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## Beyond Cigarette Smoking: Smoke-free Home Rules and Use of Alternative Tobacco Products

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### Abstract

**Background:** A smoke-free home rule has been associated with reduced cigarette consumption; however, it is unknown whether a home rule is associated with the use of alternative tobacco products such as smokeless tobacco products, regular and water pipes, and cigars. This study examined the association between the smoke-free home rules and ever and current of alternative tobacco products (ATP).

**Method:** Data from the 2010–2011 U.S. Tobacco Use Supplements to the Current Population Survey were analyzed using multivariable logistic regressions, including variables related to smoke-free home rules.

**Results:** Overall, 83.9% respondents reported a smoke-free home rule inside their homes. 20.6% of respondents had tried at least one type of ATP and 3.9% were current users in 2010–2011. Having a smoke-free home rule was associated with lower likelihood of current versus never use of any ATP (AOR=0.80, 95% CI: 0.77–0.83). Among ever users of any ATP, the existence of a smoke-free home rule was associated with lower odds of being a current user (AOR=0.49, 95% CI: 0.43–0.56). Similar associations were observed for each type of ATP examined ( $p < 0.05$ ).

**Conclusion:** Smoke-free home rules are associated with lower current ATP use among the U.S. population. Future research should examine whether promoting smoke-free home rules could help to reduce ATP use and related diseases.

### INTRODUCTION

Cigarette smoking is the dominant form of tobacco use in the U.S. and its prevalence has decreased over time. In contrast, the use of alternative tobacco products (ATP), including regular and water pipes (hookahs), cigars, smokeless tobacco products, and electronic cigarettes (e-cigs) has remained stable or even gained popularity.(1,2) ATPs are usually perceived as less hazardous to health relative to cigarettes. For example, pipe and cigar

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None to declare.

smokers consider them at little risk for health because they smoke at a lower frequency and do not inhale the smoke.(3) Many hookah users believe smoking a hookah is less risky than cigarette smoking because smoke gets filtered through the water.(4) Yet smoking cigars and pipes, including hookahs, increases the risk for heart disease, cancers, and chronic lung diseases.(5) In recent years, various smokeless tobacco products, such as snus and e-cigs, have been created and proposed as safer products relative to cigarettes and even a method to reduce cigarette consumption.(6) However, smokeless tobacco products are addictive and have been associated with increased risk for cancers and stroke, and there is no evidence that they facilitate cigarette smoking cessation.(6) Given the increasing popularity of these products, and their negative impacts on health, it is important to understand how public health policies can reduce ATP use.

Smoke-free home rules, policies to restrict or ban smoking combustible tobacco products including cigarettes, cigars, and pipes etc. inside the home, have been voluntarily adopted by many U.S. households and have been found to protect non-smokers and children from secondhand smoke (SHS) exposure.(7) The existence of smoke-free home rules have been associated with cigarette smoking cessation and reduced cigarette consumption.(8) This reduction or cessation may occur because smoke-free home rules make it inconvenient to smoke, reflect pressure from other household members, or indicate that smokers are ready to quit smoking.(8) Previous research also suggests that smoke-free home rules deliver an anti-smoking message that help deter smoking initiation among adolescents, whether their parents or friends smoke or not.(9)

To date, however, it remains unknown whether smoke-free home rules are associated with the use of ATP. For combustible ATP like cigars and pipes, smoke-free home rules may prevent or reduce the use of them through the same pathways as cigarette use. For non-combustible ATP like smokeless tobacco and e-cigs, however, home rules could either induce cigarette smokers to switch to them in order to compensate for their needs for nicotine or may convey an anti-tobacco social norm that could prevent or reduce the use of ATP. Using the most recent 2010–2011 U.S. Tobacco Use Supplements to the Current Population Survey (TUS-CPS), a nationally representative sample, this study examined the association between the establishment of smoke-free home rules and current use of ATP.

## METHODS

Data from the 2010–2011 TUS-CPS were used. The TUS-CPS is a survey of tobacco use that is administered as part of the U.S. Census Bureau' CPS. Within a survey period, it uses a large sample of households surveyed that provides representative data on tobacco-related behaviors, norms and attitudes at the national and state levels among the civilian non-institutionalized population of the U.S. The methods of the TUS-CPS have been described in detail elsewhere.(10) Data from all permanent household members aged 18 years or older were used; however, proxy-respondents were excluded from analysis because the smoke-free home rule question was only applicable to self-respondents. The final analytical sample included 167,554 individuals.

The existence of a smoke-free home rule is defined as endorsement of the response “*No one is allowed to smoke anywhere inside your home*”. It is specified that “rules” include any unwritten “rules” and pertain to all people whether or not they reside in the home or are visitors, workmen, etc. Four questions assessed whether respondents had ever used, *even one time*: 1) a regular cigar or cigarillo or a little filtered cigar; 2) a regular pipe filled with tobacco; 3) a water pipe or hookah pipe filled with tobacco; and 4) smokeless tobacco, such as moist snuff, dip, spit, chew tobacco or snus. Those who answered “yes” were further asked whether they currently use these products every day, some days, or not at all. These eight survey items were used to define never, former and current use of cigar, pipe, water pipe, and smokeless tobacco. Individuals were classified as never ATP users if they reported not having used ATP, even once in their lifetime. Those who had ever used ATP but did not use ATP at the time of the survey were defined as former ATP users and current ATP users were those who reported ATP use every day or some days.

Simple descriptive statistics on the prevalence of smoke-free home rules and ATP ever and current use were computed. We then conducted multivariable logistic regressions to examine the association between smoke-free home rules and current versus never and former use of ATP, respectively. Factors that are potentially associated with the use of ATP and smoke-free home rules were included as covariates, including age, gender, marital status, race/ethnicity, education attainment, household income, whether living with underage children, and cigarette smoking status. Multilevel approach was used to reflect the nested nature of the data and accommodate group-level effects, like differences in statewide tobacco control policies. Survey weights supplied with the TUS-CPS were used to account for the sampling design. All analyses were performed with STATA/MP 13.0 (StataCorp LP, College Station, TX).

## RESULTS

Overall, 83.9% respondents reported a smoke-free home rule inside their homes. Approximately, one fifth (20.6%) of individuals have tried at least one type of ATP and 3.9% were current users. Specifically, 16.7% of the respondents reported ever using cigar, 6.6% pipe, 2.7% water pipe, and 7.5% smokeless tobacco. The rates for current use of these four types of ATP in 2010–2011 were 2.0%, 0.3%, 0.5% and 1.7% respectively. Overall, 38.3% ever and 27.4% current ATP users were former cigarettes smokers, and 25.1% and 31.9%, respectively, were current cigarettes smokers. A gradient was observed indicating that the prevalence of home rules was lowest among current users of any ATP (67.3%), higher among former users (79.5%), and highest among never users (85.7%). The differences in rates of home smoking rules among these three groups were statistically significant ( $p < 0.001$ ). The same pattern was observed when we examined use of each individual ATP separately. The prevalence of home rules was 46.8% among current conventional cigarettes smokers.

Results from multivariable logistic regressions show that having a smoke-free home rule was associated with lower likelihood of current versus never use of any ATP (AOR=0.80, 95% CI: 0.77–0.83), after the adjustment of individual and household characteristics (Table 1). Among ever users of any ATP, the existence of a home rule was associated with lower odds

of being a current user (AOR=0.49, 95% CI: 0.43–0.56). Similar associations were observed for each individual type of ATP. It should be noted that the association between a home rule and current ATP use varied substantially across different types of ATP, with lower odds between a home smoking rule and former use of pipes (AOR=0.39, 95% CI: 0.32–0.47) and cigars (AOR=0.54, 95% CI: 0.49–0.59) compared to smoke-less tobacco products (AOR=0.77, 95% CI: 0.68–0.86).

## DISCUSSION

This is one of the first studies to examine the association between smoke-free home rules and ATP use. Our findings indicate that individuals who have a home smoking ban inside their home are less likely to be current ATP users versus never or former users, regardless of type of ATP. Although the prevalence of home rules was higher among smokeless tobacco users (73.2%, data not shown) compared to cigarette smokers (46.8%), results from the logistic regression do not support the idea that home smoking rules promote switching from cigarettes to smokeless tobacco. While the cross-sectional design precludes establishing the causal nature of this association, it is plausible that the adoption of a home non-smoking rule may discourage the uptake of ATP and/or encourage discontinuation of ATP products. Like cigarette smokers, users of regular and water pipes and cigars may find it more difficult to smoke them with the implementation of a smoke-free home rule because they are all combustible tobacco products and can produce SHS. For smokeless tobacco products, this is a less significant issue. In fact, tobacco industry has marketed smoke-less tobacco to be used as substitute in smoke-free environments.(6) Still, the adoption of a smoking ban may convey anti-tobacco norms held by household members that could influence the likelihood of initiating or continuing to use smokeless ATP. However, the association between ATP use and home rules may also be explained by reverse causation that those who have never used any type of ATP and those who quit are more likely to adopt a smoke-free home. In sum, the finding suggests the need for longitudinal, experimental studies testing the effects of adopting a smoking ban on ATP use.

This study complements previous research on the impact of smoke-free home rules on cigarette smoking,(8) by providing evidence on the significant association between smoke-free home rules and ATP use. If future research using prospective designs suggests this that non-smoking rules can help reduce not only cigarette but also ATP use, the findings would call for interventions promoting the adoption of smoke-free home rules to advance comprehensive tobacco control and reduce tobacco-related diseases. By 2010–2011, the prevalence of smoke-free home rules was 83.9% among U.S. households,(11) but there is still room for improvement. Former and current cigarette smokers are the majority of ATP users but are less likely to have a smoke-free home rule in their homes compared to never cigarette smokers.(10,12) Thus, interventions promoting the adoption of home smoking bans among former and current smokers should be evaluated as potentially effective to encourage smoking cessation and reduction of ATP use.

This study is subject to limitations. First, our analysis was based on cross-sectional data, restricting causal inference. Future research with longitudinal data is needed to examine the temporal relationship and examine causation. Second, the measure of ever use of ATP by the

TUS-CPS includes individuals who only tried ATP once. It is unknown whether these respondents were ever regular users of ATP and therefore limits the conclusions we can draw regarding former ATP users. Our list of ATP also did not include e-cigs, the newest and upward trending form of ATP. Future research should also examine the association of home smoking rules and the use of e-cigs.

In conclusion, smoke-free home rules are associated with lower ever and current use of ATP among the U.S. population. The promotion of smoke-free home rules might contribute to the reduction of ATP use and related diseases, but more research is needed to understand the nature of this association and its public health implications.

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Multivariable logistic regressions\* examining the association between home smoking rules and alternative tobacco products (ATP) use in the U.S., 2010–2011 (N=167,554)

**Table 1.**

	Smokeless tobacco		Water pipe (Hookah)		Cigar		Pipe		Any ATP	
	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI	AOR	95% CI
Smoke-free home rules										
No	Ref.		Ref.		Ref.		Ref.		Ref.	
Yes	<b>0.67</b>	<b>(0.60–0.74)</b>	<b>0.60</b>	<b>(0.47–0.76)</b>	<b>0.50</b>	<b>(0.46–0.54)</b>	<b>0.33</b>	<b>(0.27–0.40)</b>	<b>0.50</b>	<b>(0.47–0.53)</b>
Smoke-free home rules										
No	Ref.		Ref.		Ref.		Ref.		Ref.	
Yes	<b>0.77</b>	<b>(0.68–0.86)</b>	<b>0.62</b>	<b>(0.49–0.80)</b>	<b>0.54</b>	<b>(0.49–0.59)</b>	<b>0.39</b>	<b>(0.32–0.47)</b>	<b>0.49</b>	<b>(0.43–0.56)</b>

\* All multivariable logistic regressions were adjusted for age, gender, marital status, race/ethnicity, education attainment, household income, whether living with underage children, cigarette smoking status (never, former, and current smoker). Multilevel approach was used to accommodate state-level effects.

**AOR:** adjusted odds ratio; **CI:** confidence interval