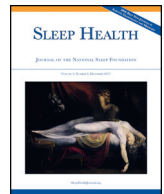




Contents lists available at ScienceDirect

Sleep Health

Journal of the National Sleep Foundation

journal homepage: sleephealthjournal.org

Hours of service regulations for professional drivers in continental Latin America[☆]

Guido Simonelli, MD^{a,*}, Giannina Bellone, MSc^{b,c,d}, Diego Golombek, PhD^{b,d}, Daniel Pérez Chada, MD^e, Nick Glozier, MBBS, PhD^f, Vincent F. Capaldi, MD^a, Daniel E. Vigo, MD, PhD^{c,g}, Meir H. Kryger, MD^h

^a Behavioral Biology Branch, Walter Reed Army Institute of Research, Silver Spring, MD, USA

^b Chronobiology Laboratory, Science and Technology Department, National University of Quilmes (UNQ), Bernal, Argentina

^c Chronophysiology Laboratory, Institute for Biomedical Research (BIOMED), Pontifical Catholic University of Argentina (UCA) and National Scientific and Technical Research Council (CONICET), Buenos Aires, Argentina.

^d National Scientific and Technical Research Council (CONICET), Argentina

^e Pulmonary and Sleep Clinic, Department of Medicine, Austral University, Pilar, Argentina.

^f Brain and Mind Centre, Sydney Medical School, University of Sydney, Australia

^g Faculty of Psychology and Educational Sciences, Katholieke Universiteit Leuven, Leuven, Belgium

^h Pulmonary, Critical Care and Sleep Medicine, Yale School of Medicine, New Haven, CT, USA

ARTICLE INFO

Article history:

Received 16 February 2018

Received in revised form 18 July 2018

Accepted 19 July 2018

Available online xxxx

ABSTRACT

Objectives: To describe the hours of service provisions in continental Latin America.

Design: Information on regulations of service hours was extracted from either the national transportation authorities or ministries of transportation (or the equivalent institution) from each country.

Setting: Seventeen sovereign countries in continental Latin America (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela).

Participants: N/A

Intervention (if any): N/A

Measurement: Data on (a) limit on work hours, (b) mandatory daily time off (or rest), (c) overall schedule (mandatory weekly time off), and (d) daily breaks were extracted and summarized.

Results: Of the 17 countries surveyed, 9 countries have provisions limiting the daily amount of hours of service for professional drivers. Ten have provisions for mandatory daily rest, but only 5 have explicit provisions limiting the number of continuous working days, with mandatory uninterrupted time off >35 hours. Eight countries have provisions for mandatory breaks that limit the hours of continuous driving (ranging from 3 to 5:30 hours).

Conclusion: Regulations that govern a population with 6 million injuries and over 100,000 deaths per year due to motor vehicle accidents leave important gaps. A minority, 6, of the countries regulated all 3 aspects; daily hours, breaks, and time off, and 3 regulate none of these. The regulations are less precise and restrictive than those in high-income countries, despite the doubled road injury mortality, and likely expose professional drivers and other road users to an increased risk of fatigue-related accidents.

© 2018 National Sleep Foundation. Published by Elsevier Inc. All rights reserved.

Introduction

Insufficient sleep and circadian misalignment, coupled with long working hours, put truck and bus drivers at an increased risk for

road accidents.¹ In the past 2 decades, new special provisions that regulate work hours for professional drivers have been put in place in high-income countries and have been recently reviewed in the context of sleep and fatigue prevention (Mansfield et al).² In the European Union, hours of service provisions allow driving for up to 9 hours per day, whereas in the United States and Canada, provisions allow for up to 11 and 13 hours of driving, respectively.² Continental Latin America comprises a region of 17 sovereign Spanish/Portuguese-speaking countries with an estimated population of approximately 569 million people. In this region, there are over 6 million reported injuries and over 100,000 reported deaths as a result of

[☆] Financial support: This manuscript was prepared while GS held a National Research Council Research Associateship Award at Walter Reed Army Institute of Research (WRAIR).

* Corresponding author at: Behavioral Biology Branch, Center for Military Psychiatry and Neuroscience Research, Walter Reed Army Institute of Research, 503 Robert Grant Avenue, Room #2W84, Silver Spring, MD 20910. Tel.: +301 319 9234 (Office).

E-mail addresses: guido.simonelli.ctr@mail.mil, guido.simonelli@icloud.com (G. Simonelli).

motor vehicle accidents per year.³ Road accidents are not only the leading cause of death for people aged between 15 and 44 in Latin America, its social and economic cost is estimated to account for up to 1.5% of the region's gross domestic product.³ In this brief report, we identify the current provisions regulating hours of service in continental Latin America and discuss whether these regulations may be effective in preventing fatigue and drowsiness among professional drivers.

Methods

Information on regulations of service hours was extracted from either the national transportation authorities or ministries of transportation (or the equivalent institution) from each 1 of the 17 sovereign countries included in this study (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, Venezuela). If no information on current regulations was found, we (a) searched for laws or regulations with provisions that regulate hours of service and (b) contacted local authorities to verify the lack of special regulations on this matter. Data on the regulations were later summarized and entered into Table 1 with the following categories: (a) limit on work hours; (b) mandatory daily time off (or rest); (c) overall schedule (mandatory weekly time off); (d) daily breaks. Table S1 shows the complete list of regulations found in Spanish or Portuguese per country as well as its translation to English.

Results

Table 1 shows the summary of hours of service provisions per country. The table is color-coded with 3 colors to represent the existence or not of provisions. We colored in green the cells for which regulations existed, in yellow when regulations existed but they were somewhat unclear or too vague, and in red when there were no provisions. Of the 17 countries surveyed, only 9 countries have regulations in place that limit the daily amount of hours of service for professional drivers (Fig. 1). In 3 countries, drivers' maximum allowed driving time is less than 10 hours (Paraguay, Uruguay, and Venezuela). On the other hand, in Argentina, Brazil, Chile, Costa Rica, and Peru, drivers may drive for up to 12 hours daily, whereas in Mexico, drivers may drive for up to 14 hours per day. Of the 8 countries that had no special provisions that limit the daily hours of service, 3 countries at least imposed weekly hour limits (Honduras, Nicaragua, and Ecuador). The remaining 5 countries (Bolivia, Colombia, El Salvador, Guatemala, and Panama) have no special provisions that limit working hours for professional drivers.

Only 10 countries in continental Latin America have special provisions for mandatory daily rest (or daily time off) for professional drivers (Fig. 2). Of these, 1 country required only 4 hours of rest (Bolivia), and 1 country (Paraguay) had in their provisions an unspecified amount of rest ("sufficient rest"). In the remaining 8 countries, professional drivers are required to have at least 8 hours of uninterrupted daily rest with a relatively small variation among countries (Argentina, Brazil, Chile, Honduras, Mexico, Nicaragua, Uruguay,

Table 1
Summary of current service hours regulations in continental Latin America

Country	Limit on Work Hours	Mandatory Daily Time Off (or Rest)	Overall Schedule [Mandatory Weekly Time Off]	Daily Breaks
Argentina	Daily: 12h Weekly: 44h	Daily: 12h	7-d cycle: 36h off (uninterrupted) 28-d cycle: may work for up to 22 consecutive days (264h) and then take 6 days off	30 minutes for every 5:30h of driving
Bolivia	X	Daily: 4h	X	X
Brazil	Daily: driving 8h (up to 12h with overtime) Weekly: 44h (Waiting time is not computed as work time)	Daily: 11h (8h uninterrupted)	7-d cycle: 35h off (uninterrupted) 7-d cycle: time off could be split into 2 periods one of these periods should be at least 30h (uninterrupted) 21-d cycle: 180h on duty maximum	60 minutes per day and 30 minutes every 5.5h of driving (for freight) or 30 minutes every 4h of driving (for buses) 24m per hour for a total of 5h of driving
Chile	Daily: 12h Monthly: 180h	Daily: 8h		
Colombia	X	X	X	X
Costa Rica	Daily: 12h Weekly: None	X	X	90 minutes
Ecuador	Daily: None Weekly: 40h	X	7-d cycle: 48h off (uninterrupted)	Unspecified amount
El Salvador	X	X	X	X
Guatemala	X	X	X	X
Honduras	Daily: None Weekly (daytime driving): 44h Weekly (nighttime driving): 36h	Daily: 10h (uninterrupted)	X	90 minutes (can be divided in up to 3 periods of 30 minutes)
Mexico	Daily: 14h Weekly: None Monthly: None	Daily 8h (if driving 14h)	X	30 minutes for every 5:30h of driving
Nicaragua	Daily: None Weekly: 60h Monthly: None	Daily: 8h (uninterrupted)	X	1h for every 6 hours of driving
Panama	X	X	X	X
Paraguay	Daily: 8h or 5h if driving between 8PM and 6AM Weekly: 48h	Unspecified amount	X	X
Peru	Daily: 12h Weekly: None Monthly: None	X	X	2h break after 5h of (daytime) continuous driving 2h break after 4h of (nighttime) continuous driving
Uruguay	Daily: 9h Weekly: 48h	Daily: 10h (8h uninterrupted)	X	Unspecified duration break after 5h of driving
Venezuela	Daily: 9h (and twice a week 10h) Weekly: 56h Bi-Weekly: 90h	Daily: 11h (3 times a week could be reduced to 9h, still averaging 77h of weekly rest)	7-d cycle: 45h off (uninterrupted) 21-d cycle: One weekly rest period of 45h could be divided into 24h, and there remaining 21h could be added to the 45h of one of the subsequent 2 week	45 minutes (uninterrupted or in 15 min intervals) for every 4:30h of continuous driving



Fig. 1. Countries with provisions that limit working hours.



Fig. 2. Countries with provisions that regulate mandatory time off.

and Venezuela). On the other hand, 7 of the 17 countries in continental Latin America have no special provisions for mandatory rest for professional drivers (Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Panama, and Peru).

In 5 countries (Argentina, Brazil, Chile, Ecuador, and Venezuela), there are explicit provisions that limit the number of continuous working days, with mandatory 35–48 hours of interrupted time off or limiting the number of working hours in a specific timeframe. Furthermore, and with the exception of Ecuador, these countries have provisions that account for complex driving calendars (eg, 7-day cycles, 14-day cycle), and some allow some flexibility to accumulate time off on a bi- or triweekly basis. Finally, only 8 countries (Argentina, Brazil, Chile, Costa Rica, Mexico, Nicaragua, Peru, and Venezuela) have mandatory breaks that limit the hours of continuous driving (range: 3 to 5:30 hours).

Discussion

Our results show that approximately half of the countries in continental Latin America have special provisions that limit daily driving for professional drivers. With the exception of Colombia and Bolivia, larger and more populated countries have regulations that limit the maximum number of hours that these drivers can drive within 24 hours, and the limits have a similar range (9–14 hours) as in North America and Europe. Approximately half of the countries surveyed have special provisions for mandatory daily time off. Countries from the Andean region and Central America were less likely to have regulations on mandatory time off. Finally, only 4 countries have special provisions that account for complex driving schedules and that allow the accumulation of time off.

Our summary of comparison of provisions shows high heterogeneity between countries and, for the most part, these provisions likely

fail to prevent drivers from (a) driving excessive hours and (b) resting insufficiently. Perhaps as an illustrative example (and similar to provisions from high-income countries), it is not clear what the driver does with his/her mandatory daily time off (although it is clear what the driver should do: sleep).² Additionally, most of the driving limits make no mention to the waiting time that long-haul drivers are often exposed to for loading and unloading. Loading and unloading have been identified as a fatiguing behavior for truck drivers, and in most high-income countries, time spent performing those task counts toward the work hours limit.^{2,4} Hours of service regulation should further specify whether time spent in nondriving task counts toward the work hour limits.

In 2016, the age-standardized deaths per 100,000 due to motor vehicle accidents in Latin America (and the Caribbean) were more than double the rate in Western Europe (6.65 vs 2.93 per 100,000, respectively).⁵ Although it is not possible to demonstrate that this difference in deaths is due to more lax driving restrictions, this may be a contributing factor.⁶ Therefore, more stringent restrictions may be especially relevant for Latin America, a region that relies heavily on these types of vehicles for public transport. Creating effective provisions that limit work hours and protect daily rest is an important step to fight drowsy driving and avoid potential accidents. For example, new regulations put in place in 2013 in the United States were modeled prior to implementation as likely to prevent approximately 1400 crashes and 560 injuries each year, representing an economic burden of 280 million dollars annually.^{7,8}

Importantly, extensive research should be accomplished prior to the design and implementation of new regulations. For example, the aforementioned regulations put in place in 2013 in the United States introduced provisions that took into consideration the major circadian low for the majority of truck drivers and required drivers

who wanted to “restart their week” to take a break of 34 hours that includes two 1:00 AM to 5:00 AM rest periods. However, an interrupted time-series analysis of the impact of these regulations in the state of Ohio suggested that they did not significantly change the already occurring downward trend of accidents involving trucks in that state.⁹ The authors of the study suggested that by virtue of limiting nighttime driving, daytime traffic congestion may have increased, possibly making roads less safe.^{9,10} This study and work in general from high-income countries highlight the need for designing new regulations that take into consideration other factors such as weather conditions, traffic congestion, and brake safety.^{9,10}

Another important step to fight drowsiness and fatigue in the context of these provisions (although outside of the scope of this manuscript) regards how these policies are being policed and enforced. For example, in some countries, these provisions are enforced exclusively by inspectors of the national commission for transport regulation (or equivalent), whereas in other countries, the police enforce the provisions during regular road checks. To such a degree, and perhaps anecdotally, it is likely that adherence to these policies is low in comparison to high-income countries. There are multiple reports that show high levels of sleepiness, long hours, and insufficient sleep among professional drivers in this region in both countries with and without provisions.^{11–16} For example, one study from Argentina showed that drivers on average drove almost 16 hours (4 hours above the limit).¹¹ Similarly, studies from Brazil have shown average driving hours that exceed the limits imposed by law, as well as high prevalence of sleepiness and use of amphetamines.^{13,17,18} Limited evidence from limited countries shows nevertheless poor adherence to current provisions. In high-income countries, noncompliance to hours of service regulations has been also widely documented. For example, in the United States, a nationally-representative survey of 1265 long-haul truck drivers showed that up to 37% reported being noncompliant with hours of service rules.¹⁰ Interventions such as increasing enforcement of these provisions, as well as a strict scrutiny on transportation companies and campaigns to promote awareness, should be considered. For example, an important aspect is the extent to which the company vs the driver is punished for such violations. Higher compliance might be achieved if both the company and the driver are sanctioned (or rewarded) rather than just the driver or the company. To our knowledge, there is one study in the region (Mexico) that showed that a multifaceted road safety intervention approach can decrease crash rates, although this program was mainly focused on prevention of drink-driving, seatbelt, and child restraint use.¹⁹

Conclusions

This study is the first to systematically describe the current provisions that regulate the amount of driving hours of professional drivers in Continental Latin America. Only a minority of these countries regulate all 3 aspects of professional driver's daily hours, breaks, and time off, with patchy provision elsewhere and none at all in 3 countries. The regulations seem less sophisticated than in high-income countries and appear to be commonly ignored despite the region having a much higher mortality burden from road traffic injuries. Given the extensive work linking driving hours, sleep disturbance, and safety within the transport industry, for the most part, the region's regulations leave important gaps, exposing professional drivers and other road users to an increased risk of fatigue-related accidents.²⁰

Conflicts of interest

None of the authors have any relevant conflicts of interest to report.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.sleh.2018.07.009>.

Acknowledgments

This manuscript was written while GS held an NRC fellowship. Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the author and are not to be construed as official or as reflecting true views of the Department of the Army or the Department of Defense. The investigators have adhered to the policies for protection of human subjects as prescribed in AR 70-25.

References

- Jovanis Paul P, PDK-FWACC. Hours of Service and Driver Fatigue: Driver Characteristics Research. Federal Motor Carrier Safety Administration; 2011 <https://rosap.nhtl.bts.gov/view/dot/70>.
- Mansfield D, Kryger M. Regulating danger on the highways: hours of service regulations. *Sleep Health*. 2015;1:311–313.
- Negrete U. Making Roads Safe in Latin America and the Caribbean. In: Hayes Lisa, Rosenberg Mark, Abraham Jerry, editors. Decatur, GA, USA: Global Road Safety Forum 2007; 2014 <http://documents.worldbank.org/curated/en/799451468266722297/Making-roads-safe-in-Latin-America-and-the-Caribbean>.
- Morrow PC, Crum MR. Antecedents of fatigue, close calls, and crashes among commercial motor-vehicle drivers. *J Saf Res*. 2004;35:59–69.
- IHME. Institute for Health Metrics and Evaluation. Seattle: University of Washington; 2016.
- Ameratunga S, Hajar M, Norton R. Road-traffic injuries: confronting disparities to address a global-health problem. *Lancet*. 2006;367:1533–1540.
- Administration FMCS. In: Transportation DO, editor. Hours of Service of Drivers; 2011.
- Goel A. Hours of service regulations in the United States and the 2013 rule change. *Transp Policy*. 2014;33:48–55.
- Anderson JR, Ogden JD, Cunningham WA, Schubert-Kabban C. An exploratory study of hours of service and its safety impact on motorists. *Transp Policy*. 2017; 53:161–174.
- Chen GX, Sieber WK, Lincoln JE, Birdsey J, Hitchcock EM, Nakata A, et al. NIOSH national survey of long-haul truck drivers: injury and safety. *Accid Anal Prev*. 2015; 85:66–72.
- Perez-Chada D, Videla AJ, O'Flaherty ME, Palermo P, Meoni J, Sarchi MI, et al. Sleep habits and accident risk among truck drivers: a cross-sectional study in Argentina. *Sleep*. 2005;28:1103–1108.
- Torregroza-Vargas NM, Bocarejo JP, Ramos-Bonilla JP. Fatigue and crashes: the case of freight transport in Colombia. *Accid Anal Prev*. 2014;72:440–448.
- Takitane J, de Oliveira LG, Endo LG, de Oliveira KC, Munoz DR, Yonamine M, et al. Amphetamine use by truck drivers on highways of Sao Paulo state: a risk for the occurrence of traffic accidents? *Cien Saude Colet*. 2013;18:1247–1254.
- Caso A. Rey de Castro J, Rosales-Mayor E (Sleep habits and traffic accidents in inter-provincial bus drivers of Arequipa, Peru). *Rev Peru Med Exp Salud Publica*. 2014;31:707–711.
- Deza-Becerra F, Rey de Castro J, Gonzales-Gonzales C, Leon-Jimenez FE, Osada-Liy J, Rosales-Mayor E. Sleep habits, fatigue, and sleepiness in Chiclayo-Peru's bus drivers. *Sleep Breath*. 2017;21(3):745–749. <https://doi.org/10.1007/s11325-017-1502-9> Epub 2017 Apr 21.
- Risco J, Ruiz P, Marinos A, Juarez A, Ramos M, Salmavides F, et al. Excessive sleepiness prevalence in public transportation drivers of a developing country. *Traffic Inj Prev*. 2013;14:145–149.
- de Oliveira LG, de Souza LM, Barroso LP, Gouveia MJ, de Almeida CV, Munoz DR, et al. Occupational conditions and the risk of the use of amphetamines by truck drivers. *Rev Saude Publica*. 2015;49:61. <https://doi.org/10.1590/S0034-8910.2015049005944> Epub 2015 Sep 18. English, Portuguese.
- Peixe TS, de Almeida RM, Giroto E, de Andrade SM, Mesas AE. Use of illicit drugs by truck drivers arriving at Paranaguá port terminal, Brazil. *Traffic Inj Prev*. 2014; 15:673–677.
- Chandran A, Perez-Nunez R, Bachani AM, Hajar M, Salinas-Rodriguez A, Hyder AA. Early impact of a national multi-faceted road safety intervention program in Mexico: results of a time-series analysis. *PLoS One*. 2014;9:e87482.
- Philip P, Akerstedt T. Transport and industrial safety, how are they affected by sleepiness and sleep restriction? *Sleep Med Rev*. 2006;10:347–356.