# MOTOR-VEHICLE INJURY PATTERNS IN EMERGENCY-DEPARTMENT PATIENTS IN A SOUTH-EUROPEAN URBAN SETTING.

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ABSTRACT

The objectives are to identify the main injury patterns in the various types of user (of cars, motorcycles / mopeds, bicycles and pedestrians) injured in traffic crashes and treated in hospital emergency services, along with their main demographic characteristics.

One-year cumulative survey all of patients attended to emergency departments in Barcelona, Spain, over a 12-month period (1998) for injuries due to motor vehicle crashes. Bivariate descriptive analyses were conducted to identify the different profiles of motor-vehicle injury patients by age, sex, user type, injured body region and type of injuries. ISS scoring was used to determine injury severity.

Of the nearly 17,000 injured traffic victims during 1998, 62% were men. Young people between 15 and 39 (71.6%) were most affected. 42% were users of two-wheeled motor vehicles, followed by car occupants (32%) and pedestrians (24%). Neck sprain (33 %) was the most common injury among car occupants, multiple contusion and contusion of lower limbs among two-wheeled motor vehicles (23.5% and 14% respectively) and pedestrians (17.3% and 14.4% respectively) and upper limb fractures (20%) among cyclists.

Motorcycle and moped users, mainly young males, have the highest probability of suffering injuries, with lower limbs being the most affected anatomical region. Elderly pedestrians sustaining injuries to the lower limbs and the head contribute substantially to the overall injury situation.

The impact of traffic injuries as one of the main causes of death, morbidity and disablement in the developed countries is well known (Murray et al., 1996). Traffic injuries represent an important health problem in Spain (Seguí-Gómez, 2000) being one of the leading European Union countries in terms of numbers of injured cases and deaths due to this cause (Laumont, 1998). In spite of the fact that at the beginning of the nineties morbidity/mortality rates due to traffic accidents declined (Ministerio Sanidad, 1999; Redondo et al, 2000), in recent years they have risen again (Plasència, in press).

In Barcelona (1,700,000 inhabitants), the second largest city in Spain, significant efforts have been made to determine mortality (Pañella et al., 1991), morbidity (Plasència et al., 1995) and disablement (Ferrando et al., 1998a) related with traffic injuries. Studies have also been carried out to assess the impact of legislative measures implemented in the city aimed at reducing traffic injury mortality (Plasència et al, 1998; Ferrando et al., 1998b) as well as the utilization of hospital emergency services (Seguí-Gómez et al., 1996, Cirera et al., 1998) as a valid and reliable source of information for monitoring characteristics of traffic injury cases.

The objectives of the present study are to identify the main injury patterns in the various types of user (of cars, motorcycles / mopeds, bicycles and pedestrians) injured in traffic crashes and treated in hospital emergency services, along with their main demographic characteristics.

Methods:

Subjects: subjects were those individuals attended to by the emergency department of seven Barcelona public hospitals for injuries due to a MV crash during 1998.

Source of information: Data analyzed were transmitted from 7 emergency departments participating in the DUHAT (Dades d'Urgències Hospitalàries per Accidents de Trànsit) project (Institut Universitari de Salut Pública de Catalunya, 1995), coordinated by the Municipal Institute of Health, and cover 90% of cases attended to by the Barcelona Public Hospitals Network. This project, begun in 1994, systematically collects

information on MV crash victims seen in emergency departments of the Barcelona Public Hospitals Network, including demographic and diagnostic data, as well as user type information. The remaining 10% of injury cases for which information is not available comprises cases attended to by private sources of care, which also tend to be lower overall severity.

Methods: For the period under study, the data base comprised 16976 cases. The variables transmitted from the participating centers and which are used in this study include: sex, age, type of user (car, motorcycle / moped, bicycle, pedestrian) and injury diagnoses. The coding of these diagnoses, according to ICD-9-CM criteria (WHO, 1988), was carried out either by coders within each hospital, or by coders of the Municipal Institute of Health.

Severity of injuries was determined using the ICDMAP program (The Johns Hopkins Health Research and Development Center and the Maryland Institute of Emergency Medical Services System, 1988) which automatically converts diagnoses in terms of ICD-9-CM codes into AIS and ISS codes. In 16.3 % of the cases it was not possible to do this conversion due to unspecific or missing diagnosis.

Bivariate descriptive analyses were performed to identify the various injury patterns (by anatomical region and type of injury) among the different types of injured users, as well as their main demographic characteristics (by age and sex). All statistical analyses were carried out using the SPSS statistical package (Norusis, 1993)

Results:

During the year 1998, nearly 17,000 injured traffic victims were treated in the emergency departments of the seven main hospitals of the city (table 1); of these, more than half were men (62%). In terms of age the groups most affected were young people between 15 and 39 (71.6%), in particular those in their twenties (40%).

Table 1. Description of the principal characteristics of the traffic injury cases in Barcelona, 1998.

| | Injured persons (N) | Percent (%) |
|---|---|---|
| Gender | | |
| Males | 10563 | 62.2 |
| Females | 6413 | 37.8 |
| Age | | |
| 1-9 | 290 | 1.7 |
| 10-14 | 244 | 1.4 |
| 15-19 | 2407 | 14.2 |
| 20-29 | 6756 | 39.9 |
| 30-39 | 2966 | 17.5 |
| 40-49 | 1508 | 8.9 |
| 50-59 | 1087 | 6.4 |
| 60-69 | 771 | 4.5 |
| 70-79 | 595 | 3.5 |
| >80 | 325 | 1.9 |
| Type of User | | |
| Car | 2758 | 31.8 |
| Motorcycle/moped | 3601 | 41.6 |
| Pedestrian | 2097 | 24.2 |
| Bicycle | 30 | 0.7 |
| Other (public transport) | 208 | 1.7 |
| Anatomical Region | | |
| Head | 1687 | 11.8 |
| Neck | 2664 | 18.7 |
| Face | 1065 | 7.5 |
| Thorax | 1603 | 11.2 |
| Abdomen | 131 | 0.9 |
| Upper limbs | 2763 | 19.4 |
| Lower limbs | 4312 | 30.3 |
| ISS | Mean: 2.1;<br>Standard deviation: 2.1 | |

Almost half the injured were users of two-wheeled motor vehicles (42%), followed by car occupants (32%) and pedestrians (24%). Injured bicycle users represented 0.7% of the total number of injured cases. The anatomical region with the greatest number of injuries was lower limbs (30 %), followed by upper limbs (19.4 %) and neck (18.7 %). Severity (ISS) for all injuries taken together was 2.1. Only 10% of the injury cases treated by emergency services were subsequently admitted to hospital.

In all groups of users, the presence of men is notable (table 2) with the exception of pedestrians where there are

slightly more women (51%). The numbers of young injured cases is also notable, except among pedestrians where 37% are over 50 years of age. The neck was the anatomical region sustaining most injuries (39%) among car users, lower limbs among two-wheeled motor vehicles (45%) and pedestrians (40.5%) and upper limbs among cyclists (48%). Cyclists presented injuries of greater severity (ISS=3) followed by pedestrians (ISS=2.7).

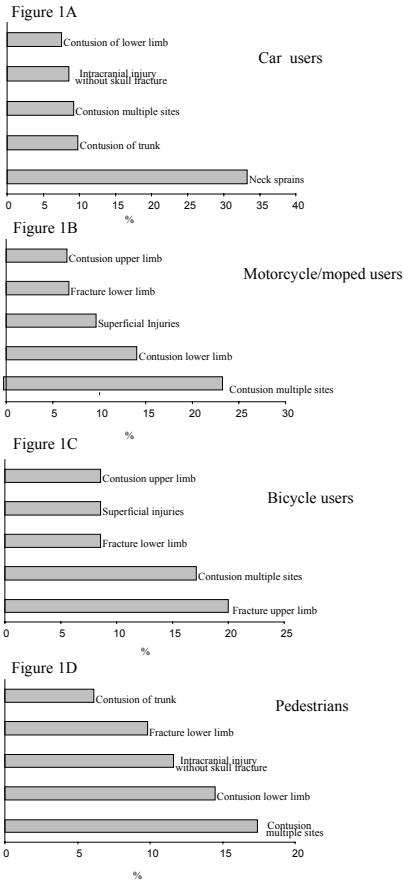
Table 2 Description of the principal characteristics of traffic injury cases by user type. Barcelona 1998

| | Car users | | Motorcycle / moped users | | Pedestrian | | Bicycle users | |
|---|---|---|---|---|---|---|---|---|
| | Users (N) | % | N | % | N | % | N | % |
| Gender * | | | | | | | | |
| Males | 1519 | 55.2 | 2595 | 72 | 1024 | 49 | 27 | 90 |
| Females | 1234 | 44.8 | 1009 | 28 | 1067 | 51 | 3 | 10 |
| Age * | | | | | | | | |
| 1-9 | 60 | 2.2 | 2 | 0.1 | 84 | 4.1 | 0 | 0 |
| 10-14 | 37 | 1.3 | 14 | 0.4 | 81 | 3.9 | 1 | 3.3 |
| 15-19 | 148 | 5.4 | 735 | 20.4 | 155 | 7.4 | 6 | 20 |
| 20-29 | 997 | 36.2 | 1901 | 52.7 | 336 | 16.1 | 12 | 40 |
| 30-39 | 566 | 20.6 | 628 | 17.4 | 263 | 12.6 | 7 | 23.3 |
| 40-49 | 382 | 13.9 | 196 | 5.4 | 200 | 9.6 | 2 | 6.7 |
| 50-59 | 291 | 10.6 | 92 | 2.5 | 238 | 11.4 | 1 | 3.3 |
| 60-69 | 166 | 6 | 20 | 0.5 | 257 | 12.3 | 1 | 3.3 |
| 70-79 | 80 | 2.9 | 14 | 0.4 | 281 | 13.4 | 0 | 0 |
| >80 | 26 | 0.9 | 2 | 0.1 | 194 | 9.3 | 0 | 0 |
| Anatomical region * | Injuries (N) | % | N | % | N | % | N | % |
| Head | 270 | 10.9 | 207 | 7.3 | 342 | 18.9 | 1 | 4 |
| Neck | 972 | 39.1 | 150 | 5.2 | 66 | 3.6 | 0 | 0 |
| Face | 299 | 12 | 133 | 4.6 | 154 | 8.5 | 2 | 8 |
| Thorax | 347 | 13.9 | 254 | 9 | 181 | 10 | 1 | 4 |
| Abdomen | 20 | 0.8 | 33 | 1.1 | 22 | 1.2 | 0 | 0 |
| Upper limbs | 276 | 11.1 | 775 | 27.3 | 308 | 17 | 12 | 48 |
| Lower limbs | 296 | 11.9 | 1288 | 45.3 | 733 | 40.5 | 9 | 36 |
| ISS * | Mean : 1.9 Standard deviation: 1.9 | | Mean: 2.19 Standard deviation: 2.2 | | Mean: 2.7 Standard deviation: 2.7 | | Mean: 3 Standard deviation: 3.1 | |

* $p < 0.01$

Neck sprain (33 %) was the most common injury among car occupants (figure 1), multiple contusion and contusion of lower limbs among two-wheeled motor vehicles (23.5% and 14% respectively) and pedestrians (17.3% and 14.4% respectively) and upper limb fractures (20%) among cyclists.

Figure 1. Description of the principal lesions by injured traffic users. Barcelona 1998




## Discussion:

In this study, as in others previously carried out in Barcelona (Plasència et al., 1995), the important contribution of motorcycle and moped users to the total number of injured traffic victims in the city continues to manifest itself. The male, usually

young, users of these vehicles are the group with the highest probability of presenting traffic accident injuries. Another subgroup with an important probability of presenting injuries is that of elderly pedestrians.

This is the first study in Barcelona that has looked at injury patterns presented by the different types of users involved in traffic injuries and treated in hospital emergency services. The study shows how the different types of injured users present with a variety of injury types and anatomical areas affected.

Thus, car occupants most frequently suffer neck injuries, followed by thorax, and limbs, mainly lower limbs, neck sprain and chest bruising being the most common injuries. These results agree with those found in other studies (Norin et al., 1997) in which traffic injury and disability among car occupants were investigated, and it was seen that the anatomical areas most frequently sustaining injury among patients with low levels of disability, as was the case in our study, were the neck and limbs, while among occupants presenting higher levels of disability, the head was the area most commonly affected. In other studies (Bring et al. 1996; Gargan et al., 1997) the neck also appears as one of the anatomical areas most commonly involved in injuries to car occupants.

It has been found (Chandler et al., 1997; McConnell et al., 1997; Gupta et al., 1998) that chest injuries in car collisions are associated with the use of seatbelts. As in our study information was not available about use of safety measures, we cannot assess whether injuries of the chest observed in our study is associated or not with seatbelt use. Limbs also appear in other studies (Crandall et al., 1998; Fildes et al., 1997) as anatomical regions with a high frequency of injuries among car occupants.

Motorcycle and moped users presented greater injuries of lower limbs, in agreement with results found in other research (Peek Asa et al., 1996). This is the first time that traffic injuries to bicycle users have been studied in Barcelona. Despite the low numbers of victims detected, they stand out as the victims sustaining injuries with the highest levels of severity. Limb fractures and multiple bruising were the injuries most often found In other studies (Puranik et al., 1998; Kennedy, 1996) the head was found to be the most affected region among seriously injured bicycle users. It is important to note that bicycle use is an emerging phenomenon in the city traffic flow, and thus it is

expected the next few years will see a rise in the number of bicycle accident victims.

With regard to pedestrians, our results agree with those of other studies (Calhoun et al., 1998; Kong et al., 1996; Eastridge et al., 1997; Durkin et a., 1999) which point to the higher frequency of lower limb and head injuries, mainly bruising and lower limb fractures, and intracranial injuries without fracture of the cranium

The present study was carried out with traffic victims treated in hospital emergency services who presented injuries of low severity, the majority of whom did not require admission to hospital. In the DUHAT project, only 10% of MV crash victims attended by emergency services require hospital admission (Seguí, Plasència, Ferrando et al., 1995). These are a small subgroup of victims that generally involves more severe cases than those not admitted. In our information system for these victims we do not have the information related to the injury diagnoses that are presented in the hospital discharges, we have only the first injury evaluation carried out in the emergency services which in general provide an injury diagnoses less precise than that provided by the hospital discharge. For these reasons, patterns of injuries related to more severe MV crash victims could be underrepresented in our study.

Despite the limitation of identifying only patients with lower severity levels, several studies (Burt et al., 1998; Van Camp et al., 1998; Bring et al., 1996) point out the utility of working with these sources of information, as well as the importance of low severity traffic accident injuries in both health care terms and social terms (McClure et al., 1996).

Another limitation of this study appears as a consequence of the non-availability of information regarding the circumstances involved in producing the traffic accidents. Thus, we have not been able to relate such circumstances with the production of injuries, as has been done in several studies (McLellan et al., 1996; Peek Assa et al., 1996; Dolinis, 1997; Crandall et al., 1998; Fildes et al., 1997). Nor has it been possible to relate, as other studies have done (Norin et al., 1997; Chandler et al., 1997; Niemcryk et al., 1997; McConnell et al., 1997; Gupta et al., 1998; Van Camp et al., 1998; Sasso et al., 1997; Porter et al, 1998; Hollands et al., 1996; Loo et al., 1996; Swierzewski et al., 1994), the use of particular safety measures such as seatbelts or airbags in cars, or helmets in cyclists and motorcyclists, with the

production of injuries. It will be possible to overcome these limitations when it becomes possible to link city hospital and police information sources, currently in an experimental phase (Cirera et al., 1999).

Despite these limitations, the present study shows the principal characteristics, in demographic and injury pattern terms, of injured traffic victims treated in hospital emergency services in a Southern European city, indicating that out of all traffic victims, it is the group of motorcycle and moped users, mainly young males, who have the highest probability of suffering injuries, with lower limbs being the most affected anatomical region, as well as the important contribution by elderly pedestrians sustaining injuries to the lower limbs and the head. This knowledge will contribute to interventions aimed at prevention and reduction of traffic accident injury rates in our city.

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References

Bring G, Björnstig U, Westman G. Gender patterns in minor head and neck injuries: an analysis of casualty register data. Accid Anal Prev 28(3): 359-369; 1996.

Burt CW, Fingerhut LA. Injury visits to hospital emergency departments: United States, 1992-95. Vital Health Stat 13, 131: 1-76; 1998.

Calhoun AD, McGwin G, King WD, Rousculp MD. Pediatric pedestrian injuries: a community assessment using a hospital surveillance system. Acad Emerg Med 5 (7): 685-690; 1998.

Chandler CF, Lane JS, Waxman KS. Seatbelt sing following blunt trauma is associated with increased incidence of abdominal injury. Am Surg 63(19): 885-888; 1997.

Cirera E, Plasència A, Ferrando J, Seguí-Gómez M. Factors associated with severity and hospital admission of motor-vehicle injury cases in a southern european urban area. 42nd Annual Conference of the Association for the Advancement of Automotive Medicine. 1998.

Cirera E, Plasència A, Ferrando J, Arribas P. Probabilistic linkage of police and emergency department sources of information on motor vehicle injury cases: a proposal for improvement. 43nd Annual Conference of the Association for the Advancement of Automotive Medicine. 1999.

Crandall JR, Martin PG, Sieveka EM, Pilkey WD, Dischinger PC, Burgess AR, Oquinn TD, Schmidhauser CB. Lower limb response and injury in frontal crashes. Accid Anal Prev 30(5): 667-677; 1998.

Dolinis. Probability factors for 'whiplash' in drivers: a cohort study of rear-end traffic crashes. Injury 28 (3): 173-179; 1997.

Durkin MS, Laraque D, Lubman I, Barlow B. Epidemiology and prevention of traffic injuries to urban children and adolescents. Pediatrics 103 (6): 74; 1999.

Eastridge BJ, Burgess AR. Pedestrian pelvic fractures: 5-year experience of a major urban trauma center. J Trauma 42 (4): 695-700; 1997.

Ferrando J, Plasència A, MacKenzie E, Orós M, Arribas P, Borrell C. Disabilities resulting from traffic injuries in Barcelona, Spain: 1-year incidence by age, gender and type of user. Accid Anal and Prev 30 (6): 723-730; 1998a.

Ferrando J, Plasència A, Orós M, Borrell C. The impact of the helmet law on motorcycle crash mortality in Barcelona, Spain. 4th World Conference. Injury Prevention and Control.
World Health Organization. 1998b.

Fildes B, Lenard J, Lane J, Vulcan P, Seyer K. Lower limb injuries to passenger car occupants. Acci Anal prev 29(6): 785-791; 1997.

Gargan M, Bannister G, Main C, Hollis S. The behavioral response to whiplash injury. J Bone Joint Surg Br 79(4): 523-526; 1997

Gupta N, Auer A, Troop B. Seat belt-related injury to the common iliac artery: case report and review of the literature. J Trauma 45 (2): 419-421; 1998.

Hollands CM, Winston FK, Stafford PW, Shochat SJ. Severe head injury caused by airbag deployment. J Trauma 41 (5): 920-922; 1996.

Institut Universitari de Salut Pública de Catalunya. Lesionats per accident de trànsit atesos als serveis d'urgències hospitalaris. Anàlisi descriptiu. Projecte DUHAT. 1995.

Kennedy A. The pattern of injury in fatal pedal cycle accidents and the possible benefits of cycle helmets. Br J Sports Med 30 (2): 130-133; 1996.

Kong LB, Lekawa M, Navarro RA, McGrath J, Cohen M, Margulies DR, Hiatt JR. Pedestrian-motor vehicle trauma: an analysis of injury profiles by age. J Am Coll Surg 182 (1): 17-23; 1996.

Laumon B. Recherche épidémilogique et accidentologie routière en Europe. Rev Épidém et Santé Publ. 46: 509-521; 1998

Loo GT, Siegel JH, Dischinger PC, Rixen D, Burgess AR, Addis MD, OQuinn T, McCammon L, Schmidhauser CB, Marsh P, Hodge PA, Bents F. Airbag protection versus compartment intrusion effect determines the pattern of injuries in multiple trauma motor vehicle crashes. J Trauma 41 (6): 935-951; 1996.

McClure RJ, Douglas RM. The public health impact of minor injury. Accid Anal and Prev 28 (4): 443-451; 1996.

McConnell EJ, Macbeth GA. Common carotid artery and tracheal injury from shoulder strap seat belt. J Trauma 43 (1): 150-152; 1997.

McLellan BA, Rizoli SB, Brenneman FD, Boulanger BR, Sharkey PW, Szalai JP. Injury pattern and severity in lateral motor vehicle collisions: a Canadian experience. J Trauma 41 (4): 708-713; 1996.

Ministerio de Sanidad y Consumo. Informe sobre la salud de los españoles: 1998. Secretaría General Técnica. Centro de Publicaciones. Ministerio de Sanidad y Consumo. 1999.

Murray CJL, Lopez AD. The Global burden of disease: a comprehensive assessment of mality and disability from disease, injuries, and probability factors in 1990 and projected to 2020. Geneva: World Health Organization; 1996.

Niemcryk SJ, Kaufmann CR, Brawley M, Yount SI. Motor vehicle crashes, restraint use, and severity of injury in children in Nevada. Am J Prev Med 13 (2): 109-114; 1997.

Norin H, Krafft M, Korner J, Nygren A, Tingvall C. Injury severity assessment for car occupants in frontal impacts, using disability scaling. J Clin Epidemiol 50(1): 95-103; 1997.

Norusis MJ/SPSS Inc. SPSS for Windows. Base System User's Guide. Release 6.0. SPSS Inc. 1993.

Pañella H, Plasència A, Borrell C. Mortalidad por causas externas en residentes en Barcelona (1983-1987). Gac Sanit 5: 160-168; 1991.

Peek Asa C, Kraus JF. Injuries sustained by motorcycle riders in the approaching turn crash configuration. Accid Anal Prev 28 (5): 561-569; 1996.

Plasència A, Borrell C, Antó JM. Emergency department and hospital admissions and deaths from traffic injuries en Barcelona Spain. A one-year population-based study. Accid Anal Prev 27: 591-600; 1995.

Plasència A, Ferrando J, Orós M, Borrell C. The impact of a seat-belt law on traffic crash mortality in a south-european urban area. 4th World Conference. Injury Prevention and Control. World Health Organization.1998.

Plasència A, Mocada S. Objetivo 11: Accidentes. En: Informe SESPAS 2000. La salud pública. Nuevos desafíos ante un nuevo siglo. Alvarez-Darcet C, Peiró S, eds. (en prensa).

Porter Rs, Zhao N. Patterns of injury in belted and unbelted individuals presentng to a trauma center after motor vehicle crash: seat belt syndrome revisited. Ann Emerg Med 32 (4): 418-428; 1998.

Puranik S, Long J, Coffman S. Profile of pediatric bicycle injuries. South Med J 91 (11): 1033-1037; 1998.

Redondo JL, de Dios Luna del Castillo J, Jiménez JJ, Lardelli P, Gálvez R. Evolución de la mortalidad por accidentes de tráfico en España, 1962-1994. Gac Sanit 14 (1): 7-15; 2000.

Sasso RC, Meyer PR, Heinemann AW, Van Aken J, Hastie B. Seat-belt use and relation to neurologic injury in motor vehicle crashes. J Spinal Disord 10 (4): 325-328; 1997.

Seguí-Gomez M, Plasència A, Ferrando J. et al. Sistemas de información sobre lesionados por accidente de tráfico atendidos en los servicios de urgencias hospitalarios. XIII reunión de la SEE. Barcelona, 1995.

Seguí-Gómez M, Plasència A, Borrell C. Calidad de los diagnósticos en urgencias de las lesiones por causas externas que requieren ingreso hospitalario. Gac Sanit 10: 110-116; 1996.

Seguí-Gómez M. Lesiones de tráfico en España: una llamada a la acción. Gac Sanit 14 (1): 1-3; 2000.

Swierzewski MJ, Feliciano DV, Lillis RP, Illig KA, States JD. Deaths from motor vehicle crashes: patterns of injury in restrained and unrestrained victims. J Trauma 37 (3): 404-407; 1994.

The Johns Hopkins Health Research and Development Center and the Maryland Institute of Emergency Medical Services System. ICDMAP. Determining injury severity for hospital discharge: A program to map ICD-9-CM diagnoses into AIS and

ISS severity scores. The Johns Hopkins Health Research and Development Center and the Maryland Institute of Emergency Medical Services System. Baltimore, MD: USA; 1988.

Van Camp LA, Vanderschot PM, Sabbe MB, Delooz HH, Goffin J, Broos PL. The effect of helmets on the incidence and severity of head and cervical spine injuries in motorcycle and moped accident victims: a prospective analysis based on emergency department and trauma center data. Eur J Emerg Med 5 (2): 207-211; 1998.

World Health Organization. International Classification of Diseases, 9th revision, clinical modification. Comission Professional and Hospital Activities, Ann Arbor, MI, USA. 1980.

(*Presenter:* Maria Segui-Gomez)

*Narayan Yoganandan:* This was done in Barcelona. Do you have any plans to do this is other parts of Spain?

*M. Segui-Gomez:* Unfortunately, I'm not aware of any other plans in other parts of Spain to establish a similar surveillance system. We pioneered this back in 1993 and since then no one has approached us with any comments to do something similar.

*N. Yoganandan:* Is there any interest from the EU or from the Spain Government?

*M. Segui-Gomez:* You're asking the wrong person. As you can see, I spend most of my time here so I don't really know the politics internally between the first author and the European Union. I know they are members of the European safety commission team, but I don't know if there are any plans to enlarge this. If I remember correctly, the only similar project in Europe is a Greek project that takes emergency department data and has a wonderful injury surveillance system. They do not only include motor vehicles; they include any type of injury, but as far as I can tell, and maybe the Italians in the audience can confirm this, those two would be the only two surveillance systems that I'm aware of.

*Carl Clark:* One of the main means to reduce bicycle injuries, both in Europe and in the United States, is to give separate bicycle lanes. Denmark is so impressive on this, but in New England they're doing a great deal of it now. How is that progressing in Barcelona? Is there government pressure to do this?

*M. Segui-Gomez:* I would actually love to do a field trip and come back with a precise answer. There have been some developments, mostly over the last 8 or 10 years. Some areas of the city have designated bike lanes, although if you walk through Barcelona, you will notice that it's not really the most bike friendly city, both in terms of the topography and in terms of the layout. What they have done actually is they have designated bike days to encourage people to use their bikes as an alternative mode of transportation. So for particular days in the year they will close a number of streets, and actually let those become bike streets and those seem to be very popular and have very high acceptance.

*Unidentified questioner:* Were the head injuries study with helmets and without helmets?

*M. Segui-Gomez:* We cannot tell precisely because, as I said, data is not collected by the EDs. I can tell you that at the time of the study, helmet use among motorcyclists was around 80% so the presumption is that and obviously a slightly larger per cent of those who are in a crash are unhelmeted, if I can use that word, but the presumption is that would be higher than you would have thought and higher than the United States helmet rate.