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A Qualitative Mediation Study to Evaluate a School-Based Tobacco Prevention Program in India (Project MYTRI)

S. Lewis Bate¹, Melissa H. Stigler², Marilyn S. Thompson³, David P. MacKinnon⁴, Monika Arora⁵, Cheryl L. Perry², and K. Srinath Reddy⁶

¹Arizona State University; now Arlington, TN, USA

²Michael & Susan Dell Center for Healthy Living, University of Texas School of Public Health, Austin, TX, USA

³School of Social and Family Dynamics, Arizona State University, Tempe, AZ, USA

⁴Department of Psychology, Arizona State University, Tempe, AZ, USA

⁵Health Related Information Dissemination Amongst Youth (HRIDAY), New Delhi, India

⁶Public Health Foundation of India, Institute for Studies in Industrial Development (ISID), New Delhi, India

Abstract

Causal mediating processes were examined using qualitative methods to evaluate a tobacco-use prevention program for adolescents in India, Project MYTRI (Mobilizing Youth for Tobacco-Related Initiatives in India). Interviews were conducted with Project MYTRI leaders and staff persons. The focus of the interviews was to learn about the program implementation and to characterize how Project MYTRI classroom sessions altered student-level psychosocial risk factors (mediators) to prevent or reduce tobacco use among students in intervention schools in Delhi and Chennai. From qualitative analysis, key mediating variables were identified (students' tobacco knowledge, skills development, beliefs about tobacco, intentional beliefs, advocacy beliefs, and self-efficacy beliefs), a qualitative mediation path model was drawn, causal processes were described, and contextual influences (potential moderators) were explained. The qualitative findings complemented the results of statistical mediation analysis, yielding a detailed and contextualized description of how Project MYTRI affected students.

Keywords

mediation analysis; qualitative research; tobacco prevention; adolescents; India; psychosocial risk factors

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Corresponding Author: S. Lewis Bate, 7719 Shadow Hills Drive, Arlington, TN 38002, USA, slewisbate@gmail.com.

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Statistical mediation analysis is used in prevention and treatment studies to identify and describe mediating variables that intervene in the causal path between an independent variable and a dependent variable. A statistical mediation model tests the $X \rightarrow I \rightarrow Y$ relation, which specifies the independent variable (X) causes an intervening variable (I), which, in turn, causes the dependent variable (Y ; MacKinnon 2008). Because causal processes are often intricate and difficult to define, information from various sources and methods is valuable. Qualitative study can help unravel this complexity by offering further insight into causal mediation processes that can complement findings from quantitative mediation analysis. In this study, qualitative interviews were used within a group-randomized trial to gain better understanding of the causal mechanisms by which an intervention, Project MYTRI (Mobilizing Youth for Tobacco-Related Initiatives in India), operated to reduce tobacco use among students in India.

Qualitative methods may be used in mediation studies to identify possible mediators, explain causal mechanisms and the contextual factors within which they operate, search out alternative causal mechanisms not predicted by theory describe treatments as delivered and unintended outcomes or “side effects” of the treatment, understand participants’ meanings and experiences in a treatment, and elucidate as many possible alternative meanings of interactions, events, and processes as possible (Behrens and Smith 1996; Davidson 2000; MacKinnon 2008). Despite the potential utility, only a few qualitative mediation studies have been documented. For one, Dworkin and colleagues (2006) conducted a posttrial qualitative analysis to further understand how an HIV prevention intervention worked in terms of five key intervening factors. Other studies have used qualitative methods to identify or provide evidence in support of potential mediators (Lucksted et al. 2000; Mishra et al. 2005; Sormanti et al. 2001).

The qualitative method we used was based on the same theoretical framework as statistical mediation analysis. However, our goal was not to replicate quantitative mediation analysis using qualitative data. Rather, it was to use qualitative methods to gather more in-depth information on the causal processes and to do so in a way that complemented quantitative findings. Statistical mediation analysis supports examination of causal effects among variables by testing the action and conceptual theories (Judd and Kenny 1981; MacKinnon 2008; MacKinnon et al. 2002).

Action theory involves the process by which a treatment modifies selected mediating variables ($X \rightarrow I$). The test of the action theory indicates whether an independent variable influenced a mediator variable as theory suggested it would (Chen 1990). Conceptual theory refers to the process that relates theoretical mediators to the outcome variable ($I \rightarrow Y$) and is based on information from developmental theories as well as previously observed relations between intervening and outcome variables. The test of the conceptual theory investigates whether a mediator variable influenced a specified dependent variable according to theory (Chen 1990).

The aim of this analysis was to describe causal processes associated with the action and conceptual theories, which we termed action processes and conceptual processes, respectively. Using a grounded theory approach with interview data, we built narratives that

provided impressions of participants' intervention experience. Traditionally, these impressions emerge from the data and include observed behaviors as well as mental and social processes that reflect participants' beliefs, values, meanings, intentions, and expectations (Behrens and Smith 1996; Huberman and Miles 1985; Maxwell 2004a, 2004b). Process induction and a constant comparative technique were used to elucidate causal processes (Behrens and Smith 1996; Lincoln and Guba 1985). Causal processes were identified as action or conceptual processes, and a qualitative mediation model was drawn that mapped and connected the processes. Detailed descriptions of each action and conceptual process were built using the model and narratives and included: (1) qualitative evidence of the causal process; (2) important characteristics of the process; and (3) contextual factors that may have influenced the process. Compared to other qualitative approaches aimed at providing causal explanation, the unique aspect of this method was to differentiate and characterize the causal processes specifically as treatment to mediator processes (i.e., action processes) or mediator to outcome processes (i.e., conceptual processes).

Project MYTRI is a research study that directed the development, implementation, and evaluation of a multicomponent school-based intervention designed to prevent and reduce tobacco use among adolescents in Delhi and Chennai, India (Perry et al. 2008). Previous analyses indicated Project MYTRI was successful in reducing cigarette smoking and *bidi* (a hand-rolled, unfiltered cigarette) smoking among adolescents in both cities over the 2-year study period (Perry et al. 2009; Stigler et al. 2007). Tobacco use is expected to account for 13.3% of all deaths in India by 2020 (Reddy and Gupta 2004). Contributing to the epidemic are an estimated 5,500 youth who start using smoked or smokeless tobacco each day in India (Patel 1999). Project MYTRI is a collaborative effort between researchers and practitioners in the United States and India; it is funded by the Fogarty International Center (2002–2007) as part of a larger initiative to build capacity for conducting tobacco control research worldwide (Stigler et al. 2007).

A translational research process directed the design of the intervention. The intervention model was based on social cognitive theory and the social influences model (Baranowski et al. 1996; U.S. Department of Health and Human Services (USDHHS) 1994), the researchers' prior experience with school-based prevention programs and efficacy trials in the United States and India, and tobacco prevention models in the West (Perry et al. 2003; Perry et al. 2008; Perry et al. 2002; Reddy et al. 2002). The intervention model, shown in Figure 1, specified program components, defined the desired outcomes of the intervention, and identified psychosocial risk factors believed to predict tobacco use among urban youth in India (Stigler et al. 2007). As illustrated by the model, a causal relationship was assumed among the intervention components, psychosocial risk factors, and outcomes; the four intervention components were intended to alter the psychosocial risk factors in order to prevent or reduce tobacco use among youth in Delhi and Chennai. Thus, the intrapersonal, social-contextual, and environmental psychosocial risk factors were the targeted mediators to be altered by the intervention.

Evaluation of Project MYTRI began in 2004 and reflected a mixed-methods approach. Evaluation activities included student surveys, focus group discussions, tracking documents,

and observations. Statistical mediation analysis of the student survey data was performed to identify which of the psychosocial risk factors were significant mediators between the program and outcomes (Bate et al. 2009; Stigler et al. 2011). Mixed-effects models were used to adjust for dependence among scores due to clustered data (i.e., students nested within schools), and an analysis of covariance (ANCOVA) method was used to handle the repeated measures design (i.e., baseline and 1-year follow-up).

Analysis of qualitative data was used to complement the findings of the quantitative mediation analysis. Interviews were conducted with Project MYTRI leaders and staff persons to learn about the intervention as implemented and to characterize the action and conceptual processes associated with the targeted psychosocial risk factors. Specifically, the aim of the interviews was to seek information on the following research questions: (1) What attitudes, behaviors, and interactions characterize how participants (i.e., students, teachers, peer leaders) were affected by Project MYTRI? (2) Based on staff perceptions, what action processes (i.e., how the intervention as implemented influenced the psychosocial risk factors) and conceptual processes (i.e., how the psychosocial risk factors may have influenced students' tobacco use and intentions) took place to bring about program effects? (3) What other noncurricular factors—within the classroom or in the environment—were observed that might have influenced action processes, conceptual processes, or program outcomes?

Method

Participants

Interviews were conducted with individuals who observed and facilitated the implementation of Project MYTRI. Project MYTRI was a 2-year group-randomized trial involving students in 32 schools in Delhi and Chennai. Schools were stratified by city, matched by school type and gender, and randomly assigned to intervention groups ($n = 16$ schools) and delayed-intervention control groups ($n = 16$ schools). Approximately 4,400 students composed the intervention group. The implementation occurred over the 2004–2005 and 2005–2006 school years when students were in the 6th/8th grades and 7th/9th grades, respectively (Bate et al. 2009; Perry et al. 2008).

Eight community coordinators (CCs), a research assistant, a qualitative scientist, and the project director were interviewed. These staff persons had extensive field experience and were involved with students in both the intervention and the control groups. Each year of the implementation, CCs conducted onsite observations of Project MYTRI classroom sessions. Four CCs observed in schools in Delhi and four CCs observed in Chennai schools. Each CC was assigned to two schools and observed at least two sessions at each school. CCs also assisted in observations in schools other than those to which they were assigned. Only the eight CCs who observed sessions during the second year of the program were interviewed, although several had observed first-year sessions as well. CCs were not aware of the conceptual model underlying the intervention.

Seven 70-minute classroom sessions were conducted each year in the intervention schools. The classroom curricula were adapted from activities implemented in other social influence

programs (Perry et al. 1992; Perry et al. 2002; Reddy et al. 2002), and included knowledge components, skills building, and normative education that focused on altering psychosocial risk factors for tobacco use in this setting (Perry et al. 2008). The curricula involved collaborative games (e.g., “Spin the Wheel” to identify reasons why people do or do not start using tobacco), competitions (e.g., “street play” to role play resisting offers to use tobacco), and other activities (e.g., “Lights, Camera, Action!” to practice advocating against tobacco use) that were designed to be fun and interactive (Perry et al. 2008).

Activities were conducted in small groups of 10–15 students and were led by student-elected peer leaders who received training prior to classroom sessions. Similar to other social influences-based programs, peer leaders played a key role in the delivery of the classroom curricula in accordance with the belief that peers can effectively transfer knowledge, skills, and strategies to student participants, thus increasing the likelihood of program success (Tobler 1986). Teachers also received prior training and participated in implementing activities. Teachers and peer leaders were given instruction manuals and students worked from handbooks. Materials were provided in English, Hindi, or Tamil, depending on the primary language at each school. The program content addressed numerous forms of tobacco use, including cigarettes, chewing tobacco, and *bidis*. More detailed information on the intervention can be found elsewhere (Perry et al. 2008; Stigler et al. 2007).

Procedure

Interviews were conducted online with the use of Macromedia Breeze, a web-conferencing tool, in May 2006 during the later part of the second year of the intervention. The interview guide reflected a semistructured interview format. The guide was designed to elicit a portrayal of student participants’ interactions, attitudes, and behaviors from the perspective of MYTRI staff (e.g., “How did students respond to peer leaders?”), and to learn about action and conceptual processes that suggested how the program worked to bring about its effects on students (e.g., “In what way do you feel students were changed the most from their experience in the program? In what other ways were they changed? How could you tell?”; “What connections did you see between the skills students learned and their attitudes towards tobacco use?”). In addition, the guide was intended to draw out descriptions of contextual factors that may have influenced participant attitudes and behaviors (e.g., “What stood out to you about the environment of the classroom sessions? “What might have limited the quality of the students’ experience?”). Verbatim transcripts of the interviews were completed and stored on a CD.

Analysis

The interviews and qualitative data analysis were conducted prior to statistical mediation analysis of the student survey data and thus were not informed by the quantitative results. Figure 2 presents the analytic process used to investigate the action and conceptual processes. Coding and analysis were conducted with the use of Atlas.ti qualitative software (Muhr 2006). A grounded theory approach was applied, in which codes and conceptual categories were generated inductively from the data and used to construct themes that explained the experience of participants (Glaser 1992). First, open coding was utilized to label and categorize transcribed interview data. Initially, words, lines, or segments of data

were given codes such as “Students’ voicing their personal commitment,” “Peer leader sense of responsibility,” “Teacher sincerity level.” Next, the individual codes were used to form categories, which were revised and adjusted until they appropriately reflected the data. The final coding system included 22 categories related to students’, peer leaders’, and teachers’ attitudes, engagement levels, interactions, and changes as well as other topics related to parents, schools, and MYTRI staff and activities. Additional context-related categories represented region, family environment, classroom environment, socioeconomic status (SES), risk status, gender, curriculum year, grade level, and school type. The number of codes within a category ranged from 6 to 28. For instance, the category “Beliefs” was composed of 22 codes such as “Students’ beliefs about media messages” and “Students’ beliefs about people who smoke.” Based on the categories and codes, a narrative was written that described themes related to participants’ attitudes, behaviors, levels of engagement, and interactions. Contextual and environmental factors were also characterized.

To identify action and conceptual processes, process induction was performed, in which the data were searched for potential causal paths that were then tested against other cases (George and Bennett 2005); however, the inductive process was accompanied by a theoretical predisposition toward a priori hypotheses of mediating factors based on the espoused program theory as depicted in Figure 1. To help trace processes in the data, Atlas.ti software was used to assign links between categories, codes, and concepts. The links were used to pull segments of data that pertained to relationships between like factors (e.g., categories or topics). For example, some of the assigned links included: (1) Beliefs and Skills, (2) Confidence and Advocacy, and (3) Student Engagement and Intentions. Numerous links were assigned, and each segment of data within a link was searched for a single causal process or multiple causal processes, if evident. Then, in the manner of a constant comparative technique, processes delineated by one segment of data were compared to processes identified by the next segment of data within the same link; agreement bolstered evidence and description of the process, whereas disagreement called for either altering the process or adding an additional process. The use of links was particularly beneficial for separating the action and conceptual processes since links that represented direct associations with outcomes referenced conceptual processes, and all others represented action processes.

Additional links were used to identify potential moderators, such as “Parents influence student’s intentions” and “Teacher characteristics affect implementation.” Atlas.ti allows criteria-based searches, and, by simultaneously pulling links that represented relationships between like factors and those associated with potential moderating factors, it enabled investigation of how particular moderators influenced specific action or conceptual processes.

In the final stage of analysis, a qualitative mediation model was drawn that mapped the action and conceptual processes. The model was used to facilitate discussion of the causal processes. Descriptions of each path in the model—which represented action and conceptual processes—were composed, based on: (1) narratives of students’ experiences and interactions in the program; (2) information on moderators; and (3) the mediation model. Descriptions included qualitative evidence of change (i.e., indications the causal process

existed), important characteristics (i.e., key elements) of the causal process associated with the path, and contextual influences such as sociocultural or environmental variables that may have influenced the process.

Results

The qualitative mediation model is shown in Figure 3. The original program model specified only a general outcome to reduce and prevent tobacco use among participants. Therefore, the qualitative data were searched for more specific outcomes. As illustrated in the model, those that emerged as the central outcomes for the program as implemented included: (1) not using tobacco as indicated by refusing offers and quitting former tobacco use; and (2) advocating against others' tobacco use. The psychosocial risk factors that were important mediators between the intervention and tobacco-use outcomes included students' knowledge, skills, beliefs about tobacco, intentional beliefs, advocacy beliefs, and self-efficacy beliefs.

A summarized narrative of *one* of the causal processes—the action process linking Project MYTRI and students' knowledge about tobacco use—is provided here as an example of the type of narratives that were composed to describe the action and conceptual processes. Knowledge about the negative effects of tobacco use is not typically a critical element of tobacco prevention programs in the West, but in this study knowledge was a relevant factor (Stigler et al. 2011). Statistical mediation analyses indicated students' knowledge about tobacco use was a significant mediator of the program's effect on reducing students' intentions to use tobacco (Bate et al. 2009; Stigler et al. 2011). Descriptions of the other action and conceptual processes shown in the qualitative mediation model are discussed elsewhere (Bate 2007).

The Action Process: Project MYTRI and Students' Tobacco Knowledge

The association between Project MYTRI and students' tobacco knowledge was fundamental to the potential influence of Project MYTRI since students' gain in knowledge about tobacco use was associated with changes in other psychosocial risk factors, including their beliefs about tobacco, their own tobacco use (intentional beliefs), the necessity to advocate against tobacco use (advocacy beliefs), their self-efficacy to refuse tobacco, and their self-efficacy to inform others about the ills of tobacco use, as shown in Figure 3. These changes were, in turn, links to the program's outcomes.

Qualitative Evidence of Change in Students' Knowledge

On the whole, students began the intervention with very little knowledge about tobacco, although CCs made different assessments as to exactly how much knowledge students had prior to the intervention. Some CCs felt students knew very little and did not even know it was harmful; others believed some students knew tobacco use posed some sort of risk but were unaware of anything specific about the consequences of tobacco use or tobacco-related issues. Several CCs said that Indian tradition contributed to students' misconception about tobacco use. One CC stated:

I think the general belief of the students here was that tobacco chewing is a very, you know, old practice in India. It has been practiced in India for quite a long time.

We were having maharajas and kings who were doing it. So they always thought that nothing was wrong with it.

CCs generally agreed that, prior to implementation of MYTRI, private school students (who were generally more affluent) were more likely than government school students (less affluent) to know a little about tobacco use, but their knowledge was still limited.

The first-year implementation of Project MYTRI was described as “a lot of revelation” for private school and government school students alike. CCs felt strongly that students gained a great deal of knowledge, especially about the harmful effects of tobacco, but also about the short- and long-term physical effects of tobacco and the negative social, environmental, and economic effects of tobacco. CCs recalled that students were “taken by surprise” and “shocked” by what they learned about tobacco. One CC recalled:

The students don't have a very good idea about the harmful effects of tobacco before the MYTRI project, but when the MYTRI program is being implemented, they got to know, okay, even when I use tobacco some of the body parts are being affected. Some had a belief that they would only have a cough.... They were all really shocked that such a harmful and ill effect is being caused because of using tobacco.

CCs felt that students' knowledge about tobacco continued to increase during the second-year curriculum. One CC said the second year was an “eye opener to most of the students” since it helped students “look at a maze of real-life problems on what exactly would happen if you get addicted to tobacco.” In addition, students learned more about tobacco-related policy and laws.

According to those interviewed, the depth of students' knowledge gain was evidenced by the way students demonstrated their knowledge during activities such as the street play and debate competition, and they showed signs of processing the information thoroughly during numerous MYTRI activities. For instance, a Chennai CC said that the way students handled questions, considered alternative answers, and communicated their answers in a convincing fashion during the Pressure Points activity indicated to her they were truly processing and learning about the ill effects of tobacco use.

Key Elements of the Action Process

Generally, four key elements characterized the action process linking students' knowledge gain and Project MYTRI: student engagement, teacher involvement, peer leadership, and contextual influences. Essentially, these elements were factors that were influential in *how* students' gained knowledge and *to what extent* students learned about tobacco.

Student engagement—Students' knowledge gain was in part a result of the extent to which they were engaged in program activities. Student engagement was based on interest level and depth of involvement in activities. As might be expected, the more interested students were in activities, the more involved they were. Generally, students showed more interest in year 1 activities than in year 2 activities based on the nature of the curriculum. First-year activities were preferred because they were fun oriented and creative. For

instance, the first-year curriculum included numerous games, competitions, and the street play. The second-year curriculum focused more on shaping advocacy skills, so activities were more thinking oriented (i.e., writing, reading, preparing), which some students found “burdensome” or “boring.” CCs explained students wanted to be entertained by games and competitions that served as a diversion from the normal school-day routine. Thus, during those activities, students were more interactive and more involved. A CC recalled students’ reactions to the second-year curriculum:

It was more of thought; they had to write, they had to discuss. So, I felt that the students were not much interested. They preferred a more competition-based or a game-based program. What they told me was that, “Ma’am, all these eight periods ... we study and the only diversion for us is MYTRI project. We need something more which will deviate us.”

Regardless of grade level, students preferred entertaining activities. Yet, despite a preference for fun versus thinking activities, many students put forth effort during serious activities. A CC explained:

(Students) found it a little bit of a burden the year two project ... because they had to prepare a debate and you know all sorts like this—they were a bit overburdened. But, the students are given a very good opinion about the MYTRI project. They all love it. Whenever I go to school they’ll ask me, “When will you come back, Ma’am, for the MYTRI project?”

Thus, although academically oriented activities did seem to temper some students’ interest level and engagement in those particular activities, students remained interested in the program overall.

In addition to elements of the curriculum, the *way* activities were implemented was important to students’ engagement level and subsequent knowledge gain. Students themselves were factors in the implementation in how they interacted with one another. Student interactions during MYTRI were, for the most part, characterized as cooperative, helpful, and full of discussion. For example, a CC commented that students “do all the activities very interactively. They discuss among themselves, they help each other.” Another explained, “If somebody does not understand the question, immediately they consult with each other, they understood it properly, and they give an answer.” This helpful interaction seemed pervasive. It was generally agreed that the positive nature of students’ interactions facilitated their learning.

Teacher involvement—Teacher attitudes and involvement were another key element of the action process between Project MYTRI and students’ knowledge gain. Teachers had the potential to influence student engagement levels. For instance, an enthusiastic and sincere approach from the teacher generally had the power to stimulate a similar attitude in students. A CC in Chennai observed that in one of the private schools, students were more interested in their homework and exams than in MYTRI. Some teachers were able to successfully inspire the students to have greater interest and enthusiasm toward the project, despite the exams. Likewise, a lack of interest on a teacher’s part could elicit a similar disinterest among students. A CC recalled that in one school, the teachers were not involved in MYTRI and “it

showed on the children,” who only took “a little” from the activity. That is not to say all student interest in the program was generated by teachers or that teachers were always able to lift the interest of students; nor is it to say negative students’ attitudes were evoked by teachers. For instance, in Delhi government schools, some teachers exhibited low interest in the intervention, but students still showed a great deal of interest. Overall, however, teachers had the potential to affect student attitudes.

According to interviewees, teachers had the potential to influence students’ experience in MYTRI because, in India, teachers are viewed as authority figures and exemplars to the students. CCs described teachers as role models who guided students and who students looked up to, listened to, and obeyed. A Chennai CC explained:

When the teacher says that these are some of the consequences of using tobacco ... when the teacher explains, see if you’re still going to smoke, know that none of your friends will come and talk to you. When this kind of information is being given to them ... they take them to the heart.

CCs believed that students experienced greater learning about tobacco when teachers were highly involved in activities, emphasized the harms of tobacco use, and shared personal insights and real-life examples.

Peer leadership—Peer leaders also affected the implementation of classroom activities and thus influenced students’ tobacco knowledge gain. Peer leaders could encourage student involvement in activities by effectively leading discussions and activities. Predominantly, peer leaders performed their role successfully. They were described as having a proper command of activities and the ability to give appropriate instructions to their group members, which led to smooth activities and effective classroom discussions. Some CCs even felt peer leaders were the primary implementers of the program and actually played a greater role in implementing activities than teachers because the peer leaders were more interested, more prepared, and understood the activities better than teachers.

In some classrooms, part of the reason peer leaders played such a central role in activities was because the teachers were not fully participating so the peer leaders had to bridge the gap. Although peer leaders were meant to have a central role in the delivery of the intervention, in some cases, they assumed an even greater capacity than expected. In both Chennai and Delhi, there were some teachers who, for a variety of reasons, were either not prepared, not focused, not available, or not interested in MYTRI activities. In some of those classrooms, peer leaders were observed to successfully take the lead in activities. For example, in a private school in Chennai, a teacher told the peer leaders he would only “sit and observe.” In response, the peer leaders conducted the activity from beginning to end and were “highly enthusiastic in every bit of the activity ... covered everything, made good discussions, and wrapped it up perfectly.” Several CCs observed similar instances when peer leaders moderated the potentially negative result of a less-involved teacher and helped elicit a positive outcome for students (e.g., continued learning).

Peer leaders were not, however, always willing or able to bridge the gap when teachers were not full participants. For example, a CC recalled an occasion in a government school in

Delhi when a teacher was distracted and did not conduct the MYTRI activity and the peer leaders did not successfully run the activities. The CC observed chaos in the classroom, such that students were talking about movies, sharing jokes, and playing games instead of completing the activity. In such instances, students' knowledge gain was limited.

Contextual influences—School type and gender were two contextual factors that appeared to influence student engagement levels and thus were potential moderators in the action process between Project MYTRI and students' knowledge gain. In Delhi and Chennai, students in government schools generally tended to show more enthusiasm in MYTRI activities than private school students. Government school students were mostly from low SES backgrounds ranging from the “poor, lower middle class” to the “slums,” and government schools did not have the resources to support extracurricular activities. Consequently, students had very limited exposure to nonacademic opportunities and were therefore very excited to participate in MYTRI activities. In addition, the government school curriculum was described as minimally interactive, in which students “just get dictation from teachers.” MYTRI was a very different type of school experience for them, as described by a CC:

(MYTRI) has been a one-of-a-kind opportunity for them to indulge in activities which are so very different from their monotonous classroom things and they have had an opportunity to interact with their peers and to play fun, learning games that were part of our curriculum.

Also, several interviewees believed the intervention was “the only way” government school students could have been exposed to information on tobacco use. Because the information was not available elsewhere, government school students were very interested to learn about tobacco through the program.

Overall, the same level of enthusiasm was not demonstrated by students in private schools. Engagement levels of private school students were described as being more diverse. Some students were very involved and participated “wholeheartedly” in the program, whereas others lacked interest. One CC noted, “In government schools, they will interact with us so freely but the private school students ... will be so reserved and they won't respond properly.”

Several explanations were given to account for the reserved attitude of some private students toward MYTRI. First, private school students were from more affluent backgrounds, and private schools were able to offer numerous extracurricular activities to students. Therefore, private school students did not see MYTRI as an extracurricular outlet as did the government students. Second, private school students tended to be more focused on their academics than on extracurricular activities. Third, private school students were more likely to have encountered information about tobacco use either at home or in another program. This is not to say that private school students did not participate. Rather, they were less consistent in their participation than government students. Hence, school type was a potential moderator of students' knowledge gain via affecting student attitudes and participation in MYTRI activities.

Gender was another potential moderator of students' engagement levels and subsequent knowledge gains, particularly in government schools where girls participated more in MYTRI activities than boys. A CC explained, "The girls would be the first to say, 'I'm ready to do this' as compared to the boys." Girls were generally described as being more "prepared" and "responsible" than the boys. Some CCs felt it was simply a reflection of common gender differences at that age, in which boys acted "cool" in doing things and girls put forth their "best" effort, whether toward MYTRI activities or otherwise. An alternate explanation had to do with the culture surrounding government school students from low SES environments. A CC explained,

I think the knowledge level of boys is much more higher in India than girls. Because girls in government school they can't go out for much, they can't watch TV so much. So they would like to have the knowledge.

It was believed that because government school girls were exposed to less information and experiences than boys, girls had a greater thirst for new information and were more receptive than boys to learning about tobacco use. Numerous other contextual factors were discussed as important influences on the effect of the intervention, but school type and gender were specifically related to the action process linking MYTRI and students' tobacco knowledge gain.

Discussion

This qualitative study was part of a mixed-methods evaluation. Statistical mediation analyses were conducted previously to test whether Project MYTRI changed the psychosocial risk mediators, which, in turn, altered students' tobacco-use behaviors and intentions (Bate et al. 2009; Stigler et al. 2011). Changes in reasons to use tobacco and in normative beliefs were particularly important for reducing students' tobacco-use behaviors and intentions. Other significant mediating variables were knowledge of tobacco's negative health effects, beliefs about social consequences, reasons not to use tobacco, and advocacy skills self-efficacy. Findings from this qualitative study converged with some of the statistical findings and provided additional information about how Project MYTRI achieved its effects.

Key mediating variables emerging from this qualitative analysis were students' knowledge about tobacco, beliefs about tobacco, skills development, intentional beliefs, advocacy beliefs, and self-efficacy beliefs. Skills development and advocacy beliefs were new variables identified from the qualitative data and, accordingly, were not tested in the quantitative analysis. Two specific outcomes were described by the qualitative data: (1) not using tobacco as indicated by quitting former tobacco use and refusing offers to use; and (2) advocating against tobacco use. Data suggested reciprocal causation between the two outcome variables (Flay et al. 1999).

The qualitative model yielded a detailed sketch of the mediation processes. More specifically, it specified the causal chain, designated the action and conceptual processes, and showed that multiple causal processes led to each outcome. Descriptions accompanying the model highlighted distinctive elements of each process and complemented statistical results. For example, advocacy skills self-efficacy was a significant mediator in the

quantitative study. The qualitative data showed that students' confidence in using their advocacy skills increased as they gained knowledge about the harmful effects of tobacco use and developed communication and other personal skills. Communication skills were strengthened through program activities that encouraged students to express their beliefs about tobacco use and to do so in multiple settings, such as in small groups, a debate competition, and a student parliament. Interpersonal skills grew as students interacted informally with teachers and others outside their circle of friends during intervention activities.

The qualitative findings also complemented statistical findings by highlighting contextual factors that were potential moderators of the relations between the intervention, mediators, and student-level outcomes. School type, city, grade level, gender, sociocultural beliefs about gender, school environment, and home environment were contextual factors that may have influenced how students experienced the program and how effectively students internalized the message. Further research is needed to clarify the effects of the potential moderators.

For Project MYTRI and similar programs, understanding the effects of the interrelationships between students, peer leaders, teachers, and schools is of particular interest. Peer leaders, teachers, and school leaders each served as role models to the students and had the potential to influence students' experience in the intervention, which could have influenced the causal mechanisms between the program and the outcomes. According to the interview data, positive relationships among the peer leaders, students, and school administrators provided the most favorable conditions for fostering a positive experience for students. A central question that arose out of the results was to what extent could one role model moderate the performance of the others, in the absence of the ideal scenario? For instance, could the teachers' role be minimized without reducing program impacts? Could teachers and peer leaders compensate for lack of school support? The interview data provided some insight into these questions, but further study would be required to more fully understand the interrelationships.

Of the four intervention components (i.e., classroom curricula, school posters, parent postcards, peer-led health activism), only the classroom curricula component was addressed in the current study. Since the program was designed to reach its goals via all four components, it would be of interest to understand how the mediators and outcomes were affected differentially by the separate program components. Multiple sources of data would be useful to validate findings and supplement information on the action and conceptual processes.

A limitation of this study was that interviews were not conducted at the student level but with MYTRI staff members. Additionally, the number of interviewed staff members was small, but these individuals were the only appropriate staff interviewees in that they had extensive field experience with students in both study conditions. Experiences pertaining to students, peer leaders, and teachers were based on what interviewees either observed themselves or learned from other sources. To reduce bias as much as possible, interviewees were asked to share their impressions of the authenticity of events and discuss factors they used to make judgments of authenticity, as well as to identify sources of information. Also,

descriptions of both positive and negative events were sought during the interviews. Although we collected staff-level information, data gathered were informative and useful, especially given the dearth of available evidence in this prevention research setting.

Our interview guide drew considerable information on action processes, but limited data on conceptual processes. It may have been difficult for interviewees to observe and/or describe conceptual processes, or certain interview questions may have been ineffective. For example, the question “What connections did you see between the skills students learned and their intentions to use tobacco?” garnered little to no response. A better question might have been “When did students’ express any intentions to use tobacco, either positive or negative?” followed by probing questions to delineate instances. Another challenge in the interviews was a language barrier, which might have prevented some interviewees from either understanding the interview questions or fully communicating their responses. Interviewees were fluent in English, although English was not necessarily their primary language.

In general, intensive study through observations, in-depth interviews, focus groups, and other methods can be used to build detailed descriptions or narratives that provide revealing “pictures” of the action and conceptual processes (Maxwell 2004a, 2004b). Since the literature hosts so few qualitative mediation studies, much opportunity exists for further study of how qualitative methods may be used to elucidate mediation processes. Numerous inductive and deductive techniques, including grounded theory, process tracing, pattern matching, analytic induction, and constant comparison, among others, may be used for qualitative investigation of mediation processes depending on the research purpose (Behrens and Smith 1996; Campbell and Stanley 1966; Lincoln and Guba 1985; Scriven 1974).

Understanding causal mechanisms and methodologies for evaluating these mechanisms is crucial for the development of treatment and prevention programs in the health and social sciences. Stakes are high in terms of financial and human resources available in prevention and research contexts, and, importantly, for participants experiencing the outcomes of prevention programs. Given the complexity of identifying and understanding mediation processes, investigation through a program of research involving numerous studies and methods is ideal (MacKinnon 2008). Combining quantitative and qualitative methods to study mediation processes can lead to a more comprehensive and contextualized view of causal mechanisms at work in a program or treatment.

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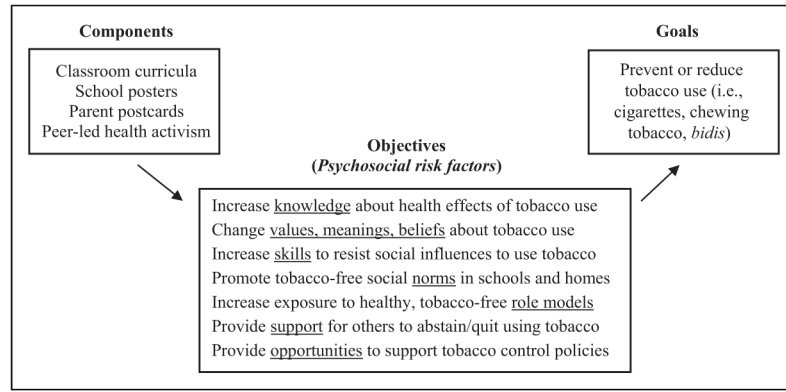


Figure 1. Behavioral intervention model for Project MYTRI.

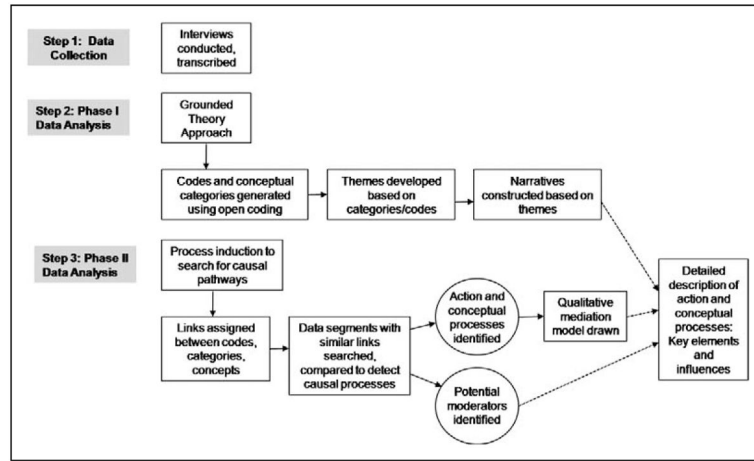


Figure 2. Steps of the qualitative research process to identify and describe action and conceptual processes associated with Project MYTRI implementation.



Figure 3. Qualitative mediation model depicting the causal path between Project MYTRI and student-level outcomes.