

Process evaluation of a tobacco prevention program in Indian schools—methods, results and lessons learnt

Shifalika Goenka^{1,2,3,*}, Abha Tewari⁴, Monika Arora^{3,4}, Melissa H. Stigler⁵, Cheryl L. Perry⁵, J. P. Saulina Arnold⁶, Sangita Kulathinal^{1,7} and K. Srinath Reddy^{1,3,4}

¹Centre for Chronic Disease Control, C1/52 Safdurjung Development Area, Delhi 110016, India, ²Indian Institute of Public Health Sector 44, Gurgaon 122002, Haryana, India, ³Public Health Foundation of India, 4/2. Siri Fort Institutional Area, August Kranti Marg, New Delhi 110016, India, ⁴Health Related Information Dissemination Amongst Youth, C1/52 Safdurjung Development Area, 3rd Floor, New Delhi 110016, India, ⁵University of Texas School of Public Health, Austin Regional Campus, Michael & Susan Dell Center for Healthy Living, University of Texas Administration Building (UTA), 1616 Guadalupe Street, Suite 6.300, Austin, TX 78701, USA, ⁶Tamil Nadu Voluntary Health Association, Chennai 600023, Tamil Nadu, India and ⁷Indic Society for Education and Development (INSEED), Nashik 422011, Maharashtra, India

*Correspondence to: S. Goenka. Indian Institute of Public Health, Delhi, Temporary Campus, Instit. Area, Plot No. 34, Sector 44, Gurgaon-122002 (Haryana), India; (*alternative address*) Centre for Chronic Disease Control, C1/52 Safdurjung Development Area, 2nd Floor, New Delhi 110016, India. E-mail: shifalika.goenka@iiphd.org; shifalika9@yahoo.com

Received on January 5, 2010; accepted on August 13, 2010

Abstract

In India, 57% of men between 15 and 54 years and 10.8% of women between 15 and 49 years use tobacco. A wide variety of tobacco gets used and the poor and the underprivileged are the dominant victims of tobacco and its adverse consequences. Project MYTRI (Mobilizing Youth for Tobacco-Related Initiatives in India) was a tobacco prevention intervention program, a cluster-randomized trial in 32 Indian schools which aimed to decrease susceptibility to tobacco use among sixth- to ninth-grade students in urban settings in India. This culture-specific intervention, which addressed both smokeless and smoked forms of tobacco, was Indian in content and communication. We qualitatively developed indicators which would help accurately measure the dose of the intervention given, received and reached. A multi-staged process evaluation was done through both subjective and objective measures. Training the teachers critically contributed toward a rigorous implementation and also correlated with the outcomes, as did a higher proportion of students participating in the classroom discussions and better peer-leader-student communication. A size-

able proportion of subjective responses were 'socially desirable', making objective assessment a preferred methodology even for 'dose received'. The peer-led health activism was successful. Teachers' manuals need to be concise.

Introduction

Tobacco, the leading preventable cause of death, killed 100 million people in the 20th century worldwide and could kill 1 billion in the 21st century [1]. Tobacco is projected to kill 50% more people in 2015 than human immunodeficiency virus (HIV)/acquired immunodeficiency syndrome and be responsible for 10% of all deaths globally [2]. The total economic cost of tobacco use in 2004 amounted to 1.7 billion dollars (US dollars). Of the 5.4 million tobacco attributable deaths worldwide in 2005, 700 000 were from India [3]. Although, the tobacco attributable deaths, between 2002 and 2030, in high-income countries are projected to decline by 9%, they are projected to double from 3.4 to 6.8 million in the low- and middle-income countries [2].

India is the second largest consumer of tobacco in the world, second only to China. In India, 57% of

men between 15 and 54 years and 10.8% of women between 15 and 49 years use tobacco [4]. A wide variety of tobacco gets used in India. Apart from the smoked forms which include cigarettes and bidis, a plethora of smokeless forms get used [3, 5]. Whereas 32.7% of men and 1.4% of women smoke tobacco, many more—36.5% of men and 8.4% of women—chew tobacco [4]. Aggressive marketing by tobacco companies have made the youth vulnerable to tobacco products [6]. More than 25% of the youth between 13 and 15 years have tried tobacco and 17.7% of the youth currently use tobacco [3]. In addition, an inverse correlation between tobacco use and educational/socioeconomic status, and a higher susceptibility to tobacco and its adverse health consequences among disadvantaged populations in India, makes tobacco prevention a public health priority [7–14]. Since addiction to nicotine for most people occurs prior to adulthood and nearly all first use of tobacco occurs before high school graduation, it is suggested that if adolescents can be prevented from using tobacco, most will never start using tobacco [15, 16].

Design overview of the a tobacco prevention program—MYTRI

Project MYTRI (Mobilizing Youth for Tobacco-Related Initiatives in India), a recently concluded study, aimed to decrease susceptibility to tobacco use among sixth- to ninth-grade students in urban settings in India [15]. Through a group-randomized trial design, 32 schools located in two large cities in India ($n = 16$ in Delhi and $n = 16$ in Chennai) were recruited, matched and randomly assigned to receive a 2-year tobacco preventive intervention or serve as a delayed intervention control [15]. The results of the baseline survey [17], the intermediate outcomes (after 1 year) and the final outcomes have been published. Intermediate outcomes assessed after 1 year of intervention yielded small benefits and those after 2 years of intervention yielded significant benefits [18, 19]. Project MYTRI was able to target a population of >6000 adolescents and maintain scientific standards comparable to studies conducted with much smaller samples in United States [19].

Process evaluation improves the science of randomized trials [20]. It bridges the gap between prevention science and prevention practice [20]. Process evaluation is an invaluable part of overall program evaluation as it gives us an accurate picture of program implementation [21]. Social and behavioral interventions have become increasingly complex, making it important for researchers to know the extent to which intervention components are actually implemented [22].

The scope and implementation of process evaluation have grown in complexity as their importance and utility have been more widely recognized [23]. Different results from the same or similar prevention programs raise concerns that differential implementation may account for the variability [24].

In this paper, we describe the process evaluation of this tobacco prevention program in Indian schools. We elaborate on the methodology of the process evaluation, results of the process evaluation (after Year 1 intervention) and lessons learnt. The school-based scores of (i) dose given (DG), (ii) dose received (DR) and (iii) reach, of the intervention are reported. We also correlate the school-based scores to the study's outcome, the relative change in susceptibility to chew tobacco.

Methods

We first describe the multi-component tobacco prevention intervention (Project MYTRI) and then the participants. We then describe how we did the process evaluation. Subsequently, we outline the conceptual framework we selected for analysis and reporting of the results of the process evaluation.

Intervention

Project MYTRI intervention was entirely Indian in its content, context, communication (both textual and pictorial) and delivery. Theoretically, it was based on the social cognitive theory and the existing evidence-based smoking prevention programs, as a frame of reference [5, 19, 25, 26]. The intervention consisted of a classroom curriculum, school posters, parent postcards and training of the

intervention implementers [15]. The implementers were the teachers and student peer leaders.

The intervention is available in English on the website www.hriday-shan.org. Please view and download the English classroom curriculum, the teachers' manual, the students' manual, peer leaders' manual, the school posters and parent postcards from the Web site. The Hindi and Tamil language versions are available on request.

The classroom curriculum—structure

It consisted of seven different classroom sessions. Each session was of 35–60 min each, initiated and implemented by the usual classroom teachers and peer leaders. Each classroom session had a common predefined multi-component structure consisting of the following intra-session elements: a written text of learning objectives, teacher's script, students' script, games, worksheets, discussion and wrap-up. Peer leaders and teachers interacted with the students to deliver the intervention, who, in turn, we hoped would actively participate and enjoy it. Student and peer leader involvement was intricately woven throughout the curriculum. Each session-specific poster provided the launch pad and complimented the content of that classroom session.

The classroom curriculum—content

The seven different classroom sessions, posters and parent postcards focused on imparting behavioral skills and contextual knowledge to decrease their susceptibility to taking up tobacco in the future.

In a pre-activity before the first session, Project MYTRI and the mascots Disha and Deepak were introduced and the students elected their own peer leaders in each class. 'Classroom session 1' entitled, 'Guess the numbers' put forward, in numbers, the burden of tobacco use (both smoked and smokeless). The supporting poster theme was '50 Lakh people die of tobacco related diseases each year in India'. The puzzle and worksheet too were on Guess the numbers. The different types of tobacco being used—zarda, beedi, khaini, gutka, hookah, panmasala, snuff, etc.—were also discussed with the students.

'Classroom session 2' was 'Poison Puzzle: What is in Tobacco?'. It familiarized the children with the

various harmful ingredients that are present in tobacco and which are common to poisons/harmful substances like insecticides, pesticides, naphthalene balls, nuclear weapons, etc. There were two jigsaw puzzle games—'Grimy Gutka' and 'Crooked Cigarette'.

'Classroom session 3' was entitled 'How does Tobacco Harm? Negative Health Consequences of Tobacco Use'. It delved into the various long- and short-term health consequences of tobacco use (smoked and smokeless forms). Students also discovered that breathing someone else's tobacco was harmful. They appreciated the benefits of not choosing tobacco.

Classroom session 4 'Tobacco Trauma: It Affects Every Sphere of Life' dealt with the harmful social effects of tobacco use and also gave more details on passive smoking. The corresponding school poster said 'Please Stop, Your Smoke is Hurting Us'.

On similar lines, the classroom session 5 for the eighth class and session 6 for the sixth class were entitled: 'Spin the Wheel: 10 Reasons Not To Use Tobacco'. It elaborated on the strong reasons not to use tobacco and contrasted it to the social reasons why people start using tobacco. The sessions, cumulatively, intended to develop a mindset against tobacco and decrease the susceptibility to use tobacco. It helped toward modeling social skills. Classroom session 5 of Class 6 elaborated on creating a healthy home—a tobacco-free home. In the classroom session 6 (Class 8): 'Pressure Pads: Learn to Resist Offer of Tobacco', the students analyzed various social situations where tobacco is offered, learnt how to refuse it and practiced applying these skills to various social situations. It provided real-life competencies to resist tobacco. Lastly classroom session 7, 'Speak Out: Advocate for No Tobacco Use' imparted advocacy skills where students learnt how to speak out against tobacco. The corresponding poster read 'We Have the Strength to Say No to Tobacco'.

The classroom curriculum—delivery

The seven sessions had to be delivered on seven different days, over 4–5 months. Each classroom

teacher was free to decide their own schedule for its delivery.

Posters

Eight different illustrative posters were used. Each was put up in the classroom 1 day prior to the delivery of the respective classroom session. The posters reinforced the content of each classroom session.

Parent postcards

Six illustrative parent postcards (with six different pictorial messages, specific to the learning objectives) were given to each student after the respective classroom session, to take home to share with their parents. Parents needed to sign the postcard stubs which the student then returned to the student peer leaders, who documented its return on a tracking sheet.

Training the program implementers

The training conducted through lectures, group work and role playing imparted knowledge on the evils and burden of tobacco use in India and hands on skills with the intervention materials—posters, postcards, manuals, games and worksheets (conducted in September 2004).

Teachers: The teacher coordinator and the usual classroom teachers of each class, from the classes of sixth and eighth grades of the intervention schools, were invited to be trained in a whole day's training workshop.

Peer leaders: Proportional to the number of students in each class, four to six students, in a class of 30–45, were elected by their classmates, from each section, in each class. They were designated as student peer leaders. Half a days training for the peer leaders, before the start of the intervention, was conducted at the school itself. In addition, booster training was given to them before delivery of each classroom session. These peer leaders facilitated the implementation, for example, they facilitated the small-group activities (e.g. games, brainstorming sessions) in the classrooms, as well as extracurricular activities that went on within (intra) and between (inter) schools.

Inter-school activities

The classroom sessions culminated with the children creating/enacting 'drama/skits' and 'model making' from each school in intra-and inter-school events. Two inter-school events, one in Delhi and the other in Chennai, conducted over half a day, were organized. The entire intervention was staggered between August 2004 and February 2005. The classroom sessions were delivered between October 2004 to February 2005 [15, 18].

Participants

Sixteen schools, eight each in Delhi and eight in Chennai, received the intervention. Four in each city were private and four were state-funded or government schools. The students in the private schools were from higher income backgrounds. All the students ($n = 5564$; 2823 in Delhi and 2741 in Chennai) of the sixth and eighth grades in these schools participated in the intervention and elected their own peer leaders. The student peer leaders (781 of which, 402 were from Delhi and 379 from Chennai) and 125 teachers (67 in Delhi and 58 in Chennai) delivered the intervention. Additional characteristics of participant are available elsewhere [17].

Process measures and indicator variables

Systematic qualitative observations by social scientists during the piloting of the intervention enabled identification of indicator variables which would best capture the multi-component, multi-faceted tobacco prevention intervention, in its depth and breadth. To develop indicators for concepts and refining their importance, qualitative observations of behaviors in their natural context should provide the lead [27, 28]. Such methods also confer greater validity [29].

A range of indicator variables were identified. Various instruments (process instruments) or process measures were developed to be administered at various stages of the intervention. These were piloted and then modified and refined after the piloting.

All the individual process measures are available from the authors and a sample is available as Supplementary material online. The various process

measures (instruments) are listed in Column 1 of Table I. Table I also lists who completed (filled) the instruments (Column 2) and when or at what stage of the intervention were they completed (Column 3), specific indicator variables in each instrument (Column 4) and how these indicator variables contributed to the process components—dose given, dose received and reach (Column 5). The scales used for each indicator variable are also given (Column 4). Variable numbers assigned in the corresponding process tables of dose given, dose received and reach are given (Column 5).

Community coordinators

Professionals with a master's degree in psychology or social work or sociology or nutrition were recruited on this project and trained. They were the link between the investigators and the implementers during the actual delivery of the program in the field. They visited the schools, interacted with the teachers and the peer leaders and delivered the teachers' manuals, the peer leaders' manuals and the students' manuals to the schools. They also visited the schools, to interact with the teachers and the peer leaders before each session was delivered and gave out the session-specific posters, postcards (in five of seven activities) and games (in four of seven activities). This meeting between the community coordinators and the implementers allowed for short, activity-specific booster trainings to be given.

They observed and documented the actual delivery of the classroom sessions [Objective Systematic Structured Observations (OSSOs)] on session-specific OSSO forms. The subjective feedback forms and the attendance sheets were also collected by the community coordinators. They helped in administering the outcome measure forms which the students filled. They also made school reports detailing the facilitators and barriers encountered during delivery of the tobacco prevention intervention.

Process assessment at training

The attendance of the teachers was recorded on the 'teacher's training attendance sheet', and their feedback about the training and MYTRI program was recorded on a 'teacher's training feedback forms'.

Similarly, the attendance of the peer leaders was documented on the 'peer leader's training attendance sheet' and their feedback of the training and MYTRI program on the 'peer leader's training feedback forms'.

Process assessment done in school/classrooms and inter-school event

Peer leaders maintained the students' attendance, in an 'attendance sheet', for each classroom session, in each class. Peer leaders also gave their subjective feedbacks, at the end of the curriculum, on the peer leader's end of curriculum feedback forms.

Teacher's gave their feedback after each classroom session was delivered and also at the end of the entire program (seven different session-specific forms and one at the end). Attendance was also recorded at the inter-school event. OSSOs were made by the community coordinators, on session-specific OSSO forms, during actual delivery of the classroom sessions.

Process assessment—posters and parent postcards

On the 'poster tracking sheets', the peer leaders noted, before each specific classroom session, whether the specific posters were hung and its location.

On the 'postcard stub tracking sheet' the peer leaders noted the number of signed postcard stubs that the students returned. This documented the parental outreach of messages. Subjective feedback about the posters and postcards was sought through questions in the 'teacher's feedback forms' and the peer leaders 'end of curriculum feedback forms'. Objective assessments were made by the community coordinators on OSSOs.

Conceptual framework for the process evaluation

A multi-staged, multi-component process assessment was made by data collected from multiple sources: the teachers, students, peer leaders and community coordinators.

For a comprehensive assessment and rigor in evaluation, we used the process assessment framework proposed by Saunder *et al.* [24], which in turn has

Table I. Continued

No.	Data collection instruments or process instruments	Filled by whom?	Implemented when?	Indicator variables. number denotes the classroom session (scales used for the item are given in parenthesis)	How did the variables contribute? Process component (variable numbers assigned in the corresponding process tables of dose given, dose received, reach)
6	Postcard stub tracking sheet (for six different postcards)	Trained peer leaders	After the respective classroom session	Postcards given and proportion of signed stubs returned (yes/no)	Dose given (Variable 3) Reach
7	Poster tracking sheets (for eight different posters)	Trained community coordinator	After the respective classroom session	Proportion of posters hung (yes/no) and location (and open ended)	Dose given (Variable 2) Reach
8	Teacher's classroom curriculum session-specific feedback forms and end of curriculum feedback forms (7 + end feedback)	Trained teachers	After the respective classroom session and at the end	Did teachers enjoy teaching lesson? 1-7 (yes/no) Students enjoyment/participation during various elements of the classroom sessions: (i) Posters (Likert 1-3 smiley faces, could not be conducted) (ii) Objectives (Likert 1-3 smiley faces, could not be conducted) (iii) Mascot script (Likert 1-3 smiley faces, could not be conducted) (iv) Teacher's script, (Likert 1-3 smiley faces, could not be conducted) (v) Games (Likert 1-3 smiley faces, could not be conducted), (vi) Worksheet (Likert 1-3 smiley faces, could not be conducted), (vii) Discussion (Likert 1-3 smiley faces, could not be conducted) (viii) Wrap-up (Likert 1-3 smiley faces, could not be conducted) Did students find worksheets difficult? 2, 5, 6 (yes/no, could not be done) Did peer leaders communicate well with student? (yes/no) Students absorption while playing the games; 1, 2 (yes/no) Were students left out while playing the games? 2 (yes/no) Did students read and absorb the completed puzzle; 2 (yes/no) Proportion of the students in each class participating in the discussion. Session 1, 2, 3, 4, 5, 6 and 7 (%)	Dose received Dose received (Variables 4 and 5) Dose received (Variable 8) Dose received (Variable 10) Dose received (Variable 7, a, b, c) Dose received (Variable 6)

Table I. *Continued*

No.	Data collection instruments or process instruments	Filled by whom?	Implemented when?	Indicator variables. number denotes the classroom session (scales used for the item are given in parenthesis)	How did the variables contribute? Process component (variable numbers assigned in the corresponding process tables of dose given, dose received, reach)
9	Peer leader's end of curriculum feedback forms	Peer leaders	At the end of the classroom curriculum	General impression and suggested changes (open ended) Was the training handbook difficult? (easy to follow, little difficult can be improves, difficult to understand and can be improved, other open-ended suggestions) Confidence in tobacco prevention activities (very confident, not so confident, not confident at all) Commitment to tobacco prevention activities (more committed, less committed, equally committed) than their classmates General impression and suggested changes (open ended)	Contextual reasons Dose received (Variable 9) Dose received (Variables 11 and 12)
10	Classroom: student attendance sheet	Peer leaders	At the end of each classroom session	Proportion of students who attended each classroom sessions (yes/no)	Reach
11	Inter-school event: attendance sheet	Peer leaders	During the inter-school event	Proportion of students who attended the inter-school event (yes/no)	Reach
12	School reports	Community coordinator	Throughout of MYTRI implementation	Detailed narrations and experiences of the interactions with the students, teachers and school authorities	Contextual reasons

For eighth grade only and \$ for sixth grade only.

been adapted from other important works [23, 28, 29]. The conceptual definitions of the process components which contribute to the process assessments are as follows.

Dose given (completeness): Dose given is the quantity and the rigor of implementation, of the intended intervention units, that are actually delivered to the participants. Dose given (DG) is a

function of the implementers and should be documented objectively. It was computed by each intervention school as given in Tables II and III.

Dose received (exposure): Dose received (DR) is the extent to which participants are satisfied, understand, actively engage with, interact with, are receptive to and absorb or imbibe or use material or recommended resources. Dose received

Table II. *Dose given*

Dose given: The composite score for the dose given, to each intervention school, was computed as the weighted average of the following eight variables.

- (i) Product of the Q_1 and Q_2 of implementation of the classroom sessions ($Q_1 \times Q_2$): Q_1 was quantity and Q_2 was the rigor of implementation of Q_1 . The quantity (Q_1) was defined as the percentage of the classroom sessions actually implemented out of the seven planned sessions, and Q_2 was defined as the average percentage of the implementation of the intra-session elements of the classroom session. In each classroom session, there were six intra-session elements—objectives, students' script, teacher's script, games, worksheets and wrap-up.

Since variable Q_1 is the proportion of the seven classroom sessions delivered in each school, if all the seven classroom sessions were delivered then the score would be 100% but if only two of the seven classroom sessions were delivered then the score would be 28% ($=2/7$).

For variable Q_2 , the rigor of the implementation was a simple average of the proportion of the six intra-session elements which were implemented in classroom session 1, in classroom session 2, 3, etc., in a particular school. If 80% of the intra-session elements got conducted in classroom session 1–4 and 70% got conducted in classroom session 5–7 then the rigor of implementation of the classroom sessions was 75.7%.

- (ii) Proportion of the 8 posters hung in each school: If all the eight different types of posters were hung in a school then the score assigned was 100%, but if only two types were hung then it was 25%.
- (iii) Proportion of the 6 parent postcards delivered in each school: If all the six different postcards were delivered in a school then the score assigned was 100%, but if only one type of postcard was delivered then the score was 16.7%.
- (iv) Did the school participate in the inter-school event? The school's participation in the inter-school event gave a score of 100% and its absence, a score of 0%.
- (v) Proportion of the teachers trained to deliver the intervention: If all the teachers who were to deliver the intervention, in a school, were trained then the score was 100%.
- (vi) Proportion of the student peer leaders trained to deliver the intervention: If all student peer leaders who were to deliver the intervention, in a school, were trained, then the score was 100%.
- (vii) Proportion of classroom sessions in each school where the teachers handled the discussions well with the students: If, in a particular school, in one class the teachers handled the discussion well in 4/7 (57%) of the classroom sessions, and in another class, in 7/7 (100%) of the sessions, in another class in 0/7 (0%) of the classroom sessions, and if there are three classes in that school delivering the intervention, then the average score for that school would be the simple average of the three values, which is 52%.
- (viii) Proportion of classroom sessions in each school where the student peer leaders communicated well with students: If there are two classes delivering the intervention in a school, and in the first class, only in 3/7 (43%) sessions the student peer leaders communicated well with the students, and in the other class the student peer leaders communicated well with the students in all the 7/7 sessions, then, the score for the school would be a simple average of two which is 72%.

The composite score for the dose given to each intervention school was computed as the weighted average of the eight variables listed above. The weights were arbitrary based on qualitative observations. During our qualitative observations during the pilot, we learnt that the observations of the actual delivery of the classroom sessions and the rigor of delivery of the classroom sessions significantly influenced the delivery of the entire intervention. We therefore gave $Q_1 \times Q_2$ a weightage of 50. We also performed principal component analysis. We found that only 50–60% of the variability was explained by the first three components for the dose delivered. This helped further confirming our weightages that we had assigned.

The weights were thus measured by combining the insight gained through qualitative observational understanding and the loads given to each variable in the first three principal components. We tried changing the weights but the overall differences in the performance of the schools did not change, validating our weighing scheme.

Table III. Dose of the tobacco prevention intervention given (DG)—School scores (%)

Variable		1	2	3	4	5	6	7	8	9	
School codes	Proportion of classroom sessions delivered (Q ₁) in each school	Proportion of intra-session elements of the classroom sessions delivered (Q ₂) in each school	Q ₁ × Q ₂	Proportion of eight posters hung in each school	Proportion of six postcards given in each school	Whether or not the school participated in the inter-school event	Proportion of teachers trained in each school	Proportion of peer leaders trained in each school	Whether or not the teachers handled the discussions well with the students? Proportion of teachers who did	Whether or not the peer leaders communicated well with students? Proportion of peer leaders who did	School-wise dose given (39–95)
1	100	68	68	100	100	100	100	90	52	93	75
3 ^a	57	66	38	37.5	50	0	100	94	42	75	49 ^a
5	100	87	87	100	100	100	67	100	93	86	89
7 ^a	29	79	23	12.5	16.7	0	100	93	75	100	47 ^a
9	100	37	37	100	100	100	65	81	15	43	45
11	100	52	52	100	100	100	100	98	40	90	65
13	100	49	49	100	100	100	75	98	44	20	53
15	100	35	35	100	100	100	67	89	8	12	39
17	100	83	83	100	100	100	100	83	81	100	88
19	100	85	85	100	100	100	100	97	95	91	90
21	100	83	83	100	100	100	100	100	88	100	90
23	100	90	90	100	100	100	100	100	79	100	91
25	100	80	80	100	100	100	100	93	69	100	84
27 ^a	29	97	28	12.5	16.7	0	100	89	100	100	49 ^a
29	100	92	92	100	100	100	100	95	100	100	95
31	100	86	86	100	100	100	100	97	90	100	91
Weights			50	5	5	2	4	4	15	15	

Dose given to each school is the weighted average of variable values in columns 1, 2, 3, 4, 5, 6, 7 and 8 for each school. Q₂: Intra-session elements of the classroom curriculum are learning objectives, students' script, teacher's script, games, worksheets and wrap-up.

^aProgram implementation indefinitely delayed after classroom session 4 (school ID 3) and 2 (school ID 7, 27).

Table IV. *Dose received*

Dose received: The composite score for the dose received, by each intervention school, was computed as the weighted average of the following 12 variables:

- (i) Proportion of teachers reporting a high satisfaction with MYTRI intervention. It is the proportion of teachers, from each intervention school, reporting '7' on a Likert scale of 1–7 on their satisfaction with the MYTRI intervention program.
- (ii) Proportion of student peer leaders reporting a high satisfaction with MYTRI intervention. It is the proportion of student peer leaders, from each intervention school, also reporting 7 on a Likert scale of 1–7 on their satisfaction with the MYTRI intervention program. None of the teachers and student peer leaders gave a rating between 1 and 4 with almost all responses were between 6 and 7. To increase the differential between schools, only 7 was taken.
- (iii) Proportion of classroom sessions, from each school, in which the teachers reported that they enjoyed teaching (yes/no), when they delivered it.
- (iv) Students' enjoyment with the intra-session elements namely, objectives, students' script, teacher's script, games, worksheet, wrap-up and discussion. It is the simple average of the whether the students enjoyed each of six intra-session elements, namely, objectives, students' script, teacher's script, games, worksheet and wrap-up in each of the seven classroom sessions. There were three degrees of smiley faces (1–3); we collapse 2–3 to calculate 'yes'.
- (v) Proportion of students' enjoyment with posters. It is the proportion of classroom session where the students enjoyed the posters. It was computed in the same way as Variable 4.
- (vi) Mean proportion of the class participating in the classroom discussions. It is the mean of the proportion of students participating in the discussions, in each of the classroom sessions, in that school.
- (vii) Proportion of classroom sessions, where the students were involved and absorbed the games. It is the proportion of classroom sessions, in each school, where the students were involved and absorbed the various games.
- (viii) Proportion of classroom sessions where the students understood the worksheet. It is the proportion of classroom sessions in which the teachers reported that the students did not find the worksheet difficult.
- (ix) Proportion of student peer leaders reporting that the training manual was easy to understand.
- (x) Proportion of classroom session in which the teacher reported that the student peer leaders communicated well with the students.
- (xi) Proportion of student peer leaders reporting a high commitment to tobacco prevention activities. It is the proportion of student peer leaders, from each school, reporting a high commitment to tobacco prevention activities at the end of the intervention.
- (xii) Proportion of student peer leaders reporting more confidence than their classmates in leading tobacco prevent activities in the future. It is the proportion of student peer leaders reporting that their confidence in tobacco prevention activities was higher than their classmates.

While computing the dose received, all the individual variables received the same weightage '5'. Due to constraints of space, Variable 4 contains six different variables and therefore has been given a weightage of 30 instead of 5. It consisted of relative enjoyments during various elements of the classroom sessions—objective, students' script, teacher's script, games, worksheet and wrap-up. Each of the variables was given the same weightage of 5.

(DR) is typically assessed by subjective behavioral indicators and was computed by each intervention school as given in Tables IV and V.

Reach: It is the extent to which the intervention reached the intended target audience. It was computed by each intervention school as given in Tables VI and VII.

Assessing the outcomes of the intervention

Outcomes were assessed, through a student self-administered anonymous survey, administered to each student before and after the tobacco prevention intervention. Specific details about the rigorous piloting, standardization and the psychometric properties of the instrument are detailed elsewhere

[6, 18, 30]. Since many more people in India chew tobacco, we use spearman's correlation coefficient to correlate the 'school-wise scores of change in social susceptibility to chew tobacco' with the rigor in implementation (Fig. 1).

Data analysis

Dose given, dose received and reach were constructed from indicator variables extracted from the various process instruments which are listed in Table I. Dose given was based on objective documentation of the actual delivery of the intervention and dose received on subjective feedbacks.

We used Spearman's correlation coefficient to explore the bivariate relationships between the

Table V. Dose of the tobacco prevention intervention received—school scores (in %)

Variable	1	2	3	4a ^a	4b	5	6	7a	7b	7c	8	9	10	11	12	
School code	Teachers satisfaction with MYTRI	Peer leaders satisfaction with MYTRI	Teacher enjoy delivering in classroom session	Students' enjoyment in classroom sessions	Students' enjoyment in classroom discussion	Students' enjoyment—posters	% Of class actively participating	Student absorption while playing game	Student absorption while playing game	Student absorption while playing game	Worksheets easy	Proportion reporting training manual easy	Good peer leader student communication	Peer leaders commitment high	Peer leaders confidence high	School-wise scores of dose received (%)
1	53	44	100	83	95	76	66	92	85	100	98	63	100	49	64	77
3	100	57	100	69	90	88	49	0	0	100	100	0	100	0	0	58
5	41	65	100	82	89	72	82	100	100	100	97	86	95	36	81	79
7	0	64	100	93	100	100	99	100	100	100	71	0	100	0	0	72
9	93	85	100	75	71	55	80	100	91	100	93	53	100	29	63	75
11	82	88	96	67	58	50	60	100	43	100	79	72	90	27	61	67
13	57	55	93	77	64	59	61	88	56	89	82	56	83	57	74	70
15	93	92	100	73	67	71	87	100	17	100	86	71	88	45	46	71
17	78	77	100	80	87	68	97	100	78	100	96	89	100	37	50	79
19	75	79	100	78	90	69	94	100	100	100	100	83	98	22	47	78
21	0	94	100	84	90	75	95	75	75	100	75	92	100	50	79	76
23	0	79	100	81	95	75	99	100	50	100	100	83	100	46	71	76
25	100	97	100	57	57	48	96	83	100	100	90	83	98	31	93	72
27	98	100	100	74	78	0	98	100	78	89	60	0	100	0	0	63
29	100	89	100	53	78	48	95	100	100	100	75	91	98	64	98	74
31	82	98	95	47	74	67	93	100	100	100	96	81	100	75	92	73
Weight	5	5	5	30	5	5	5	5	5	5	5	5	5	5	5	

SS: students' script and TS: teachers' script.

^aVariable 4: due to constraints of space, this column contains six different variables and therefore has been given a weightage of 30 instead of 5. It consisted of relative enjoyments during various elements of the classroom sessions—objective, students' script, teacher's script, games, worksheet and wrap-up. Each of the variables was given the same weightage of '5'.

Table VI. *Dose reached*

Reach: The composite reach score, for each intervention school, was computed from the simple average of the following three variables.

- (i) Proportion of students attending the classroom sessions: The attendance of the students during each of the classroom sessions was recorded. It varied across the different classroom sessions. The minimum proportion of the students attending the classroom sessions in each school was taken here (so that we do not overestimate the reach). For example, if the proportion of the students attending the classroom sessions varied from 84 to 96% in the seven classroom sessions, then 84% was the score assigned here since it indicated the percentage of students present in all the seven classroom sessions.
- (ii) Proportion of signed postcards returned in each school. This documented parental reach of messages.
- (iii) Proportion of students participating in the inter-school event.

various variables, the composite school-based scores and the outcome.

When looking at the outcome ‘social susceptibility to chewing tobacco’, a higher score denoted a greater risk. The relative change in susceptibility to chewing tobacco was calculated as $100(\% \text{ susceptibility in 2005} - \% \text{ susceptibility in 2004})/\% \text{ in 2004}$.

Results

All the classroom sessions, posters, postcards and inter-school components were fully implemented in 13 of the 16 schools with partial implementation in the remaining 3 (school IDs 3, 7, 27) schools. The average dose given was 71.3% and the average dose received was 72.5%. Though, the school-wise scores of the dose given varied widely from 39–95%, the scores of dose received showed lesser variability, they ranged from 58 to 79%.

The average reach score for the delivery of the intervention was 64.8%. (69.9% for attendance at the classroom sessions, 65.8% for inter-school event and 58.7% for the proportion of signed postcard stubs returned).

Tables III, V and VII delineate the dose of the intervention given, received and reached, respectively, to each intervention school.

Training of the teachers and the delivery of the interventions

Proportion of teachers trained in a school correlated with better implementation of objectives ($r = 0.58$, $P < 0.02$), teacher’s script ($r = 0.57$, $P < 0.02$), student’s script ($r = 0.53$, $P < 0.05$), worksheets

($r = 0.56$, $P < 0.02$) and superior peer leaders–student communications ($r = 0.75$, $P < 0.001$) as documented by OSSOs. It was also of greater benefit in lowering the susceptibility to chewing tobacco ($r = 0.53$, $P < 0.05$).

Subjective feedbacks versus objective assessment in the Indian setting

OSSOs revealed that the ‘learning objectives’ and ‘teacher’s script’ were relatively the least often conducted among the various components/elements, making them the differentiating variable between the well-implemented and the less well-implemented interventions. [On an average, learning objectives were conducted 51% (4–96%, standard deviation (SD) = 30), the teacher’s script 68% (17–100%, SD = 30) and games 91% (73–100%, SD = 11) of the times.] The ‘rigor of implementation’, which consisted of the percentage of these intra-session element delivered, namely learning objectives, students’ script, teacher’s script, games, worksheets and wrap-up, as documented by objective observations, therefore correlated most strongly with the implementation of the learning objectives ($r = 0.90$, $P < 0.0001$) and teacher’s script ($r = 0.95$, $P < 0.001$).

We compared the delivery of the learning objectives and teacher’s script, as recorded through OSSOs with the subjective feedbacks, in each school. On 91 occasions when the ‘learning objectives’ were not conducted, 84 times (92.3%) the teachers had reported that the objectives were ‘enjoyed and participated’ rather than reporting ‘not conducted’. Similarly, out of 64 occasions when the teacher’s script was not conducted, 63 times (98.4%) the teachers reported it as ‘enjoyed

Table VII. Reach: extent to which the tobacco prevention intervention reached the target audience (in %)

Variables	Proportion of students attending the classroom sessions in %							1	2	3	Reach score of each school 1 + 2 + 3/3
	Classroom session 1	Classroom session 2	Classroom session 3	Classroom session 4	Classroom session 5	Classroom session 6	Classroom session 7				
School code (<i>n</i> = total number of students)								Minimum attendance recorded across all classroom sessions in each school	Proportion of parent postcards returned in each school	Proportion of students participating in the inter-school event from each school	
01 (331)	96	85	84	84	90	89	85	84	55	95	78
03 (0) ^a	0*	0*	0*	0*	0	0	0	0	0	0	0
05 (238)	100	96	94	98	98	97	97	94	62	97.3	84
07 (0) ^a	0*	0*	0	0	0	0	0	0	0	0	0
09 (399)	95	86	89	87	94	94	94	86	83	69	79
11 (332)	97	85	83	76	90	86	89	76	78	56.6	70
13 (342)	97	94	91	89	94	92	95	89	75	80	81
15 (221)	99	89	88	89	93	93	87	87	78	93	86
17 (307)	96	82	94	96	93	96	96	82	82	81	82
19 (224)	96	95	95	92	96	97	98	92	79	85	85
21 (138)	98	89	85	84	93	89	89	84	82	83	83
23 (132)	98	83	91	92	98	98	99	83	76	86.4	82
25 (284)	94	84	83	82	88	90	88	82	82	68.4	77
27 (0) ^a	0*	0*	0	0	0	0	0	0	0	0	0
29 (361)	99	94	96	97	96	97	96	94	51	79	75
31 (530)	96	86	89	86	92	92	92	86	56	79	74
Mean (including three schools where intervention was abandoned)								69.94	58.7	65.79	64.75
Mean (excluding three schools where intervention was abandoned)								86.08	72.23	81	79.69

^aProgram implementation indefinitely delayed in these schools.

*Sessions conducted but the attendance was not taken by the peer leaders.

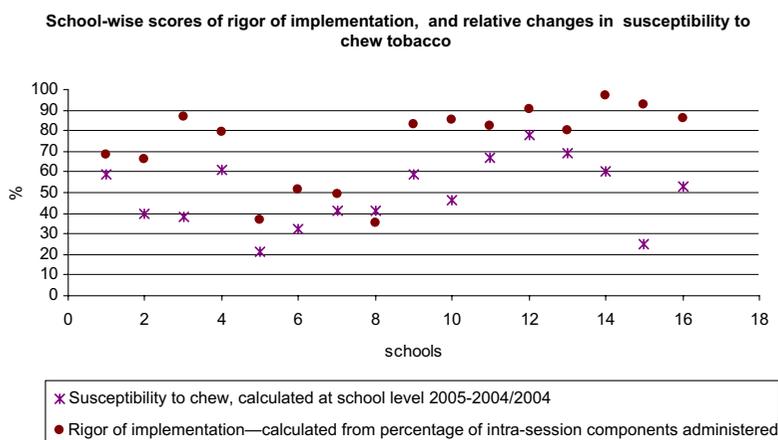


Fig. 1. School-level scores of relative change in susceptibility to chew tobacco and rigor of implementation of intra-session components.

and participated’ rather than ‘not conducted’. This clearly shows the magnitude of the ‘deference effect’ and consequently indicates the poor validity of subjective feedbacks in Indian school settings.

Correlates of outcomes

The school-wise scores of the rigor in implementation of the classroom curriculum are plotted against the school-wise outcomes, change in the susceptibility to chew tobacco, in Fig. 1. In addition, the communication between students and peer leaders ($r = 0.66$, $P < 0.005$) and higher proportion of students participating in the classroom discussions ($r = 0.70$, $P < 0.005$) correlated with better outcomes.

Discussions

Process evaluation of this culture-specific tobacco prevention intervention for urban Indian schools revealed rigor in implementation and a good reach suggesting a high potential for the intervention to impact the study outcomes. This program was Indian in content and delivery. It was well accepted by the students and teachers and implementable in both private and public schools. Some important lessons were learnt. Qualitative observations during piloting of the intervention identified variables and enabled

development of a rigorous process evaluation framework for this culture-specific tobacco prevention program.

The importance of training teachers

Schools with a higher proportion of teachers trained not only had better implementation of the classroom curriculum but also better outcomes. Such schools also had better communication between the students and peer leaders. Researchers from other school-based interventions have long recognized training to be a critical contributor toward better implementation of programs [31–33]. A review, Dusenbury *et al.* [32], also reports that teachers who received training were more likely to implement the curriculum with fidelity than teachers who did not receive training and a more extensive training was associated with a higher quality implementation.

Teacher training manuals/handbooks

Subjectively, the teachers had reported that the training manuals are very helpful (when they examined the manuals at training). In practice, however, the community coordinators reported that teachers, more often than not, in their busy schedule, had little time to read the teacher’s manual and consequently the classroom sessions were delivered based on whatever they remembered from their

training. Although it has been extensively reported that detailed instruction manuals have the potential to enhance the delivery and fidelity of an implementation [32, 34], analysis from our study indicates that teacher-training manuals need to be most importantly concise. Resonant with our findings, a Dutch school-based obesity program also reports that although teachers perceived the detail manual as very helpful, time constraint was a commonly expressed problem [35].

Peer leaders in school-based tobacco prevention interventions

The perceptions of the peer leaders, who were elected by students themselves, would reflect and also influence the views of students. It was observed that the peer leaders were an important support to the teachers in the delivery of the tobacco prevention intervention. In fact better the ‘peer leader–student communication’, better was the rigor in the implementation. Majority of the peer leaders had found (‘7’ on a Likert scale of 1–7) the multi-component classroom sessions (75.5%), the parent postcards (74.6%) and posters (78.8%) very appropriate and also felt confident (79.2%) of leading tobacco prevention activities in the future [36].

Peer leader-led health education programs have been widely used as an effective vehicle for preventing drug abuse and tobacco prevention among adolescents [37–39]. The National Institute for Health and Clinical Excellence recommends that student nominated peer leaders should be trained by adults to deliver interventions aimed to prevent uptake of tobacco in schools [40]. The Center for Disease Control, USA, also recommends peer leaders, but recognizes that, although peer leader programs can offer an important adjunct to teacher-led instruction, such programs require additional time and effort to initiate and maintain [41]. Besides, tobacco and drug abuse, they have also been used for promoting better nutrition [42], helmet use [43] and preventing HIV [34, 44]. To go a step further, in a published review, Mellanby *et al.* [45] critically compare peer-led and adult-led education in schools and conclude that there is evidence suggesting that peer-led

health promotion may in fact be more effective than adult-led.

The importance of OSSOs as a measure for process assessment in Indian school settings

OSSOs, made by trained community coordinators, objectively documented the rigor in delivery of the curriculum; the dynamics of interaction between the teachers and students, peer leaders and students; and the classroom discussions, on pre-structured session-specific OSSO forms.

The community coordinators during observations had reported that teachers do not like to give critical feedback. This was confirmed by the large discrepancies (94–98% discordance) between the teacher feedbacks and objective observations. Although other researchers have also reported that ‘teacher reports’ may not be as valid as objective assessments [32, 46], the extent of it is alarming in the Indian school-based setting. For the same reason, dose received showed little variability across schools. This makes it imperative that (even if it means extra costs) processes need to be measured objectively in the Indian school settings.

Conceptually, similar to the OSSOs, Bouffard *et al.* [21] developed a structured observation technique, Systematic Social Observations, in therapeutic communities, to evaluate firsthand the social climate of correctional institutes [21]. They too reported that stakeholder interviews provided firsthand feedback, but in some cases lead to potentially biased information, therefore recommending the use of combined evaluation methodologies [21].

Objectively documenting teacher–student and peer leader–student interactions

Analytically, it was found that, better was the teachers’ and peer leaders’ communication with the students, better was the ‘rigor in implementation’. Resnicow *et al.* [46], for the ‘Gimme-5-school program’, developed a composite measure, in which they recorded through objective observations, the teacher–student interaction, which they called ‘rapport’. When they compared the various measures, they found that rapport and observed fidelity

appeared to be most valid (as against teacher self-report, questionnaire, post-implementation interview) and also significantly associated with change in health knowledge. Similarly, in a drug-use prevention program too, it has been reported that students in classrooms where teachers manage proactively are more likely to gain social competencies [20].

Games in school-based classroom curricula

Games were reported by the teachers, peer leaders and community coordinators as the most enjoyed, popular and most often implemented element of the classroom sessions.

Key indicator variables which may be used to measure dose given and dose received

Research must determine which aspects of processes are most important to assess [47]. Also, should paucity of resources/funding restrict a detailed process assessment, we should be able rely on few indicator variables to document the dose given and dose received. Analytically, it was discerned that each of the following variables could be used as predictors—dose given: objective assessment of the teacher's ability to handle the discussions with the students and the delivery of the teacher's script and objective; dose received: objective assessment of the proportion of students participating in the classroom discussion and peer leader–student communication. Time spent on the intervention, internationally used to calculate the dose given, was found to be unreliable in the Indian School setting. The teachers spent most of their time getting the students to come into the class and get organized, for the delivery of the intervention.

Conclusions

The culture-specific, multi-component, tobacco prevention program which addressed both smokeless and smoked forms of tobacco was successfully implemented in both public and private schools in urban India. Qualitative observations enabled development of a rigorous process evaluation framework.

Training of teachers was significantly associated with both better implementation and better outcomes. Comprehensive training of teachers needs to be a critical component of school-based interventions in India. Peer leader tobacco empowerment approaches in Indian schools are successful and should be espoused in school-based interventions.

A high proportion of socially desirable answers made OSSO a preferred assessment technique for process assessment, in schools in India. For the same reason, even dose received which theoretically should be entirely subjective needs to incorporate an objective component while assessing the processes in schools in India.

Teachers, in the Indian school settings, amidst their busy schedule do not get time to revise the curriculum before its actual delivery. So health intervention programs in Indian schools should be designed in such a way that they do not require teachers to reread or prepare before delivery of the curriculum. For the same reason, the teacher manuals need to be simple and concise rather than detailed and elaborate.

When resources limits a detailed process assessment, the following variables could be used as indicators—objective assessment of teacher's communication and ability to handle the discussion with the students (dose given), implementation of objectives (dose given), teacher's script (dose given), the peer leader's communication with the students (dose received) and proportion of the class participating in the discussions (dose received).

Supplementary data

Supplementary data are available at *Health Education Research* online.

Funding

Fogarty International Center (R01TW05952-01 to C.L.P., principal investigator).

Acknowledgements

We are grateful to the community coordinators in Delhi and in Chennai for the diligent follow-up with

the schools, teachers and students and also for their systematic documentation and detailed periodic feedback and data entry. We are also grateful to the schools, the principals and the students without which the study would not be possible. Ethical clearance: Passive, but informed, consent was taken from each student's parent; students provided active assent at the time of the survey. These procedures were required by the Independent Ethics Committee in Mumbai and the Institutional Review Board at the University of Minnesota.

Conflict of interest statement

None declared.

References

1. WHO Report on the Global Tobacco Epidemic. *The MPOWER Package*. Geneva, Switzerland: World Health Organization, 2008.
2. Mathers CD, Loncar D. Projections of global mortality and burden of disease from 2002 to 2030. *PLoS Med* 2006; **3**: e442.
3. Report on Tobacco Control in India. *Ministry of Health and Family Welfare*. New Delhi, India: Govt of India, 2004.
4. National Family Health Survey (NFHS)—2005-2006. *Use of Tobacco: A Fact Sheet*. 2009. Available at: http://www.whoindia.org/LinkFiles/Tobacco_Free_Initiative_nfhs3.pdf Accessed: 4 September 2010.
5. 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.
6. Arora M, Reddy KS, Stigler MH *et al.* Associations between tobacco marketing and use among urban youth in India. *Am J Health Behav* 2008; **32**: 283–94.
7. Mathur C, Stigler MH, Perry CL *et al.* Differences in prevalence of tobacco use among Indian urban youth: the role of socioeconomic status. *Nicotine Tob Res* 2008; **10**: 109–16.
8. Rani M, Bonu S, Jha P *et al.* Tobacco use in India: prevalence and predictors of smoking and chewing in a national cross sectional household survey. *Tob Control* 2003; **12**: e4.
9. Gupta PC, Ray CS. Tobacco, education & health. *Indian J Med Res* 2007; **126**: 289–99.
10. Reddy KS, Prabhakaran D, Jeemon P *et al.* Educational status and cardiovascular risk profile in Indians. *Proc Natl Acad Sci U S A* 2007; **104**: 16263–8.
11. Gupta R. Smoking, educational status and health inequity in India. *Indian J Med Res* 2006; **124**: 15–22.
12. Gupta R, Gupta VP, Sarna M *et al.* Serial epidemiological surveys in an urban Indian population demonstrate increasing coronary risk factors among the lower socioeconomic strata. *J Assoc Physicians India* 2003; **51**: 470–7.
13. Reddy KS. The burden of disease among the global poor. *Lancet* 1999; **354**: 1477.
14. Subramanian SV, Nandy S, Kelly M *et al.* Patterns and distribution of tobacco consumption in India: cross sectional multilevel evidence from the 1998-9 national family health survey. *Br Med J* 2004; **328**: 801–6.
15. Perry CL, Stigler MH, Arora M *et al.* Prevention in Translation: tobacco use prevention in India. *Health Promot Pract* 2008; **9**: 378–86.
16. US Department of Health and Human Services. *Preventing Tobacco Use among Young People: A Report of the Surgeon General*. Atlanta, GA: US Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Centre for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1994.
17. Reddy KS, Perry CL, Stigler MH *et al.* Differences in tobacco use among young people in urban India by sex, socioeconomic status, age, and school grade: assessment of baseline survey data. *Lancet* 2006; **367**: 589–94.
18. Stigler MH, Perry CL, Arora M *et al.* Intermediate outcomes from Project MYTRI: Mobilizing Youth for Tobacco-Related Initiatives in India. *Cancer Epidemiol Biomarkers Prev* 2007; **16**: 1050–6.
19. Perry CL, Stigler MH, Arora M *et al.* Preventing tobacco use among young people in India: project MYTRI. *Am J Public Health* 2009; **99**: 899–906.
20. Harachi TW, Abbott RD, Catalano RF *et al.* Opening the black box: using process evaluation measures to assess implementation and theory building. *Am J Community Psychol* 1999; **27**: 711–31.
21. Bouffard J, Taxman F, Silverman R. Improving process evaluations of correctional programs by using a comprehensive evaluation methodology. *Eval Program Plann* 2003; **26**: 149–62.
22. Steckler A, Linnan L. *Process Evaluation for Public Health Interventions and Research*. San Francisco, CA: Jossey-Bass, 2002.
23. Saunders RP, Evans MH, Joshi P. Developing a process-evaluation plan for assessing health promotion program implementation: a how-to guide. *Health Promot Pract* 2005; **6**: 134–47.
24. Harachi TW, Abbott RD, Catalano RF *et al.* Opening the black box: using process evaluation measures to assess implementation and theory building. *Am J Community Psychol* 1999; **27**: 711–31.
25. Flay BR. The promise of long-term effectiveness of school-based smoking prevention programs: a critical review of reviews. *Tob Induc Dis* 2009; **5**: 7.
26. Perry CL. *Creating Health Behavior Change: How to Develop Community-Wide Programs for Youth*. Thousand Oaks, CA: Sage Publications, 1999.
27. Green J, Thorogood N. *Qualitative Methods for Health Research*. London, New Delhi, Thousand Oaks, CA: Sage Publications, 2004.
28. Goenka S. Qualitative research: a need to uncap its potential. *Natl Med J India* 2001; **14**: 301–3.
29. Bernard HR. *Research Methods in Anthropology. Qualitative and Quantitative Approaches*, 2nd edn. London: AltaMira Press. A division of Sage Publications, 1995.

30. Stigler MH, Perry CL, Arora M *et al.* Why are urban Indian 6th graders using more tobacco than 8th graders? Findings from Project MYTRI. *Tob Control* 2006; **15**(Suppl. 1):i54–60.
31. Story M, Mays RW, Bishop DB *et al.* 5-a-day Power Plus: process evaluation of a multicomponent elementary school program to increase fruit and vegetable consumption. *Health Educ Behav* 2000; **27**: 187–200.
32. Dusenbury L, Brannigan R, Falco M *et al.* A review of research on fidelity of implementation: implications for drug abuse prevention in school settings. *Health Educ Res* 2003; **18**: 237–56.
33. Hausman AJ, Ruzek SB. Implementation of comprehensive school health education in elementary schools: focus on teacher concerns. *J Sch Health* 1995; **65**: 81–6.
34. Plummer ML, Wight D, Obasi AI *et al.* A process evaluation of a school-based adolescent sexual health intervention in rural Tanzania: the MEMA kwa Vijana programme. *Health Educ Res* 2007; **22**: 500–12.
35. Singh AS, Chinapaw MJ, Brug J *et al.* Process evaluation of a school-based weight gain prevention program: the Dutch Obesity Intervention in Teenagers (DOiT). *Health Educ Res* 2009; **24**: 772–7.
36. Khan F, Tewari A, Arora M *et al.* *Peer-Led Health Activism for Tobacco Prevention among Indian Youth -Mytri Year 1*. 2006. The 13th World Conference on Tobacco, Washington, DC, USA. Poster number 102(144).
37. Klepp KI, Halper A, Perry CL. The efficacy of peer leaders in drug abuse prevention. *J Sch Health* 1986; **56**: 407–11.
38. Cuijpers P. Effective ingredients of school-based drug prevention programs. A systematic review. *Addict Behav* 2002; **27**: 1009–23.
39. Hunt MK, Fagan P, Lederman R *et al.* Feasibility of implementing intervention methods in an adolescent worksite tobacco control study. *Tob Control* 2003; **12**(Suppl. 4): IV40–5.
40. National Institute of Health and Clinical Excellence. *School-Based Interventions to Prevent Smoking. Quick Reference Guide*. London: NICE—National Institute of Health and Clinical Excellence, 2010. Available at: www.resources.healthyschools.gov.uk/_j2257f939-ddee-4b23-8b17-9d3e00af2b85 Accessed: 4 September 2010.
41. CDC. *Guidelines for School Health Programs to Prevent Tobacco Use and Addiction*. 1994: CDC, Department of Health and Human Services, US Govt, Recommendations and Reports. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/00026213.htm>. Accessed: 4 September 2010.
42. Frenn M. Peer leaders and adolescents participating in a multicomponent school based nutrition intervention had dietary improvements. *Evid Based Nurs* 2003; **6**: 44.
43. Hall M, Cross D, Howat P *et al.* Evaluation of a school-based peer leader bicycle helmet intervention. *Inj Control Saf Promot* 2004; **11**: 165–74.
44. Pearlman DN, Camberg L, Wallace LJ *et al.* Tapping youth as agents for change: evaluation of a peer leadership HIV/AIDS intervention. *J Adolesc Health* 2002; **31**: 31–9.
45. Mellanby AR, Rees JB, Tripp JH. Peer-led and adult-led school health education: a critical review of available comparative research. *Health Educ Res* 2000; **15**: 533–45.
46. Resnicow K, Davis M, Smith M *et al.* How best to measure implementation of school health curricula: a comparison of three measures. *Health Educ Res* 1998; **13**: 239–50.
47. Baranowski T, Stables G. Process evaluations of the 5-a-day projects. *Health Educ Behav* 2000; **27**: 157–66.