Published in final edited form as:

Am J Health Promot. 2019 September ; 33(7): 1058–1062. doi:10.1177/0890117119847868.

Adolescent Tobacco and Betel Nut Use in the US-Affiliated Pacific Islands: Evidence From Guam

Pallav Pokhrel, PhD¹, Francis Dalisay, PhD², Ian Pagano, PhD¹, Wayne Buente, PhD³, Elizabeth Guerrero, MPA⁴, Thaddeus A. Herzog, PhD¹

¹University of Hawaii Cancer Center, University of Hawai'i at Mānoa, Honolulu, HI, USA

²College of Liberal Arts & Social Sciences, University of Guam, UOG Station, Mangilao, Guam

³School of Communications, University of Hawai'i at Mānoa, Honolulu, HI, USA

⁴Tobacco Prevention & Control Program, Department of Public Health and Social Services, Mangilao, Guam

Abstract

Purpose: To determine the prevalence of, and the risk and protective factors associated with, tobacco product use among adolescents in Guam, a US-Affiliated Pacific Island (USAPI) territory. To examine disparities in risk and protective factors across indigenous and nonindigenous groups.

Design: Quantitative; cross-sectional.

Setting: Middle and high schools in Guam.

Sample: The Global Youth Tobacco Survey sample included a representative sample of 24496th to 12th graders (71% response rate). Sample for the supplemental study included 670 middle school students (76% response rate across randomly selected classrooms).

Measures: Self-reported measures of lifetime and past 30-day tobacco and betel nut use, social competence, resistance self-efficacy, risk perceptions, friend and family tobacco product use, and ease of access to tobacco products.

Analysis: Multilevel logistic regression and analysis of covariance.

Results: The prevalence rates of current cigarette, smokeless tobacco, and e-cigarette use among middle school students were 8%, 8%, and 25%, respectively. Ability to resist social pressure to use tobacco/betel nut use was strongly associated with lower likelihood of tobacco (odds ratio [OR] = 0.76; 95% confidence interval [CI]: 0.68–0.84) and betel nut use (OR = 0.74; 95% CI: 0.67–0.82). Indigenous Pacific Islanders scored significantly lower on protective and higher on risk factors.

Conclusion: Tobacco product use rates among Guam middle school students appear to be 4 to 5 times higher than the US national average rates. There is an urgent need for developing tobacco

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Corresponding Author: Pallav Pokhrel, University of Hawai'i Cancer Center, University of Hawai'i at Mānoa, 701 Ilalo St, Honolulu, HI 96822, USA., ppokhrel@cc.hawaii.edu.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

and betel nut use prevention programs for USAPI youth that are tailored to the needs of indigenous Pacific Islanders.

Keywords

tobacco; e-cigarette; betel nut; adolescents; pacific islander

Purpose

People living in the US-Affiliated Pacific Islands (USAPI) face significant public health challenges, including higher burden of tobacco-related cancer and cardiovascular diseases.^{1,2} Especially, morbidity and mortality due to lung and bronchus cancer, head and neck cancer, and heart diseases appear to be markedly higher in the USAPI than the United States as a whole.³ Most tobacco users begin using tobacco in adolescence.⁴ In the United States, nationally, the rates of prevalence for current cigarette smoking, smokeless tobacco use, and e-cigarette use among middle school students are 1.8%, 1.8%, and 4.9%, respectively.⁵ However, little is currently known about the tobacco product use behavior of USAPI adolescents. Data on the use of new tobacco products such as e-cigarettes are especially lacking. Betel nut (*Areca catechu*) chewing is also common in the USAPI⁶ and has not been well studied among adolescents. Although how betel nut is used varies by culture, it is common practice to use betel nut in combination with tobacco in form of a quid.⁶ Current estimates regarding the prevalence of betel nut use in combination with tobacco among adolescents in USAPI are lacking. The International Agency for Research on Cancer regard betel nut as a group 1 carcinogen.⁷

Clearly, preventing tobacco and betel nut use among USAPI adolescents is likely to help reduce the burden of chronic diseases in the region. The purpose of the current study is to (1) determine the prevalence of different types of tobacco product use among adolescents in Guam; (2) test the effects of modifiable intrapersonal, interpersonal, and environmental risk and protective factors on tobacco and betel nut use; and (3) to examine the ethnic differences in those risk and protective factors.

Methods

Design

Two cross-sectional, paper-and-pencil surveys were conducted in 2017 to 2018: the Global Youth Tobacco Survey (GYTS) and a supplemental survey. Ethical approval was obtained from the university institutional review boards.

Sample

The *GYTS* was administered in 2017 among 2449 (49% girls) adolescents from 5 high schools and 8 middle schools in Guam. A 2-stage cluster sample design was used to produce a representative sample of students in grades 6 to 12. The first-stage sampling frame consisted of all schools containing grades 6 to 12. The second sampling stage consisted of systematic equal probability sampling of classes from each participating school. All classes in the selected schools were included in the sampling frame. All students in the selected

classes were eligible to participate in the survey. The overall response rate was 71% for GYTS. Data were collected in the classroom by research staff.

The *supplemental survey* was administered in 2017 to 2018 among N = 670 middle school students. The survey contained 73 items. Four classrooms were randomly selected from each of the 8 public middle schools in Guam. Data were collected in the classroom by research staff. The overall response rate was 76%.

Measures

Global Youth Tobacco Survey.—Demographic variables included age, gender, school grade, and weekly spending money. Lifetime and past 30-day cigarette smoking, e-cigarette use, and smokeless tobacco use were each assessed with a single item. The definition of smokeless tobacco also included “betel nut with tobacco” and “betel quid with tobacco.”

Supplemental study.—Demographic variables included age, gender, household crowdedness (as a proxy for socioeconomic status), and ethnicity. Lifetime and past 30-day cigarette smoking and e-cigarette use were measured with the same items as in GYTS. Smokeless tobacco (eg, dip, Snus) and betel nut use were separately assessed.

Additionally, intrapersonal, interpersonal, and environmental variables that are known to be modifiable predictors of adolescent tobacco use were assessed. In the intrapersonal domain, we assessed tobacco and betel nut use risk perceptions,⁸ social competence,⁹ and resistance self-efficacy.¹⁰ Interpersonal influence was assessed in terms of family and peer use of tobacco and betel nut.¹⁰ Environmental influence was measured in terms of parental permissiveness, ease of access to cigarettes and betel nut at home, ease of cigarette and betel nut purchase, and ease of access to cigarettes and betel nut through adults and friends.¹⁰

Data Analysis

Global Youth Tobacco Survey.—Weighted and unweighted prevalence estimates for lifetime and past 30-day cigarette, e-cigarette, and smokeless tobacco use were computed separately for middle and high school students. Gender differences in prevalence estimates were tested using the Rao-Scott χ^2 test ($\alpha = .05$; 2 tailed).

Supplemental survey.—Because participants were nested within schools, multilevel (mixed effects) logistic regression analysis was conducted to test the associations between intrapersonal, interpersonal, and environmental variables and adolescent cigarette smoking and betel nut use. Next, we conducted post hoc tests of ethnic differences in risk/protective factors using analysis of covariance, with Tukey honest significant difference test for multiple comparisons.

Results

Table 1 shows the weighted and unweighted prevalence rates for lifetime and past 30-day cigarette, e-cigarette, and smokeless tobacco use, including gender differences in rates. In the supplemental sample, lifetime and past 30-day betel nut use rates were 13.6% and 6.9%, respectively. The past 30-day use betel nut use rates for Chamorro, other Pacific Islander (eg,

Chuukese, Marshallese), and non-Pacific Islanders (eg, Filipino, Chinese, Korean) were 4.5%, 23.7%, and 0.6% ($P < .0001$), respectively.

Table 2 shows the results of the regression analysis. Ethnic differences analysis showed that non-Pacific Islander (ie, non-indigenous) adolescents consistently scored lowest across risk factors and highest across protective factors.

Discussion

The current data indicate that USAPI adolescents may be at drastically higher risk for tobacco product use compared with the national US adolescent population. For example, the past 30-day prevalence rates for cigarette and smokeless tobacco use among Guam middle school students were approximately 4 times higher than in a nationally representative sample of US middle school students and past 30-day e-cigarette use was 5 times higher.⁵

We found that adolescents who possessed higher tobacco/ betel nut risk perceptions were less likely to use tobacco/betel nut. Similarly, adolescents who reported being socially more competent to navigate through social situations conducive to tobacco/betel nut use, without succumbing, were less likely to have used tobacco/betel nut. In addition, adolescents who were more confident that they could resist peer pressure to use tobacco/betel nut were less likely to have used tobacco/betel nut. In fact, resistance self-efficacy was found to have the strongest association with lower odds of tobacco/betel nut use among all intrapersonal protective factors considered. This is consistent with the finding that peer tobacco/betel nut use, an indicator of peer influence, appears to be a strong predictor of tobacco/betel nut use. On the mainland US, social influence— and life skills—based school-based adolescent substance use prevention programs are known to have reduced substance use initiation and escalation by helping adolescents improve social competence and resistant self-efficacy.¹¹ Similar health promotion programs may need to be developed for USAPI youths.

Surprisingly, higher prevalence of tobacco/betel nut use among family members was not associated with increased likelihood of tobacco/betel nut use. However, higher parental permissiveness was found to show strong effects on increased likelihood of tobacco/betel nut use. Future research can clarify whether permissiveness moderates the effects of family use prevalence on adolescent use of tobacco/betel nut use. Regardless, incorporating family-based strategies into a prevention program focused on adolescent skills training may be effective for the current population. The current findings also have implications for antitobacco and betel nut policy development and enforcement in the USAPI. A qualitative study¹² indicated that betel nuts are easy to access for adolescents in Guam and the neighboring islands. For example, Guam adolescents reported picking betel nuts from the tree or obtaining them from relatives without much difficulty. Although selling tobacco to minors is prohibited in Guam and some other Micronesian islands,¹² how well the law is enforced is not clear. It is likely that media-based interventions aiming to change pro-tobacco/betel nut social norms may make accessing tobacco/betel nut more difficult for youth.

Based on the current findings, it seems that direct social influence may exert strong effects on cigarette smoking and betel nut use. In addition, given that betel nuts are culturally widely acceptable in the USAPI, environmental factors such as ease of accessibility also appear to be influential in regard to cigarette and betel nut use behavior. Thus, the current findings suggest that a prevention program for Guam youth may need to consider focusing on changing social norms. In addition, it appears that training adolescents on social competence and resistance self-efficacy and improving their knowledge about tobacco/betel nut risks may be crucial for any type of effective prevention program.

In summary, the results from the supplemental study indicate that intrapersonal, interpersonal, and environmental factors that have been successfully targeted in tobacco and other substance use prevention programs in the past with non-USAPI adolescents¹³ may be effective for USAPI adolescents as well, for both betel nut and tobacco use. We also found that indigenous Pacific Islanders are at heightened risk of tobacco/betel nut use than nonindigenous groups. In the case of betel nut use, the disparity may be understandable in terms of the cultural roots of betel nut use in the Pacific.⁴ Betel nuts have historically been an integral part of the Pacific Island culture, playing an important role in the customs.⁶

There are certain limitations to the present study. The GYTS survey lacked information on participants' ethnicity. Because of budgetary constraints, we were not able to sample high school students in the supplemental study. Since our data are cross-sectional, no causal inferences may be made based on the present analysis.

Acknowledgments

The authors would like to thank Ms Chantay Benitez for help with data collection.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This research was funded by grant (U54CA143728) from the National Cancer Institute.

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SO WHAT?**What is already known on this topic?**

Prevalence rates of tobacco and betel nut use and associated diseases appear to be high in the USAPI adults.

What does this article add?

This study shows that tobacco product use rates are markedly high among USAPI adolescents compared with the national rates. The study also showed that several intrapersonal, interpersonal, and environmental risk/ protective factors known to be associated with substance use on the mainland US apply to the USAPI adolescents as well.

What are the implications for health promotion practice or research?

There is an urgent need for adolescent health promotion programs in Guam. Such programs may be best if delivered in schools in the form of a prevention curriculum. Moreover, the programs may benefit from involving parents. Training adolescents on skills to resist pro-tobacco or betel nut social influence and training parents to control family-level environmental risk factors may be particularly helpful. Clearly, more research on program development is needed.

Table 1.

Lifetime and Recent (Past 30 Day) Tobacco Product Use Prevalence Among Guam Middle and High School Students.

Tobacco Products	Middle School			High School		
	All	Boys	Girls	All	Boys	Girls
	No. (No. W); Proportion; 95% CI ^a			No. (No. W); Proportion; 95% CI ^a		
Lifetime use	1173 (6499); 100	583 (3406); 52.4	590 (3093); 47.6	1276 (9803); 100	665 (5265); 53.7	611 (4538); 46.3
Cigarette	279 (1580); 25.2; 21.1–29.3	145 (856); 26.0; 21.7– 30.3	134 (724); 24.3; 19.2– 29.3	539 (4151); 43.6; 39.2–48.1	303 (2390); 46.9; 41.9–52.0	236 (1760); 39.8; 34.2–45.4
E-cigarette	398 (2240); 36.8; 32.3–41.2	217 (1267); 40.1; 35.1–45.1	181 (973); 33.2; 27.5– 38.8	715 (5412); 59.1; 55.3–67.2	389 (3000); 62.2; 57.2–67.1	326 (2412); 55.7; 51.1–60.2
Smokeless tobacco ^c	183 (1038); 16.5; 13.6–19.3	94 (554); 16.8; 13.2– 20.4	89 (484); 16.2; 12.6– 19.8	306 (2361); 24.9; 21.5–28.4	171 (1367); 27.0; 22.4–31.6	135 (994); 22.5; 18.6– 26.4
Past 30-day use						
Cigarette	90 (516); 8.4; 6.3– 10.6	43 (264); 8.3; 5.9– 10.7	47(252); 8.6; 5.9–11.3	145 (1095); 11.8; 9.6– 13.9	99 (758); 15.3; 12.3– 18.3	46 (337); 7.7; 5.4– 10.0
E-cigarette	272 (1547); 25.2; 21.4–29.1	147 (863); 27.1; 22.8– 31.5	125 (683); 23.2; 18.0, 28.3	498 (3841); 40.6; 37.3–43.9	295 (2297); 45.6; 41.0–50.2	203 (1545); 34.9; 31.3–38.5
Smokeless tobacco ^c	85 (489); 7.9; 6.1–9.7	45 (273); 8.4; 6.0– 10.7	40(216); 7.3; 4.9–9.8	155 (1200); 12.9; 10.2–15.5	98 (782); 15.6; 11.9– 19.4	57 (418); 9.6; 7.0– 12.3

Abbreviation: CI, confidence interval.

^aData, from the Global Youth Tobacco Survey (GYTS)—Guam, are expressed as unweighted sample size, weighted population size (W), weighted percentages, and 95% confidence interval; weighted to be representative of the population of Guam.

^bP-value for statistically significant gender difference in prevalence is based on the Rao-Scott χ^2 test.

^cSmokeless tobacco was defined for the participant as “chewing tobacco such as tobacco leaf, tobacco leaf and life; betel nut or betel quid with tobacco; Snus, snuff, dip, Orbs, and so on.”

Table 2.Associations of Risk and Protective Factors With Recent Cigarette and Betel Nut Use.^a

	Past 30-Day Cigarette Use	Past 30-Day Betel Nut Use
Risk and Protective Factors	Odds Ratio (95% Confidence Interval)	
Intrapersonal		
Social competence	0.65 (0.55–0.77) ^b	0.71 (0.60–0.84) ^b
Resistance self-efficacy	0.76 (0.68–0.84) ^b	0.74 (0.67–0.82) ^b
Risk perception	0.76 (0.56–1.0) ^c	0.55 (0.45–0.68) ^b
Interpersonal		
Family use	0.99 (0.70–1.4)	1.1 (0.80–1.5)
Peer use	1.5 (1.3–1.6) ^b	1.5 (1.4–1.7) ^b
Environmental		
Parental permissiveness	2.2 (1.7–2.8) ^b	1.6 (1.3–1.9) ^b
Ease of access at home	1.2 (1.1–1.3) ^d	1.2 (1.1–1.3) ^b
Ease of access at school	1.2 (1.1–1.3) ^b	1.1 (1.0–1.2) ^c
Ease of purchase	1.1 (1.0–1.2) ^c	1.3 (1.2–1.4) ^b
Ease of access through adults	1.1 (1.0–1.2) ^c	1.2 (1.1–1.3) ^b
Ease of access through friends	1.2 (1.1–1.3) ^b	1.5 (1.3–1.7) ^b

^aModel adjusted for age, gender, ethnicity, socioeconomic status, and sensation seeking.^b $P < .0001$.^c $P < .05$.^d $P < .01$.