Patterns of seatbelt use in different socioeconomic communities in the Cape Town Metropole, South Africa

D J van Hoving,[1] MB ChB, DipPec (SA), MMed (Emerg Med), MScMedSci (Clin Epi); **M Sinclair**,[2] BSc, M Urban Design, PhD;
L A Wallis,[1] MB ChB, MD, DIMCRSCEd, Dip Sports Med, FRSCEd (A&E), FCEM, FCEM (SA)

[1] *Division of Emergency Medicine, Stellenbosch University, Parow, South Africa*
[2] *Department of Civil Engineering, Stellenbosch University, South Africa*

Corresponding author: *D J van Hoving (nvhoving@sun.ac.za)*

Background. Road traffic injuries are a leading cause of death and may be related to social inequality.
Objective. To establish whether patterns of seatbelt use vary between different socioeconomic communities in the Cape Town Metropole, South Africa.
Methods. Vehicles and their occupants at 7 high-volume crossings (3 in high-income areas) were placed under surveillance for 2 hours each during November 2010. All occupants were eligible for inclusion except occupants of non-motorised vehicles, two-wheel motorised vehicles, buses, taxis, heavy goods vehicles and emergency vehicles. Child seatbelt use was recorded only for children who appeared older than 3 years.
Results. A total of 4 651 vehicles with 6 848 occupants were surveyed. Rates of seatbelt use were 45.1% (*n*=3 090) for all occupants, 54.0% (*n*=2 513) for drivers, 33.1% (*n*=521) for front-seat passengers (adults 33.2%, *n*=452; children 32.7%, *n*=69) and 9.0% (*n*=56) for rear-seat passengers (adults 4.0%, *n*=13; children 14.4%, *n*=43). Occupants from high-income areas were more likely to wear seatbelts (odds ratio (OR) 4.35; 95% confidence interval (CI) 3.89 - 4.88). Use of child restraints was poor overall (22.3%, *n*=114), but also varied according to income areas (high income 40.9%, *n*=99; low income 0.03%, *n*=6; OR 26.77; 95% CI 11.44 - 62.63).
Discussion. The impact of road traffic injuries is significant, but can be decreased by using appropriate restraining devices. Seatbelt use in South Africa, although compulsory, is neither strictly adhered to nor enforced. Their use is proportionally lower in lower-income areas. Specific interventions are required to target these communities directly.

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Road traffic injuries are among the leading causes of death worldwide, resulting in an estimated 1.24 million deaths annually.[1] This loss of life is comparable in scale to that caused by only the most pervasive communicable diseases, such as malaria and tuberculosis.[2]

Middle- and low-income countries are disproportionately affected by road traffic injuries. Eighty percent of road traffic deaths occur in countries that have 72% of the world's population, but only 52% of the world's registered vehicles.[1] This trend is further illustrated when the latest overall global road traffic fatality rate (18 deaths per 100 000 population) is divided into high-income countries (8.7/100 000), middle-income countries (20.1/100 000) and low-income countries (18.3/100 000).[1]

Large disparities also exist between regions, as well as between countries in the same region. Africans have the highest risk of dying from a road traffic injury (24.1/100 000 population).[1] In the African region, Nigeria and South Africa (SA) have the highest fatality rates at 33.7 and 31.9 deaths per 100 000 population per year, respectively.[3]

Age-specific driver mortality rates in Africa were highest in the youngest age group (15 - 29 years), with 3 out of every 4 deaths being of males.[3-4] Economically disadvantaged families are hardest hit by deaths of those entering their most productive years, as a result of both loss of income and direct medical costs.

Complex road safety initiatives and strategies have been formulated and implemented, but one of the simplest and most effective ways of reducing traffic deaths is to increase rates of seatbelt use by vehicle occupants.[1] Research proves conclusively that restraining devices (seatbelts and child restraints) are one of the most effective measures to achieve a reduction in road traffic deaths and major injuries sustained by vehicle occupants.[5] The risk of death for drivers and front-seat passengers is decreased by 45%, while the risk of serious injury is lowered by 50%.[5] For passengers seated at the back, this risk is decreased by 25 - 75%, while child restraints reduce the risk by approximately 70% in infants and by between 54% and 80% in young children.[6-7]

In the USA during 2009, more than half (53%) of fatally injured passengers were unrestrained.[8] It is further estimated that 13 000 lives were saved by seatbelts that year in the USA alone, and this number could have increased by another 4 000 if all occupants had used seatbelts.[5] Another reason to wear a seatbelt is to prevent ejection from the vehicle; more than 75% of people ejected from the vehicle during a collision eventually die from their injuries. Occupants not wearing seatbelts are 30 times more liable to be ejected and killed than those who were 'buckled up'.[5]

Rates of seatbelt use vary greatly across the globe.[1] In the USA, seatbelt use increased from 11% in 1981 to nearly 85% in 2010, mainly as a result of improved legislation, education and technology.[5] The national rate in SA from 1982 to 1995 varied between 46.9% and 69.2%, although it has since generally declined.[9-10]

A disturbing trend is also seen in children. According to statistics from the Child Accident Prevention Foundation of South Africa,

84% of children in vehicles are not restrained and 80% of children who had been injured in collisions were not restrained.[11] In Bloemfontein, restraints were used for only 8.8% of children.[12]

SA has had numerous road safety strategies in place, but it is not clear how effective they have been in reducing this burden of disease.[13] The fact that fatal injury levels remain largely unchanged year-on-year suggests that current strategies are falling short.[14] Determining local patterns in road behaviour between different socioeconomic groups has the potential to allow an evidence-based approach to help reduce road traffic collisions in the future.

Objective

To establish how patterns of seatbelt use vary between different socioeconomic communities in the Cape Town Metropole, SA.

Methods

Study design

Emergency Medical Services in the Western Cape undertook an audit of seatbelt use, and the Division of Emergency Medicine in collaboration with the Division of Civil Engineering, Stellenbosch University, retrospectively analysed the data. The study was approved by the Stellenbosch University Human Research Ethics Committee (ref. N11/03/080) and the Western Cape Health Research Committee (ref. 2012 RP 06).

Study setting

Seven high-volume crossings in the City of Cape Town were identified (Table 1). Three of these crossings were situated in traditionally high-income areas (Bellville, Newlands and Milnerton) and 3 in traditionally low-income areas (Mitchell's Plain, Gugulethu, Du Noon).[15] One crossing was situated in the City Bowl itself and served as a 'hybrid' where people from different socioeconomic areas mix.

The crossings were under surveillance for two 1-hour sessions: an hour during rush hour (07h00 - 08h00 or 16h30 - 17h30) and an hour during less busy periods (10h30 - 11h30 or 14h00 - 15h00). The surveillance was done on random weekdays and weekend days. Students from the Division of Civil Engineering worked in pairs to collect the data during November 2010.

All adult occupants (>14 years) of vehicles were eligible for inclusion, with the exception of occupants of non-motorised vehicles, two-wheel motorised vehicles, buses, taxis, heavy goods vehicles and emergency vehicles. Child seatbelt use was recorded only for children who appeared older than 3 years of age, SA seatbelt legislation currently prescribing the use of seatbelts for children from this age upwards.[16] Children younger than 3 years currently do not have to be restrained, itself a concern.

Variables were collected on a standardised data collection sheet (Fig. 1). Collected data were transferred onto a password-protected electronic spreadsheet (Microsoft Office Excel 2007).

Data collection sheet

Study: The prevalence of seatbelt use in the Cape Town Metropole

Location:

Belville	City Bowl	Du Noon	Gugulethu
Milnerton	Mitchell's Plain	Newlands	

Time of day:

07h00 - 08h00	10h30 - 11h30	14h00 - 15h00	16h30 - 17h30

Day of the week:

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Data collection sheet example:

Row 1: Young male driver wearing seatbelt; an adult front seat passanger without seatbelt; two adults and child on rear seat without restraints.

Row 2: Elderly female driver unrestrained (talking on cell phone) with unrestrained child on front seat.

DRIVER									FRONT-SEAT PASSENGER				REAR-SEAT PASSENGER/S			
Gender		Age group			Seatbelt		Cell phone		Seatbelt adult		Seatbelt child		Seatbelt adult/s		Child restraint/s*	
M	F	Y	M	E	Y	N	Y	N	Y	N	Y	N	Y	N	Y	N
✓		✓			✓					✓				✓✓		✓
	✓			✓		✓	✓					✓				

*Fig. 1. Data collection sheet. * Age appropriate child restraint. Gender: M = male; F = female. Age group: Y = young; M = middle aged; E = elderly. Y = Yes; N = no.*

Table 1. Exact locations of high-volume crossings

Suburb	Income area	High-volume crossings
Bellville	High	Crossing of Durban Road and Bill Bezuidenhout Avenue
City Bowl	Mix	Crossing of Strand Street and Adderley Street
Du Noon	Low	Crossing of Potsdam Road and Dumani Street
Gugulethu	Low	Crossing of Lansdowne Road and Duinefontein Road
Milnerton	High	Crossing of Marine Drive and Racecourse Road
Mitchell's Plain	Low	Crossing of Merrydale Avenue and Morgenster Road
Newlands	High	Confluence of Protea Road, Main Road and Campground Road

The primary aim of the retrospective analysis was to compare the percentages of seatbelt use in different socioeconomic areas in the Cape Town Metropole, and to disaggregate these results by age and gender. For this purpose, odds ratios (ORs) with corresponding 95% confidence intervals (CIs) were calculated and compared between the different variables (OpenEpi version 3.01, http://www.openepi.com). A 5% level of significance was used.

Results

A total of 4 651 vehicles, with 6 848 occupants, were surveyed (Table 2). Rates of seatbelt use were 45.1% (*n*=3 090) for all occupants, 54.0% (*n*=2 513) for drivers, 33.1% (*n*=521) for front-seat passengers (adults 33.2%, *n*=452; children 32.7%, *n*=69) and 9.0% (*n*=56) for rear-seat passengers (adults 4.0%, *n*=13; children 14.4%, *n*=43).

Vehicle occupants in high-income areas were generally more likely to wear seatbelts than those in low-income areas (OR 4.35; 95% CI 3.89 - 4.88), with a combination of the two effects evident in the City Bowl area (Fig. 2). Drivers from high-income areas were 3 times more likely to wear seatbelts than their counterparts from low-income areas (high income 66.0%, *n*=1 585; low income 34.7%, *n*=524; OR (adjusted for age and gender) 3.02; 95% CI 2.62 - 3.45). This trend continued in the passenger group, where 42.5% (*n*=346) used seatbelts in the high-income areas compared with 12.4% (*n*=127) in the low-income areas (OR adjusted for age and position in vehicle 5.66; 95 % CI 4.43 - 7.22).

The influence of the driver wearing a seatbelt on seatbelt use by other occupants in the vehicle revealed an overall adjusted OR of 11.3 (95% CI 8.47 - 15.09; OR adjusted for age, gender and income areas). When divided into income areas and adjusted for age and gender, low-income areas were again worse off (high-income adjusted OR 10.25; 95% CI 7.09 - 14.84 v. low-income adjusted OR 13.3; 95% CI 8.36 - 21.16).

Use of child restraints was poor overall (22.3%, *n*=114), but also varied between socioeconomic areas. Children in high-income areas were significantly more likely to wear seatbelts than children from lower-income areas (high income 40.9%, *n*=99; low income 0.03%, *n*=6; OR 26.77; 95% CI 11.44 - 62.63).

Table 2. Demographics of vehicle occupants

	n (%)
Drivers, *N*=4 651	
Age group	
Young	1 631 (35.1)
Middle aged	2 258 (48.5)
Elderly	762 (16.4)
Gender	
Male	3 129 (67.3)
Female	1 522 (32.7)
Front-seat passengers, *N*=1 572	
Adults	1 361 (86.6)
Children	211 (13.4)
Rear-seat passengers, *N*=625	
Adults	327 (52.3)
Children	298 (47.7)

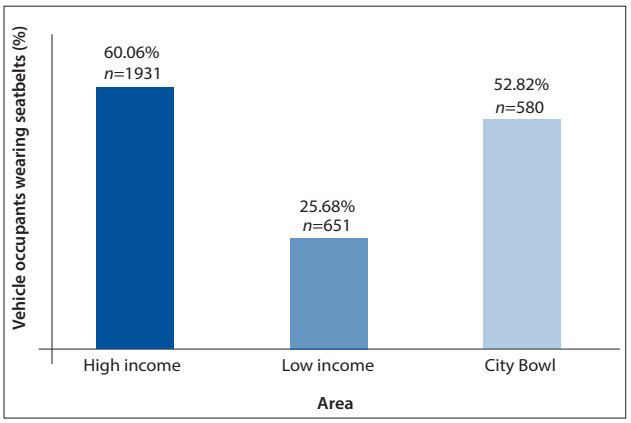

Fig. 2. Vehicle occupants wearing seatbelts in different socio-economic areas in the Cape Town Metropole (the City Bowl represents a mixture of vehicles from high- and low-income areas).

Discussion

This study demonstrates a decline in seatbelt use compared with previous SA studies. Olukoga and Noah documented use of 81% by drivers, 50% by front-seat passengers and 8% by rear-seat passengers.[9] Their data were obtained during countrywide road blocks when occupants might have been prompted to 'buckle up' when approaching the roadblock, therefore overestimating the seatbelt compliance rate.[9] The Automobile Association of South Africa subsequently recorded lower seatbelt wearing rates in drivers (64%) and front-seat passengers (41%), but significantly higher rates in rear-seated passengers (24%).[10] This study, although smaller, used a similar surveillance methodology to our study and the results should therefore be comparable.

Seatbelt wearing rates are mainly dependent on mandatory seatbelt laws and the enforcement of such legislation.[1] The South African National Road Traffic Act stipulates mandatory seatbelt use for both front- and rear-seat vehicle occupants.[16] Enforcement of this legislation must improve – SA has rated its own seatbelt law enforcement as only 2 out of 10 (only 25% of all countries rate their seatbelt enforcement as 'good', i.e. 8 or above).[1]

Most people view traffic injuries or deaths as inherently democratic (i.e. equal risk and equal effect), but this research clearly shows that residents of lower-income areas are less likely to wear seatbelts and are at higher risk of being killed or seriously injured. This relationship between social inequality and injury risk is a well-described phenomenon, locally and internationally.[1,12-13,17-18] Seatbelt use has been shown to be related to level of education, socioeconomic insecurity and subjective poverty, with income level being the strongest predictor of mortality and morbidity, particularly in men and younger persons.[17,19]

The financial burden of road traffic deaths and injuries is substantial. It includes direct (arising out of medical treatment) and indirect costs (arising from loss of productivity and income), and affects the victim(s) and their dependants as well as impacting on the region or country. In the City of Cape Town during 2005, a total of 660 persons were killed in road traffic collisions (almost 2 a day), while 16 317 were injured (almost 45 a day), resulting in an approximate annual cost of R2.7 billion.[20] Globally, road traffic collisions cost countries up to 3% of their gross national product.[1]

The majority of persons in lower-income areas in the Cape Town Metropole earn less than R2 500 per month, making it unlikely that they would be able to afford life or medical insurance;[21] in the event of death or serious injury, household members are potentially left without income.

The reasons for the socioeconomic risk differentiation is poorly understood, but it is clear that specific interventions need to be developed to target lower-income communities directly.[22] This is not to suggest that proven strategies in high-income areas should be disregarded; they may continue to be applied with success while taking area-specific factors (e.g. sustainability and specific barriers) into account.[23-24]

The Socorro Seatbelt Programme serves as an example of how a change in the perceived norms in a community (i.e. making non-use of seatbelts less socially acceptable) can increase seatbelt use.[25] The programme consisted of didactic teaching sessions, role-model stories, seatbelt newsletters and a family slogan and poster contest, all with the support of the local church.[25] Education programmes to change high-risk road behaviour are known to be beneficial, but are not always affordable.[26] Furthermore, lower-income populations are more likely to drive older vehicles, many of which may not have rear seatbelts, the installation of which is costly.

Age-appropriate child restraints (child seats, booster cushions, etc.) are currently not required by SA law.[16] They are also not supplied by vehicle manufacturers and the cost of installing them is for the vehicle owner's own account. Elsewhere, free distribution of age-appropriate child restraints combined with education regarding their use has proved to be beneficial.[26] Similarly, incentives (e.g. discount coupons or gift certificates) combined with education have improved uptake of the use of restraining devices.[26]

One very interesting conclusion from our study is that passengers are far more likely to be restrained (11 times more likely in this study) if the driver is wearing a seatbelt, a tendency that is well documented locally and internationally.[12,27] Not only does seatbelt use by drivers need to be enforced, but drivers should also be held responsible for their passengers. The SA Road Traffic Act stipulates that 'The driver of a motor vehicle shall ensure that all persons travelling in such motor vehicle shall wear a seatbelt … '.[16] There needs to be a stronger focus on primary seatbelt enforcement (traffic authorities allowed to stop vehicles in which occupants are unrestrained) rather than secondary seatbelt enforcement (traffic authorities fining unrestrained occupants only if the vehicle is stopped for other reasons such as speeding).[28]

Study limitations

The main limitations of the study are, firstly, the possibility of inaccurate estimation of the occupants' age; however, we do not believe that this affects the conclusions. Secondly, the specific areas, the high-volume crossings in those areas and the four time periods were not selected randomly. Nevertheless, the chosen areas and crossings are considered representative of the different socioeconomic classes in the City of Cape Town. Thirdly, the non-inclusion of nights could potentially have skewed results towards overestimation of the percentage of seatbelt use, as driving behaviour at night tends to differ from that during the day. Lastly, the study reflects only the use of restraining devices and cannot comment on the functionality of the devices used.

Conclusion

The impact of traffic injuries is significant, but can be decreased by use of seatbelts and appropriate child restraining devices. Seatbelt use in SA, although compulsory, is neither strictly adhered to nor enforced. Their use is proportionately lower in lower-income areas, suggesting that specific interventions are required to target these communities directly.

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