

**Israeli Commercial Drivers and Alcohol Misuse:
Impact, Prevalence, and Risk Factors**

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Executive Summary

This study reports on a survey of 227 commercial (i.e., bus and truck) drivers in Israel conducted in 2011 and 2012. The purpose of the study was to assess the prevalence of risky drinking and its distribution among the commercial driver workforce in Israel, as well as to identify possible work conditions, policies and practices that might be associated with the precipitation and/or exacerbation of such behavior. The study's findings indicate that there is a direct association between the severity of risky drinking and the frequency of driver involvement in moderate to severe motor vehicle accidents (MVAs). Nevertheless, they also indicate a relatively low base-rate of risky drinking among those participating in the study. Even on the basis of a lower-than-usual cutoff score for risky drinking (6 on the AUDIT scale rather than 8), we found fewer than 6% of drivers self-reporting to engage in such behavior. Key work-related factors associated with the severity of drivers' risky drinking included the perception of permissive co-worker drinking norms, role conflict, and supervisory abuse. Additionally, among those perceiving more permissive drinking cultures, we found an inverse association between supervisors' intervention competencies and the severity of driver risky drinking, suggesting that in these situations, supervisory monitoring and intervention may serve as an important protective factor. Based on these findings, we offer a number of practical steps that may be taken by policy makers and leaders in government, management and labor organizations to address this issue in general, and the risk factors that we identified in particular.

Studies suggest that those who drive large vehicles (e.g., trucks and busses) for a living (henceforth, *commercial drivers*) are more likely to be involved in a vehicular accident than private motorists, even when mileage is taken into account (e.g. Chapman, Roberts & Underwood, 2000; Broughton et al, 2003). Indeed, accidents involving those employed who drive for a living account for a large proportion of the total number of work-related deaths in the world. For example, in Australia, almost half of all motor vehicle accidents involve commercial (i.e., truck) drivers (Mitchell, Driscoll & Healey, 2004; Boufous & Williamson, 2006), while in Greece, 25 percent of all accidents involve heavy trucks (Tzamalouka, Papadakaki & Chliaoutakis, 2005). In Sweden, commercial drivers account for the greatest number of those injured or killed on the job relative to their representation in the workforce, with driver deaths accounting for about 10 percent of all work-related fatalities in that country (Bylund, Björnstig & Larsson, 1997). And in terms of economic impact, Miller and Galbraith (1995) calculated that motor vehicle accidents (MVA) involving commercial drivers cost the US economy some \$23 billion per year, or approximately 17 percent of the \$140 billion in workplace injury- and fatality-related lost productivity in the United States.

Similarly, in Israel, commercial drivers are disproportionately involved in vehicular accidents. One of every 1000 trucks weighing 3.5-34 tons was involved in an accident in 2011. This figure that is six times more than the accident rate for private vehicles in that same year. Moreover, nearly 3 percent of all trucks weighing over 34 tons were involved in an accident, a figure which is 25 times greater than that of private vehicles. No less surprising is the fact that bus crashes account for some 10 percent of total road fatal accidents in Israel with 2 of every 1000 buses involved in an accident in 2011 (18 times more than private vehicles; Israel Road Safety Authority, 2012). Moreover, the involvement of commercial drivers in fatal MVAs appears to be increasing in Israel. In 2011, 383 people died in 340 fatal accidents in Israel (an increase of 2% compared to the previous year), with trucks involved in 61 (or 18%) of these accidents, and buses involved in an additional 35 (10%). That is, commercial

drivers were involved in over 25% of all MVAs involving fatalities in Israel, an increase of 30 to 40 percent compared to prior years (Israel Road Safety Authority, 2012).

The disproportionate involvement of commercial drivers in MVAs suggests the need to better understand what it is about commercial driving that may account for such a high accident rate. Given that commercial driving involves heavier vehicles demanding quicker response times, research into the factors increasing commercial drivers' vulnerability have focused on human factors, and in particular, on those conditions and behaviors that may adversely affect driver awareness, mindfulness and/or response times such as driver exhaustion and alcohol misuse.

Research into the prevalence and causes of driver exhaustion is extensive with studies finding that fatigue leads to a reduction in alertness, longer reaction times, poor psychometric coordination and less efficient information processing (Lavie et al., 1987; Horne and Reyner, 1995). This is hardly surprising given that cognitive competencies lie at the very core of safe driving (Aworemi et al, 2010). Indeed, several studies identify driver fatigue as a key cause of accidents involving heavy vehicles. For example Hussein (2009) found that 58 percent of the 107 truck accidents examined were attributable to driver fatigue. Similarly, Sabbagh-Ehrlich et al. (2005) interviewed 160 truck drivers, finding that fatigue is highly prevalent among long-haul truck drivers, with nearly a third reporting having fallen asleep at the wheel at least once in the past year. Importantly, her research points to the link between employment policies and practices on the one hand, and driver fatigue on the other.

In contrast, we know little about alcohol misuse among commercial drivers. Data collected among truck drivers by the Substance Abuse and Mental Health Services Administration (USA) indicate prevalence rates of 14.3% for heavy alcohol use, a key element in risky drinking behavior. While other studies (Couper, et al. 2002) conducted in North America report that the prevalence of trace findings of excessive blood alcohol concentrations ($BAC > 0.04$) among on-duty drivers is substantially lower (approximately 2%), for a number of

reasons, even these figures are disturbing. First, these figures stem from countries in which, unlike Israel, pre-employment and random alcohol/drug-testing regulations are rigorously enforced. Second, although trucks represent just 6 percent of all vehicles on Israeli roads, truck crashes account for 20 percent of road deaths in Israel (Sabbagh-Ehrlich, Friedman & Richter, 2005). Thus, even a 2 percent prevalence rate of excessive BAC levels can have broad road safety implications. Indeed, among fatally injured truck drivers in the USA, 33 percent of the drivers had detectable blood concentrations of alcohol. Nevertheless, researchers have yet to study the prevalence of alcohol misuse or impairment among commercial drivers in Israel. Moreover, little is known about the work-related risk factors potentially associated with substance misuse among these workers.

Accordingly, the two over-arching objectives of this study are to: (a) assess the prevalence of those patterns of drinking that may heighten drivers' risk of involvement in MVAs, and (b) examine the degree to which work-related factors identified in other occupations may similarly serve as occupational risk factors for alcohol misuse among commercial drivers. Getting a better understanding of the prevalence of misuse is critical from a policy perspective in that efficient resource allocation is contingent upon understanding the severity of the problem and identifying among which driver subpopulations it may be most concentrated (Frone, 2006). Enhancing our understanding of work-related risk factors is important in that in order to design effective workplace prevention efforts, it is critical to first identify those dimensions of work and employment that are most strongly associated with the behavior itself.

Alcohol Misuse, Alcohol Impairment and Risky Drinking

Clearly, the operation of a motor vehicle by an alcohol-impaired individual increases that person's risk of being involved in an accident. But there are vastly different opinions as to what level or pattern of alcohol consumption is associated with alcohol impairment. For

example while there is substantial evidence that low ($\leq .05\%$) to moderate ($> .05\%$ to $.08\%$) Blood Alcohol Content or **BAC** does *not* affect performance on simple reaction time tasks or simple motor or choice reaction time tasks, there *is* evidence that such moderate BAC levels may impair performance on more complex tasks such as those requiring the performance of several functions simultaneously and/or in a very short time span (Martin, 2007; Jung, 2001). Indeed, Zador, Krawchuk and Voas (2000) found the relative risk of crash involvement to be dramatically higher even at the moderate BAC levels noted above. Similarly, Moskowitz and Fiorentino's (2000) review of 112 studies examining the link between BAC and driver behavior indicates that BACs of as low as 0.01 can have a significant impact on a variety of mental functions required for safe driving including pattern recognition, reasoning, detection of auditory and visual stimuli, ability to divide attention, time estimation, traffic hazard perception, anticipation time, and general reaction time. These authors report that by BACs of 0.05 g/dl (the BAC resulting approximately an hour after an adult male consumes two drinks, and the legal limit in Israel), the majority of the experimental studies examined reported significant driver skills impairment, and that by 0.08 g/dl, more than 94% of the studies reviewed exhibited significant driver skills impairment, concluding that "all drivers are expected to experience impairment in some driving-related skills by 0.08 g/dl or less."

Furthermore, as a number of researchers have noted, the resulting pharmacological effects on cognition may generate all kinds of atypical (and in a driving context, highly risky) behaviors, including aggression and hostility (Gustafson, 1986; Steele & Josephs, 1990; Steele & Southwick, 1985). According to the disinhibition hypothesis, these behaviors may occur because alcohol weakens brain mechanisms (e.g., the ability to accurately assess the risk of acting on an immediate aggressive impulse) that normally restrain impulsive behaviors, including inappropriate aggression (Cook & Moore, 1993; Gustafson, 1994).

Studies also suggest that these pharmacological effects, are the highest within an hour of the actual drinking episode (when blood alcohol concentration or BAC is highest) (Frone,

2012). How long these effects may linger after the actual drinking episode ends depends on the initial BAC, the individual's body mass, and other factors affecting alcohol metabolization. Accordingly, some studies suggest that among those manifesting a pattern of heavy or at-risk drinking (i.e., defined as the consumption of five servings of alcohol on a given day for men (and four for women); National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2005) these effects may last for several hours after the conclusion of a drinking episode (Wilkinson, Sedman, Sakmar, Kay, & Wagner, 1977). Others suggest that even consistent moderate alcohol consumption (e.g., 2-3 drinks daily) -- if spread out over several hours or over 2 or 3 drinking occasions throughout the day -- is unlikely to place the individual at heightened risk (Bacharach, Bamberger & Biron. 2010). Similarly, although moderate consumption that is time-concentrated (i.e., 2 or 3 drinks in one sitting) may, as noted above, result in acute intoxication, even this pattern of consumption may not increase relative risk if the drinking occurs two or three hours before the individual gets behind the wheel as BAC will in most cases decrease to levels below a BAC of 0.05 g/dl within that time.

Nevertheless, based on his review of the research on the pharmacological effects of alcohol, Frone (2012: 85) concludes that there is consistent evidence that "cognitive and psychomotor impairment increases as both the level of acute intoxication (BAC) and the complexity of the task increase." Given that commercial driving involves a relatively high degree of cognitive and psychomotor complexity, the pharmacological literature suggests that the relative risk of accident involvement increases at even moderate levels of alcohol consumption if this consumption occurs proximate to the time of vehicle operation. Accordingly, the consumption of even moderate amounts of alcohol (i.e., 2-3 servings) at a single sitting may serve as risky drinking behavior among commercial drivers, particularly if such behavior occurs frequently enough to increase the likelihood that it occurs proximate to vehicle operation.

Although the evidence above suggests that drivers' risky drinking may at least partially explain their disproportionate involvement in MVAs, we know little about the prevalence of such behavior among commercial drivers. While an understanding of drivers' basic patterns of alcohol consumption is likely to be informative, the pharmacological evidence presented above suggests that research on driver risk should most likely focus on those particular patterns of alcohol consumption most likely to be linked with acute intoxication; that is patterns that might result in alcohol-impaired driving (or driving while intoxicated; **DWI**) and hence increased risk of MVA. Such *risky drinking* (also referred to as alcohol misuse; Frone, 2012) typically involves periodic heavy alcohol consumption (i.e., 6 or more servings of alcohol at one time), high modal consumption (i.e., 3 or more drinks per day on a consistent basis), and/or other alcohol-related behaviors or consequences indicative of misuse. Risky drinking behavior may increase the risk of DWI and thus MVA involvement by increasing the probability that at the time of vehicle operation, the driver's BAC is high enough for perception, information processing and stimulus-response to be impaired and perhaps (depending on the quantity and type of alcohol consumed and the driver's body mass, up to 2 to 4 hours; Wilkinson et al., 1977; NIAAA, 2005) remain impaired for an extended period of time. Indeed, research suggests that risky drinkers are more than 30 times as likely to DWI as those either abstaining or drinking moderately (Liu et al., 1997), and more than 70% of drivers convicted of DWI have been assessed as engaging in risky drinking (CDC, 2011). **Accordingly, in this study, our primary focus is on risky drinking, and more specifically: (a) its link to MVA involvement (i.e., impact), (b) its prevalence and (c) distribution among commercial drivers, and (d) the work-related factors that may be associated with (and perhaps predictive of) it.**

Brief summary of findings on alcohol consumption and alcohol-related MVAs in Israel:

Until recently, Israel was considered to be a country with relatively few alcohol-related

problems (Bamberger & Barhom-Kidron, 1998). However, the 1990s were characterized by a general increase in alcohol consumption across Israel's various sub-populations, with the proportion of adults consuming alcohol on a regular basis jumping from 30% in 1995 to 38% in 1998 (Weiss, 2000). Recent data published by the Israel Anti-Drug Authority (Bar Hamburger et al., 2009) indicates that 64% of the population between the ages of 18 to 40 in Israel consumes alcohol (typically wine) on at least a periodic basis. This figure is similar to the prevalence rate of consumption found in earlier study (Bar Hamburger et al., 2005). According to the report (Bar Hamburger et al., 2009), prevalence rates are significantly higher for those between the ages of 18-34 (approximately 66% report consuming alcohol) and for those immigrating after 1989 (75%) than for those between the ages of 35-40 (60% consume alcohol) and those either born in Israel (68%) or immigrating before 1989 (74%). More significantly, Bar Hamburger et al. (2009) found 25% of study participants reporting having been intoxicated at least one during the previous 12 months (compared to 12% in 2005), and 21% reporting having consumed five or more servings at a single seating (i.e., meeting the NIH criteria for "heavy drinking") in the previous month (compared to 18% in 2005). Weiss, (2000) estimates the number of alcoholics in Israel at between 50,000 to 100,000.

In terms of alcohol consumption among those in the active workforce, the most recent IADA epidemiological study (Bar Hamburger et al., 2009) finds that a higher proportion of individuals employed in the service occupations consumed alcohol at least one time in the past year (72%) than all other surveyed occupations (next highest being Professional workers {Industry, Construction, Agriculture} at 68%). Still, these data indicate that, prevalence of substance use (defined in terms of use at least one time in the past year) does not significantly vary by employment sector.

To our knowledge, only one study has attempted to estimate the prevalence of *workplace* (as opposed to workforce) substance abuse or impairment. Using a national sample of 100 Israeli enterprises, Bamberger and Biron (2006) estimated the national prevalence rate

of workplace substance use or impairment in Israel to be 0.16% with the highest rate of reported on-site alcohol use or impairment in the past year among mid-size enterprises (i.e., those with between 200-500 employees; 30% of firms reported one or more such cases), and enterprises employing a high proportion of post-1989 émigrés (36% of such firms report one or more such cases vs. 19% of firms employing a low proportion of post-1989 émigrés).

Finally, just as worksite alcohol research in Israel is limited, so too are data regarding the link between alcohol consumption and road safety in Israel. Israeli legislation permits individuals to drive as long as their BAC is 50 mg of alcohol for 100 ml of blood or less (the level of alcohol remaining in the blood up to one hour after consuming the equivalent of roughly 1.5 servings of alcohol). This level is higher than that of some countries (particularly those promoting a "zero tolerance" policy such as Estonia and Japan), but lower than that of others (e.g., Ireland which allows levels of up to 0.8) (Weiss, 2001; European Committee, 2012). However, because BAC is not routinely checked among Israeli drivers, there is little consistency across studies examining the proportion of road accidents involving alcohol (e.g., reports range from 7% of deadly accidents involving alcohol, to 15%) (Or Yarok, 2007). Despite these inconsistencies, what does seem apparent is that, like the rate of alcohol consumption in general, the proportion of road accidents attributable in part or in toll to alcohol has been consistently on the rise (Or Yarok, 2007).

The Impact and Prevalence of Risky Drinking Among Israeli Commercial Drivers

Despite the harmful consequences of risky drinking noted above, many individuals continue to drink and drive. Indeed, in 2005, there were 16,885 traffic fatalities due to alcohol-related crashes in the United States and over 1.4 million drivers were arrested for driving under the influence of alcohol or narcotics (NHTSA, 2005). In Israel, although drivers caught with a BAC of > 0.05% are, as noted above, subject to criminal prosecution, recent estimates are that alcohol is nevertheless involved in up to nine percent of all vehicular crashes involving drivers

between the ages of 25-44 (Peleg & Aharonson, 2004; Central Bureau of Statistics, 2006), and over 4 percent of all road accident-related emergency room admissions (Soffer et al., 2006). The proportion of *fatal* accidents attributable to DWI among *all* drivers (i.e., not just commercial drivers) ranges anywhere from 7 of to 15 percent (Or Yarok, 2007).

Surprisingly, despite the disproportionate involvement of commercial drivers in MVAs, we have no data on the prevalence of risky drinking among Israeli commercial drivers or its association with MVA involvement. Moreover, even American data regarding the involvement of alcohol in crashes involving commercial drivers is rather mixed. On the one hand, data collected among truck drivers by the US Government indicate prevalence rates of 14.3 percent for heavy alcohol use, suggesting a high potential for substance-involvement in accidents involving commercial vehicles such as trucks and busses. Moreover, among fatally injured truck drivers in the USA, detectable blood concentrations of alcohol were found in 33% of the cases. On the other hand, Couper, et al. (2002) report that the prevalence of trace findings of illicit substances or excessive blood alcohol concentrations (BAC>0.04) among on-duty drivers is substantially lower (approx. 2%), with the American Trucking Association (2007) reporting a positive, post-crash alcohol test rate of just 0.1% (i.e., just 1 in 1000 truckers involved in a crash testing positive for a BAC of > 0.04).

Still, considering that while trucks represent just 6 percent of all vehicles on Israeli roads, truck crashes account for 20 percent of road deaths in Israel, and that 6.4 of every 1000 trucks weighing 34 tons or more were involved in an accident in 2006 (costing the Israeli economy over NIS 300 million in damages) (Haaretz, 2008), even a 1 percent prevalence rate of risky drinking (resulting in potential on-the job impairment with a BAC > 0.04) among Israel's on-duty commercial driver population -- half that reported by Couper et al. -- may have broad road safety implications. **Accordingly, the first two goals of our study were to: (a) assess the degree to which risky drinking may be associated with Israeli commercial drivers' involvement in road-related incidents and (b) estimate -- using the World Health**

Organization's *Alcohol Use Disorder Inventory Test* (AUDIT) -- the prevalence of risky drinking among commercial truck and bus drivers in Israel.

Predictions: Although we posit no formal hypotheses with regard to these first two objectives, previous research in other countries provides some insight into what might be expected in Israel. Accordingly with regard to the first objective (i.e., link to MVA involvement), based on the pharmacological evidence provided above, we expect that whatever the link between risky drinking and MVA involvement, this association is likely to be substantially stronger than that between a more general, modal pattern of alcohol consumption (i.e., frequency and quantity of consumption) and MVA involvement.

Regarding the second (prevalence-related) objective, we expect prevalence rates of risky drinking among Israeli commercial drivers to be considerably lower than that of their American counterparts (i.e., as noted above, around 14 percent) for several reasons. First, prior occupational prevalence research conducted in the United States (Frone, 2006) and Israel (Bamberger & Biron, 2006) suggests that although risky drinking is relatively rare in both workforces, it is more rare in Israel than the United States. For example, in the United States, Frone (2006) found only 1.8% of workers drinking at least one time in the 12-month period before coming to work, and 7.1% of workers drinking at least one time in the 12-month period during the workday (i.e., during lunch breaks, during other breaks), with most of those engaging in such risky behavior employed in such occupations as management, arts and entertainment, food preparation and serving, construction and building maintenance, and sales (Frone, 2006; 2012). In contrast, using a similar metric, Bamberger and Biron (2006) reported an overall 12-month prevalence rate for workplace substance use in Israel of just 0.16%. Second, the nature of the transport industry in Israel – and in particular, the fact that few driving jobs require trips lasting more than several hours – is such that many of the work-

related factors contributing to such behaviors (discussed below) among American drivers are likely to be less applicable to Israeli drivers.

The Distribution of Risky Drinking Among Israeli Commercial Drivers

The third objective of this study was to get a sense of the distribution of risky drinking across the commercial driver population and thus assess the degree to which the problem of risky drinking is more concentrated in some demographic driver groups than others. As suggested earlier, this is important in order to be able to target and hence more efficiently allocate prevention and intervention resources.

Prior research in the USA and Israel suggests that risky drinking tends to be unevenly distributed among and within workforce subpopulations. For example, in the USA, the prevalence of risky drinking among women between the ages of 18-30 employed in low risk occupations was 32% vs. 55% for men of the same age and in the same occupations, and 13% for women ages 31-65 in these same occupations. Similarly, in Israel, Bamberger and Biron (2006) found the prevalence of at-work impairment to be higher in enterprises employing a higher proportion of men and immigrants from the former Soviet states, and lower in enterprises engaging a higher proportion of Muslims. Accordingly, in the current study, we examine how the level of risky drinking may be linked to driver age, ethnicity, tenure, as well as with the type of vehicle operated by the driver (i.e., bus vs. truck).

Age: There is a relatively high degree of consensus regarding the link between age and risky drinking, with most scholars positing an inverse relationship. Underlying this logic are several arguments. For example one explanation of the inverse age-drinking relationship is that with age comes increasing responsibility and the recognition that risky drinking may have adverse, employment-related consequences for the individual (Maggs & Schulenberg, 2004). A second

is that as individuals age, they take on increased family responsibilities, such that the adverse consequences of risky drinking may not impact only themselves, but also their spouse and children as well (Schulenberg et al. 2003). Findings from empirical research in the USA and Israel are consistent with this logic, indicating that among employed adults, risky patterns of alcohol consumption are more prevalent among younger than older workers (Frone, 2006; Bamberger & Biron, 2006), and that among employed adults, alcohol misuse decreases with age (Bacharach et al., 2002; Frone 2012). Also consistent with this logic are findings regarding the link between age and DWI which indicate that those under the age of 35 are at a significantly higher risk of driving under the influence of alcohol (Maskalyk, 2003; NHTSA, 2003). Thus, we propose:

Hypothesis 1: Age will be inversely associated with the severity of risky drinking behavior among commercial drivers.

Ethnicity: Ethnicity may also be associated with differential patterns of drinking behavior in that ethnic identity may define for the individual a set of norms and implicit rules guiding alcohol consumption (Heath, 2000; Bamberger & Barhom-Kidron, 1998). Ethnographic research conducted in Israel on the link between ethnic identity and drinking among employees suggests that even subtle ethnic differences can have substantial implications on patterns of alcohol consumption (Bamberger & Barhom-Kidron, 1998). For example, although Snyder's (1958) classic study suggests that, for a variety of reasons, Jews drink less than other ethnic groups, Bamberger and Barhom-Kidron (1998) demonstrate that this may not be the case in Israel in that consumption patterns for Jewish Israelis from particular ethnic backgrounds may be more similar to that of the non-Jews in the countries from which they emigrated, while for large groups of no-Jews (e.g., Muslims), abstinence may be the rule due to the Koran's blanket prohibition against alcohol consumption. Given that the truck and bus driver population

includes a substantial proportion of Jewish immigrants from high consumption countries (e.g., former Soviet countries) as well as Muslim Arabs, we posit:

Hypothesis 2: The severity of risky drinking behavior will be higher among commercial drivers self-identifying as Jews than of those self-identifying as members of some other ethnic group.

Job Tenure: Studies also suggest that over and above the effects of age, job tenure seems to have a significant vulnerability effect on employee alcohol misuse. For example, Ragland et al. (1995) found that there was a positive association between the number of years driving buses and the average weekly alcohol consumption. These same investigators found that the number of heavy drinkers (more than 15 drinks per week) was also progressively higher as service tenure increased. Such findings are interesting in that age and tenure tend to be positively correlated and, as noted above, age has typically been found to relate *inversely* with risky drinking. One explanation for these divergent findings may be that the tenure-drinking relationship may be cohort-governed, with more tenured cohorts in the United States holding more permissive drinking norms relative to those entering more recently. Alternatively, the heightened vulnerability of more veteran workers may be stress-related with more tenured drivers also being the most burnt-out and thus, the most likely to use alcohol as a means of tension reduction (Frone, 1999). In light of these findings, it is likely that the distribution of risky drinking will be higher among less tenured employees, but that any such inverse association tenure and the severity of risky drinking will be diluted when age is taken into account. Accordingly, we propose that:

Hypothesis 3: Tenure will be inversely associated with the severity of risky drinking.

Bus versus Truck (Vehicle type): Finally, it is likely that risky patterns of drinking will be more prevalent among truck (as opposed to bus) drivers. While the operation of both types of vehicles involves complex cognitive and psychomotor functions, bus driving also entails heavy

psycho-social demands. Indeed, drivers are not only expected to drive safely and stay on schedule, they are also expected to be courteous and helpful to their customers and provide exceptional customer service (Tse, Flin, & Mearns, 2006). On the one hand, as with other service workers, such demands might take their emotional toll on bus drivers, with risky drinking being adopted as a means of tension reduction (Conger, 1956). On the other hand, the heavy moral responsibility associated with transporting people as opposed to cargo, as well as the heightened visibility of psycho-motor performance for bus as opposed to truck drivers, likely motivate drivers to manage job-related stress in ways that are less likely to put passengers at risk. Indeed, according to the U.S. Department of Transportation (DOT, 2010), trucks are disproportionately more involved in MVAs than busses. Accordingly, we posit that:

Hypotheses 4: The severity of risky drinking will be greater among truck drivers relative to bus drivers.

Work-related Risk Factors and Problem Drinking among Commercial Drivers

As noted above, the fourth research question addressed by this study concerns the role played by work-related conditions in explaining the severity of risky drinking among commercial drivers. A focus strictly on the demographic covariates of risky drinking implicitly assumes that risky drinking is a problem that commercial drivers bring to the workplace. However, a number of scholars suggest that regardless of the occupation, certain workplace conditions may increase employees' vulnerability to risky drinking, thus precipitating such behavior or exacerbating it (Bacharach et al, 2002). These conditions are typically referred to as work-related risk factors. Accordingly, as in other occupations, there are likely to be certain aspects of commercial driving that may be conducive to the initiation or exacerbation of risky drinking. Bacharach et al., (2002) and Frone (2012) identify three major sets of work-related risk factors potentially associated with the onset or exacerbation of employee drinking problems, namely: occupational stress, permissive drinking norms, and workplace social control and policy enforcement.

Occupational Stress: Drawing from a tension-reduction perspective (Conger, 1956), several studies suggest that employee risky drinking may represent a strategy to cope with negative emotions resulting from exposure to aversive physical and psychosocial qualities of the work environment (Frone, 1999). A wide variety of workplace conditions, policies and practices may serve as “stressors” or stimuli generating the negative emotional states for which alcohol may be used as a means of coping (Frone, 1999). Some of the stressors found in other studies to be linked to heightened employee drinking or alcohol misuse include: excessive or conflicting work demands (Grunberg et al., 1998; Bacharach et al., 2002), abusive supervisors or co-workers (Bamberger & Bacharach, 2006; Rospenda, Richman & Shannon, 2009), job insecurity (Diaz & Cabrera, 1997, Frone 2008), exposure to traumatic workplace events (Bamberger, 2005), hazards work environments (Frone, 2012) and work-family conflicts (Bellavia & Frone, 2005). Several studies suggest that drivers are exposed to a wide variety of both acute and chronic stressors (Tse, Flin & Mearns, 2006; Ogazi & Edison, 2012), including conflicting work demands, work-family conflicts, workplace hazards and non-supportive supervision (Evans & Carrere 1991; Kompier, 1996; Kompier & di Martino, 1995; De Croon et al., 2004). To the extent that some drivers, like workers employed in other occupations, may use alcohol as a mode of tension reduction (Frone, 1999), we posit:

Hypothesis 5: The severity of risky drinking behavior will be positively associated with the level of perceived workplace stressors such as (5a) role conflict, (5b) work-family conflict, (5c) hazardous workplace climate and (5d) supervisory abuse.

Underlying this stress-based perspective is the idea that these stressors likely affect risky-drinking by virtue of their effect on the employee’s emotional state, with employees using alcohol to address the negative emotional state (such as stress) resulting from the stressors, rather than the stressors themselves (Frone, 1999). This suggests that stressors may generate

stress-induced alcohol misuse, with stress – a key negative emotional state -- mediating the link between these stressors and risky drinking. Accordingly we posit that:

Hypothesis 6: The association between workplace stressors and the severity of risky drinking behavior will be mediated by drivers' felt stress.

Permissive Drinking Norms or Social Availability: Second, research on occupational and workplace cultures suggests that worksite drinking and other problematic employee drinking behaviors are likely to be more prevalent in those work contexts in which alcohol is socially available (Ames, Grube & Moore, 2000). The perception of implicit approval of drinking in certain contexts (e.g., before work; after work; in the workplace) by those in one's social network serves as an indicator of injunctive (or attitudinal) drinking norms. Based on theories of social norms and social influence (Cialdini & Trost, 1998), scholars have posited and demonstrated that such perceptions often play a key role in affecting employee risky drinking (Frone, 2012). Indeed, Bacharach et al. (2002) found permissive injunctive drinking norms to have the most potent, direct effects on employee drinking behavior, far outweighing the effects of stressors and other workplace risk factors. Accordingly, we propose:

Hypothesis 7: The severity of risky drinking behavior will be positively associated with perceptions of coworkers' injunctive drinking norms.

Workplace Social Control and Policy Enforcement: As noted by Roman (1980: 407), workplace social control “is exercised through socialization, patterns of reward distribution, and efforts to identify and control deviant behavior.” From a workplace social control perspective, a key work-related risk factor is the failure of the enterprise or other relevant institutions to regulate employee alcohol use. Researchers examining how social control affects employee alcohol use tend to focus on such factors as the existence of alcohol-related policy, direct supervisory enforcement, and the visibility of job performance and supervisor

contact. To date, scholars have found little or no support for a protective role of alcohol-related policy or policy enforcement by supervisors. For example Larson et al. (2007) failed to find a link between employment in an enterprise with a written workplace alcohol policy and employee heavy alcohol use (Roman & Trice, 1972). Similarly, while support has been found for an inverse association between supervisor contact/enforcement and employee alcohol use at work (Ames et al., 2000; Moore et al., 2012; Frone & Trinidad 2012), in just as many studies have no evidence of a protective effect has been detected (Bacharach et al., 2002; Macdonald et al., 1999; Parker & Farmer, 1988). For example, Ames et al., (2000) found ethnographic evidence that employee perceptions of their supervisor's willingness and ability to intervene in suspected cases of employee alcohol impairment at work was inversely associated with problem drinking. In contrast, when examined together with other variables, a measure of perceived supervisory willingness and ability to intervene had no significant inverse association with employee problem drinking. Where scholars *have* found support for the social control perspective is with respect to the visibility of job performance (Frone, 2003; Macdonald et al., 1999). More specifically, these studies have found employee alcohol misuse to be significantly lower among employees: (a) employed in positions in which they have more contact with their supervisors, and who (b) feel that their performance is visible to their supervisors and that their supervisors closely monitor their work performance.

Although there appears to be consistent support only with regard to supervisory contact and visibility, it is possible that supervisory willingness and ability to intervene may play a role in reducing vulnerability in some occupations but not others. Accordingly, we posit:

Hypothesis 8: The severity of risky drinking behavior will be inversely related to the level of alcohol policy enforcement such that risky drinking behavior will be inversely related to (a) supervisory contact, (b) supervisory monitoring, and (c) supervisors' willingness and ability to intervene when alcohol impairment is suspected.

The Conditioning Effects of Injunctive Drinking Norms: Aside from the direct, additive effects of one set of risk factors or another on risky drinking, a number of work-related risk factors may work in combination (i.e., interact) to explain risky drinking among drivers. For example, Frone (1999) posits, and Bacharach et al. (2002) find that the relationship between workplace stress and the severity of alcohol misuse may be amplified in the context of more permissive coworker injunctive drinking norms. As Frone (1999) notes, the basic premise of such a moderation model is that injunctive norms, by creating a more vulnerable environment for employees, heighten the potential impact that stressors may have (via felt strain) on drinking. One way that this may occur is that in such contexts, employees may deem it more normatively legitimate to use alcohol as a means by which to cope with negative emotional states (Grunberg et al., 1999). Alternatively, employees in such contexts may draw from more permissive peer drinking norms that heavier (as opposed to more moderate) alcohol consumption is the “right” way to address work-based tension, with the result being that when employees in such contexts engage in stress-induced alcohol use, their intake is higher than that of employees engaged in work contexts characterized by less permissive injunctive drinking norms (Sonnenstuhl, 1996). Accordingly, we propose:

Hypothesis 9: The relationship between workplace stressors and risky drinking will be moderated by perceptions of more permissive coworker injunctive drinking norms, such that this relationship will be amplified in among those employees perceiving their coworkers as holding more permissive drinking norms and attenuated among those perceiving their coworkers as possessing more restrictive drinking norms.

Similarly, injunctive drinking norms may moderate the impact of social control variables on the severity of risky drinking among commercial drivers. However, the nature of this interaction remains uncertain. Trice and Roman (1972) suggest that while greater monitoring may be unnecessary and in fact counter-productive (i.e., breeding resistance) in those work contexts in which there is no real normative basis for assuming that employees report to work

impaired, in those contexts in which peer norms are supportive of heavier drinking, supervisory monitoring may have an important deterrence effect. A number of more recent studies (Frone & Trinidad, 2003; MacDonald et al., 1999) find support for such a notion.

In contrast, a number of ethnographic studies suggest that it is precisely in highly permissive drinking cultures that social control may result in labor-management conflict with employees using risky drinking as a mode of resistance. For example, Mannello and Seaman (1979) found that while enhanced alcohol policy enforcement may be effective in reducing problem drinking in the context of less permissive drinking cultures, in the railroad industry, characterized by a highly permissive drinking culture, enhanced policy enforcement over the years has only further entrenched problem drinking by employees. Similarly, Sonnenstuhl's (1996) study of problem drinking among tunnel workers suggests that in work settings in which heavy drinking is a deeply entrenched element of the occupational subculture, managerial efforts to restrict such behavior through strict social regulation is likely to backfire, resulting only in more deeply entrenched and problematic drinking behaviors. Cospers (1979: 886) provides a potential explanation for such an effect. He argues that, "in certain occupational subcultures, drinking, rather than being viewed as pathological, may be seen as communicative behavior symbolizing social solidarity." Managerial efforts to restrict or limit drinking behavior may thus be viewed by workers as a direct attempt by management to break this solidarity and to exercise more direct control in the workplace. According to the literature on workplace resistance (Hodson, 1995), all such attempts by management to exert increased control – be they directly coercive or subtly hegemonic -- are liable to trigger some form of employee resistance, ranging from spontaneous and tacit to more organized and explicit. The ethnographic literature suggests that, at least in the context of heavy drinking work cultures, when managers choose alcohol policy as the venue for exercising greater control, rather than resorting to organized protests, employees tend to use alcohol-related behaviors as a mechanism of resistance.

Although the backlash proposition emergent from the ethnographic literature (i.e., the notion that social control can exacerbate risky drinking as a form of employee resistance) may make sense in the two, rather extreme occupations studied and discussed above, its generalizability to other work contexts remains questionable. Moreover, logic suggests that supervisory-based deterrence practices such as monitoring are less likely to have detectable effects in contexts in which less permissive peer norms already operate to discourage risky drinking. Accordingly, we posit that:

Hypothesis 10: The relationship between social control and risky drinking will be moderated by injunctive drinking norms such that the inverse association between social control (i.e., supervisory contact, visibility, willingness and ability to intervene) and risky drinking will be stronger among those perceiving more permissive injunctive drinking norms than among those perceiving less permissive injunctive drinking norms.

Methods

Overall Approach

As noted above, our interest in the current study was to assess the impact, prevalence, distribution, and work-based antecedents of risky drinking (rather than on-the-job impairment) among Israeli commercial drivers. Prior research in the United States has used a roadside assessment (i.e., random testing of drivers for impairment) approach in order to capture the prevalence of on-the-job alcohol impairment (e.g., Wolfe, 1986; Voas et al., 1996). While an ideal approach for assessing on-the-job impairment, this approach has several deficits. First, it is a costly approach, requiring the allocation of substantial resources and typically demanding the involvement of law enforcement personnel (RSA, 2012). Second, given that drivers cannot be asked to complete a detailed survey on the roadside, this approach is less than ideal for the collection of risk factors data. An alternative approach involves the use of mailed surveys or phone-based interviewing. However, prior research suggests that for research on such stigma-

associated issues as risky drinking (particularly among drivers), there is a high risk of sample selection bias. Accordingly, we adopted a third approach involving the collection of self-reported, survey data from drivers either participating in a seminar on driver ergonomic health and wellbeing (approximately 75% of all participants) or waiting off-road (e.g., at some terminal) while on a designated break.

Design and Sample

Using self-report questionnaires, data were collected from a 227 commercial drivers employed by eight separate transport enterprises. 104 drivers were employed in passenger transport (i.e., bus drivers) and an additional 123 drivers were employed in commercial/goods transport (i.e., truck drivers). In the case of two enterprises, drivers were randomly sampled from two geographically separated operating divisions, with drivers in each division having little contact with the drivers in other divisions. Accordingly, we organized our data such that drivers were nested within 11 work units (4 units in two companies, and 7 units in the 7 remaining enterprises that participated in the study). Enterprises were recruited on a convenience basis, with employees from larger transport enterprises dominating our sample.

In each participating company, we surveyed a random sample of drivers. In some of these companies, surveys were distributed to the drivers during the start of a work break at a terminal and collected at the end of the break. In others, the drivers were asked by their managers to participate in a ½-day seminar on driver ergonomics, and were asked to complete the survey as part of the seminar. In all cases, participants were told that their survey was anonymous and that all data would be kept confidential with access to the surveys limited to the TAU research staff. Subjects were instructed not to fill in IDs and personal information, but were requested to enter the company name. Additionally, a survey code number was printed on each questionnaire. All participants were informed that they were under no obligation to complete the survey, and that they could stop filling it in at any point they wish. Identical

surveys (validated on the basis of back-translation from the original English) were printed in three languages (Hebrew, Arabic and Russian) to facilitate completion by drivers more proficient in one of those languages than the others.

Of the 312 surveys distributed, 239 were returned. Of these, 12 surveys were returned with less than 50% of the items completed, for a final response rate of 73 percent (227/312). It should be noted, however, that in a relatively large proportion of surveys, various items were left incomplete. Accordingly, for several of our analyses, particularly those using list-wise deletion, the actual number of analyzed responses is significantly less than 227.

All respondents were male. Respondents ranged in age from 26 to 71, with a mean age of 45.5 (s.d. = 9.95) years. As can be seen in Figure 1, most participants were between the ages of 35 - 44 years old. The youngest participant was 27 years old and the oldest was 71.

In terms of ethnicity (see Figure 2), our sample roughly reflects the ethnic breakdown in Israel, with Jews accounting for approximately 77% of the commercial driver population, and Christians, Muslims accounting for the remainder. Among the Jewish drivers, the vast majority (accounting for 59% of the full sample) identify themselves as Russian. 69.6 % of participants were born in Israel.

Muslim Druze Other

Figure 1:

Distribution of Respondents by Age

Russian Jews

Christian N=184

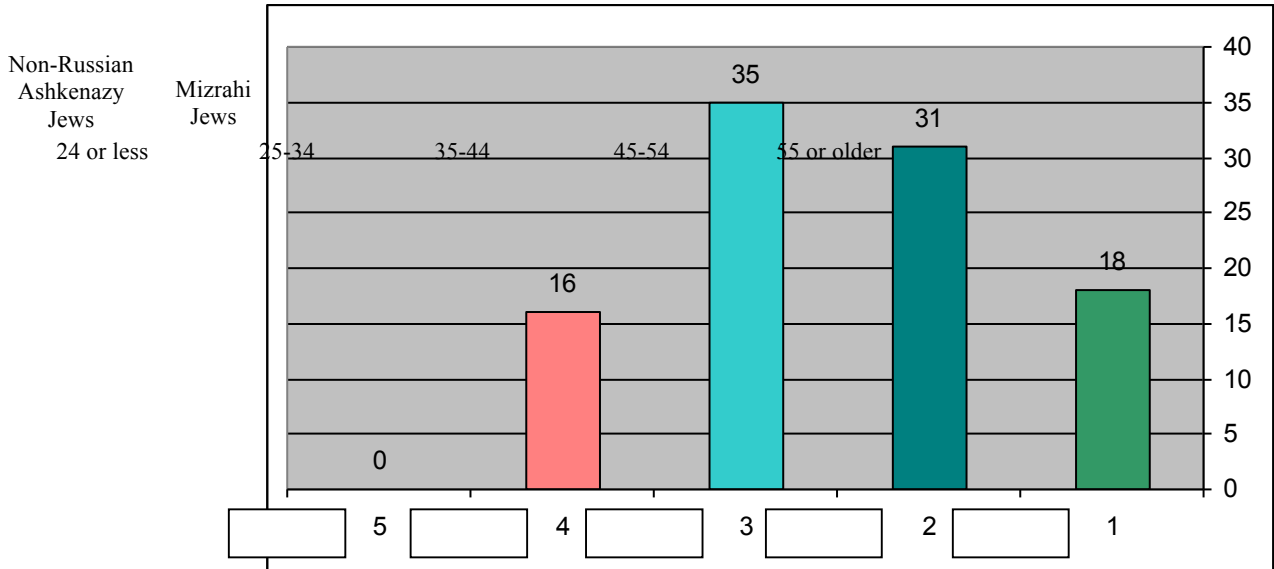
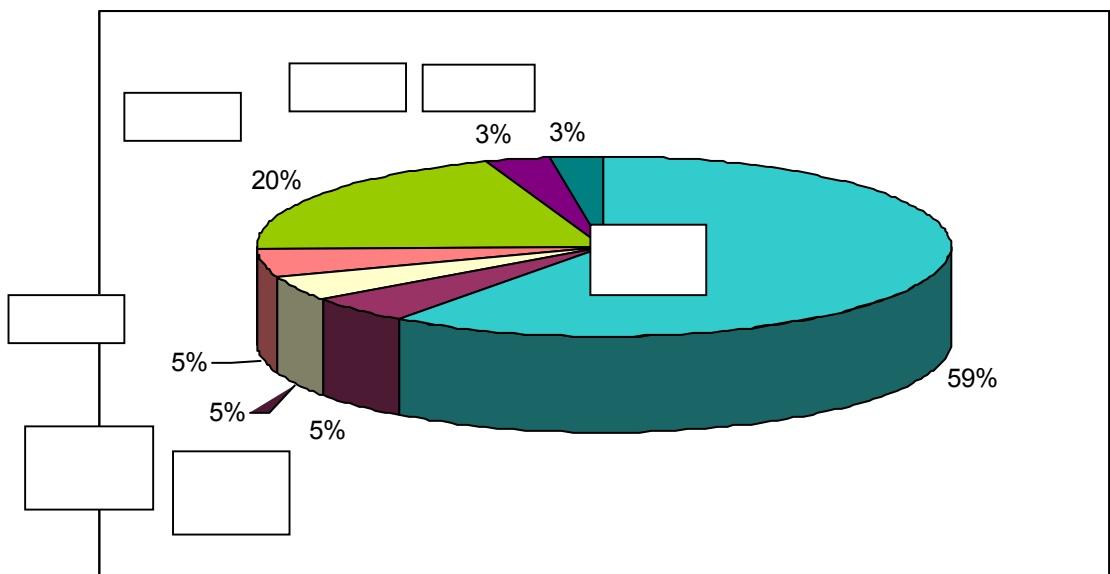


Figure 2:

Distribution of Respondents by Ethnic Identity

N=205



In terms of family status, as shown in Figure 3, over 75% of participants were married or living with a partner.

Figure 3:
Distribution of Respondents by family status

N=214

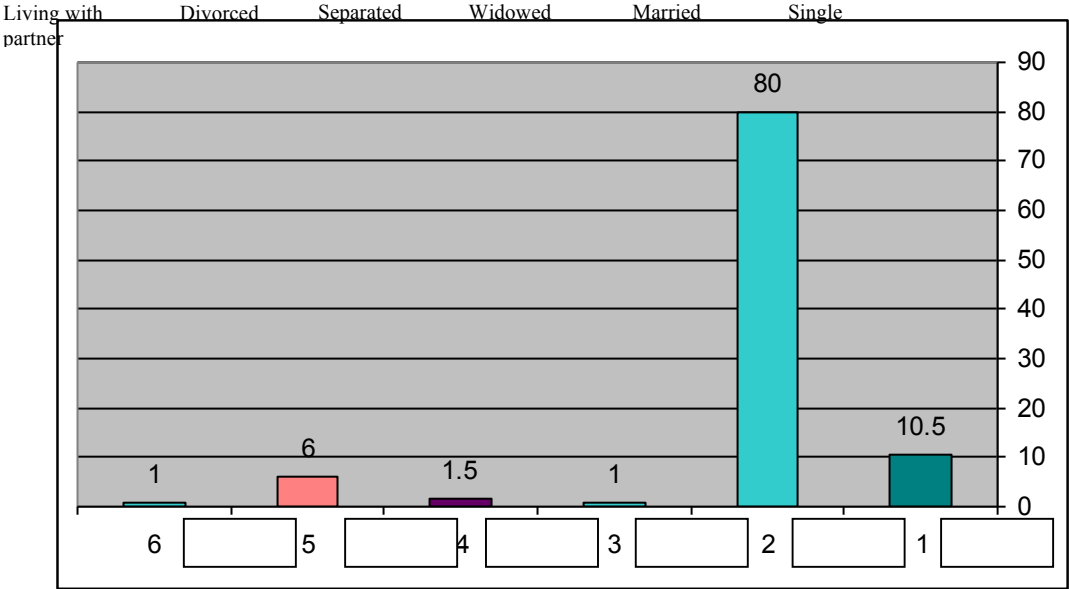


Figure 4 shows that our participants were nearly evenly divided between bus and truck drivers, while Figure 5 indicates that the vast majority of the drivers in our sample (90%) had less than 20 years of experience. Indeed, drivers with 30 or more years of experience accounted for less than 2 percent of our sample.

Bus drivers

Truck driver

Figure 4:

Distribution of Respondents by vehicle type

N=227

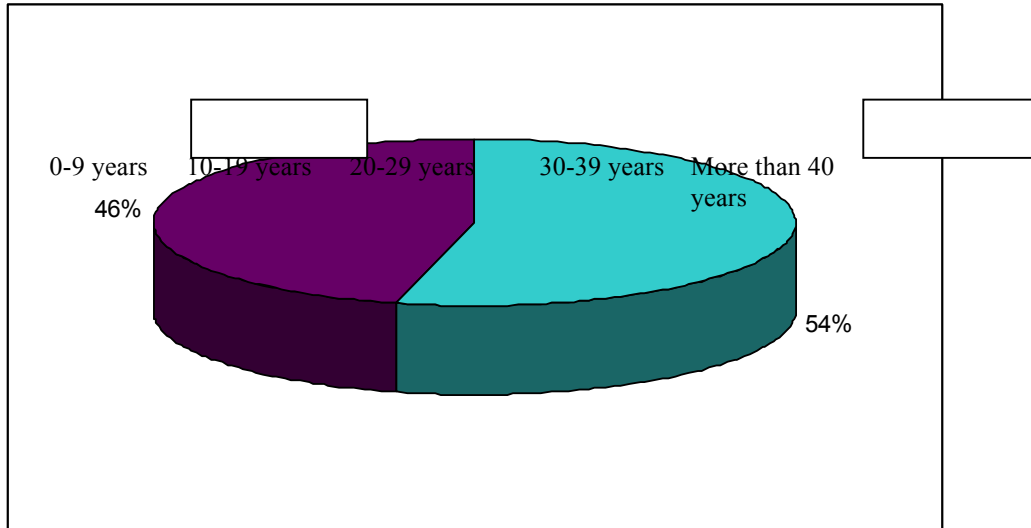
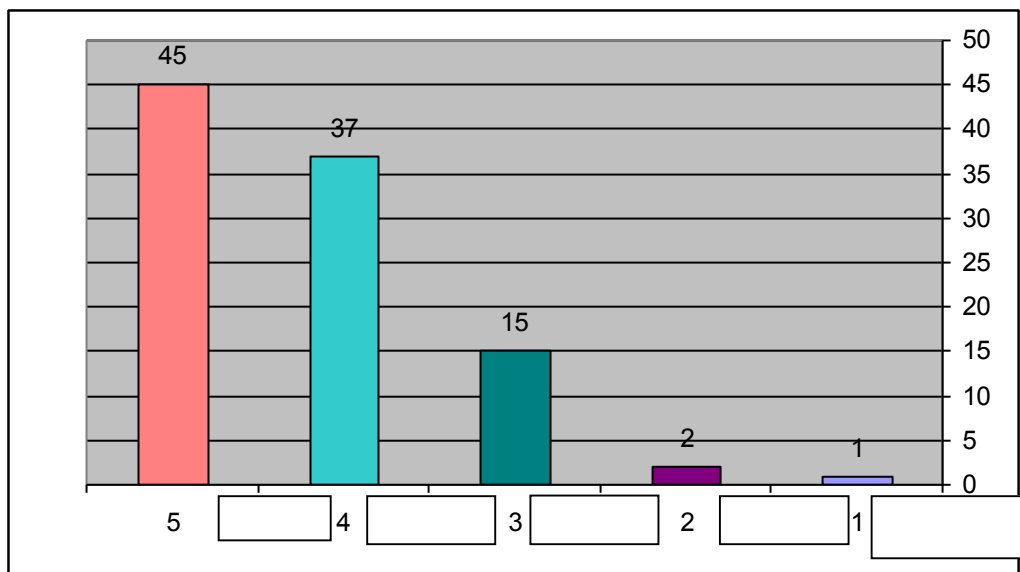


Figure 5:

Distribution of Respondents by tenure

N=178



Measures

Impact and Prevalence: To address the first two research questions (impact and prevalence) we focused on two sets of variables. In order to assess impact, we measured participants' involvement in three types of MVAs. Specifically, participants were asked how many times in the past year they were involved in: (a) an accident in which they incurred injuries severe enough to require medical attention; (b) an accident in which three or more individuals (with one potentially being themselves) were injured; (c) an accident involving a fatality.

We assessed prevalence on the basis of three separate measures of drinking. First, in order to assess modal consumption, we asked participants to indicate on how many days in the last month they consumed an alcoholic beverage such as beer, wine or liquor (i.e., frequency of alcohol consumption). Response categories were 0 (never) to 5 (four times a week or more). We also asked them to indicate, on those occasions when they did drink alcoholic beverages in the last month, the average number of servings they consumed each time (i.e., average *quantity of consumption*). Response categories were 0 (less than 1 serving per occasion) to 5 (10 or more drinks). Both are standard measures of alcohol consumption that have been used and validated across a wide range of work-site studies (Frone, 2012). Finally, to assess the primary drinking variable of interest, the *severity of risky drinking*, we used the 10-item Alcohol Use Disorders identification Test (AUDIT) (Babor, de la Fuente, Saunders & Grant, 1989), a reliable and widely validated screening instrument that is sensitive to early detection of risky drinking. Participants are asked the frequency with which, in the past year, they (a) consumed alcohol in a pattern indicative of heavy drinking (e.g., "how often do you drink six or more servings of alcohol in one sitting"), (b) experienced symptoms of habituation or dependence (e.g., "how often during the last year have you found that you were not able to stop drinking once you had started?"), and (c) experienced a number of adverse consequences of drinking (e.g., "how often have you been unable to recall what happened the night before because of your drinking?").

Participants provide a rating on each item ranging from 0 (never) to 4 (every day or nearly every day), with a scale score calculated as the sum of the first 8 item-specific scores, plus the sum of the last two items, each scored as 0, 2 or 4. The scale creators specify scores of 6-7 as indicating “at-risk” drinking and scores of 8-12 as indicative of hazardous drinking, with scores greater than 12 as indicative of alcohol dependence. Cronbach alpha is .77.

Distribution: To address the third research question regarding the distribution of risky drinking among Israeli commercial drivers (Hypotheses 1-4), we coded the type of vehicle driven (*type*) as a dummy variable according to the type of enterprise employing them (1=bus, 0=truck). *Age* and years on the job (*tenure*) were self-reported by participants. Finally, while participants could respond to the item on ethnicity by checking one of several options (e.g., Jew, Muslim, Druze, Christian), we coded ethnicity as a dummy variable with 1 indicating Jew, and 2 indicating other.

Risk Factors: Measures relating to work-related risk factors (hypotheses 5-10) were largely drawn from those used in prior work-related risk factor research (Bacharach et al., 2002; Frone, 2012).

Five stress-related measures were used. *Stress* was assessed on the basis of the Center for Epidemiologic Studies’ Depression Scale (CES-D) developed by Radloff (1977). The CES-D is a 20-item self report depression scale, asking for participants to score how they felt in the last month, for example- "I thought my life had been a failure" and "my sleep was restless". Scored moved from (1) – not at all to (4) most of the time. Cronbach alpha = 0.90. We assessed *role conflict* on the basis of an 11-item scale developed by Rizzo, House and Lirtzman (1970). This scale ($\alpha=.86$ in the current study) has been used extensively in research and has been found to be psychometrically sound (Schuler, Aldag & Brief, 1977; Smith, Tisak & Schneider, 1993). To assess *work-family conflict*, we used the measure developed by Frone et

al. (1992) which is composed of five items measuring the extent to which participants find it difficult to manage their time between work and family (e.g., "Sometimes I have difficulties in balancing my time between work and family activities"). Scored on a 7-point Likert-type scale ranging from *never* (1) to *always* (7), the scale reliability (Cronbach alpha) is 0.95. *Hazardous climate perceptions* was measured using items from Zohar's (1980, 2000) safety climate instrument, with ten items covering three content themes: Active Practices (Monitoring, Enforcing), Proactive Practices (Promoting Learning, Development), and Declarative Practices (Declaring, Informing). Sample items include: "My supervisors reacts quickly to solve the problem when told about safety hazards", "My supervisors listens carefully to workers' ideas about improving safety," with participants responding on a 5-point scale (1=strongly disagree to 5 = strongly agree). To calculate hazardous climate perceptions, we subtracted the mean score from 6 such that higher scores reflect the perception of a more hazardous work climate. Finally, we assessed *abusive supervision* according to Tepper's (2000) 15-item scale (sample items include: "My supervisor ridicules me" and "My supervisor tells me my thoughts and feelings are stupid"). Participants rated their responses in terms of disagree (1) to agree (5). Cronbach alpha is= 0.96.

Permissiveness of injunctive drinking norms was assessed on the basis of the measure developed and validated by Bacharach et al. (2002). Using this measure, respondents were asked to answer 3 questions, regarding their perception of the number of drinks each of three co-workers (identified by the respondent as those with whom he feels the closest) feels are acceptable to drink: (1) "1-2 hours **BEFORE** starting one's shift", (2) "**DURING** work hours" and (3) "**AFTER** work". We took the mean number of drinks perceived by the participant as deemed acceptable by the particular coworker to drink at the specified time for each of these three as our measure of co-worker drinking, with higher values suggestive of more permissive coworker drinking norms. The majority of participants failed to complete items relating to

drinking *before* or *during* work hours, with many noting such comments as “this is illegal” or “not done”.

Three work-related factors associated with social control were assessed, all drawn from Bacharach et al. (2002). First, we assessed the degree of *supervisory contact* by asking participants to indicate how frequently in the past month they spoke face to face with their supervisor or dispatcher. Participants responded along a 7-point scale ranging from (1) once or twice to (7) more than four times per day. Second, we assessed *supervisor monitoring* by asking participants to indicate the degree to which their manager or dispatcher is able to monitor their activities during the course of a regular work day. Participants responded along a 7-point scale ranging from (1) not at all to (7) all the time, completely. Finally, to assess the *supervisor’s willingness and ability to intervene* in those situations when an employee is suspected of being impaired at work, we combined the two separate two-item scales for (a) willingness, and (b) ability developed by Bacharach et al., (2002). Participants responded to four items (two tapping willingness, and two tapping ability) asking them the degree to which each statement (sample statement = “My supervisor has the skills and abilities to assist those workers suffering from alcohol misuse.”) accurately reflects their supervisor (1=not at all; 7=very much so). We combined these two subs-scales both because it is likely that supervisor’s willingness to intervene is strongly influenced by their belief in their ability to do so, as well as because Bacharach et al. (2002) reported the two scales as being highly correlated ($r=.45$). Doing so resulted in a measure with a higher reliability (Cronbach alpha is 0.72) than that of the two sub-sample specific alphas (both < 0.70) reported by Bacharach et al.

Control Variables: In our multivariate analyses described below, we took into account a number of possible confounding variables. In addition to age, ethnicity, type of vehicle and job tenure (all described earlier), we also controlled for *year of immigration* and *country of birth* (a dummy variable with Israel=1 and 0 if otherwise). Furthermore, because disposition

may influence individuals' responses to items tapping affect and perceptions, we also controlled for *negative affect*. We did so on the basis of negative subscale of the Positive and Negative Affect Schedule (*PANAS*), a 20-item instrument measuring positive affect and the other measuring negative affect. Each item of the 10 negative affective items are rated on a 5-point scale ranging from 1 = *very slightly or not at all* to 5 = *extremely* to indicate the extent to which the respondent has felt this way in the past month. Cronbach alpha for negative affect (NA) was 0.91, substantially higher than the alphas of .84-.87 reported by Watson et al. (1988).

Data analyses

Data were analyzed in several steps: First, to assess the impact issue noted above, we tested the association between the severity of risky drinking (i.e., AUDIT score) and modal consumption (quantity and frequency) on the one hand, with the frequency of involvement in each of the three types of MVA incidents noted earlier (namely, accidents with self-injury only; accidents involving multiple injuries, and accidents involving one or more fatalities). Second, simple frequency distributions were used to assess the overall prevalence and severity of risky drinking. Third, to examine how risky drinking is distributed among the population of commercial drivers in Israel (Hypothesis 1-4), we conducted a series of T-Tests and examined bivariate relations between risky drinking and the four sample descriptors (i.e., age, tenure, vehicle type and ethnicity). Finally, we tested Hypothesis 5-10 on the basis of both bivariate and multivariate analyses. Given that our data are nested (drivers nested in work units), we ran the multivariate analyses on the basis of a mixed model, taking into account the random intercepts at the unit level before estimating the association of the various risk factors and the severity of risky drinking at the individual level.

Results

Table 1 displays the means, standard deviations and inter-item correlations of the study variables. An inspection of the table indicates no apparent problem of multicollinearity. The findings reported in this table also indicate a rather mean low severity of risky drinking among drivers ($M=1.14$, $s.d.=2.4$). It should be recalled that sensitivity/specificity analyses of the AUDIT indicate that a minimal score of 8 serves as the cutoff for risky drinking for the population at large. Even if we take into account the heightened cognitive complexity and demands of their job and thus, following Volk et al. (1997), assume the lower 6-point cutoff for “at-risk” drivers, our results (with a mean of under 2) suggest that most of the commercial drivers in our sample do not engage risky drinking. Similarly, most drivers perceive their coworkers’ after-work drinking norms as only moderately permissive ($M=1.53$, $s.d. =.93$).

Table 1 also suggests some initial, bivariate support for several of our hypotheses. For example, as we posited, the severity of risky drinking is positively correlated to the permissiveness of perceived drinking norms ($r=0.43$, $p<.01$). Similarly, as one would expect, there are positive associations between risky drinking and both dimensions of modal consumption, namely the frequency of consumption ($r=0.59$, $p<.01$) and the quantity of consumption ($r=0.59$, $p<.01$). There are also positive associations between the various stressors and felt stress variables (e.g., role conflict is associated with stress at $r=.48$, $p<.01$), as well as among the stressors themselves (e.g., role conflict is associated with work-family conflict at $r=.14$, $p<.05$, and hazardous work climate at $r=.35$, $p<.05$). More interesting, however, are the significant negative correlations between role conflict, and supervisor monitoring and intervention ($r=-.30$, $p<.01$) and ($r=-.33$, $p<.01$) respectively, suggesting that by monitoring work and taking a more interventionist role, supervisors may effectively address some of the conflicts felt by drivers, particularly when one of their peers has an alcohol-related problem. Finally, it is interesting to note that role conflict is moderately correlated with involvement in MVAs ($r=.30$, and $.24$; $p<.01$ in both cases for MVAs resulting in driver injury and multiple victims, respectively).

Table 1: Descriptive results and correlations (N=227)

	Variables	M	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	Risky drinking	1.14	2.41	(0.77)																		
2	Negative affect	1.40	0.57	.32**	(0.91)																	
3	Age	45.45	9.40	-.20*	-.08	---																
4	Role conflict	2.77	1.30	.19*	.39**	.06	(0.86)															
5	Work family conflict	4.78	2.07	-.01	.01	-.16	.14*	(0.95)														
6	Hazardous work climate	1.77	1.09	.06	.26**	-.00	.35**	.06	(0.96)													
7	Supervisor abuse	1.53	0.82	.20*	.30**	.06	.43**	.21**	.36**	(0.96)												
8	Permissiveness of after work inj. drink norms	1.58	0.94	.43**	.38**	-.03	.30**	.25*	.20	.43**	---											
9	Supervisory contact	3.25	1.85	-.05	-.01	.10	.00	-.19**	-.03	.02	.02	---										
10	Supervisor monitoring	5.51	1.92	-.1	-.09	.07	-.30**	.16*	-.32**	-.06	-.04	.03										
11	Supervisor intervention	4.79	2.09	-.08	-.13	-.14	-.33**	.07	-.31**	-.16*	-.03	-.03	.31**	(0.72)								
12	# accidents in past year in which driver injured.	0.40	1.31	.28**	.14	.16	.30**	.12	.05	.30**	.27*	.19**	-.06	-.16*	---							
13	# accidents in past year with multiple people injured.	0.19	0.80	.16*	.06	.11	.24**	-.10	.08	.11	.32**	.06	-.20**	-.13	.40**	---						
14	# accidents in past year in which there was one or more fatalities	0.39	1.28	.19*	.12	.04	.14	-.03	.18*	.13	.04	.02	-.24**	-.13	.33**	.44**	---					
15	Stress	1.30	0.47	.32**	.54**	.16*	.48**	.07	.24**	.43**	.28*	-.09	-.16*	-.25**	.21**	.06	-.06	(0.9)				
16	Vehicle type (0=bus; 1=truck)	0.54	0.50	-.07	-.28**	-.13*	-.48**	-.19**	-.32**	-.45**	-.33**	-.07	.24**	.31**	-.31**	-.15*	-.25**	-.34**	---			
17	Ethnicity (Jews = 1; Non-Jews = 2)	1.24	0.43	-.05	.16*	-.20**	.29**	-.08	.11	.08	-.06	.10	-.24**	-.23**	.06	-.02	.05	.13	-.28**	---		
18	Tenure	11.60	8.10	-.12	-.06	.47**	-.02	-.20*	-.12	-.13	.51**	-.05	-.09	-.05	.06	.11	.17*	-.10	.16*	.12	---	
19	Freq. of consumption	0.63	0.92	.59**	.12	-.32**	.05	-.00	.03	.02	.31**	-.02	.05	.11	.01	-.07	-.09	.12	.16*	-.22**	-.19*	---
20	Quantity of consumption	0.05	0.36	.59**	.10	-.09	.03	-.11	.01	-.06	.30**	-.00	-.13	-.02	.15*	.19*	.07	-.06	-.05	-.09	-.13	.24**

* p<0.05 ** p<0.01

Figures in parentheses are Alpha coefficients

Research Question 1 – Impact

The first question that we sought to address in our analysis was the association between the severity of risky drinking among Israeli commercial drivers and their self-reported incidence of MVA involvement. The accident rate for the drivers in our sample (see rows 12 - 14 of Table 1) was higher than we expected, with the data suggesting that the commercial drivers in our sample are involved in approximately one accident in which they or others are hurt nearly every two years ($M=.40$, $s.d.=1.3$ for number of accidents in past year involving driver injury; $M=.19$, $s.d.=.79$ for number of accidents in past year involving other victims, and $M=.39$, $s.d.=1.28$ for number of accidents in past year involving fatalities).

Despite the small sample size and relatively limited variance in risky drinking, as can be seen in Table 1, we found a significant, positive correlation between the severity of risky drinking and all three indicators of accident involvement. More specifically, the severity of risky drinking was significantly related to the number of times in the past year drivers reported being involved accidents involving: (a) driver injuries severe enough to require medical attention ($r=.27$, $p<.001$), (b) other injured victims ($r=.16$, $p<.05$) and (c) one or more fatalities ($r=.19$, $p<.05$).

We also predicted that the association between risky drinking and MVA involvement would be more robust than that between modal alcohol consumption and MVA involvement. This prediction was partially supported. Indeed, no significant correlation was found between any of the three MVA items and the frequency of alcohol consumption. In contrast, a significant correlation *was* found between the typical quantity of alcohol consumed when drivers drink, and both the number of times in the past year drivers reported being involved accidents involving: (a) driver injuries severe enough to require medical attention ($r=.15$, $p<.05$), (b) other injured victims ($r=.19$, $p<.05$). Quantity of consumption had no statistically

significant correlation with the number of times in the past year drivers reported being involved in accidents involving fatalities.

Research Question 2—Prevalence

Overall, our findings suggest that risky drinking among commercial drivers is a rare but not unknown phenomenon. On the basis of an AUDIT cutoff score of 8, only 3.3% of participants can be categorized as “risky drinkers.” However, as noted earlier, this cutoff score is likely too high for commercial drivers given the nature of their occupation and the risk that even moderate alcohol impairment may pose to them and others if they are driving. Accordingly, like Volk et al. (1997), we identified risky drinkers on the basis of an AUDIT score of 6 or higher. With such a cutoff, we found 5.1 % of participants to be “risky drinkers”.

Decomposing these numbers further, just under 36% of participants reported that they drink at least once a month, with half of these (i.e., 18% of drivers) reporting that they drink between two and four times a month, and just over 10% of these (i.e., 5% of all drivers) reporting that they drink between 2-3 times a week. Less than 1% of study participants reported drinking more than 3 times a week.

In terms of the quantity of alcohol consumed, 6.1% of participants reported drinking at least six servings of alcohol on a single occasion in the past month, but only 1.5% reported typically drinking over 6 servings of alcohol on those occasions when they do drink (i.e., conceivably more than once a month), and only 0.5% reported drinking 6 or more drinks on a single occasion on a daily basis (a strong indicator of alcohol dependence).

Scores on other, individual AUDIT items shed further light on the relatively low prevalence of risky drinking among Israeli commercial drivers. As shown in Figure 6, six percent or fewer participants reported having experienced one or more of the AUDIT

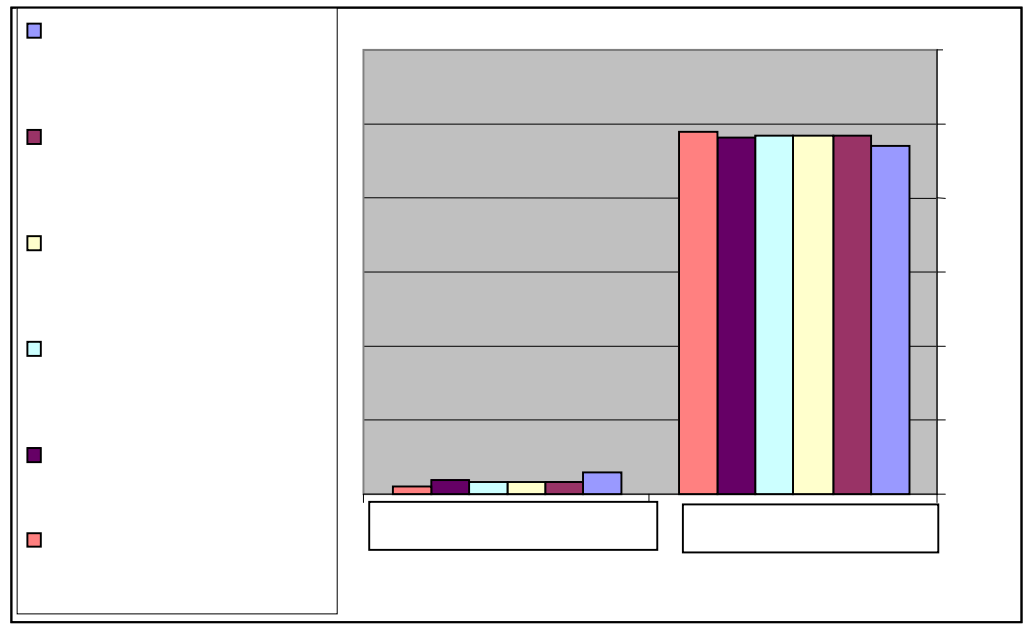
0 drinks or more in one occasion 120
 couldn't stop drinking 98 96 97 97 97 94 100
 conditions that may be indicative of risky drinking or alcohol dependence. The highest
 couldn't do the expected rate was for consuming six or more drinks in a single serving in the past month
 because of drinking 60
 (6%), while the lowest prevalence rate was for being unable to remember the events of the
 needed first drink to get going 40
 previous night due to drinking (2%).
 felt regret because of drinking 2 4 3 3 3 6 20
 couldn't remember what happened because of drinking 1 1 1 1 1 1 0
 Happened at least once 1 Never happened

Research Question 3 – Distribution

The third research question sought to ascertain the degree to which the problem of risky drinking is more concentrated in certain demographic driver groups in Israel than others. To test the four hypotheses (Hypotheses 1 – 4) specified earlier (regarding differences by age, ethnicity, tenure and vehicle type), we estimated the proportion of risky drivers (AUDIT score of 6 or higher) in various sub-samples as well as ran a number of T-tests.

Figure 6:

Percent of Commercial Drivers Reporting a Positive Score on Key AUDIT Items (n=215)



T-Test result for age factor

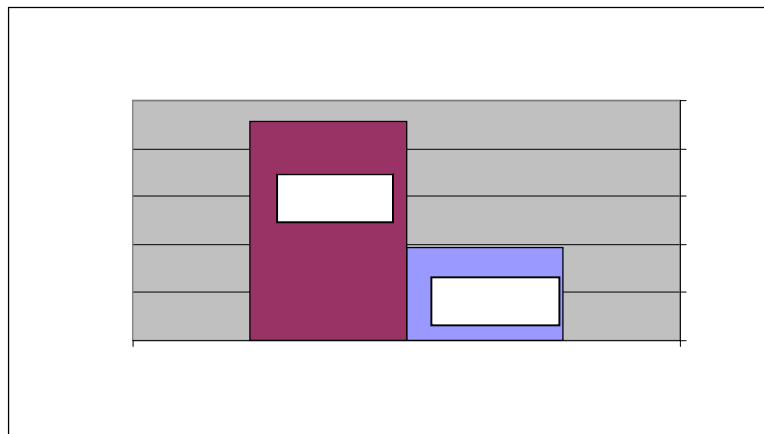
2.2759

2.5

Hypothesis 1 – Age: Hypothesis 1 proposed that the severity of risky drinking will be higher for younger drivers than older ones. To test this hypothesis we divided our sample into two driver groups, one including those age 34 and younger (n=29; 14% of the sample), and the other comprised of drivers age 35 and older (n=185; 86% of the sample). As shown in Figure 7, the analysis revealed that, as we hypothesized, there is indeed a significant difference between the two age groups ($t_{(28)}=2.28, p<.05$) in the severity of risky drinking behavior. The severity of risky drinking for younger drivers is indeed more severe (Mean=2.27, s.d. =3.31) than that of the older drivers (Mean=0.96, s.d. = 2.19). Additionally, while risky drivers (AUDIT score of 6 or higher) comprised 11.1% of drivers age 34 and under, they comprised only 2.1% of drivers over the age of 35.

Figure 7

T-Test Results for Age



Hypothesis 2 – Ethnicity: Hypothesis 2 proposed that the severity of risky drinking will be higher for drivers self-identifying as Jews (n=148; 77%) than for drivers with other ethnic self-identities (n=45; 23%). As shown in Figure 8, the analysis revealed that, while the mean severity of risky drinking among Jewish drivers was higher (M=1.18, S.D. = 2.36) than that of non-Jewish drivers (M=0.89, S.D. = 2.60), the difference was not statistically significant ($t_{(67)}=$

0.66, $p > .05$). Additionally, while risky drivers (AUDIT score of 6 or higher) comprised 5% of Jewish drivers, they comprised only 4% of the non-Jewish drivers.

Hypothesis 3 – Tenure: Hypothesis 3 proposed that the severity of risky drinking will be inversely associated with tenure (i.e. higher for more junior drivers, lower for more senior drivers). To test this hypothesis we divided our sample at the median level of tenure (i.e., 11 years). Interestingly, as shown in Figure 8, the analysis revealed the opposite association between tenure and the severity of risky drinking. While there is a marginally significant difference between more junior and more senior drivers ($t_{(168)} = 1.88$; $p < .10$), contrary to our hypotheses, the mean level of risky drinking severity for junior drivers is higher (Mean=1.26, S.D.=0.78) than that of more senior drivers (Mean=0.70, S.D.=0.32). Additionally, while risky drivers (AUDIT score of 6 or higher) comprised 6% of more junior drivers, they comprised only 2.3% of the more veteran driver group.

Hypothesis 4 – Vehicle Type: Hypothesis 4 proposed that the severity of risky drinking will be higher for truck drivers ($n=116$; 54%) than for bus drivers ($n=98$; 46%). Contrary to our hypothesis, the mean severity of risky drinking was slightly higher among bus drivers (M= 1.34; S.D.= 0.71) than truck (M= 0.97; S.D.=0.68) drivers, but this difference was not statistically significant ($t_{(138)} = 1.04$; N.S.). Moreover, while risky drivers (AUDIT score of 6 or higher) comprised 8.2% of the bus drivers in our sample, they comprised only 2.6% of the truck drivers.

Tenure by groups

1.26

1.4

Figure 8:

1.2

1

0.7 T-Test Results for Tenure

AUDIT

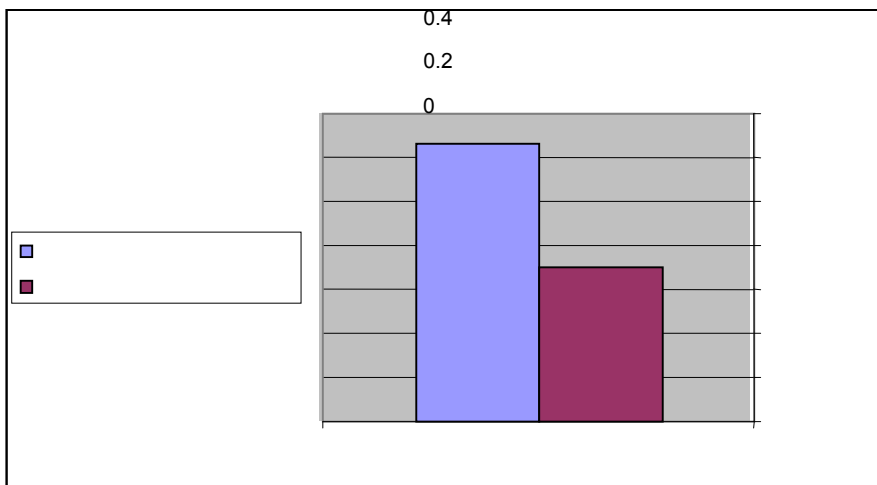
0.6

0.4

0.2

0

tenure less than 11 years
tenure more than 11 years



Research Question 4 – Work-Related Risk Factors

Recognizing that the severity of risky drinking is associated with commercial drivers' involvement in MVAs, our final set of analyses set to establish the degree to which work conditions and managerial practices might explain the variance in drivers' risky drinking severity. The six risk factor hypotheses proposed earlier suggest that three main sets of work-related conditions and practices may directly or indirectly play a role in precipitating or exacerbating risky drinking on the part of commercial drivers. To test these hypotheses, we ran a series of hierarchical regression analyses using a mixed model approach. This hierarchical approach allowed us to observe the differential explanatory power of alternative models relative to one another and relative to a baseline, control model. As noted earlier, the mixed model approach involved the specification of random intercepts at the unit level as part of a model estimating the association of the various risk factors and the severity of risky drinking at the individual level, thus allowing us to take into account the nesting of drivers within one of 11 different work units. The results of analyses examining direct and mediated

effects (Hypotheses 5 – 8) are shown in Table 2, while the results of the moderation analyses (Hypotheses 9 and 10) are shown in Table 3.

Baseline Analysis: We began our analysis by testing several baseline models containing control variables only. The first baseline model tested included the following potential control variables: Negative Affect, Age, Ethnic Identity (a dummy variable with Jewish as reference), Vehicle Type, Tenure, Marital Status (a dummy variable with married as reference), Year of Immigration, and Country of Birth (a dummy variable with Israel as reference). Of these variables, only two – age and negative affect -- were significantly associated with the severity of risky drinking. Notable is the fact that when we tested a model including both age and tenure, the inverse relationship between tenure and the severity of risky drinking apparent in Table 1 was no longer significant. That is, as we predicted, any inverse association likely stems from the confound between age and tenure.

In order to preserve model parsimony, we retested a baseline model including only these two control variables. As shown in Model 1 of Table 2, negative affect has a positive association with the severity of risky drinking (estimate = .49, $p < .01$), while age is inversely associated with the severity of risky drinking (estimate = -.03, $p < .05$). This baseline model explains 10% of the variance in the severity of risky drinking among those in our sample.

Table 2: Results of Mixed-Model, Hierarchical Regression Analysis – Model-specific Main effects

DV	Severity of Drinking n = 206 <i>MODEL 1</i>		Severity of Drinking n = 154 <i>MODEL 2</i>		Stress n = 147 <i>MODEL 3</i>		Severity of Drinking n = 145 <i>MODEL 4</i>		Severity of Drinking n = 83 <i>MODEL 5</i>		Severity of Drinking n = 183 <i>MODEL 6</i>	
	B.	SE	B.	SE	B.	SE	B.	SE	B.	SE	B.	SE
Negative Affect	.49 **	.17	.28	.21	.33**	.07	.13	.26	.09	.14	.40*	.18
Age	-.03*	.01	-.07 **	.02	.01**	.00	-.08**	.02	-.04**	.01	-.04*	.01
Role Conflict			.25 *	.12	.08**	.03	.14	.13				
Work Family Conflict			-.10	.06	.00	.02	-.11	.07				
Hazardous Climate			-.18	.13	.01	.03	-.23	.14				
Supervisor Abuse			.35**	.17	.15**	.04	.26	.20				
Stress							.71 **	.25				
Inj. Drink Norms									.37**	.10		
Supervisory Contact											.05	.06
Supervisory Monitor											-.03	.06
Spv. willingness and ability to intervene											.08	.06
R ²	.10		.18		.32		0.23		.26		.10	
ΔR ²			0.08*				0.05**		0.16**		0.00 (NS)	

* = p<.05

**=p<.01

Stressors and Strain: Hypotheses 5 and 6 specified that a number of work-related stressors – namely role conflict, work-family conflict, hazardous workplace climate and supervisory abuse -- are associated with the severity of risky drinking (Hypothesis 5), and that their impact on risky drinking severity is mediated by felt stress (Hypothesis 6). As shown in Model 2 of Table 2, we found moderate support for Hypothesis 5 with both role conflict (estimate = .25, $p < .05$) and supervisory abuse (estimate = .35, $p < .01$) being positively associated with the severity of risky drinking as hypothesized. Moreover this model explained a significantly greater proportion of the variance in risky drinking ($R^2 = .18$) severity than the baseline model (Model 1; $\Delta R^2 = .08$, $p < .05$).

Full support was found for Hypothesis 6 which specified that the association between these workplace stressors and the severity of risky drinking is mediated by felt stress. Per convention (Baron & Kenny, 1986), we assessed mediation by first testing the association between the four stressor variables noted above and felt strain (the proposed mediator). Of these four, only role conflict (estimate = .08, $p < .01$) and supervisory abuse (estimate = .15, $p < .01$) were significantly associated with stress, explaining 32% of the variance in the latter (see Model 3 of Table 1). Next, we expanded the direct effect model (Model 2) to include Model 3's dependent variable, stress. The results of this expanded model are shown in Model 4 of Table 1. Indicative of full mediation, the results indicate that while none of the four stressors are significantly associated with the severity of risky drinking, stress is (estimate = .71, $p < .01$). Moreover, this expanded model explain 23% of the variance in the severity of risky drinking (as opposed to 18% of the variance of explained by Model 2; $\Delta R^2 = .05$, $p < .01$), suggesting that in addition to mediating the effect of the four stressors included in Model 2, stress also explains additional, independent variance.

Norms: To test Hypothesis 7 regarding the association between permissive injunctive drinking norms and the severity of risky drinking, we tested a model including the control

variables and the three measures of permissive injunctive drinking norms noted in the methods section. Models testing the association between the severity of risky drinking and norms regarding drinking prior to the start of work or during work hours indicated no significant effect, most likely due to the small number of responses to these particular norms items ($n < 50$ in each of the two models tested). However, as shown in Model 5 of Table 2, consistent with the hypothesis, we did find a significant, robust and positive association between the permissiveness of after work drinking norms and the severity of risky drinking (estimate = .37, $p < .01$). Moreover, even though this model included only one theoretical variable, it explained the most variance in the dependent variable of all the models tested, and nearly three times as much variance as the baseline model shown in Model 1 of Table 2 (i.e., $R^2 = .26$; $\Delta R^2 = .16$, $p < .01$).

Social Control: In Hypothesis 8, we posited that three social control variables (i.e., supervisory contact, monitoring and willingness & ability to intervene) would be positively associated with the severity of risky drinking. This hypothesis received no support. None of the three indicators were found to have a significant association with the severity of risky drinking, and the difference between the variance explained by this model and the baseline model upon which it is based was not statistically different from zero.

Interactions:

In Hypothesis 9, we posited that the positive relationship between workplace stressors and risky drinking would be amplified when participants perceived coworker injunctive drinking norms to be more permissive. To test this hypothesis, we supplemented to Model 2 of Table 1 four interaction terms corresponding to the interaction of each of the four stressor variables with the *after work* injunctive drinking norms variable. All interaction terms were centered to the grand mean prior to conducting the analysis per Aiken, West, & Reno (1991). As can be

seen in Model 7 of Table 3 (below), two of the four interaction terms specified were found to have a significant interaction with the severity of risky drinking, namely the interaction between role conflict and injunctive drinking norms (estimate = .35, $p < .01$) and the interaction between supervisory abuse and injunctive drinking norms (estimate = -.89, $p < .01$). Additionally, by taking into account the conditioning effect of injunctive drinking norms, this interactive norm-stress model explained over twice as much of the variance in the severity of risky drinking relative to the un-moderated, direct effect model (i.e., Model 2) not taking norms into account (i.e., $R^2 = .47$; $\Delta R^2 = .29$, $p < .01$).

Table 3: Results of Mixed-Model, Hierarchical Regression Analysis – Moderation

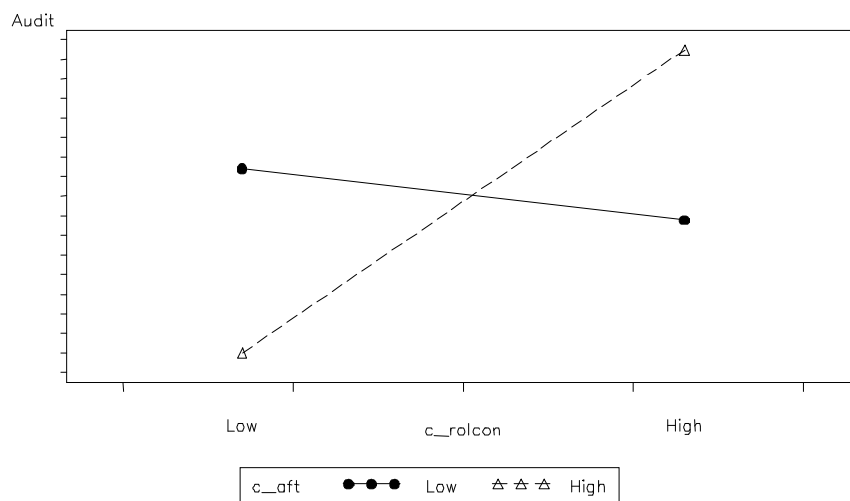
	<i>MODEL 7</i>		<i>MODEL 8</i>	
	Severity of Drinking (n=63)		Severity of Drinking (n=79)	
Neg. Affect	.09	.23	-.01	.16
Age	.06**	.01	-.03*	.01
Role Conflict	.25*	.10		
Work Family Conflict (WFC)	-.10	.07		
Hazardous Climate	-.26	.15		
Supervisory Abuse	.28	.20		
Injunctive Drink Norms	-.02	.20	.30*	.11
Supervisory Contact			-.03	.07
Supervisory Monitoring			-.07	.07
Supervisor ability to confront			-.02	.07
Role Conflict x Inj. Drink Norms	.35**	.11		
WFC x Inj. Drink Norms	-.05	.10		
Hazardous Climate x Inj. Drink Norms	.00	.19		
Spvsr. Abuse x Inj. Drink Norms	-.89**	.27		
Spvsr. Contact x Inj. Drink Norms			.06	.07
Spvsr. Monitor x Inj. Drink Norms			-.21*	.10
Ability to confront x Inj. Drink Norms			.04	.09
R ²	.47		.44	
ΔR^2	0.29* (relative to Model 2)		0.34** (relative to Model 6)	

* = $p < .05$

** = $p < .01$

In order to interpret the nature of the role conflict interaction, we ran a simple-slopes analysis examining the association between role conflict and the severity of risky drinking under conditions of low versus high permissive drinking norms. Low permissive drinking norms were specified at a level equivalent to one standard deviation below the mean level of permissive drinking norms, while high permissive drinking norms were specified at a level equivalent to one standard deviation above the mean level of permissive drinking norms. As can be seen in Figure 9, Hypothesis 9 was supported. Among those perceiving coworker after-work drinking norms to be *less* permissive, role conflict had no significant association with the severity of risky drinking. In contrast, as hypothesized, the relationship between role conflict and the severity of risky drinking was positive and significant (Estimate = 0.60, $p < .01$) among those perceiving coworker after-work drinking norms to be *more* permissive.

Figure 9: The Relationship between Role Conflict and the Severity of Risky Drinking Under Conditions of Less and More Permissive Coworker Drinking Norms

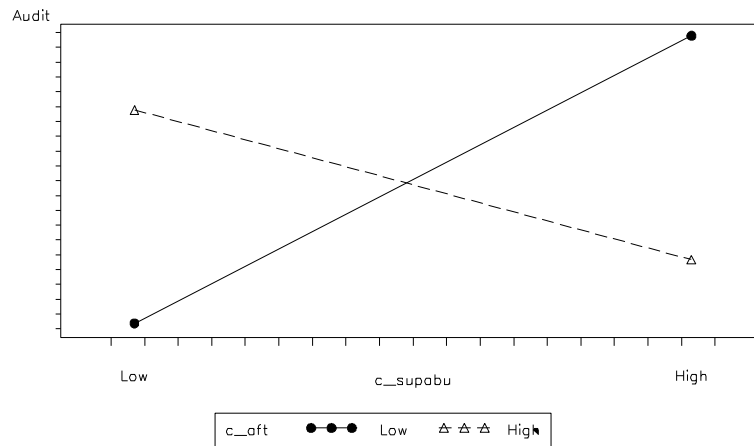


We ran a similar, simple slopes analysis for the interaction between supervisory abuse and injunctive norms. The results of this analysis (shown in Figure 10) run somewhat counter to the hypothesis, indicating it is precisely among those perceiving *less* permissive drinking

Estimate = 1.17, $p < .01$

norms for which supervisory abuse is significantly associated with more severe risky drinking (estimate = 1.17, $p < .01$). In contrast, supervisory abuse had no significant effect on the severity of risky drinking among participants perceiving more permissive drinking norms

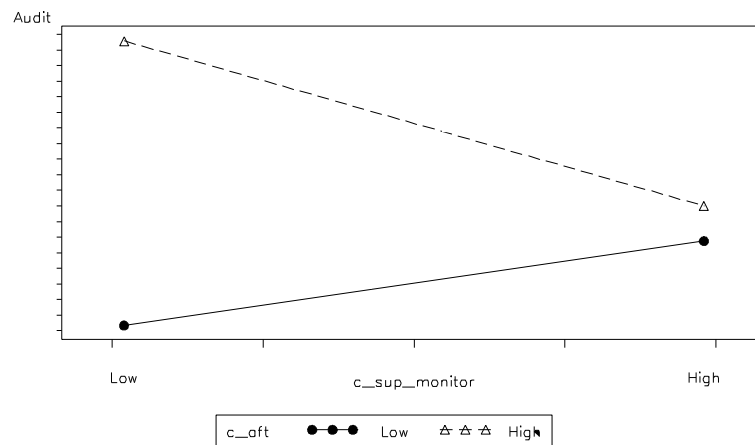
Figure 10: The Relationship between Supervisory Abuse and the Severity of Risky Drinking Under Conditions of Less and More Permissive Coworker Drinking Norms



We adopted the same approach for testing Hypothesis 10, which posited a stronger protective (i.e. inverse) effect of the social control variables on the severity of risky drinking among those perceiving more permissive injunctive drinking norms (i.e., inverse association), than among those perceiving less permissive drinking norms. More specifically, we supplemented to Model 6 of Table 1 three interaction terms corresponding to the interaction of each of the three social control variables with the *after work* injunctive drinking norms variable. Again, all interaction terms were centered to the grand mean prior to conducting the analysis per Aiken et al., (1991). As can be seen in Model 8 of Table 3, of the three interactions, only one – supervisory monitoring and injunctive norms – had a significant association with the severity of risky drinking (estimate = $-.21$, $p < .05$). Still, here too the interaction model explained over three times the variance in the main effect model on which it was based (i.e., Model 6; $R^2 = .44$; $\Delta R^2 = .34$, $p < .01$).

A simple-slopes analysis (shown in Figure 11 below) indicates that, consistent with Hypothesis 10, it is precisely among those perceiving coworker drinking norms to be more permissive that monitoring has a protective effect, with more monitoring associated with less severe risky drinking (estimate = -0.28 , $p < 0.05$). In contrast, among those perceiving coworker drinking norms to be less permissive, supervisory monitoring has a slightly positive but non-significant association with the severity of risky drinking.

Figure 11: The Relationship between Supervisory Monitoring and the Severity of Risky Drinking Under Conditions of Less and More Permissive Coworker Drinking Norms



Discussion

Whereas a number of studies substantiate the rather obvious link between on-the-road driver alcohol impairment and MVA involvement (Moskowitz & Fiorentino, 2000), our analyses provide some of the first evidence that a *general* pattern of risky drinking among commercial drivers is associated with more frequent MVA involvement. More specifically, we found a strong positive correlation between the severity of risky drinking and the frequency of MVAs involving moderate driver injuries, and a weaker, yet still significant, association

between the severity of risky drinking and the frequency of MVAs involving the injury or death of others. These findings are notable in that our study focused on *workforce* rather than workplace drinking, indicating that commercial drivers' *general* patterns of drinking (i.e., both on and off the job) are associated with their likelihood of being involved in an MVA. While we do not have any data on the mechanism driving this linkage, we may speculate that one way in which such workforce risky drinking is linked to MVA involvement is that some of this drinking occurs just before or during work hours, thus increasing the risk of driver impairment on duty. One way this might occur, for example, is if drivers are called to work unexpectedly after having engaged in heavy drinking earlier in the day or evening (e.g., at a wedding or a party).

Gratefully, our findings also indicate that the overall prevalence of such risky drinking is relatively low. Indeed, using the 8-point AUDIT cutoff, we found only 3.3% of drivers to meet the criteria for risky drinking. This is significantly lower than the 14% prevalence rate for heavy drinking in the USA reported by SAMSHA. Nevertheless, while such an 8-point cutoff enhance the specificity of our estimation, it also likely reduces sensitivity with the latter perhaps being of greater concern given the safety-sensitive nature of commercial driving. That is, it may be better to screen in more false positives, than to fail to include those who place themselves and others at risk yet fail to drink in a clearly hazardous manner. Accordingly, we also identified risky drinking on the basis of a 6-point AUDIT cutoff, finding a slightly higher prevalence rate, namely 5.1 percent.

It is important to note that those engaging in risky drinking were not evenly distributed across our sample of commercial drivers. Instead, they were disproportionately concentrated in the Jewish, younger, and less tenured segments of our sample, and were more likely to be truck as opposed to bus drivers. Understanding that this behavior may be more concentrated in some driver segments than others is important in that it may help direct prevention and intervention

efforts and resources. For example, the findings suggest that it may make more sense to focus screening efforts at younger, more junior drivers rather than older, more tenured ones.

Our findings also lend important insights into the kind of prevention and intervention efforts that might be adopted to try to reduce the prevalence of risky drinking among commercial drivers. More specifically, our findings indicate that three main work-related factors increase driver vulnerability to risky drinking, namely role conflict, supervisory abuse, and more permissive coworker injunctive drinking norms, with vulnerability greatest under combined conditions of high role conflict and more permissive drinking norms. Additionally, the results of our moderator analyses suggest that, at least among those perceiving their coworkers as holding more permissive drinking norms, supervisory monitoring may offer a significant means of protection with higher levels of monitoring associated with less severe levels of risky drinking.

The fact that workplace conditions are associated with employee drinking is neither new nor groundbreaking as similar findings have been reported in other occupations (for a review, see Frone, 2012). However, the findings of the current study are important in that they highlight the role of workplace conditions, policies and practices in potentially precipitating and/or exacerbating risky drinking specifically among commercial drivers. Moreover, they are important in that they suggest a number of ways that policy makers, managers and labor leaders may be able to work together to address this issue.

Limitations:

Before we address the policy implications of our findings, it is important that we highlight the study's limitations. First, our analysis is based on a relatively small sample of commercial drivers. The small sample, when combined with missing data (particularly on sensitive and low-base rate phenomena such as risky drinking) reduce statistical power, thus increasing the possibility of Type II error. On the other hand, the fact that we found support

for most of our hypotheses despite limited statistical power attests to the relative robustness of our findings.

Second, given the nature of our data, it may be risky to generalize our findings back to the population of commercial drivers in Israel as a whole. More specifically, we sampled our drivers from among some of Israel's largest trucking and bus companies. It is highly likely that these companies take more care in carefully selecting and training their drivers than smaller companies. Moreover, there is a significant population of independent owner drivers in Israel which we were unsuccessful in tapping for our sample. Finally, the IDF serves as the largest "employer" of commercial drivers in Israel, yet none of these drivers, despite our original intentions, were included in our sample. Although these drivers tend to be young, and thus potentially at heightened risk, their work context is entirely different from that of civilian drivers. Accordingly, we would be very hesitant to generalize our findings to this sizeable segment of the commercial driver population in Israel.

In addition to the questionable external validity of our findings stemming from sample bias at the *organizational* level (i.e., our inability to access the military and smaller transport organizations), external validity may have been further constrained by sample bias at the *individual* level. More specifically, although our 73% response rate suggests a relatively low rate of driver refusals, it is entirely possible that these refusals were systematic, with those engaging in risky drinking disproportionately declining to participate for fear of being identified and sanctioned. Although there is no way for us to assess the extent of such within-firm sample bias, we believe that if anything, by effectively reducing the study's statistical power, it is likely to have only increased the likelihood that our findings err on the conservative.

Fourth, although many of our analyses aimed at understanding the etiology of risky drinking among commercial drivers, our data were cross sectional in nature, thus raising the possibility of same source bias (AKA common method variance), and making it impossible to

ascertain the causal nature of the relationships examined. Same source bias may serve as an alternative explanation for our findings to the extent that one or more underlying, individual difference factors confounded responses on both risk factor and risky drinking items. However, we deem the risk of same source bias to be limited for two reasons. First, we controlled for negative affect which often serves as a key factor confounding associations between self-reported antecedents and outcomes (Edwards, 2008). Second, main effect relationships were largely maintained and strengthened in the expected manner when subjected to moderation analysis, something that we would be unlikely to observe were the direct relationship based solely on some underlying confound. As for causality, many of the relationships examined in the current study have been examined in other working populations using longitudinal data. Although caution must be exercised when drawing causal conclusions even from longitudinal data, these studies consistently indicate that the risk factors examined in the current study explain (rather than are explained by) drinking-related variables. Accordingly, while it is completely feasible that some supervisors may, for example, respond to risky drinkers in a more abusive manner, most research suggests that supervisory behavior comes first, with abuse generating substantial stress, and for some, motivating risky drinking as a means by which to cope and adjust (Bamberger & Bacharach, 2006; Rospenda et al., 2008).

Finally, in addition to collecting data on general risky drinking in the *workforce*, we also sought to collect data on *workplace* (i.e., on-duty) drinking and impairment. As noted by Frone (2012), from both policy-making and a managerial perspectives, this distinction is critical in that, as noted earlier, the more proximate the drinking to actual job performance, the greater the likelihood that even moderate drinking will result in at-work impairment and perhaps diminished work performance. However, as noted earlier, despite the anonymity of our survey process, many of the study participants felt uncomfortable answering these on-duty consumption or impairment items for fear that they might incriminate themselves. Accordingly, we wish to emphasize that our data reflect general, not on-duty, drinking patterns.

Thus, even those identified as engaging in risky drinking may not necessarily do so during or proximate to work hours or in any manner in which they be alcohol-impaired at work.

Policy Implications:

Despite these limitations, the findings reported above suggest that certain steps, while perhaps most politically expedient, may be less than prudent, particularly given the relatively limited prevalence of risky drinking on the part of Israel's commercial drivers. On the other hand, our findings also suggest the severity of risky drinking may be sensitive to shifts in company culture, policy and practice, and that therefore, a number of more subtle and relatively low-cost policy initiatives, may be more efficacious in reducing the risk of on-duty impairment.

Not Recommended: While we must once again caution about the questionable generalizability of our findings, to the extent that they do reflect the way in which Israel's commercial drivers drink, they suggest that the prevalence of *workforce* risky drinking is quite low. Particularly since only a certain portion of workforce risky drinking is likely to be associated with on-duty impairment, this low prevalence rate for risky drinking among Israel's commercial drivers suggests that it likely makes little sense to mandate a blanket alcohol screening policy for this industry. Although mandatory pre-employment alcohol screening, followed by post-employment, random alcohol testing for those in safety-sensitive positions have been proposed or adopted by many governments, these programs tend to be extremely costly, and the evidence regarding their efficacy in reducing and deterring on-duty impairment is shaky at best (Frone, 2012). For example, Spicer and Miller (2005) found the positivity rate for random testing of on-duty impairment in the US to have declined from 0.5% in 1995 (when industry-wide alcohol testing first went into effect) to 0.1% five years later. Similarly, the Federal Transit Authority (1997; 2010) reported a decline in alcohol violation (BAC<.04) rates of only 0.10

percentage points between 1995 (0.25%) to 2008 (0.15%). While both of these studies demonstrate that the positivity rate did in fact decline following the adoption of random testing, they also highlight already low base-rates, and therefore extremely small changes over time. Furthermore, it is impossible to attribute these shifts strictly to the adoption of pre-employment screening and random testing as transportation enterprises adopted a variety of other deterrence, prevention and intervention programs (e.g., employee assistance programs) at the same time.

Recommended: The findings of our study identify several aspects of commercial drivers' work environment that may increase drivers' vulnerability to engage in a pattern of more severe risky drinking. To the extent that drivers' perceptions of coworkers' drinking norms are associated with the severity of risky drinking, steps should be taken to shift drivers' norms regarding what is an acceptable pattern of drinking for those in safety-sensitive positions, as well as new and young drivers' perceptions of these norms. To the extent that a variety of (particularly supervisor-based) stressors may be associated with drivers' risky drinking, efforts should be taken to work with management to address these issues and to afford to drivers frameworks that might facilitate enhanced stress-coping. Finally, to the extent that supervisor willingness and ability to intervene in probable cases of alcohol dependence and/or impairment, our findings suggest that supervisor training may be helpful. Accordingly, we recommend consideration of the following five steps aimed at addressing these vulnerability factors:

1. Peer Assistance and mentoring to change norms and facilitate stress coping. While any form of organizational culture change is a difficult and timely process, a number of studies suggest that the most effective means by which to change workplace drinking cultures is from the bottom up (Sonnenstuhl, 1996; Bacharach et al., 1994; 2001).

Based on this research, enterprises in a number of industries, but particularly in the transportation sector, have encouraged the adoption of peer assistance program in order to both shift employee drinking norms, and to facilitate early help-seeking for those who may be engaging in a pattern of risky drinking. Peer Assistance Programs rely on a network of trained, employee volunteers (many of whom engaged in risky drinking in the past) to: (a) engage in a variety of informal, fun activities such as picnics aimed at educating employees and their families about the risks of alcohol misuse; (b) informally communicate the message to veterans that even off-duty risky drinking endangers all and is therefore no longer acceptable; (c) mentor new employees as they learn their jobs, placing a special emphasis on what is expected from new drivers with respect to their drinking behavior; and (d) provide support and facilitate help-seeking for those employees (or family members of employees) who may be misusing alcohol. Peer volunteers in most programs receive two-days of rudimentary training in peer counseling and are guided by a professional counselor. More information on peer assistance and its adoption in Israeli enterprises may be found in Golan et al. 2009; 2010).

2. Supervisor training: Training of supervisors should focus on the two main issues, namely addressing sources of driver stress that may contribute to risky drinking, and enhancing supervisor competencies in identifying and assisting those reporting to duty alcohol-impaired and/or with a possible problem with alcohol misuse.
 - a. Stress-related training should focus on identifying those enterprise-specific policies and practices that may contribute to driver felt role-conflict, and developing practical steps to changing conflict-generating work procedures and routines. Additionally, stress training should focus on identifying and addressing supervisory behaviors that might be perceived by employees as

abusive. For example, role play exercises might be useful in helping managers reflect on the nature and efficacy of their own supervisory behaviors.

- b. Alcohol-related training programs should include information on the enterprise's alcohol policy, the potential performance and behavioral problems associated with impairment on duty and risky drinking when off-duty.

Emphasis should be placed on teaching supervisors to observe, document, and focus on performance-related problems rather than personal behaviors.

Additionally, supervisors should be taught to avoid trying to diagnose or treat risky drinking or alcohol misuse, and instead using a constructive confrontation approach (with the threat of discipline if necessary) to motivate the driver to seek help (perhaps by referring the driver to a peer counselor if such a program is in place).

3. Employee education: Employees should be provided the same type of information as that provided for supervisors. New employees should be educated about the risks associated not only with on-duty impairment, but with off-duty risky drinking as well. "Refresher" training in substance policies and the impact of risky drinking should be provided periodically.
4. Driver Wellness Programming: Wellness programs address a broad spectrum of health and lifestyle issues with the aim of enhancing employee physical, mental and behavioral health. Such efforts might be helpful by facilitating more effective means of driver stress coping and shifting beliefs about the "benefits" and acceptability of heavy or risky drinking.
5. Alcohol testing: As noted earlier, there is little evidence to support the efficacy of random testing in the transportation industry. Nevertheless, other testing protocols may be effective in shifting norms, particularly among young, occupational newcomers,

about the acceptability of even off-duty risky drinking and/or reducing the risk of on-duty impairment.

- a. Given the relatively high prevalence of risky drinking among young, more junior commercial drivers, pre-employment screening may be effective in communicating the message to prospective employees that alcohol-related policies are taken seriously by the employer. While it is unlikely that many candidates will report to an interview impaired, some may report with legal, but elevated BACs (perhaps stemming from having several drinks the night before the test). While such a test result should not be used as the basis for a negative selection decision (after all, drinking off duty is not illegal), those hired with legal but elevated pre-employment BAC levels should be given feedback, warned that even such off-duty drinking may pose a risk, and informed how they might be able to shift their schedule if they feel that they may be unfit for duty.
- b. Probable-cause testing, is initiated after a trained observer (such as a trained supervisor or peer) has reason to believe that the driver is impaired while on duty. Data from the Federal Transit Authority (2008) indicate that the positivity rate for an alcohol violation based on probable cause testing, while relatively low (19.7%) is still much higher than the overall violation rate for all testing circumstances combined (0.3%). Such training, when combined with supervisory training and any type of employee assistance effort (such as a peer assistance program) designed to facilitate help-seeking, may be effective in preventing MVAs stemming from risky drinking, as well as in providing aid to drivers misusing or dependent on alcohol.

References

בר המבורגר, ר., רוזינר, א., ניראל, ר. (2009). השימוש בחומרים פסיכואקטיביים בקרב תושבי מדינת ישראל 2009: מחקר אפידמיולוגי VII, הרשות הלאומית למלחמה בסמים ובאלכוהול, ירושלים.
חוסין, ג. (2009). תנאי עבודה, עייפות ותאונות של נהגי רכב כבד בקרב נהגים ערבים. האוניברסיטה העברית ירושלים.

Aiken, L. S., West, S. G., & Reno, R. R. (1991). *Multiple regression: Testing and interpreting interactions*. London: Sage Publications, Inc.

American Trucking Associations (2007). Drug and Alcohol Testing of Commercial Motor Vehicle Drivers. Testimony submitted to the Subcommittee on Highways and Transit of the U.S. House of Representatives Transportation and Infrastructure Committee. ATA: Arlington, VA.

Ames, G. M., Grube, J. W., & Moore, R. S. (2000). Social control and workplace drinking norms: a comparison of two organizational cultures. *J Stud Alcohol*, 61(2), 203-219.

Aworemi, J. R., Abdul-Azeez, I. A., Oyedokun, A.J., & Adewoye, J.O. (2010). Efficacy of Driver's Fatigue on Road Accident in Selected Southwestern States of Nigeria. *International business research*, 3, 225-232.

Bacharach, S., Bamberger, P. & Biron, M. (2010). Alcohol consumption and workplace absenteeism: The moderating effect of social support. *Journal of Applied Psychology*, 95, 3, 334-348.

Bacharach, S. Bamberger, P. & Sonnenstuhl, W.J. 2002 Driven to drink: Managerial control, work-related risk factors, and employee problem drinking. *Academy of Management Journal.*, 45, 637-658.

Bamberger, P. A. (2005). Work-Based Critical Incidents and Problem Drinking: Taking Intrusive Reactions, Traumatic Distress, and the Kindling Effect Into Account *Work and Occupations* 32, 257-289.

- Bamberger, P. and Aviv Barhom-Kidron, A.. (1998). "Spirits at Work in the Promised Land: Ethnic Identity, Work-related Risk Factors and Drinking Behavior Among Immigrants in Israel." *Journal of Applied Behavioral Science*, 34, 445-467.
- Bamberger, P. and Bacharach, S.B. (2005). Abusive management and subordinate problem drinking: Taking resistance, stress and subordinate personality into account. *Human Relations*, 59, 723-752.
- Bamberger, P. & Biron, M. (2006). The prevalence and distribution of employee substance-related problems and programs in the Israeli workplace. *J. Drug Issues* 36, 755-786.
- Bar-Hamburger, R., Ezrachi, Y., Roziner, I., & Nirel, R. (2005). *The use of psychoactive substances in Israel* (Epidemiologic Research). Jerusalem, Israel: Israel Antidrug Authority.
- Bar-Hamburger, R., Ezrachi, Y., Roziner, I., & Steinberg, D. (2009). *The use of psychoactive substances in Israel* (6th Epidemiologic Research). Jerusalem, Israel: Israel Anti-drug Authority.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173-1182.
- Bellavia, G., & Frone, M. (2005). Work-family conflict. In J. Barling, E. K. Kelloway, & M. Frone (Eds.), *Handbook of Work Stress*, pp. 113 -147). Sage Publications: Thousand Oaks.
- Broughton, J., Baughan, C. J., Pearce, L., Smith, L., & Buckle, G. (2003). *Work related road accidents*. TRL Report 582. Crowthorne: Transport Research Laboratory.
- Bylund, P-O., Björnstig, U., & Larsson, T. J. (1997). Occupational road trauma and permanent medical impairment. *Safety Science*, 26, 187-200.
- Centers for Disease Control and Prevention (CDC), (2011). Impaired drinking: Get the facts (online fact sheet). Retrieved on Nov. 21,2012 from http://www.cdc.gov/motorvehiclesafety/Impaired_Driving/Impaired-driv_factsheet.html.

- Central Bureau of Statistics (2006). Internal report on the comparison of Police and health data. Jerusalem: Central Bureau of Statistics.
- Chapman, P., Roberts, K., & Underwood, G. (2000). A study of the accidents and behaviours of company car drivers. In G. B. Grayson (Ed.), *Behavioural Research in Road Safety X*. Crowthorne: Transport Research Laboratory.
- Cialdini, R.B., & Trost, M.R. (1998). "Social influence: Social norms, conformity, and compliance." In D. Gilbert, S. Fiske, & G. Lindzey (Eds.) *The handbook of social psychology*, 4th edition (2), pp. 151-192. New York: McGraw-Hill. ISBN 0070237107.
- Conger, J. (1956). "Reinforcement theory and the dynamics of alcoholism." *Quarterly Journal of Studies on Alcohol*, 17, 296-305.
- Cook, P.J., & Moore, M.J. (1993). Economic perspectives on reducing alcohol-related violence. In Martin, S.E. (Ed.) *Alcohol and interpersonal violence*, pp. 193-212. NIAAA Research Monograph No. 24. NIH Pub. No. 93-3496. Rockville, MD: NIAAA.
- Cosper, R. (1979). Drinking as conformity: A critique of the sociological literature on occupational differences in drinking. *Journal of Studies on Alcohol*. 40, 868-891.
- Couper, et al. 2002. Prevalence of drug use in commercial tractor-trailer drivers, *J. Forensic Science.*, 47, 562–567.
- De Croon E.M., Sluiter J.K., Blonk R.W., Broersen J.P., Frings-Dresen, M.H. (2004). Stressful work, psychological job strain, and turnover: a 2-year prospective cohort study of truck drivers. *Journal of Applied Psychology*, 89,442-54.
- Department of Transportation (DOT). (2010). Large truck and bus crash facts: 2008. Washington, D.C.: Analysis Division, Federal Motor Carrier Safety Administration, Department of Transportation. Retrieved on 21/11.12 from: www.fmcsa.dot.gov/documents/hos/2011_HOS_Final_Rule_EA.pdf.
- Diaz, R. I., & Cabrera, D. D. (1997). Safety climate and attitude as evaluation measures of organization safety. *Accident Analysis & Prevention*, 29(5), 643-650.

- Edwards, J. R. (2008). To prosper organizational psychology should... overcome methodological barriers to progress. *Journal of Organizational Behavior*, 29, 469–491.
- European Commission (2012). The legal limit. Brussels: Author. Retrieved on Nov. 11, 2012 from:
http://ec.europa.eu/transport/road_safety/specialist/knowledge/alcohol/prevalence_ate_of_alcohol_consumption/the_legal_limit.htm
- Evans, G. & Carrere, S. (1991). Traffic congestion, perceived control, and psychophysiological stress among urban bus drivers. *Journal of Applied Psychology*, 76, 658.
- Federal Transit Authority (1997). Drug and alcohol testing results: 1996 annual report (FTA Publication No. FTA-MA-18X018-98-1) Washington, D.C.: Author.
- Federal Transit Authority (2010). Drug and alcohol testing results: 2008 annual report (FTA Publication No. FTA-MA-26-5566-10-1) Washington, D.C.: Author.
- Frone, M. R. (1999). Work stress and alcohol use. *Alcohol Research and Health*, 23, 284-291. Available at: <http://pubs.niaaa.nih.gov/publications/arh23-4/284-291.pdf>.
- Frone, M. R. (2003). Predictors of overall and on-the-job substance use among young workers. *Journal of Occupational Health Psychology*, 8, 39-54.
- Frone, M.R. (2006). Prevalence and distribution of alcohol use and impairment in the workplace: A U.S. national survey. *JSAD*, 67, 147-156.
- Frone, M.R. (2008). Are work stressors related to employee substance abuse? The importance of temporal context in assessments of alcohol and illicit drug use. *Journal of Applied Psychology*, 93, 199-206.
- Frone, M.R. (2012). *Alcohol and Illicit Drug Use in the Workforce and Workplace*. Washington, D.C.: American Psychological Association.
- Frone, M. R., Russell, M. & Cooper, M. L. (1992a). Antecedents and outcomes of work-family conflict: Testing a model of the work-family interface. *Journal of Applied Psychology*, 77, 65-78.

- Golan, M., Bacharach, Y. and Bamberger, P. (2010). Peer Assistance Programs in the Workplace, in *Contemporary Occupational Health Psychology: Global Perspectives on Research and Practice*, Volume 1 (eds J. Houdmont and S. Leka), Wiley-Blackwell, Oxford, UK.
- Golan, M., & Bamberger, P. (2009). The Cross-Cultural Transferability of a Peer-Based Employee Assistance Program (EAP): A Case Study, *Journal of Workplace Behavioral Health*, 24, 4, 399-418
- Grunberg, L., Moore, S. & Greenberg, E.S. (1998). Work stress and problem alcohol behavior: A test of the spillover model, *Journal of Organizational Behavior*, 19, 487-502.
- Grunberg, L., Moore, S., Anderson-Connolly, R., & Greenberg, E.S. (1999). Work stress and self-reported alcohol use: The moderating role of escapist reasons for drinking. *Journal of Occupational Health Psychology*, 4, 29–36.
- Gustafson, R. (1986). Threat as a determinant of alcohol-related aggression. *Psychological Reports*, 58, 287-297.
- Gustafson, R. (1994). Alcohol and aggression. *Journal of Offender Rehabilitation*, 21, 41-80.
- Haaretz (2008) “Truck crashes cost NIS 310m damages a year” (English edition, May 13, 2008, p. 11).
- Heath, D. B. (2000). *Drinking occasions: Comparative perspectives on alcohol and culture*. Philadelphia, PA: Brunner/Mazel Publishers.
- Horne, J.A., and Reyner, L.A. (1995). ‘Sleep related vehicle accidents’ in: *British Medical Journal*, 310, p.565-567.
- Hodson, R. (1995). Worker Resistance: An Underdeveloped Concept in the Sociology of Work *Economic and Industrial Democracy*, 16, 79-110
- Israel Bureau of Statistics. (2011). *Statistical Abstract of Israel 2011*. Jerusalem: Author.

Israeli National Authority of Road Safety. (2012). Trends in road safety in Israel: 2005-2011

(In Hebrew). Retrieved on 22/11/2012 from:

http://rsa.gov.il/meidamechkar/meidastatisti/Documents/Megamot2001_2005.pdf

Jung, J. (2001). *Psychology of alcohol and other drugs*. Thousand Oaks, CA: Sage.

Kompier, M.A.J., & di Martino, V.(1995) . Review of bus drivers' occupational stress and stress prevention, *Stress Medicine, 11*, 253–62

Kompier, M. A. J. (1996). Bus drivers: Occupational stress and stress prevention. Working paper: CONDI/T/WP.2/ 1996. Geneva: International Labour Office (Conditions of Work & Welfare Facilities Branch).

Larson, S.L., Eyerman, J., Foster, M.S., and Gfroerer, J.C. (2007). Worker Substance Use and Workplace Policies and Programs (DHHS Publication No. SMA 07-4273, Analytic Series A-29). Rockville, MD: Substance Abuse and Mental Health Services Administration, Office of Applied Studies.

Lavie, P., Wollman, M., & Pollack, I. (1987). Frequency of sleep related traffic accidents and hour of the day. *Sleep Research, 16*: 275.

Liu S., Siegel P.Z., Brewer R.D., Mokdad A.H., Sleet D.A., Serdula M. (1997). Prevalence of alcohol impaired driving: Results from a national self-reported survey of health behaviors. *JAMA. 277*,122–125.

MacDonald, S., Wells, S., & Wild, T. C. (1999). Occupational risk factors associated with alcohol and drug problems. *American Journal of Drug and Alcohol Abuse, 25*, 351–369.

Maggs, J. L., Schulenberg, J. E. (2004-2005). Trajectories of alcohol use during the transition to adulthood. *Alcohol Research & Health, 28*, 195-201.

Maskalyk, J. (2003). Drinking and driving. *Canadian Medical Association Journal, 168*, 313.

Miller, T. R., & Galbraith, M. (1995). Estimating the costs of occupational injury in the United States. *Accident Analysis and Prevention, 27*, 741-747.

- Mitchell, R., Driscoll, T., & Healey, S. (2004). Work-related road fatalities in Australia. *Accident Analysis and Prevention*, 36, 851-860.
- Boufous, S., & Williamson, A. (2006). Work-related traffic crashes: A record linkage study. *Accident Analysis and Prevention*, 38, 14-21.
- Mannelo, T. A., & Seaman, F. J. (1979). Prevalence, Costs and Handling of Drinking Problems on Seven Railroads: Final Report. Washington, D.C.: University Research Corporation.
- Martin, C.S. (2007). Measuring acute alcohol impairment. In S.B. Karch (Ed.), *Drug abuse handbook* (2nd ed., pp. 316-333). New York, NY: CRC Press.
- Moore, R.S., Ames, G.M., Duke, M.R., & Cunradi, C.B. (2012). Food service employee alcohol use, hangovers and norms during and after work hours. *Journal of Substance Use*, 17, 269-276.
- Moskowitz, H., & Fiorentino, D. (2000). A Review of the Literature on the Effects of Low Doses of Alcohol on Driving-Related Skills (Report No. DOTHS 809028). Washington, D.C: Department of Transportation
- Monnier, J., Cameron, R.P, Hobfoll, S.E., & Gribble, J.R.. (2002). The Impact of Resource Loss and Critical Incidents on Psychological Functioning in Fire-Emergency Workers: A Pilot Study. *International Journal of Stress Management*, 9, 11 – 29.
- National Highway Traffic Safety Administration. (2003a). Initiatives to address impaired driving. Washington, DC: Integrated Project Team.
- National Institute on Alcohol Abuse and Alcoholism (2005). *How to screen for heavy drinking*. Washington, DC: NIAAA. Retrieved on 11/7/2005 from:
http://pubs.niaaa.nih.gov/publications/Practitioner/PocketGuide/pocket_guide5.htm
- Ogazi, C., & Edison, E. (2012). The drink driving situation in Nigeria. *Traffic Injury Prevention*, 13, 115-9.
- Peleg, K., & Aharonson-Daniel, L. (2004). Road traffic accidents - severe injuries. How missing data can impair decision making? (in Hebrew). *Harefuah*, 143(2), 111-115.

- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1, 385-401.
- Ragland, D. R., Winkleby, M. A., Schwalbe, J., Holman, B., Morse, L., Syme, S. L., & Fisher, J. M. (1987). Prevalence of hypertension in bus drivers. *International Journal of Epidemiology*, 16, 208-214.
- Rizzo, R.J., House, R.J., & Lirtzman, S.I. (1970). Role conflict and ambiguity in complex organizations. *Administrative Science Quarterly*, 15, 150-163.
- Roman, P. (1980). Medicalization and social control in the workplace: prospects for the 1980s. *Journal of Applied Behavioral Science*, 16, 407-422.
- Rospenda, K.M., Fujishiro, K., Shannon, C.A., & Richman, J.A. (2008). Workplace harassment, stress, and drinking behavior over time: Gender differences in a national sample. *Addictive Behaviors*, 33, 964-967.
- Rospenda, K.M., Richman, J.A., & Shannon, C.A. (2009). Prevalence and mental health correlate of harassment and discrimination in the workplace: results from a national study. *Journal of Interpersonal Violence*, 24, 819-43.
- Sabbagh-Ehrlich, S., Friedman, L., Richter, E.D. (2005). Working conditions and fatigue in professional truck drivers at Israeli ports. *Injury Prevention*, 11, 110-114.
- Schuler, R. S., Aldag, R. J., & Brief, A. P. (1977). Role conflict and ambiguity: A scale analysis. *Organizational Behavior and Human Performance*, 20, 119-128.
- Schulenberg, J.E., Maggs, J.L., & O'malley, P.M. (2003). How and why the understanding of developmental continuity and discontinuity is important: The sample case of long-term consequences of adolescent substance use. In: Mortimer, J.T., and Shanahan, M.J., eds. *Handbook of the Life Course*. New York: Plenum Press, pp. 413-436.
- Smith, C. S., Tisak, J., & Schmieder, R.A. (1993), The Measurement Properties of the Role Conflict and Role Ambiguity Scales: A Review and Extension of the Empirical Research, *Journal of Organizational Behavior*, 14, 37-48.
- Snyder, C. (1958). *Alcohol and the Jews*. London: Feffer & Simons.

- Soffer, D., Zmora, O., Klausner, J. B., Szold, O., Givon, A., Halpern, P., Schulman, C., & Peleg K. (2006) Alcohol Use among Trauma Victims Admitted to a Level 1 Trauma Center in Israel. *IMAJ*, 8, 98-102.
- Sonnenstuhl, W.J. (1996). *Working Sober*. Ithaca, NY: ILR Press.
- Spicer, R.T. & Miller, T.R. (2005). Impact of a workplace peer-focused substance abuse prevention and early intervention program. *Alcoholism: Clinical and Experimental Research*, 29, 609-611.
- Steele, C. M., & Southwick, L. (1985). Alcohol and social behavior: The psychology of drunken excess. *Journal of Personality and Social Psychology*, 48, 18- 34.
- Steele, C., Josephs, R. (1990). Alcohol myopia: its prized and dangerous effects. *American Psychologist*, 45, 921–933.
- Summala, H., & Mikkola, T. (1994). Fatal accidents among car and truck drivers: Effects of fatigue, age, and alcohol consumption. *Human Factors*, 36, 315-326.
- Tepper, B. J. (2000). Consequences of abusive supervision. *Academy of Management Journal*, 43, 178-190.
- Trice, H.M., & Roman, P.M. (1972). *Spirits and demons at work*. Ithaca: ILR Press.
- Tse, L. M., Flin, R. T., & Mearns, K. (2006). Bus driver well-being review: 50 years of research. *Transportation Research Part F: Traffic Psychology and Behaviour*, 9, 89-114.
- Tzamalouka, G., Papadakaki, M., & Chliaoutakis, J. EI. (2005). Freight transport and non-driving work duties as predictors of falling asleep at the wheel in urban areas of Crete. *Journal of Safety Research*, 36, 75-84.
- Voas, R.B., Wells, J., Lestina, D., Williams, A., and Greene, M. (1997). Drinking and driving in the US: The 1996 National Roadside Survey. In Mercier-Guyon, C. (Ed.), *Proceedings of the 14th International Conference on Alcohol, Drugs and Traffic Safety – T97*, Annecy, 21 – 26 September 1997 (Vol. 3, pp. 1159–1166). Annecy, France: Centre d'études et de recherches en médecine du trafic.

- Volk, R. J., Steinbauer, J. R., Cantor, S. B., & Holzer, C. E. (1997). The Alcohol Use Disorders Identification Test (AUDIT) as a screen for at-risk drinking in primary care patients of different racial/ethnic backgrounds. *Addiction* 92(2), 197–206.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063-1070.
- Weiss, S. (2000). Trends of alcohol consumption in Israel in 1990–1998. *Alcologia*, 12, 27–30.
- Wilkinson, P.K., Sedman, A.J., Sakmar, E., Kay, D.R., & Wagner, J.G. (1977). Pharmacokinetics of ethanol after oral administration in the fasting state. *Journal of Pharmacokinetics and Biopharmaceutics*, 5, 207-224.
- Wolfe, A.C. (1986). National Roadside Breathtesting Survey: Procedure and results. Washington, DC: Insurance Institute for Highway Safety.
- Zohar, D. (1980). Safety climate in industrial organizations: theoretical and applied implications. *Journal of Applied Psychology* 65, 96-102.
- Zohar, D. (2000). A group-level model of safety climate: Testing the effect of group climate on micro-accidents in manufacturing jobs. *Journal of Applied Psychology*, 85, 587-596.
- Zador, P.L., Krawchuk, S. A., & Voas, R.B. (2000). Relative Risk of Fatal and Crash Involvement by BAC, Age and Gender. Washington D.C.: National Highway Traffic Safety Administration.