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Moving Towards a True Depiction of Tobacco Behavior among Asian Indians in California: Prevalence and Factors Associated with Cultural Smokeless Tobacco Product Use

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Abstract

BACKGROUND—Asian Indians in the US exhibit disproportionate burdens of oral cancers and cardiovascular disease, potentially linked to smokeless tobacco. However, little is known about use of cultural smokeless tobacco (CST) products among this population.

METHODS—2004 California Asian Indian Tobacco Use Survey data (n=1,618) was used to investigate CST prevalence among California’s Asian Indians. CST products included *paan*, *paan masala*, and *gutka*. Multivariable logistic regression was conducted to examine factors associated with current CST use, compared to never use, for socioeconomic status, acculturation measures, and religious affiliation.

RESULTS—Current CST prevalence was 13.0% (men: 14.0%, women: 11.8%). In contrast, prevalence of current cigarette use was 5.5% (men: 8.7%, women: 1.9%) and lower for cultural smoked tobacco (*bidis*: 0.1%, *hookah*: 0.5%). Factors associated with CST use include being male, aged 50+, immigrant status, speaking an Asian Indian language at home, higher education (high school/some college AOR=2.6, 95% CI 1.1–6.5; college degree+ AOR=4.0, 95% CI 1.7–9.5), higher income (\$75,000–100,000 AOR=2.5, 95% CI 1.3–4.7; >\$100,000 AOR=2.6, 95% CI 1.4–5.0), identifying as non-Sikh (Hinduism AOR= 10.0, 95% CI 6.0–16.5; other faiths AOR=10.2, 95% CI 5.9–17.7), and disagreeing that spiritual beliefs are the foundation of life (AOR=2.1, 95% CI 1.2–3.5).

CONCLUSION—Current CST prevalence is relatively high among California’s Asian Indians compared to smoking, with narrower differences between genders. The association with higher

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CONFLICTS OF INTEREST

Outside of funding support from aforementioned sources, all authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

Conceptualization: A.M., M.V.M., & E.K.T.; Methodology: A.M. & M.M.; Formal Analysis: M.V.M.; Resources: M.V.M.; Writing – Original Draft: A.M.; Writing – Review & Editing: A.M., M.V.M., & E.K.T.; Visualization: A.M. & M.M.; Project Acquisition: A.M.; Funding Acquisition: A.M. & E.K.T.

socioeconomic status is contrary to typical cigarette smoking patterns. Acculturation and religious affiliation are important factors associated with current use. Healthcare providers and policymakers should consider such determinants for targeted interventions.

Keywords

Asian Indian Americans; oral tobacco; culture; epidemiology; California; cancer disparities

INTRODUCTION

Disparities related to tobacco use, both globally and within the US, remain a major public health threat.^{1, 2} India has the highest global incidence of oral cancer, presumably due to smokeless tobacco products (often combined with betel/areca nut) that are culturally popular (referred hereafter as cultural smokeless tobacco (CST) products).^{3, 4} In India, these CST products may be used for fulfilling religious obligations, observing traditional holidays and celebrating events.⁵ For instance, *paan* (a homemade betel quid often containing tobacco) is used by Hindus as one of eight religiously-sanctioned enjoyments of life⁵ whereas commercially-manufactured concoctions of betel-nut and tobacco, such as *paan masala* and *gutka*, are used to denote hospitality and equality.⁶ Such CST products are popular among South Asians outside of the subcontinent.^{7–13} Smokeless tobacco products are associated with increased risk of oral cancers and cardiovascular diseases; these preventable conditions may be attributable to CST products as well.¹⁴ The 2009–2010 Global Adult Tobacco Survey demonstrates that prevalence of smokeless tobacco in India is higher than smoked products (smokeless tobacco: 23.6% men, 17.2% women; cigarette: 5.3% men, 0.1% women; *bidis*: 9.9% men, 1.2% women); higher wealth is associated with cigarette smoking, but inversely associated with smokeless tobacco and *bidis*.¹⁵

Little is known about CST use among the over three million AIs living in the US, who represent the third largest Asian American subgroup; the largest proportion of this population reside in California (18.5%).¹⁶ Rates of cigarette smoking by AIs in the US and UK are consistently lower than the general population and other Asian American subgroups.^{7, 17, 18} One study in the northeastern US described South Asian immigrant men having higher smokeless tobacco use than non-White men; however, this general population survey did not ask about CST products.¹⁹ Other studies assessing CST products have been regional convenience samples.^{8, 20} Evidence from a split-sample survey found the majority of South Asian CST users not endorsing use of smokeless tobacco, but these questions did not ask about CST products.⁹ Since most population-based surveys measure use of cigarettes and other mainstream tobacco products, tobacco use among AIs is likely underestimated by neglect of CST. By including CST products, we feel that prevalence estimates from this study will be a more "true" reflection of AI tobacco use and associated behaviors of current users vs. those who have never used.

One study hypothesis was that prevalence of CST use would be higher than cigarettes with narrower gender differences, particularly for less acculturated respondents, as studies in India indicate that men and women have similar rates of using specific forms of tobacco, particularly smokeless.²¹ Another hypothesis was that sociocultural factors would be

associated with use. If so, religious differences in patterns of CST use would exist as certain AI faiths (e.g., Sikhism) have strict prohibitions on any form of tobacco use whereas others, as mentioned earlier, are permissive or promote use of particular products, even post-migration.^{11, 22}

METHODS

Survey

The 2004 California Asian Indian Tobacco Use Survey (CAITUS) was the first statewide effort to gather data on CST products. To date, this is the only population-based survey in the US which has collected data about both mainstream and cultural forms of tobacco used by AIs, as well as measures related to specific faiths and identity. CAITUS was funded by the California Tobacco Control Program (California Department of Public Health) and collected by an academic-government-community collaborative. The authors had no involvement in sampling, instrument development, or exclusion of particular subgroups. Detailed methodological documentation is available elsewhere.²³ Surnames used for CAITUS were compiled using unique names²⁴ combined with surnames identified by the Vital Statistics Office for the California Department of Health Services. Selection of respondents was done without replacement. Of the 4,008 eligible AI households agreeing to continue with the survey, 3,228 completed telephone interviews. Ratio adjustment weights were used to correct for nonresponse and non-coverage and stratified by gender and age grouping, based on 2000 US Census data. For the present analysis, the final sample was restricted to 1,616 participants who reported currently using CST or having never used CST.

Measures

Outcome Measure: Tobacco Use—The primary outcome was a composite variable of CST products²⁵ - *paan*, *paan masala*, or *gutka*. Despite their cultural specificity, *bidis* (hand-rolled tobacco cigarettes) and *hookah* (water pipe) were excluded from subsequent analyses due to being smoked products and negligible use (0.1% and 0.5%, respectively).

Respondents who reported chewing *paan*, *paan masala*, and/or *gutka* every day or some days were defined as current users. Never users were defined as not having used any CST product over their lifetime. For cigarettes, respondents who did not report smoking at least 100 lifetime cigarettes were defined as never smokers, while those currently smoking every day or some days were defined as current smokers.^{26, 27}

Covariates

Sociodemographics: Age was categorized in quartiles and gender was dichotomized. Level of education was categorized into four levels, while income was categorized into quintiles.

Acculturation: Acculturation measures included respondents' country of birth, percentage of life spent in the US, and language most often spoken at home. While these reflect proxies, not scales, such measures have been deemed suitable substitutes for large epidemiological studies.²⁸ Additionally, we analyzed self-identity with responses dichotomized (American or Asian Indian/Asian Indian-American).

Religious Faith: Responses about religious faith were categorized as Hinduism, Islam, Sikhism, Buddhism, Zoroastrianism, Christianity/Catholicism, Judaism, Atheist (but still spiritual), none (or non-spiritual Atheist), and other. For regression analysis, modified religion categories were collapsed into tertiles (i.e., Hinduism, Sikhism, other), due to small samples for Islam and other religions.

Degree of religiosity was derived from Likert-type responses to three survey questions: “My spiritual beliefs are the foundation of my approach to life”, “I believe I am a religious person”, and “I observe the traditional holidays that are important in my culture and religion.” Responses to the first two questions were collapsed from a 5-point Likert agreement scale to a 3-point one due to small cell sizes, whereas responses to the last question were unchanged.

Analysis

Frequencies were calculated for categorical data and chi-square analyses and used to examine descriptive differences. A multivariable model was constructed for current vs. never use of CST by sociodemographic characteristics, acculturation, and religious factors. The statistical model was developed after systematically examining relative impacts of each set of factors on current use as an outcome (not shown) through a series of models. The final model (n=1,616) used a stepwise-forward selection process to include only variables that were statistically associated (p < 0.05) with CST use. Missing data were reported as a separate line item for variables missing more than 1% of responses. All statistical tests were two-sided using an alpha-level of 0.05. All analyses were conducted using SAS 9.3 (Cary, NC).

RESULTS

Characteristics of study sample

The study sample (Table 1) had predominantly emigrated from urban Indian cities (66.4%, not shown), with only 6.9% born in the US. Most respondents had college degrees (79.0%) and earned household incomes over \$75,000 (50.2%). The majority of respondents subscribed to Hinduism or Sikhism.

Tobacco Use Behavior

Prevalence of current CST use was 13.0% (14.0% for men, 11.8% for women). Use of *bidis* and *hookah* were low (0.1% and 0.5%, respectively). In contrast, prevalence of current cigarette use was 5.5% (8.7% men, 1.9% women) and lower for mainstream smokeless tobacco (0.2% for snuff, 0.7% for “chewing” tobacco).

Among current CST users, most did not use every day (*paan/paan masala*: 97.0% men, 98.9% women; *gutka*: 77.3% men, 95.6% women). Among past-30 day current users, men appeared to use *gutka* more frequently than women (*paan/paan masala*: 25.2% men, 19.9% women; *gutka*: 57.2% men, 32.2% women).

Characteristics of current vs. never users of CST

For both men and women, higher current CST use was reported by AIs with a college degree or higher, born in India, and practicing Hinduism. Lower CST use was reported for those with lower annual incomes. Gender differences in current vs. never use were only statistically significant for AI men aged 18–29, respondents born in the US, those who self-identify as “Asian Indian or Asian Indian American”, and women who rarely or never observed culturally or religiously important holidays. Differential non-response by gender was observed for how often an Indian language was spoken at home, with more male respondents than female respondents speaking an Indian language at home, leading to potential misclassification bias for this variable.

Multivariable analyses

Factors significantly associated with current CST use but not retained in the final model included: 1) self-identity as AI compared to American, 2) belief in being a religious person. Self-identity was not included in the final model since it was not statistically significant after including other sociodemographic factors and religion in the model. Belief in being a religious person was moderately correlated ($r=0.61$) with another religiosity variable. No other interactions or multicollinearity were identified among variables retained in the final model (variance inflation factor <2).

Table 2 shows the final multivariable model with AIs having greater odds of current vs. never CST use if they were male, aged 40+ compared to the youngest group, had higher education (including advanced degrees) compared to those with less than a high school diploma, had the highest two quintiles of household incomes ($> \$75,000$) compared with the lowest quintile, were immigrants compared to US-born, spoke an AI language at home compared to those who spoke only English, practiced Hinduism or other AI faith compared to those who practiced Sikhism, and disagreed that spiritual beliefs are the foundation of life. Among immigrants only, there was an increasing odds of current CST use based on increasing percentage of life spent in the US, but the difference was not statistically significant.

DISCUSSION

California AIs report using CST at levels comparable to the general state adult cigarette smoking prevalence in 2004 (14.6%).²⁹ Unlike cigarette use, findings confirm the hypothesis that both AI men and women exhibit similarly high CST prevalence. Although less than rates observed in the Indian subcontinent, the finding that CST use is more common in California AIs than cigarettes is commensurate with regional studies utilizing convenience samples of AIs residing in ethnic enclaves.^{8, 20, 30} Over a third of New York City respondents were ever users and approximately 70% of these ever users were current CST users.²⁰ Another study reported that 28% of South Asian respondents in Los Angeles were current CST users.⁸

Study findings also confirmed the hypothesis that Hindus would have higher CST prevalence than other religious faiths, given that *paan* and other products containing betel-nut are

integral for religious practice.³¹ The low CST prevalence among Sikhs likely reflects religious restrictions. The finding that current CST users were more likely to disagree that spiritual beliefs are the foundation of life may reflect that survey measures of religious affiliation and cultural practices do not necessarily equate with degree of religiosity.

Higher odds of CST use among those with higher education and greater household incomes was counterintuitive, as educational attainment and higher income negatively correlate with tobacco prevalence in the US.²⁶ In contrast to the well-described inverse relationship with socioeconomic status and smoking, cigarette smoking rates in India actually *increase* with educational status and financial resources.¹⁵ One possible explanation is that AIs with higher socioeconomic status are chosen for leadership in highly-visible cultural institutions,³² which may lead to greater participation in social settings and environments which facilitate culturally-valued tobacco use behaviors. It is unlikely that higher prevalence of CST use among the highly-educated is an economic phenomenon given that in the US, many of these products are relatively inexpensive, thus it is unlikely that only higher income individuals would purchase and use them.³³

The social acceptability of CST was reinforced by higher odds of use by women, and those who spoke an AI language at home very often, as preservation of language may be an active attempt to maintain traditional practices.³⁴ Immigrants had higher odds of CST use relative to AIs born in the US. However, greater proportion of life spent in the US as an immigrant was not significantly associated with the increased likelihood of use. Thus, the expected influence of acculturation on smoking behaviors in other Asian American subpopulations—where more acculturated men may have higher quitting rates, and more acculturated women and those born in the US have higher prevalence rates^{35, 36}—is not observed with CST products for AIs.

These findings demonstrate that CST is being used non-daily by AIs in California, but more research is needed to understand the health implications of intermittent use. The International Agency for Research on Cancer has determined products containing betel-nut—with or without tobacco—are carcinogenic^{37, 38}; therefore, preventing or ceasing use of CST (as a subset of betel-nut consumables) is important for cancer prevention among AIs. While intermittent use may pose less risk, duration of exposure may be important. For cigarettes, it is recognized that occasional smoking has significant health effects, especially for cardiovascular and all-cause mortality among men, but more research is needed for infrequent uses of CST as well.³⁹ Smokeless tobacco products are also associated with an increased cancer and cardiovascular risk; therefore monitoring CST products, particularly among the South Asian population in the US, is important for prevention of conditions attributable to use.⁴⁰

Some US states with large AI populations have implemented efforts to address use of CST. For instance, educational campaigns in New York have targeted both consumers (e.g., increasing awareness regarding consequences of use) and retailers (e.g., enforcement of existing policies on sales) in attempts to reduce use.¹⁰ As study findings indicate concerning CST prevalence rates, California's tobacco control efforts may benefit from implementing such practices, along with those found in the UK, such as community-based outreach,

standard clinical screening of CST use among AIs, and provision of tailored interventions incorporating evidence-based pharmacological and behavioral strategies,⁴¹ adapted to target the unique sociodemographic predictors found in this analysis.

This study is subject to a number of limitations. It was not designed to compare differences between daily and non-daily users, and this would be an area of future research especially for health implications with prospective cohort studies. The sample size was quite small in the lowest income/education groups, which might generate “noise” in the regression model. As CAITUS was administered in 2004, the patterns found in this analysis will need to be replicated with present-day surveillance. However, lack of strategies targeting CST among California’s AIs make it unlikely that these patterns have changed significantly among this at-risk community.

CONCLUSION

To date, this is the only study which provides a population-based investigation of current prevalence and correlates of CST use among AIs in the US. As such, results of this study provide an evidence base for future research on tobacco behavior among all South Asian subgroups in the US. In addition to a large sampling frame, this study highlights patterns of CST products which are traditionally excluded from statewide and national tobacco surveillance efforts. Given the relative importance of CST within this population, future research should consider an expanded scope of products for epidemiological investigation and clinical screening. Improved surveillance, targeted interventions, and implementation of policy-level strategies may provide a more comprehensive understanding of the unique contribution of tobacco and facilitate the reduction of disparities in this population.

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References

1. David, A., Esson, K., Perucic, AM., Fitzpatrick, C. Tobacco use: Equity and social determinants. In: Blas, E., Kurup, AS., editors. Equity, social determinants and public health programmes. Geneva: World Health Organization; 2010.
2. Fagan P, King G, Lawrence D, et al. Eliminating tobacco-related health disparities: directions for future research. *Am J Public Health.* 2004; 94:211–217. [PubMed: 14759929]
3. Mukherjea A, Wackowski OA, Lee YO, Delnevo CD. Asian american, native hawaiian and pacific islander tobacco use patterns. *Am J Health Behav.* 2014; 38:362–369. [PubMed: 24636032]
4. Mishra GA, Pimple SA, Shastri SS. An overview of the tobacco problem in India. *Indian J Med Paediatr Oncol.* 2012; 33:139–145. [PubMed: 23248419]
5. Reddy, KS., Gupta, PC. Report on tobacco control in India. New Delhi: Ministry of Health and Family Welfare, Government of India; 2004. p. 589-594.
6. WHO. Betel-quid and areca-nut chewing and some areca-nut-derived nitrosamines. Lyon, France: International Agency for Research on Cancer Monographs on the Evaluation of Carcinogenic Risks to Humans; 2004. p. 1-334.

7. Millward, D., Karlsen, S. Tobacco use among minority ethnic populations and cessation. London: Race Equality Foundation; 2011.
8. Glenn BA, Surani Z, Chawla N, Bastani R. Tobacco use among South Asians: results of a community-university collaborative study. *Ethn Health*. 2009; 14:131–145. [PubMed: 18821101]
9. Manderski MT, Steinberg MB, Rahi KN, Banerjee SC, Delnevo CD. Surveillance of Tobacco Use Among South Asians in the US: Are We Underestimating Prevalence? *J Community Health*. 2016; 41:1140–1145. [PubMed: 27470121]
10. Mukherjea A, Modayil MV. Culturally specific tobacco use and South asians in the United States: a review of the literature and promising strategies for intervention. *Health Promot Pract*. 2013; 14:48S–60S. [PubMed: 23690257]
11. Messina J, Freeman C, Rees A, et al. A systematic review of contextual factors relating to smokeless tobacco use among South Asian users in England. *Nicotine Tob Res*. 2013; 15:875–882. [PubMed: 23089485]
12. Hossain MS, Kypri K, Rahman B, Milton AH. Smokeless tobacco consumption in the South Asian population of Sydney, Australia: prevalence, correlates and availability. *Drug Alcohol Rev*. 2014; 33:86–92. [PubMed: 24256138]
13. Mukherjea A, Morgan PA, Snowden LR, Ling PM, Ivey SL. Social and cultural influences on tobacco-related health disparities among South Asians in the USA. *Tob Control*. 2012; 21:422–428. [PubMed: 21708814]
14. Boffetta P, Straif K. Use of smokeless tobacco and risk of myocardial infarction and stroke: systematic review with meta-analysis. *BMJ*. 2009:339.
15. Singh A, Arora M, English DR, Mathur MR. Socioeconomic gradients in different types of tobacco use in India: evidence from Global Adult Tobacco Survey 2009–10. *BioMed Research International*. 2015; 2015:9.
16. Census. Race Reporting for the Asian Population by Selected Categories: 2010: U.S. Census Bureau. 2000
17. Kim SS, Ziedonis D, Chen KW. Tobacco use and dependence in Asian Americans: a review of the literature. *Nicotine Tob Res*. 2007; 9:169–184. [PubMed: 17365748]
18. CDC. Prevalence of cigarette use among 14 racial/ethnic populations--United States, 1999–2001. *MMWR Morb Mortal Wkly Rep*. 2004; 53:49–52. [PubMed: 14749612]
19. Delnevo CD, Steinberg MB, Hudson SV, Ulpe R, Dipaola RS. Epidemiology of cigarette and smokeless tobacco use among south Asian immigrants in the northeastern United States. *J Oncol*. 2011; 2011:252675. [PubMed: 21772842]
20. Changrani J, Gany FM, Cruz G, Kerr R, Katz R. Paan and Gutka Use in the United States: A Pilot Study in Bangladeshi and Indian-Gujarati Immigrants in New York City. *J Immigr Refug Stud*. 2006; 4:99–110. [PubMed: 17492057]
21. Turk T, Murukutla N, Gupta S, et al. Using a smokeless tobacco control mass media campaign and other synergistic elements to address social inequalities in India. *Cancer Causes Control*. 2012; 23(Suppl 1):81–90. [PubMed: 22350861]
22. Cooper RG, Khan S. Alcohol Consumption and Tobacco Smoking by South Asians in India and Britain Pakistan journal of medical research. 2007; 46:78–87.
23. McCarthy, WJ., Divan, H., Shah, D., et al. California Asian Indian Tobacco Survey – 2004. Sacramento, CA: California Department of Health Services; 2005.
24. Lauderdale DS, Kestenbaum B. Asian American ethnic identification by surname. *Population Research and Policy Review*. 2000; 19:283–300.
25. Mukherjea A, Modayil MV, Tong EK. Paan (pan) and paan (pan) masala should be considered tobacco products. *Tob Control*. 2014
26. CDC. Vital signs: current cigarette smoking among adults aged ≥ 18 years --- United States, 2009. *MMWR Morb Mortal Wkly Rep*. 2010; 59:1135–1140. [PubMed: 20829747]
27. NCI. Those who continue to smoke: Is achieving abstinence harder and do we need to change our interventions?. Bethesda, MD: US Department of Health and Human Services; 2003.
28. Alegria M. The challenge of acculturation measures: what are we missing? A commentary on Thomson & Hoffman-Goetz. *Soc Sci Med*. 2009; 69:996–998. [PubMed: 19664868]

29. CDC. Behavioral Risk Factor Surveillance System (BRFSS). Sacramento, CA: Tobacco Control Program, California Department of Public Health; 1984–2011.
30. WHO. International Institute for Population Sciences Global Adult Tobacco Survey India (GATS India) 2009–2010. New Delhi, India: World Health Organization, Ministry of Health and Family Welfare, Government of India; 2010.
31. Verma S. Areca nut (betel nut) chewing: a popular Indian cultural practice and its mucosal implications. *Int J Dermatol*. 2011; 50:229–232. [PubMed: 21244394]
32. Mehta R, Belk RW. Artifacts, identity, and transition: Favorite possessions of Indians and Indian immigrants to the United States. *Journal of Consumer Research*. 1991:398–411.
33. Awang, K., Taylor, D. Acacia mangium: growing and utilization. Bangkok: Winrock International Institute for Agricultural Research, Forestry/Fuelwood Research and Development Project (F/FRED), FAO Forestry Research Support Programme for Asia and the Pacific & Forest Tree Improvement Project; 1993.
34. Aghi MB, Gupta P, Mehta F. Intervention in the tobacco habits of rural Indian women. *World Smoking Health*. 1984; 9:10–14. [PubMed: 12179597]
35. Tong EK, Nguyen TT, Vittinghoff E, Perez-Stable EJ. Smoking behaviors among immigrant Asian Americans: rules for smoke-free homes. *Am J Prev Med*. 2008; 35:64–67. [PubMed: 18541178]
36. Zhu SH, Wong S, Tang H, Shi CW, Chen MS. High quit ratio among Asian immigrants in California: implications for population tobacco cessation. *Nicotine Tob Res*. 2007; 9(Suppl 3):S505–514. [PubMed: 17978979]
37. WHO. Tobacco Habits Other Than Smoking–Betel-Quid and Areca-Nut Chewing and Some Related Nitrosamines: The Evaluation of Carcinogenic Risks to Humans. Lyon: World Health Organization, International Agency for Research on Cancer; 1985.
38. Sharma DC. Betel quid and areca nut are carcinogenic without tobacco. *Lancet Oncol*. 2003; 4:587. [PubMed: 14567361]
39. Schane RE, Ling PM, Glantz SA. Health effects of light and intermittent smoking: a review. *Circulation*. 2010; 121:1518–1522. [PubMed: 20368531]
40. Tully RP, Zaheer M, Saha B. Smokeless tobacco and cardiovascular risk in non-Caucasian patients. *Br J Anaesth*. 2011; 107:105–106. [PubMed: 21685119]
41. Croucher R, Shanbhag S, Dahiya M, Kassim S, Csikar J, Ross L. Smokeless tobacco cessation in South Asian communities: a multi-centre prospective cohort study. *Addiction*. 2012; 107(Suppl 2): 45–52.

TABLE 1

Prevalence of Current and Never Cultural Smokeless Tobacco (CST) Use by Gender Among Asian Indian Adults in California (unweighted %)

	MALE: %, 95% CI		FEMALE: %, 95% CI	
	Current CST Users (N=250)	Never CST Users (N=636)	Current CST Users (N=170)	Never CST Users (N=598)
SOCIODEMOGRAPHICS				
Age				
18–29	14.6* (10.2–19.0)	23.0* (19.7–26.3)	26.5 (19.8–33.1)	36.0 (32.2–39.9)
30–39	40.9* (34.7–47.0)	33.0* (29.3–36.7)	37.1 (29.8–44.3)	34.9 (31.0–38.7)
40–49	18.6* (13.8–23.5)	17.9* (14.9–20.9)	18.2 (12.4–24.1)	16.9 (13.9–19.9)
50+	25.9* (20.4–31.4)	26.0* (22.6–29.5)	18.2 (12.4–24.1)	12.2 (9.5–14.8)
Education				
Less than high school	2.0*** (0.3–3.7)	8.7*** (6.5–10.9)	0.6*** (0.0–1.8)	9.9*** (7.5–12.3)
High school OR some college/trade school	9.6*** (5.9–13.3)	20.8*** (17.6–23.9)	10.1*** (5.5–14.6)	21.3*** (18.0–24.6)
College degree OR Graduate/professional school	88.4*** (84.4–92.4)	70.6*** (67.0–74.1)	89.3*** (84.7–94.0)	68.8*** (65.1–72.5)
Household Income				
Not Reported	12.0*** (8.0–16.0)	11.8*** (9.3–14.3)	20.6*** (14.5–26.7)	19.2*** (16.1–22.4)
<\$20K	4.4*** (1.9–6.9)	12.9*** (10.3–15.5)	2.9*** (0.4–5.5)	11.5*** (9.0–14.1)
\$20K - <\$50K	7.6*** (4.3–10.9)	17.8*** (14.8–20.7)	10.0*** (5.5–14.5)	18.9*** (15.8–22.0)
\$50K - <\$75K	13.2*** (9.0–17.4)	13.5*** (10.9–16.2)	11.8*** (6.9–16.6)	14.4*** (11.6–17.2)
\$75K - <\$100K	21.6*** (16.5–26.7)	14.8*** (12.0–17.5)	24.1*** (17.7–30.6)	16.6*** (13.6–19.5)
>\$100K	41.2*** (35.1–47.3)	29.2*** (25.7–32.8)	30.6*** (23.6–37.5)	19.4*** (16.2–22.6)
ACCULTURATION				
Country of Birth				
Born in United States	2.8*** (0.8–4.8)	8.8*** (6.6–11.0)	2.4*** (0.1–4.6)	8.9*** (6.6–11.1)
Born in India	88.8*** (84.9–92.7)	77.7*** (74.4–80.9)	90.6*** (86.2–95.0)	76.1*** (72.7–79.5)
Born in Another Country	8.4*** (5.0–11.8)	13.5*** (10.9–16.2)	7.1*** (3.2–10.9)	15.1*** (12.2–17.9)

	MALE: %, 95% CI		FEMALE: %, 95% CI	
	Current CST Users (N=250)	Never CST Users (N=636)	Current CST Users (N=170)	Never CST Users (N=598)
Percentage of life in United States				
Not Reported	0.8 ^{***} (0.0–1.9)	2.0 ^{***} (0.9–3.1)	0.6 ^{**} (0.0–1.7)	1.2 ^{**} (0.3–2.0)
Less than 25%	36.4 ^{***} (30.4–42.4)	43.4 ^{***} (39.5–47.3)	51.2 ^{**} (43.6–58.7)	53.3 ^{**} (49.3–57.3)
25% to <50%	39.6 ^{***} (33.5–45.7)	29.2 ^{***} (25.7–32.8)	25.3 ^{**} (18.7–31.8)	25.3 ^{**} (21.8–28.7)
50% to <75%	16.8 ^{***} (12.2–21.4)	12.6 ^{***} (10.0–15.2)	16.5 ^{**} (10.9–22.1)	7.5 ^{**} (5.4–9.6)
75% or more but not born in United States	3.6 ^{***} (1.3–5.9)	3.9 ^{***} (2.4–5.4)	4.1 ^{**} (1.1–7.1)	3.8 ^{**} (2.3–5.4)
Born in United States	2.8 ^{***} (0.8–4.8)	8.8 ^{***} (6.6–11.0)	2.4 ^{**} (0.1–4.6)	8.9 ^{**} (6.6–11.1)
Indian language spoken at home				
Very Often	69.6 ^{***} (63.9–75.3)	62.5 ^{***} (58.8–66.3)	72.9 (66.2–79.6)	69.4 (65.7–73.1)
Somewhat Often	17.2 ^{***} (12.5–21.9)	13.5 ^{***} (10.9–16.2)	17.6 (11.9–23.4)	15.9 (13.0–18.8)
Not Often	11.6 ^{***} (7.6–15.6)	14.0 ^{***} (11.3–16.7)	7.6 (3.6–11.7)	10.0 (7.6–12.4)
Not Reported	1.6 ^{***} (0.0–3.2)	9.9 ^{***} (7.6–12.2)	1.8 (0.0–3.7)	4.7 (3.0–6.4)
I consider myself American	2.8 ^{**} (0.8–4.9)	9.1 ^{**} (6.8–11.4)	1.8 (0.0–3.9)	2.9 (1.5–4.3)
I consider myself Asian Indian or Asian Indian-American	97.2 ^{**} (95.1–99.2)	90.9 ^{**} (88.6–93.2)	98.2 (96.1–100)	97.1 (95.7–98.5)
Not Reported	-	-	-	-
RELIGIOUS FAITH				
Religion(4-categories)				
Sikhism	3.3 ^{***} (1.0–5.5)	35.8 ^{***} (32.0–39.5)	6.0 ^{***} (2.4–9.7)	30.8 ^{***} (27.1–34.6)
Hinduism	76.0 ^{***} (70.7–81.4)	40.9 ^{***} (37.0–44.7)	72.9 ^{***} (66.1–79.7)	54.2 ^{***} (50.2–58.3)
Islam	6.9 ^{***} (3.7–10.1)	3.5 ^{***} (2.1–5.0)	8.4 ^{***} (4.2–12.7)	5.8 ^{***} (3.9–7.6)
Other South Asian faith	13.8 ^{***} (9.5–18.1)	19.8 ^{***} (16.7–22.9)	12.7 ^{***} (7.6–17.7)	9.2 ^{***} (6.8–11.5)
Spiritual beliefs are the foundation of life				
Not Reported	5.8 (2.8–8.8)	7.8 (5.7–10.0)	1.2 (0.0–2.9)	2.3 (1.1–3.5)
Disagree	6.6 (3.5–9.8)	9.0 (6.7–11.3)	6.0 (2.4–9.6)	7.5 (5.4–9.7)
Neither Agree or Disagree	9.5 (5.8–13.3)	7.2 (5.1–9.2)	1.8 (0.0–3.8)	4.2 (2.6–5.9)

	MALE: %, 95% CI		FEMALE: %, 95% CI	
	Current CST Users (N=250)	Never CST Users (N=636)	Current CST Users (N=170)	Never CST Users (N=598)
Agree	78.0 (72.8–83.2)	76.0 (72.6–79.4)	91.0 (86.7–95.4)	86.0 (83.1–88.8)
I believe that I am a religious person				
Not Reported	5.7 (2.8–8.6)	8.4 (6.2–10.6)	1.2* (0.0–2.8)	2.2* (1.0–3.4)
Disagree	68.7 (62.9–74.5)	72.7 (69.2–76.2)	83.4* (77.8–89.1)	87.9* (85.3–90.6)
Neither Agree or Disagree	11.8 (7.8–15.8)	6.9 (4.9–9.0)	9.5* (5.0–13.9)	3.9* (2.3–5.5)
Agree	13.8 (9.5–18.1)	12.0 (9.4–14.5)	5.9* (2.3–9.5)	6.0* (4.0–7.9)
Observed traditional holidays important to culture and religion				
No, rarely or never	10.8 (7.0–14.7)	14.0 (11.3–16.7)	2.4*** (0.1–4.7)	6.9*** (4.9–8.9)
Yes, some of the time	38.6 (32.5–44.6)	33.1 (29.5–36.8)	31.4*** (24.3–38.4)	25.0*** (21.6–28.5)
Yes, much of the time	23.7 (18.4–29.0)	20.5 (17.4–23.6)	30.8*** (23.8–37.7)	24.2*** (20.8–27.6)
Yes, almost always	26.9 (21.4–32.4)	32.3 (28.7–36.0)	35.5*** (28.3–42.7)	43.9*** (39.9–47.9)

Note: p-values are reported for current vs. never cultural tobacco users within each gender

* p < 0.05

** p 0.01

*** p 0.001

TABLE 2

Final Multivariable Logistic Regression of Current vs. Never Users of Cultural Smokeless Tobacco among Asian Indian Adults in California

	Odds Ratios (95% CI) N = 1,618
SOCIODEMOGRAPHICS	
Age	
18 – 29 (referent)	1.0
30 – 49	1.1 (0.8, 1.6)
40 – 49	1.5 (1.0, 2.3)
50+	1.9 (1.3, 2.9)
Gender	
Male	1.5 (1.2, 2.0)
Education	
Less than high school (referent)	1.0
High school OR some college/trade school	2.6 (1.1, 6.5)
College degree OR graduate/professional school	4.0 (1.7, 9.5)
Household income	
<\$20,000 (referent)	1.0
\$20,000 to <\$50,000	1.5 (0.8, 3.1)
\$50,000 to <\$75,000	1.9 (1.0, 3.7)
\$75,000 to <\$100,000	2.5 (1.3, 4.7)
>\$100,000	2.6 (1.4, 5.0)
Not reported	2.1 (1.1, 4.1)
ACCULTURATION	
Percentage of life in United States	
<25%	2.1 (1.1, 4.3)
25% to <50%	2.8 (1.3, 5.6)
50% to <75%	3.4 (1.6, 7.3)
75% or more but not born in United States	3.2 (1.4, 7.3)
Born in United States (referent)	1.0
Not reported (may include equal % in India & United States)	0.7 (0.1, 4.2)
Language most often spoken at home	
Indian language	2.3 (1.5, 3.4)
English or non Asian Indian language (referent)	1.0
RELIGIOUS FAITH	
Religion	
Hinduism	10.0 (6.0, 16.5)
Sikhism (referent)	1.0
Other Asian Indian faiths (including Islam, Jainism, Buddhism)	10.2 (5.9, 17.7)

	Odds Ratios (95% CI) N = 1,618
Spiritual beliefs are the foundation of life	
Agree (referent)	1.0
Neither Agree nor Disagree	1.6 (0.8, 3.1)
Disagree	2.1 (1.2, 3.5)
Not reported	1.0 (0.5, 2.1)
Observed traditional holidays important for culture/religion	
Yes, almost always (referent)	1.0
Yes, much of the time	1.2 (0.8, 1.6)
Yes, some of the time	1.2 (0.9, 1.7)
No, rarely or never	0.8 (0.5, 1.3)

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