

A decade of tobacco control: The South African case of politics, health policy, health promotion and behaviour change

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Background. The South African (SA) government has implemented comprehensive tobacco control measures in line with the requirements of the Framework Convention on Tobacco Control. The effect of these measures on smoking prevalence and smoking-related attitudes, particularly among young people, is largely unknown.

Objective. To describe the impact of a comprehensive health promotion approach to tobacco control amongst SA school learners.

Methods. Four successive cross-sectional Global Youth Tobacco Surveys (GYTSs) were conducted in 1999, 2002, 2008 and 2011 among nationally representative samples of SA grades 8 - 10 school learners. We assessed the prevalence of current smoking (having smoked a cigarette on ≥ 1 day in the 30 days preceding the survey) and smoking-related attitudes and behaviours.

Results. Over the 12-year survey period current smoking among learners declined from 23.0% (1999) to 16.9% (2011) – a 26.5% reduction. Reductions in smoking prevalence were less pronounced amongst girls and amongst black learners. We observed an increase in smoking prevalence amongst learners between 2008 and 2011. Smoking-related attitudes and behaviours showed favourable changes over the survey period.

Conclusion. These surveys demonstrate that the comprehensive and inter-sectorial tobacco control health promotion strategies implemented in SA have led to a gradual reduction in cigarette use amongst school learners. Of concern, however, are the smaller reductions in smoking prevalence amongst girls and black learners and an increase in smoking prevalence from 2008 to 2011. Additional efforts, especially for girls, are needed to ensure continued reduction in smoking prevalence amongst SA youth.

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Globally, tobacco use is the leading cause of premature mortality. The major health impact of tobacco use in the future will be felt in low- and middle-income countries^[1] such as South Africa (SA). Since the late 1980s, SA researchers provided epidemiological and economic evidence that underpinned the need for tobacco control legislation.^[2] Beginning in 1994, with the election of the first democratic government, a comprehensive set of measures to mitigate the impact of tobacco use on human health were enacted. This included interventions at the ecological level, such as legislation banning the advertising of tobacco products, classifying nicotine as an addictive drug, restricting smoking in public places and increasing excise duties on cigarettes. In addition, there were interventions aimed at individuals encompassing school health education (e.g. changes in the national school curriculum declaring nicotine a drug of addiction) aimed at improving health literacy.^[3-6]

The Global Youth Tobacco Surveys (GYTSs) conducted in SA in 1999, 2002, 2008, and 2011^[7,8] show the impact of tobacco control policies on youth smoking over a 12-year period.

Data for the same period based on market surveys, such as the All Media and Products Survey^[9,10] showed sustained reductions in SA cigarette consumption amongst adults. Per capita consumption decreased by 54% from 1999 to 2011. This sharp fall in per capita cigarette consumption followed a modest decrease in cigarette

consumption throughout the 1980s. After increasing by 140% between 1970 and its peak in 1991, aggregate cigarette consumption decreased by 39% between 1991 and 2004 (Fig. 1).

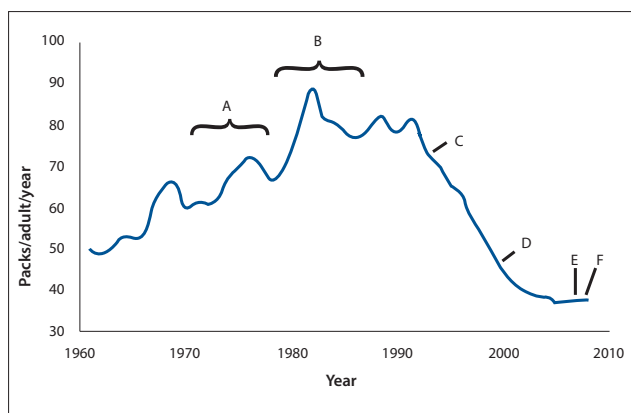


Fig. 1. National cigarette consumption from 1960 - 2009. Key events are indicated as follows: A: local government banned smoking in cinemas, B: restriction on smoking on domestic flights, C: Tobacco Products Control Act of 1993, D: Tobacco Products Control Amendment Act no. 12 of 1999, E: Tobacco Products Control Amendment Act no. 23 of 2007, F: Tobacco Products Control Amendment Act no. 63 of 2008.

Methods

The GYTS is a nationally and provincially representative cross-sectional school-based survey conducted among secondary school learners.^[11] We analysed data from independent GYTSs conducted in 1999, 2002, 2008, and 2011. The sampling strategies, survey questions and study procedures used were consistent across all the surveys.

Sampling

In each year, a two-stage cluster sample design stratified by the country's 9 provinces was used to provide nationally and provincially representative data. At the first stage of sampling, schools were the primary sampling units and were selected with a probability proportional to the school learner enrolment size in grades 8 - 11. The national schools databases of all public schools containing grades 8 - 11 were obtained from the National Department of Education (DoE), and provided the sampling frames for the first stage of sampling. We excluded private schools (4.4% of all schools) for logistical reasons. A total of 10 963 public schools with a combined grades 8 - 11 learner enrolment of 3.7 million were eligible for selection.^[12]

At the second stage of sampling, grades 8 - 11 classes were selected from each participating school, using systematic equal probability sampling with a random start. All learners in the selected classes were eligible to participate. For each survey year, 23 schools per province and an average of 2 classes per school were selected.

Questionnaire development and measurements

We adapted the standardised GYTS questions provided by the Centres for Disease Control and Prevention (CDC), USA^[13] for relevance to the SA context. The questionnaire was developed in English and then translated and back-translated into the 10 remaining official SA languages by academics proficient in the respective languages. The final questionnaire included close-ended questions related to (i) the socio-demographic characteristics of the learners, (ii) tobacco use behaviour, (iii) access to tobacco products, (iv) knowledge and attitudes toward tobacco, (v) exposure to environmental tobacco smoke, (vi) attitudes regarding cessation, (vii) knowledge of media messages about tobacco, (viii) exposure to tobacco prevention education at school and (ix) community activities discouraging smoking.

Race was reported with the historical apartheid classifications: black, coloured, Indian, white, or other. Learners were permitted to answer that they did not know their race group.

Learners were considered to be current cigarette smokers if they responded positively to having smoked cigarettes on ≥ 1 day in the 30 days preceding the survey.

Ethics approval

Ethics approval for the study was obtained from the SA Medical Association Research Ethics Committee (for GYTS 2008, MRC 5 07; GYTS 2011, MRC GYTS 12/18/2010; no approval numbers were issued for GYTS 1999 and 2002, but ethics approval was granted). Informed consent was obtained from the National DoE, school principals, parents, and learners. Assent was also obtained from learners on the day of the survey.

Data collection

Survey procedures were designed for anonymous and voluntary participation. Data were collected from August to October in each survey year through self-administered questionnaires and was supervised by trained survey administrators.

Data capturing and analysis

We sent the learners' answer sheets to the CDC for electronic data capturing and preliminary analysis. On return to SA, the dataset was further analysed using SAS software (version 9.2). In calculating prevalence rates, the probabilities of sample selection (at the school and class level) and non-response (school, class and student levels) were adjusted for using weighted data, which were post-stratified to approximate province level distributions of grade and gender. We recoded the data from question responses into meaningful prevalence variables and computed prevalence rates and 95% confidence intervals (CIs). The prevalence of current smoking was examined for each of the 4 survey years according to the demographic characteristics of gender, age, race, and grade.

Differences between individual prevalence estimates were considered statistically significant if $p < 0.05$ and the 95% CIs did not overlap. We merged the 4 datasets to examine the change in the prevalence of current smoking over the 4 survey years. Controlling for gender, age and race where applicable, we applied logistic regression to the merged data to determine the effect of survey year on the outcomes of current smoking, with $p < 0.05$ being considered significant.

In addition, we analysed the prevalence of selected knowledge, attitudes and social influence items regarding tobacco smoke across the 4 survey years using logistic regression analyses to test the effect of survey year on each outcome variable. We determined which smoking-related variables to investigate by testing their associations with current smoking using logistic regression analysis.

Results

Demographic characteristics

In 1999, 6 045 learners participated in the GYTS; while the 2002, 2008, and 2011 surveys each captured over 8 000 learners (Table 1). In each year, a marginally higher proportion of females than males participated in the survey. Approximately half of the learners were ≥ 16 years, while between 44.7% and 45.7% were aged 13 - 15 years. The majority of the learners were black, with an increase from 54.1% (1999) to 76.2% (2011).

Prevalence of current smoking

Nationally, the prevalence of current smoking among grades 8 - 10 learners declined from 23.0% (1999) to 16.9% (2011) (Table 2, Figs 2 and 3). This was statistically significant when controlling for race, age, and gender in the regression model.

Male learners had significantly higher current smoking rates than female learners, being almost twice that of females. Decreases in current smoking across the surveys were observed among male and female learners. A smoking increase was noted among female learners between 2008 and 2011, but was not statistically significant.

Although current smoking decreased from 18.4% (1999) to 15.4% (2011) among black learners, this trend was not significant. Coloured learners had significantly higher rates of current smoking than did black learners and learners who reported that they did not know their race group. Current smoking among coloured learners remained high in 1999, 2002 and 2008 before declining to 31.4% in 2011. A similar trend was observed for white learners, whose rates of current smoking showed a decrease from 29.0% (1999) to 12.4% (2011). For Indian learners, the rates of current smoking were higher in 2008 and 2011 than in 1999 and 2002. However, this was not statistically significant, probably due to the small sample size of Indian learners.

The prevalence of current smoking declined across survey years for learners in all grades and in most of the age groups; however, between

Table 1. SA GYTS demographic characteristics

	1999 <i>n</i> (%)	2002 <i>n</i> (%)	2008 <i>n</i> (%)	2011 <i>n</i> (%)
National	6 045	8 935	8 602	8 499
Gender				
Male	2 859 (49.4)	4 074 (46.0)	4 078 (48.0)	4 137 (49.0)
Female	2 924 (50.6)	4 781 (54.0)	4 422 (52.0)	4 306 (51.0)
Age (years)				
≤12	571 (9.9)	124 (1.4)	119 (1.4)	157 (1.9)
13	456 (7.9)	651 (7.3)	239 (2.8)	478 (5.6)
14	964 (16.7)	1 669 (18.8)	1 681 (19.7)	1 380 (16.3)
15	1 159 (20.1)	2 005 (22.6)	2 054 (24.0)	2 010 (23.8)
≥16	2 619 (45.4)	4 431 (49.9)	4 454 (52.1)	4 438 (52.4)
Grade				
8	2 533 (43.6)	3 004 (33.6)	2 872 (33.4)	2 588 (30.5)
9	1 654 (28.5)	3 694 (41.3)	2 611 (30.4)	2 896 (34.1)
10	1 620 (27.9)	2 237 (25.0)	3 119 (36.3)	3 015 (35.5)
Race				
Black	3 155 (54.1)	5 873 (66.3)	6 251 (73.3)	6 419 (76.2)
Coloured	860 (14.8)	1 303 (14.7)	1 127 (13.2)	837 (9.9)
Indian	152 (2.6)	81 (0.9)	113 (1.3)	92 (1.1)
White	768 (13.2)	931 (10.5)	542 (6.4)	575 (6.8)
Other	85 (1.5)	34 (0.4)	42 (0.5)	36 (0.4)
Unknown	807 (13.8)	637 (7.2)	456 (5.3)	462 (5.5)

SA = South Africa; GYTS = Global Youth Tobacco Survey.

2008 and 2011, current smoking increased in some subgroups, such as among grade 9 learners and learners aged ≥16 years, although these increases were not statistically significant. Current smoking increased with age.

Knowledge, beliefs and social influence variables regarding cigarette smoking

Several knowledge, belief, and social influence variables regarding smoking changed among learners over the 12-year period (Table 3). These smoking-related variables were significantly associated with current smoking rates ($p < 0.001$). The variables examined were (i) belief that cigarette smoke was harmful to one's health (odds ratio (OR) 1.23), (ii) belief that smoking makes one feel more comfortable at celebrations or parties (OR 1.18), (iii) reporting that all their best friends smoke (OR 9.08), (iv) positive impression of a man who smokes (OR 5.95), (v) positive impression of a woman who smokes (OR 4.01), (vi) belief that it is safe to smoke for 1 - 2 years as long as you quit after that (OR 3.52), (vii) allowing someone to smoke around you if they ask for permission (OR 4.67), (viii) and reporting that at least one parent smokes (OR 2.03).

Approximately three-fifths of the learners reported that smoking was harmful to their health; however, there was no significant increase over the 12-year period in the proportion of learners who claimed to know this fact. Significantly fewer learners in 2008 (13.5%) than in 1999 (19.6%) believed that 'it was safe to smoke for only a year or two, as long as you quit after that'.

There was a consistent decline in the prevalence of learners who reported that at least 1 parent smoked, with a significantly lower prevalence observed in 2011 (29.5%) than in 2002 (36.4%) and in

1999 (46.3%). In addition, there was a significant decrease in the prevalence of learners who reported that most, or all, of their close friends smoked – from 18.5% (1999) to 11.6% (2008) and 11.3% (2011).

The prevalence of learners who had a positive impression of men and of women who smoke decreased consistently across the 4 surveys. Significantly fewer learners in 2008 (7.2%) and 2011 (7.4%) thought that 'a woman who smokes is successful, intelligent or sophisticated' compared to 1999 (10.5%). Significantly fewer learners in 2008 (9.3%) and 2011 (8.6%) believed that 'a man who smokes is successful, intelligent or macho' compared to 1999 (13.4%) and 2002 (12.4%).

The percentage of learners who reported that smoking cigarettes 'makes one feel more comfortable at celebrations, parties and social gatherings' increased over the 4 survey years from 35.1% to 46.2% with significantly more learners reporting such in 2008 and 2011 than in 1999 and 2002. This increasing trend was noted among both male and female learners.

Discussion

In 12 years from 1999 to 2011 there were 5 million children in SA exposed to an environment in which smoking was seen as unacceptable social behaviour. The surveys conducted between 1999 and 2011 provide evidence of a decline in smoking prevalence amongst learners by age, gender and race group. This is striking, given that adolescent smoking uptake has increased worldwide. This socio-cultural change occurred during a period in which the government was introducing a comprehensive set of health promotion measures to curb tobacco use in SA.

Table 2. SA GYTS prevalence of current (past month) cigarette smoking*

	1999		2002		2008		2011		p-value
	n (%)	95% CI	n (%)	95% CI	n (%)	95% CI	n (%)	95% CI	
National	5 319 (23)	19.0 - 27.0	8 278 (18.5)	16.7 - 20.3	7 827 (16.5)	14.6 - 18.5	7 856 (16.9)	14.5 - 19.4	<0.0001
Gender									
Male	2 488 (28.8)	24.5 - 33.1	3 716 (26.7)	23.5 - 29.9	3 634 (22.8)	20.3 - 25.5	3 768 (21.7)	18.5 - 25.0	<0.0001
Female	2 640 (17.5)	13.1 - 21.9	4 503 (11.5)	9.2 - 13.8	4 121 (10.5)	8.6 - 12.8	4 055 (12.1)	9.9 - 14.4	<0.0001
Grade									
8	2 224 (16.9)	14.4 - 19.4	2 754 (14.0)	11.2 - 16.8	2 560 (13.0)	10.4 - 16.2	2 360 (12.3)	9.7 - 15.0	0.03
9	1 454 (28.1)	20.9 - 35.3	3 413 (19.3)	16.4 - 22.2	2 373 (17.3)	14.3 - 20.9	2 686 (19.2)	15.0 - 23.4	<0.0001
10	1 465 (24.9)	19.5 - 30.3	2 111 (23.3)	19.6 - 27.0	2 894 (18.5)	15.2 - 22.3	2 810 (19.3)	14.7 - 24.0	<0.0001
Age (years)									
≤12	454 (28.7)	21.7 - 35.7	101 (14.4)	2.1 - 26.7	78 (20.6)	10.0 - 37.7	114 (19.6)	4.4 - 34.8	0.05
13	408 (14.7)	8.9 - 20.5	620 (9.1)	6.6 - 11.6	210 (8.2)	4.6 - 14.0	456 (6.8)	3.2 - 10.4	0.01
14	885 (17.4)	13.2 - 21.6	1 573 (13.8)	11.1 - 16.5	1 566 (13.6)	10.2 - 18.0	1 309 (11.5)	8.1 - 14.8	0.01
15	1 049 (18.9)	16.0 - 21.8	1 902 (17.9)	15.1 - 20.7	1 916 (14.2)	12.1 - 16.6	1 886 (14.5)	11.6 - 17.4	0.01
≥16	2 316 (26.9)	20.9 - 32.9	4 047 (22.4)	20.1 - 24.7	4 015 (18.8)	16.1 - 21.9	4 061 (21.4)	17.7 - 25.2	<0.0001
Race									
Black	2 788 (18.4)	13.2 - 23.6	5 450 (15.7)	13.4 - 18.0	5 787 (13.0)	11.3 - 14.7	5 956 (15.4)	13.0 - 17.9	0.13
Coloured	762 (37.4)	32.9 - 41.9	1 182 (38.7)	35.1 - 42.3	1 045 (38.0)	32.2 - 43.6	764 (31.4)	24.0 - 38.9	<0.0001
White	708 (29.0)	22.8 - 35.2	882 (21.7)	16.6 - 26.8	514 (25.6)	21.9 - 29.4	538 (12.4)	10.4 - 14.4	<0.0001
Indian	120 (23.4)	10.2 - 36.6	74 (21.4)	12.9 - 29.9	112 (28.3)	21.5 - 35.2	80 (26.5)	28.7 - 50.1	0.97
Other	63 (38.9)	21.6 - 56.2	<30	-	36 (35.5)	14.5 - 56.6	<30	-	0.28
Unknown	705 (19.3)	13.6 - 25.0	593 (16.3)	11.3 - 21.3	429 (18.6)	13.3 - 23.9	424 (13.1)	7.6 - 18.7	0.02

SA = South Africa; GYTS = Global Youth Tobacco Survey; CI = confidence interval.
* Smoked cigarettes on ≥1 day in the 30 days preceding the survey.

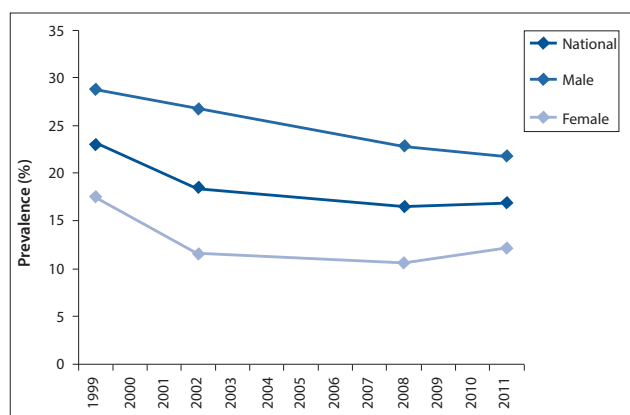


Fig. 2. Prevalence of current (past month) smoking by gender for grades 8 - 10 learners, 1999 - 2011 based on GYTS results.

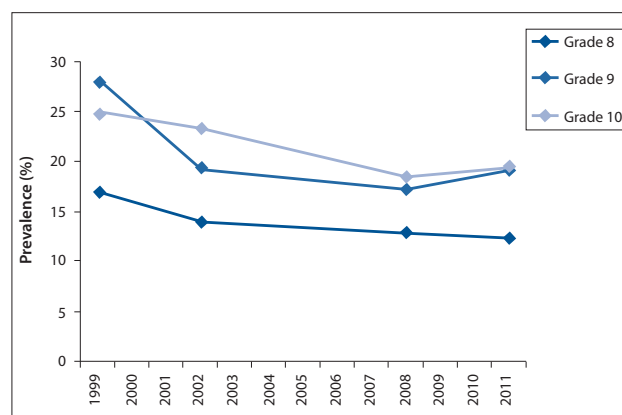


Fig. 3. Prevalence of current (past month) cigarette smoking by grade for grades 8 - 10 learners, 1999 - 2011 based on GYTS results.

SA has been a global leader in tobacco control since the late 1980s.^[2] Before the advent of the first democratic government in 1994, progress had been made in tobacco control despite powerful industry pressure.^[2] In the academic sphere, research has focussed on the epidemiology of tobacco-using behaviour^[2] and its impact on the economy. Efforts were made in the late 1980s and early 1990s to ensure that the development of health policy in the African National Congress, as it prepared to take power in 1994, incorporated best practice in international tobacco control. Consequently, the first budget tabled by the new government in 1994 included a

commitment to increase excise duties on cigarettes to ≥50% of the total cost of the pack, an increase that has been maintained in the 18 years since. An example of 'price elasticity', this intervention appears to be a contributory factor in the 30% decline in tobacco consumption that occurred^[9] and in the 26.5% reduction in smoking prevalence amongst learners over the following 18 years, thus exerting a powerful influence in moderating smoking behaviour.^[9,10]

SA played a key role in the establishment of the Framework Convention on Tobacco Control (FCTC),^[14] which advocates for a comprehensive approach to tobacco control in the 174 countries that

Table 3. SA GYTS knowledge and beliefs regarding cigarette smoking

	1999		2002		2008		2011		p-value
	n (%)	95% CI	n (%)	95% CI	n (%)	95% CI	n (%)	95% CI	
Beliefs									
Helps people feel more comfortable at celebrations/parties	5 849 (35.1)	32.0 - 38.2	8 856 (36.3)	34.1 - 38.6	8 504 (44.0)	42.3 - 45.8	8 414 (46.2)	43.6 - 48.8	<0.0001
A man smoking is successful, intelligent or macho	5 842 (13.4)	11.8 - 15.0	8 817 (12.4)	10.7 - 14.2	8 499 (9.3)	8.2 - 10.3	8 409 (8.6)	7.5 - 9.8	<0.0001
A woman smoking is successful, intelligent or sophisticated	5 945 (10.5)	9.2 - 11.7	8 764 (9.7)	8.5 - 10.9	8 489 (7.2)	6.3 - 8.2	8 388 (7.4)	6.2 - 8.6	<0.0001
Knowledge variables									
It is harmful to your health	5 964 (64.1)	56.7 - 71.4	8 724 (67.9)	63.9 - 71.9	8 464 (59.3)	55.6 - 63.1	8 366 (67.3)	62.4 - 72.1	<0.0001
It is safe to smoke for only a year or two as long as you quit after that	5 895 (19.6)	15.8 - 23.4	8 864 (14.5)	13.5 - 15.5	8 370 (13.5)	12.4 - 14.6	8 277 (14.6)	13.4 - 15.9	<0.0001
Social influence variables									
At least one parent smokes	5 907 (46.3)	43.2 - 49.3	8 871 (36.4)	33.0 - 39.7	8 529 (32.0)	29.8 - 34.1	8 436 (29.5)	27.1 - 31.8	<0.0001
Most or all my best friends smoke	5 940 (18.5)	15.7 - 21.2	8 867 (12.9)	11.3 - 14.5	8 456 (11.6)	10.4 - 12.9	8 349 (11.3)	10.1 - 12.6	<0.0001
If someone asks permission to smoke near you, you let them smoke	5 743 (37.4)	33.4 - 41.4	8 745 (42.5)	37.7 - 47.3	8 438 (39.6)	36.8 - 42.4	8 365 (38.2)	35.1 - 41.2	0.219

SA = South Africa; GYTS = Global Youth Tobacco Survey; CI = confidence interval.

are now signatories to the convention. Government support for the FCTC is critical to preserve the gains achieved and to protect against strong global marketing and trade and related efforts by tobacco companies to increase their presence in developing countries.

Female learners had a smaller reduction in smoking prevalence than male learners and a slight uptake from 2008 to 2011, mirroring data from many countries that now show that the smoking prevalence ratio of boys to girls has reduced, and even reversed, compared to the ratio of men to women.^[15] In SA, the ratio of boys to girls is now about 2:1 compared to 3:1 among adults. This has reversed in countries as diverse as Argentina, the USA and Russia portending a massive future tobacco epidemic among women 30 years from now. Efforts in tobacco control amongst the youth will need to be redoubled, particularly for young women for whom tailored and targeted interventions must be developed.

While current smoking rates among black learners were lower than that of the other race groups, the proportion of black learners in the samples increased over the 4 surveys. This did not have a confounding effect on the results, however, because when controlling for race, age and gender in the regression model, the decrease in the national smoking rate from 1999 - 2011 was found to be statistically significant.

During the period from 1999 to 2011 adult smoking prevalence declined.^[9] The decline from 46.3% (1999) to 29.5% (2011) in learners who reported that at least 1 parent smoked is consistent with the reported national trends in adult smoking prevalence. There was also a significant decline from 18.3% (1999) to 11.3% (2011) in learners

who reported that most or all of their best friends smoke. As parents and peers are key role models in determining whether adolescents take up smoking or not, this suggests that a positive social norm of non-smoking is being created for adolescents by parents and peers.

Only about one-third of learners claimed that they were actually able to say 'do not smoke in my presence' suggesting that placing youth in a situation of conflict can be better dealt with by a total ban of all smoking in public places.

Smoking-related social norms appear to have changed from 1999 to 2011 in that fewer learners reported that men and women who smoke are perceived to be intelligent and glamorous. Cigarette smoking appears to be losing its aspirational value amongst SA youth. The tobacco industry states that its key strategic objective is to see consumers switch from cheaper low value brands, to more glamorous and high-margin brands in their portfolio. As anti-smoking strategies are crafted and refined in the future, it will be important to ensure that young people develop the value that smoking-related behaviour is viewed to be irresponsible, negative and 'uncool'. This is likely to be a dynamic process as SA is an emerging economy that is undergoing rapid socioeconomic and sociocultural transitions.

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References

1. World Health Organization. WHO Report on the Global Tobacco Epidemic 2011: Warning about the dangers of tobacco. Geneva: WHO, 2011. http://whqlibdoc.who.int/publications/2011/9789240687813_eng.pdf (accessed 14 May 2013)
2. Yach D, McIntyre D, Saloojee Y. Smoking in South Africa: the health and economic impact. *Tob Control* 1992;1(4):272-280. [<http://dx.doi.org/10.1136/tc.1.4.272>]
3. Tobacco Products Control Act of 1993. Pretoria: Government Gazette, 1993.
4. Tobacco Products Control Amendment Act No. 12 of 1999. Vol. 406. Pretoria: Government Gazette, 1999.
5. Tobacco Products Control Amendment Act No. 23 of 2007. Vol. 512. Pretoria: Government Gazette, 2008.
6. Tobacco Products Control Amendment Act No. 63 of 2008. Vol. 523. Pretoria: Government Gazette, 2009.
7. Swart D, Reddy SP, Panday S, Philip JL, Naidoo N, Ngobeni N. The 2002 Global Youth Tobacco Survey (GYTS): The 2nd GYTS in South Africa (SA) - A comparison between GYTS (SA) 1999 and GYTS (SA) 2002. Cape Town: South African Medical Research Council, 2004.
8. Reddy SP, James S, Sewpaul R, Koopman F. The 2008 Global Youth Tobacco Survey: The 3rd GYTS in South Africa. Cape Town: South African Medical Research Council, 2010.
9. van Walbeek C. Recent trends in smoking prevalence in South Africa - some evidence from AMPS data. *S Afr Med J* 2002;92(6):468-472.
10. Blecher EH, van Walbeek CP. Cigarette affordability trends: an update and some methodological comments. *Tob Control* 2009;18(3):167-175. [<http://dx.doi.org/10.1136/tc.2008.026682>]
11. Warren CW, Riley L, Asma S, et al. Tobacco use by youth: a surveillance report from the Global Youth Tobacco Survey project. *Bull WHO* 2000;78(7):868-876.
12. South African National Department of Education. Annual School Survey. Pretoria: South African Government Printing Works, 2009.
13. Centers for Disease Control and Prevention. GYTS Core questionnaire. <http://www.cdc.gov/mmwr/preview/mmwrhtml/ss5701a3.htm>. 2007 (accessed 14 May 2013)
14. World Health Organisation. WHO Framework Convention on Tobacco Control (WHO FCTC), 2003. http://www.who.int/fctc/text_download/en/ (accessed 14 May 2013)
15. Warren CW, Lee J, Lea V, et al. Evolution of the Global Tobacco Surveillance System (GTSS) 1998-2008. *Glob Health Promot* 2009;16(2):4-37. [<http://dx.doi.org/10.1177/1757975909342181>]

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