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The taxi industry: working conditions and health of drivers, a literature review

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ABSTRACT

The taxi industry plays an important role in urban transportation systems, both in economic and mobility terms. In the case of the former, it provides employment for a large number of people and circulates significant amounts of money. In the case of the latter, it is a flexible means of transportation capable of arriving at any destination. Although the way the taxi industry is organised varies across countries and even within countries, some factors are shared at varying latitudes of the globe. Working conditions, habits, health, and exposure to road crashes have been a subject of interest for researchers from various disciplines, including medicine, psychology, and economics. However, much of this research focuses on a part of the problem and is not mutually referential. A review of the literature may be useful not only to researchers of diverse disciplines but also to industry representatives and those public officials responsible for transportation, road safety and health policy. This article provides a comprehensive review of the working conditions of taxi drivers, their relationship to road risk exposure and their consequences on the health of workers. It also includes information on coping strategies and protective behaviors. The review is based on a Scopus database search. The search covered the period from 1990 to 2015. This initial search was complemented with other database searches, which yielded some additional studies. Our goal was to summarise existing knowledge, identify possible lines of research and suggest some practical recommendations. It would be important (a) to reduce the workload, establish adequate time for breaks, and provide access to healthcare, (b) to implement actions to promote and maintain healthy habits, (c) to diagnose, detect and treat indicators of occupational fatigue and stress, and (d) to develop programs that make it possible to evaluate work concerns and broaden coping strategies to foster positive changes.

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Introduction

Fatal and non-fatal injuries resulting from traffic accidents are a worldwide concern. Although the estimated number of victims has remained stable over the past few years,

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it continues to be high, with more than 1.2 million people dying annually throughout the world (World Health Organization (WHO), 2015). The problem is even more pronounced among professional drivers (truck drivers, bus drivers, taxi drivers, etc.) than it is among drivers in the general population, even when controlling for differences in exposure levels (Taylor & Dorn, 2006). These working conditions, which include long hours and rotating shifts, are associated with feelings of fatigue (a factor linked to traffic accidents), sedentariness, and a poor diet (de Castro Moreno & Mazzilli Louzada, 2004; Häkkänen-Nyholm & Summala, 2000; Meng et al., 2015; Taylor & Dorn, 2006). Among other observable consequences of these working conditions are health issues, such as cardiovascular disease, hypertension, obesity, and musculoskeletal disorders (Chen, Chan, Katz, Chang, & Christiani, 2004; Chen, Chang, Chang, & Christiani, 2005; Gany, Gill, Ahmed, Acharya, & Leng, 2013). These factors make professional driving an activity with potentially negative effects.

Although different groups of professional drivers share these problems, there are differences among them (de Castro Moreno & Louzada, 2004; Öz, Özkan, & Lajunen, 2010; Meng et al., 2015; Taylor & Dorn, 2006). Understanding these differences, more so than the similarities, is fundamental to the development of interventions to improve working conditions and reduce deaths, injuries, and illnesses associated with the job.

In the present review, the focus is on the taxi industry, which plays an important role in an urban transportation system. In economic terms, it employs a great number of people, both directly and indirectly, and is responsible for the circulation of a significant amount of money. As a mode of transportation, taxis are exceptionally flexible and capable of arriving at any destination (Shi, Tao, Li, Xiao, & Atchley, 2014). The industry's potential impact on road safety is also important. For these reasons, the working conditions, habits, and health of taxi drivers have been subjects of interest for researchers from diverse disciplines, including medicine, psychology, and economics. This interest has generated a significant body of research, but each study typically covers only some of the issues and furthermore these studies do not always reference each other. For this reason, a review of the literature may be useful not only to researchers of diverse disciplines but also to industry representatives and those public officials responsible for transportation, road safety, and health policy.

Although the characteristics of the job of taxi driver may vary among and even within countries, there are factors that are shared across the varying latitudes of the globe. This article provides a comprehensive review of the characteristics of the taxi industry, the working conditions in the sector and, especially, the health consequences of working as a taxi driver. Our goal is to summarise existing knowledge, identify possible lines of research and suggest some practical recommendations to improve the occupational safety and health of taxi drivers.

The article is organised as follows. First, in order that the reader may know how sources were selected, we present the general procedure we followed in our review. Second, we provide a summary of results in three basic areas: (a) characteristics and working conditions of the sector; (b) road safety and risk; and (c) occupational health issues and protective behaviours. Even though the analysed phenomena are intimately linked and the proposed order is not the only one that is possible, these three large categories are sufficiently general to encompass the areas covered by researchers. It is necessary to note that, because health issues are associated with working conditions, the description of the different ailments includes, in some cases, a mention of the working condition

that led to it. Nevertheless, our intent was to avoid unnecessary redundancy. Lastly, based on our review, we offer guidelines and recommendations at various levels.

About this review

It is important to recognise that previous reviews on this subject can be found in empirical studies by other authors (e.g. Dalziel & Soames Job, 1997; Öz et al., 2010; Rosenbloom & Shahar, 2007). Comparatively, our review is broader and more exhaustive in terms of scope and sources. We used the following process. First, we conducted a Scopus database search. We inputted diverse terms in a variety of search engines. Basically, the term “taxi driver” was combined with others, such as “health”, “health condition”, “working conditions”, “job stress”, and “occupational stress”. The search covered the period from 1990 to 2015. After eliminating duplicate results and studies that were not relevant to the central theme of this article, we identified 60 entries. This initial search was complemented with other database searches (e.g. LILACS, SCIELO), which yielded 10 additional studies.

Each study was read and analysed by the authors. Then we prepared a comprehensive summary of the information. Lastly, the results were grouped into one of three basic areas. The first area summarises information pertaining to the characteristics of the taxi industry and some of the common work conditions in the sector (regulations, workload, etc.). This area is contextually important because it sheds light on some of the sector’s occupational health risks and problems. The second area summarises research on road safety and risky driving behaviours as they pertain to taxi drivers, a subject that has been the focus of a good part of the scientific research in this field. Lastly, the third area of our analysis covers occupational health issues, focusing especially on how they are related to working conditions. This last area includes a subsection on coping strategies and protective behaviours as possible moderating factors.

The taxi industry and working conditions

Taxi service regulations are generally codified at the municipal level and establish the way the services operate, the number of licences available, the rates, and the requirements for vehicles and drivers (Blasi & Leavitt, 2006; Moore & Balaker, 2006; Sun, Yu, Zeng, Wang, & Tian, 2017). There is no consensus on how to regulate the taxi market. Opinions are split between those who favour regulation and those who do not (e.g. Cooper, Mundy, & Nelson, 2010; Moore & Balaker, 2006). Consequently, there are taxi services that operate under very restrictive regulations, others that operate under regulations that control only some aspects of the service (such as rates), and yet others that are completely unregulated.

Taxi service regulations seem to have received more attention with the emergence of Transportation Network Companies (TNCs). These companies, the best known of which is Uber, introduced some novel changes into urban transportation systems. However, it should be kept in mind that these companies tend to operate in large cities, and generally under low-regulation conditions. Further, the evidence of their impact on taxi services is not conclusive. On the one hand, there are studies that indicate that TNCs and taxis are in direct competition for passengers (e.g. Sun et al., 2017). Consequently, taxi drivers

experience a reduction in the number of trips, the value of licences and the income they earn (Bond, 2015; Rayle, Dai, Chan, Cervero, & Shaheen, 2016). On the other hand, there is evidence that these companies do not compete exactly for the same niche market and that they also affect other means of transportation (Rayle et al., 2016). Lastly, in some cities, TNCs provide a complementary service and do not appear to affect the earnings of taxi drivers (Hai, Yang, Li, Li, & Yang, 2016). In any event, it appears that the emergence of TNCs has led to improvements in terms of customer service among taxi services (Bond, 2015). However, working conditions seem to be similar for TNC drivers, at least in terms of earnings and work hours (e.g. Wood, Parry, Carruthers, & Rose, 2017). The innovation that these services supposedly represent for transportation systems requires further research to better appraise them.

There are diverse forms of labour organisation for taxi drivers. Although drivers are for the most part independent contractors (e.g. Bawa & Srivastav, 2013; Burgel, Guillen, & White, 2012), there are companies that hire a significant number of drivers (e.g. Sun et al., 2017), as well as cooperatives constituted by the owners of one or more taxi cabs, which can then be rented to other drivers (e.g. Blasi & Leavitt, 2006). In the case of independent contractors, conditions vary. The most significant difference is whether or not the contractor holds the licence or owns the vehicle. Licenced contractors with their own vehicles tend to work shorter hours and during the better shifts, and are paid when their vehicles are used by other drivers (e.g. Ledesma, Poó, & Peralta, 2008; Mayhew, 2000a). On the other hand, hired drivers and those who rent a licence tend to work the worst shifts and typically pay for the use of the vehicle, including fuel costs (e. g., Bawa & Srivastav, 2013; Mayhew, 2000a; Meng et al., 2015).

Although there are varying regulations and forms of labour organisation, the characteristics of the work are quite similar throughout the world. One shared characteristic is that taxi drivers are remunerated based on the number of trips and the distance covered (piecework). As a result, daily earnings vary. This can be compensated for by working longer hours (Ledesma et al., 2008; Machin & De Souza, 2004; Pang & Mu, 2007; Routley, Ozzane-Smith, Qin, & Wu, 2009; Tseng, 2013). During work shifts, breaks tend to be few and their length varies depending on trip demand (e.g. Dalziel & Soames Job, 1997; Meng et al., 2015). Usually these breaks are taken in the vehicle because taxi drivers do not tend to have special areas to rest, eat, and attend to their personal hygiene (e.g. Gany et al., 2013; Vlachantoni, Gerakopoulou, Afilochiou, Desypriss, & Petridou, 2010).

Despite long hours, monthly earnings are typically low, and in many cases lower even than minimum wage (e.g. Shi et al., 2014). Additionally, other factors impact earnings. First, a practice observed in several countries is that drivers, although they are not the owners, assume vehicle maintenance costs and, in many cases, pay for the use of a licence (Ledesma et al., 2008; Mayhew, 2000a; Sun et al., 2017; Wang & Delp, 2014). When the work relationship is insecure and informal, the vast majority of taxi drivers do not have health insurance for themselves and their families, do not have vacations, nor do they contribute to social security (e.g. Apantaku-Onayemi et al., 2012; Blasi & Leavitt, 2006; Burgel et al., 2012; Gany et al., 2013; Gany et al., 2016). Additionally, they rarely have union representation to negotiate collectively for the betterment of their working conditions (Wang & Delp, 2014; Ledesma et al., 2008). Some researchers indicate at least two factors that impede collective organisation: drivers tend to be suspicious of organised labour, and

their bosses prohibit them from joining a union (e.g. Ledesma et al., 2008; Wang & Delp, 2014).

Another issue associated with excessively long work hours is exposure to potentially harmful environmental factors, such as the constant, low-level vibrations transmitted by the vehicle (Bulduk, Bulduk, Süren, & Ovali, 2014; Chen, Chang, Chang et al., 2005; Funakoshi, Taoda, Tsujimura, & Nishiyama, 2004). The exposure to these vibrations is due to the poor ergonomics of automobiles. In most cases, automobiles are not designed for the demands of a long work shift. This problem is aggravated by the poor posture exhibited by many drivers.

Further, taxi drivers are exposed to the environmental contaminants produced by the combustion of fossil fuel, such as benzene, lead, and carbon dioxide (Brucker et al., 2013, 2014, 2015; Jo & Yu, 2001; Zagury, LeMoullec, & Momas, 2000). Additionally, some vehicle traits, such as antiquity, size, and the type of fuel used, can have negative impacts (Mohammadyan, Alizadeh, & Etemadinejad, 2010). The older and smaller the car, the greater the contamination.

Looking at the drivers themselves, one similarity across all countries is that they share demographic traits. Taxi driver is a predominantly male occupation (Chen, Chang, Chang et al., 2005; Clarke, Ward, Bartle, & Truman, 2009; Lim & Chia, 2015). The percentage of women taxi drivers is very small. As a result, they are almost never represented in research samples. One exception is the work of Yeh, Tseng, Liu, and Tseng (2015), a study on women taxi drivers in Taiwan. According to their findings, working conditions are the same for women as for men.

Although there are some university graduates among them, typically the vast majority of taxi drivers have not completed their secondary education or only completed their primary education (e.g. Bawa & Srivastav, 2013; Tseng, 2013; Yang et al., 2014). An exception to this pattern is found in those countries where the workforce is composed mainly of immigrants. In these cases, the educational level of taxi drivers may be slightly higher and the number of university graduates among them tends to be greater (Gany et al., 2016). This is due to educated immigrants moving to those countries in search of better living conditions, but facing difficulties when integrating into the workforce (Facey, 2003).

With some exceptions, such as the case of England's Black Cab taxi drivers (Wood et al., 2017), taxi driver is an easy job to get in many countries because it generally does not require any special qualifications. Additionally, many unemployed individuals may see it as a temporary solution to their predicament (e.g. Bawa & Srivastav, 2013; Facey, 2010; Ledesma et al., 2008). Many taxi drivers view driving a taxi as a short-term job until something better comes along. However, the long working hours make it difficult to find time to search for a better alternative. Thus, some authors indicate that many taxi drivers remain in a job that in most cases they wish they could leave (e.g. Gany et al., 2013; Facey, 2010).

In the case of immigrant taxi drivers, they may face harassment and discrimination from passengers (Burgel et al., 2012; Facey, 2003). But not only immigrant taxi drivers are subject to violence. Taxi drivers as a whole are more likely to be victims of assault while at work (Gany et al., 2013; Grisi Velôso, de Oliveira Filho, Silva de Medeiros, & dos Santos Araujo, 2009). Further, studies indicate that, over a 12-month period, the percentage of taxi drivers that were victims of assault ranged from 50% to 75% (e.g. Ledesma et al., 2008; Mayhew, 2000a). These incidents include being punched, stabbed, and shot. The likelihood that a taxi driver will die while working is higher than for any other occupation

(Castillo & Jenkins, 1994; National Institute for Occupational Safety and Health (NIOSH), 1996). Several aspects of the job, such as direct contact with clients, picking up potentially dangerous passengers (prostitutes, drug dealers), handling money, and working alone, often at night and in dangerous areas, constitute risk factors that increase their chances of being victims of assault (e.g. Burgel, Guillen, & White, 2012, 2014; Facey, 2003). For women taxi drivers, there is the additional risk of being a victim of sexual assault (Mayhew, 2000a). Recommendations to reduce the risk of physical attack include: training programmes for taxi drivers and police; the use of technological devices such as Global Positioning System; antitheft barriers; electronic payment systems; and legislative changes. Interventions ought to consider all of these measures in order to be effective (Mayhew, 2000b).

The road safety issue

In the literature review, we noticed that a good amount of attention has been given to traffic collisions and related injuries. Taxi drivers are involved in a significant number of crashes at a proportionally higher rate than non-professional drivers. Statistics from various studies collected over periods of time ranging from one month to three years indicate that from 20% to 50% of taxi drivers were involved in a crash (Dalziel & Soames Job, 1997; La, Lee, Meuleners, & Van Duong, 2013; Ledesma et al., 2008; Shi et al., 2014). However, these statistics do not usually factor in the differential exposure to potential crashes faced by taxi drivers (af Whalberg, 2009). An exception is the study by Öz et al. (2010), which controlled for age and distance travelled, and found no difference in the rate of crashes between taxi drivers and non-taxi drivers. However, a small sample was used and it is not possible to determine if there was bias in the selection of the study's participants.

In addition to information on the number of crashes, it is important to have data on associated risk factors in order to design adequate prevention programmes. In the case of taxi drivers, those factors might be associated with working conditions that might influence behaviour. Below, we summarise the results of research on risk behaviours and their association with factors such as stress, fatigue, and personal traits.

Risky driving behaviour

Some of the risky behaviours that explain the involvement of taxi drivers in road accidents are not unique to the profession. Among these are: misjudging the distance between vehicles; engaging in often-prohibited manoeuvres, such as U-turns and driving in reverse; ignoring traffic lights; stopping in prohibited areas; and using a cellphone while driving (Clarke et al., 2009; Shi et al., 2014).

Other factors that are directly related to driving a taxi contribute to risky behaviours. One is driving at night, which increases the risk of collision and injury versus driving when there is daylight (Lam, 2014). Competition for new passengers also leads to risky and aggressive driving behaviours. These include driving beyond the speed limit, ignoring the suggested minimal distance with the vehicle in front, and cutting off other vehicles. These types of behaviours appear to be naturalised among taxi drivers, who see them as a necessary part of the job in order to make enough money at the

end of the day (e.g. Facey, 2003, 2010; Shams, Shojaeizadeh, Majdzadeh, Rashidian, & Montazeri, 2011).

Tseng (2013) analysed the relationship between operating style and the violation of speed limits among taxi drivers. Operating style was defined as the way drivers pick up new passengers, and included waiting at a fixed location, circulating along city streets, and a combination of the two. Circulating along city streets in search of new passengers had the lowest rate of speed limit violations. Tseng suggests this could be a result of the need to spot people hailing a taxi. In contrast, the rate was higher among those who waited at a fixed location, possibly due to their desire to return quickly to the waiting area in order to be available for the next pickup. Yeh et al. (2015), however, did not observe this relationship in their study on women taxi drivers. The effect of operation style on risky behaviours requires further research in order to arrive at more definitive conclusions.

Some environmental elements may also negatively influence the behaviour of taxi drivers. Shams et al. (2011) indicate that poor road conditions and heavy traffic provoke driving anger and risky driving behaviours. Risky behaviour on the part of other motorists may also have a negative effect on driver safety. In this respect, Clarke et al. (2009) indicates that taxi drivers were not at fault in the majority of the accidents they were involved in; rather, the principal problem is that taxi drivers are exposed to a highly dangerous environment (e.g. heavy traffic, reckless drivers, and/or pedestrians).

An additional safety issue is the reluctance on the part of taxi drivers to use seat belts. Studies in various countries indicate that the majority of taxi drivers did not use seat belts or used them in an inadequate or non-functional manner (e.g. Fernandez, Park, & Olshaker, 2005; Fleiter, Gao, Qiu, & Shi, 2009; Nabipour, Khanjani, Soltani, & Akbari, 2014; Routley et al., 2009). Some explanations for this included: discomfort; the notion that seat-belt use is not that important on short trips or when driving at low speeds; and the fear of being trapped or injured by the seat belt during an assault (Routley et al., 2009). On the other hand, when fines are imposed for non-use, Fergusson, Wells, Williams, and Feldman (1999) found that taxi drivers are motivated to use or tamper the use of a seat belt. Moreover, they found that in jurisdictions where seat-belt use is mandated by law, the rates of use are higher.

Road safety and stress

Several aspects of driving a taxi can cause stress, a phenomenon associated with risky behaviours and road crashes among professional drivers (Lim & Chia, 2015; Shams et al., 2011; Taylor & Dorn, 2006).

Studies on workplace stress have largely taken one of two approaches: the person–environment fit (French, Rodgers, & Cobb, 1974) and the transactional model (Lazarus & Folkman, 1984). Both approaches are reflected in research on taxi drivers. In the person–environment fit approach, work stress is considered a consequence of the imbalance of the worker's personal characteristics with the demands of the job. The focus is on a series of objective aspects that can negatively affect individuals. For example, the relationship between the *demands* of the job and the *control* the worker has over them (Karasek, 1979). This approach, which gave us the concept of *job strain* (high demand and low control), has been used in research on the work conditions of taxi drivers (Bigert et al.,

2003; Gustavsson et al., 1996; Wang & Delp, 2014). However, in the majority of cases, this model has been used to study the impact of stress on the health of the drivers. Wang and Delp (2014) is an exception; this study observed a significant reduction in the risk of injury when drivers reported low levels of stress and good health compared to those with high stress and poor health.

The Transactional Model of Stress (Lazarus & Folkman, 1984) emphasises the individual's cognitive evaluation of objective conditions. Stress is the product of the imbalance between individuals and their environments when environmental demands exceed what individuals perceive as their capabilities and resources, and endanger their well-being. The stress process is a consequence of: (a) the primary evaluation of a situation's or stimulus' positive or negative character; (b) the secondary evaluation of the possibilities of action and confrontation; and (c) the re-evaluation of the situation in accordance with the environmental and cognitive changes produced. The stress process can trigger adverse subjective experiences such as angry driving and potentially damaging behaviours such as risk taking.

Among the articles included in this literary review, at least two explicitly use the transactional approach to study risky behaviours and their consequences in taxi drivers (Ledesma et al., 2008; Öz et al., 2010). First, Ledesma et al. (2008) observed a positive correlation between the likelihood of injury and the negative evaluation of the workload. Second, Öz et al. (2010) evaluated stress vulnerability using the Driver Stress Inventory (Matthews, Desmond, Joyner, & Carcary, 1997). They observed that negative subjective states, such as anger and anxiety, are related to risk behaviours. According to the authors, feelings of anger correlated positively with speed limit violations, Fatigue Prone-ness and Thrill Seeking, and they correlated negatively with Dislike of Driving and Hazard Monitoring. This suggests that drivers who dislike driving have greater feelings of anger; further, the greater the anger, the lesser the monitoring of potential hazards. In accordance with these results, another dimension that correlated positively with the violation of speed limits was the Dislike of Driving.

Fatigue and road risk

The term fatigue describes a general state of weariness, exhaustion and sleepiness, which is accompanied by a subjective desire to abandon the task being performed (Dalziel & Soames Job, 1997). Fatigue worsens task performance by generally slowing down responses and increasing decision-making errors. Consequently, it is not surprising that fatigue is one of the principal risk factors contributing to collisions among professional drivers (Shams et al., 2011; Taylor & Dorn, 2006). According to Dalziel and Soames Job (1997), taxi drivers may experience fatigue for two reasons. First, due to changes in the sleep cycle and alertness caused by working long hours, sleeping less, and/or working nightshifts. Second, driving itself causes fatigue when it is done for prolonged periods of time. In this case, fatigue results from the sustained concentration and alertness required of a complex task.

Rest during and after work is an important factor in countering fatigue and its consequences. In the case of taxi drivers, the more demanding the workday, be it in terms of the distance covered or fewer breaks between trips, the greater the number of collisions and the instances of speed limit violations (Dalziel & Soames Job, 1997; Tseng, 2013; Yeh et al., 2015). It is worth noting that taxi drivers feel that when they are fatigued, they drive

more safely than other drivers who are similarly fatigued. Dalziel and Soames Job (1997) indicated that this optimistic risk evaluation has a negative potential impact on the possibility of a collision.

Personal characteristics and risk

Some personal and psychological factors are associated with risky behaviours and involvement in collisions. In the case of taxi drivers, the research in this area has been uneven. The majority of the accumulated evidence pertains to age and gender. Other sociodemographic and psychological variables have received comparatively less attention.

With respect to gender, the data indicate that male taxi drivers receive more citations for violating the speed limit and being involved in crashes (Lam, 2004; Tseng, 2013). However, when a collision occurs, women have a greater likelihood of injury or death (Clarke et al., 2009; Lam, 2004). This is possibly explained by the difference in body structure between men and women. Age is another variable that is also associated with differences in risky behaviours and involvement in crashes. Independently of gender, youth is associated with driving at greater speeds, receiving more citations, being involved in more collisions, and suffering more injuries (Clarke et al., 2009; Öz et al., 2010; Yeh et al., 2015). However, some studies did not find differences among age groups (Lam, 2004; Tseng, 2013). For example, La et al. (2013) and Lam (2004) maintain that the available research on age is not conclusive.

Another sociodemographic variable that has been studied, although not as extensively, is the level of formal education. Yeh et al. (2015), for instance, observed that educational level is inversely related with speed limit violations among women. However, other authors did not observe differences attributable to educational level with respect to a specific risky behaviour (Tseng, 2013). Yeh et al. (2015) also evaluated the relationship between driving experience and traffic violations, but found no significant effect. On the other hand, Tseng (2013) observed that drivers with less than two years' experience behind the wheel had more citations for speed limit violations than did more experienced drivers. The differences between these findings could be because only women participated in the Yeh et al. (2015) study and Tseng (2013) used a sample almost entirely composed of men.

Among the psychological factors that can lead to risk taking are trait variables, defined as a stable predisposition to behave in a certain manner. Burns and Wilde (1995) indicate that drivers who experience a need for tension, adventure, and risk in their lives demonstrate a risky driving style characterised by driving at high speeds and recklessly changing lanes. Additionally, they observed that taxi drivers with a high Thrill Seeking score engaged in risky driving behaviours for the pleasure of it, and received more citations for speed limit violations and other traffic infractions. However, these authors did not document any association between personality traits and a record of crashes.

Machin and De Souza (2004) studied the relationship between some attitudinal variables and risky behaviours. Their results indicate that the predictor principle for risky behaviours is an aversion to risk taking. Specifically, they observed that the lesser the aversion to risk, the greater the incidence of risky behaviours.

Citations for traffic infractions were also a consideration for drivers. When fines are perceived as unjust, they can have a negative effect, generating anger and aggressive behaviour on the road (Shams et al., 2011). In this respect, Rosenbloom and Shahar (2007)

classified regulations and their consequences by severity (low, medium, and high), and compared how drivers from the general population and taxi drivers felt about them. The higher the severity of the regulation and its consequences, the more legitimate it was perceived by both groups. But taxi drivers who felt low- and medium-severity regulations were more unjust than non-professional drivers did. According to Rosenbloom and Shahar (2007), differential exposure to traffic increases the probability that taxi drivers will be fined for minor infractions, a factor that negatively impacts their monthly earnings and colours how they evaluate the regulation.

Working conditions and health

Numerous studies have demonstrated the physical and emotional issues that taxi drivers face, and their link to the characteristics and working conditions of the occupation. These issues include: a high incidence of musculoskeletal pain; cardiovascular diseases; overweight and obesity; digestive issues; stress; fatigue; mood and sleep disorders; respiratory problems; kidney and bladder issues; and potentially toxic habits (Bigert et al., 2003; Ekpenyong, Etebong, Akpan, Samson, & Daniel, 2012; Gany et al., 2013; Gustavsson et al., 1996; Mahdavi-Mazdeh et al., 2010; Raanaas & Anderson, 2008; Yang et al., 2014). When these data were compared with data for the general population, it was observed that the overall health of taxi drivers was poorer (Gustavsson et al., 1996). Another health-related aspect that has generated interest among researchers is the preventive behaviours and coping strategies that taxi drivers employ in dealing with work difficulties. Despite its importance, this dimension has been relatively underdeveloped.

Below, we describe the research results on the emotional issues, physical ailments, unhealthy habits, and coping strategies associated with the working conditions described above.

Emotional and health issues

Working conditions can lead to different experiences of stress that can be temporary or sustained over time (Bawa & Srivastav, 2013). Gany et al. (2013) indicated that drivers identified stress as the principal cause for their poor health and they associate it with a wide range of problems. It has been observed that among taxi drivers, stress generates physiological changes like an increase in neuroendocrine hormones (adrenaline, nor-adrenaline, cortisol) and high blood pressure. It also increases triglyceride, glucose and LDL cholesterol levels, and decreases HDL cholesterol values (Jovanovic et al., 2008). These changes can lead to ischaemic heart disease and atherosclerosis. Additionally, stress was associated with other health issues such as musculoskeletal pain, gastrointestinal problems, and strokes (Bawa & Srivastav, 2013; Gany et al., 2013).

Work overload and working at night are factors associated with increased risk of heart disease (Chen, Chen, Chang, & Christiani, 2005; Kobayashi et al., 2002). The evidence suggests that when these factors are prolonged over time, the problem becomes more pronounced. Bigert et al. (2003) observed that the risk of a heart attack was greater for those who drove a taxi for 10 years than for non-professional drivers. However, in the case of former taxi drivers, this same risk returned to the level of non-professional drivers after two years of having left the profession.

When a cardiovascular episode manifests itself suddenly while the taxi driver is behind the wheel, it is likely that a collision will occur (Hitosugi, Gomei, Okubo, & Tokudome, 2012). As a result, the driver, passengers, and other motorists may be injured or killed. In a comparative study with professional drivers, Hitosugi et al. (2012) found that the sudden onset of a cardiovascular or cerebrovascular illness was more prevalent among taxi drivers than truck drivers and bus drivers.

Unhealthy habits

Another issue that seems to be the result of poor working conditions is the development of unhealthy habits. The length of the workday and the number of days worked in a week leaves little time for recreational activities and leads to a sedentary lifestyle. According to Yang et al. (2014), this has negative consequences on the emotional well-being of taxi drivers, which worsens as they have fewer pleasurable experiences. This in turn may increase the risk of experiencing symptoms of depression (Bawa & Srivastav, 2013).

After a workday of 10 hours or more, there is scarcely any time left for physical activity and signs of general weariness are pronounced (Apantaku-Onayemi et al., 2012; Bigert et al., 2003; Yang et al., 2014). In addition to a sedentary lifestyle, taxi drivers also usually have poor eating habits. For the most part, they consume fast foods, eat few fruits and vegetables, and rarely eat at home (e.g. Apantaku-Onayemi et al., 2012; Bawa & Srivastav, 2013; Wang & Delp, 2014). Consequently, many taxi drivers are either overweight or obese, with elevated body mass indices and high cholesterol levels (e.g. Bigert et al., 2003; Chen et al., 2005; de Sena, de Pontes, Ferreira, & da Silva, 2008; Lim & Chia, 2015; Wang & Delp, 2014). These problems have been linked to disorders like diabetes, hypertension, and cardiovascular diseases. Incidences of these health issues are more prevalent among taxi drivers than the general population at large (Gustavsson et al., 1996).

Another problem related with long working hours and rotating shifts is the scarce number of sleeping hours. Various studies have documented that a large proportion of taxi drivers sleep fewer than six hours a day (e.g. Bawa & Srivastav, 2013; Lim & Chia, 2015; Nakano et al., 1998). Further, some studies have documented that many taxi drivers experience chronic obstructive sleep apnoea, characterised by a series of repetitive episodes of partial or total obstruction of the upper airways during sleep (e.g. Firestone, Mihaere, & Gander, 2009; Vlachantoni et al., 2010). Moreover, it seems that this problem is more prevalent among taxi drivers than in the general population. A typical trait among taxi drivers that increases the risk of this disorder is an elevated body mass index, or being overweight (e.g. Firestone & Gander, 2010; Firestone et al., 2009). Additionally, the risk of suffering from sleep apnoea is higher for older drivers. Insufficient sleep and sleeping poorly are associated with elevated sensations of sleepiness and fatigue syndrome (Lim & Chia, 2015).

Another health issue among taxi drivers is smoking. Various studies indicate that cigarette smoking is a frequent habit among taxi drivers and tends to be more widespread than in the general population (e.g. Bawa & Srivastav, 2013; Bigert et al., 2003; Chen et al., 2005; Yang et al., 2014). This is a problem because cigarette consumption, like driving a taxi, can contribute to DNA oxidative damage, which is a risk factor for cancer (Chuang, Lee, Chang, & Sung, 2003). As to be expected, the greater the cigarette

consumption, the greater the DNA damage. Cigarette consumption also increases the relative risk of myocardial infarction (Gustavsson et al., 1996). Another problematic factor is the interaction between environmental pollution and elevated temperatures generated by asphalt that can increase the risk of cardiac autonomic dysfunction in healthy individuals (Wu et al., 2013).

Musculoskeletal pain is another typical health issue among taxi drivers. Taxi drivers report back pain, neck pain, waist pain, and pain in their legs, knees, and feet, as well as in their shoulders, hands, and arms (e.g. Bulduk et al., 2014; Chen et al., 2004; Costa, Colucci, Sampaio, & Oliveira, 2009). Some researchers found that the prevalence of these issues is truly elevated for taxi drivers (Costa et al., 2009; Ledesma et al., 2008). Risk factors for these issues include continual exposure to low-level vibrations over prolonged periods of time, the poor ergonomic design of vehicles (which causes taxi drivers to assume poor postures while they work), the handling of heavy objects, the lack of breaks, the number of years performing this type of work, the length of the workday, and stress (Bulduk et al., 2014; Chen et al., 2004; Chen et al., 2004; Magnusson, Pope, Wider, & Areskoug, 1996).

Psychosocial factors: coping strategies

Coping strategies to mitigate occupational risk factors are another psychosocial aspect related to maintaining good health. These behaviours have received relatively little attention. Ledesma et al. (2008) analysed the work concerns of drivers and their confrontation strategies. Among their main concerns were: insecurity and crime; traffic and interaction with other motorists; collisions; the state of the roads; the effects of work on health and their personal lives; and their informal work status. Facey (2003, 2010) identified similar sources of unease such as uncertainty and economic exploitation, fatigue, and competition for passengers. The majority of these concerns derive from structural problems that are difficult for the individual to change or control.

Ledesma et al. (2008) classified the coping strategies reported by drivers in four categories: (a) Avoidance and denial strategies (e.g. letting things slide, not thinking of working); (b) Mitigation strategies, of a more active nature (e.g. practicing a sport or a pastime, and eating better); (c) Seek out social support (e.g. from family and co-workers); and (d) Specific strategies (e.g. prudent driving, selective passenger pickups).

Facey (2003, 2010) highlighted other strategies. One was to take breaks between trips. However, given the lack of infrastructure, these breaks took place inside the automobile. Another important strategy was maintaining control inside the vehicle to counter the behaviour of potentially dangerous passengers. To maintain this control, drivers resorted to various forms of conversation: (a) evaluative, to discern a passenger's intention; (b) placative, to establish trust and avoid abuses; and (c) entertaining, to create good feelings and entertain the customer.

In a similar vein, Burgel et al. (2012) observed that maintaining control inside the vehicle was crucial to preserving one's health. The authors also indicated other strategies, such as maintaining a positive attitude and proactive behaviours to safeguard one's body, such as properly handling heavy objects at work, taking time for stretching exercises, receiving massages, and contracting health insurance.

There are also negative strategies, such as alcohol and drug consumption. In this respect, Sheahan and Smith (2003) indicate that taxi drivers consume cocaine and

methamphetamines for the purpose of improving performance and self-motivation, and smoke marijuana to cope with stress. Burgel et al. (2012) indicated that self-medication was also a common habit among taxi drivers. These behaviours seem to be related to the lack of support provided by the organisations and lead to worsening health conditions (Sheahan & Smith, 2003).

In summary, the coping strategies used are mostly of an individual and mitigating nature, geared to modifying the perception of the problems or mitigating their effects, but without changing the determinants that arise from the working conditions. On the other hand, collective organising is less common. However, it is clear that the sources of stress are common to nearly all workers and stem from the system's structural elements.

Conclusion

Taxi drivers have a high level of exposure to health risk factors. These include: (a) road crashes, workplace violence and environmental pollution; (b) challenges to maintaining healthy habits and implementing protective measures (e.g. seat-belt use); (c) informal work; and (d) few coping strategies to tackle the problems that arise at work, with individual initiatives predominating.

Some of these issues have received more attention than others. For example, the effects of pollution have been the subject of sophisticated studies conducted by researchers at varying latitudes. The same is true of health issues, such as musculoskeletal pain, sleep disorders, and issues associated with being overweight. In contrast, the perception of work problems and the confrontation strategies employed by taxi drivers have received less attention.

Turning to matters of the research itself, in terms of methodology, there are some positive aspects, such as the use of varying methodologies to obtain data. The convergence of the results validates the conclusions. In this respect, it is important to incentivise the use of mixed methodologies. On a less positive note, there are some aspects that can be problematic. When age groups are analysed, for instance, the definition of these groups varies greatly from one study to the next, making it difficult to generalise conclusions. Further, studies based on self-reporting use non-standardised instruments. The creation of ad hoc instruments to evaluate different aspects according to the interests of the authors is common, but little to no evidence of their metric qualities is provided. This makes it difficult to compare results across studies. It is important to emphasise that there exist few longitudinal studies that evaluate the health of taxi drivers over time. We also did not find any cross-cultural studies, which would be valuable given the similarities of the difficulties faced by taxi drivers in different parts of the world.

Recommendations

Based on the aforementioned literature review, we suggest the following guidelines and courses of action that we believe to be useful to promote driver health and safety. These guidelines should not be considered norms. Rather their objective is to indicate possible lines of action to develop prevention and work health promotion programmes that may or may not be pursued.

First, the need for labour policies to improve working conditions seems evident. Reducing the workload, establishing adequate time for breaks, and providing access to health-care are some of the areas that require new regulations. These changes seem indispensable in order to achieve real and sustained improvements.

In conjunction with these policies, it would be necessary to implement actions to promote and maintain healthy habits. In this regard, it seems necessary to design and implement interventions to: (a) achieve healthier eating habits; (b) mitigate the adverse effects of a sedentary lifestyle; (c) improve periodic check-ups of health indicators; (d) reduce the consumption of psycho-addictive substances; and (e) prevent the development of musculoskeletal issues. These interventions should be simple in order that they may be applied in the typical work context of taxi drivers (e.g. Gany, Gill, Baser, & Leng, 2014).

In terms of occupational training, we suggest several courses of action. Above all else, it is essential to train drivers about road safety. In addition to providing basic knowledge, it would be important to cover other relevant issues, such as the prevention of fatigue and stress at work. Additionally, it seems that training is needed on how to deal with stress in adverse traffic conditions, and how to handle anger and violence; further, skills to manage problem passengers need to be developed.

With respect to fatigue and stress, the priority should be to modify the working conditions that cause them, which requires interventions like regulations on the length of the work day. Additionally, it appears to be important to diagnose, detect, and treat indicators of occupational fatigue and stress, especially at the emotional and cognitive levels. It should also be relevant to avoid accumulating fatigue over time and prevent states that can result difficult to revert (e.g. chronic fatigue).

It would also be positive to develop programmes that make it possible to evaluate work concerns and broaden coping strategies to foster positive changes. Although there are personal differences when it comes to how to best confront problems, it would be beneficial for workers to collectively come up with strategies to resolve the issues they face at work. A collective approach has the potential to lead to change by increasing social relationships and group cohesion. Another important area that should be pursued is the development of social skills to favour the creation of support networks within the work environment.

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