

Differences in tobacco use among young people in urban India by sex, socioeconomic status, age, and school grade: assessment of baseline survey data

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Summary

Background The epidemic of tobacco use is shifting from developed to developing countries, including India, where increased use is expected to result in a large disease burden in the future. Changes in prevalence of tobacco use in adolescents are important to monitor, since increased use by young people might be a precursor to increased rates in the population.

Methods 11 642 students in the sixth and eighth grades in 32 schools in Delhi and Chennai, India, were surveyed about their tobacco use and psychosocial factors related to onset of tobacco use. Schools were representative of the range of types of school in these cities.

Results Students who were in government schools, male, older, and in sixth grade were more likely to use tobacco than students who were in private schools, female, younger, and in eighth grade. Students in sixth grade were, overall, two to four times more likely to use tobacco than those in eighth grade. 24·8% (1529 of 6165) of sixth-grade students and 9·3% (509 of 5477) of eighth-grade students had ever used tobacco; 6·7% (413 of 6165) and 2·9% (159 of 5477), respectively, were current users. Psychosocial risk factors were greater in sixth-grade than in eighth-grade students. The increase in tobacco use by age within each grade was larger in sixth grade than in eighth grade in government schools, with older sixth-grade students at especially high risk.

Discussion The finding that sixth-grade students use significantly more tobacco than eighth-grade students is unusual, and might indicate a new wave of increased tobacco use in urban India that warrants confirmation and early intervention.

Introduction

Tobacco use continues to be the leading cause of preventable death worldwide.¹ However, the burden of tobacco use is shifting from developed to developing countries.² By 2030, it is estimated that 10 million people per year will die from tobacco use, with 70% of those deaths occurring in developing countries.³ In India, the proportion of all deaths that can be attributed to tobacco use is expected to rise from 1·4% in 1990 to 13·3% in 2020, which will result in enormous economic, emotional, and societal costs in a population of more than a billion people.⁴

Increased use of tobacco at the population level can often first be recognised by increased use among young people, since most people begin to use tobacco while they are teenagers, become addicted, and thereby become adult users, carrying the wave of increased use into the population over time.^{5,6} This pattern was seen very clearly in the USA after the introduction and advertising of brands of cigarettes for women in the late 1960s. There were substantially increased initiation rates only among women younger than 18 years old, who remained smokers into adulthood, and increased the overall adult female smoking rates in the 1970s and 1980s.^{7,8} In India, recent data suggest an increase in the prevalence of regular tobacco use among urban teens in Delhi and Mumbai since 2001.⁹ Thus, we aimed to carefully

examine current tobacco use in teenagers in urban India, and to explore whether particular subgroups used tobacco at higher rates, since these trends should be important for prediction of changes in future tobacco use and tobacco-related morbidity and mortality.^{5,6}

Methods

Study design and participants

Project MYTRI (Mobilising Youth for Tobacco-Related Initiatives in India) is a randomised community trial with a long-term goal to prevent and reduce tobacco use among young people in the sixth to ninth grades (age 10–16 years) in Delhi and Chennai, India.¹⁰ The trial involves a 2-year intervention to prevent tobacco use with two cohorts of students, those in the sixth and eighth grades in 2004. 32 schools with students in the sixth to 12th grades are participating in the trial. These schools were selected because they were representative of the range of types of schools in these urban cities, including government (low-to-middle income), private (middle-to-upper income), girls-only, boys-only, and co-educational schools. The study design is shown in figure 1. Schools were also selected that were not near to each other, to avoid contamination of the control schools in the trial, and that were willing to sign a cooperative agreement for 2 years of full participation.¹⁰ In the present study, we assessed the baseline tobacco use data from sixth-grade

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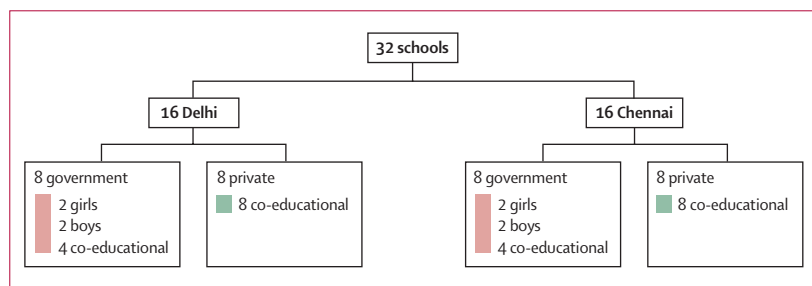


Figure: Project MYTRI study design

and eighth-grade students in the 32 schools. We postulated that students who were in government schools, boys, older in age, and in the eighth grade, would be using more tobacco than those who were in private schools, girls, younger in age, and in the sixth grade.

All students in the sixth and eighth grades ($n=12\,484$) in the 32 schools were eligible and were invited to participate in the baseline survey in the summer of 2004. Informed passive parental consent and active student assent procedures were used. Letters were sent home from the schools to parents of all eligible students. Parents were asked to return a card if they did not want their child to participate in the survey. Students were read a form at the time of the survey ensuring confidentiality and also that their standing with their school and with the project would not be jeopardised by not participating. Every student signed an assent form if they agreed to participate. The institutional review board at the University of Minnesota (Minneapolis, MN, USA) and the Indian Independent Ethics Committee (Mumbai, India) approved the study protocol.

Procedures

The tobacco use survey was a self-administered paper and pencil survey administered in school classrooms by trained survey interviewers from the project. The questions about tobacco use were adapted from the Global Youth Tobacco Survey, which has been used in eighth-grade to tenth-grade students.^{11,12} To ensure appropriate adaptation for sixth-grade students and our population, we did 48 focus groups with 435 students to gather information on their understanding of tobacco, tobacco use, and psychosocial predictive factors.¹³ We then developed the questionnaire on the basis of this information, the Global Youth Tobacco Survey, and previous surveys. The draft questionnaire was translated from English and back-translated into Hindi and Tamil. All private schools in both cities had English versions. The government schools' versions were in Hindi in Delhi and in Tamil in Chennai. We administered the draft questionnaire to small groups of sixth-grade and eighth-grade students ($n=60$) in English, Hindi, and Tamil in government and private schools in Delhi and Chennai, and then discussed each question with them,

and modified the questionnaire accordingly. Finally, we piloted the survey in English and Hindi with 235 students in private and government schools in Delhi in order to pilot survey implementation (including student questions and concerns during administration) and assess the psychometric properties of the survey.

Tobacco use items measured ever use and current use of chewing tobacco, cigarettes, and bidis (hand-rolled cigarettes). Current use of tobacco was measured by the questions: "During the last 30 days, did you (chew tobacco in any form?) (smoke one or more bidis?) (smoke one or more cigarettes?)". The response categories were "yes" or "no". Ever use of tobacco was measured by the questions: "How old were you when you first (chewed tobacco in any form?) (put a lit cigarette in your mouth?) (put a lit bidi in your mouth?)". The response categories were "I have never (chewed tobacco) (put a lit cigarette in my mouth) (put a lit bidi in my mouth)", or a specific age ranging from 7 years or less to 16 years or more. These response categories were collapsed to create a dichotomous variable: no use versus ever use of tobacco.

Additionally, psychosocial factors that are associated with tobacco use among young people in the USA were assessed with scales that measured intentions to use tobacco in the future, social susceptibility to use tobacco, reasons to use tobacco, and normative expectations concerning tobacco use.^{6,14-17} All scales were created by adding up the scores of the responses to individual items. The two intentions scales each included four items: "Do you think you will try chewing tobacco (smoking cigarettes or bidis) in the next month? In the next year? When you enter college? When you are an adult?". Each item had four response categories including: "surely yes (3), maybe yes (2), maybe no (1), and surely no (0)". The scale range was 0-12 and the α coefficients for the intentions scales were 0.85 (chewing) and 0.87 (smoking). The two social susceptibility scales each included four items: "If one of your close friends gave you chewing tobacco (a cigarette or bidi), would you chew (smoke) it? If a group of friends gave you . . . ? If one of your family members gave you . . . ? If someone at a party gave you . . . ?" Each item had four response categories: "surely yes (3), maybe yes (2), maybe no (1), and surely no (0)". The scale range was 0-12 and the α coefficients for the two social susceptibility scales were 0.87 (chewing) and 0.88 (smoking). The reasons to use tobacco scale was measured by six items that addressed whether chewing or smoking was fashionable, fun to do with friends, grown up and brave, a way to reduce boredom, attractive to friends who are boys, and attractive to friends who are girls. Each item had four response categories: "surely yes (3), maybe yes (2), maybe no (1), and surely no (0)". The scale range was 0-18 and the α coefficient for the reasons to use tobacco scale was 0.73. The final scale addressed social norms (normative expectations) concerning tobacco use and was measured by six items: "If you were

to use tobacco, do you think . . . Your close friends would like it? Your parents would like it? Your teachers would like it? Your relatives/neighbours would like it? Boys in your school/neighbourhood would like it? Girls in your school/neighbourhood would like it?" Each item had four response categories: "surely yes (0), maybe yes (1), maybe no (2), and surely no (3)." The scale range was 0–18 and the α coefficient for the normative expectations scale was 0.91. To assess the validity of the psychosocial scales, the relations between the scales and tobacco use measures were assessed among all students using a series of regression models. All the scales were significantly associated with ever use of tobacco ($p < 0.05$).

Trained survey interviewers from the Project MYTRI staff introduced the questionnaire in the classrooms, then allowed students to complete it at their desk with a pencil that we provided. Survey interviewers answered any questions as they arose during the survey administration, including queries related to the clarification of questions on the survey instrument. Students were given unique identification codes to assure confidentiality. Teachers remained in the classrooms but did not participate in the survey administration.

Statistical analysis

A series of mixed-effects regression models were used to assess differences in rates of tobacco use and psychosocial scales by relevant demographic factors, including city (Delhi vs Chennai), type of school (private vs government), sex (boys vs girls), grade (sixth vs eighth grade), and age (≤ 11 years vs 12 years vs 13 years vs ≥ 14 years). This kind of regression model is the most appropriate, in view of the nested study design, as it accounts for variability between both students and schools.¹⁸ All comparisons between grade levels were adjusted for, when not stratified by, other demographic factors (city, school type, sex, age). In examining interactions between grade and other demographic factors, the only significant interaction was between age and grade, so comparisons between grade levels were additionally adjusted for the age*grade interaction. All analyses were done with SAS (version 8.80) statistical software.

Role of the funding source

The sponsor of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

94% of the sample participated ($n=11\,748$). Of the remainder, 4.4% were absent on the initial and make-up survey days (we came in on a second day to every school to survey those who were absent on the initial survey day); 1.5% did not participate because of parent or

student refusal. After exclusion of inconsistent responders (<1%), that is, those with four or more inconsistent responses on the survey (such as reporting that they had used tobacco in the past month, but had not ever used in their lives), the analysis sample size was 11 642. The sample analysed included 5889 (50.6%) from Delhi, 4489 (38.6%) from private schools, 6386 (54.9%) who were male, and 6165 (52.9%) who were in the sixth grade. Mean age was 11.21 years (range 10–16 years) for students in the sixth grade and 12.92 years (10–16 years) for those in the eighth grade.

Overall, 1667 (14.7%) students had ever used tobacco; 1242 (10.8%) had chewed tobacco, 851 (7.4%) had smoked cigarettes, and 796 (7%) had smoked bidis. 520 (4.6%) were current tobacco users, with 346 (3%) currently using chewing tobacco, 163 (1.4%) cigarettes, and 180 (1.6%) bidis. Significant differences in ever use of any kind of tobacco were found by type of school, sex, age, and grade level. 1237 (17.3%) students at government schools and 476 (10.6%) at private schools had ever used tobacco. 1086 (17%) boys and 568 (10.8%) girls had used tobacco. Of students aged 10 years or younger, 96 (6%) had used tobacco, compared with 282 (9.3%) aged 11 years, 416 (14.9%) aged 12 years, 454 (17.6%) aged 13 years, and 346 (21.9%) aged 14 years or older. 1529 (24.8%) sixth-grade students had ever used tobacco, compared with 509 (9.3%) eighth-grade students.

These differences by demographic factors were in the expected direction except for the difference between sixth-grade and eighth-grade students. Students in the sixth grade were significantly more likely to use all forms of tobacco than students in the eighth grade (table 1), in each city, in government schools, and for both sexes (table 2). Sixth-grade students' tobacco use was, overall, two to four times that of eighth-grade students. Students in the sixth grade were overall using more tobacco than those in the eighth grade in every age group. The increase in tobacco use by age was greater in sixth-grade students than eighth-grade students ($p=0.0003$).

	Sixth grade (n=6165)	Eighth grade (n=5477)	Ratio*	p
Ever use of tobacco				
Chewing tobacco	19.0% (17.4–20.6)	6.8% (5.3–8.3)	2.8:1	<0.0001
Smoking bidis	11.9% (10.6–13.2)	3.4% (2.2–4.6)	3.5:1	<0.0001
Smoking cigarettes	12.5% (11.1–13.9)	4.7% (3.5–5.9)	2.7:1	<0.0001
Any kind of tobacco	24.8% (23.0–26.6)	9.3% (7.7–10.9)	2.7:1	<0.0001
Current use of tobacco				
Chewing tobacco	4.5% (3.7–5.3)	1.6% (0.9–2.3)	2.8:1	<0.0001
Smoking bidis	2.0% (1.4–2.6)	0.9% (0.4–1.4)	2.2:1	0.0009
Smoking cigarettes	2.0% (1.4–2.6)	0.9% (0.4–1.4)	2.2:1	0.0016
Any kind of tobacco	6.7% (5.6–7.8)	2.9% (1.9–3.9)	2.3:1	<0.0001

Data in parentheses are 95% CI. Estimates generated from mixed-effects models adjusted for city, school type, sex, age, and grade*age. *Compares prevalence of tobacco use in sixth grade with that in eighth grade.

Table 1: Differences in prevalence of tobacco use between sixth-grade and eighth-grade students (n=11 642)

	Sixth grade (n=6165)	Eighth grade (n=5477)	Ratio*	p
City				
Chennai	23.4% (20.1–26.7)	8.9% (6.7–11.1)	2.6:1	<0.0001
Delhi	25.4% (23.4–27.4)	9.0% (5.6–12.4)	2.8:1	<0.0001
School				
Private	10.8% (5.0–16.6)	8.9% (6.0–11.8)	1.2:1	0.5426
Government	28.7% (26.7–30.7)	11.0% (9.0–13.0)	2.6:1	<0.0001
Sex				
Girls	20.1% (17.6–22.6)	6.9% (5.1–8.7)	2.9:1	<0.0001
Boys	29.2% (27.0–31.4)	12.1% (9.5–14.7)	2.4:1	<0.0001
Age (years)				
≤11	16.6% (14.4–18.8)	8.3% (3.5–13.1)	2.0:1	0.0003
12	25.3% (22.8–27.8)	6.3% (4.4–8.2)	4.0:1	<0.0001
13	30.3% (26.7–33.9)	9.1% (7.5–10.7)	3.3:1	<0.0001
≥14	32.1% (25.9–38.3)	12.1% (8.0–16.2)	2.7:1	<0.0001

Data in parentheses are 95% CI. Estimates generated from mixed-effects models adjusted for (when not stratified by) city, school type, sex, age, and grade*age.
*Compares prevalence of tobacco use in sixth grade with that in eighth grade.

Table 2: Differences in prevalence of ever use of any kind of tobacco between sixth-grade and eighth-grade students, by city, type of school, sex, and age (n=11 642)

The only difference between grade levels that was not significant was for private schools. In further examining the interaction between age and grade by school type, the differences between sixth and eighth grades were significant for all ages in government schools, but only for 12-year-olds in private schools (table 3). However, in the private schools, only 33 students (1.4%) in the sixth grade were aged 13 years or older, and only 55 students (2.4%) in the eighth grade were aged 11 years or younger. In view of these small numbers, the comparisons by age for private schools were limited in meaning. Notably, in 12-year-olds at private schools, sixth-grade students' tobacco use was nearly four times that of eighth-grade students.

The significant age*grade interaction in government schools seemed to be driven by the clear increase in tobacco use by age in sixth-grade students; this trend was

	Sixth grade (n=6165)	Eighth grade (n=5477)	p
Intentions to chew	1.55 (5.50)	0.76 (4.44)	<0.0001
Intentions to smoke	0.97 (3.93)	0.45 (2.96)	<0.0001
Susceptibility to chew	1.32 (5.50)	0.67 (4.44)	<0.0001
Susceptibility to smoke	0.92 (3.93)	0.39 (2.96)	<0.0001
Reasons to use	2.78 (7.07)	2.51 (5.92)	0.0041
Normative expectations	3.35 (10.49)	1.65 (9.62)	<0.0001

Data are mean (SD). Estimates are generated from mixed-effects models adjusted for city, school type, sex, age, and grade*age. High scores on these scales indicate more risk or less protective.

Table 4: Differences in psychosocial factors associated with tobacco use, by grade (n=11 642)

less apparent in eighth-grade students. In private schools, the significant interaction seemed to be driven by different relations between grade and tobacco use by age. In 12-year-olds, sixth-grade students used more tobacco than eighth-grade students, but in those aged 13 years or 14 years and older, the prevalence was actually higher in eighth-grade students (although not significantly so).

Analyses of psychosocial factors also showed consistently significant differences between grade levels (table 4). Students in the sixth grade also had greater intentions to use tobacco in the future, more social susceptibility to use, more positive reasons to use tobacco, and more positive normative expectations concerning tobacco use than those in the eighth grade. These psychosocial risk factors were all associated with significantly greater tobacco use in all students (p<0.05, data not shown).

Discussion

Increased grade level in school has been thought to be the factor that most reliably predicts tobacco use among young people,⁶ but we found the opposite in our data from Delhi and Chennai. Even though increased age was also associated with tobacco use, this trend was found within rather than across grade levels. In fact, increase in tobacco use by age was significantly greater in the sixth-grade than in the eighth-grade cohort. This difference was noted primarily in government schools, among students with lower socioeconomic status. These findings are highly unusual and suggest that this group of teenagers in urban India are just beginning to use tobacco at increased rates. Of particular concern is the very high prevalence of ever having used tobacco (>32%) in sixth-grade students aged 13 years and older in government schools. Since early use of tobacco predicts greater likelihood of addiction, longer lifetime use, and higher rates of lung cancer, these findings are of importance to public health.^{5,6}

The results of the analyses of psychosocial factors are also consistent with greater use among sixth-grade than eighth-grade students, since these factors indicate that sixth-grade students have a significantly greater risk profile associated with onset of tobacco use in this age

	Sixth grade		Eighth grade		Ratio*	p
	Number	Prevalence	Number	Prevalence		
Private schools						
Total	2326		2143			
Age ≤11 years	2090	11.0% (8.4 to 13.6)	52	11.0% (2.3 to 19.7)	1.0:1	0.9939
Age 12 years	203	21.5% (17.2 to 25.8)	934	5.9% (3.8 to 8.0)	3.6:1	<0.0001
Age 13 years	22	3.0% (-8.9 to 14.9)	1018	7.6% (5.6 to 9.6)	0.4:1	0.4513
Age ≥14 years	11	3.8% (-16.9 to 24.5)	139	7.0% (-2.0 to 16.0)	0.5:1	0.7414
Government schools						
Total	3811		3306			
Age ≤11 years	2289	21.5% (18.2 to 24.8)	202	12.1% (6.0 to 18.2)	1.8:1	0.0008
Age 12 years	814	25.8% (23.1 to 28.5)	841	6.1% (3.3 to 8.9)	4.2:1	<0.0001
Age 13 years	426	32.5% (28.8 to 36.2)	1114	9.8% (7.4 to 12.2)	3.3:1	<0.0001
Age ≥14 years	282	36.2% (31.2 to 41.2)	1149	15.7% (13.3 to 18.1)	2.3:1	<0.0001

Data in parentheses are 95% CI. Estimates generated from mixed-effects models adjusted for city and sex. 56 students did not provide their age, so the analysis sample was 11 586. *Ratio compares prevalence of tobacco use in sixth grade with that in eighth grade.

Table 3: Differences in prevalence of ever use of any kind of tobacco, by grade, age, and type of school (n=11 642)

group. Young adolescents are particularly likely to internalise messages from society.^{5,8} Despite policies to control tobacco,⁴ messages in a rapidly changing India may be increasingly pro-tobacco, with greater exposure to media from other countries, smoking in Bollywood movies, and images via the internet. For example, the Cigarettes and Other Tobacco Products Act was passed in India in 2003, prohibiting all direct and indirect advertising of tobacco products, smoking in public places, sales of tobacco products to people younger than 18 years, and sales of tobacco products near educational institutions.⁴ In response, one tobacco company (Godfrey-Philips India) positioned air-conditioned lorries (Mobile Smoking Lounges) outside major attractions, such as a sports stadium and shopping malls, in four major cities in India, including Delhi, so smokers can sit in the lounge and smoke in comfort. Thus, although India is a leader in global tobacco control, the tobacco industry has also developed methods to counteract or ameliorate the effects of policy changes, and these actions may be of particular interest to young adolescents as they begin to explore the adult world.^{4,5}

Notably, 10.8% of the sixth-grade students in our cohort had ever smoked cigarettes, compared with 4.2% (in Delhi) and 5.5% (in Tamil Nadu, the state where Chennai is located) of students in the eighth-to-tenth grades who participated in the Global Youth Tobacco Survey in 2001.¹⁹ Likewise, 6.7% of sixth-grade students in our study were current users of tobacco, compared with 4% and 7.1% of students in the Global Youth Tobacco Survey in 2001. Even with the increase suggested by the recent Indian Cancer Association data,⁹ our younger sixth-grade cohort of students was using tobacco at similar or substantially higher rates than students who were 2–4 years older. Clearly, surveys of tobacco use in students should begin before eighth grade (about age 13 years) if a true measure of early-onset rates is to be achieved.

The only demographic group in which sixth-grade students did not significantly differ from eighth-grade students was among those in private schools. However, the private schools had very little age dispersion, with small sample sizes in one of the grades for ages 11 years and younger, 13 years, and 14 years and older. The only age group with substantial numbers of students in both grades was 12-year-olds, in whom the rate of tobacco use was nearly four times greater for sixth-grade than for eighth-grade students. Thus, private schools might also be facing increased use in younger children, although the data from this study are inconclusive.

Other explanations for these outcomes include under-reporting or over-reporting by one grade level, lack of understanding of the survey items by the sixth-grade students, or differential school drop-out of tobacco users from sixth to eighth grades. Methods were used to ensure confidentiality in data collection; these methods have yielded valid responses in previous work.^{6,20} An

extensive process of survey development was undertaken to ensure that sixth-grade students understood the exact meanings of the questions on the survey. Moreover, the consistency of the data across different populations, and the reliability and predictive validity of the measures, suggest that confusion about the questions or over-reporting or under-reporting by one grade level would not account for the degree of differences noted between grades. Additionally, attrition rates are low (yearly, about 10–12%) between sixth and eighth grade in the Project MYTRI schools, compared with rates before sixth grade, and are not large enough to account for the differences seen between grades. For example, since 21.8% of sixth-grade and 6% of eighth-grade students have ever used tobacco (table 1), then even if disproportionately more tobacco users dropped out than non-users, about half of the tobacco users would have to drop out every year from sixth to eighth grade (and there could be no new users) in order to match the lower rates of eighth-grade students. Clearly, since this is a cross-sectional study, longitudinal data are needed to confirm the sustained increase in tobacco use rates in this cohort over time.

Limitations of this study include its cross-sectional design, the need for replication and follow-up of the cohort until adulthood, and the absence of physiological data as another measure of tobacco-use behaviour. The sample of schools was not randomly selected from the population, but was representative of the mix of types of schools in these cities and does provide a sample of students of lower to higher socioeconomic status and both sexes.

The difference in rates of tobacco use between the sixth and eighth grades, and the replication of this difference in two cities, in government schools, and for girls and boys, strongly suggests that sixth-grade students in urban India use tobacco at two to four times the rate that eighth graders do. Of particular concern are older sixth-grade students in government schools, who already report having used tobacco at high rates. These findings might indicate the initial wave of a large increase in tobacco use in India, which is alarming and warrants confirmation and early intervention in young students.

Contributors

K S Reddy is principal investigator of Project MYTRI in India. He worked on all aspects of survey development and design, data collection protocols, data management, and data analysis. He read, edited, and wrote portions of the manuscript. C L Perry is principal investigator of Project MYTRI and is responsible for the scientific integrity of the study. She worked on all aspects of survey development and design, data collection protocols, data management, and data analysis. She wrote the research article with input from the co-authors. M H Stigler is project director of Project MYTRI in Minnesota and is responsible for the ongoing management of the scientific components of the project. She worked on all aspects of survey development and design, data collection protocols, data management, and data analysis. She did data analyses for this paper and wrote sections pertaining to the study methods and results. M Arora is project director of Project MYTRI in India and was responsible for training the study staff, coordinating the ongoing management of all staff in India, and implementation of all aspects of

the project. She worked on all aspects of survey development and design, data collection protocols, data management, and data analysis. She read, edited, and wrote portions of the paper.

Conflict of interest statement

We declare that we have no conflict of interest.

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References

- 1 WHO. The millennium development goals and tobacco control. Geneva: World Health Organization, 2005.
- 2 Ezzati M, Lopez AD. Estimates of global mortality attributable to smoking in 2000. *Lancet* 2003; **362**: 847–52.
- 3 Stewart BW, Kleihues P, eds. World cancer report. Lyon: IARC Press, 2003.
- 4 Reddy KS, Gupta PC. Tobacco control in India. New Delhi: Ministry of Health and Family Welfare, Government of India, 2004.
- 5 Perry CL. The tobacco industry and underage teen smoking: tobacco industry documents from the Minnesota litigation. *Arch Pediatr Adolesc Med* 1999; **153**: 935–41.
- 6 US Department of Health and Human Services. Preventing tobacco use among young people: a report of the Surgeon General. Atlanta: Centers for Disease Control and Prevention, Office on Smoking and Health, 1994
- 7 Pierce JP, Gilpin EA. A historical analysis of tobacco marketing and the uptake of smoking by youth in the US: 1890–1977. *Health Psychol* 1995; **14**: 500–08.
- 8 Pierce JP, Lee L, Gilpin EA. Smoking initiation by adolescent girls: an association with targeted advertising. *JAMA* 1994; **271**: 608–11.
- 9 Sharma S. Smoking to look cool, thin. *Hindustan Times* (Delhi), March 2, 2005.
- 10 Perry CL, Stigler MH, Arora M, Reddy KS. Prevention in translation: tobacco use prevention in India. *Health Promot Pract* (in press).
- 11 Centers for Disease Control and Prevention. Global Youth Tobacco Survey (GYTS), Delhi, India fact sheet. http://www.cdc.gov/tobacco/global/gyts/factsheets/2001/India_delhi_factsheet.htm (accessed July 29, 2005).
- 12 Warren CW, Riley L, Asma S, et al. Tobacco use by youth: a surveillance report from the Global Youth Tobacco Survey project. *Bull World Health Organ* 2000; **78**: 868–76.
- 13 Mishra A, Arora M, Stigler MH, et al. Indian youth speak about tobacco: results of focus group discussions with school students. *Health Educ Behav* 2005; **32**: 363–79.
- 14 Botvin GJ, Botvin EM, Baker E, Dusenbury L, Goldberg CJ. The false consensus effect: predicting adolescents' tobacco use from normative expectations. *Psychol Rep* 1992; **70**: 171–78.
- 15 Eckhardt L, Woodruff SI, Elder JP. A longitudinal analysis of adolescent smoking and its correlates. *J Sch Health* 1994; **64**: 67–72.
- 16 Komro KA, Perry CL, Munson KA, Stigler MH, Farbakhsh K. Reliability and validity of self-report measures to evaluate drug and violence prevention programs. *J Child Adolesc Substance Abuse* 2004; **13**: 17–51.
- 17 Pierce JP, Coi WS, Gilpin EA, Farkas AJ, Merritt RK. Validation of susceptibility as a predictor of which adolescents take up smoking in the US. *Health Psychol* 1996; **15**: 355–61.
- 18 Raudenbush SW, Bryk AS. Hierarchical linear models: applications and data analysis methods (2nd edn). Thousand Oaks, CA: Sage Publications, 2002.
- 19 Centers for Disease Control and Prevention (CDC). India—Tamil Nadu—Standard 8-0 Global Youth Tobacco Survey (GYTS) fact sheet. http://www.cdc.gov/tobacco/global/gyts/factsheets/2001/India_TamilNadu_factsheet.htm (accessed July 29, 2005).
- 20 Komro KA, Kelder SH, Perry CL, Klepp K-I. Effects of a saliva pipeline procedure on adolescent self-reported smoking behavior and youth smoking prevention outcomes. *Prev Med* 1993; **22**: 857–65.