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PEDAL AND MOTOR CYCLE HELMET USE, SPLIT BY GENDER: EVIDENCE FROM EUROPE, CENTRAL AMERICA AND THE CARIBBEAN

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ABSTRACT

According to the WHO's Global Status Report on Road Safety of 2013, road fatalities were 1.24 million for the 182 countries studied; the injury statistics were as always less precise: depending on definition and recording measures, there were 20-50 million injuries –either extreme of the spectrum would constitute the size of a medium-large nation state. In economic terms the cost of road injuries in 2000 was recorded in the WHO Report as in excess of $1/2 trillion –again equivalent to the GDP of medium-large national economies. Correct helmet use was estimated in the study to reduce the risk of death by 40%, and that of serious injury by 70%. These somewhat sobering statistics provide the backdrop for the empirical study of helmet use by riders of bicycles and motorcycles analyzed by gender, age, number of riders and personal/cargo use, which are presented below. Locations in the following countries were chosen in Central America and the Caribbean, for empirical observation of helmet use: Latin America (Cuba, Costa Rica and Nicaragua) and locations in the following countries in Europe (U.K., Italy and the Netherlands.) The data collected are summarized, analyzed and reviewed; and comparisons between countries and regions made. Policy implications are discussed. Tentative policy recommendations are suggested, subject to more extensive empirical research, for a more pro-active approach to road safety for pedal and motor cycle users –not just operators but also passengers, who constitute some of the most vulnerable road users.

JEL: R41, N70, I00, H83

KEYWORDS: Road Safety, Bicycle Helmet Use, Motorcycle Helmet Use, Risk, Gender Differences, Public Health, Public Policy, Transport Management

INTRODUCTION

The sobering statistics published by the WHO (World Health Organization), of millions of fatalities plus tens of millions of serious injuries sustained annually by road users, were qualified by the following comments specifically related to bicycle and motorcycle operation and riding: helmet use was estimated to reduce the risk of death by 40%, and that of serious injury by 70%. These enormous potential savings of lives and on-going misery, in addition to the hundreds of millions of dollars of lost income resulting from road accidents (half a trillion is cited in the WHO report overall), have provided the interest in conducting the following empirical study of helmet use by riders of bicycles, and of motorcycles, analyzed by operator vs. passenger, by gender, by number of riders and by use (personal/cargo), in the hope of detecting underlying commonalities and differences per category, location, country and global region. Most of the existing literature has focused on accident and fatality/injury analysis, mostly comprising secondary research; the present study is empirical research using the author's primary data; it provides and analyzes data on 2-wheeler riding behavior, rather than focusing on accidents, injuries and death. Since the study was self-financed, observations were restricted to 16 locations in the following 6 selected countries; and in 2 distinct global regions: Central America and the Caribbean (Costa Rica, Nicaragua and Cuba) and European Union (The U.K., the Netherlands and Italy.)

The existing literature is briefly reviewed in the next section. Following is a section providing data and analysis for each location, and some comparative cross-country and regional analysis are reviewed. Some implications of the results are discussed, together with further theoretical analysis. Concluding comments are made, including tentative policy recommendations, subject to further research, for a global approach to road safety for some of the most vulnerable road users. Appendix 3 provides all 4,533 observations, split by bicycle and motorcycle operators, by passengers and by gender identification for each; these data are collated for each of the 16 locations, and aggregated. Appendix 1 provides totals per country, and per global region studied, plus ranking for each of the countries' studied, according to helmet use, for both motorcycle and pedal cycle users. Appendix 2 focuses on motorbikers' helmet use only.

LITERATURE REVIEW

According to the WHO's Global Status Report on Road Safety of 2013, road fatalities were 1.24 million for the 182 countries studied in the report; the injury statistics were as always less precise: depending on definition and recording measures, there were 20-50 million injuries –either extreme of the spectrum would constitute the size of a medium-large nation state. Data for countries not covered in the Report can only be imagined, since records tend to cover data in countries with less extreme experiences –not quite the tip of the iceberg, but understating the state of the accident universe, rather than overstating it. In economic terms the cost of road injuries back in 2000 was recorded in the 2013 WHO Report as in excess of $1/2 trillion – again equivalent to the GDP of medium-large national economies. Correct helmet use was estimated in the study to reduce the risk of death by 40%, and that of serious injury by 70%. According to the European Road Safety Observatory (2007):

Motorized Two-wheelers: Motorcycle and moped fatalities in western European together represent 10-15% of all traffic fatalities. For both mopeds and motorcycles, the rate of fatalities per 105vehicles is much higher for younger riders than for older riders. Ireland and Greece exhibited increasing fatality rates in these five years. (1990-95)

Cyclists: The number of cyclists killed per cycled kilometre is very much influenced by the total number of cycled kilometres. The accident risk based on the amount of cycling is lowest in Denmark and the Netherlands (resp. 15.9 and 17.6 fatalities per billion km). The risk is particularly high in France and Great-Britain (resp. 67.7 and 52.5), where the amount of cycling is low. It has been proven that the risk decreases as exposure increases

> Safety: improvement of the safety of cyclists on the road is therefore a precondition for promotion of cycling….design principles and measures for improving cyclist's safety include
>
> Grade-separated crossings for crossing main roads (urban motorways, main arterials etc)
>
> Frequent crossing possibilities along main roads, in order to prevent the barrier effect for cyclists
> Wide cycle tracks and wide pavements along main roads, affording cyclists good accessibility, safety and security
>
> Junctions provided with crossings for cyclists.

The World Resources Institute, India wrote in its Sustainable Cities publication under the following heading:

"Challenges arising from the rapid growth of two-wheelers –Road Accident Deaths"

Safety is a particularly significant concern with the use of two-wheelers. Data from 2012 showed that two-wheeler riders account for the largest share of road fatalities (23%) and India records the maximum number of deaths from motorized two-wheeler accidents in the world. In Pune, 50% of traffic accident fatalities in 2010-11 were two-wheeler riders, only 1% of whom were wearing a helmet. For a variety of reasons, Indian states have not notified the helmet law, and when introduced, it is partial in nature. Compliance and enforcement of the law has been poor. Also of concern is the license age being reduced from 18 to 16 years, with many youngsters in their early teens riding two-wheelers illegally.

Mark Hinchcliffe wrote the following with regard to the situation in Australia (Motorbike News 20/1/15)

Powered Two-Wheelers

PTW's provide little protection against injuries in the case of an accident. Injuries to the legs are frequent, but injuries to the head are more severe even though wearing a helmet. Accident studies show head injuries would have been much more frequent if helmets had not been worn. From the point of view of preventing injuries there is no reason to exclude any group of PTW users from compulsory wearing a helmet.

Australian Road fatalities were down in 2014, from the previous year, except for vehicle passengers.
'Unfortunately, reflecting the growing popularity of riding among women, females represented 10 of the 187 riders who died, compared with 7 of 201 riders last year.

Road Deaths 2014

Riders 187 (201 in 2013); Pillions 5 (12); Cyclists 45 (49); Car Drivers 532 (567); Car Passengers 229 (202); Pedestrians 151 (157)'

"Despite what authorities tell us about riders killing themselves in single-vehicle crashes, Australian road death statistics for the past couple of years prove the opposite.

Government statistics show that of the 187 riders and five pillions killed last year, only 40% of crashes were single-vehicle accidents, which is down from 49% the previous year.
Most motorcycle crashes last year involved a car, while 14 were collisions with trucks and two with buses. Most fatal motorcycle crashes also occurred around town where bikes are more vulnerable to being hit by other vehicles, not on highways and sparsely populated country areas."
What has ben taken for granted in Hinchliffes analysis is the exceptionally proactive (aggressive?) stance of Australian public policy towards helmet use, 'drunk driving'and other strongly penalized criminal offences.

Juxtapose this public policy position, and its positive effects on road fatalities across the board, with that of India: as reported by Ruinkar (2013)

> *Between 1970 and 2011, the number of accidents increased 4.4 times accompanied with 9.8 times increase in fatalities and 7.3 times increase in the number of persons injured, against the backdrop of more than a 100-fold increase in the number of registered motor vehicles and close to a four-fold increase in the road network.*
>
> *During 2011, a total of 4,97,686 road accidents were reported by all States/UTs [Figure 1]. The proportion of fatal accidents in the total road accidents has consistently increased since 2002 from 18.1 to 24.4% in 2011. The severity of road accidents measured in terms of persons killed per 100 accidents has also increased from 20.8 in 2002 to 28.6 in 2011.*

With its population of less than 0.5% that of India, the relatively flourishing economy of Costa Rica is reflected in its similar increase in motorcycle use, and the road carnage which has ensued. La Nacion published on Page 1 its leading article highlighting the severity of the problem: 81 fatalities were recorded for YTD, compared to 52 for the same period the previous year –an increase of 56% year on year to that point. More significant from the perspective of data collation: 5,000 injuries were reported for motorcycle users in the first 3 months of 2015. Note that in Costa Rica, with a relatively well-developed hospital and emergency system, some credence can be given to the ratio of deaths to injuries in motorcycle accidents. If we were to hazard a guess as to the number of injuries globally due to motorcycle accidents, we might do worse than to borrow the ratio: 5,000/82= 60.98, or a multiple of roughly 60 times. Using that multiple and applying it to an approximation of 500,000 motorcycle fatalities worldwide would yield 30 million injuries PER ANNUM, and according to Indian and WHO predictions, rapidly growing. Finally mention should be made of the findings of motorcycle fatalities reported by the IIHS (Insurance Institute for Highway Safety), using U.S. Department of Transportation's FARS data, (updated January 2015):

> *1997 recorded 811 deaths, of which 785 (97%) were helmetless.*
>
> *By contrast: 2013 recorded 741 deaths, of which 464 (63%) were helmetless; (150= 20% were not identified as with or without helmet.*
> *Hence we have an important rationale for this empirical study. No gender split was given by this IIHS secondary research: providing a motivation for the parameters of the research outlined below.*

DATA AND METHODOLOGY

The data collected is presented in Appendix 3 and further analysis is provided in Appendices 1 and 2, infra. Some 4,500 individual observations are recorded and collated, organized by each of 16 specified locations, in 6 countries, and divided between European and Central American/Caribbean locations. The countries are Costa Rica, Nicaragua and Cuba, in Latin America; and the U.K., Netherlands and Italy, in Europe.
The methodology employed by the investigator/author was to observe and manually record the use/nonuse of helmets by 2-wheel riders, distinguishing between male and female, operator and passengers, and where possible other safety-related characteristics, such as use of earphones, smoking, heavy load carrying etc. Each of the 16 locations was selected to provide as clear and unobstructed view of road users as possible. In each, a standard observation period of one hour was used.

Problems with Methodology

Since the observations and recordings were taken in a specific time and place, it would not be feasible to replicate the study; the best that could be done would be to repeat a one-hour observation at the same time, on the same day of the week, with similar weather conditions –all of which variables would clearly have some impact on bicycle and motorcycle use.

Accuracy of observation and recording: it would be impossible to warranty 100% accuracy of observation and recording: e.g. a large bus or truck might have obscured vision at an observation point for enough time to lose some observations; in busy locations it would have been impossible to warranty that the same operator did not pass through the observation point more than once; gender differentiation/identification was sometimes difficult to ascertain, e.g. when motorbike operators and/or riders were both helmeted and wearing thick motorbike gear; thus in auditing/accounting terminology, errors of both omission and commission almost certainly occurred, in the course of the study. However, in the opinion of the author the number of errors would have been fairly minimal, relative to the total of over 4,500 observations recorded. The additional observations –e.g. smoking users, earphone use, precise age of users both old and young, could not be ascertained with the degree of accuracy of the basic observations; they are therefore added as

narrative comments to complement each scenario; additional human and electronic resources would be required to undertake the more comprehensive set of observations and analysis which the subject is considered by this investigator to warrant –hopefully available in the future.

RESULTS AND DISCUSSION

The following provide brief descriptive contexts and data analysis pertaining to observations in each location.

Locations in Central America and the Caribbean

Location #1: San Jose, Costa Rica: Avenida 4, Calle Central was chosen to check whether the new dedicated bike lane in the city center would attract cyclists, and help change the San Jose motorized vehicle culture to a more non-motorized culture. In fact, the new bike lane was hardly used by cyclists, but continued to be used by hundreds of pedestrians during the observation hour. 50% of the cyclists observed comprised one group of teenage males, who chose to cycle on the extremely busy Avenida 2, which is generally full of cars, taxis and buses. Of the 104 2-wheeler users, some 20% were pedal cyclists, almost all without helmets, and virtually all male; of the motorcycle users, virtually all wore helmets (as required by law, and with an obvious police presence); the majority of the passengers were female, and comprised some 25% of total motorcycle use. San Jose, the capital of Costa Rica, has some 1 million residents, and suffers from major vehicle congestion and resultant ambient pollution. Observation date January 2 2016; time: 13.55 pm -14.55 pm.

Location #2: Santa Cruz, Costa Rica: Santa Cruz is a major commercial town in the province of Guanacaste, with a population in the thousands. The observation location was in the central square next to the major bus station, which had the highest local traffic count. Of the 3 locations, Santa Cruz had by far the most 2-wheel traffic –roughly double the volume of motorbike users, still mostly with helmets; but more strikingly, at 324 bicycle users, over 15 times the number of bike users than in San Jose –roughly 10% of them being passengers, un-helmeted, with a substantial number of these children (10 boys, 17 girls, plus a second girl passenger). Observation date: May 4, 2015; time: 11.55 am -12.55 pm.

Location #3: Villa Real, Costa Rica: With a population in the thousands, Villa Real has evolved as a 'feeder' town to the predominantly tourist-oriented beach town of Tamarindo, some 4km away. It provides most of the labor supply to the tourist businesses of Tamarindo, and while no longer exclusively Latin American in population, it is still predominantly so. Here 70% of the 2-wheel users were motorcycle users; compliance to the legal requirement of helmet use was less stringent, with some 15% of male operators helmetless, (8 of 54 observed), and 1/3 of female operators likewise driving without helmets (3 out of 9). Whilst the numbers are small, the issues raised are not. Although not part of the scope of this investigation, it was noted that 7-10 horse riders used the busy intersection in Villa Real, all male, none with helmets. The town has not lost all its roots. Observation date: Friday, September 11, 2015; time: 9.05 am-10.05 am.

Location #4: Rivas, Nicaragua: Rivas is a commercial entrepot, the first market city North of the main border of Nicaragua from Costa Rica, en route to Managua, Granada and Leon, the 3 principal cities of Nicaragua; it is also situated strategically between San Juan del Sur and San Jorge, the gateway to La Isla de Ometepe. Of the 3 Nicaraguan towns studied, Rivas had by far the largest proportion of bicycle/tricycle users -166 cf 111 motorbike users. It was also unique insofar as pedal tricycles were a common form of public taxi, and as such numbered 71, of the total number of 'pedal cycle' operators. None wore helmets. All were male. Only 11 females were bicycle operators, comprising almost exactly 1/10 the number of male operators. However if one were to discount the all-male pedal taxi operators, the ratio of female to male bicycle operators would change to ¼ -still a major imbalance; all helmetless. The number of female passengers on the other hand outnumbered the number of male –at 20 cf 17. Females displayed more

proclivity to be passengers than operators. Of the total of 111 motorbike users, 76 were male operators, and only 5 were male passengers; cf 14 female operators and 16 female passengers. The helmet use divide was as follows: approx. 4/5 of male operators wore helmets (16% were helmetless); whilst 100% of female operators wore helmets (14/14). However, as passengers, females were less inclined to wear helmets – fewer than half did so (7/16). 2 boys and 3 girls were included in the number of helmetless bicycle passengers, plus one boy operator. Among the female motorbike passengers was one girl. Observation date September10 2015; time 13.05-14.05 pm.

Location#5: San Juan del Sur, Nicaragua: SJDS has developed from a fishing village into a tourist resort town during the last two decades. Some of the increased prosperity is reflected in the ubiquity of private transportation –from pedal cycles to motor cycles to cars, trucks and SUVs. Thus in our observations the total number of bicycle users was 98, compared to the total number of motorbike users, which was some 40% higher, at 140. All bicycle users were helmetless, including 2 child passengers (one boy, one girl) and one child operator (male). Included in the bicycles reported were 5 pedal tricycles, used primarily for carrying cargo or passengers. Of the motorbike operators, the majority of the males (86/110, or 78%) wore helmets, but 24 (=22%) did not. For female operators, the percentages were 50/50: half the females wore helmets, and 50% were helmetless. The number of passengers was insignificant. Observation date September 12 2015; time 13.15-14.15.

Location #6: Moyogalpa, Nicaragua: Moyogalpa is the principal port and largest town on la Isla de Ometepe, the largest island in el lago de Nicaragua. Like San Juan del Sur, it has developed recently into a tourist reception nexus, and the growth in the use of private transportation has reflected this rapid development. Motorbike use outstripped bicycle use by almost exactly 2:1, in our observations (116 cf 59). Of the 59 bicycle users, one (a male adult passenger) did wear a helmet. 2 boy operators, plus 2 boy passengers, and 5 girl operators, plus 1 girl passenger, were among the 58 bicycle users who were helmetless. Compared to all other Latin American locations studied, Moyogalpa boasts by far the highest percentage of motorcycle users and passengers without helmets. It is the only location where helmetless male users outnumber those with helmets (40 cf 39). By contrast some 36% of female operators were without helmets, though the absolute numbers are much smaller than those of the male operators (5 cf 9). Among passengers, almost all males were helmetless, compared with females, 36% of whom did wear a helmet (5 cf 9). Observation date: September 10, 2015; time 8.30-9.30 am.

Location #7: La Habana, Cuba: Barrio Cecilia is about 10 km from the city center of old Habana, with major arterial roads into the epicenter. Buses conveyed the vast majority of traffic. As is evident, helmet use was zero for both operators and passengers, of either gender, for bicycle users. Male passengers comprised over 1/3 of total bicycle ridership. Motorbike operators were overwhelmingly male, on a ratio of close to 12:1, male to female. Likewise passengers were predominantly male, but with a ratio of only 2.5:1. Excluded from the data was the sight of 2 police officers, both male, on a day succeeding the observation: both were helmeted. Their location was in the center of Habana. Few other cyclists were observed; none were helmeted. Observation date: December 4, 2015; time: 17.00-18.00.

Location #8: Pilon, Cuba: Pilon has a population numbered in the thousands, compared to Habana's population, which numbers in the millions. As is clear from the data observed, in the Central Square, the private transportation of choice was overwhelmingly the bicycle, which was both operated by helmetless riders, of whom only 15% were female, and whose passengers were likewise helmetless, (both first and second passengers). 2 of the first passengers were boys; 1 was a girl; the 2 second passengers were boy and girl respectively. In addition there were 3 pedal tricycles, being used as a taxi service –no helmets were in evidence. The one motorbike observed had a helmeted male operator and a helmeted male passenger. Observation date: Sat. October 10, 2015; time: 21.30-22.30.

European Locations

Location #9: Portsmouth, U.K: Portsmouth -The Front, close to the city center, provided an unobstructed view of traffic. In all, however, only 93 2-wheeler users were observed: the majority on bicycles (77/93=83%). Of these, the majority were male operators without helmets; but 8/53 (15%) did wear helmets. Among the 21 female operators the proportion of helmeted operators was far higher: 6/21 = 29% wore helmets –almost double the usage of male bicycle operators. Of the 16 motorbike users, only 1 was a passenger. Only 1 operator (a male) was helmetless. 14/16=88% of the operators were male; one was female. 2 boys were bicycle operators and helmeted, one was a helmeted passenger, one not. Likewise 2 girls were bicycle operators, one with, one without helmet, and a girl passenger was helmetless. No children were on motorbikes. Observation date Saturday, July 4 2015; time 16.00-16.45

Location #10: Bournemouth, U.K.: Of the 16 locations in the study, the lowest number of 2-wheelers observed was in this seaside location of Bournemouth. The observation point chosen was in view of bicycle lanes, and with restricted car use. Just 4 motorbike users were observed, all male, all helmeted. Of the 72 bicycle users, all were operators; none passengers; just over 2/3 male and 1/3 female. The ratio of helmeted to un-helmeted operators was similar for each gender: 11/38=29% for males; 6/17=35% for females. Observation date: July 1, 2015; time: 12.05 pm-1.05 pm.

Location #11: Brighton, U.K.: In Brighton's town center, the observation point included regular vehicle roads, with no bicycle lanes; however it was close to a pedestrian market, closed to motorized traffic, but heavily used by pedal cyclists. Just 6 motorbike operators were observed, all male, all helmeted. Just one motorbike passenger was observed, female, also helmeted.

Location #12: Amsterdam, Netherlands: The contrast between bicycle use in the U.K. and in the Netherlands is quite marked, according to the data observed in this study. Outside the central train station, literally thousands of bicycles were parked –an indication of the 'bicycle culture' of the city. Bicycle lanes were provided around the city center, and were in constant and dense use. In the one hour of observation, forming the basis of this study, a street was chosen roughly 2km from the central train station. (specific spot: Zeeburg/Jadaplein). 529 bicycle users were observed: with an almost equal gender split. The great majority were operators (male 268; female 245) but there were 4 male as opposed to 12 female passengers. None of the 529 observed wore helmets. All 4 of the male passengers were children. 9/12 (75%) of the female passengers were children. 6 female operators were children; just one male. One adult male was observed speaking on the cell phone, while riding single-handed. Very few 4-wheel vehicles were observed. Compared to elsewhere, the bicycles themselves were mostly old, much used, and non-sporty. They were clearly intended primarily as modes of transportation, as opposed to status symbols. There were more male operators, as the evening got darker. Observation date: February 16, 2016; time 18.00-19.00.

Location #13: Lecce, Italy: The Central Square in Lecce was chosen as the observation point. Just 13 motorbike users were observed -9 male, 4 female. All the males wore helmets. The 2 female operators wore helmets; the 2 female passengers did not. Female bicycle users made up close to one third, and male users 2/3 of the total number (80 cf 155, of the total of 235 users). Of these the overwhelming majority were helmetless. 2 of the 4 helmeted male cyclists were police. While motorized traffic was authorized on the peripheral roads in view, it was not officially authorized for other than public motorized vehicles in the central square; hence the majority of the 2-wheelers using the square as a transit point were pedal cyclists. This may have given a skewed perception of the relative use of motorized and non-motorized 2-wheelers throughout this small, well-preserved town. It also may help explain the relatively lax mode of bicycle operation: 8 of the male operators were observed using cell phones while cycling, and 2 were smoking – both of which operations reduced riding to a single-handed task. It might also help explain the high incidence of older cyclists (judged at least 65+): 7, of the total of 151 males operating without helmets, or

roughly 5%. 5 of the bicycle passengers were children, and all female –including an infant second passenger carried by her mother on the crossbar. Observation date: Monday, February 22, time: 12.35-13.35.

Location #14: Bari, Italy: A far larger port town than Lecce, Bari exhibited a high use of motorbikes, and a secondary use of pedal cycles: 367/474=77% of 2-wheeled traffic observed was motorized. Of those, the majority were composed of male operators (293/367=80%), all helmeted. By contrast, 7 females were motorbike operators, again all helmeted. The passenger population shows a markedly different story: while 23/25 male passengers wore helmets (92%), none of the 42 female passengers observed were wearing helmets. There appeared to exist a clear cultural divide by gender, for passenger helmet wear. Male un-helmeted pedal cyclists outnumber female un-helmeted operators by exactly 5:1 in our study; but again the incidence of un-helmeted female bicycle passengers is far higher than that of un-helmeted male passengers (8:1).; again possibly indicating a cultural gender divide. Both second un-helmeted bicycle passengers were girls. Observation date: Saturday February 27, 2016; time: 11.55 am -12.55 pm.

Location #15: Napoli, Italy: Observations were made close to the central railway station, on a main road (Garibaldi). At 888 observations in one hour, Naples registered the highest level of 2-wheel use among the 16 locations selected, and also the highest number of motorbike use; conversely it registered proportionately the least use of pedal cycles among the 16 locations studied (24/888, approximating 2.5%). All male pedal cyclists were helmetless, as was the sole male passenger (a child). One female cyclist was observed without a helmet. Almost all male motorbike operators wore helmets (8/652=just over 1% were helmetless); compared to a much higher proportion of female operators without helmets (6/87= just under 7%). The high passenger helmet use was more or less equal across the gender divide (49/56=88% for males; cf 51/60=85% for females.) Of the 7 male passengers riding without helmets, one was a child. Of the 9 female helmetless first passengers, one was a child. However of the 3 helmetless second passengers, all 3 were girls. It was observed that the vast majority of vehicles on the road were private cars, and speed limits were noticeably not enforced. Observation date: Friday, February 19; time: 8.40-9.40 am.

Location #16: Rome, Italy: Weather conditions were windy, chilly, turning into driving rain. Location: Largo di S. Susanna, 1 km from central train station. Bicycle riders were scant: at 12, males outnumbered the 3 females 4:1. 2 males were using earphones. All were helmetless. None had passengers. In the motorbike population, virtually all users wore helmets, regardless of operator/passenger status or gender. This contrasts starkly with the observations of other Italian cities. Roughly one in 5 five operators were female; whilst female passengers outnumbered male by some 7:1. Inter-gender operator and passenger behavior patterns seemed to be clearly defined. Two of the male operators were smoking, which would impede 2-handed steering. Just one motorbike passenger was a child (male, and helmeted). As the rain and wind got stronger, and the temperature dropped (to 9-10 degrees Celsius), 2-wheeler use dropped substantially. Observation date: March5, 2016; time: 17.15-18.15.

DISCUSSION AND ISSUES RAISED

The range of variation in helmet use, across operators and passengers of both bicycles and motorbikes, is large, and is not accounted for entirely by the legal constraints in the 6 different jurisdictions covered in the 16 locations observed. Cultural variations seem to account, for example, for the comparative laxity of helmet use for female motorbike passengers in Bari, compared particularly to Rome, but even to Napoli. Proportionately the least well-helmeted, for both bicycle and motorbike users, were 2-wheel riders in Amsterdam. Moyogalpa in Ometepe comes a distant second. All of these latter findings may also have explanations in the cultural context of each location: 2-wheelers in Amsterdam have such a critical mass, outnumber 4-wheelers so obviously, that they can perceive themselves as 'kings (queens?) of the road'. This would definitely be a totally incorrect perception in, for example, Napoli, where 4-wheelers constitute the majority of vehicular traffic, and therefore a constant threat to the safety of 2-wheeler traffic, motorized or otherwise. Police surveillance of helmet use was nowhere in evidence, in any of the 16 locations; nor

was there any evidence of police surveillance of unseated first and second passengers on bicycles, many of whom were children and un-helmeted.

The difficulty of changing an entrenched culture is well illustrated by the creation and the ignoring of the new bicycle lane in central San Jose. Very few San Jose residents have considered bicycles a viable form of transport. Until a complete and connected network of bicycle lane is established, keeping cyclists separate and safe from motorized traffic, it may be reasonable to expect most San Jose residents to shun their new city center bicycle lane. Nonetheless, cultural attitudes do change: there are more cyclists evident in downtown San Jose than there were a decade ago.

More General Theoretical Considerations Raised -The Notion of Risk and Attitudes Towards Risk –Wilde Revisited!

Gerald Wilde raised an academic storm when he first introduced his notion of risk homeostasis (Wilde, 1989.) He suggested essentially that people have an inbuilt predisposition to risk, such that public policies reducing the probabilities of accident/injury in one area will merely make people more predisposed to increase their risk level in another: thus forcing all cyclists to wear helmets may merely encourage them to cycle faster and more recklessly, to 'compensate'.

Needless to say, the theory has remained controversial since its conception several decades ago. It has remained so in its later iterations (1994, and 2001). In the present empirical study, we might explain the use of earphones, cell phones, smoking of cigarettes while cycling etc., all as strategies by 2-wheel operators to increase their level of risk to a level more attractive to them. Thus public policies to attempt to curb such action may end up a waste of time, since the perpetrators would just find alternative high-risk activities as compensation. The popularity of 'extreme sports' would fit well into Wilde's exposition.
The problem with this logic is that not only are the perpetrators putting themselves at risk. In the context of this study, passengers and other road users are also affected by the risk proclivities of all road users. Thus public policy can be seen as a prophylactic mechanism for the whole of society, not just for individual recalcitrant road users.

An alternative overarching theory to the seductive model provided by Wilde and his protagonists is that of assessing the value of life attached 1/ to individuals, in their behavior, especially as it relates to risk-taking activities; and 2/ to different societies, with respect to the risk-taking activities of their members. This approach might help better to explain the enormous disparities between mortality and injury rates of poor, as compared to rich countries, which gap seems to be widening rather than narrowing. Much of the literature review would tend to reinforce this view. The smoking and drinking habits of different societies, rich and poor, might be used to check the utility of such an alternative theoretical approach. The two approaches would not seem to be mutually exclusive. Further discussion of this suggested approach will be left to a later date, when more comprehensive data have been collected and analyzed from a wider range of locations and countries.

The Hierarchy of Power

Ironically perhaps, the same basic technology has driven most advances in land surface transportation –the harnessing and development of the wheel. However, a major diremption exists in the inherent safety built into the design of transport modes using one-wheel, two-wheel, three-wheel, 4-wheel, 6-wheel 18-wheel vehicles, and so on. The two-wheel vehicle is inherently more risky to operate, as a matter of balance and stability, than the 4-wheel. Caterpillar systems such as tanks employ would seem to provide not just the greatest stability, but ipso facto the greatest power. As it happens generally the larger the number of wheels, the heavier the vehicle and the more powerful the motive force needed (engine power). In this hierarchy of power, the 2-wheel motorized cycle is low down, and the pedal cycle is lower (Lehrer, 1997a, b, and c.)

However, a compensating characteristic of any 2-wheeler is its agility (it can 'turn on a dime'); and the very lightness of a bicycle provides it with the added valuable quality of portability (compared, for example, to a tank). Some members of society may be willing to sacrifice the power, security, status and comfort of multiple-wheeled vehicles for the agility, portability (and of course economy and environmental friendliness) of a 2-wheeler, especially the non-motorized variety, despite (or perhaps because of?) its low power ranking among all other land vehicles.

CONCLUDING COMMENTS AND POLICY IMPLICATIONS

Given the cyclists' low power position, it could be argued that it behooves government jurisdictions to do their utmost to compensate for that low power position, for example by providing separate and protected bicycle paths. This has been the strategy adopted in the Netherlands, and improved and safer bicycle infrastructure is increasingly being built and/or retrofitted elsewhere (Costa Rica and the U.K. among countries in this study, and Canada, the U.S., Germany and Panama among other countries elsewhere. If this public transportation management policy were to be accepted at the level of radical infrastructure development, it might be argued that draconian enforcement of helmet use would be seen as somewhat of a red herring, deflecting public health policy from a much more radical approach to bicycle user safety. It may be argued that the impact of a 20-ton truck colliding with a bicycle or motorcycle user is much the same, whether or not he or she is wearing a 'safety helmet'. Whilst true, the two areas of public health and safety improvement can be seen as mutually re-enforcing, rather than mutually exclusive: seriously enforced 2-wheeler helmet use would help to substantially reduce 'target risk' of fatalities and injuries –at a local, national, regional and global level. With deeper public health and transportation infrastructure pockets, properly segregated motorcycle and bicycle lanes would provide a deeper amelioration to the misery attached to the increasing millions of current 2-wheeler deaths and injuries world-wide.

Suggestions for Further Research

This study has neglected to relate localized helmet use to the impact on fatalities and serious injuries, at the local level of observation. To do so would have required access to hospital and police records, at the very local level –not necessarily openly forthcoming, and not inexpensive. The results might have provided a useful though by no means perfect feedback on the efficacy of helmet use, in and around the locations observed. The expectation would of course be an inverse relation between helmet use and fatalities and serious injuries, as suggested by the WHO report cited in the introduction. Funding will be sought for this additional research; also for extension of the helmet use research to other locations, in other regions, with different cultural contexts –such as S. and S.E. Asia, Australasia, N. Europe, E. Europe and S. America.

APPENDIX

Appendix 1: Empirical Study of Helmet Use in 6 Countries: 3 in Latin America and 3 in Europe

	Total Observations	Bicycle Users		Motorbike Users		Country Ranking of Helmet Use	
		W/Helmets	%	W/Helmets	%	Bici	M/bik
All Countries	4533	84/2151	3.9	2114/2382	88.7		
Central America and the Caribbean	1712	5/973	0.5	591/739	80.0		
1. Costa Rica	669	4/384	1.0	261/285	91.6	3	4
2. Nicaragua	690	1/323	0.3	244/367	66.5	4	5
3. Cuba	353	0/266	0.0	86/87	98.9	5=	1
Europe	2821	79/1178	6.7	1523/1643	92.7		
1. U.K.	295	59/268	22.0	26/27	96.3	1	3
2. Netherlands	578	0	0	10/49	20.4	5=	6
3. Italy	1948	20/381	5.2	1487/1537	96.7	2	2

Appendix 2: Comparing Latin American Helmet Use Observations to European –Focus on Motorbike Use, Split by Gender

Total Latin American Motorbike Users in study: 739					
	MWH*	**MNH#**	**FWH+**	**FNH^**	**OPERS/TOT USRS@**
Opertrs	462= 62.5%	84= 11.4%	47=6.4%	12=1.6%	605/739=82%
					PSNGRS/TOT USRS
Pasngrs	32=4.3%	23=3.1%	50=6.8%	29=3.9%	134/739=18%
Total European Motorbike Users in study: 1,643					
	MWH*	MNH#	FWH+	FNH^	OPERS/TOT USRS@
Opertrs	1189=72.4 %	41=2.5%	141=8.6%	10=0.6%	1381/1643=84%
					PSNGRS/TOT USRS
Pasngrs	82=5.0%	9=0.5%	111=6.8%	60=3.7%	262/1643=16%

Codes: MWH=Males wearing helmets, MNH#=Males not wearing helmets, FWH+=Females wearing helmets, FNH^=Females not wearing helmets, OPERS/TOT USRS@=Operators/Total Users*

Appendix 3: Statistical Summary of 8 Observation Points in Latin America, plus 8 locations in Europe of bicycle and motorcycle users with and without helmets, split by Gender

	Bicycle								**Motorbike**								
	Operators				**Passengers**				**Operators**				**Passengers**				**Totals**
	MWH	**MNOH**	**FWH**	**FNOH**	**MWH**	**MNOH**	**FWH**	**FNOH**	**MWH**	**MNOH**	**FWH**	**FNOH**	**MWH**	**MNOH**	**FWH**	**FNOH**	
Central America and Carribean																	
1. San Jose, Costa Rica	2	19		1					59		1		5		16	1	104
2. Santa Cruz, Costa Rica		198		99		10		17	109		8		4	2	6	2	455
3. Villa Real, Costa Rica	1	30	1	3		1		2	46	8	6	3	1	4		4	110
4. Rivas, Nicaragua		118		11		17		20	64	12	14		3	2	7	9	277
5. San Juan Del Sur, Nicaragua		81		8		6		3	86	24	4	4	2	7	10	3	238
6. Moyogalpa, Nicaragua		32		23	1	2		1	39	40	9	5	1	8	5	9	175
7. Habana, Cuba		31		5		20		1	58		5		15		6	1	142
8. Pilon, Cuba		167		24		9		9	1				1				211
Total Central America and Caribbean	**3**	**676**	**1**	**174**	**1**	**65**	**-**	**53**	**462**	**84**	**47**	**12**	**32**	**23**	**50**	**29**	**1,712**

Europe																	
9. Portsmouth, UK	8	45	6	15	1	1		1	13	1	1		1				93
10. Bournmouth, UK	11	38	6	17					4								76
11. Brighton, UK	19	63	7	29	1				6		1						126
12. Amsterdam, Netherlands		268		245		4		12	10	31		4				4	578
13. Lecce, Italy	4	151	1	73				6	9		2					2	248
14. Bari, Italy	6	75	2	15		1		8	293		7		23	2		42	474
15. Napoli, Italy		15	7	1		1			644	8	87	6	49	7	51	12	888
16. Roma, Italy		12		3					210	1	43		9		60		338
Total Europe	**48**	**667**	**29**	**398**	**2**	**7**	**-**	**27**	**1,189**	**41**	**141**	**10**	**82**	**9**	**111**	**60**	**2,821**
Combined Totals	51	1,343	30	572	3	72	-	80	1,651	125	188	22	114	32	161	89	4,533

REFERENCES

European Road Safety Observatory: 'Challenges arising from the rapid growth of two-wheelers', 2007

Hinchcliffe, M. 'Road Death Statistics' Motorbike News, Australia, 20/1/15

Insurance Institute for Highway Safety. Excerpt from Report on Motorcycle deaths, helmeted and un-helmeted, 1997 and 2013, using FARS data. January 2015

Lehrer, K. A. "Road Safety as a public health issue." Presented at the 3rd Road Transport Conference, Lima, Peru, sponsored by the World Bank and the International Road Federation, 1997

---------- "Violence and road safety on the roads". Presented at the 3rd Road Transport Conference Lima, Peru, sponsored by the World Bank and the International Road Federation, 1997

---------- "Power, Status and Mobility Related to Injury and Death -Towards a Sociological Understanding of Violence and Vulnerability on the Roads"-XIIIth International Road Federation World Meeting, 1997

La Nacion Injuries and Deaths on Motorcycles. P.1, San Jose, 15/5/16

Ruikar, M. National Statistics of road traffic accidents in India. Journal of Orthopedics, Traumatology and Rehabilitation, 2013, 6:1-6

Safety Net, Directorate-General, Transport and Energy, European Commission. 'Powered Two-wheelers'. 16/10/2009

Wilde, Gerald J. S. Target Risk. PDE Publications. Toronto 1994

Wilde, Gerald J. S. Risk Homeostasis Theory: an overview. Injury Prevention.bmj.com Volume 4 Issue 2, 1989

Wilde, Gerald J.S. Target Risk 2. PDE Publications. Toronto 2001

World Health Organization. Global Status Report on Road Safety. Geneva, 2013

World Resources Institute India –Sustainable Cities, 2016

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