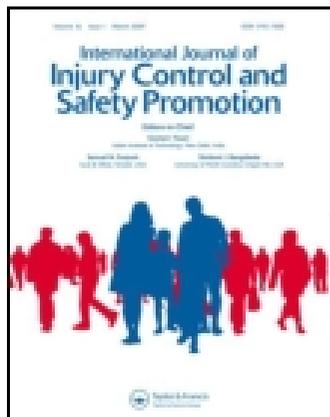


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## Motorcycle helmet use in Mar del Plata, Argentina: prevalence and associated factors

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Injuries resulting from motorcycle crashes constitute a growing problem in Argentina and other Latin American countries. The problem is aggravated because helmet use is not widespread. This observational study analysed the prevalence of helmet use and related factors in a city in Argentina. The sample consisted of 2542 observations of motorcyclists. The results show an incidence of helmet use of 69.8% for drives and 43.4% for passengers. Helmet use was greater among women. Environmental and temporal conditions were related with the rate of helmet use. The findings indicate a considerable increase in helmet use with respect to prior years, providing evidence in favour of government policies. However, the number of motorcycles in circulation has tripled in the past five years, and therefore, the public health impact of injuries due to motorcycle crashes persists.

**Keywords:** protective devices; helmet; motorcycles; Argentina

### 1. Introduction

Injuries resulting from traffic crashes are a problem worldwide, but their impact is greater in low- to medium-income countries, where the crash rates are as much as double those of high-income countries (World Health Organization [WHO], 2013). Further, the mechanisms for injury and the groups affected differ. Motorcyclists in particular are an especially affected group in low- to medium-income countries. In Argentina, the number of crashes involving motorcyclists has increased considerably along with an accelerated increase in the number of motorcycles in circulation (National Agency of Road Safety [ANSV], 2012). In the City of Mar del Plata, the latest road crashes report indicates that motorcyclists accounted for half of the fatalities and that in 85% of the cases, a helmet was not used (MPG, 2013).

Helmet use is the main preventive measure motorcyclists can take to avoid or at least reduce injuries (WHO, 2013). By wearing a helmet, a motorcyclist reduces his or her chances of dying due to a traffic injury and of incurring grave and debilitating head, neck and spinal column injuries; helmet use is also associated with a speedier recovery and a reduced need for hospital care (Servadei et al., 2003).

Despite the evidence, the rate of helmet use continues to be low in many countries (Hung, Stevenson, & Ivers, 2006; Li, Li, & Cai, 2008; Skalkidou, Petridou, Papadopoulos, Dessypris, & Trichopoulos, 1999; Zamani-Alavijeh, Bazargan, Shafiei, & Bazargan-Hejazi, 2011). In Argentina,

despite being mandated by law, helmet use is not widespread (Ledesma & Peltzer, 2008).

The evidence indicates that various factors are associated with helmet use. These factors are both of a personal and contextual nature. Among the former, it has been observed that women tend to use helmets more than men (Ledesma, Peltzer, Poó, & Cremonte, 2010; Papadakaki et al., 2013; Skalkidou et al., 1999), that drivers use helmets more than passengers (Ackaah & Afukaar, 2010; Bachani et al., 2012; Ledesma et al., 2010), and that comfort, aesthetic reasons and peer pressure influence helmet-use decisions (Conrad, Bradshaw, Lamsudin, Kasniyah, & Costello, 1996; Germeni, Lionis, Davou, & Petridou, 2009; Zamani-Alavijeh et al., 2011).

Among contextual factors, it has been observed that there is less helmet use in a city's peripheral areas, during weekends, at night (e.g. Ackaah & Afukaar, 2010; Barrancos Liberatti, Maffei de Andrade, Soares, & Matsuo, 2003; Hung et al., 2006; Ledesma & Peltzer, 2008; Li et al., 2008; Skalkidou et al., 1999) and under certain climatic conditions, such as warm weather (Hung, Stevenson, & Ivers, 2008; Skalkidou et al., 1999). It is also known that regulations mandating helmet use, the sales price of helmets, and traffic control measures affect the rate of use (Houston, 2007; Hung et al., 2006; Zamani-Alavijeh et al., 2011).

#### 1.1. Justification, objectives and hypothesis

In recent years, various measures aimed at regulating and promoting helmet use have been implemented in our

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country and our city. Locally, there is greater control on public roadways and several education, awareness raising and legislative actions have been implemented. These actions include providing motorcyclists free helmets and a local law requiring vendors to give away a free helmet for every motorcycle sale. However, the impact of these actions is unknown.

The objective of this study was to evaluate the prevalence of helmet use in the City of Mar del Plata, as well as to examine associated factors. We hypothesise an increase in the prevalence of use compared to the estimates of prior years (Ledesma & Peltzer, 2008; Ledesma et al., 2010). Based on the existing literature, we assume the rate of use will be related to certain human and environmental variables. We expect the helmet-use rate will be higher among women rather than men, and among drivers rather than passengers. We also predict less helmet use at certain times, specifically at night and during the weekends. Lastly, we hypothesise that the helmet-use rate will increase under unfavourable climate conditions.

## 2. Method

### 2.1. Sample

A total of 2542 observations were made of motorcyclists on public roadways in the City of Mar del Plata, Argentina. These observations took place between June and November 2012. They were made in nine different locations in the city. At each location, data were reported over the course of an hour-long observation during one weekday (day and night) and one weekend day (day and night).

### 2.2. Instrument

Data were collected using a standardised instrument to code helmet-use observations (Ledesma & Peltzer, 2008). This is a simple, user-friendly instrument. It allows for the reporting of (a) place and time period of observation; (b) environmental and climate conditions (time, amount of daylight, temperature, humidity, visibility, wind and weather conditions); (c) vehicle information (motorcycle type and presence of license plate) and (d) information on the motorcyclist (role-driver or passenger, gender, and helmet use).

### 2.3. Procedure

The observations were made by the researchers and a group of trained students. The criteria were standardised and an instruction manual was prepared to guide observers. The observation locations were well lit, either by natural or artificial light. The data were analysed and administered with the SPSS 18 programme. A descriptive analysis was performed to estimate the helmet-use rate

and a logistic regression model was used to identify the factors possibly related with helmet use. The latter was undertaken separately for the drivers and passengers in the sample. Missing data were deleted from the logistic regression analysis. The dependent variable (helmet use/no helmet use) was coded so that the odds ratio could be easily interpreted as an increase in the helmet-use rate, taking the first category of each independent variable as a reference category (see codification in Table 2).

## 3. Results

The observed helmet-use rate was 69.8% among drivers and 43.4% among passengers, revealing a significant increase over previous years (2006–2007: 39.3% among drivers and 23.7% among passengers; 2008: 57.4% among drivers and 21.3% among passengers). Table 1 shows the use rates under varying conditions. Tables 2 and 3 show the results of the logistic regression models.

The logistic regressions indicated that gender has a significant effect on helmet use. Male tended to wear helmets less than female; we found this to be the case in both our samples of drivers and passengers. In terms of type of motorcycle, a significant effect was observed in the sample of passengers. Passengers on motorbikes that are usually used for intercity travel (custom, touring and sport categories) had a higher use rate compared to their counterparts on a typical urban motorcycle model. Furthermore, we did observe that drivers and passengers on motorcycles with license plates had a higher rate of helmet use compared to those on motorcycles without license plates.

No differences were found between daytime and nighttime helmet use, but there was a notable difference between weekday and weekend use in the driver's sample, with results showing reduced helmet use on weekends. Additionally, the sample of drivers revealed a relationship between the time of day and weekend helmet use, with a tendency towards reduced use during the day on weekends.

The weather proved to be another contextual factor associated with helmet use in motorcycle drivers. The rate of use increased when weather conditions were unfavourable (greater helmet use during rainy and cloudy days compared to sunny days with clear skies). There was no observable difference with respect to the seasons (winter versus spring).

Lastly, there was an observable association between helmet use by drivers and passengers in both samples. Helmet use on the part of the driver was a predictor for helmet use on the part of the passenger, and vice versa.

## 4. Discussion

The results suggest an increase in the helmet-use rate compared to previous years, in concordance with what has been reported nationally (ANSV, 2012). The rate

Table 1. Percentage of helmet use according to varying conditions.

Variables		Observed drivers	% of helmet use by drivers	Observed passengers	% of helmet use by passengers
Gender	Male	2278	68.1	262	33.6
	Female	255	84.3	402	49.4
	Missing	9	66.6	0	
Climate conditions	Sunny	1222	66.8	309	40.5
	Cloudy	1233	72.2	345	46.1
	Rainy	87	82.8	10	50.0
Type of motorcycle	Biz like	1343	69.3	347	41.2
	Moped 50cc and scooter	162	73.5	26	42.3
	Street standard	646	69.0	205	42.2
	Custom/touring/sport	180	74.4	51	60.8
	Off-road (cross, etc.)	161	66.2	30	46.7
	Other types	38	76.3	3	66.7
Moment of the day	Unidentified	12	50.0	2	100
	Daytime	1299	68.3	335	44.8
Part of the week	Night-time	1243	71.3	329	42.2
	Weekday	1508	72.3	366	45.9
License plate	Weekend	1034	66.1	298	40.6
	Yes	2025	72.0	525	45.9
Season	No	261	51.2	79	29.1
	Unidentified	256	67.1	60	39.3
	Winter	1199	69.9	300	39.4
	Spring	1343	69.7	314	47.3

increase can be attributed to the policies implemented and to concerted efforts, both of which are relatively new in the country and the city. However, a large percentage of motorcyclists, especially passengers, still do not make use of this safety measure.

Further, it is important to note that the number of motorcycles in circulation has grown significantly in recent years, increasing from near 34,000 vehicles in 2007 to approximately 110,000 vehicles in 2012 (Gobbi, 2013). This is an important factor that undermines the

Table 2. Factor associated with helmet use among motorcycle drivers in the city of Mar del Plata, Argentina. Results of multiple logistic regression analysis.

Predictor variables	B	S.E.	Wald	Df	p	ExpB
Gender (ref.: female)						
Male	-1.002	0.219	20.860	1	<.001	0.367
Passenger helmet use (ref.: no passenger)			127.894	2	<.001	
No helmeted passenger	-1.523	0.136	125.286	1	<.001	0.218
Helmeted passenger	-0.055	0.166	0.111	1	.739	0.946
Climate conditions (ref.: sunny)			11.513	2	.003	
Cloudy	.323	.112	8.277	1	.004	1.381
Rainy	.721	.314	5.256	1	.022	2.056
Type of motorcycle (ref.: biz like)			3.005	5	.699	
Moped 50cc and scooter	.303	.231	1.723	1	.189	1.354
Street standard	.090	.124	.530	1	.467	1.095
Custom/touring/sport	.240	.205	1.370	1	.242	1.272
Off-road (cross, enduro, etc.)	.049	.212	.053	1	.818	1.050
Other types	.226	.490	.212	1	.645	1.253
Moment of the day (ref.: daytime)						
Night-time	-0.228	0.144	2.495	1	.114	0.796
Part of the week (ref.: weekend)						
Weekday	0.621	0.219	8.048	1	.005	1.861
Presence of motorcycle license plate (ref.: yes)						
No	-.877	.148	34.894	1	<.001	.416
Season (ref.: spring)						
Winter	-.075	.107	.483	1	.487	.928
Moment of the day × part of the Week	.621	.219	8.048	1	.005	1.861

Table 3. Factor associated with helmet use among motorcycle passengers in the city of Mar del Plata, Argentina. Results of multiple logistic regression analysis.

Predictor variables	B	S.E.	Wald	Df	p	ExpB
Gender (ref.: female)						
Male	-.720	.189	14.561	1	<.001	.487
Driver helmet use (ref.: helmeted driver)						
No helmeted driver	-1.565	.175	80.319	1	<.001	.209
Climate conditions (ref.: sunny)			.206	2	.902	
Cloudy	.075	.179	.176	1	.674	1.078
Rainy	.138	.547	.064	1	.801	1.148
Type of motorcycle (ref.: biz like)			11.392	5	.044	
Moped 50cc and scooter	.170	.300	.322	1	.571	1.186
Street standard	.272	.203	1.802	1	.180	1.313
Custom/touring/sport	1.065	.344	9.599	1	.002	2.900
Off-road (cross, enduro, etc.)	.582	.370	2.474	1	.116	1.789
Other types	.119	.944	.016	1	.899	1.127
Moment of the day (ref.: daytime)						
Night-time	.068	.232	.086	1	.770	1.070
Part of the week (ref.: weekend)						
Weekday	-.411	.254	2.620	1	.106	.663
Presence of motorcycle license plate (ref.: yes)						
No	-.575	.254	5.110	1	.024	.563
Season (ref.: spring)						
Winter	-.007	.179	.001	1	.970	.993
Moment of the day × part of the week	.161	.356	.205	1	.650	1.175

progress achieved so far. In effect, although in relative terms the rate of use has gone up, in absolute terms the number of motorcyclists who do not use helmets has grown compared to previous years. Subsequently, of course, the prevalence of motorcycle crashes has increased, as has the resulting demand placed on the healthcare system (ANSV, 2012).

Despite the increase in helmet use, personal and contextual factors still exist that explain the variations observed in the use of this safety device. First, as in our previous study, gender differences persist. Women wear helmets more extensively than men. This finding is supported by studies conducted in other countries (Papadakaki et al., 2013; Skalkidou et al., 1999) and is consistent with the fact that, in general, men tend to exhibit riskier road behaviour, which is reflected in higher fatality and morbidity indices. Evidently, it is necessary to increase preventive efforts with the masculine population, especially considering that the majority of motorcycle users are men.

Additionally, we also continue to observe a relationship between helmet use and climatic conditions, with a decrease in helmet use on sunny days, and an increase on rainy days, in concordance with our earlier research (Ledesma et al., 2010). Other studies indicate that in warm weather, riders refuse to use a helmet because they deem doing so uncomfortable (Hung et al., 2008; Skalkidou et al., 1999). It seems that the perception of comfort/discomfort continues to play an important role in the decision to use a helmet. Besides climate, the day of the week is another situational factor related to use.

Weekend riders were less likely to wear a helmet, which is also consistent with previous studies (e.g. Barrancos Liberatti et al., 2003; Conrad et al., 1996; Li et al., 2008; Skalkidou et al., 1999). We suppose that this is due to the fact that on weekends, the prevalence of younger motorcyclists is greater, recreational use increases and police enforcement is laxer.

Lastly, the absence of a motorcycle license plate was related with non-helmet use, in concordance with our previous research (Ledesma et al., 2010). We believe this is because having a license plate is a rule-compliance indicator, as is helmet use. We understand that this reflects a general lack of regulation in the use of motorcycles that goes beyond the mere issue of helmet use. Compared to a car, a motorcycle continues to be considered a more 'informal' mean of transportation that offers a more accessible mobility mode for certain sectors of society.

In light of these findings, it seems necessary to maintain and increase efforts aimed at improving the rate of helmet use. Better and increased control at certain times is required, as is continuing education efforts and other types of interventions (such as providing free helmets) aimed at increasing helmet use among motorcyclists. In this respect, helmet-use monitoring provides a basic indicator of road safety and is a fundamental tool to guide prevention efforts. Finally, it is important to note that the increase in motorcycle use is related to the lack of alternative means of quality transportation. Consequently, it seems necessary to implement policies that discourage this intrinsically less safe mode of transportation by offering more accessible and efficient means of public transportation.

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