

California's T21 Law and Adolescents' Tobacco and Nicotine Use: Appendix 1

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## **Appendix 1**

### **Associations of California's T21 Law with Changes in Trends in Adolescents' Tobacco and Nicotine Use**

**(California Healthy Kids Survey Details and Supplemental Tables)**

### California Health Kids Survey

We analyzed data from a statewide sample of 7<sup>th</sup>, 9<sup>th</sup>, and 11<sup>th</sup> graders from public schools in California that participated in the California Healthy Kids Survey (CHKS) from 2010-11 to 2017-18. For a given school, the CHKS data are collected every other school year. Data collection is staggered, however, such that it occurs in approximately half the schools each school year. Data are collected in the fall each school year for some schools and in the spring for others. CHKS is managed by WestEd, a non-profit research organization, in collaboration with the California Department of Education (CDE).[1] School districts were formerly required to participate in CHKS to comply with the No Child Left Behind Act, Title IV, and are now required to participate if they receive funding under the State Tobacco Use Prevention Education Program. Otherwise CHKS participation is voluntary. Minimum CHKS requirements include participation by students in 7<sup>th</sup>, 9<sup>th</sup>, and 11<sup>th</sup> grades with a targeted response rate of 70% using passive or active parental consent. Based on CDE data, we estimate for the 2017-2018 and 2018-2019 survey years that 71% of schools with 7<sup>th</sup>, 9<sup>th</sup>, and 11<sup>th</sup> grades participated. To get complete student response rates would require us to access individual school reports for each year across all the years and schools. However, using a random sample of high schools from 48 school districts in 19 counties across several years we found the average response rates were 73% for 9<sup>th</sup> graders and 68% for 11<sup>th</sup> graders, with an overall rate of 71%.

*Sample characteristics.* The study sample includes data collected from 2,956,054 students who provided complete data on tobacco and nicotine use and other study variables. Because the survey did not include items about e-cigarette use until 2013, fewer students are included in those analyses (N = 2,069,487). Of CHKS participants in the study sample, 51% were female, 49% were Latinx, 22% identified as non-Latinx White, 1% as American

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Indian/Alaska Native, 2% as Native Hawaiian/Pacific Islander, 11% as Asian American, 4% as Black or African American, and 12% as more than one race or unknown race/ethnicity. About 34% of participating students in the study sample were in 7<sup>th</sup> grade, 35% in 9<sup>th</sup> grade, and 31% in 11<sup>th</sup> grade.

### Measures

*Cigarette smoking.* Students were asked how many times they had smoked a whole cigarette in their lifetime with 6 responses from “0 times” to “7 or more times”. They were also asked how many days they smoked cigarettes in the past 30 days, with 6 responses from “0 days” to “20 to 30 days”. Because of the skewed distribution of the responses, we dichotomized these measures (1 = any lifetime/past month use).

*Smokeless tobacco use.* Students were asked how many times in their lifetime they used smokeless tobacco and on how many days they used smokeless tobacco or snuff in the past 30 days using the same scales as for cigarette smoking. These measures were dichotomized (1 = any lifetime/past month use).

*E-cigarette use.* From the school year 2013-2014 onward, students were asked how many times they had used electronic cigarettes in their lifetime and past 30-days using the same scales as for cigarette smoking and smokeless tobacco use. We dichotomized these measures for the analyses (1 = any lifetime/past month use).

*Demographics.* Students were asked their sex, grade, race, and ethnicity. Sex was coded as a dummy variable (1 = Female). Grade was coded into two dummy variables, with 7<sup>th</sup> grade as the reference group. Race/ethnicity was coded as a series of dummy variables, with non-Latinx White as the reference group.

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**Table S1** Results of Mixed Effects Logistic Regressions Testing Associations Between California's T21 Law and Cigarette Smoking: Changes in Slopes (OR, 95% CI)

Predictor	Lifetime Smoking		Past 30-Day Smoking	
	Model 1	Model 2	Model 1	Model 2
T21	0.85 (0.73, 0.98)*	0.93 (0.69, 1.26)	1.26 (1.01, 1.56)*	1.73 (1.13, 2.64)**
Survey year	0.82 (0.81, 0.82)***	0.85 (0.84, 0.85)***	0.82 (0.81, 0.82)***	0.84 (0.83, 0.84)***
9 <sup>th</sup> Grade <sup>1</sup>	3.35 (3.21, 3.51)***	3.35 (3.21, 3.50)***	2.17 (2.06, 2.27)***	2.16 (2.06, 2.27)***
11 <sup>th</sup> Grade <sup>1</sup>	5.93 (5.68, 6.20)***	5.94 (5.68, 6.20)***	3.29 (3.13, 3.45)***	3.28 (3.13, 3.44)***
Female	0.77 (0.76, 0.78)***	0.77 (0.76, 0.78)***	0.722 (0.71, 0.73)***	0.72 (0.71, 0.73)***
American Indian/Alaska Native <sup>2</sup>	1.62 (1.57, 1.68)***	1.65 (1.52, 1.79)***	1.70 (1.63, 1.78)***	1.57 (1.43, 1.73)***
Native Hawaiian/Pacific Islander <sup>2</sup>	1.12 (1.09, 1.15)***	1.42 (1.32, 1.52)***	1.12 (1.08, 1.17)***	1.32 (1.20, 1.45)***
Asian American <sup>2</sup>	0.47 (0.46, 0.48)***	0.57 (0.54, 0.59)***	0.49 (0.48, 0.50)***	0.59 (0.55, 0.62)***
African American <sup>2</sup>	0.89 (0.87, 0.91)***	1.06 (1.00, 1.12)*	1.08 (1.05, 1.11)***	1.12 (1.05, 1.20)***
Multi-racial/unknown <sup>2</sup>	1.10 (1.08, 1.12)***	1.26 (1.21, 1.30)***	1.08 (1.06, 1.10)***	1.14 (1.09, 1.19)***
Latinx <sup>2</sup>	1.14 (1.13, 1.16)***	1.42 (1.38, 1.45)***	1.07 (1.05, 1.09)***	1.22 (1.18, 1.26)***
T21 x Survey Year	1.02 (1.00, 1.04)*	1.01 (0.97, 1.05)	0.97 (0.94, 1.00)*	0.93 (0.88, 0.98)**
T21 x American Indian/Alaska Native	–	3.11 (0.94, 10.32)	–	2.92 (0.61, 13.86)
T21 x Native Hawaiian/Pacific Islander	–	0.85 (0.25, 2.81)	–	1.31 (0.24, 7.23)
T21 x Asian American	–	0.78 (0.38, 1.60)	–	0.44 (0.16, 1.23)
T21 x African American	–	1.42 (0.61, 3.30)	–	1.88 (0.61, 5.75)
T21 x Multi-racial/unknown	–	1.06 (0.63, 1.80)	–	0.84 (0.40, 1.77)
T21 x Latinx	–	0.89 (0.62, 1.26)	–	0.60 (0.36, 1.00)*
Survey Year x American Indian/Alaska Native	–	1.00 (0.98, 1.02)	–	1.02 (1.00, 1.05)

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Predictor	Lifetime Smoking		Past 30-Day Smoking	
	Model 1	Model 2	Model 1	Model 2
Survey Year x Native Hawaiian/Pacific Islander	–	0.94 (0.92, 0.95)***	–	0.95 (0.93, 0.98)***
Survey Year x Asian American	–	0.95 (0.94, 0.96)***	–	0.95 (0.93, 0.96)***
Survey Year x African American	–	0.96 (0.94, 0.97)***	–	0.99 (0.98, 1.01)
Survey Year x Multi-racial/unknown	–	0.97 (0.96, 0.98)***	–	0.99 (0.97, 1.00)*
Survey Year x Latinx	–	0.95 (0.94, 0.96)***	–	0.97 (0.96, 0.98)***
T21 x Survey Year X American Indian/Alaska Native	–	0.86 (0.73, 1.01)	–	0.86 (0.70, 1.06)
T21 x Survey Year X Native Hawaiian/Pacific Islander	–	1.05 (0.89, 1.23)	–	0.99 (0.79, 1.24)
T21 x Survey Year X Asian American	–	1.05 (0.95, 1.15)	–	1.14 (1.00, 1.31)
T21 x Survey Year X African American	–	0.95 (0.85, 1.07)	–	0.91 (0.78, 1.05)
T21 x Survey Year X Multi-racial/unknown	–	0.99 (0.93, 1.07)	–	1.02 (0.92, 1.13)
T21 x Survey Year X Latinx	–	1.02 (0.97, 1.07)	–	1.07 (1.00, 1.14)

<sup>1</sup>Reference category is 7<sup>th</sup> grade.

<sup>2</sup>Reference category is non-Latinx White.

\* $p < 0.05$  \*\* $p < .01$  \*\*\* $p < 0.001$

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**Table S2** Results of Mixed Effects Logistic Regressions Testing Associations of California's T21 Law with Tobacco and Nicotine Use by Race and Ethnicity: Change in Slopes<sup>1</sup>

Racial/Ethnic Group	Lifetime Smoking		Past 30-Day Smoking	
	OR	95% CI	OR	95% CI
Non-Latinx White	1.01	0.97, 1.05	0.93**	0.88, 0.98
American Indian/Alaska Native	0.87	0.74, 1.01	0.80*	0.65, 0.98
Native Hawaiian/Pacific Islander	1.06	0.91, 1.24	0.92	0.74, 1.14
Asian American	1.06	0.97, 1.15	1.06	0.94, 1.20
African American	0.96	0.86, 1.07	0.84*	0.73, 0.97
Multi-Racial/Unknown	1.00	0.95, 1.06	0.95	0.87, 1.03
Latinx	1.03	1.00, 1.05	0.99	0.96, 1.03
	Lifetime Smokeless Use		Past Month Smokeless Use	
	OR	95% CI	OR	95% CI
Non-Latinx White	0.93**	0.89, 0.98	0.90**	0.84, 0.97
American Indian/Alaska Native	0.96	0.80, 1.14	0.84	0.67, 1.06
Native Hawaiian/Pacific Islander	0.94	0.77, 1.15	0.90	0.69, 1.17
Asian American	1.04	0.92, 1.18	1.00	0.86, 1.17
African American	1.01	0.89, 1.14	0.80**	0.69, 0.93
Multi-Racial/Unknown	0.99	0.92, 1.06	0.86**	0.78, 0.96
Latinx	1.01	0.97, 1.04	0.99	0.94, 1.04
	Lifetime E-Cigarette Use		Past Month E-Cigarette Use	
	OR	95% CI	OR	95% CI
Non-Latinx White	1.17***	1.14, 1.21	1.88***	1.81, 1.96
American Indian/Alaska Native	0.97	0.85, 1.09	1.67***	1.42, 1.97
Native Hawaiian/Pacific Islander	1.08	0.97, 1.19	1.85***	1.60, 2.14
Asian American	1.09**	1.03, 1.15	1.98***	1.82, 2.16
African American	0.88***	0.82, 0.94	1.39***	1.25, 1.54
Multi-Racial/Unknown	1.04*	1.00, 1.08	1.75***	1.65, 1.85
Latinx	1.02	1.00, 1.04	1.79***	1.74, 1.83

<sup>1</sup>All models controlled for survey year, grade in school, race, ethnicity, and sex. The individual group effects of T21 were estimated using models with the race/ethnicity x T21 product terms, but no T21 x survey year term.

\* $p < 0.05$  \*\* $p < .01$  \*\*\* $p < 0.001$ .

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**Table S3** Results of Mixed Effects Logistic Regressions Testing Associations Between California's T21 Law and Smokeless Tobacco Use: Changes in Slopes (OR, 95% CI) (OR, 95% CI)

Predictor	Lifetime Smokeless Use		Past Month Smokeless Use	
	Model 1	Model 2	Model 1	Model 2
T21	1.10 (0.91, 1.33)	1.59 (1.11, 2.28)*	1.46 (1.12, 1.91)**	1.91 (1.12, 3.26)*
Survey year	0.88 (0.88, 0.89)***	0.90 (0.89, 0.90)***	0.88 (0.88, 0.89)***	0.90 (0.90, 0.91)***
9 <sup>th</sup> Grade <sup>1</sup>	1.86 (1.78, 1.94)***	1.85 (1.78, 1.94)***	1.54 (1.47, 1.61)***	1.54 (1.47, 1.61)***
11 <sup>th</sup> Grade <sup>1</sup>	2.95 (2.83, 3.08)***	2.95 (2.83, 3.08)***	1.99 (1.90, 2.08)***	1.99 (1.90, 2.08)***
Female	0.45 (0.44, 0.45)***	0.45 (0.44, 0.45)***	0.44 (0.43, 0.45)***	0.44 (0.43, 0.45)***
American Indian/Alaska Native <sup>2</sup>	1.65 (1.59, 1.72)***	1.67 (1.52, 1.84)***	1.98 (1.88, 2.08)***	1.89 (1.67, 2.13)***
Native Hawaiian/Pacific Islander <sup>2</sup>	0.98 (0.94, 1.03)	1.06 (0.96, 1.17)	1.20 (1.14, 1.27)***	1.27 (1.12, 1.45)***
Asian American <sup>2</sup>	0.40 (0.39, 0.41)***	0.48 (0.45, 0.52)***	0.50 (0.48, 0.52)***	0.59 (0.54, 0.65)***
African American <sup>2</sup>	1.04 (1.01, 1.07)*	1.14 (1.07, 1.23)***	1.54 (1.48, 1.59)***	1.72 (1.58, 1.87)***
Multi-racial/unknown <sup>2</sup>	0.95 (0.93, 0.97)***	0.97 (0.92, 1.01)	1.02 (1.00, 1.05)	1.07 (1.00, 1.14)*
Latinx <sup>2</sup>	0.93 (0.91, 0.94)***	1.01 (0.97, 1.04)	1.07 (1.05, 1.10)***	1.22 (1.16, 1.27)***
T21 x Survey Year	0.98 (0.96, 1.01)	0.93 (0.89, 0.98)**	0.94 (0.90, 0.98)***	0.90 (0.84, 0.97)**
T21 x American Indian/Alaska Native	–	0.84 (0.21, 3.29)	–	1.56 (0.25, 9.44)
T21 x Native Hawaiian/Pacific Islander	–	1.02 (0.21, 4.84)	–	1.14 (0.15, 8.77)
T21 x Asian American	–	0.52 (0.20, 1.38)	–	0.59 (0.17, 2.12)
T21 x African American	–	0.57 (0.21, 1.53)	–	2.56 (0.74, 8.81)
T21 x Multi-racial/unknown	–	0.64 (0.33, 1.24)	–	1.40 (0.55, 3.57)
T21 x Latinx	–	0.60 (0.39, 0.92)*	–	0.54 (0.29, 1.01)
Survey Year x American Indian/Alaska Native	–	1.00 (0.97, 1.02)	–	1.02 (0.98, 1.05)

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Predictor	Lifetime Smokeless Use		Past Month Smokeless Use	
	Model 1	Model 2	Model 1	Model 2
Survey Year x Native Hawaiian/Pacific Islander	–	0.98 (0.95, 1.01)	–	0.98 (0.95, 1.02)
Survey Year x Asian American	–	0.95 (0.93, 0.96)***	–	0.95 (0.92, 0.97)***
Survey Year x African American	–	0.98 (0.96, 0.99)**	–	0.97 (0.95, 0.99)*
Survey Year x Multi-racial/unknown	–	1.00 (0.98, 1.01)	–	0.99 (0.97, 1.01)
Survey Year x Latinx	–	0.98 (0.97, 0.98)***	–	0.97 (0.95, 0.98)***
T21 x Survey Year X American Indian/Alaska Native	–	1.03 (0.86, 1.23)	–	0.93 (0.73, 1.19)
T21 x Survey Year X Native Hawaiian/Pacific Islander	–	1.01 (0.82, 1.24)	–	1.00 (0.76, 1.31)
T21 x Survey Year X Asian American	–	1.12 (0.98, 1.27)	–	1.11 (0.94, 1.31)
T21 x Survey Year X African American	–	1.08 (0.95, 1.23)	–	0.89 (0.75, 1.05)
T21 x Survey Year X Multi-racial/unknown	–	1.06 (0.97, 1.16)	–	0.96 (0.85, 1.09)
T21 x Survey Year X Latinx	–	1.08 (1.02, 1.14)*	–	1.10 (1.01, 1.20)*

<sup>1</sup>Reference category is 7<sup>th</sup> grade.

<sup>2</sup>Reference category is non-Latinx White.

\* $p < 0.05$  \*\* $p < .01$  \*\*\* $p < 0.001$



## California's T21 Law and Adolescents' Tobacco and Nicotine Use: Appendix 1

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**Table S4** Results of Mixed Effects Logistic Regressions Testing Associations Between California's T21 Law and E-Cigarette Use: Changes in Slopes (OR, 95% CI)

Predictor	Lifetime E-Cigarette Use		Past Month E-Cigarette Use	
	Model 1	Model 2	Model 1	Model 2
T21	0.48 (0.44, 0.54)***	0.24 (0.20, 0.30)***	0.01 (0.01, 0.02)***	0.01 (0.01, 0.02)***
Survey year	1.00 (0.99, 1.00)	1.01 (1.00, 1.02)*	0.80 (0.80, 0.81)***	0.85 (0.84, 0.87)***
9 <sup>th</sup> Grade <sup>1</sup>	2.65 (2.57, 2.74)***	2.66 (2.57, 2.75)***	2.13 (2.05, 2.22)***	2.14 (2.06, 2.22)***
11 <sup>th</sup> Grade <sup>1</sup>	4.20 (4.06, 4.34)***	4.21 (4.07, 4.35)***	2.84 (2.73, 2.96)***	2.85 (2.74, 2.97)***
Female	0.90 (0.90, 0.91)***	0.90 (0.90, 0.91)***	0.84 (0.83, 0.84)***	0.84 (0.83, 0.84)***
American Indian/Alaska Native <sup>2</sup>	1.27 (1.23, 1.32)***	1.80 (1.40, 2.32)***	1.38 (1.32, 1.44)***	2.08 (1.52, 2.84)***
Native Hawaiian/Pacific Islander <sup>2</sup>	1.24 (1.20, 1.28)***	1.44 (1.17, 1.76)**	1.20 (1.15, 1.24)***	1.93 (1.48, 2.52)***
Asian American <sup>2</sup>	0.48 (0.47, 0.49)***	0.58 (0.52, 0.66)***	0.45 (0.44, 0.46)***	0.72 (0.60, 0.85)***
African American <sup>2</sup>	0.92 (0.90, 0.94)***	0.94 (0.80, 1.09)	0.90 (0.87, 0.92)***	1.53 (1.25, 1.87)***
Multi-racial/unknown <sup>2</sup>	1.12 (1.11, 1.14)***	1.25 (1.13, 1.38)***	1.05 (1.03, 1.07)***	1.33 (1.17, 1.52)***
Latinx <sup>2</sup>	1.31 (1.30, 1.32)***	1.62 (1.51, 1.73)**	1.17 (1.15, 1.18)***	2.10 (1.92, 2.29)***
T21 x Survey Year	1.06 (1.04, 1.07)***	1.17 (1.14, 1.21)***	1.81 (1.78, 1.86)***	1.88 (1.81, 1.96)***
T21 x American Indian/Alaska Native	–	4.59 (1.85, 11.40)***	–	2.21 (0.65, 7.52)
T21 x Native Hawaiian/Pacific Islander	–	1.81 (0.84, 3.92)	–	1.16 (0.38, 3.48)
T21 x Asian American	–	1.72 (1.11, 2.67)*	–	0.70 (0.35, 1.38)
T21 x African American	–	6.91 (4.03, 11.85)***	–	8.57 (3.87, 18.96)***
T21 x Multi-racial/unknown	–	2.22 (1.57, 3.14)***	–	1.57 (0.96, 2.56)
T21 x Latinx	–	2.51 (1.98, 3.19)***	–	1.34 (0.96, 1.86)
Survey Year x American Indian/Alaska Native	–	0.94 (0.89, 0.99)*	–	0.94 (0.88, 1.00)

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Predictor	Lifetime E-Cigarette Use		Past Month E-Cigarette Use	
	Model 1	Model 2	Model 1	Model 2
Survey Year x Native Hawaiian/Pacific Islander	–	0.98 (0.94, 1.02)	–	0.92 (0.87, 0.97)**
Survey Year x Asian American	–	0.97 (0.95, 0.99)**	–	0.92 (0.89, 0.96)***
Survey Year x African American	–	1.01 (0.98, 1.04)	–	0.92 (0.89, 0.96)***
Survey Year x Multi-racial/unknown	–	0.99 (0.97, 1.01)	–	0.97 (0.95, 1.00)*
Survey Year x Latinx	–	0.98 (0.96, 0.99)***	–	0.90 (0.89, 0.93)***
T21 x Survey Year X American Indian/Alaska Native	–	0.82 (0.73, 0.93)**	–	0.89 (0.75, 1.05)
T21 x Survey Year X Native Hawaiian/Pacific Islander	–	0.92 (0.83, 1.02)	–	0.98 (0.84, 1.14)
T21 x Survey Year X Asian American	–	0.93 (0.88, 0.99)*	–	1.05 (0.96, 1.15)
T21 x Survey Year X African American	–	0.75 (0.70, 0.81)***	–	0.74 (0.66, 0.82)***
T21 x Survey Year X Multi-racial/unknown	–	0.89 (0.85, 0.93)***	–	0.93 (0.87, 0.99)*
T21 x Survey Year X Latinx	–	0.87 (0.84, 0.89)***	–	0.95 (0.91, 0.99)*

<sup>1</sup>Reference category is 7<sup>th</sup> grade.

<sup>2</sup>Reference category is non-Latinx White.

\* $p < 0.05$  \*\* $p < .01$  \*\*\* $p < 0.001$

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**Reference**

California Department of Education. California Healthy Kids Survey 2020.  
<https://www.cde.ca.gov/ls/he/at/chks.asp>