



Injury-related behaviour among South African high-school students at six sites

Alan J Flisher, Catherine L Ward, Holan Liang, Handsome Onya, Nomfundo Mlisa, Susan Terblanche, Arvin Bhana, Charles D H Parry, Carl J Lombard

Objectives. To document and compare prevalence rates of adolescent injury-related risk behaviours at six sites in South Africa.

Design. The identical self-administered instrument was used at all sites. Prevalence rates (with 95% confidence intervals) were calculated taking the multistage cluster sampling strategy into account.

Setting and subjects. In Cape Town, Durban, Port Elizabeth and Mankweng participants were drawn from either grades 8 or 9, and grade 11, while in Queenstown and Umtata they were drawn from grade 11 only. We selected 39 schools in Cape Town and Durban, 33 in Port Elizabeth and 20 in each of the rural areas.

Outcome measures. Road-related risk behaviour, violence, and suicide attempts.

Results. Across the sites there were high rates of risk behaviour in all domains. For example, in the 12 months preceding the survey an estimated 52.8% of grade 11 males in Cape Town had travelled in the front seat of a motor vehicle without a seatbelt, 33.0% of grade 8 males in Mankweng had bullied others, while 44.5% of the same group had been bullied, and 18.6% of females in Port Elizabeth had attempted suicide. Rates were lower in rural areas for behaviour involving motor vehicles, but there were no consistent urban-rural findings for violence-related behaviour. Females were at higher risk of suicidal behaviour and males were at higher risk of other injury-related behaviour.

Conclusions. There is a need for effective interventions to reduce the extent of injury-related risk behaviour in adolescents in urban and rural settings.

S Afr Med J 2006; 96: 825-830.

Injuries are among the leading causes of death and contribute substantially to the global burden of disease, particularly in the developing world.¹ In South Africa homicide and traffic

Department of Psychiatry and Mental Health and Adolescent Health Research Institute, University of Cape Town

Alan J Flisher, MSc (Clinical Psychology), MMed (Psychiatry), MPhil (Child and Adolescent Psychiatry), PhD, FCPsych (SA), DCH

Holan Liang, MA, MRCPsych

Department of Psychiatry and Mental Health and Adolescent Health Research Institute, University of Cape Town, and Child, Youth and Family Development Research Programme, Human Sciences Research Council, Cape Town

Catherine L Ward, PhD

Health Promotion Unit, University of Limpopo, Polokwane, Limpopo

Handsome Onya, MPH

Student Counselling Centre, University of Fort Hare, Alice, E Cape

Nomfundo Mlisa, MA (Clinical Psychology)

Department of Social Work, University of the Western Cape, and Department of Social Work, University of Port Elizabeth, E Cape

Susan Terblanche, PhD

Child, Youth and Family Development Research Programme, Human Sciences Research Council, and Department of Psychology, University of KwaZulu-Natal, Durban

Arvin Bhana, PhD

Alcohol and Drug Abuse Research Unit, Medical Research Council, and Department of Psychology, Stellenbosch University, W Cape

Charles D H Parry, MA (Clinical Psychology), MSc, PhD

Biostatistics Unit, Medical Research Council, Cape Town

Carl J Lombard, PhD

Corresponding author: A J Flisher (alan@rmh.uct.ac.za)

accidents are among the leading four causes of mortality, and contribute even more to the burden of disease.² Adolescents, in particular, contribute significantly to this injury burden, as shown for example by a study in Pennsylvania in 1993 where juvenile violent crime accounted for 46.6% of total victim costs from all violent crime.³ In South Africa, a study on injuries on farms⁴ showed that 46.6% of injuries were not work-related, and of those, nearly one-third were sustained by children and youth under the age of 20.

However, injury data illuminate only a small part of the picture. Injury-related risk behaviours increase the probability of injury and should be the target of preventive efforts. Such risk behaviours include road-use behaviour (such as failure to use a seatbelt or motorcycle helmet, and travelling with an intoxicated driver), carrying a weapon, bullying and suicidal behaviour. Despite the extent of injuries among South African adolescents, relatively little research on risk behaviour is available.

A previous study⁵ among Cape Town high-school learners showed trends similar to those found internationally. However, the data were collected in 1990, and were restricted to adolescents living in Cape Town. It is important to assess risk behaviours regularly in order to determine where prevention efforts are succeeding or failing. A more recent youth risk-behaviour survey⁶ has provided national and provincial data on prevalence rates. While such data are essential, this aggregation makes it difficult to compare specific cities or regions and study urban-rural differences. Examining specific cities or regions provides greater contextual understanding in terms of specific prevention opportunities and needs.



This article reports on injury-related risk behaviours from three urban settings (Cape Town, Durban and Port Elizabeth) and three rural settings (Mankweng in Limpopo Province and Queenstown and Umtata in the Eastern Cape). Specifically, we aimed to document rates of involvement in selected risk behaviours in each setting, stratified by grade and gender, and to compare prevalence rates across gender, grade and setting.

Methods

Separate surveys were conducted at six sites using multistage sampling strategies. Survey data were gathered using the identical instrument. Participants and procedures for each study are described below.

Participants

In Cape Town, Durban and Port Elizabeth a multistage stratified random sampling strategy was used to select schools, while in the three rural areas no stratification was used as the schools were relatively homogeneous in terms of student demographic characteristics. We stratified Cape Town and Durban schools by postal code groupings, as areas with the same postal code tend to be relatively homogeneous with regard to socio-economic status and racial composition. In Port Elizabeth, we stratified the schools by their historical racial classification into four strata: historically white schools, historically coloured schools, historically black schools, and 'other'. In the three urban areas we selected a number of schools from each stratum such that the number of schools was proportional to the number of students within that stratum. Within each stratum (for the urban schools) and for all the schools (in the three rural areas), we selected the required number of schools such that the probability of selection was directly proportional to the size of the school. We selected 39 schools in Cape Town and Durban, 33 in Port Elizabeth and 20 in each of the rural areas.

Within each school we then randomly selected two grade 11 classes, and from their combined class lists we randomly selected 40 students. In Cape Town, Durban and Mankweng we followed the same procedure with grade 8, and in Port Elizabeth with grade 9 learners.

Measure

The instrument comprised a self-administered adolescent risk-behaviour questionnaire, as used in the previous risk-behaviour study.⁵ Questions were on demographics, transport-related behaviour (such as failure to use a seatbelt, travelling in a car with an intoxicated driver and failure to use a motorcycle helmet), carrying a weapon, and suicidal behaviour. Two questions on bullying were added for this study, viz.: 'During the past 12 months have you bullied anybody at school?' and 'During the past 12 months, have you ever been bullied at school?'. Time scales for all behavioural questions referred to the past 12 months, except in the case of weapon carriage where the time scale was the past 4 weeks. Questions required only a 'yes' or 'no' response.

The questionnaire was translated from English into Afrikaans, Xhosa, Zulu and Sepedi, and then checked by back-translation. There is evidence of satisfactory test-retest reliability in English and Xhosa.^{7,8} Within the questionnaire, students were asked whether they had ever used a fictitious substance ('Derbisol'). Those who responded positively to this question were excluded from the study.

Procedure

The studies were approved by the relevant research ethics committees at the participating universities and permission to conduct the study was obtained from the relevant education departments and the principals of the selected schools.

We administered the questionnaires in the classroom, and no members of the school staff were present during administration of the questionnaires. Participants were assured that their responses would be anonymous and confidential, and they were seated so that they could not see the responses of their classmates.

Analysis

We obtained prevalence estimates with 95% confidence intervals (CIs), stratified by site, grade and gender. Weighted data analyses were carried out to take account of the multistage sampling strategy, using Stata 8's suite of survey commands.⁹ For all sites 'school' was specified as the cluster, and in the three cities the additional stratification was also specified. Sampling weights were computed using the number of learners in the school, the number of learners in the grade (of a specific school) and the number of learners sampled from the grade. All prevalence rates were calculated as proportions of the whole population. For questions contingent on having ever ridden or driven a motor vehicle or motorcycle, prevalence rates were calculated as ratios of the number of students who participated in the risk behaviour (e.g. had ridden a motorcycle and had failed to use a helmet) to the population as a whole (e.g. those who had either not ridden a motorcycle, or who had worn a helmet while riding a motorcycle).

We compared the results between sites for each gender (within each grade) and for each grade (within each gender). In comparing two groups, if the 95% CIs did not overlap, this was considered a significant ($p < 0.05$) difference between the groups.¹⁰ If the CIs overlapped but not to the extent that the point estimate of one group was contained within the CI of the other group, this was considered an indication of a marginally significant difference between the groups.¹⁰ If they overlapped to the extent that the point estimate of one group was contained within the CI of the other group, we could not draw any conclusions.¹⁰

Results

The number of learners in each stratum and their ages are given in Table I. The proportion of males varied between 42.6% and 49.1%. The prevalence rates and 95% CIs of selected risk behaviours, stratified by site, grade and gender, are



presented in Table II. There were high rates of risk behaviour in all domains. For example, with regard to the road-related behaviour of grade 11 males in Cape Town, 52.8% had travelled in the front seat of a motor vehicle without a seatbelt, 27.0% had travelled as a passenger in a car with an intoxicated driver, and 18.9% had failed to use a motorcycle helmet. With regard to violence-related behaviour, 13.9% of grade 11 males in Queenstown had carried a knife to be used as a weapon, and 33.0% of grade 8 males in Mankweng had bullied others, while 44.5% of the same group had been bullied. As far as suicide attempts were concerned, 18.6% of females in Port Elizabeth reported having made a suicide attempt.

There was a tendency for rates of injury-related risk behaviour to be lower in the rural than the urban sites. For the items involving motor vehicles, the rates of risk behaviour tended to be lower in the rural settings. For seatbelt non-use, the rates were significantly lower for each of the rural settings compared with each of the urban settings, except for seatbelt non-use among grade 8/9 learners. In this group the rates for the only rural setting for which data were available (Mankweng) did not differ significantly from the rates for females in any of the urban settings and from the rates for Port Elizabeth males (although the letter was marginally significant). With regard to travelling as a passenger in a car with an intoxicated driver, the rates among grade 8 and 9 learners in Mankweng (the only rural site for which data were available) were significantly or marginally significantly lower than for each of the urban sites. For grade 11 Mankweng and Queenstown learners, the rates for travelling as a passenger in a car with an intoxicated driver were significantly or marginally significantly lower than for each of the urban sites. The rates for Umtata males and females did not differ from those of either of the urban sites. Queenstown grade 11 males were significantly or marginally

significantly less likely to report helmet non-use than those in any other setting. Except for grade 11 females, Mankweng learners were significantly or marginally significantly less likely to carry a knife to school to be used as a weapon than those in other settings. Port Elizabeth grade 11 males were significantly or marginally significantly less likely to carry a knife to school to be used as a weapon than their counterparts from any other setting, except Mankweng. Rates of knife carrying among grade 11 males in both Umtata and Queenstown did not differ from rates in Cape Town and Durban. There were no consistent inter-site differences for either of the bullying items, except that the rates for Queenstown grade 11 students for bullying others were significantly or marginally significantly lower than for all other settings (except for Durban females). With regard to suicide attempts, rates were significantly or marginally significantly higher for Port Elizabeth grade 9 male and female learners than for their counterparts in other settings.

Except for suicide, males were more likely to be involved in violence-related behaviour than females. There were only 4 subgroups for which this was not the case, and in none of these instances was the difference significant or marginally significant. Conversely, in the subgroups where males were more likely to be involved, the difference was significant or marginally significant in the majority of cases. Females were more likely than males to attempt suicide in all subgroups, with the difference being significant or marginally significant in 4 cases.

The findings regarding grade differences were not consistent between behaviours. With regard to seatbelt non-use and being a passenger in a car with an intoxicated driver, rates were higher for the grade 11 learners than for the grade 8 learners, except for male and female learners from Mankweng for seatbelt non-use. Of the 14 comparisons, 9 were significant or

Table I. Demographic description of sample

		Grade 8 (Cape Town, Durban, Mankweng)		Grade 11	
		Males	Females	Males	Females
Number	Cape Town	625	812	581	868
	Durban	528	684	497	690
	Port Elizabeth	517	634	454	660
	Umtata	-	-	325	473
	Queenstown	-	-	336	450
	Mankweng	370	393	370	402
Age (yrs) (mean, 95% CI)	Cape Town	14.3 (14.0 - 14.6)	14.0 (13.8 - 14.2)	17.5 (17.0 - 18.0)	17.3 (16.9 - 17.8)
	Durban	14.5 (14.1 - 14.8)	14.2 (13.8 - 14.5)	17.5 (17.1 - 18.0)	17.3 (17.0 - 17.7)
	Port Elizabeth	15.9 (15.5 - 16.3)	15.4 (15.2 - 15.7)	17.7 (17.4 - 18.1)	17.5 (17.2 - 17.8)
	Umtata	-	-	19.4 (19.0 - 19.9)	18.8 (18.3 - 19.3)
	Queenstown	-	-	19.7 (19.4 - 20.1)	19.6 (19.0 - 20.2)
	Mankweng	14.8 (14.4 - 15.2)	14.2 (13.8 - 14.5)	18.5 (18.0 - 19.1)	17.7 (17.0 - 18.4)



marginally significant. There were no consistent findings with regard to motorcycle helmet non-use and knife carrying, with no significant or marginally significant findings for either of these domains. With regard to both perpetration and being a victim of bullying, rates were higher in grade 8 than grade 11, even though only 4 of the comparisons were significant or

marginally significant. In the case of suicide attempts there were no consistent grade differences.

Discussion

This study provides prevalence rates for several injury-related risk behaviours among high-school learners from six diverse

Table II. Risk behaviours – prevalence (95% CI) as percentage of the population*

		Grade 8 (Cape Town, Durban, Mankweng), Grade 9 (Port Elizabeth)		Grade 11	
		Males	Females	Males	Females
Front passenger, no seatbelt	Cape Town	37.3 (31.6 - 43.1)	28.1 (22.3 - 33.9)	52.8 (46.8 - 58.8)	40.5 (35.2 - 45.8)
	Durban	37.6 (31.7 - 43.4)	33.3 (27.3 - 39.3)	40.4 (32.0 - 48.7)	36.3 (29.4 - 43.1)
	Port Elizabeth	29.1 (22.4 - 35.8)	25.8 (21.4 - 30.3)	42.1 (35.4 - 48.7)	28.5 (23.5 - 33.6)
	Umtata	-	-	23.6 (15.5 - 31.7)	15.7 (9.8 - 21.7)
	Queenstown	-	-	19.1 (14.1 - 24.0)	16.6 (12.0 - 21.1)
	Mankweng	20.6 (13.5 - 27.8)	24.7 (14.7 - 34.7)	17.1 (12.6 - 21.6)	13.6 (8.2 - 18.9)
Passenger in car with intoxicated driver	Cape Town	8.6 (5.5 - 11.8)	8.5 (5.2 - 11.8)	27.0 (22.1 - 31.9)	23.7 (18.9 - 28.4)
	Durban	10.9 (7.1 - 14.6)	9.6 (5.4 - 13.8)	25.6 (17.6 - 33.5)	16.4 (10.8 - 21.9)
	Port Elizabeth	18.0 (13.4 - 22.6)	15.4 (11.9 - 19.0)	25.1 (19.4 - 30.9)	20.1 (15.6 - 24.5)
	Umtata	-	-	26.7 (19.9 - 33.5)	18.8 (15.1 - 22.4)
	Queenstown	-	-	16.1 (10.1 - 22.1)	10.6 (6.1 - 15.1)
	Mankweng	4.3 (1.3 - 7.3)	5.0 (2.1 - 8.0)	5.8 (3.1 - 8.6)	5.5 (2.3 - 8.6)
Non-use of motorcycle helmet†	Cape Town	16.2 (13.4 - 19.0)	11.2 (8.2 - 14.1)	18.9 (13.6 - 24.1)	9.8 (7.6 - 12.1)
	Durban	14.3 (10.6 - 18.0)	4.0 (2.0 - 6.0)	11.3 (5.9 - 16.6)	4.9 (1.5 - 8.2)
	Port Elizabeth	16.1 (10.1 - 22.1)	10.5 (7.2 - 13.8)	15.7 (11.6 - 19.8)	6.6 (3.8 - 9.4)
	Umtata	-	-	15.8 (11.2 - 20.4)	8.3 (5.2 - 11.4)
	Queenstown	-	-	5.2 (2.3 - 8.0)	7.6 (3.8 - 11.3)
	Mankweng	-	-	-	-
Carried a knife to school to be used as a weapon (past 4 weeks)	Cape Town	10.3 (7.7 - 13.0)	1.6 (0.5 - 2.7)	11.2 (8.3 - 14.1)	1.3 (0.6 - 2.1)
	Durban	8.2 (5.2 - 11.2)	1.9 (0.5 - 3.2)	12.6 (7.6 - 17.5)	2.1 (0.5 - 3.7)
	Port Elizabeth	5.9 (3.5 - 8.3)	2.5 (0.3 - 4.7)	5.5 (3.6 - 7.5)	0.8 (0.2 - 1.4)
	Umtata	-	-	12.3 (7.3 - 17.2)	1.6 (0.6 - 2.6)
	Queenstown	-	-	13.9 (10.6 - 17.0)	0.6 (0.0 - 1.5)
	Mankweng	2.9 (0.7 - 5.1)	0.2 (0.0 - 0.9)	3.0 (1.0 - 5.1)	0.3 (0.0 - 0.8)
Bullied others	Cape Town	27.7 (22.7 - 32.7)	16.4 (13.5 - 19.3)	22.9 (18.1 - 27.7)	14.5 (11.0 - 17.9)
	Durban	17.8 (13.1 - 22.4)	13.8 (8.9 - 18.7)	21.0 (15.4 - 26.7)	9.5 (5.6 - 13.3)
	Port Elizabeth	20.1 (15.0 - 25.3)	10.7 (7.3 - 14.0)	18.8 (14.4 - 23.3)	9.7 (7.0 - 12.4)
	Umtata	-	-	12.9 (8.2 - 17.7)	12.2 (8.5 - 16.0)
	Queenstown	-	-	7.7 (4.2 - 11.1)	6.4 (3.8 - 9.0)
	Mankweng	33.0 (20.0 - 46.0)	16.1 (11.4 - 20.8)	23.1 (16.5 - 29.7)	10.5 (7.0 - 13.9)
Been bullied	Cape Town	42.2 (36.1 - 48.3)	31.5 (26.6 - 36.5)	27.2 (22.4 - 32.0)	27.3 (23.0 - 31.6)
	Durban	35.6 (30.1 - 41.3)	24.9 (19.1 - 30.7)	19.4 (14.1 - 24.7)	14.7 (10.4 - 19.1)
	Port Elizabeth	24.3 (18.1 - 30.4)	18.8 (14.5 - 23.2)	18.7 (11.3 - 26.2)	14.6 (11.9 - 17.4)
	Umtata	-	-	22.0 (16.4 - 27.6)	19.3 (15.2 - 23.4)
	Queenstown	-	-	22.3 (18.6 - 26.0)	23.7 (19.1 - 28.3)
	Mankweng	44.5 (33.9 - 55.1)	30.8 (22.5 - 39.0)	43.2 (33.6 - 52.8)	25.1 (20.3 - 30.0)
Actually trying to commit suicide†	Cape Town	5.6 (3.1 - 8.2)	13.2 (9.5 - 17.0)	6.5 (3.9 - 9.1)	14.0 (11.2 - 16.8)
	Durban	5.4 (3.0 - 7.8)	6.9 (4.7 - 9.1)	4.2 (1.7 - 6.7)	10.4 (7.7 - 13.2)
	Port Elizabeth	8.7 (6.2 - 11.1)	18.6 (15.1 - 22.1)	10.5 (4.8 - 16.2)	11.9 (8.4 - 15.4)
	Umtata	-	-	11.6 (5.2 - 17.9)	12.6 (7.7 - 17.4)
	Queenstown	-	-	2.0 (0.4 - 3.5)	4.2 (2.0 - 6.3)
	Mankweng	-	-	-	-

*The time frame for all items was 1 year, except for the item involving knife-carrying (for which it was 4 weeks).
†Question not asked at the Mankweng site.



settings (including three urban and three rural settings), which allowed for inter-site comparisons. At each site an identical questionnaire was administered to a large sample of learners, selected using similar or identical multistage cluster approaches. The statistical approach was appropriate for the multistage cluster samples.

High rates of adolescent injury-related behaviour occurred in both urban and rural settings in South Africa, in both genders, and all the grades studied. Although comparison with international studies is hampered by differing methodologies, study populations and definitions of risk behaviour, it would appear that there are no consistent and marked deviations from the findings obtained in previous studies (conducted in developed countries).¹¹ There was a tendency for rates to be lower in rural areas (especially Queenstown and Mankweng) than urban areas for items involving cars or motorcycles. This probably reflects reduced access to these modes of transport. However, as development takes place and these areas become characterised by more features of urban living, one can expect these rates to increase. While it is clear that interventions are urgently needed in urban settings, it is equally important to ensure that there is recognition of the dangers of increasing development (for example increased involvement in motor vehicle collisions) and the importance of preventive interventions. These interventions should include health education and health promotion, and law enforcement to prevent motor vehicles without seat belts from being allowed on the road and to apprehend people who engage in the risk behaviours that were addressed in this study.

Rates of knife carrying were relatively low in Mankweng but not the two Eastern Cape sites, and there were no consistent differences in the rates of involvement in bullying, either as perpetrator or victim. This is consistent with the international literature, which suggests that the rates in rural areas are the same as or higher than in urban areas.^{12,13} Suicide rates were lower for Mankweng and Queenstown than for the other sites. It is possible that a greater degree of social cohesion and reduced access to means of suicide (such as high buildings, weapons and poisons) in these rural sites serve as protective factors. There was a particularly high rate of suicidal behaviour among Port Elizabeth grade 9 females (18.6%). Further research is necessary to determine whether these findings can be replicated. If this is the case, it will be necessary to unearth the reasons for these phenomena with a view to implementing preventive strategies.

The finding that females are at higher risk of suicidal behaviour and males are at higher risk of other injury-related behaviour is consistent with previous local and international findings.^{5,6,14} The higher rates of suicidal behaviour among females has been ascribed to their being more reflective and less likely to direct their aggression outwardly than males.⁵ The higher rates of other injury-related behaviour among males has

been attributed to biological determinants, a greater propensity for risk taking in general, and a tendency to act out violent attitudes owing to processes of socialisation.⁵ In South Africa such socialisation processes are particularly pertinent since rigid definitions of maleness exist which convey stereotyped images of power and dominance.⁵

Two grade-related findings merit comment. First, seatbelt non-use and being a passenger in a car with an intoxicated driver were more common among the grade 11 students. This could be because learners in higher grades have increased access to motor vehicles. Second, involvement in bullying, as perpetrator or victim, was more common in grade 8 than grade 11. It is possible that a certain proportion of bullying is a developmental phenomenon in that it is yoked to younger adolescence (or younger age groups), or that those involved in bullying are more likely to drop out of school. Again, further research is required to elucidate this issue.

This study has some limitations. First, it was based on self-report data; as such the reported rates may be lower than the actual rates as adolescents may have been reluctant to report their engagement in illegal or dangerous activities. However, in conducting the study a great deal of care was taken to assure participants of confidentiality and anonymity. Second, the study was limited to adolescents who were attending school on the day of the survey. This could be a systematic bias as those who had dropped out of school or who were absent on the day might also be at higher risk of engaging in risk behaviour.¹⁵ Third, the questionnaire was administered in one of five languages (Afrikaans, English, Pedi, Xhosa and Zulu). It is possible that the original English meaning of a question may not have been achieved precisely in one or more translated versions. However, considerable care was taken in the translation process as outlined above.

The main implication of the above findings is that intervention measures are needed to reduce the extent of injury-related risk behaviour in both urban and rural settings, and hence the burden of morbidity and mortality attributable to injury. Some such interventions are generic in that they are applicable to all the behaviours reported, such as increasing the amount and quality of information that is available to adolescents engaging in the risk behaviours. Another example of a generic intervention is the use of student opinion leaders to change social norms in a direction that is less conducive to risk behaviours, for example through reducing the extent to which bullying is tacitly condoned. Other interventions are targeted in that they are pertinent for a subset of behaviours only. These include more consistent legal enforcement of road-related behaviour such as failure to use seatbelts, and the identification of adolescents at risk for suicide. In addition to the prevention of injury-related behaviour, medical practitioners and other health care providers need to be aware that many of their adolescent patients are engaging in such



risk behaviours. Such awareness will result in higher detection rates, and hence a higher probability that their patients will receive the optimal medical and psychological interventions for the sequelae of involvement in such risk behaviours.

This study was funded by the United Nations Development Programme, the Medical Faculty Research Committee of the University of Cape Town, the Mental Health and Substance Abuse Directorate of the Department of National Health (through the Medical Research Council of South Africa's South African Community Epidemiology Network - Drug Use (SACENDU) project), the National Research Foundation (South Africa), and the World Health Organization Programme on Substance Abuse. The authors appreciate the co-operation of the provincial education departments, principals and other educators and learners, the fieldworkers at the six sites, Greg Distiller who assisted with the data analysis, and Rinette Dickinson who assisted with data cleaning.

1. Mock C, Quansah R, Krishnan R, Arreola-Risa C, Rivara F. Strengthening the prevention and care of injuries worldwide. *Lancet* 2004; **363**: 2172-2179.
2. Bradshaw D, Groenewald P, Laubscher R, et al. Initial burden of disease estimates for South Africa, 2000. *S Afr Med J* 2004; **93**: 682-688.
3. Miller TR, Fisher DA, Cohen MA. Costs of juvenile violence: policy implications. *Pediatrics* 2001; **107**: E3.
4. Marais S. Injuries on farms - the role of the community based health care worker in documenting data. *Injury and Safety Monitor* 2004; **3**: 2-5.
5. Flisher AJ, Ziervogel CF, Charlton DO, Leger PH, Robertson BA. Risk-taking behaviour of Cape Peninsula high-school students: Parts II, VI and VII. *S Afr Med J* 1993; **83**: 474-476 and 486-494.
6. Reddy SP, Pandey S, Swart D, et al. *Umthenthe Uhlaba Usamila - The South African Youth Risk Behaviour Survey 2002*. Cape Town: South African Medical Research Council, 2003.
7. Flisher AJ, Evans J, Muller M, Lombard C. Test-retest reliability of self-reported adolescent risk behaviour. *J Adolesc* 2004; **27**: 207-212.
8. Flisher AJ, Kaaya S, Butau T, et al. Test-retest reliability of adolescent risk behaviour in three African cities. *African Journal of Drug and Alcohol Studies* (in press).
9. Lemeshow S, Cook ED. Practical considerations in the analysis of complex sample survey data. *Rev Epidemiol Sante Publique* 1999; **47**: 479-487.
10. Washington State Department of Health. *Guidelines for Using Confidence Intervals for Public Health Assessment*. Olympia, Wash: Washington State Department of Health, 2002.
11. Smith-Khuri E, Iachan R, Scheidt PC, et al. A cross-national study of violence-related behaviors in adolescents. *Arch Pediatr Adolesc Med* 2004; **158**: 539-544.
12. Atav S, Spencer GA. Health risk behaviours among adolescents attending rural, suburban, and urban schools: A comparative study. *Family and Community Health* 2002; **25**: 53-64.
13. Fahs PSS, Smith BE, Atav AS, et al. Integrative research review of risk behaviours among adolescents in rural, suburban and urban areas. *J Adolesc Health* 1999; **24**: 230-243.
14. Grunbaum JA, Kann L, Kinchen SA, Williams B, Ross JG, Lowry R. Youth risk behaviours among adolescents in rural, suburban and urban areas. *J Adolesc Health* 1999; **24**: 230-243.
15. Flisher AJ, Chalton DO. High-school dropouts in a working-class South African community: selected characteristics and risk-taking behaviour. *J Adolesc* 1995; **18**: 105-121.

Accepted 6 March 2006.