Determinants of Health Provider Advice for Tobacco Cessation and Sugar-Sweetened Beverage Intake in Stanislaus and Madera Counties. A Patient Perspective Study

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Abstract

Background: Oral health is an essential aspect of overall health. A national epidemic of poor oral health outcomes exists among those living under poverty, the elderly and several minority groups. Tobacco use and consumption of sugar-sweetened beverages (SSB) are preventable risk factors that contribute to poor oral health. Dental providers are considered a primary line of defense to deliver tobacco cessation and SSB consumption interventions. This study seeks to examine the prevalence and predictors of receiving such interventions in the dental setting in two counties in California's Central Valley.

Methods: Data for 419 participants used in this cross-sectional study were collected throughout Madera and Stanislaus counties. Sociodemographic and dental health characteristics were used to examine their effect on the receipt of advice about tobacco cessation and the consumption of SSBs by a dental provider. A series of logistic regression models were constructed to define what characteristics influenced the odds of receipt of advice in such setting.

Results: Among the overall total of participants included in this analysis, 32% indicated the receipt of advice about tobacco cessation while 53% indicated the receipt of SSB advice by their dental health provider. Measures such as teeth appearance satisfaction, employment, and county of residence had significant effects on the odds of the receipt of tobacco cessation advice. While measures for perception of the importance of preventative visits to the dentist, dental appearance satisfaction, reason for dental visit, tooth flossing frequency, Denti-Cal insurance and being 65 years or older were significant in predicting the odds of receiving SSB consumption advice.

Conclusion: There is a need of implementing system changes within the dental practice to ensure that all patients get tobacco and SSB related interventions.

Introduction

Oral health is an essential aspect of overall health. Evidence exists on the relationship between poor oral health and the initiation or exacerbation of chronic inflammatory diseases or conditions[1-3] as well as adverse pregnancy outcomes.[4] A report from The National Institute of Dental and Craniofacial Research stated that about 90% of adults between the ages of 20 and 64 had had at least one cavity in their lifetime and 26% of adults in the US having untreated tooth decay.[5] Similarly, the Centers for Disease Control and Prevention (CDC) reported that advanced gum disease affects 4%–12% of the US adult population, adding that more than 7,800 people, mostly older Americans, die from oral and pharyngeal cancers each year.[6] Caries and periodontal disease share common preventable risk factors with other chronic diseases, including poverty, poor diet, and tobacco use.[7]

In 2000, the US Surgeon General's report on the status of oral health indicated the existence of a "silent epidemic" of poor oral health among the nation's most vulnerable individuals- those living under poverty, the elderly and several minority groups.[8] The San Joaquin Valley in California, a region although considered as the most productive agricultural region in the world, with a highly diverse population,[9] is inundated with high poverty rates, lower educational attainment as well as medical provider shortages where those factors contribute to the poor health status found in the region.[10,11]

Studies have shown that advice from medical and dental providers to reduce the consumption of sugar-sweetened beverages or quit tobacco impacts patient's behavior.[12-14] Understanding the factors that impact whether or not individuals receive dental advice regarding sugar-sweetened beverage and tobacco intake is vital, as dental interventions are crucial to

fighting oral health disease in underserved regions with large minority populations such as California's SJV.

Excess sugar consumption, specifically through the consumption of sugar-sweetened beverages (SSB) that is; beverages containing added sugars such as sucrose and high fructose corn syrup that are found in products such as soda pop, juice drinks and energy drinks,[15,16] has been identified as a risk factor for oral health, with numerous studies reporting significant associations between dental caries and SSB consumption.[16-23] As for tobacco use, besides its widely known effects on cardiovascular health and lung cancer incidence, plenty of evidence exists on the relationship between tobacco use and oral health disease, where primary forms of tobacco use such as cigarettes, cigars, pipe tobacco, and smoke-less tobaccos are considered as risk factors for severe oral health consequences such as oral cancer, periodontitis, gingival recession, mucosal lesions, coronal caries, root caries, implant failure, as well as aesthetic effects such as teeth staining and halitosis.[7,24-30]

The CDC estimates that Americans make about 500 million visits to the dentist each year.[6] Such number points to a unique opportunity to introduce tobacco cessation and SSB intake interventions in the dental setting. In terms of effectiveness, tobacco-related interventions by dental professionals have been shown to help patients decide to quit as well as reported sustained abstinence.[13,31-37] Nonetheless, while studies show that dentists perceived tobacco cessation as an important aspect of dental care,[38] there are indicators that many dentists do not implement tobacco interventions.[39-41] As for SSB interventions, a systematic review that was done by Harris et al., that evaluated studies with findings on dietary interventions done in the dental setting, concluded that patients who received dietary advice from their dental care provider were more

likely to report positive dietary behavior change compared to those who did not receive any advice.[14]

In November 2016, California's Healthcare, Research and Prevention Tobacco Tax Act (Proposition 56) was approved, where the ballot measure increased the state's tobacco tax by $2.[42] Revenues from this tax established a dedicated revenue source for the state's oral health program with a $30 million increase in funding than previous years.[43] The expansion of the oral health program prompted oral health needs assessments all over the state to work on identifying and establishing solutions for oral health needs in each county.[44] In 2018, needs assessments completed by UC Merced in conjunction with Madera County Health Department and Stanislaus County Health Services Agency, in Madera and Stanislaus County, revealed the existence of high rates of oral health needs.[45,46] Besides the previously mentioned factors such as high poverty rates, poor dental health outcomes might be exacerbated by the fact that these counties are reported to have higher than average smoking rates found in California [47] as well as higher consumption of SSBs; determined by the intake of a sugary drink one or more times per day among adults, compared to the overall average in California (Table 1).[48]

	California	San Joaquin Valley	Madera	Stanislaus
Tobacco use	12.6% (CI: 11.8% - 13.4%)	17.1% (CI: 15.0% -19.1%)	14.0% (CI: 11.5% - 16.5%)	11.5% (CI: 7.8% - 15.2%)
SSB Intake	17.4% (CI: 16.5% -18.3%)	24.2% (CI: 21.7% - 26.8%)	27.0% (CI: 22.5% - 31.6%)	19.0% (CI: 14.2% - 23.8%)

Given the effect of tobacco use and SSB consumption on oral health, tobacco cessation and SSB consumption, interventions by all health care providers are needed, particularly in the

dental setting. However, the percentage of patients that are advised about their tobacco use and SSB intake in the dental setting in the San Joaquin Valley is unknown. This study seeks to understand how many individuals in two counties in the San Joaquin Valley (Madera and Stanislaus) receive tobacco use and diet interventions, and what are the social and dental characteristics of the patients that are less/more likely to receive such interventions. While many studies on the subject matter were based on data collected from dental providers,[38,41,49-52] this study focuses on understanding differences in receipt of tobacco cessation and SSB consumption from the patient's perspective and experiences.

Methods:

Data:

Data used in this cross-sectional study were collected throughout Madera and Stanislaus counties. Based on recommendations by each county's public health departments, high traffic areas were selected to conduct self-administered surveys. Those areas included: farmer's markets, swap meets, flea markets, community clinics, libraries and community meetings. Additionally, public health departments allowed researchers to attend Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) events and WIC classes in order to request participation for the surveys. Data for a total of 419 participants were collected, composed of adults, age 18 and above, whose zip-code is located in one of the two counties. Surveys were available in English and Spanish, and bilingual research assistants were available to assist participants who were unable to read or write. Surveys were collected with IRB approval from UC-Merced IRB review board.

Survey Development

Survey questions were tested for readability by UC-Merced students and public health department members, who took the survey and gave recommendations on confusing or potentially misinterpreted questions in both English and Spanish (see Table 2 for survey questions). Survey questions were adopted from the California Health Interview Survey (CHIS), in which measures are extensively validated. Based on previous unpublished pilot studies that were done in the region, we discovered that income-related questions are often left blank. Consequently, we used receipt of WIC or CalFresh/SNAP[53] (programs that provide nutrition assistance to low income individuals) as a proxy to measure poverty level. Also, considering the political climate, citizenship and immigration status questions were not administered to ensure participants were comfortable answering the questions in the survey.

Table 2: Examples of questions from the questionnaire

Cognitive
How important is it to see a dentist to prevent tooth decay?
How confident are you filling out medical forms by yourself?
How would you rate your overall health?
How would you rate the health of your teeth and gums?
How important is it to see a dentist to prevent gum disease?
How important is it to see a dentist to prevent tooth loss?
Affective:
Are you satisfied with the way your teeth look?
Behavioral:
How often do you brush your teeth?
How often do you floss your teeth?
About how long has it been since your last trip to the dentist?
Dental Problems:
Do you have any bleeding gum problems?
Do you have a dry mouth?
Do you have any broken teeth?
Do you have any chewing difficulty?
Do you have cavities that need filling?
Do you have sore gums?
Do you have any toothache pain?

Measures

The two primary outcome variables were 1) receipt of advice about the consumption of sugar-sweetened beverage (yes or no) by their dental provider 2) Receipt of advice about tobacco use from a dental provider (yes or no). These variables were measured by asking participants: "*[h]as your dentist ever talked to you about the types of beverage you drink and the effect of beverages on your teeth?"* and "*[h]as your dentist ever talked to you about using tobacco, such as asking if you smoke or use tobacco products and/or suggesting you quit*?", respectively.

The primary independent variables in this study were; dental health variables as well as sociodemographic variables. Dental health variables included: self-rated overall health and self-rated dental health; which were assessed using a three-level scale of excellent, good or poor. In addition, satisfaction with dental profile was included and it was measured with yes or no. We also asked about the reason for the last dental visit, whether it was for a dental problem or for a routine checkup. Dental health variables also included behavioral dental variables such as brushing and flossing frequency, which were measured by once a day or less or twice a day or more.

Since more than 50% of the population residing in Stanislaus and Madera counties are eligible for Denti-Cal coverage, we restricted insurance coverage options to having Denti-Cal, or having other insurance coverage (through an employer, the Department of Veterans Affairs, parents, or other venues). Notably, almost a third of the respondents left this question blank. As a result, individuals' insurance status was coded as having Denti-Cal insurance, not having Denti-Cal insurance, or not responding to the question.

We also constructed a dental issue index of questions that ask about bleeding gums, dry mouth, broken teeth, cavities, sore gums, toothache, loose teeth and chewing difficulty in which

respondents were given the options yes or no. Also, questions that asked about perceived importance to visit the dentist for prevention of tooth decay, gum disease, and tooth loss were assessed using a three-level scale of extremely important, important or not at all important. We used factor analysis to confirm that those measures could be place in the dental issue index. Because the variables that measured dental problems were binary (yes or no), we ran a polychoric correlation matrix, which we used as the basis for exploratory factor analysis. Our analysis indicated a one-factor solution (Eigenvalue=4.21) and variables measuring bleeding gums, dry mouth, broken teeth, cavities, sore gums, toothache, loose teeth, chewing difficulty loaded onto the same factor with a factor loading of 0.5 or above.

Additionally, a perceived importance for dental visits for prevention index was also constructed in which questions asking *"How important is it to see a dentist to prevent tooth decay," "How important is it to see a dentist to prevent gum disease," "How important is it to see a dentist to prevent tooth loss."* These questions had three options: "*Not at all important, Important, Extremely important.*" The measures were confirmed to be included in an index using factor analysis with a varimax rotation. A one-factor solution was concluded with a Cronbach's Alpha= .93. Variables measuring perceived importance to visit the dentist to prevent tooth decay, prevent gum disease, and prevent tooth loss loaded into the same factor with a factor loading of .83 or above.

As for sociodemographic variables, the following were used as predictors of receiving a dental intervention- SSB or tobacco related: sex (male, female), age categories (18-34, 35-64, 65 or older), race/ethnicity (White, Hispanic, other), employment (employed, unemployed, other), literacy level (always confident to fill medical forms, sometimes/ never confident to fill medical

forms), having a High School Diploma/GED (yes, no), and receipt of WIC or CalFresh/ Snap (yes, no).

Analysis:

Differences between means in continuous variables were tested using t-tests. Chi-square test was used for categorical variables to determine their significance at a .05 significance level. Since the outcomes of this study were binary (yes/no), logistic regression was used to examine the relationship between dental health variables and demographic variables with receiving advice from a dental provider about tobacco use and SSB consumption. A total of four analyses were conducted for each of the dependent variables. The first analysis looked at the relationship between demographic variables and dental variables while the second analysis looked at the relationship between demographic variables only and the outcomes of interest, respectively. The third analysis looked only at the relationship between dental health characteristics and the outcomes of interest, and the last model used a backward elimination approach to determine the most parsimonious model by twelve stepwise approaches. All analyses were done using Stata/IC version 15.[54]

Results:

Participants:

Among the overall total of 419 participants included in this analysis, 32% indicated that they received advice about tobacco cessation while 53% indicated the receipt of SSB advice by their dental health provider (Table 3). Participants were more likely to be female (68%), aged between 35 to 64 years old (53%), and were more likely to be Hispanic (53%). Almost (70%) of participants did not utilize WIC, SNAP or CalFresh benefits with a majority indicating that they completed high school level education or above (77%). As for employment, participants were

equally likely to be employed (full or part time) or non-employed (46%), with (37.7%) indicating that they had Denti-Cal; California Department of Health Care Services', Medi-Cal Dental Program.

Bivariate analysis showed a significant difference in the number of participants across the different demographic and dental characteristics who reported receiving SSB advice, however there were few differences detected around receiving tobacco cessation advice. Bivariate analysis showed that the population that received tobacco cessation advice varied by sex, race/ethnicity, WIC or SNAP/CalFresh receipt, and county of residence. Populations who received SSB consumption advice varied by insurance status.

Table 3. Characteristics of adults who visit a dental health provider and the prevalence of receiving advice about tobacco use and consumption of sugar-sweetened beverages, Stanislaus and Madera General Population Oral Health Survey 2018

		Prevalence of receipt of tobacco cessation advice		Prevalence of receipt of sugar-sweetened beverage consumption advice	
Characteristics	N (%)	%	p-value	%	p-value
Sex					
Male	107(25.5)	37.4		50.5	
Female	284(67.8)	30.3	**0.015**	55.3	0.481
Missing	28(6.7)	32.1		39.3	
Age					
18-34	141(31.3)	27		57.5	
35-64	220(52.5)	38.2	0.191	54.6	0.108
65 or older	50(11.9)	22		34	
Missing	8(1.9)	25		50	
Race/Ethnicity					
White	131(31.3)	26.7		46.6	
Latino/Chicano/Hispanic	223(53.2)	33.6	**0.035**	55.6	0.716
Other including multi	61(14.6)	37.7		57.4	
Missing	4(1.0)	50		50	
Receive WIC or SNAP/CalFresh					
No	289(69.0)	27.7		52.6	
Yes	122(29.1)	42.6	**0.048**	54.1	0.187
Missing	8(2.0)	37.5		50	

Education (HS diploma or equivalent)					
No	90(21.5)	33.3		46.7	
Yes	322(76.9)	31.7	0.790	54.7	0.334
Missing	7(1.7)	42.9		57.1	
Employment					
Employed	194(46.3)	31.4		56.2	
Unemployed	195(46.5)	33.9	0.144	50.8	0.451
Other (seasonal, retired)	20(4.8)	25		50	
Missing	10(2.4)	30		40	
Denti-Cal Insurance					
Denti-Cal insurance	158(37.7)	31.7		56.3	
Other insurance	134(32.0)	38.8	0.336	61.9	**0.003**
No response	127(30.3)	26		39.37	
County					
Madera	254(60.6)	34.3	**0.042**	50.8	0.535
Stanislaus	165(39.4)	29.1		56.4	
Total	419	32		53	

Receipt of Tobacco Cessation Advice:

Results from the logistic regression models that show the correlation between sociodemographic and dental characteristics and the receipt of tobacco cessation advice are shown in Table 4. Model 1 examined the combined effects of sociodemographic and dental health characteristic among the study sample. Participants who were 35-64 years old had 3.4 times the odds of receiving tobacco cessation advice from their dental health provider, compared to those aged between 18 and 34. (OR=3.42, 95% CI: 1.15, 10.14). Those who reported other in their employment status had lower odds of receipt of advice compared to participants who were employed. (OR=.11, 95% CI: .02, .70). Additionally, those who lived in Stanislaus county, compared to those who live in Madera, had lower odds of receiving advice about tobacco cessation (OR=.25, 95% CI: .08 - .84). These trends were consistent across Model 2; where we only examined sociodemographic characteristics. Except for age (35-64 years old) and

employment status, sociodemographic characteristics were not statistically significant predictors for receipt of tobacco cessation advice across all models.

When controlling only for dental and overall health characteristics, as seen in Model 3, we found no statistically significant predictors of receiving smoking cessation advice. However, participants that rated their overall health status as good (OR=.31, 95% CI: .09-1.02) compared to those who rated their health as excellent, had lower odds of receiving smoking cessation advice compared to those who rated their health as excellent. While their 95% confidence intervals crossed 1, p=.05, but the variable was not included in Model 4. Lastly, in Model 4, where only statistically significant variables were used, similar associations to models 1-3 were found, where participants who were satisfied with their dental appearance had higher odds of receipt of tobacco cessation advice compared to those who are not (OR=2.04, 95% CI: 1.06 – 3.92). Participants who resided in Stanislaus county (OR=.51, 95% CI: .26 – 1.00) had lower odds of receipt of tobacco cessation advice compared to their counterparts.

Table 4. Odds Ratios for Receiving Tobacco Cessation Advice in the Dental Setting, Stanislaus and Madera General Population Oral Health Data, 2018

	Model 1**			Model 2**			Model 3***			Model 4****		
Variables	OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI
Perceived Overall Health Status												
Excellent		Reference						Reference				
Good	0.27	0.09	.06- 1.23				0.31	0.05	.09 – 1.02			
Poor	0.15	0.34	.02 – 1.32				0.17	0.06	.03 – 1.05			
Perceived Dental Health Status												
Excellent		Reference						Reference				
Good	1.26	0.80	.22- 7.12				1.22	0.77	.32 – 4.59			
Poor	1.00	1.00	.11 – 9.24				0.99	0.99	.17 - 5.88			
Importance of Prevention Index	1.09	0.54	.82 -1.46				0.97	0.74	.80 - 1.17			
Dental Appearance Satisfaction												
No		Reference						Reference			Reference	
Yes	2.88	0.06	.95 – 8.75				2.41	0.07	0.92 – 6.30	**2.04**	**0.03**	**1.06 – 3.92**
Reason for Dental Visit												
Routine check-up		Reference						Reference				
Dental problem	1.09	0.88	0.35 – 3.44				1.53	0.36	.62 – 3.80			
Tooth Brushing Frequency												
Once a day or less		Reference						Reference				
twice a day or more	1.19	0.78	0.35 – 4.10				1.33	0.57	.51 – 3.48			
Tooth Flossing Frequency												
Once a day or less		Reference						Reference				
twice a day or more	2.07	0.20	.69 -6.20				1.76	0.21	.73 – 4.24			
Dental Disease Index (1-8)	4.45	0.15	.43 – 45.67				5.93	0.08	.79 – 44.78			
Denti-Cal Insurance												
Denti-Cal Insurance		Reference						Reference				
Other Insurance	1.75	0.37	.52 – 5.91				1.93	0.18	0.74- 5.05			
No response	.47	0.22	.14-1.56				0.61	0.67	0.24- 1.50			
Sex												
male		Reference			Reference							

female	0.79	0.67	.28 - 2.27	1.08	0.84	.49 - 2.38					
Race/Ethnicity											
white		Reference			Reference						
Latino	1.15	0.82	.34 – 3.88	1.32	0.55	.52 -3.33					
other	0.91	0.86	.24 – 3.45	1.02	0.97	.34 - 3.07					
Age											
18-34		Reference			Reference						
35-64	**3.42**	**0.03**	**1.15 – 10.14**	**3.27**	**0.01**	**1.39 - 7.71**					
65+	.80	0.82	0.12 - 5.40	1.85	0.40	.44 - 7.67					
Employment											
employed		Reference			Reference				Reference		
unemployed	0.62	0.40	.20 -1.90	0.49	0.11	.20 - 1.18	0.66	0.23	.34 – 1.30		
other (seasonal, retired)	**0.11**	**0.02**	**.02 - .70**	**0.22**	**0.05**	**.05 - 1.00**	**0.28**	**0.05**	**.08 - .1.01**		
Literacy											
always confident		Reference			Reference						
sometimes/never confident	0.85	0.74	.31- 2.30	0.65	0.30	0.29 - 1.48					
Has A High School Diploma Or GED											
No		Reference			Reference						
Yes	1.14	0.83	.24 - 5.04	1.15	0.77	.45- 2.96					
Receives WIC, Snap or CalFresh											
No		Reference			Reference						
Yes	1.47	0.51	.47 – 4.56	2.41	0.07	.93 - 6.24					
County											
Madera		Reference			Reference						
Stanislaus	**0.25**	**0.03**	**.08 – 0.84**	0.51	0.10	.23 - 1.13		**.51**	**0.05**	**0.26 – 1.00**	
AIC		186.5			206.2		203.3		236.9		
BIC		257.3			243.3		243.3		253.1		

Notes:

* Full Model ** Social Determinants Model
*** Dental Health Characteristics Model **** Significant Variables Model

Receipt of SSB Consumption Advice:

Table 5 displays results obtained from the four logistic regressions used to model the relationship between sociodemographic and dental health characteristics and the receipt of SSB consumption advice by a dental health provider. In Model 1, where both sociodemographic and dental health characteristics were used, odds of receipt of advice were higher as participants scored upwards in the Perceived Importance of Prevention Index. (OR=1.25, 95% CI: 1.04-1.49). Also, similar to the models used to predict tobacco cessation advice, dental appearance satisfaction was statistically significant where those who answered "yes" (OR=1.92, 95% CI: 1.03- 3.58) had higher odds of receiving advice compared to those who answered "no." Compared to White participants, those who were not "White" or" Latino" (OR=2.34, 95% CI: 1.04 – 5.27) had higher odds of receipt of SSB advice. There were lower odds of receipt of SSB consumption advice among those aged 65 or higher (OR=.26, 95% CI: .09 - .75), compared to those aged between 18 and 34.

In Model 2, where only sociodemographic characteristics were examined, sex, race/ethnicity, age, employment status, high school education, poverty level nor county of residence had statistically significant effects on receipt of advice. However, participants who reported "sometimes/never confident" (OR=.59, 95% CI: .36 - .99) on filling medical forms had lower odds of receipt of advice compared to those who reported "always confident." However, when examining dental health characteristic only as seen in Model 3, similar effects were found in The Perceived Importance of Prevention Index (OR 1.16, 95% CI: 1.02 – 1.32) and dental appearance satisfaction (OR:1.81, 95% CI: 1.04 – 3.16) that were found in Model 1. Additionally, participants who reported having Denti-Cal insurance (OR:2.08, 95% CI:1.15 – 3.76) had higher odds of receipt of SSB consumption advice compared to those who did not.

In Model 4, with only significant variables, those who reported satisfaction with their dental appearance (OR=1.94, 95% CI: 1.22- 3.10) had higher odds of receiving advice than those who did not), and with every one-point increase in the Perceived Importance of Prevention Index (OR=1.17, 95% C: 1.03 – 1.32), participants had higher odds of receiving SSB consumption advice. Those who reported visiting the dentist for a dental problem (OR: .49, 95% CI: .30 - .08) reported lower odds for receiving advice about their SSB consumption compared to those who reported visiting the dentist for a routine check-up. Participants who reported flossing twice a day or more (OR: 1.82, 95% CI: 1.09- 3.04) had higher odds of receiving advice compared to those who flossed once a day or less. In addition, those who reported having Denti-Cal (OR= 1.91, 95% CI: 1.9 – 3.33) had higher odds of receiving advice about their SSB consumption compared to those who did not, while those who were aged 65 or older (OR=.28, 95% CI: .13 - .63) had lower odds of receiving SSB consumption advice by their dental provider to those aged between 18 and 34.

Table 5. Odds Ratios for Receiving SSB Consumption Advice in the Dental Setting, Stanislaus and Madera Oral Health General Population Data, 2018

Variables	Model 1*			Model 2**			Model 3***			Model 4****		
	OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI	OR	p-value	95% CI
Perceived Overall Health Status												
Excellent		Reference						Reference				
Good	.52	.08	.25 - 1.08				.49	.04	.25 - .98			
Poor	.68	.58	.17 - 2.66				.54	.35	.15 - 1.95			
Perceived Dental Health Status												
Excellent		Reference						Reference				
Good	.97	.94	.43 - 2.20				1.13	.75	.53 - 2.39			
Poor	.68	.51	.21 - 2.18				.83	.74	.28 - 2.46			
Perceived Importance of Prevention Index	**1.25**	**.01**	**1.04 - 1.49**				**1.16**	**.03**	**1.02 - 1.32**	**1.17**	**.02**	**1.03 - 1.32**
Dental Appearance Satisfaction												
No		Reference						Reference			Reference	
Yes	**1.92**	**.04**	**1.03 - 3.58**				**1.81**	**.04**	**1.04 - 3.16**	**1.94**	**.01**	**1.22 - 3.10**
Reason for Dental Visit												
Routine check-up		Reference						Reference			Reference	
Dental problem	.64	.17	.34 - 1.20				.59	.07	.34 - 1.04	**.49**	**.01**	**.30 - .80**
Tooth Brushing Frequency												
Once a day or less		Reference						Reference				
twice a day or more	1.85	.09	.90 - 3.81				1.66	.12	.88 - 3.12			
Tooth Flossing Frequency												
Once a day or less		Reference						Reference			Reference	
twice a day or more	1.69	.10	.90 - 3.16				1.51	.13	.89 - 2.58	**1.82**	**.02**	**1.09 - 3.04**
Dental Disease Index (1-8)	.86	.84	.20 - 3.69				1.11	.88	.29 - 4.23			
Has Denti-Cal Insurance												
Denti-Cal Insurance		Reference						Reference			Reference	
Other Insurance	1.52	.24	.75 - 3.07				**2.08**	**.02**	**1.15 - 3.76**	**1.91**	**.02**	**1.9 - 3.33**
No response	.84	.62	.42 - 1.67				.87	.65	.48 - 1.58	.71	.23	.41 – 1.25
Sex												

male		Reference			Reference						
female	.99	.98	.55 - 1.79	1.06	.80	.65 - 1.75					
Race/Ethnicity											
White		Reference			Reference						
Latino	1.20	.58	.63 - 2.26	1.41	.20	.84 - 2.37					
other	**2.34**	**.04**	**1.04 - 5.27**	1.65	.15	.84 - 3.26					
Age											
18-34		Reference			Reference					Reference	
35-64	.67	.19	.36 - 1.22	.88	.61	.54 - 1.44	.77	.30	.47 - 1.26		
65+	**.26**	**.01**	**.09 - .75**	.50	.11	.22 - 1.17	**.28**	**.00**	**.13 - .63**		
Employment											
employed		Reference			Reference						
unemployed	1.49	.20	.81 - 2.74	1.04	.87	.63 - 1.73					
other (seasonal, retired)	1.15	.80	.37 - 3.56	.91	.86	.34 - 2.44					
Literacy											
always confident		Reference			Reference						
sometimes/never confident	.73	.31	.40 - 1.34	**.59**	**.04**	**.36 - .99**					
Has A High School Diploma Or GED											
No		Reference			Reference						
Yes	.85	.69	.39 - 1.87	1.19	.60	.63- 2.22					
Receives WIC, Snap or CalFresh											
No		Reference			Reference						
Yes	1.20	.59	.61 - 2.33	1.17	.56	.69 - 2.01					
County											
Madera		Reference			Reference						
Stanislaus	.78	.46	.41 - 1.50	1.35	.21	.84 - 2.15					
AIC		406			487.9		440.5			469.4	
BIC		495.1			534.1		490.2			504.8	

Notes:
* Full Model ** Social Determinants Model *** Dental Health Characteristics Model **** Significant Variables Model

Discussion:

In this study, we exhibit the differences in frequency of receiving advice on tobacco cessation and SSB consumption. Firstly, pertaining to tobacco cessation advice, our results point out the challenges to reach the Healthy 2020 goal of having 58.2% of dental care providers delivering tobacco cessation interventions[55] since only 37% of the study participants reported receiving such advice, compared to national data that indicated 52.9% of general practice dentists reported that they or their dental team usually or always ask patients if they use tobacco in 2010. [55]As for SSB consumption advice, despite the magnitude of consequences caused by SSB consumption in the region, such as poor oral health and diabetes,[10] there are also disparities in the receipt of SSB consumption advice across all groups, with only 53% of our sample reported receiving advice on SSB consumption from dentists.

The *Clinical Practice Guideline, Treating Tobacco Use and Dependence*[56] was established in 2008 for health providers including dental care providers to facilitate tobacco cessation among their patients. In addition, Medicare and Medicaid incentivize medical providers for the use of electronic health records (EHR).[57] The Meaningful use act of EHR facilitates tobacco screening and tobacco cessation where each patient is screened for tobacco use and given the 5A's (Ask, Advise, Assess, Assist, Arrange), still this study points to the disparities in the percentage of patients who are asked and given advice about their tobacco use given their Denti-Cal insurance coverage, where only 31.7% of our sample with Denti-Cal insurance reported receiving advice.

Consistent with findings of previous studies done on receipt of tobacco use advice from health professionals,[40] education level, sex, or poverty status were not associated with receiving advice from a dental health provider. Nonetheless, our results illustrate that those who are retired, and aged 65 or more, had lower odds of receiving tobacco cessation than their counterparts, signifying the need of reviewing dental care practices for this group, as well as dental insurance coverage.

As for SSB consumption, according to the *American Community Survey*, Hispanics are the largest ethnic minority in SJV, with over 32% of the total population in California.[58] A study by Park et al. reported that Hispanics were less likely to report SSB consumption to be a risk factor for dental caries.[59] Given that Hispanics are more likely to be obese and diabetic than non-Hispanics,[60] our findings point to an opportunity to increase dental health knowledge, since only 53% of respondents who identified as Hispanic received SSB consumption advice in the dental setting. Additionally, a study done by Mekonnen et al, showed that modelling the effect of decreasing SSB consumption in California by 10–20% between 2013 and 2022 would lower incident cases of diabetes by 12,000 to 23,000 (a 1.8–3.4% reduction).[61] This indicates the importance of implementing systems change to increase SSB consumption advice within the dental setting.

Our results suggest that employment is a significant factor when predicting tobacco cessation advice. Since health insurance in the United States is reliant on permanent full-time employment or falling under designated income threshold to qualify for state-funded Denti-Cal, this points to a unique predicament for workers. Since agriculture-related jobs, a leading employment sector in the San Joaquin Valley (SJV), does not provide robust health benefits to its workers, as seasonal workers comprise a large percentage of its workforce in this area.[62]This is compounded by the fact that large areas in the SJV are designated as medical provider shortage areas, where oral health needs assessments done in Stanislaus and Madera counties found a shortage of dental health providers that accept Denti-Cal plans.[45,46] Our results imply the need to increase the number of providers that accept Denti-Cal.

Oral health disease contributes to both to poorer subjective oral health and a poorer self-rated general health, extending its effects to the satisfaction of dental appearance. Our findings suggest that patients who are satisfied with their dental health status were more likely to perceive their dental care visit positively and to recall advice given by their dental care provider.

Limitations:

The study's cross-sectional observational design limits its generalizability across other populations, since it only draws from three counties in the Central Valley. A limitation that emerged during analysis and affected the ability to achieve meaningful statistical analyses was the tobacco use advice measure that asked participants whether or not they received advice from their dentist: "*Has your dentist ever talked to you about using tobacco, such as asking if you smoke or use tobacco products and/or suggesting you quit?"* The three options that were provided were: "*Yes, No, I don't smoke"*. This in turn eliminated a considerable proportion of respondents from being included in the analysis, since about 52% of the respondents checked "*I don't smoke"*. Furthermore, since the survey tool retrospectively asks about receiving tobacco and SBB advice, recall bias might pose as a limitation since we were unable to verify with their dentist whether or not they were advised about tobacco use or their SSB consumption.

Conclusion

There is a need of implementing system changes within the dental practice in the two counties examined to ensure that all patients receive tobacco cessation and SSB related interventions. In 2019, the State of California implemented a coordinated effort to address oral health disparities by providing the opportunity to fund a "local oral health program" to all local health jurisdictions in California. Our analysis points to populations within Stanislaus and Madera County who may benefit from sustained and coordinated oral health education campaigns. Our analysis also indicates that education campaigns focusing on dental appearance and the importance of oral health prevention efforts may increase attention to oral health in the community.

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