Published in final edited form as:

Soc Sci Med. 2010 September ; 71(5): 891–897. doi:10.1016/j.socscimed.2010.06.002.

Westernization and Tobacco Use Among Young People in Delhi, India

Melissa H. Stigler, Poonam Dhavan, Duncan Van Dusen, Monika Arora, K. Srinath Reddy, and Cheryl L. Perry

Social Science and Medicine

Abstract

Few studies have explored the relationship between acculturation and health in non-immigrant populations. The purpose of this study was to investigate the relationship between “westernization” and tobacco use among adolescents living in Delhi, India. A bi-dimensional model of acculturation was adapted for use in this study to examine (a) whether young people's identification with Western culture in this setting is related to tobacco use and (b) whether their maintenance of more traditional Indian ways of living is related to tobacco use, also. Multiple types of tobacco use common in India (e.g., cigarettes, bidis, chewing tobacco) were considered. Socioeconomic status (SES), gender, and grade level were examined as potential effect modifiers of the relationship between “westernization” and tobacco use. The study was cross-sectional by design and included 3,512 students in eighth and tenth grades who were enrolled in 14 Private (higher SES) and Government (lower SES) schools in Delhi, India. A self-report survey was used to collect information on tobacco use and “westernization.” The results suggest that young people's identification with Western influences may increase their risk for tobacco use ($p < 0.001$), while their maintenance of traditional Indian ways of living confers some protection ($p < 0.001$). Importantly, these effects were independent of one another. Boys benefitted more from protective effects than girls, and tenth graders gained more consistent benefits than eighth graders in this regard, too. Negative effects associated with identification with Western ways of living were, in contrast, consistent across gender and grade level. The positive and negative effects of acculturation on adolescent tobacco use generalized across all tobacco products considered here. Future interventions designed to curb youth tobacco use in India may benefit by paying closer attention to cultural preferences of these young consumers.

INTRODUCTION

India, like many emerging economies worldwide, is in the midst of an epidemiologic transition characterized by rising rates of chronic disease, driven largely by behavioral risk factors that are modifiable, like tobacco use (Reddy, Shah, Varghese, & Ramadoss, 2005). In the first two decades of the 21st century, India will experience the fastest increase in deaths related to tobacco worldwide, escalating from 1% of all deaths to more than 13% (Reddy & Gupta, 2004). This transition appears to be fueled by increasing urbanization, industrialization, and globalization (Reddy et al., 2005). These factors are changing the way people live and the environments in which they reside, in ways that may escalate behavioral risk. While the effects of urbanization and industrialization on chronic disease and its related behavioral risk factors are well-documented, the effects of globalization are less well-specified (Reddy et al., 2005).

Globalization refers to the increasing connectivity of our world and its cultures, driven by the exchange of people, ideas, and goods, often through key media outlets and marketing efforts (Tomlinson, 1999). This connectivity extends through economic, political, social, and

cultural spheres of our lives (Tomlinson, 1999). Its relationship to the growing global burden of chronic disease through economic and political channels is well-documented (e.g., Beaglehole & Yach, 2003; Woodward, Drager, Beaglehole, & Lipson, 2001), while its relationship to chronic disease via social or cultural conduits has been studied much less extensively, by comparison. The latter topic of study is analogous to investigations of the impact of acculturation on the health of immigrant populations, worldwide. Recent reviews of over 100 studies of Hispanic immigrants in the United States (Lara, Gamboa, Kahramanian, Morales, & Bautista, 2005) and more than 50 studies of Asian immigrants in countries like the United States, Canada, Australia, New Zealand, and the United Kingdom (Salant & Lauderdale, 2003) illustrate that acculturation can have positive (e.g., increased utilization of health services), negative (e.g., increased alcohol use, poorer dietary intake), or mixed effects (e.g., mental health) on health-related outcomes.

Although the body of literature on the effect of globalization on health is growing (e.g., Almeida-Filho, 1998; Furr, 2005; Pigg, 1995), no commonly accepted theoretical framework(s) exists to describe and explain the direct and indirect effects that diverse aspects of globalization can have on health (Woodward, Drager, Beaglehole, & Lipson, 2001). The same can be said of research on the effect of acculturation on the health of immigrant populations (Abraido-Lanza, Armbrister, Florez, & Aguirre, 2006). Arnett, as example, argues that the central consequence of globalization, as it relates to culture, is that it influences issues of identity (Arnett, 2002). He suggests that “most people in the world now develop a bi-cultural identity, in which part of their identity is rooted in their local culture while another part stems from their awareness of their relation to the global culture” (p.777; Arnett, 2002). His theory is informed by modern perspectives in acculturation, or cultural adaptation, research in immigrant populations, which support this bi-dimensional framework (e.g., Berry, 1997; Rogler, Cortés, & Malgady, 1991).

In contemporary India, the most pervasive influence, by far, on what defines “global culture” is that of the West, especially that from the United States and the United Kingdom. English language movies, music, and television shows are prominent and popular here, as are Western goods, like food, soft drinks, and clothing. McDonalds and Marlboros now punctuate shopping possibilities here, offering consumers the opportunity to purchase Maharaja Macs (Bansal, John, & Ling, 2005; Pingali, 2006) and brands of cigarettes popular with youth in the West (USDHHS, 1994). The success of *Slum Dog Millionaire* demonstrates, too, how Western media have been adapted for use in this setting. In response to growing globalization, market researchers and advertising agencies in India now commonly craft hybrid images and messages that reflect this new bi-cultural identity – one that is local (i.e., Indian) and one that is global (i.e., Western) (Mazzarella, 2003). Culture is commodified in this context (Mazzarella, 2003).

Arnett's focus is also on adolescents, as they are integrally involved in and affected by this process of globalization. Compared to children or adults, adolescents are more exposed to, and perhaps seek out, different types of media, like music, movies, television, and the internet, as they develop towards adulthood. These channels are used to facilitate the exchange of global ideas and information, making possible subsequent changes in beliefs and behaviors, especially for adolescents (Schlegel, 2001). Teens are often the target of specific marketing efforts, as well, which are increasingly focused on selling “global brands” – the large majority of which originate in the West (e.g., Nike, Coca Cola) – to “global teens,” given similar patterns of consumption among urban adolescents worldwide (UNDP, 1998). Often, these marketing efforts reflect and can capitalize upon key developmental tasks of adolescence, particularly identity formation, especially if local role models are linked to “global products” (Arnett, 2002; Mazzarella, 2003; Perry, 1999). The latter practice is common in India today (Mazzarella, 2003).

Arnett's theoretical focus on teens is relevant here because most tobacco use in India begins in adolescence (Reddy & Gupta, 2004). Adolescence is the only stage of development where tobacco use could be viewed as “functional,” serving key developmental tasks, such as identity formation, as well (Perry, 1999). Some reports suggest the prevalence of tobacco use among young people has remained steady in recent years (Sinha et al., 2008), while others imply it may be rising, instead (Reddy, Perry, Arora, & Stigler, 2006). According to the most recent Global Youth Tobacco Survey (GYTS) in India, in 2006, 3.6% of students 13–15 years old report currently smoking cigarettes and 11.9% report currently using other types of tobacco products, like bidis or gutkha (Sinha, et al., 2008). Compared to other countries in the West, like the United States, the rate of cigarette smoking among youth in India is lower (vs. 13.0%, in U.S.), while the use of other tobacco products is similar (vs. 10.6% in U.S.) (Warren et al., 2007).

The aim of this study is to examine the relationship between globalization and tobacco use among adolescents in Delhi, India, via this culture shift. Given the predominant influence of the West in India, globalization is further specified as “westernization” in this study. This, in turn, is defined as a type of acculturation whereby people in non-Western countries (e.g., India) come under the influence of Western culture in such matters as language, lifestyle, values and/or beliefs (Salant & Lauderdale, 2003). Research on “westernization” in other Asian countries worldwide suggests that although certain aspects of the health and cultural transitions in these countries may appear analogous, the way(s) in which “westernization” is experienced can be different, as can its impact on health outcomes and behavior (Furr, 2005; Pike & Borovy, 2004).

METHODS

Study design

This study is cross-sectional by design. It is a secondary analysis of data collected in Project MYTRI (Mobilizing Youth for Tobacco-Related Initiatives in India), a group-randomized trial designed to test the efficacy of a tobacco prevention intervention for youth (Perry, Stigler, Arora, & Reddy, 2009). This study focuses on the survey that was administered to students in 2006. In this year, an addendum was appended to the survey that included measures of the construct of interest in this study, “westernization.” The study includes a convenience sample of 14 schools that participated in Project MYTRI this year. Random sampling of schools is not feasible in large-scale, group-randomized trials like these (Murray, 1998). However, the schools are representative of the types of schools in this setting (Perry, et al., 2009). For example, half of them were Private schools (middle-upper SES) and half were Government schools (low SES). Ethical clearances were obtained from appropriate ethics boards in India and the United States, which required passive parental consent and active student assent to participate in the survey.

Participants

All students associated with Project MYTRI in these schools were eligible for this study and invited to participate. Most of these students were in the 8th and 10th grades in 2006, as the study had begun when they were in 6th and 8th grades in 2004. As some students did not progress academically over time, the sample for the 2006 survey also included students in the 6th, 7th, and 9th grades. The number of eligible students for the study was 4483. Of these, 4403 (90.1%) participated in the tobacco and “westernization” surveys. Non-participants included parent refusals (0.4%), student refusals (0.1%), and student absentees (9.3%). Make-up surveys were conducted to reduce the number of absentees. Response rates were somewhat lower in Private schools (86.0%) compared to Government schools (93.4%), but did not vary by grade. Due to small sample sizes, 6th, 7th, and 9th grade students were

excluded from this analysis. The final analysis sample includes the 3512 students who were in the 8th and 10th grades. Of these, 60% were boys (v. girls), 49% attended a Private (v. Government) school, and 62% were in 8th (v. 10th) grade. The mean age of the 8th and 10th graders was 13.3 and 15.0 years, respectively.

Data collection

Participants completed self-administered surveys specific to tobacco use behaviors and “westernization.” More information about specific measures on the surveys is detailed below. Data were collected in schools by two-person teams of trained research staff. Confidentiality of students’ responses was assured. A unique student identification number not recognizable to the student, parent, principal, or teacher was used to track the administration of these surveys and to link the tobacco use behaviors with the measures of “westernization,” as well. Surveys were administered in either Hindi or English based on the medium of instruction in each school. These surveys underwent a rigorous pilot procedure with more than 200 students before the implementation of this study to ensure reliability and validity. As part of this, the surveys were translated (English to Hindi) and back-translated (Hindi to English) for translation reliability. No differences in responses were noted between those students surveyed in different languages.

Tobacco use—The tobacco survey is adapted from similar instruments, like the Global Youth Tobacco Survey (Warren et al., 2008). The measures of tobacco use behaviors included questions about ever (i.e., lifetime) use, past year use, and current (i.e., past month) use of chewing tobacco, bidis (i.e., hand rolled, flavored cigarettes), and cigarettes. All of these types of tobacco use are problematic among youth in India (Reddy & Arora, 2005). Intentions to chew or smoke tobacco in the future (i.e., when they got to college, and when they were an adult) were measured, too. All questions were dichotomized in analyses to reflect no use (or no intentions) or use (or intentions). Further information about these measures can be found in previous publications by this team (Perry et al., 2009; Reddy et al., 2006; Stigler et al., 2006).

“Westernization.”—The “westernization” survey is adapted from instruments used to measure acculturation in immigrant populations (e.g., ARMSA-II; Cuellar, Arnold, & Maldonado, 1995). Two dimensions of “westernization” were measured: (a) maintenance of the culture of origin (i.e., Indian) and (b) identification with the new culture being introduced (i.e., Western). A mirror technique was employed to evaluate these two dimensions across multiple domains. That is, all of the questions were asked from an (a) Indian and (b) Western perspective. Four domains of culture were measured, in turn: preferences for (a) language; (b) media; (c) food; and (d) consumer goods. The measure, therefore, is behaviorally-based and consistent with an orthogonal approach to cultural identification (Cabassa, 2003; Salant & Lauderdale, 2003).

The instrument included 24 questions, total. The list of questions appears in Table 1, organized by dimensions and domains. The responses to each item were on a four point Likert scale: (1) never, (2) sometimes, (3) often, (4) very often. Two multiple item summative scales (n=12 items/scale) were created: (a) an Indian scale and (b) a Western scale. Mean scores, overall, were 21.62 for the Indian scale and 17.31 for the Western scale. The theoretical range for both scales was 0 to 36. Cronbach’s alphas were 0.84 for the Indian scale and 0.90 for the Western scale. Scores on these scales were moderately correlated (Pearson’s $r=0.34$, $p<0.01$).

Socio-demographics—Key demographic indicators of interest in this study included gender, grade level, and socioeconomic status. Gender was measured by self-report, using a

single indicator on the tobacco survey (i.e., “Are you a boy? girl?”). Information about grade level was collected during administration of the tobacco survey from school officials. These analyses focus on students in the 8th and 10th grades. SES was measured using school type, a variable often applied as a proxy indicator in this setting (e.g., Sharma, 1999). In India, Private schools typically cater to students from higher SES backgrounds, while Government schools typically cater to students from lower SES families. Private schools usually cost much more to attend than Government schools, which offer enrollment for a nominal fee (Sharma, 1999).

Data analysis

First, differences in the Western and Indian scales by key sociodemographic factors (e.g., gender, etc) were examined in univariate linear regression models. Differences in each scale (i.e., Western or Indian scale) were investigated, separately, by these characteristics.

Then, logistic regression was used to study the association between “westernization” and tobacco use. Each measure of tobacco use was used as a dependent variable in separate models. Both measures of “westernization” were included as independent variables, so that the effect of one dimension of “westernization” (e.g., Western) is adjusted for the effect of the other (e.g., Indian), given this bi-dimensional approach to measurement (Rogler et al., 1991). Gender, school type (SES), and grade level were considered as possible effect modifiers. When significant interactions were observed (e.g., gender), models were stratified (e.g., to consider relations among boys and girls, separately). Models were adjusted for other sociodemographic variables (e.g., school type, grade level, age), when not stratified by them, in order to control for potential confounding. Tobacco use varies by gender, school type (SES), grade level, and age (Reddy et al., 2006), as did our measures of “westernization” (see Table 2), thus the use of these covariates. None of the relations investigated here varied by study condition ($p>0.50$).

Mixed-effects regression models were used to investigate all associations described above. This type of regression model is appropriate for studies like these, since students are sampled within schools. School was specified as a nested random effect (Raudenbush & Bryk, 2002). The level of statistical significance was set at $p=0.05$ for all analyses. All analyses were conducted in STATA v10 using *xtmixed* and *xtlogit*, which uses a maximum likelihood estimation method to calculate the appropriate regression coefficients, reported in Tables 2, 3, 4, and 5.

RESULTS

The distribution of “westernization” scale scores by selected demographic factors is presented in Table 2. The Western and Indian scale scores both varied by grade level, school type, and age. In addition, the Indian scale score varied by gender, also. Tenth graders had a significantly higher score on the Western and Indian scales, when compared to eighth graders ($p<0.001$). As age increased, scores on the Western and Indian scales increased, also ($p<0.001$). Private school students had a significantly higher score on the Western scale, compared with students enrolled in Government schools ($p<0.001$), while Government school students had a significantly higher score on the Indian scale, compared to students enrolled in Private schools ($p=0.011$). Although there were no differences between boys and girls in the Western scale score ($p=0.688$), the Indian scale score was higher among girls compared with boys ($p=0.001$).

The association between the Western scale and the different measures of tobacco use did not vary across gender, grade level, or school type ($p>0.10$). Therefore, these results are presented for the entire sample, in Table 3. Overall, higher scores on the Western scale were

significantly associated with more tobacco use ($p<0.001$). This trend was consistent across all measures (i.e., ever use, past year use, past month use) and all types (i.e., cigarette smoking, bidi smoking, and chewing tobacco) of tobacco use, as well as for both measures of intentions to smoke or chew tobacco in the future (i.e., use in college, and use when an adult) ($p<0.001$). The magnitude of these associations was somewhat larger for smoked forms of tobacco versus chewing tobacco, and somewhat larger for more recent use compared with less recent use.

The association between the Indian scale and the different measures of tobacco use, by comparison, *did* vary by gender and grade level ($p<0.05$), but not by school type ($p>0.10$). Therefore, these results are presented separately by gender (Table 4) and grade level (Table 5).

Overall, higher scores on the Indian scale were significantly associated with less tobacco use for boys ($p<0.001$), but there was no association between the Indian scale and tobacco use among girls ($p>0.05$). These trends were consistent across all measures (i.e., ever use, past year use, past month use) and all types (i.e., cigarette smoking, bidi smoking, and chewing tobacco) of tobacco use, for boys ($p<0.001$) and girls ($p<0.05$). Higher scores on the Indian scale were significantly associated with fewer intentions to use tobacco in the future, also, among both boys ($p<0.001$) and girls ($p<0.05$). These trends were consistent across all of the measures of intentions to use tobacco, except for intentions to smoke in college, and for girls only ($p=0.325$). The magnitude of all of these associations was generally higher for boys, compared with girls.

Overall, higher scores on the Indian scale were also significantly associated with less tobacco use among tenth graders ($p<0.001$). Though higher scores on the Indian scale were also related to less tobacco use among eighth graders, these relationships were not always statistically significant ($p=0.033-0.621$). Among tenth graders, these trends were consistent across all measures (i.e., ever use, past year use, past month use) and all types of tobacco (i.e., cigarette smoking, bidi smoking, and chewing tobacco) ($p<0.001$). Among eighth graders, the findings were only statistically significant for cigarette smoking (all measures, $p<0.05$) and ever use of bidis ($p<0.05$). Higher scores on the Indian scale were also significantly associated with fewer intentions to use tobacco in the future, for tenth graders ($p<0.001$) and eighth graders ($p<0.001$). These trends were consistent across all measures and both types of intentions, too.

DISCUSSION

In this study, identification with more Western ways of living was associated with more tobacco use, while identification with more traditional, Indian ways of living was associated with less tobacco use. This finding is consistent with prior studies of adolescent immigrants in the US, including Hispanic (e.g., Epstein, Botvin, & Diaz, 1998) and Asian (e.g., Rissel, McLellan, & Bauman, 2000) youth, which demonstrate that greater acculturation is associated with more smoking. This relationship is also consistent across research studies of adult immigrants, too, though these findings are mixed compared to research among youth (Lara et al., 2005; Salant & Lauderdale, 2003). There has been no research on the effects of acculturation on tobacco use in non-immigrant populations to date. Prior studies on this topic in immigrant populations have employed a uni-dimensional model of acculturation. This study, therefore, makes a substantial contribution to the discussion on the relationship between acculturation and tobacco use and extends this body of literature by demonstrating there are independent effects associated with identification with the new culture (i.e., Western) and maintenance of the culture of origin (i.e., Indian). Interestingly, the magnitude of risk and protection conferred by these two dimensions of acculturation, when modeled as

independent effects, appears to be similar, as evidenced by the magnitude of the regression coefficients in the analyses. This finding is unique and notable.

Notably, too, the relationship between more Western ways of living and tobacco use was consistent across gender, SES, and grade level. In contrast, the relationship between more traditional, Indian ways of living and tobacco use varied by gender and grade level, though not by SES. Specifically, greater identification with traditional ways of living was associated with less tobacco use among boys, but not girls – as well as less use of all tobacco products among 10th graders, but only cigarettes among 8th graders. Previous research suggests that the effects of acculturation on tobacco use do occur differentially across socio-demographic factors (Salant & Lauderdale, 2003). Many studies suggest, for example, that the effects of acculturation on tobacco use are stronger for women/girls, compared with men/boys. That is, higher levels of acculturation are associated with more tobacco use among women and girls and less tobacco use among men and boys. These findings are consistent across studies of Hispanic immigrants (e.g., Marin, Perez-Stable, & Marin, 1989) and Asian immigrants (e.g., Lee et al., 2000), too. The present study provides more details about the specific dimension(s) of acculturation that might contribute to increased tobacco use. It may not be the increased identification with Western ways of living that is fully responsible for these differential effects, but a lack of identification with more traditional ways of living, instead. This hypothesis should be explored in the future.

Prior research on the relationship between acculturation and tobacco use has focused, appropriately, on cigarette smoking. This type of tobacco use is the most common in the West, among adolescents (USDHHS, 1994) and adults (Giovino et al., 2009). In other countries of the world, like India, tobacco is commonly consumed in other ways (Warren et al., 2008). Only 20% of the tobacco used in India, for example, is smoked in the form of a cigarette (World Health Organization, 1997). Bidi smoking and chewing tobacco are more widespread (Reddy & Gupta, 2004). The relationships between “westernization” and tobacco use reported in this study were consistent across all types of tobacco products considered here, including those that are more (e.g., chewing tobacco) and less traditional (e.g., cigarettes) in India. That is, both the positive and negative effects of “westernization” on youth tobacco use generalized across all types of products, even though Western tobacco products are just emerging in this market.

These findings have implications for the development of interventions designed to curb tobacco use among young people in India. As the tobacco epidemic spreads across India, its consumption is expected to continue to increase among both adolescents and adults (Shafey, Ericksen, Ross, & Mackay, 2009). Effective interventions, therefore, appropriately tailored to this setting, are urgently required (Perry et al., 2006). Given the strength and speed with which globalization is achieving its effects, it may, or may not, be feasible to successfully temper an individual's preferences for Western ways of living, or strengthen their attachment to more traditional, Indian ways of living in order to reduce health-related risk behaviors, like tobacco use. Some suggest this is the way to integrate the results of acculturation studies like these into interventions to improve health (e.g., Ebin et al., 2001). The influences of the West (e.g., foods, media, other consumer goods) are strong and still reasonably new in this setting. These influences can be especially attractive to adolescents, who are often quick to adopt innovations like these (Rogers, 2003). Prevention scientists, therefore, might consider, instead, tailoring their interventions to appeal to particular groups of individuals or segments of the population that may respond to intervention strategies or intervention messages in similar ways. Audience segmentation and market research are two examples of techniques successfully employed by the tobacco industry to market to young tobacco users – these could be likewise applied by tobacco control practitioners to reduce youth tobacco use (Cook, Wayne, Keithly & Connolly, 2003). An examination of how Western goods are

marketed in this setting may be helpful to crafting new intervention strategies and innovative messages that would appeal to youth who prefer Western ways of living. Practices of social marketing (e.g., Weinreich, 1999) like these should be considered when developing interventions to curb tobacco use among youth here.

Limitations

Acculturation is a dynamic process that varies across both time and space (Berry, 1997). This study, like others before it (Lara et al., 2005; Salant & Lauderdale, 2003), provides only a single snapshot of this process, at a particular point and place. In this study, “westernization” is considered among a group of school-going adolescents around the turn of the 21st century, in Delhi, India. The results of this study may not generalize across other contexts. The sample of schools selected for study is not a random one, though it is representative of the different kinds of schools in this city and includes boys and girls, students from lower and higher SES settings, and students from two grade levels (Reddy et al., 2006). The findings from this study are also limited only to tobacco use and may not generalize to other types of health behaviors or health outcomes, either. In studies of acculturation and health among immigrant populations, these effects vary across different dimensions of health (Lara et al., 2005; Salant & Lauderdale, 2003).

This study does not identify the mechanisms by which “westernization” might affect tobacco use among youth, but suggests that this is done in day-to-day ways such as through the types of foods, media, and goods that young people consume. Recall that our measure of “westernization” is, in fact, behaviorally-based, which is an important limitation to consider, too. Acculturation impacts not only behaviors, but also affect (i.e., emotions) and cognitions (i.e., values, beliefs, attitudes) (Cuellar et al., 1995). Mechanisms elucidating the relationship between acculturation and health are limited (Lara et al., 2005; Salant & Lauderdale, 2003). More research must be conducted to specify explicit theories and test them to tease out the key intervening variables responsible for this effect. Changes in cognitions and social norms might be relevant to acculturation and tobacco use in Asian adolescents (Unger et al., 2000).

CONCLUSION

In an increasingly interconnected world, globalization and specifically acculturation become critical health determinants. As social environments become more homogenous, so do many of our health risks. Within this context, the purpose of this study was to investigate the relationship between “westernization” and tobacco use among adolescents in India. The study capitalizes on a large, diverse sample of youth here, using a theoretically-grounded measure of “westernization” that reflects contemporary perspectives on acculturation and globalization. Results suggest that young people's identification with Western culture may increase their risk for tobacco use, while maintenance of more traditional, Indian ways of living may confer some protection. The effects associated with a more traditional, Indian way of living varied by gender and grade level. Boys appeared to benefit more from these protective effects than girls, and tenth graders gained more consistent benefits than eighth graders. In contrast, the negative effects related to identification with a Western way of living were consistent across gender, grade level, and SES. Future research and interventions to curb tobacco use among youth in India may benefit by paying closer attention to these cultural preferences of young consumers.

REFERENCES

- Abraido-Lanza AF, Armbrister AN, Florez KR, Aguirre AN. Toward a theory-driven model of acculturation in public health research. *American Journal of Public Health* 2006;96(8):1342–1346. [PubMed: 16809597]
- Almeida-Filho N. Becoming modern after all these years: Social change and mental health in Latin America. *Culture, Medicine and Psychiatry* 1998;22:285–316.
- Arnett JJ. The psychology of globalization. *American Psychologist* 2002;57(10):774–783. [PubMed: 12369500]
- Bansal R, John S, Ling PM. Cigarette advertising in Mumbai, India: Targeting different socioeconomic groups, women, and youth. *Tobacco Control* 2005;14(3):201–206. [PubMed: 15923471]
- Beaglehole R, Yach D. Globalisation and the prevention and control of non-communicable disease: The neglected chronic diseases of adults. *Lancet* 2003;362(9387):903–908. [PubMed: 13678979]
- Berry JW. Immigration, acculturation, and adaptation. *International Journal of Applied Psychology* 1997;46:5–34.
- Cabassa LJ. Measuring acculturation: Where we are and where we need to go. *Hispanic Journal of Behavioral Sciences* 2003;25:127–146.
- Cook BL, Wayne GF, Keithly L, Connolly G. One size does not fit all: How the tobacco industry has altered cigarette design to target consumer groups with specific psychological and psychosocial needs. *Addiction* 2003;98(11):1547–1561. [PubMed: 14616181]
- Cuellar I, Arnold B, Maldonado R. Acculturation rating scale for Mexican Americans-II: A revision of the original ARSMA scale. *Hispanic Journal of Behavioral Sciences* 1995;17:275–304.
- Ebin VJ, Sneed CD, Morisky DE, Rotheram-Borus MJ, Magnusson AM, Malotte CK. Acculturation and interrelationships between problem and health-promoting behaviors among Latino adolescents. *Journal of Adolescent Health* 2001;28(1):62–72. [PubMed: 11137908]
- Epstein JA, Botvin GJ, Diaz T. Linguistic acculturation and gender effects on smoking among Hispanic youth. *Preventive Medicine* 1998;27(4):583–589. [PubMed: 9672952]
- Furr LA. On the relationship between cultural values and preferences and affective health in Nepal. *International Journal of Social Psychiatry* 2005;51(1):75–86.
- Giovino GA, Biener L, Hartman AM, Marcus SE, Schooley MW, Pechacek TF, et al. Monitoring the tobacco use epidemic I. Overview: Optimizing measurement to facilitate change. *Preventive Medicine* 2009;48(1 Suppl):S4–10. [PubMed: 18809429]
- Lara M, Gamboa C, Kahramanian MI, Morales LS, Bautista DE. Acculturation and Latino health in the United States: A review of the literature and its sociopolitical context. *Annual Review of Public Health* 2005;26:367–397.
- Lee SK, Sobal J, Frongillo EA Jr. Acculturation and health in Korean Americans. *Social Science & Medicine* 2000;51(2):159–173. [PubMed: 10832565]
- Marin G, Perez-Stable EJ, Marin BV. Cigarette smoking among San Francisco Hispanics: The role of acculturation and gender. *American Journal of Public Health* 1989;79(2):196–198. [PubMed: 2913840]
- Mazzarella, W. *Shoveling Smoke: Advertising and Globalization in Contemporary India*. Duke University Press; Durham, NC: 2003.
- Murray, DM. *Design and analysis of group-randomized trials*. Oxford University Press; New York, NY: 1998.
- Perry CL. The tobacco industry and underage youth smoking: Tobacco industry documents from the Minnesota litigation. *Archives of Pediatrics and Adolescent Medicine* 1999;153:935–941. [PubMed: 10482208]
- Perry CL, Stigler MH, Arora M, Reddy KS. Prevention in translation: Tobacco use prevention in India. *Health Promotion Practice* 2006;9(4):378–386. [PubMed: 16861597]
- Perry CL, Stigler MH, Arora M, Reddy KS. Preventing tobacco use among youth in India: Project MYTRI. *Journal of the American Public Health Association* 2009;99(5):899–906.
- Pigg SL. The social symbolism of healing in Nepal. *Ethnology* 1995;34(1):17–36.

- Pike KM, Borovoy A. The rise of eating disorders in Japan: Issues of culture and limitations of the model of “westernization”. *Culture, Medicine & Psychiatry* 2004;28(4):493–531.
- Pingali P. Westernization of Asian diets and the transformation of food systems: Implications for research and policy. *Food Policy* 2006;32:281–298.
- Raudenbush, SW.; Bryk, AS. Hierarchical linear models: Applications and data analysis methods. 2nd edition. Sage publications; Thousand Oaks, CA: 2002.
- Reddy KS, Arora M. Tobacco use among children in India: A burgeoning epidemic. *Indian Pediatrics* 2005;42(8):757–761. [PubMed: 16141476]
- Reddy, KS.; Gupta, PC. Tobacco control in India. Ministry of Health and Family Welfare, Government of India; New Delhi: 2004.
- Reddy KS, Perry CL, Stigler MH, Arora M. 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(9510):589–594. [PubMed: 16488802]
- Reddy KS, Shah B, Varghese C, Ramadoss A. Responding to the threat of chronic diseases in India. *Lancet* 2005;366(9498):1744–1749. [PubMed: 16291069]
- Rissel C, McLellan L, Bauman A. Factors associated with delayed tobacco uptake among Vietnamese/Asian and Arabic youth in Sydney, NSW. *Australian & New Zealand Journal of Public Health* 2000;24(1):22–28. [PubMed: 10777974]
- Rogler LH, Cortés DE, Malgady RG. Acculturation and mental health status among Hispanics: Convergence and new directions for research. *American Psychologist* 1991;46(6):585–597. [PubMed: 1952420]
- Rogers, EM. Diffusion of innovations. 5th edition. Free Press; New York, NY: 2003.
- Salant T, Lauderdale DS. Measuring culture: A critical review of acculturation and health in Asian immigrant populations. *Social Science & Medicine* 2003;57(1):71–90. [PubMed: 12753817]
- Schlegel, A. The global spread of adolescent culture. In: Crockett, LJ.; Silbereisen, RK., editors. *Negotiating adolescence in times of social change*. Cambridge University Press; New York: 2001.
- Shafey, O.; Eriksen, M.; Ross, H.; Mackay, J. The Tobacco Atlas. 3rd edition. American Cancer Society; Atlanta, GA: 2009.
- Sharma, N. Understanding adolescence. National Book Trust; Delhi, India: 1999.
- Sinha DN, Gupta PC, Reddy KS, Prasad VM, Rahman K, Warren CW, et al. Linking global youth tobacco survey 2003 and 2006 data to tobacco control policy in India. *Journal of School Health* 2008;78(7):368–373. [PubMed: 18611211]
- Stigler MH, Perry CL, Arora M, Reddy KS. Why are urban Indian 6th graders using more tobacco than 8th graders? Findings from Project MYTRI. *Tobacco Control* 2006;15(Suppl 1):54–60.
- Stigler MH, Perry CL, Arora M, Shrivastav R, Mathur C, Reddy KS. Intermediate outcomes from project MYTRI: Mobilizing youth for tobacco-related initiatives in India. *Cancer Epidemiology, Biomarkers & Prevention* 2007;16(6):1050–1056.
- Tomlinson, J. Globalization and culture. The University of Chicago Press; Chicago: 1999.
- Unger JB, Cruz TB, Rohrbach LA, Ribisl KM, Baezconde-Garbanati L, Chen X, et al. English language use as risk factor for smoking initiation among Hispanic and Asian American adolescents: Evidence for mediation by tobacco-related beliefs and social norms. *Health Psychology* 2000;19(5):403–410. [PubMed: 11007148]
- United Nations Development Programme. Human development report. Oxford University Press; New York: 1998.
- United States Department of Health and Human Services. Reducing Tobacco Use among Young People: A Report of the Surgeon General. Centers for Disease Control and Prevention, Office on Smoking and Health; Atlanta, GA: 1994.
- Warren CW, Jones NR, Peruga A, Chauvin J, Baptiste JP, Costa de Silva V, et al. Centers for Disease Control and Prevention (CDC). Global youth tobacco surveillance, 2000–2007. *Morbidity & Mortality Weekly Report. Surveillance Summaries* 2008;57(1):1–28. [PubMed: 18219269]
- Weinreich, NK. Hands on Social Marketing: A Step by Step Guide. Sage Publications; Thousand Oaks, CA: 1999.

- Woodward D, Drager N, Beaglehole R, Lipson D. Globalization and health: A framework for analysis and action. *Bulletin of the World Health Organization* 2001;79(9):875–881. [PubMed: 11584737]
- World Health Organization. Tobacco or Health: A Global Status Report, Country profiles by Region. WHO; Geneva, Switzerland: 1997.

Table 1Description of multi-item^a scales used to measure “westernization.”

a. Western scale (n=12 items, range 0–36, mean=17.31, SD=8.24, Cronbach's α=0.90)	
Language preferences	How often do you speak with your mother or father in English?
	How often do you speak with your siblings in English?
	How often do you speak with your friends in English?
Media preferences	How often do you watch English TV shows?
	How often do you watch English movies or films?
	How often do you listen to English music?
Preferences for food	How often do you eat English food for lunch or dinner (such as pizza, burgers, etc.)?
	How often do you eat Indian food for a snack (such as potato chips, french fries, garlic bread, etc.)?
	How often do you eat Indian food for dessert (such as cakes, puddings, pastries, etc.)?
Other consumer goods	How often do you wear Western clothing (such as jeans, t-shirts, and skirts)?
	How often do you go out to a Western coffee house (such as Café Coffee Day, Barista)?
	How often do you go for shopping to a Western-type shopping mall (such as Ansal Plaza, Big Bazaar, etc.)?
b. Indian scale (n=12 items, range 0–36, mean=21.62, SD=7.17, Cronbach's α=0.84)	
Language preferences	How often do you speak with your mother or father in your mother tongue (Hindi, or other Indian language)?
	How often do you speak with your siblings in your mother tongue (Hindi, or other Indian language)?
	How often do you speak with your friends in your mother tongue (Hindi, or other Indian language)?
Media preferences	How often do you watch Hindi (or other Indian language) TV shows?
	How often do you watch Hindi (or other Indian language) movies or films?
	How often do you listen to Hindi (or other Indian language) music?
Preferences for food	How often do you eat Indian food for lunch or dinner (such as roti, rice, dal, vegetables, dosa, etc.)?
	How often do you eat Indian food for a snack (such as namkeen, rusk, etc.)?
	How often do you eat Indian food for dessert (such as kulfi, halwah, milk sweets, etc.)?
Other consumer goods	How often do you wear traditional Indian clothing (such as salwar kameez/sari for girls; kurta pajama for boys)?
	How often do you go out to a traditional Indian coffee house (such as Coffee Home)?
	How often do you go for shopping to traditional Indian markets (such as Karol Bagh, Chandni Chowk, etc.)?

^aResponse options for each item were on a 4 point Likert scale: (1) never, (2) sometimes, (3) often, (4) very often.

Table 2

Differences in the Western and Indian scale scores by socio-demographic factors; Delhi, India (n=3512).

	Western scale ^a			Indian scale ^a		
	Mean	(SE)	p-value ^b	Mean	(SE)	p-value ^b
Grade						
8 th grade	16.55	(1.26)		20.84	(0.19)	
10 th grade	18.33	(1.26)	<0.001	22.88	(0.22)	<0.001
School type						
Private	20.82	(1.01)		21.18	(0.24)	
Government	13.56	(1.01)	<0.001	22.03	(0.23)	0.011
Age						
<=12 years	16.42	(1.27)		20.94	(0.26)	
13 years	16.81	(1.26)		21.28	(0.19)	
14 years	17.20	(1.25)		21.62	(0.17)	
15 years	17.59	(1.26)		21.97	(0.20)	
>=16 years	17.99	(1.27)	<0.001	22.31	(0.27)	0.001
Gender						
Girls	17.25	(1.23)		22.25	(0.26)	
Boys	17.14	(1.22)	0.688	21.16	(0.23)	<0.001

^aModels consider the effect of each sociodemographic factor on each dimension of "westernization," or acculturation, (i.e., Western or Indian), separately.

^bp-value represents differences in each scale score by each sociodemographic factor using an unadjusted random intercept mixed effects regression model.

Table 3

Association between the Western scale ^a and tobacco use, among all students; Delhi, India (n=3512).

	β	(SE)	p-value ^b
<i>Ever use</i>			
Any kind of tobacco	0.051	0.009	<0.001
Chewing tobacco	0.053	0.010	<0.001
Smoking bidis	0.051	0.013	<0.001
Smoking cigarettes	0.060	0.011	<0.001
<i>Past year use</i>			
Any kind of tobacco	0.056	0.012	<0.001
Chewing tobacco	0.050	0.013	<0.001
Smoking bidis	0.085	0.020	<0.001
Smoking cigarettes	0.082	0.015	<0.001
<i>Past month use</i>			
Any kind of tobacco	0.065	0.013	<0.001
Chewing tobacco	0.060	0.015	<0.001
Smoking bidis	0.086	0.020	<0.001
Smoking cigarettes	0.087	0.017	<0.001
<i>Intentions to use</i>			
Chew in college	0.073	0.010	<0.001
Chew when adult	0.066	0.010	<0.001
Smoke in college	0.091	0.011	<0.001
Smoke when adult	0.078	0.010	<0.001

^a Models adjust for the effect of one dimension (e.g., Indian) of “westernization” on tobacco use, when considering the effect of the other (e.g., Western).

^b p-value represents test of the association using a random intercept mixed effects regression model adjusted for gender, school type, grade level, and age

Table 4

Association between the Indian scale^a and tobacco use, by gender; Delhi, India (n=3512).

	Boys (n=2102)			Girls (n=1409)		
	β	(SE)	p-value ^b	β	(SE)	p-value ^b
Ever use						
Any kind of tobacco	-0.053	0.011	<0.001	-0.009	0.018	0.638
Chewing tobacco	-0.052	0.012	<0.001	-0.008	0.021	0.705
Smoking bidis	-0.062	0.016	<0.001	-0.059	0.030	0.050
Smoking cigarettes	-0.055	0.013	<0.001	-0.046	0.025	0.064
Past year use						
Any kind of tobacco	-0.079	0.014	<0.001	0.009	0.026	0.733
Chewing tobacco	-0.087	0.016	<0.001	-0.001	0.031	0.966
Smoking bidis	-0.080	0.021	<0.001	0.044	0.074	0.554
Smoking cigarettes	-0.092	0.017	<0.001	-0.019	0.035	0.578
Past month use						
Any kind of tobacco	-0.092	0.015	<0.001	0.004	0.033	0.900
Chewing tobacco	-0.097	0.018	<0.001	-0.023	0.044	0.597
Smoking bidis	-0.090	0.021	<0.001	-0.024	0.090	0.788
Smoking cigarettes	-0.098	0.018	<0.001	0.028	0.046	0.537
Intentions to use						
Chew in college	-0.065	0.013	<0.001	-0.062	0.023	0.006
Chew when adult	-0.073	0.012	<0.001	-0.057	0.023	0.015
Smoke in college	-0.085	0.013	<0.001	-0.024	0.024	0.325
Smoke when adult	-0.066	0.012	<0.001	-0.053	0.023	0.020

^aModels adjust for the effect of one dimension (e.g., Western) of "westernization" on tobacco use, when considering the effect of the other (e.g., Indian).

^bp-value represents test of the association using a random intercept mixed effects regression model adjusted for grade level, school type, and age. The models for past year use of bidis was only adjusted for school type and age and the model for current use of bidis was adjusted for age, so models could converge.,

Table 5

Association between the Indian scale ^a and tobacco use, by grade level; Delhi, India (n=3512).

	8 th graders (n=2163)			10 th graders (n=1349)		
	β	(SE)	p-value ^b	β	(SE)	p-value ^b
Ever use						
Any kind of tobacco	-0.024	0.012	0.053	-0.066	0.014	<0.001
Chewing tobacco	-0.020	0.014	0.152	-0.068	0.016	<0.001
Smoking bidis	-0.046	0.020	0.020	-0.074	0.020	<0.001
Smoking cigarettes	-0.042	0.016	0.009	-0.064	0.016	<0.001
Past year use						
Any kind of tobacco	-0.029	0.017	0.086	-0.090	0.018	<0.001
Chewing tobacco	-0.035	0.020	0.082	-0.096	0.019	<0.001
Smoking bidis	-0.014	0.028	0.621	-0.136	0.028	<0.001
Smoking cigarettes	-0.050	0.023	0.033	-0.100	0.021	<0.001
Past month use						
Any kind of tobacco	-0.041	0.020	0.045	-0.112	0.020	<0.001
Chewing tobacco	-0.036	0.026	0.169	-0.118	0.022	<0.001
Smoking bidis	-0.034	0.032	0.287	-0.128	0.026	<0.001
Smoking cigarettes	-0.050	0.025	0.049	-0.113	0.023	<0.001
Intentions to use						
Chew in college	-0.070	0.015	<0.001	-0.063	0.017	<0.001
Chew when adult	-0.072	0.014	<0.001	-0.065	0.017	<0.001
Smoke in college	-0.072	0.015	<0.001	-0.073	0.018	<0.001
Smoke when adult	-0.059	0.013	<0.001	-0.072	0.017	<0.001

^aModels adjust for the effect of one dimension (e.g., Western) of “westernization” on tobacco use, when considering the effect of the other (e.g., Indian).

^bp-value represents test of the association using a random intercept mixed effects regression model adjusted for gender, school type, and age. The models for past year use of bidis and past month use of bidis were adjusted for school type and age only, so that these models could converge appropriately, as well.