

# Battling Tobacco Use at Home: An Analysis of Smoke-Free Home Rules Among US Veterans From 2001 to 2011

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Tobacco use imposes an enormous public health and financial burden and remains the single most preventable cause of mortality and morbidity in the United States.<sup>1</sup> US veterans use tobacco at a higher rate than do nonveteran civilians.<sup>2</sup> In 2007, the prevalence of cigarette smoking was estimated to be 25.0% among male and 22.0% among female veterans, compared with 20.0% and 18.0% among male and female nonveterans, respectively.<sup>3</sup> Many individuals initiate smoking after entering military service and report using tobacco as a coping mechanism to relieve stress, alleviate boredom, and calm down while on duty.<sup>4</sup> In addition, veteran tobacco use may be influenced by the high rates of mental health disorders following military deployment.<sup>2</sup>

Smoking harms almost every organ of the body, and causal relations have been established between smoking and cancer, cardiovascular disease, stroke, and other diseases.<sup>5</sup> A previous study found that veterans were more likely to report fair or poor health and experience 2 or more chronic conditions than were their peers who had not served in the military.<sup>6</sup> Tobacco use adds to the health burden veterans already shoulder<sup>2</sup> and may contribute to health disparities in tobacco-related diseases between veteran and nonveteran populations. Furthermore, the detrimental effects of smoking extend to veterans' families that are exposed to secondhand smoke (SHS). According to the 2006 surgeon general's report, SHS has immediate adverse effects on the cardiovascular system and causes premature death.<sup>7</sup> There is no risk-free level of SHS exposure.<sup>7</sup> It is estimated that in 2011, there were about 22.7 million US veterans.<sup>8</sup> Together with their families, they represent a sizable population that is at high risk for the harmful effects of tobacco smoking and SHS exposure.

One way to reduce the health impact of smoking and increase cessation is to implement

**Objectives.** We examined national trends in smoke-free home rules among US veterans and nonveterans.

**Methods.** We used data from the 2001–2002 and 2010–2011 Tobacco Use Supplement to the Current Population Survey to estimate and compare the existence of smoke-free home rules among veterans and nonveterans for each survey period.

**Results.** The prevalence of a complete smoke-free home rule among veterans increased from 64.0% to 79.7% between 2001 and 2011 ( $P < .01$ ) but was consistently lower than were rates estimated for nonveterans (67.6% and 84.4%, respectively). Disparities between the 2 groups increased significantly over time ( $P < .05$ ).

**Conclusions.** Despite the general increase in the adoption of smoke-free home rules, veterans lag behind the rest of the US population. Interventions promoting the adoption of complete smoke-free home rules are necessary to protect veterans and their families and to reduce disparities. (*Am J Public Health*. 2014;104:S572–S579. doi:10.2105/AJPH.2014.301975)

a smoke-free home rule. Smoke-free home rules are policies household residents or other individuals establish to restrict or ban cigarette smoking inside the home.<sup>9</sup> Unlike public smoke-free policies that are enforced by laws, home rules are adopted and implemented on a voluntary basis by household members or landlords. Therefore, smoke-free home rules are an important indicator of changes in social norms regarding the acceptability of smoking. Previous studies indicate that smoke-free home rules provide multiple benefits to household residents. For nonsmokers, the presence of a smoke-free home rule is associated with lower levels of SHS exposure, regardless of household members' smoking status.<sup>9,10</sup>

Mills et al. found that, for adult smokers, adoption of smoke-free home rules is associated with smoking cessation, lower relapse rates, and reduced cigarette consumption.<sup>11</sup> It is possible that a smoker consumes less tobacco or quits smoking because a smoke-free home rule makes it inconvenient to smoke or provides pressure from other nonsmoking household members, or it may be that the individual is less dependent on tobacco.<sup>11</sup> Studies also found that smokers may

adopt a smoke-free home rule in preparation for a quit attempt.<sup>12</sup> Additionally, existing literature shows that smoke-free home rules promote antismoking social norms and reduce smoking initiation among youths.<sup>13</sup> It should be noted that an incomplete home rule (allowing smoking somewhere in the home or at certain times) considerably undermines the protective effects of a home rule against SHS exposure.<sup>14</sup>

The prevalence of smoke-free home rules among the general population in the United States has increased from 67.2% in 2001–2002<sup>15</sup> to 83.9% in 2010–2011.<sup>16</sup> Significant reductions in tobacco use and SHS exposure have been observed throughout this period.<sup>17,18</sup> A number of individual, interpersonal, community, and societal factors have been found to be associated with the likelihood of reporting a smoke-free home rule. Individuals who are younger, nonsmoking, Hispanic, of a higher socioeconomic status (individual)<sup>9,19,20</sup>; are living with children and other nonsmokers; have been counseled by physicians (interpersonal)<sup>21–23</sup>; are working in smoke-free workplaces (community)<sup>24</sup>; and are exposed to formal tobacco control policies

and an antismoking culture (societal)<sup>25,26</sup> are more likely to report having a smoke-free home rule.

To date, no study to our knowledge has examined the adoption of smoke-free home rules among US veterans, a vulnerable population with high rates of tobacco use. It is unclear to what extent veterans and the people living with them benefit from this protective behavior. It is also unknown whether a gap exists between veterans and nonveteran civilians in the establishment of smoke-free home rules. Because of the role smoke-free home rules may play in reducing cigarette smoking and SHS exposure, it is important to examine this public health issue among the veteran population. Knowledge of rates of smoke-free home rules and their distribution among veterans and nonveterans may inform future intervention opportunities targeting veterans and their families to reduce cigarette smoking, SHS exposure, and tobacco-attributable diseases.

We tracked national and state-level trends in smoke-free home rules among veterans from 2001 to 2011 and compared the likelihood of adopting home rules among veterans and nonveterans over this period. We also explored individual, interpersonal, and societal characteristics associated with the presence of smoke-free home rules among veterans for the 2010–2011 survey period.

## METHODS

We used data from the 2001–2002 and 2010–2011 Tobacco Use Supplement to the Current Population Survey (TUS-CPS). The TUS-CPS is a National Cancer Institute–sponsored survey of tobacco use administered as a part of the US Census Bureau’s CPS. It is designed to represent the US civilian non-institutionalized population. Within a given survey period, the TUS-CPS samples about 240 000 individuals and is a key source of national and state-level representative data regarding smoking-related behaviors.<sup>27</sup> The TUS-CPS survey interviews all eligible household members aged 18 years or older; data for the 2001–2002 TUS-CPS included individuals aged 15 years and older, but we restricted our analyses to those aged 18 years or older. We included only self-respondents who

provided a valid response to the smoke-free home rule question in the final sample. The overall response rates were 57.4% in 2001–2002 and 54.6% in 2010–2011.

## Measures

The CPS asked all respondents whether they ever served on active duty in the US armed forces. We defined individuals who provided a positive response as veterans and those responding negatively as nonveterans.

All self-respondents of the TUS were asked,

Which statement best describes the rules about smoking inside your home? (Note: “home” is where you live. “Rules” include any unwritten “rules” and pertain to all people whether they reside in the home or are visitors, workmen, etc.).

Response options included (1) “No one is allowed to smoke anywhere inside your home,” (2) “Smoking is allowed in some places or at some times inside your home,” and (3) “Smoking is permitted anywhere inside your home.” A complete smoke-free home rule was defined as “No one is allowed to smoke anywhere inside your home.”

All TUS-eligible respondents were asked about their smoking status and categorized into 3 groups: (1) current smokers (individuals who have smoked 100 or more cigarettes in their lifetime and were smoking every day or some days at the time of the interview), (2) former smokers (those who had smoked 100 or more cigarettes but no longer smoked), and (3) never smokers (those who had smoked fewer than 100 cigarettes).<sup>27</sup> On the basis of residents’ smoking status, we classified households into 2 categories: nonsmoker households (without any current smokers) and smoker households (with at least 1 current smoker).

We assessed additional individual and interpersonal factors, including age (18–29, 30–39, 40–49, 50–59, 60–69, or ≥ 70 years), gender, marital status (married vs other status), race/ethnicity (non-Hispanic White, non-Hispanic African American, Hispanic, and other), education level (< high school, high school graduate, and ≥ college graduate), household income (< \$25 000, \$25 000–\$49 999, and ≥ \$50 000), and whether the respondent was living with underage children, defined as those aged 17 years or younger. On the basis of residents’ smoking status, we

classified households into 2 categories: non-smoker households (without any current smokers) and smoker households (with at least 1 current smoker). We selected these variables according to previous research on factors associated with smoke-free home rules and availability of data.<sup>19,22–24</sup>

We used state identifiers provided by the CPS to track the prevalence of home rules among veterans across the states and as covariates to account for unmeasured state-level factors that may affect the adoption of smoke-free home rules, including exposure to different statewide tobacco control policies.

## Statistical Analysis

We estimated prevalence rates of smoke-free home rules and conducted multivariable logistic regressions to compare the overall likelihood of adopting a complete smoke-free home rule between veterans and nonveterans for each survey cycle, adjusting for individual and interpersonal characteristics and state of residence. We estimated a full model that included both survey periods and an interaction term between veteran status and survey period indicator to test for differences in home rules between veterans and nonveterans over time. Finally, we conducted logistic regression models to identify individual and interpersonal characteristics associated with the establishment of complete home rules among the veteran population. We stratified all regressions by household smoking status (i.e., nonsmoker vs smoker households).

We used self-response adjustment weights provided by the TUS-CPS to accommodate the complex sampling design to produce population estimates. We also adjusted for cluster effects at the household level. We performed all analyses with the statistical package Stata/MP version 13.0 (StataCorp LP, College Station, TX).

## RESULTS

The veterans included in our sample represented a weighted population of 23 947 326 and 20 798 522 for the 2001–2002 and 2010–2011 survey periods, respectively. The weighted population for nonveterans was 181 430 899 and 204 067 935, respectively.

Veterans' average age was 57.6 years (SD = 15.5) in 2001–2002 and 60.3 years (SD = 15.7) in 2010–2011, and they were predominantly male (94.3% and 93.0%, respectively; Table 1). Approximately two thirds of the veterans were married. The majority of veterans were non-Hispanic White and had completed high school but not college. Only about one fifth were living with underage children. Compared with nonveteran civilians, veterans were older and more likely to be male, non-Hispanic White, and a high school graduate but less likely to live with underage children.

The percentages of ever smokers (i.e., the sum of former and current smokers) were substantially higher among veterans than nonveterans during the 2 study periods (63.3% vs 39.2% in 2001–2002 and 56.6% vs 32.1% in 2010–2011, respectively;  $P < .001$ ). The prevalence of current smoking was 21.6% among veterans and 20.7% among nonveteran civilians in 2001–2002 and decreased to 17.2% and 15.6%, respectively, by 2010–2011 (Table 1). After age and gender adjustments, absolute disparities in smoking between veterans and nonveterans widened relative to nonadjusted estimates. Adjusted rates of current smoking were

23.7% for veterans and 20.2% for nonveterans in 2001–2002. In 2010–2011, they were 18.7% and 15.4%, respectively (data not shown). For both survey cycles, smoking veterans consumed more cigarettes than did their counterparts who had not served in the military. In 2001–2002, average daily cigarette consumption was 18.9 (SD = 10.4) for veterans and 15.0 (SD = 9.6) for nonveterans ( $P < .001$ ). By 2010–2011, average consumption was 16.1 (SD = 9.5) and 12.8 (SD = 8.6), respectively ( $P < .001$ ).

Overall, the prevalence of a complete smoke-free home rule among veterans

**TABLE 1—Individual and Household Characteristics of Veterans and Nonveterans: Tobacco Use Supplement to the Current Population Survey, United States, 2001–2011**

Characteristics	2001–2002		2010–2011	
	Veterans (n = 23 055), % (95% CI)	Nonveterans (n = 162 281), % (95% CI)	Veterans (n = 17 007), % (95% CI)	Nonveterans (n = 150 547), % (95% CI)
Age, y				
18–29	4.2 (3.8, 4.5)	24.0 (23.7, 24.3)	4.2 (3.8, 4.7)	24.1 (23.8, 24.4)
30–39	10.7 (10.2, 11.2)	21.6 (21.4, 21.9)	7.6 (7.1, 8.1)	18.2 (17.9, 18.4)
40–49	14.2 (13.7, 14.8)	22.2 (21.9, 22.5)	13.5 (12.8, 14.1)	19.1 (18.9, 19.4)
50–59	24.6 (23.9, 25.3)	14.3 (14.1, 14.5)	16.6 (15.9, 17.2)	18.0 (17.8, 18.3)
60–69	19.5 (18.9, 20.1)	8.5 (8.3, 8.7)	27.4 (26.6, 28.2)	11.0 (10.8, 11.2)
≥ 70	26.8 (26.1, 27.5)	9.3 (9.2, 9.5)	30.8 (30.0, 31.6)	9.6 (9.4, 9.8)
Male	94.3 (93.9, 94.6)	41.9 (41.6, 42.1)	93.0 (92.5, 93.4)	43.6 (43.3, 43.8)
Married	68.8 (68.0, 69.5)	52.9 (52.2, 53.2)	63.6 (62.7, 64.5)	51.1 (50.7, 51.4)
Race/ethnicity				
Non-Hispanic White	83.9 (83.2, 84.5)	71.2 (70.8, 71.6)	81.0 (80.2, 81.7)	66.4 (66.0, 66.8)
Non-Hispanic African American	9.9 (9.3, 10.4)	11.9 (11.6, 12.1)	10.1 (9.6, 10.7)	11.6 (11.3, 2011.8)
Hispanic	4.4 (4.0, 4.8)	11.8 (11.6, 12.1)	5.7 (5.2, 6.1)	15.1 (14.8, 15.4)
Other	1.9 (1.7, 2.1)	5.1 (4.9, 5.3)	3.2 (2.9, 3.6)	7.0 (6.8, 7.2)
Education level				
< high school	10.4 (9.9, 10.8)	18.5 (18.3, 18.8)	6.7 (6.3, 7.2)	13.5 (13.3, 13.8)
High school graduate	64.6 (63.9, 65.3)	56.5 (56.1, 56.8)	65.0 (64.1, 65.8)	57.2 (56.9, 57.6)
College graduate	25.0 (24.4, 25.7)	25.0 (24.7, 25.3)	28.3 (27.5, 29.1)	29.2 (28.9, 29.5)
Household annual income, \$				
< 25 000	23.3 (22.6, 24.0)	28.1 (27.8, 28.4)	20.9 (20.2, 21.7)	26.2 (25.9, 26.6)
25 000–49 999	32.9 (32.1, 33.7)	29.1 (28.6, 29.4)	30.4 (29.6, 31.3)	26.8 (26.5, 27.2)
≥ 50 000	43.8 (42.9, 44.6)	42.9 (42.5, 43.3)	48.6 (47.8, 49.5)	47.0 (46.6, 47.3)
Living with underage children	21.2 (20.6, 21.9)	42.6 (42.2, 43.0)	18.8 (18.1, 19.6)	38.5 (38.2, 38.9)
Living with other current smokers	11.0 (10.5, 11.6)	12.0 (11.7, 12.2)	8.0 (7.6, 8.5)	8.4 (8.2, 8.7)
Smoking status				
Never smoker	36.7 (35.9, 37.5)	60.8 (60.5, 61.1)	44.4 (43.5, 45.3)	67.9 (67.6, 68.2)
Former smoker	41.7 (41.7, 42.4)	18.5 (18.3, 18.8)	38.4 (37.6, 39.3)	16.5 (16.3, 16.7)
Current smoker	21.6 (20.9, 22.3)	20.7 (20.4, 20.9)	17.2 (16.5, 17.9)	15.6 (15.3, 15.8)

Note. CI = confidence interval.

**TABLE 2—Multivariable Logistic Regressions Comparing Smoke-Free Home Rules Between Veterans and Nonveterans: Tobacco Use Supplement to the Current Population Survey, United States, 2001–2011**

Variable	Nonsmoker Household		Smoker Household	
	% (95% CI)	AOR (95% CI)	% (95% CI)	AOR (95% CI)
2001–2002				
Nonveterans (Ref)	81.00 (80.70, 81.30)	1.00	32.00 (31.30, 32.60)	1.00
Veterans	77.40 (76.70, 78.20)	1.05 (0.98, 1.12)	27.70 (26.30, 29.10)	0.94 (0.86, 1.02)
2010–2011				
Nonveterans (Ref)	92.40 (92.20, 92.60)	1.00	53.40 (52.60, 54.20)	1.00
Veterans	89.30 (88.70, 89.90)	0.91 (0.84, 0.98)	44.50 (42.50, 46.40)	0.85 (0.77, 0.93)
Interaction (veteran status × survey period 2010–2011)		0.85 (0.77, 0.92)		0.88 (0.78, 0.98)

Note. AOR = adjusted odds ratio; CI = confidence interval. We adjusted all logistic regressions for age, gender, marital status, race/ethnicity, education level, smoking status, household income, whether living with underage children, and state of residence.

significantly increased: from 64.0% in 2001–2002 to 79.7% in 2010–2011 ( $P < .001$ ). As shown in Table 2, the increase was found regardless of household smoking status. However, the increase was sharper for veterans living in households with current smokers (from 27.7% to 44.5%) than for those from households with only nonsmokers (from 77.4% to 89.3%). It should be noted that the rate of veterans living with smokers declined from 11.0% in 2001–2002 to 8.0% in 2010–2011.

In 2001–2002, complete smoke-free home rules among veterans ranged from 51.0% in Kentucky to 86.1% in Utah (Figure 1a). By 2010–2011, the range had narrowed, with a low of 68.7% in West Virginia and a high of 94.0% in Utah (Figure 1b). The prevalence of smoke-free home rules increased by 10 percentage points or more in all states between 2001 and 2011, with the exception of Utah, which already had a high rate in 2001–2002. The prevalence of smoke-free home rules was generally higher among states in the West and lower among states in the Midwestern and Southern regions, regardless of the survey period.

Table 2 also shows the prevalence of a complete smoke-free home rule among veterans and nonveteran civilians and the results of regression models estimating the likelihood of reporting a home rule among veterans relative to nonveterans for the 2 survey periods. The table shows the results of adjusted models. Unadjusted models yielded similar results to the adjusted ones (results not shown).

For nonsmoker households, the prevalence of smoke-free home rules among veterans was consistently lower than was that for nonveterans (77.4% vs 81.0% in 2001–2002 and 89.3% vs 92.4% in 2010–2011), with absolute disparities decreasing from 3.6 percentage points to 2.1 percentage points over time. After the adjustment for individual and household characteristics, as well as state of residence, the difference in odds of establishing a complete home rule between veterans and nonveterans was nonsignificant for the first survey cycle. By 2010–2011, however, veterans became less likely to report a complete home rule than did nonveterans (adjusted odds ratio [AOR] = 0.91; 95% confidence interval [CI] = 0.84, 0.98). Formal test for interaction between veteran status and survey period confirmed that disparities had increased over the period examined and that veterans were significantly less likely than were nonveterans to live in a home with a complete smoke-free rule (AOR = 0.85; 95% CI = 0.77, 0.92).

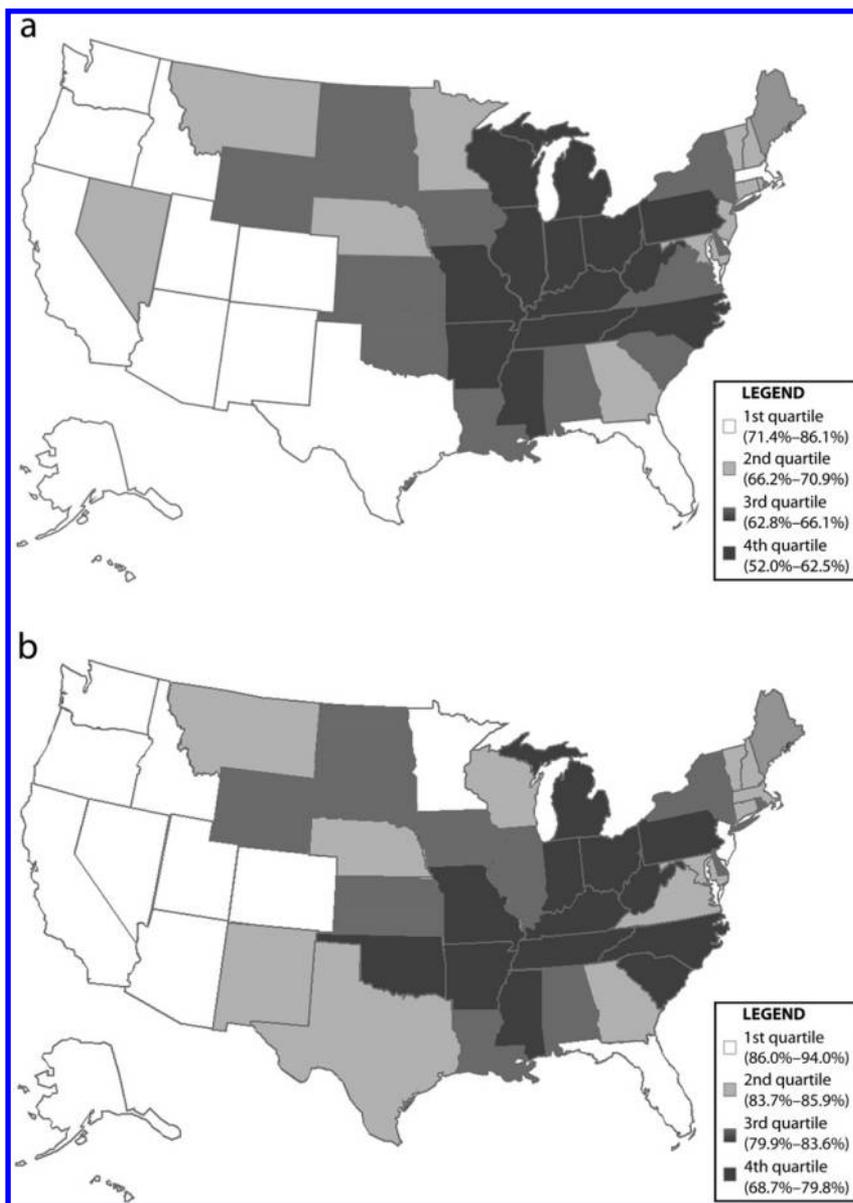
For households with 1 or more smokers, the prevalence of smoke-free home rules was 27.7% among veterans and 32.0% among nonveterans in 2001–2002. By 2010–2011, the prevalence increased for both groups to 44.5% and 53.4%, respectively, with a larger increase for nonveterans. As a result, absolute disparities between these 2 populations increased from 4.3 percentage points to 8.9 percentage points between 2001 and 2011. Compared with nonveterans from smoker households, veterans from smoker

households were equally likely to have a complete home rule in 2001–2002 but had lower odds in 2010–2011 (AOR = 0.85; 95% CI = 0.77, 0.93). The full model with the time by group interaction also indicated that a significant disparity emerged over time (AOR = 0.88; 95% CI = 0.78, 0.98).

By 2010–2011, veterans in smoker and nonsmoker households were less likely to have complete smoke-free home rules than were nonveterans. However, among veterans, certain individual and interpersonal differences predicted the likelihood of instituting smoke-free rules. Among veterans from households without any smokers, individuals who were female, married, and never smokers; had a higher educational level and household income; and were living with underage children were more likely to adopt a complete smoke-free home rule (Table 3). For veterans in smoker households, the same factors, except for gender, were associated with the likelihood of having a smoke-free rule. Furthermore, younger age and Hispanic ethnicity were uniquely associated with the likelihood of having a home rule among veterans living in a smoker household.

## DISCUSSION

We examined trends in complete smoke-free home rules among US veterans at the national and state level from 2001 to 2011. We also investigated potential disparities



**FIGURE 1—Prevalence of complete smoke-free home rules among veterans in (a) 2001–2002, and (b) 2010–2011: Tobacco Use Supplement to the Current Population Survey, United States.**

in home rules between veterans and non-veteran civilians during this period. Consistent with those of other studies, our results indicate that more than half of US veterans initiate smoking at a certain point during their lifetime.<sup>2</sup> Although almost two thirds of ever-smoking veterans have quit smoking and smoking rates have decreased during the past decade among both veterans and non-veterans, the prevalence of smoking has

remained higher among veterans relative to nonveterans, with this disparity remaining stable over time. Furthermore, smoking veterans consistently smoke more heavily than do individuals who have not served in the military. Persisting disparities in tobacco use may be caused by and contribute to the poorer health status of veterans (e.g., they have higher rates of mental health diseases).<sup>2,6</sup>

Our results are in agreement with previous research suggesting that veterans become addicted to nicotine while serving their country and suffer significantly from this addiction long after finishing their military career.<sup>2</sup> Continued work among this population is warranted to reduce tobacco use and health-related disparities between veterans and nonveterans.

We found that the national prevalence of complete smoke-free home rules among veterans has increased considerably between 2001 and 2011. However, by 2010–2011, as many as 20.0% of veterans still did not have any smoking restrictions in their homes and among them 58.8% lived in households with at least 1 smoker resident. Notably, only 44.5% of veterans living in smoker households had a complete smoke-free home rule. This is especially concerning because it is in such households that nonsmokers are in particular need of protection against SHS.

At the state level, the prevalence of smoke-free home rules among veterans increased in all states. States that had rigorous statewide tobacco control policies before 2001, including California, Florida, Arizona, Utah, Oregon, and Massachusetts, ranked among those with the highest rates of smoke-free home rules in 2001–2002. Between 2001 and 2011, more states adopted stricter policies. For example, Minnesota and Wisconsin raised their cigarette tax and implemented comprehensive smoke-free air laws, and they both observed a substantial increase in rates of smoke-free home rules over time among veterans (Minnesota: from 69.0% to 86.3%; Wisconsin: from 62.5% to 83.7%).

Moreover, smoke-free multiunit housing policies have become increasingly common in public and private multiunit housing facilities, in part driven by complaints from multiunit housing residents who have adopted smoke-free home rules but who are still exposed to SHS infiltrating their units from other units or common areas.<sup>28</sup> Such findings are consistent with existing literature revealing a relationship between smoke-free laws and home smoking restrictions probably because of changes in social norms around smoking.<sup>25,26,29</sup> Furthermore, these results suggest that veterans are as sensitive as are nonveterans to state-level smoke-free air laws.

**TABLE 3—Individual and Household Factors Associated With Adoption of Complete Smoke-Free Home Rules Among Veterans: Tobacco Use Supplement to the Current Population Survey, United States, 2010–2011**

Variable	Nonsmoker Household AOR (95% CI)	Smoker Household AOR (95% CI)
<b>Age, y</b>		
18–29 (Ref)	1.00	1.00
30–39	1.13 (0.61, 2.12)	1.11 (0.70, 1.77)
40–49	0.79 (0.46, 1.38)	0.76 (0.50, 1.17)
50–59	0.74 (0.43, 1.26)	0.53 (0.35, 0.81)
60–69	0.81 (0.48, 1.37)	0.57 (0.37, 0.87)
≥ 70	0.77 (0.46, 1.29)	0.58 (0.37, 0.92)
<b>Gender</b>		
Male (Ref)	1.00	1.00
Female	2.02 (1.45, 2.81)	0.87 (0.64, 1.17)
<b>Marital status</b>		
Unmarried (Ref)	1.00	1.00
Married	1.92 (1.67, 2.22)	1.37 (1.14, 1.65)
<b>Race/ethnicity</b>		
Non-Hispanic White (Ref)	1.00	1.00
Non-Hispanic African American	0.78 (0.62, 0.98)	0.91 (0.67, 1.23)
Hispanic	1.33 (0.89, 1.99)	1.41 (0.92, 2.14)
Other	0.99 (0.64, 1.53)	1.15 (0.75, 1.74)
<b>Education attainment</b>		
< high school (Ref)	1.00	1.00
High school graduate	1.29 (1.02, 1.62)	0.92 (0.67, 1.28)
College graduate	1.47 (1.13, 1.90)	1.25 (0.85, 1.84)
<b>Household annual income, \$</b>		
< 25 000 (Ref)	1.00	1.00
25 000–49 999	1.14 (0.96, 1.36)	1.39 (1.10, 1.74)
≥50 000	1.40 (1.16, 1.70)	2.33 (1.84, 2.95)
<b>Smoking status</b>		
Never smoker (Ref)	1.00	1.00
Former smoker	0.68 (0.60, 0.79)	0.82 (0.56, 1.19)
Current smoker	...	0.65 (0.48, 0.87)
<b>Living with children</b>		
No (Ref)	1.00	1.00
Yes	1.49 (1.14, 1.95)	1.64 (1.31, 2.05)

Note. AOR = adjusted odds ratio; CI = confidence interval. We adjusted logistic regressions for state of residence.

In 2001–2002, there was no significant difference in likelihood of adopting complete smoke-free home rules between veterans and nonveterans, regardless of household smoking status. By 2010–2011, however, veterans from both smoker and nonsmoker households became less likely to report the presence of smoke-free home rules than did their nonveteran peers. These results underscore the need to take actions to promote the

adoption of smoke-free home rules among US veterans and reduce the emergent disparity in these protective behaviors among veterans and nonveterans. Such efforts should particularly target veterans who are current and former smokers, older, unmarried, African American, with a lower education attainment and income level, without live-in children, and from a state with lower prevalence of home smoking rules, because

these groups are less likely to enact complete smoke-free home rules according to our results.

The patterns of the prevalence of smoke-free home rules for these sociodemographic groups are similar between veterans and nonveterans for both survey periods (data available as a supplement to the online version of this article at <http://www.ajph.org>). Comparison of adjusted models using data from the 2010–2011 survey period found that disparities by gender and marital status were greater among veterans than among nonveterans, but those by education and income were greater among nonveterans (data available as a supplement to the online version of this article at <http://www.ajph.org>). Further analysis also indicated that compared with California, a few states are at increased disparities between veterans versus nonveterans, including Illinois, Kentucky, New Hampshire, North Carolina, Tennessee, and West Virginia (results not shown). The findings highlight the need to address disparities within these states and by gender and marital status when promoting smoke-free home rules among the veteran population.

The Institute of Medicine has called for a tobacco-free veteran population and recommended a series of policy and clinical approaches.<sup>2</sup> Along with these approaches, the promotion of complete smoke-free home rules among veterans could help to achieve this goal. Data from the 2010–2011 TUS-CPS indicate that 54% of smoking veterans reported having been advised by health professionals to quit smoking during the previous year (data not shown). In the future, clinicians may prescribe a complete smoke-free home rule as part of smoking cessation advice. The Department of Veteran Affairs health care system, in particular, covers about a third of veterans and provides smoking cessation programs to its enrollees.<sup>2</sup>

Because of high rates of smoking and suboptimal rates of smoke-free home rules, we recommend that all Department of Veteran Affairs patients be screened for smoke-free home rule status and counseled to establish complete smoke-free home rules, especially those from smoker households. In doing so, Department of Veteran Affairs tobacco

control efforts may be strengthened in several ways. First, nonsmokers living in smoker households would be protected from SHS exposure. Second, establishment of complete smoke-free home rules could help veterans reduce tobacco use, quit smoking, and stay smoke-free.<sup>11</sup> Third, encouraging smoke-free home rules in veteran households has the potential to reduce tobacco dependence among smokers living with veterans.<sup>2</sup>

Although the Department of Veteran Affairs does not cover direct smoking cessation services to families or dependents of veterans (with a few exceptions), providing outreach to other smoking household members can decrease veteran smoking rates because smokers with smoking partners are less likely to stop smoking and more likely to relapse.<sup>30,31</sup> Future research needs to be conducted to identify effective interventions to promote the adoption of smoke-free home rules and their potential effects on rates of tobacco use and SHS exposure among veterans and their families.

### Limitations

This study is subject to limitations. Minor changes in the wording of the smoke-free home rule question were made to the TUS surveys between the 2001–2002 and 2010–2011 cycles. In the 2001–2002 version, “inside your home” was replaced with “in your home.” Additionally, the former 2001–2002 survey did not contain an explanation of “rules.” The differences might have caused misclassification. On one hand, “inside your home” may have stronger emphasis on the indoor environment, resulting in overestimation in smoke-free home rules. On the other hand, the rules explanation provides a stricter definition by including visitors, workpersons, and so on, which may result in underestimation.

Although we were not able to estimate the net effects of such misclassification using existing data, the potential bias resulting from these changes would not be different for veterans versus nonveterans. Information on smoke-free home rules derived from self-report. As the harm of smoking has become widely recognized, reporting smoke-free home rules could have been affected by social desirability.

### Conclusions

Our findings indicate that the prevalence of complete smoke-free home rules among veterans has increased from 2001 to 2011, regardless of household smoking status. However, veterans lagged behind nonveteran civilians and disparities have widened over time. These findings call for interventions targeting the veteran population and promoting the adoption of complete smoke-free home rules to protect veterans and their families and reduce disparities in tobacco use, SHS exposure, and tobacco-related diseases. Veterans who are from households with current smokers, unmarried, older, with lower education and income level, and without children living in the home are particularly in need of such interventions. ■

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### Contributors

X. Zhang led the study and was responsible for data analysis and article writing. A. P. Martinez-Donate initiated the research idea and supervised the study. J. Cook, M. E. Piper, K. Berg, and N. R. Jones helped interpret the results and revise the article.

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### Human Participant Protection

The study did not require institutional review board approval because we used publicly available data, which did not contain any identifiers of the study participants.

### References

- Centers for Disease Control and Prevention. Tobacco use: targeting the nation's leading killer. 2011. Available at: <http://www.cdc.gov/chronicdisease/resources/publications/aag/osh.htm>. Accessed October 17, 2013.
- Institute of Medicine. *Combating Tobacco Use in Military and Veteran Populations*. Washington, DC: National Academies Press; 2009.

- Brown DW. Smoking prevalence among US veterans. *J Gen Intern Med*. 2010;25(2):147–149.
- American Lung Association. Military smoking. Available at: <http://www.lung.org/stop-smoking/about-smoking/facts-figures/military-and-tobacco-use.html>. Accessed October 16, 2013.
- US Office of the Surgeon General; US Office on Smoking and Health. *The Health Consequences of Smoking: A Report of the Surgeon General*. Atlanta, GA: Centers for Disease Control and Prevention; 2004.
- Kramarow EA, Pastor PN. The health of male veterans and nonveterans aged 25–64: United States, 2007–2010. *NCHS Data Brief*. 2012;(101):1–8.
- US Department of Health and Human Services. The health consequences of involuntary exposure to tobacco smoke: a report of the surgeon general. 2007. Available at: <http://www.surgeongeneral.gov/library/secondhandsmoke/report/index.html>. Accessed October 4, 2011.
- US Department of Veterans Affairs. Veteran population. Available at: [http://www.va.gov/vetdata/Veteran\\_Population.asp](http://www.va.gov/vetdata/Veteran_Population.asp). Accessed October 16, 2013.
- Martinez-Donate AP, Johnson-Kozlow M, Hovell MF, Gonzalez Perez GJ. Home smoking bans and secondhand smoke exposure in Mexico and the US. *Prev Med*. 2009;48(3):207–212.
- Ayers JW, Hofstetter CR, Hughes SC, et al. Smoking on both sides of the Pacific: home smoking restrictions and secondhand smoke exposure among Korean adults and children in Seoul and California. *Nicotine Tob Res*. 2010;12(11):1142–1150.
- Mills AL, Messer K, Gilpin EA, Pierce JP. The effect of smoke-free homes on adult smoking behavior: a review. *Nicotine Tob Res*. 2009;11(10):1131–1141.
- Vangeli E, Stapleton J, Smit ES, Borland R, West R. Predictors of attempts to stop smoking and their success in adult general population samples: a systematic review. *Addiction*. 2011;106(12):2110–2121.
- Albers AB, Biener L, Siegel M, Cheng DM, Rigotti N. Household smoking bans and adolescent antismoking attitudes and smoking initiation: findings from a longitudinal study of a Massachusetts youth cohort. *Am J Public Health*. 2008;98(10):1886–1893.
- Van Deusen A, Hyland A, Travers MJ, et al. Secondhand smoke and particulate matter exposure in the home. *Nicotine Tob Res O*. 2009;11(6):635–641.
- National Cancer Institute. 2001–2002 Tobacco use supplement to the current population survey. Available at: <http://appliedresearch.cancer.gov/studies/tus-cps/results/data0102>. Accessed October 16, 2013.
- National Cancer Institute. 2010–11 tobacco use supplement to the current population survey. Available at: <http://appliedresearch.cancer.gov/studies/tus-cps/results/data1011>. Accessed October 16, 2013.
- Centers for Disease Control and Prevention. Vital signs: nonsmokers' exposure to secondhand smoke—United States, 1999–2008. 2010. Available at: [http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5935a4.htm?\\_cid=mm5935a4\\_w](http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5935a4.htm?_cid=mm5935a4_w). Accessed February 22, 2013.
- Centers for Disease Control and Prevention. State-specific prevalence and trends in adult cigarette smoking—United States, 1998–2007. 2009. Available at: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5809a1.htm>. Accessed November 21, 2013.

19. Zhang X, Martinez-Donate AP, Kuo D, Jones NR, Palmersheim KA. Trends in home smoking bans in the USA, 1995–2007: prevalence, discrepancies and disparities. *Tob Control*. 2012;21(3):330–336.
20. Gilpin EA, White MM, Farkas AJ, Pierce JP. Home smoking restrictions: which smokers have them and how they are associated with smoking behavior. *Nicotine Tob Res*. 1999;1(2):153–162.
21. Hawkins SS, Chandra A, Berkman L. The impact of tobacco control policies on disparities in children's secondhand smoke exposure: a comparison of methods. *Matern Child Health J*. 2012;16(suppl 1):S70–S77.
22. Binns HJ, O'Neil J, Benuck I, Ariza AJ. Influences on parents' decisions for home and automobile smoking bans in households with smokers. *Patient Educ Couns*. 2009;74(2):272–276.
23. Kegler MC, Escoffery C, Butler S. A qualitative study on establishing and enforcing smoking rules in family cars. *Nicotine Tob Res*. 2008;10(3):493–497.
24. Borland R, Mullins R, Trotter L, White V. Trends in environmental tobacco smoke restrictions in the home in Victoria, Australia. *Tob Control*. 1999;8(3):266–271.
25. Cheng K-W, Glantz SA, Lightwood JM. Association between smokefree laws and voluntary smokefree-home rules. *Am J Prev Med*. 2011;41(6):566–572.
26. Mons U, Nagelhout GE, Allwright S, et al. Impact of national smoke-free legislation on home smoking bans: findings from the International Tobacco Control Policy Evaluation Project Europe Surveys. *Tob Control*. 2012; 22(e1):e2–e9.
27. National Cancer Institute. Tobacco use supplement to the current population survey: what is the TUS-CPS? Available at: <http://riskfactor.cancer.gov/studies/tus-cps/>. Accessed March 12, 2013.
28. King BA, Cummings KM, Mahoney MC, Juster HR, Hyland AJ. Multiunit housing residents' experiences and attitudes toward smoke-free policies. *Nicotine Tob Res*. 2010;12(6):598–605.
29. Cheng K-W, Okechukwu CA, McMillen R, Glantz SA. Association between clean indoor air laws and voluntary smokefree rules in homes and cars. *Tob Control*. 2013;Epub ahead of print.
30. McBride CM, Curry SJ, Grothaus LC, Nelson JC, Lando H, Pirie PL. Partner smoking status and pregnant smoker's perceptions of support for and likelihood of smoking cessation. *Health Psychol*. 1998;17(1):63–69.
31. Homish GG, Leonard KE. Spousal influence on smoking behaviors in a US community sample of newly married couples. *Soc Sci Med*. 2005;61(12):2557–2567.