Secular trends in risk behaviour of Cape Town grade 8 students

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Objective. To compare prevalence rates of selected risk behaviours and age of first intercourse of grade 8 students in Cape Town between 1997 and 2004.

Design. Cross-sectional surveys in 1997 and 2004. Survival analysis was used to estimate the cumulative incidence of first intercourse. The log-rank statistic was used to compare the survival distributions. When comparing data from the two studies we used a logistic regression model with the factors year, race and age group to test the difference in reported risk behaviours between 1997 and 2004 within each gender.

Setting. Public high schools in Cape Town.

Subjects. Multistage cluster samples of 1 437 and 6 266 grade 8 students in 1997 and 2004 respectively.

Outcome measures. Ever having had sexual intercourse; for those that had, whether any method was used to prevent pregnancy

or disease at last intercourse, and (if so) what was used; use of tobacco, alcohol and marijuana; violence-related behaviours; and suicidal behaviour.

Results. There was a significant delay in first intercourse in 2004 compared with 1997. For males, levels of condom use were lower in 2004 than in 1997, while for females levels of injectable contraceptive use were lower. There were significant increases in past month use of cigarettes for males and marijuana for both genders. Rates of perpetration of violence behaviour remained stable or decreased from 1997 to 2004, while the rate of suicidal behaviour for males increased.

Conclusions. School-based interventions that address sexual risk behaviours should be expanded to include other risk behaviours.

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Risk behaviour can be defined as behaviour that increases one's risk of adverse outcomes in the short or long term, in the psychological, social or physical domains. Several national studies have documented prevalence rates of risk behaviours among South African adolescents, including national household surveys conducted by the Human Sciences Research Council in 2002[1] and 2005,[2] a national household survey of 15 - 24-year olds,[3] and a national survey of risk behaviour among youth in grades 8 - 11 in public high schools.[4] The present report compares risk behaviour of grade 8 students in Cape Town across two time points, 1997 and 2004. This time period is important, as one would expect the consequences of South Africa's transition to a democratic dispensation to become evident in these years. It also coincides with a period

of rapid advance of the HIV epidemic, with a corresponding increase in the extent of AIDS prevention activities. Against this background, it is crucial to know whether these profound social changes were accompanied by changes in levels of risk behaviour of high-school students.

Methods

The data reported in this paper were derived from two studies, conducted in 1997 and 2004. While selected prevalence rates from the 1997 study have been reported previously,[5-7] the prevalence rates from the 2004 study are reported for the first time in this paper.

Populations and samples

In both 1997 and 2004, the study population was grade 8 students attending public schools in Cape Town.

In 1997, we stratified the schools by postal code groupings since these groupings are relatively homogeneous in terms of factors such as social class, racially defined social group, language and culture. We selected 39 schools such that the proportion of schools in a selected stratum was directly proportional to the number of students in that stratum. The selection probability of a school was proportional to the number of students in that school. We selected 40 students from the combined class lists of two randomly selected grade 8 classes.

The 2004 sample consisted of 15 schools randomly selected from the 39 schools selected in 1997 using simple random

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sampling. All grade 8 students were selected to participate in the study. Each of these selected schools was matched to another school on a range of demographic characteristics (student population size, socially defined racial group of students, language of instruction, geographical area in which the school was located and the school fee (as a proxy for socio-economic status)). Fifteen matched pairs were formed as a result of this for use in an intervention study of an AIDS prevention strategy. Two pairs of schools were excluded from the study owing to difficulties in obtaining consent to participate in the intervention study.

Procedure

The selected students completed a questionnaire during a normal school period. The seating was arranged to minimise the risk of students seeing the responses of their classmates. No school staff were present during the administration of the questionnaire.

In 1997 the questionnaire was in paper-and-pencil format. In 2004 it was administered using personal digital assistants (PDAs). We have compared the test-retest reliability of the electronic questionnaires with paper-and-pencil questionnaires, and found that it was similar.[8]

In both years, after obtaining permission from the Western Cape Education Department and the participating schools, we sent a letter to parents at all participating schools to introduce the study. If a parent objected to their child participating in the study, they were asked to convey this by contacting the school or the research team or completing a declination form attached to the letter and returning it to the evaluation co-ordinators. All participating learners signed an assent form agreeing to participate.

Instrument

The instrument used in the 1997 study had been used in previous studies[9,10] and has been subject to extensive pilot studies in small groups and classrooms. In addition, the test-retest reliability of the items has been documented, and found to be at least satisfactory.[11,12] Finally, there is considerable evidence of the validity of the items, since they have been shown to be associated with a large number of relevant constructs.[13]

The items in the 2004 questionnaire addressing violence (including suicidality) were identical to those in the 1997 questionnaire. However, the items addressing sexual behaviour and substance use differed slightly in format, in that in 1997 they had stem questions followed by a set of contingent questions. For example, in 1997 the students were asked 'Have you ever had sexual intercourse? This means intimate contact with someone of the opposite sex during which the penis enters the vagina (female private parts)'. Students answering positively were asked a number of further questions, for example whether they or their partner had used anything to

prevent pregnancy or disease. However, in 2004 all students were required to answer all questions. If a question involved an issue that was not applicable to a particular student, they were given the option of indicating this (for example, a question involving condom use would have an option indicating that the student had not had sexual intercourse). Likewise, in 1997, for the items involving substance use, the students were asked if they had ever used the substance in question, and then asked contingent questions if they had done so. One such contingent question inquired about how many days in the previous month the substance had been used. In 2004, the respondents were asked whether they had used each of a series of substances in the previous month. For the purposes of this report, the 1997 responses were recorded to form a dichotomous variable indicating use in the previous month or not.

Analysis

For purposes of analysis the schools sampled in 2004 as well as those matched were considered to be a random sample from the public schools in 2004 and comparable to the sample drawn in 1997.

The pooled data for 1997 and 2004 were used for the estimation of the prevalence for the various characteristics by gender and year. An indicator variable for the 65 schools was created. We used the Stata programme to calculate proportions and 95% confidence intervals (CIs) by gender and year taking the sampling of schools at the first stage into account. No sampling weights were used since no 'sensible' weights can be calculated for the 2004 sample. For contingent questions, we calculated the prevalence rates for the number of students who had engaged in the activity to the number of students who answered affirmatively to the main question.

For comparing the crude prevalence of the gender and year combinations for a specific characteristic, one can use the reported 95% CIs. If the CIs do not overlap, there is a significant ($p < 0.05$) difference between the groups. If they overlap to the extent that the point estimate of one group is contained within the CI of the other group, the two estimates are not significantly different ($p > 0.05$). If the CIs overlap, but not to the extent that the point estimate of one group is contained within the CI of the other group, no definite conclusion can be made and a formal test has to be performed. For this purpose a formal comparison was done for a specific characteristic between the prevalences for 1997 and 2004 for each gender using a logistic regression model with adjustment for the factors age group and race. The clustering due to the sampling of schools was taken into account as well. The gender-specific analysis was done because gender was an important differentiating factor in the 1997 study.[6]

We used survival analysis to estimate the cumulative incidence over a limited age interval of the event first intercourse by gender and year. This approach enabled us to provide estimates of the age of first intercourse that were

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not biased by the current ages of the study participants. The reported age at first intercourse was used as the time to the event in the survival analysis. Students who had not yet experienced sexual intercourse were censored at their reported current age. The Kaplan-Meier product limit method was used to estimate the incidence curves and the corresponding confidence limits. The log-rank statistic was used to compare the survival distributions.

Results

The details of the samples are presented in Table I, and the results of the survival analysis of age of first intercourse are presented in Table II and Fig. 1. For both males ($\chi^2 = 21.97$, $p < 0.00$) and females ($\chi^2 = 44.93$, $p < 0.00$), there was a significant delay in first intercourse in 2004 compared with 1997. For example, in 2004 12.9% of male students aged 14 years had experienced their sexual debut whereas the equivalent figure in 1997 was 17.4%. The duration of the relative delay was about 1 year. Furthermore, for both years there was a significant delay in first intercourse for females compared with males.

The protection used by students who had experienced intercourse is presented in Table III. For use of any method, females were significantly more likely to use protection than males in 1997. However, in 2004 the converse finding was obtained, with males being more likely to use protection than females. For both males and females, use of protection was significantly less likely in 2004 compared with 1997. In both 1997 and 2004, males were significantly more likely to use condoms than females. Males were significantly less likely to use condoms in 2004 compared with 1997, while for females

Table I. Demographic description of the samples in 1997 and 2004*

	1997 (N = 1437)		2004 (N = 6266)	
	N	%	N	%
Gender				
Males	625	43.5	3 026	48.3
Females	812	56.5	3 240	51.7
SDRG				
Black	399	28.5	2 314	42.0
Coloured	737	52.6	2 214	40.2
Indian	9	0.6	34	0.6
White	256	18.3	908	16.5
Other	0	0.0	37	0.7
Age category				
13 years or less	514	35.2	1 752	20.0
14 years	542	37.1	2 761	44.5
15 years	231	15.8	1 225	19.7
16 years or less	174	11.9	983	15.8

* Column totals for demographic categories are less than the total sample sizes owing to missing values for these categories.
SDRG = self-denoted race group.

Table II. Estimated cumulative incidence of debut sexual intercourse

	Percentage who have had intercourse (95% confidence interval)			
	2004		1997	
Age (years)	Males	Females	Males	Females
10	2.7 (2.1 - 3.4)	0.1 (0.1 - 3.5)	4.8 (3.0 - 6.3)	0.3 (0.1 - 0.9)
11	4.6 (3.8 - 5.4)	0.2 (0.1 - 0.4)	5.7 (4.1 - 7.8)	0.4 (0.1 - 1.2)
12	8.0 (7.1 - 9.2)	0.6 (0.4 - 0.9)	8.1 (6.2 - 10.6)	0.8 (0.3 - 1.7)
13	10.8 (9.6 - 12.1)	1.5 (1.1 - 2.0)	12.8 (10.4 - 15.8)	2.5 (1.6 - 3.9)
14	12.9 (11.7 - 14.3)	2.9 (2.3 - 3.6)	17.4 (14.5 - 20.9)	7.5 (5.6 - 10.0)
15	17.1 (15.4 - 19.0)	6.6 (5.3 - 8.2)	27.9 (23.1 - 33.5)	18.5 (14.2 - 23.9)
16	19.6 (17.4 - 22.0)	14.5 (11.6 - 18.2)	37.3 (30.3 - 45.4)	29.8 (22.3 - 39.0)
17	22.6 (19.5 - 20.4)	19.7 (15.2 - 25.4)	37.3 (30.3 - 45.4)	34.8 (24.1 - 48.5)

Table III. Estimated prevalence (95% confidence interval) for protection used at last intercourse for students who had experienced sexual intercourse

	Males			Females		
	1997 (N = 133) % (CI)	2004 (N = 815) % (CI)	p	1997 (N = 83) % (CI)	2004 (N = 326) % (CI)	Adjusted p*
Any method	50 (40.5 - 59.5)	37.9 (33.9 - 42.1)	0.01	64.6 (53.6 - 74.2)	23.8 (20.1 - 27.9)	0.00
Condom	67.2 (59.4 - 74.1)	44.2 (40.2 - 48.3)	0.00	34.6 (21.8 - 50.0)	35.1 (30.4 - 40.0)	0.96
Oral contraceptive	8.6 (5.0 - 14.5)	11.7 (9.1 - 14.8)	0.17	7.6 (3.7 - 15.0)	7.1 (4.8 - 10.3)	0.79
Injection	9.5 (4.4 - 19.2)	8.0 (6.3 - 10.1)	0.10	53.1 (39.0 - 66.7)	17.7 (12.8 - 24.0)	0.00

*p-value from gender-specific logistic regression model of protection indicator on year adjusted for age group and socially defined racial group.
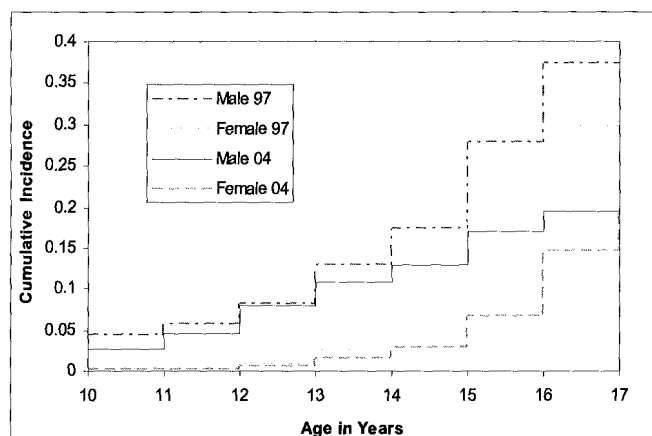
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Fig. 1. Cumulative incidence of debut of sexual intercourse by year and gender.

there were no significant differences in condom use between the two years. Females were significantly more likely than males to use injections in both years. While there was no significant difference in the proportion of males whose partners used injections between the two years, there was a large and significant decline in the proportion of females who used them (from 53.1% to 17.7%). There were no significant differences between the genders or the years in the proportion who used oral contraceptives.

In terms of substance use (Table IV), we observed significant increases for past month use of cigarettes for males and marijuana for both males and females. There were no significant differences for past month use of alcohol. In terms of violence-related behaviours, there were significant increases for carrying a knife to school to be used as a weapon (males and females) and causing serious damage to property (males only). However, there were significant decreases for going out at night beyond the neighbourhood and walking home alone (both genders), stealing (both genders), bullying (females only) and being bullied (both genders). There was a significant and large increase in suicidal behaviour for males (from 7.0% to 20.7%), but no difference for females.

Discussion

We found that there was a significant and substantial delay in first intercourse from 1997 to 2004. There are two possible explanations for this change. First, it could be due to the effects of intervention efforts that were implemented in these years. Second, the effects of the HIV epidemic may have become more evident in these years, as more people display symptoms of HIV infection or die. This could contribute to behaviour change through making it more difficult to deny the existence of the disease or to attribute it to other groups.[14] Whatever the reason for the change, it is encouraging that age of sexual debut among grade 8 students in Cape Town occurred later in 2004 than in 1997, especially given the relatively short period of

time involved. However, these findings are not consistent with the trends inferred from the Human Sciences Research Council household surveys, which concluded that in 2005 young people aged 15 - 24 years were engaging in sexual intercourse at a younger age than in 2003 or 2002.[2]

The findings for use of protection against pregnancy and disease were, however, discouraging. The proportion of both males and females who used any form of protection declined significantly between 1997 and 2004. One possible explanation for this finding is that young people might have been more likely to have sexual encounters in the context of longer and more stable relationships in 2004 compared with 1997. This is relevant for protection use, since young people may be less likely to use protection in such relationships. If further research confirms this explanation, the implication for prevention activities is that the necessity for protection should be emphasised, whether the relationship in which the sexual activity takes place is ongoing or not.

For males, the reduction in the proportion who used contraception between 2004 and 1997 can be attributed to a reduction in the proportion who used condoms, since the proportion whose partners used oral or injectable contraceptives remained stable in this time period. The reduction in the proportion who used condoms implies that increased numbers were at risk both of contracting sexually transmitted infections (including HIV infection) and of impregnating their partners. This finding contradicts data from the Human Sciences Research Council national household surveys which show a substantial increase in reported condom use at last sexual encounter among young men (and young women) aged 15 - 24 years between 2002 and 2005.[2] However, for females the decline in contraception use can be attributed to a large reduction in the proportion who used injectable contraceptives (from 53.1% to 17.7%). There was no change in the proportion who used oral contraceptives, or in the proportion whose partners used condoms. The reduction in the proportion who used injectable contraceptives may be a consequence of personnel at clinics encouraging the use of condoms owing to their beneficial effects on risk of HIV infection, even though the policy is that 'dual protection' (against risk of sexually transmitted infections and pregnancy) should be promoted. Another explanation is that concern about the adverse consequences of injectable contraceptives has resulted in decreased demand by service users and decreased promotion by service providers. Whatever the explanation for the decrease in use of injectable contraception, it is a source of concern that this decrease has placed large numbers of young women at risk for pregnancy.

The rate of recent tobacco use increased for males only, and there were no significant differences for recent alcohol use (although there was a trend ($p = 0.08$) for the rate among females to decrease). There were significant and large increases in the rates of marijuana use for both males (from 3.1% to

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Table IV. Estimated prevalence (95% confidence interval) for non-sexual risk behaviours for all students

	Males			Females		
	1997 (N = 625) % (CI)	2004 (N = 3 026) % (CI)	Adjusted p*	1997 (N = 812) % (CI)	2004 (N = 3 240) % (CI)	Adjusted p*
Smoke a whole cigarette (4 weeks)	23.0 (18.2 - 27.9)	31.5 (28.5 - 34.6)	0.00	21.3 (15.2 - 27.4)	18.2 (14.5 - 21.9)	0.11
Use alcohol (including wine and beer), other than a few sips (4 weeks)	22.0 (17.3 - 26.8)	25.9 (23.1 - 28.7)	0.23	18.0 (13.4 - 22.6)	14.8 (13.0 - 16.7)	0.08
Smoke marijuana (4 weeks)	3.1 (1.7 - 4.5)	17.2 (13.8 - 20.6)	0.00	1.9 (0.9 - 2.9)	5.2 (3.7 - 6.6)	0.01
Carry a knife at school to be used as a weapon (4 weeks)	9.7 (6.9 - 12.5)	18.0 (14.2 - 21.7)	0.01	1.3 (0.4 - 2.1)	4.6 (2.9 - 6.2)	0.00
Go out at night beyond the neighbourhood and walk home alone (4 weeks)	37.7 (33.3 - 42.0)	29.0 (26.5 - 31.3)	0.00	17.1 (13.9 - 20.2)	12.1 (10.2 - 14.0)	0.00
Stealing anything from anybody (12 months)	37.9 (33.3 - 42.5)	32.5 (29.2 - 35.7)	0.04	23.2 (19.4 - 26.9)	15.6 (13.5 - 17.6)	0.00
Cause serious damage to property (12 months)	14.4 (11.5 - 17.2)	22.7 (20.8 - 24.7)	0.00	6.8 (4.6 - 9.0)	7.8 (6.5 - 9.0)	0.75
Bully anybody at school (12 months)	28.4 (23.6 - 33.3)	26.2 (24.4 - 28.1)	0.19	15.7 (12.7 - 18.7)	12.6 (11.0 - 14.3)	0.01
Been bullied at school (12 months)	41.1 (35.8 - 46.4)	31.4 (29.0 - 33.7)	0.00	30.3 (25.6 - 34.9)	15.7 (14.4 - 16.9)	0.00
Been involved in any physical fights (12 months)	36.4 (31.8 - 41.1)	32.8 (30.3 - 35.2)	0.25	16.9 (13.8 - 19.9)	15.9 (14.1 - 17.7)	0.41
Try to put an end to one's life (12 months)	7.0 (4.6 - 9.4)	20.7 (17.3 - 24.1)	0.00	16.9 (13.2 - 20.6)	16.9 (14.6 - 19.2)	0.67

*p-value from gender-specific logistic regression model of non-sexual risk behaviour indicator on year adjusted for age group and socially defined racial group.

17.2%) and females (from 1.9% to 5.2%). Furthermore, the rates in 1997 were almost double those observed in a 1990 study that included grade 8 students.[10] Although the sampling strategies differed in the two studies, both studies aimed to produce samples that were representative of students in Cape Town in the selected grades. There is therefore robust evidence of a secular trend of an increase in marijuana use among grade 8 students in Cape Town from 1990 to 2004. This may be due to more vigorous enforcement of laws that aim to reduce drug use in developed countries such as the USA, or increased access to cannabis because the borders have become more open in recent years. The effects of an increase in marijuana use will be amplified by the current epidemic of crystal methamphetamine ('tik') in Cape Town. Urgent steps are necessary to address use of illicit drugs among young people in Cape Town.

The rates of stealing, exposure to bullying as perpetrator or victim, and involvement in physical fights decreased or remained stable for both males and females in the period under study. However, the proportion who had gone out at night beyond their neighbourhood and walked home alone decreased for both genders. This could reflect an increased sense of vulnerability to interpersonal violence. The increased rate of carrying a knife to school to be used as a weapon could also reflect such increased vulnerability, in that the young people may have carried knives to protect themselves if attacked.

There was a large increase in the proportion of boys who had attempted suicide in the previous year (from 7.0% to 20.7%), while the rate for girls remained stable. When comparing the 1997 data with those from the 1990 study cited above,[10] there

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were no significant changes for either gender. An analysis of nationally registered mortality data showed an increase in the suicide rate for young white males only from 1968 to 1990.[15] However, the increase for males in the current study was not evident only for white males, since socially defined racial group was included as a covariate in the multiple logistic regression analyses. It is an urgent research priority to ascertain whether this increase is also present in other age groups and other places in South Africa, and to identify the reasons for the increase. Such reasons are necessarily applicable only to males.

It is important to mention the limitations of the study. First, it was limited to students who were present at school on the day the study was undertaken, thus excluding dropouts and absentees who may have higher rates of risk behaviour.[9] However, for this to bias the findings about secular trends, the relationship between risk behaviour and dropout or absenteeism would need to be different between the two time periods. There is no reason to think that this might be the case. Also, the data for those who attend school are applicable for school-based interventions. Second, the study was confined to grade 8 students attending public high schools in Cape Town, which limits the extent to which the findings can be generalised to other populations. Third, the study relied on self-report data. Although we went to great lengths to ensure anonymity and confidentiality, it is possible that the data are biased, probably in the direction of providing falsely low prevalence estimates for the risk behaviours. Again, for this to bias the findings about secular trends, the extent and/or direction of the bias would need to vary between the two time periods, and again there is no reason to think that this might be the case. Finally, there were some methodological differences between the two studies. A different means of data collection was employed at the two stages. In 1997, we collected data using paper and pencil questionnaires, while in 2004 we used PDAs. However, our pilot work concluded that there were no significant differences in the prevalence rates obtained using the two methods.[8] In addition, if this were a relevant bias, one would expect that the differences between the time periods would all be in the same direction, which was not the case. Other methodological differences between the studies include the differences in question format and the absence of weighting in the 2004 study.

In conclusion, the study confirms that large numbers of grade 8 students in Cape Town engage in risk behaviour. It is necessary to replicate the findings regarding secular trends, as they may be attributable to the methodological differences between the studies mentioned above. However, if they are valid, there are some positive findings regarding secular trends for postponement of sexual debut and involvement in behaviours that are associated with interpersonal violence. These findings indicate that it is possible for risk behaviour to change in a relatively short period of time. However, the rates of selected risk behaviours among boys and/or girls changed in a direction that is associated with increased risk of adverse outcomes, such as use of protection against pregnancy of sexually transmitted infections, tobacco use, marijuana use, and suicidal behaviour. There are a number of school-based interventions in Cape Town high schools that have as their main aim to reduce the prevalence of sexual risk behaviours, including two cluster randomised control trials,[16,17] the loveLife groundBREAKER intervention,[18] and a peer education intervention[18] that is funded by the Department of Health in the Western Cape and implemented by various non-profit organisations. There is an urgent need to disseminate interventions that effectively reduce sexual risk behaviour. In addition, such interventions should increase their scope to address other the risk behaviours (such as substance use, interpersonal violence and suicidal behaviour) with which involvement in sexual risk behaviour is correlated and with which it shares common aetiological roots.[19,20]

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