problem. If drivers were sleepy during their working time, possible causes were listed. They also were asked to list practices that they employed to alleviate sleepiness, and how often they felt that they were about to fall asleep when driving.

**Accident risk.** We asked the drivers if they had been involved in accidents or had experienced any potentially dangerous events on the road because of sleepiness, and how often they had had a ‘near accident’ as a result of sleepiness in the past six months.

**Analysis.** Data are presented as mean ± standard deviation, or range or percentage, where appropriate. We performed non-parametric analyses using the Spearman rank correlation, χ²-square and Fisher’s Exact tests: r values or χ² values (with degrees of freedom in brackets) are reported. A 2-tailed P < 0.05 was considered significant. We used a commercially available statistical package (Graph-Pad Instat). Incomplete responses, or altered questions from the pilot study, were omitted from any analyses. Sample sizes (n) are indicated in each case.

**Results**

Fifteen of the 33 depot managers contacted thought that sleepiness or fatigue was a problem in the trucking industry in general. Three managers said that fatigue was not a problem at all in their company. In total, 102 male truck drivers from nine companies participated, 47% of them were between 40 and 49 years old. Demographic and work data are given in Table 1.

**Driving experience and schedules.** Most drivers (46%) reported that they had between 10 and 20 years of professional driving experience. Older drivers were more experienced than younger drivers (r = 0.74, P < 0.0001, n = 100). χ²-square statistics showed that 48% of drivers who reported not having experienced a near accident in the past six months were at least 45 years old, while 60% of drivers who reported having one or more near accident were 39 years old or less (χ²(2) 12.19, P = 0.002, n = 94). Of the drivers with more than 16 years’ driving experience, only 5% reported having experienced near accidents, and 41% of the drivers who had less than 10 years’ driving experience reported a near accident in the past six months (χ²(2) 7.70, P = 0.02, n = 95).

Most of the drivers (63%) drove alone but 28% drove with a co-driver who shared the driving (2-up), and 9% had an assistant who did not drive. Drivers who drove alone or with an assistant reported about 2.5 hours more driving per day than the 2-up drivers did (χ²(3) 17.00, P = 0.0007, n = 98). We found that drivers who drove alone were more at risk of experi-

<table>
<thead>
<tr>
<th>Table 1. Demographic and work data.</th>
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<tbody>
<tr>
<td>Mean ± s.d.</td>
</tr>
<tr>
<td>Age (yr)</td>
</tr>
<tr>
<td>Body mass (kg)</td>
</tr>
<tr>
<td>Height (m)</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
</tr>
<tr>
<td>Collar size (cm)</td>
</tr>
<tr>
<td>Professional driving experience (yr)</td>
</tr>
<tr>
<td>Distance driven per day (km/day)</td>
</tr>
<tr>
<td>Hours driven per day*</td>
</tr>
<tr>
<td>Hours worked per week*</td>
</tr>
<tr>
<td>Hours of sleep per working day</td>
</tr>
</tbody>
</table>

*Includes driving, loading or unloading, waiting at border posts and waiting for a load.
In their descriptions of a typical working day, drivers reported irregular schedules, with 72% of drivers starting their shift between 04:00 and 08:00, 21% between 01:00 and 04:00, and 7% between 18:00 and 01:00. Just over half the drivers (54%) finished their shifts between 20:00 and 01:00 and 44% finished work between 12:00 and 20:00. All the drivers said that they worked schedules besides their routine times, with 49% working overtime or with varying schedules, 42% working night shifts in addition to their daylight work hours, and 9% were on 24-hour call. More than half (58%) the drivers reported driving at least 10.5 hours per day. Those who drove for longer hours (>13.5 hours/day) were less alert at the end of their trip than drivers who drove less than 8.5 hours (χ²(3) 11.51, P = 0.009, n = 85).

Half the drivers reported that they drove between 500 and 700 km/day and 26% reported driving between 700 and 1100 km/day. Forty-two per cent of drivers reported working within the legal limit (71 h/week) for this type of work, 22% of drivers worked between 70 and 100 hours per week, and 36% reported working in excess of 100 hours per week. Of the drivers who worked 70 hours or less per week, the majority (92%) drove alone or with a non-driving assistant, whereas 32% of drivers who worked more than 100 hours per week drove 2-up (χ²(2) 20, P = 0.03, n = 97). Drivers had between zero and 3 days off work per week, with an average of 4 days off per month.

Over-the-counter stimulants were reportedly used by 5% of drivers. Almost half (43%) said that they smoked cigarettes, from 2 to 60 a day (median = 20), and 19% reported smoking cigarettes specifically to help them keep awake while driving. One driver reported smoking cannabis to alleviate sleepiness, 54% of drivers said that they drank tea, coffee and/or cola drinks to help them stay awake, and 55% declared that they ate snacks often to stay awake behind the wheel.

Physical characteristics and sleep disorders. Fifty-eight per cent of the drivers were overweight (body mass index (BMI) >25 kg/m²). Collar size correlated with BMI (Spearman rank r = 0.87, P < 0.0001, n = 73), and this was greater than 40 cm in 43% of drivers. The bigger drivers (BMI > 30 kg/m²) were more likely to report that they snored than the slimmer ones (BMI < 25 kg/m²) (χ²(2) 13.53, P < 0.001, n = 78). The bigger drivers also reported reduced alertness at the start of the trip compared to their slimmer colleagues (χ²(2) 7.00, P = 0.03, n = 75). Regular snoring was reported by 23% of drivers and another 6% reported snoring sometimes. Drivers over 40 years were more likely to report snoring or complaints of snoring from a bed partner (χ²(3) 12.97, P = 0.005, n = 85). Symptoms associated with sleep apnoea were reported by 9% of drivers; they said that they stop breathing or wake gasping for breath at least sometimes.

Sleep hygiene. Almost all the drivers reported that they slept less than 8 hours on a typical working day: 61% slept on average 6 hours or less, including 32% who slept an average of 4 hours or less. The majority of drivers said that they slept in their truck, at a truck stop or commercial area, 3% slept in their cab at the depot or a police station, and 3% slept at home. Very few said that they slept at the road-side. Of the drivers who drove 2-up, 34% reported that they slept in the cab while a co-driver drove.

About two-thirds (65%) of drivers reported being completely alert at the start of trips, but 6% who said that they were sleepy even at the start of trips were more likely to report having been involved in a potentially dangerous event (Fisher’s Exact test, P = 0.028, n = 82). Drivers who reported that they were not completely alert at the start of a trip, felt the same at the end of the trip (χ²(1) 16.46, P = 0.0003, n = 84). When sleeping at home between trips, 86% of drivers said that they obtained relatively good sleep. Three drivers commented that they slept poorly on the first night after a drive but that their sleep improved with subsequent nights off.

Nearly eight out of 10 drivers said that they had interrupted sleep when they stopped to sleep during a trip; it was sometimes a problem for 51% of drivers and always a problem for another 25% of drivers. Those who reported disturbed sleep also felt that they were not completely alert at the start of subsequent trips (χ²(1) 13.86, P = 0.001, n = 84).

The main factors that drivers said contributed to a disturbed sleep en route are listed in Table 2, noise was the biggest and most common disturbance.

Of the drivers who reported never having interrupted sleep en route, 65% also said that they did not nod off at the wheel, whereas 57% of drivers who always had interrupted sleep felt that they regularly nodded off at the wheel (χ²(4) 20.33, P = 0.0004, n = 97). Forty-two per cent of drivers who always, and 30% who sometimes, had interrupted sleep felt that they had been involved in a potentially dangerous driving incident (χ²(1) 6.21, P = 0.045, n = 96). Most of the drivers with no symptoms of sleep apnoea (89%) denied having any accidents. Of the drivers who reported signs of sleep apnoea, 44% had been involved in at least one sleep-related road accident (Fisher’s Exact test, P = 0.024, n = 89), and 78% reported being less than completely alert at the start of a trip. By contrast, 68% of the drivers who reported no signs of sleep apnoea, felt completely alert at the start of a drive (Fisher’s Exact test, P = 0.022, n = 74). Approximately half (52%) the drivers who reported snoring admitted to nodding off regularly at the wheel, while 22% reported that they sometimes nodded off (χ²(2) 17.19, P = 0.028, n = 86). By contrast, 91% of the drivers who did not snore had never had a sleep-related accident (Fig. 1). Other sleep problems reported by 14% of drivers included back pain, restlessness, insomnia and frequent nocturnal awakenings.

Sleep-related accidents. The majority of drivers said that they had not experienced a sleep-related accident or a recent near accident (Table 3). The majority (88%) of those drivers who said that they did not nod off at the wheel (71% of all drivers) also said that they had never experienced a potentially dangerous event, while 46% who regularly nodded off on

<table>
<thead>
<tr>
<th>Variable</th>
<th>Drivers reporting each problem (% of total respondents)</th>
<th>Drivers who rated the disturbance as the biggest problem (% of total respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>64</td>
<td>24</td>
</tr>
<tr>
<td>Excessive heat/cold</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>Outside activity</td>
<td>35</td>
<td>7</td>
</tr>
<tr>
<td>Uncomfortable cab</td>
<td>34</td>
<td>5</td>
</tr>
<tr>
<td>Sunlight/outside lights</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>Restlessness</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>Stress/worry</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>Sex workers</td>
<td>14</td>
<td>&lt;3</td>
</tr>
</tbody>
</table>

Other factors cited included vibration of the truck or of passing trucks, breaking and accelerating, worries about hijacking and safety, work pressure and uneven road surfaces.

Table 2. Reasons given by drivers for disrupted sleep mostly while sleeping in their truck berth en route.
the road (29% of all drivers) said that they had experienced a potentially dangerous event ($\chi^2(2)=9.28$, $P = 0.0096$, $n = 95$). The frequency of nodding off at the wheel was positively related with having had a recent near accident (Fisher’s Exact test, $P = 0.042$, $n = 93$).

**Sleepy drivers.** General factors that drivers considered made them feel tired at work are given in Table 4. When asked what they did to cope with sleepiness while driving, 55% of drivers said that they stopped for periods of between a few minutes and 7 hours, 49% continued driving and opened a window, 16% continued driving and increased auditory stimuli (they turned on the radio or made it louder, or talked or sang), 11% said that they moved their body in the seat or turned on the air conditioner. Apart from what they did to cope with sleepiness, 74% of drivers said that they stopped for periods of between a few minutes and 7 hours, 49% continued driving and opened a window, 16% continued driving and increased auditory stimuli (they turned on the radio or made it louder, or talked or sang), 11% said that they moved their body in the seat or turned on the air conditioner. Apart from what they did to cope with sleepiness, 74% of drivers said that they stopped for periods of between a few minutes and 7 hours, 49% continued driving and opened a window, 16% continued driving and increased auditory stimuli (they turned on the radio or made it louder, or talked or sang), 11% said that they moved their body in the seat or turned on the air conditioner. Apart from what they did to cope with sleepiness, 74%

### Table 4. Proportion of drivers who indicated the source (and incidence) for their tiredness at work.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Never/seldom a problem (% of total respondents)</th>
<th>Sometimes a problem (% of total respondents)</th>
<th>Often/always a problem (% of total respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disturbed sleep</td>
<td>46</td>
<td>16</td>
<td>38</td>
</tr>
<tr>
<td>Not enough sleep</td>
<td>25</td>
<td>28</td>
<td>47</td>
</tr>
<tr>
<td>Stress/worry</td>
<td>65</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>Poor health</td>
<td>75</td>
<td>17</td>
<td>8</td>
</tr>
</tbody>
</table>

Other factors cited included financial worries, domestic problems or bad working conditions.

### Table 5. Reasons given by drivers for sleepiness while driving.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Drivers reporting each problem (% of total respondents)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long work hours</td>
<td>74</td>
</tr>
<tr>
<td>Hot stuffy road</td>
<td>49</td>
</tr>
<tr>
<td>Monotonous work/road*</td>
<td>46</td>
</tr>
<tr>
<td>Poor sleep quality in the truck berth*</td>
<td>29</td>
</tr>
<tr>
<td>Time of day – particularly night driving</td>
<td>19</td>
</tr>
<tr>
<td>Loading or assisting loading between trips</td>
<td>11</td>
</tr>
<tr>
<td>Other factors†</td>
<td>6</td>
</tr>
</tbody>
</table>

*The recommended speed limit of 80 km/h was considered tiring, as well as always taking the same route.

†Either because the mattress was too thin or it got too hot because of the proximity of the engine to the mattress.

‡Other factors cited included poor daytime sleep, being at work constantly, working overtime, sitting and driving, and oncoming lights.

Discussion

Many of South Africa’s long-haul truck drivers are at risk of being involved in traffic accidents because of their disturbed sleep. Restricted and disturbed sleep during a trip contributed significantly to the drivers not being completely alert at the start of trips, and therefore more likely to nod off behind the wheel. Those drivers who reported nodding off at the wheel also tended to have been involved in a recent near accident. Other factors cited as contributing to sleepiness included the heat, which was cited by half the drivers, just under half blamed the monotony of the road and work, and a minority found that loading or assisting with a load made them sleepy when they next drove. Similar causes of sleepiness have been cited during long-distance driving elsewhere. About three-quarters of the drivers in our survey reported that the long hours contributed to their sleepiness, over half of them claimed to work more than 70 hours per week—the upper legal limit in South Africa. Drivers who drove with a co-driver tended to work more hours per week than drivers who drove alone, and were not able to sleep properly in a moving truck. These extended work hours are comparable to those that truck drivers work in other countries. About three-quarters of the drivers in our survey reported that the long hours contributed to their sleepiness, over half of them claimed to work more than 70 hours per week—the upper legal limit in South Africa. Drivers who drove with a co-driver tended to work more hours per week than drivers who drove alone, and were not able to sleep properly in a moving truck. These extended work hours are comparable to those that truck drivers work in other countries. About three-quarters of the drivers in our survey reported that the long hours contributed to their sleepiness, over half of them claimed to work more than 70 hours per week—the upper legal limit in South Africa. Drivers who drove with a co-driver tended to work more hours per week than drivers who drove alone, and were not able to sleep properly in a moving truck. These extended work hours are comparable to those that truck drivers work in other countries.
schedule. Regularizing sleep–wake schedules improves alertness. Most of our drivers reported starting work before 08:00 and almost a quarter said that they took rest times when the propensity to sleep is higher manage fatigue better. Our results confirm those of others and emphasize the importance of being alert at the start of a trip.

Most of the drivers’ sleep was disrupted and for a variety of reasons. The most common causes were noise (the biggest problem for just under a third of drivers), followed by extremes of temperature, outside activity, uncomfortable cabs, light, restlessness, stress or worries. The presence of a sleep disorder was likely to have exacerbated sleepiness in a substantial subgroup of drivers. One quarter of our sample was clinically obese, almost a third of our drivers reported that they snored, and approximately one in 10 had apnoeas or woke gasping for breath.

Sleep disorders such as habitual snoring and sleep apnoea mar sleep,35 increase sleepiness,19,36 and reduce attention.31 There is a strong direct association between sleep apnoea in drivers, and the risk of traffic accidents. A previous study on long-haul truck drivers showed that drivers with sleep-disordered breathing had a twofold higher accident rate than those without sleep-disordered breathing.30 Also, obese drivers reported unintentionally falling asleep more often and presented a twofold higher accident rate than non-obese drivers.2 Most relevant to us, drivers of heavy goods vehicles who snore every night are more sleepy,32,34 and have a higher accident liability than those who do not.31 In previous studies, neck circumference ranked highest as an independent predictor of snoring,38 and correlated well with the apnoea/hypopnoea index.32 Our results confirm that drivers who snore tend to be older, more likely to have a larger collar size, and a higher BMI and are more likely to report signs of sleep apnoea. These drivers are more likely to have experienced an accident, and to nod off behind the wheel. The drivers who reported being less than completely alert at the start of a trip had a higher BMI than those who did not. So other drivers who participated in our study who had a high BMI and collar size may have had sleep apnoea without being aware of their condition or its consequences for driving.

From our sample, age and driving experience showed an inverse relationship, as expected. The younger drivers, with less driving experience, were more likely to have had a near accident in the past six months. Our findings confirm previous reports which show that accident frequency decreased with increased age (and driving experience),10,29,38 and particularly that sleep-related accidents were more frequent in younger drivers.60 The driving experience acquired with age appears to equip the driver with better skills to avoid potential accident situations.17

Although just about two-thirds of our drivers were aware of falling asleep behind the wheel at least sometimes, only about half reported stopping driving, even for a few minutes, when they felt sleepy. Reyner and Horne19 reported that drivers making serious sleep-related errors were aware of being sleepy well beforehand. Even experienced drivers commit more errors as subjective sleepiness worsens.26 Techniques employed by our drivers to alleviate sleepiness included caffeine consumption, increasing ventilation in the truck, and listening to the radio. Although these techniques provide some relief, the improvement in alertness is only transient, and the effects on driving performance negligible.4,19,47 Taking stimulants is apparently less of a problem in South African truck drivers than in Australian drivers.7

Although subjective data have limitations, the best information drivers have about sleepiness comes from their own self-knowledge12 and it is their personal experience of sleepiness and fatigue that ultimately will determine whether they adopt good sleep hygiene and fatigue reduction strategies.1,12 Since our drivers were unlikely to obtain any immediate benefit from misrepresenting information, there was no incentive for them to provide false information. Clear trends emerged from the subjects, each of whom was unaware of any other driver’s responses.

In conclusion, we have found that long-haul truck drivers in South Africa are at significant risk of having a sleep-related road accident. The factors that put all drivers at risk, and those that distinguish the driver with exaggerated risk, are similar to the factors that induce the same situation in more affluent and better-regulated countries. An additional challenge in the South African context is the higher risk of crime, which was not specifically addressed in this study, but may contribute to drivers being unwilling to take a break at the road-side or a rest-stop if they become sleepy. Improved contact and monitoring by cell phone and electronic devices may provide better security.

Interventions that might attenuate the risk of long-haul driving accidents in South Africa, according to our data, include reducing the working week and increasing the time available for relaxation and sleep, air conditioning of cabs, the provision of quiet sleeping accommodation near safe truck stops, rescheduling driving trips towards more regular hours of work with later starts to trips, and treatment of sleep-disordered breathing and obesity where they occur. Regulation of infringements at the company level would contribute substantially to an improvement of working conditions, as well as driver performance and well being. Driving while deprived of sleep poses a danger to all road users.

We are indebted to the trucking companies and the drivers who participated in this study. Thanks to Fiona Baker for valuable technical assistance and advice, and to her and to David Makea, Jackie Mahlabla, Muzi Maseko, Lennox Nqobo and Simone Glassom for assisting with interviews.

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