School and Community Factors in the Adoption of 100% Smoke-Free Policy by California Community Colleges, 2003-2019

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ABSTRACT

Purpose: Smoke- and tobacco-free policy (SFP) is an effective strategy that can reduce tobacco-related health disparities among young adults.

Design: Longitudinal design using administrative, survey, policy data sources and geocoded tobacco outlet and American Community Survey data

Setting: California community colleges (CC) and cities/communities where colleges are located, 2003-2019.

Sample: 114 California CCs

Data: School-level (i.e., student population and demographics) and community-level data (sociodemographics, local tobacco control policy, tobacco-related norms and availability, health resources) from 2003-2019.

Measures: Key outcome is the year CC adopted a 100% SFP.

Analysis: Bivariate and multivariate Cox survival models were used to analyze timing of SFP adoption.

Results: By 2019, 61 out of 114 (53.5%) CCs were 100% SFP. While community smoking prevalence and tobacco availability were not significant, CCs in rural areas were less likely to be smoke-free. CCs located in cities with stronger tobacco policies (hazard ratio (HR)=1.08, $p<0.05$), which reported higher student health fees (HR=2.00, $p<0.05$), and received technical assistance for SFP (HR=4.59, $p<0.01$) were significantly associated with having 100% SFP.

Conclusion: Findings suggest that key community factors (strong city tobacco policies) and school and community resources (student health fees, SFP technical assistance) are associated with the presence of 100% SFP at CCs. Resources from the community or within college might support remaining CCs in becoming 100% smoke-free.

Key Words: Smoke-free policy, tobacco control, community college, young adults

INTRODUCTION

Establishing smoke-free postsecondary institutions is an effective tobacco control strategy that can reduce tobacco-related health disparities and young adult tobacco use.[1,2] Smoke-free policies (SFPs) have been significantly associated with declines in smoking and increases in anti-smoking norms.[3-6] SFP adoption is important for community colleges (CCs), whose student body is majority young adults and, compared to four-year colleges, over-represented by students of lower socioeconomic status (SES), racial/ethnic minority groups, and first generation college students, all of whom are at higher-risk for smoking.[7-9] As of 2021, only 60% of California's 115 CCs have 100% SFP, which is a striking difference from the state's four-year public colleges which have all been 100% smoke-free since 2017.[10]

Studies of college SFP adoption have focused on policy attitudes,[3,5,11] and best practices for policy implementation.[4,12] Few studies have examined factors that affect policy adoption.[13,14]. In this study, colleges' SFP adoption is examined in relation to the school composition and environment.[15] Given that most CCs are commuter campuses with little on-campus housing, SFP adoption is also considered within the broader community composition and tobacco-related environment. This study aimed to investigate school and community factors associated with having a 100% SFP among California CCs, and whether these factors varied over time.

METHODS

Secondary data from administrative, survey, and policy databases were merged to characterize California CCs' school and community from 2003 to 2019. The analytic sample includes all California colleges with physical campuses, and excludes one campus established in 2020 and another that is 100% online (final N=114 CCs).

Measures

SFP status and adoption year were obtained from the California Youth Advocacy Network's (CYAN) College Tobacco Policy database.[10] Using CYAN's criteria, we defined 100% SFP as 100% prohibition of smoking (11 CCs met this criterion) or use of any tobacco products (50 CCs met this more comprehensive criterion) on all indoor and outdoor property.

Data sources are listed in Table 1. *School Characteristics* include enrollment size, demographics, and academic outcomes from the California Community Colleges Chancellor's Office Management Information Systems Data Mart.[16,17] *School and Community Health Resources* include having a student health center, higher student health fees (≥ $20), and receipt of CYAN SFP technical assistance (TA) for policy adoption or separately a grant (i.e., Truth Initiative/American Cancer Society). These resource variables are not systematically collected over time, and thus we treat them as time-invariant in analysis except for CYAN TA. While these data are proxies for potentially valuable resources facilitating CC SFP adoption, interpretation of time-invariant variables is limited to associations. *Community Socio-demographics* were based on the city in which the CC is located or the closest incorporated city and extracted from American Community Survey (ACS), 2009-2019.[18] For 2003-2008, we interpolated missing data using Census 2000 and ACS. *Tobacco Outlet Retail Environment* includes CC's distance to nearest retailer and retailer density. Data were from the California Department of Tax and Fee Administration, and geocoded using ArcMap 10.6 .[19,20] *Community Smoking Norms* accounted for current cigarette and e-cigarette use among 9th and 11th graders from the California Healthy Kids Survey (CHKS),[21] and adult current cigarette use was from the California Health Interview Survey (CHIS).[22] CHKS data were from 2016-2019, matched from the closest secondary school district to each CC and treated as time-invariant. CHIS data were intermittent from

2003-2018 (with data carried forward in missing survey years from 2004-2012) at the county-level or regions for Los Angeles and San Diego counties.[22] *City Tobacco Policy* captured both overall city tobacco control policy grade/score (F=0 to A=12) and specific smoke-free outdoor air policy grade/score (F=0 to A=18) obtained from the American Lung Association's (ALA) State of Tobacco Control-California Local Grades for 2008-2019, and scores for 2003-2007 were imputed by carrying back the 2008 score.[23]

Analysis

Study period began in 2003 to capture factors prior to 2004, the first year of CC SFP adoption, and continued through 2019. The Cox proportional hazards model was used to examine onset of adopting SFP. The hazard of SFP adoption was modeled as $h(t) = h_0(t)\exp(\beta_* X)$ in which $h_0(t)$ is the baseline hazard function, time *t* denotes a given year from 2003 to 2019, *X* represents time-invariant or time-variant measures, and *exp(β)* is the estimated hazard ratio. In bivariate analysis, variables were entered one at a time, and then significant variables at $p<0.05$ in these analyses were entered into multivariable models. Group 1 analysis examined variables which were independent of the community college policy system such as school/city demographics); Group 2 examined policy-relevant measures controlling for Group 1 variables; and Group 3 examined health resources controlling for Models 1 and 2. The dataset was structured with each college aligned by year, right-censored at either the year of SFP adoption or, for those who have never adopted SFP, the year 2019. As noted above, time-invariant measures should be interpreted as an association. All time-varying measures were lagged one year prior to the SFP onset year to account for temporality and avoid potential reverse causation. Proportional hazards assumption tests using Schoenfeld residuals[24] were conducted; none of the resultant chi-square tests were significant, indicating that the variables do not change with time. To

account for clustering (i.e., some CCs are in the same CC school district (N=72) where a district policy would affect all CCs in that district), analyses were conducted with robust standard errors. Given that some variables were not available in all years (i.e., city tobacco policy), post-hoc analyses were conducted limiting study years to 2008-2019. Since findings were similar, we present analyses using all study years. All analyses were performed in Stata v.16.[25]

RESULTS

As of 2019, 61 of the 114 (53.5%) CA CCs were 100% SFP, but SFP status varied by school and community factors (See Table 1). CCs in urban and suburban areas were more likely to have 100% SFP compared to those in rural areas. CCs with larger student population sizes and younger age profiles had significantly positive associations with being smoke-free. CCs charging higher student health fees and CCs that received CYAN SFP TA were associated with SFP; however, having a Truth Initiative or American Cancer Society grant was not associated. CCs located in a city with strong tobacco control policies had significant association with SFP. For example, a one-point increase in the city overall policy score was associated with a 11% higher likelihood the CC had a SFP, and aone-point increase in city smoke-free outdoor policy score is associated with a 6% higher likelihood the CC has a SFP (Hazard Ratio (HR): 1.11 and 1.06, respectively).

In multivariable models (Table 2), Model 1 included significant school (student population size, % young adults) and community (% black population) composition factors which all continued to be significant. Urban/rural geography was not included due to high correlation with student population size. Models 2 and 3 found that each of the city tobacco policies remained significant, controlling for Model 1 variables. Finally, even accounting for significant compositional and policy factors, CCs that received CYAN TA were 4.6 times (HR 4.59) more likely to be smoke-free compared to CCs who did

not receive TA and CCs with the highest student health fees of $20-21 were two times (HR 2.00) more likely to be smoke-free than CCs with health fees less than $20.

Taking a closer look at rural colleges, all rural CCs, including the three smoke-free colleges, were located in cities with high smoking prevalence and poor tobacco control policies (data available upon request). All smoke-free rural CCs charged a high student health fee at $20. In addition, the three smoke-free rural CCs received CYAN TA but so did eight other non-smoke-free rural CCs.

DISCUSSION

California State Assembly Bill 1594 would have instantly made all California public colleges smoke-free, but the governor vetoed this 2016 bill citing that "the governing boards of our public colleges and universities already have the authority and are fully capable of setting smoking policies on their campuses."[26] In the absence of a statewide policy, the onus has been on the individual 115 colleges or 72 districts to adopt SFPs, which has resulted in a current patchwork of SFPs from no policy to perimeter/entryway restrictions (n=9), designated smoking areas (n=21), parking lots only (n=16), and 100% SFP campuses (n=69).[27]

This study is the first to examine policy adoption over a 16-year period within a racially/ethnically- and socioeconomically-diverse postsecondary public educational system. By situating college SFP within school and community contexts, this study examined how policies can be influenced by local contexts which are important given how CCs differ from traditional four-year colleges. Specifically, CCs are less insular with little-to-no campus housing, fewer student health resources, and weaker campus norms.[28,29] This study found that CCs with more health resources (as indicated by student health fees and receipt of SFP TA) and CCs located in cities with strong tobacco control policies were more likely to have SFP. No differences in SFP by community SES or tobacco-

related norms (i.e., smoking prevalence, retail outlets) were found, suggesting that inequities in SFP were not due to area-level disadvantage or smoking norms. However, stark geographical differences in SFP adoption are evident, with less SFP adoption by rural CCs (18%) than urban or suburban CCs (60%), a difference that persisted over time. Despite this, the main correlates of SFP adoption remained robust when controlling for geography.

For rural CCs, descriptive analyses of the 17 CCs found no consistent pattern with factors associated with SFP. Despite being located in cities with high smoking prevalence and poor tobacco control policies (similar to their non-SFP rural counterparts), three rural CCs adopted SFPs. To better understand factors most salient to rural CCs, future qualitative research could be valuable in delving into processes that facilitated or impeded SFP adoption by rural CCs.

Limitations: While models used lags and time-varying factors, findings cannot be interpreted as causal and are limited to associational relationships. The latter is especially true of key correlates (whose data were not available in all years and thus treated as time-invariant) such as student health fees. In all cases, there is potential for reverse causation. However, it is unlikely that SFP adoption would directly cause student health fees to increase or city tobacco policy to improve. Student health fees are a proxy for available school resources, and future research could consider better measures (i.e., tobacco prevention and cessation services, Student Health Advisory Committees (instrumental for health policy but not universal at all CCs)).

CONCLUSION

As the largest system of U.S. postsecondary education annually enrolling over two million students, California CCs should be a high priority target for SFP. By adopting 100% SFP, postsecondary institutions can help to promote healthy behaviors and environments for their students,

shift norms against tobacco use, encourage tobacco users to quit, and ready them for future smoke-free environments like four-year smoke-free colleges.[2] This study found that CC location in cities with strong tobacco policies, higher CC health fees, and CC receipt of SFP TA are associated with presence of 100% SFP. As of 2021, only 60% of California's CCs are 100% SFP, underscoring the large gap between two- and four-year public colleges, which are all 100% smoke-free. It is promising that a number of California CCs were leaders and early adopters of 100% smoke-free college campuses, even before their four-year college counterparts. Future research should examine how resources and campus and community relationships (i.e., tobacco-control organizations and health departments) create windows of opportunity for SFP adoption, and thus move CCs towards more equitable and healthy campuses in California and nationwide.

So What? (Implications for Health Promotion Practitioners and Researchers)

• What is already known on this topic?

Smoke-free policy (SFP) is an effective tobacco control strategy that can reduce tobacco-related health disparities, in particular among young adults in college settings, yet 40% of California community colleges (CCs) have yet to adopt a policy.

• What does this article add?

This study is the first to systematically document school and community factors associated with 100% SFP in the largest U.S. postsecondary public education system, California CCs. Findings revealed that CCs located in cities with strong tobacco policies and CCs utilizing school and health resources could be key levers for SFP adoption.

• What are the implications for health promotion practice or research?

To ensure equity with their four-year counterparts, CCs should adopt 100% SFPs by leveraging both school and community resources. However, further research and practice are needed to support rural CCs to adopt SFP.

REFERENCES

1. California Tobacco Control Program. *Summary Report: Health Equity Roundtables Advancing Health Equity in Tobacco Control.[Retrieved from: https://www.cdph.ca.gov/Programs/CCDPHP/DCDIC/CTCB/CDPH%20Document%20Library/Policy/HealthEquity/CTCPHealthEquitySummaryReport.pdf].* Sacramento, CA: California Department of Public Health; June 1 2014.

2. American College Health Association. *ACHA Guidelines: Position Statement on Tobacco on College and University Campuses [Retrieved from: https://www.acha.org/documents/resources/guidelines/ACHA_Position_Statement_on_Tobacco_Nov2011.pdf].* Hanover, MD2011.

3. Lechner WV, Meier E, Miller MB, Wiener JL, Fils-Aime Y. Changes in smoking prevalence, attitudes, and beliefs over 4 years following a campus-wide anti-tobacco intervention. *J Am Coll Health.* 2012;60(7):505-511.

4. Lee JG, Ranney LM, Goldstein AO. Cigarette butts near building entrances: what is the impact of smoke-free college campus policies? *Tob Control.* Mar 2013;22(2):107-112.

5. Seo DC, Macy JT, Torabi MR, Middlestadt SE. The effect of a smoke-free campus policy on college students' smoking behaviors and attitudes. *Prev Med.* Oct 2011;53(4-5):347-352.

6. Fallin A, Roditis M, Glantz SA. Association of campus tobacco policies with secondhand smoke exposure, intention to smoke on campus, and attitudes about outdoor smoking restrictions. *Am J Public Health.* Jun 2015;105(6):1098-1100.

7. Ma J, Baum S. Trends in community colleges: Enrollment, prices, student debt, and completion. *College Board Research Brief.* 2016.

8. Lenk K, Rode P, Fabian L, Bernat D, Klein E, Forster J. Cigarette use among young adults: comparisons between 2-year college students, 4-year college students, and those not in college. *J Am Coll Health.* 2012;60(4):303-308.

9. Solberg LI, Asche SE, Boyle R, McCarty MC, Thoele MJ. Smoking and cessation behaviors among young adults of various educational backgrounds. *American journal of public health.* 2007;97(8):1421-1426.

10. California Youth Advocacy Network. *California Public College & UniversitySmoke/Tobacco-Free Policy Report Card, 2021. [Retrieved from: https://catobaccofreecolleges.org/report-card].* Sacramento, CA2021.

11. Braverman MT, Hoogesteger LA, Johnson JA, Aaro LE. Supportive of a smoke-free campus but opposed to a 100% tobacco-free campus: Identification of predictors among university students, faculty, and staff. *Prev Med.* Jan 2017;94:20-26.

12. Rath JM, Pitzer L, Carnegie B, et al. Building capacity to implement tobacco-free policies in college and university settings with underserved populations. *Tobacco Prevention & Cessation.* 2019;5.

13. Wang TW, Tynan MA, Hallett C, et al. Smoke-Free and Tobacco-Free Policies in Colleges and Universities—United States and Territories, 2017. *Morbidity and Mortality Weekly Report.* 2018;67(24):686.

14. Trad C, Bayly J, Saint-Fort L, et al. Adoption of Tobacco- and Smoke-Free Policies in a US National Sample of Postsecondary Educational Institutions. *American Journal of Public Health.* 2018;108(10):1366-1369.

15. Frohlich KL, Abel T. Environmental justice and health practices: understanding how health inequities arise at the local level. *Sociol Health Illn.* Feb 2014;36(2):199-212.

16. Management Information Systems Data Mart. 2019. https://datamart.cccco.edu/datamart.aspx. Accessed June 3, 2019.

17. Integrated Postsecondary Education Data System. Institute of Education Sciences, National Center for Education Statistics.; 2019. https://nces.ed.gov/ipeds/. Accessed August 26, 2020.

18. American Community Survey 5-year estimates, 2009-2019. Prepared by Social Explorer. 2019. Accessed October 14, 2019.

19. *ArcMap Release 10.6* [computer program]. Redlands, CA: Environmental Systems Research Institute.; 2018.

20. California Department of Tax and Fee Administration. Cigarette & Tobacco Products Licensing Data, 2003-2018.2019.

21. California Department of Education. California Healthy Kids Survey, 2016-2019. In: Program WHaHD, ed. Education CDo, trans. San Francisco, CA2019.

22. AskCHIS Adult and Adolescent Public Use Files, 2003-2018. Current smokers. 2019. http://ask.chis.ucla.edu. Accessed September 4, 2019.

23. American Lung Association. *State of Tobacco Control-California Local Grades, 2008-2018.*2019.

24. Grambsch PM, Therneau TM. Proportional hazards tests and diagnostics based on weighted residuals. *Biometrika.* 1994;81(3):515-526.

25. *Stata Statistical Software: Release 16.* [computer program]. College Station, TX: StataCorp LLC; 2019.

26. McGreevy P. Public college students can still light up on campus after Gov. Brown vetoes smoking ban bill. *Los Angeles Times*2016.

27. California Youth Advocacy Network. *California Public College & UniversitySmoke/Tobacco-Free Policy Report Card, 2020. [Retrieved from: https://catobaccofreecolleges.org/s/Report-Card2020_v5.pdf].* Sacramento, CA2020.

28. Chiauzzi E, Donovan E, Black R, Cooney E, Buechner A, Wood M. A survey of 100 community colleges on student substance use, programming, and collaborations. *J Am Coll Health.* 2011;59(6):563-573.

29. McIntosh S, Wall AF, Johnson T, Kurtzman J, Ververs D, Ossip DJ. Tobacco Control at Community Colleges: Context and Opportunities. *Tob Prev Cessat.* Dec 2016;2.

30. California Public College & UniversitySmoke/Tobacco-Free Policy Database. 2020. https://catobaccofreecolleges.org/knack-search. Accessed August 2019.

Table 1. School and community characteristics and their association with 100% smoke-free policy

Characteristic	Time fixed (F) or varying (V)	Years	Mean(SD) / Percent[1]	Hazard Ratio (95%CI)
School geography and socio-demographics				
Geography	F	-		
Rural/town			14.9%	1.00
Suburban			42.1%	4.76 (1.52, 14.90)**
Urban			43.0%	4.60 (1.47, 14.33)**
Student population size (in 1,000)	V	2003-2018	14.0 (7.7); 19.9 (11.9)	1.02 (1.00, 1.04)*
% age 18-24	V	2003-2018	50.5 (10.1); 59.0 (10.2)	1.04 (1.02, 1.06)**
% Non-Hispanic White students	V	2003-2018	41.7 (19.4); 27.2 (14.3)	1.00 (0.99, 1.02)
% Non-Hispanic Black students	V	2003-2018	8.1 (10.6); 6.3 (5.7)	1.01 (0.97, 1.05)
% Hispanic students	V	2003-2018	26.4 (15.8); 44.8 (16.2)	0.99 (0.98, 1.01)
% Non-Hispanic Asian/Pacific Islander students	V	2003-2018	14.3 (11.4); 13.3 (10.7)	1.00 (0.98, 1.03)
% Student retention rate	V	2003-2018	81.7 (4.5); 87.2 (2.7)	0.94 (0.86, 1.03)
% Student success rate	V	2003-2018	67.0 (4.5); 72.1 (3.3)	0.94 (0.86, 1.02)
School and community health resources				
Having a student health services program	F	2019	80.7%	1.43 (0.70, 2.91)
Student health fee per student (Fall, 2019)	F	2019		
$0-19			51.8%	
$20-21			48.2%	1.81 (0.96, 3.38)ǂ
Mental health allocation $ per student	F	2018-2019	4.34 (0.83)	1.27 (0.90, 1.80)
Received CYAN Technical Assistance	V	2003-2019	0.8%; 70.2%	5.48 (1.76, 17.07)**
Received Truth or ACS grant for SFP	F	2015-2018	22.8%	0.76 (0.47, 1.22)
Community socio-demographics				
City population density (in 100/sq mile)	V	2003-2018	45.5 (28.8); 48.5 (30.2)	1.003 (0.995, 1.010)
% age 18-24	V	2003-2018	9.3 (3.6); 10.1 (3.5)	1.04 (1.01, 1.08)
% non-Hispanic white	V	2003-2018	63.1 (15.7); 62.5 (16.4)	0.99 (0.98, 1.01)
% non-Hispanic black	V	2003-2018	5.9 (6.8); 5.4 (5.6)	1.05 (1.03, 1.08)***
% Hispanics	V	2003-2018	29.0 (17.8); 35.2 (19.4)	1.00 (0.99, 1.01)
% non-Hispanic Asian/Pacific islander	V	2003-2018	11.6 (11.3); 14.7 (14.0)	1.00 (0.98, 1.02)
% four-year college graduate	V	2003-2018	27.6 (15.2); 33.8 (17.7)	1.00 (0.98, 1.01)
Median household income (in $1,000)	V	2003-2018	54.4 (22.8); 75.9 (32.9)	0.99 (0.98, 1.00)
% under poverty	V	2003-2018	13.8 (6.6); 14.8 (7.1)	1.02 (0.98, 1.05)
Community tobacco outlet density				
Distance to nearest store (miles)[2]	V	2004-2018	0.88 (1.10); 0.82 (1.07)	0.82 (0.62, 1.08)
Stores in 1 mile[2]	V	2004-2018	5.5 (7.6); 6.0 (7.1)	1.03 (0.99, 1.06)
Stores in 2 miles[2]	V	2004-2018	22.6 (25.8); 24.2 (27.1)	1.00 (0.99, 1.01)
Community adult and youth smoking prevalence				
% past year smoking adults 18+[3]	V	2003-2018	16.9% (3.1); 11.1% (4.2)	1.02 (0.95, 1.09)
% past month cigarette use, high school	F	2016-2019	3.0% (1.5)	0.92 (0.81, 1.06)
% past month e-cigarette use, high school	F	2016-2019	10.4% (4.3)	0.97 (0.91, 1.03)
Community city tobacco control policy				
City Overall tobacco control policy[4]	V	2008-2018	2.8 (3.0); 4.4 (3.7)	1.11 (1.01, 1.21)*
City Outdoor tobacco control policy[4]	V	2008-2018	5.1 (6.0); 8.7 (7.3)	1.06 (1.02 1.10)**

Notes: Descriptives and bivariate Cox survival models using robust standard errors to account for clustering of colleges at the district level, n=114, N=72. ***p<0.001, **p<0.01, *p<0.05, ǂ p<0.10

[1] For time-fixed variables, mean and standard deviation or percentage are given. For time-varying variables, mean/standard deviation or percentage are given for the first year and last year of data range.

[2] In Cox survival analysis, the missing 2003 was imputed using 2004 value.

[3] Survey data missing 2004, 2006, 2008 and 2010, and imputed using the prior year value in Cox survival analysis.

[4] In Cox survival analysis, the missing scores before 2008 were imputed using the earliest valid value.

Data Sources: *Policy*—California Youth Advocacy Network's (CYAN) College Tobacco Policy database[30]; *School Characteristics*—California Community Colleges Chancellor's Office Management Information Systems Data Mart 2003-2019[16] and the National Center for Education Statistics' database of US postsecondary institutions[17]; *School and Community Resources*—Health Services Association California Community Colleges, an organization of California CC student health service programs and CYAN policy records; *Community Socio-demographics*—American Community Survey (ACS) 5-year estimates for 2009-2019 and interpolated missing data for 2003-2008[18]; *Tobacco Retail Density*—California Board of Equalization licensed tobacco retailer database, 2003-2019[20]; *Community Smoking Norms*—2016-2019 California Healthy Kids Survey at the school-district level[21] and 2003-2018 California Health Interview Survey at the county-level, and for Los Angeles and San Diego counties, at the regional-level.[22] *City Tobacco Policy*—American Lung Association's (ALA) State of Tobacco Control-California Local Grades for 2008-2019 with overall tobacco control policy score (i.e., smoke-free outdoor air or housing, underage sales) and specific smoke-free outdoor air policy score of the city where CC is located or closest city.[23]

Table 2. Factors associated with 100% smoke-free policy adoption among California community colleges from Cox survival models (hazard ratios and 95% confidence intervals), 2003-2019

	Group 1 Analysis Socio-demographics	**Group 2 Analysis Policy**		**Group 3 Analysis Resources**	
	Model 1	Model 2	Model 3	Model 4	Model 5
School and community socio-demographics					
Student population size (in 1,000)	1.03 (1.00, 1.05)*	1.02 (1.00, 1.04)*	1.02 (1.00, 1.04)*	1.02 (0.99, 1.04)	1.01 (0.99, 1.04)
% Students ages 18-24	1.05 (1.02, 1.07)***	1.05 (1.02, 1.08)***	1.05 (1.02, 1.07)***	1.05 (1.02, 1.07)***	1.05 (1.02, 1.08)***
% City Non-Hispanic Black	1.07 (1.04, 1.11)***	1.07 (1.04, 1.10)***	1.08 (1.05, 1.11)***	1.08 (1.05, 1.11)***	1.08 (1.05, 1.12)***
Community tobacco control policy					
City overall tobacco control policy		1.08 (0.99, 1.19)ǂ		1.09 (1.00, 1.19)*	1.08 (1.00, 1.16)*
City outdoor tobacco control policy			1.06 (1.02, 1.10)**		
School and community health resources					
Student health fee, 2019 (<$20 vs ≥ $20)				2.00 (1.05, 3.79)*	
College received CYAN technical assistance					4.59 (1.75, 12.08)**

Notes: Cox survival models using robust standard errors to account for clustering of colleges at the district level, n=114, N=72.
***p<0.001, **p<0.01, *p<0.05, ǂ p<0.10

STATEMENT OF AUTHORS' CONTRIBUTIONS

C.K. Lui conceptualized and designed the study. C.K. Lui and D. Patterson obtained and managed data. Y. Ye conducted statistical analyses. C.K. Lui and Y. Ye drafted the article. N. Mulia and S.L. Trieu supported study design, interpretation of findings, and critically reviewed and revised the article. All authors provided final approval of the version to be published and agreed to be accountable for all aspects of the work.

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COMPETING INTERESTS

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