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Influence of gender and peer tobacco use on tobacco use intentions after a period of involuntary tobacco abstinence among U.S. Air Force trainees

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ABSTRACT

This study examined gender, prior tobacco use, and social-environmental factors as predictors of intentions to use tobacco (cigarette smoking and/or smokeless tobacco [ST]) after a forced period of abstinence among U.S. Air Force (USAF) trainees. Trainees completed 8½ weeks of basic military training (BMT), then 4 weeks of Technical Training; both required abstinence from tobacco. A cross-sectional survey of 13,514 USAF trainees (73% male, 90% age 18–24, 43% prior tobacco use) was conducted at the beginning of the 4-week Technical Training period. Overall, 17% of the sample reported future tobacco use intentions. Intentions for future tobacco use were less prevalent among non-tobacco users before BMT (1%) than those reporting any tobacco use (37%). From a multivariable logistic regression model predicting intentions to use any tobacco after Technical Training, significant two-way interaction effects were detected between gender, and tobacco use prior to BMT ($p = 0.0001$), and number of close friends who smoked cigarettes ($p = 0.018$), and number of close friends who used ST ($p = 0.029$). Among non-tobacco users before BMT, females were more than twice as likely as males to report tobacco intentions (Odds Ratio = 2.2, Bonferroni corrected 95% CI: 1.14.4, $p = 0.011$); no gender differences were detected among tobacco users. For females, but not males, having more friends who smoked was associated with greater likelihood of tobacco intentions (Bonferroni corrected $p \leq 0.05$). In contrast, for males, but not females, having more friends using ST was associated with greater likelihood of tobacco intentions (Bonferroni corrected $p < 0.05$). In this sample of USAF trainees, the study provides novel findings on how males and females are influenced differently by their prior tobacco use and peers' tobacco use in predicting tobacco intentions. Prevention efforts focused on uptake and resumption of tobacco use, along with gender-specific strategies, may be warranted.

1. Introduction

United States (U.S.) military personnel represent a high risk group for tobacco use. The Department of Defense health survey (Barlas et al., 2013) of all service branches (Army, Navy, Air Force, Marine Corps, and Coast Guard) ages 18–65 reported tobacco product use in the previous 12 months was 49% compared with 21% in the general U.S. adult population (Hu et al., 2016). In the Air Force, tobacco use prevalence was 40% (28% females, 44% males). Intentions or susceptibility to use tobacco are robust proximal predictors of future tobacco use (Choi et al., 2001; Pierce et al., 1996; Stewart and Moreno, 2013; Wakefield et al., 2004; Warren et al., 2006). A period of forced tobacco abstinence among U.S. Air Force (USAF) trainees represents a unique opportunity to examine predictors of tobacco use intentions. Prior research evaluating behavioral intentions after involuntary tobacco abstinence was conducted within the context of hospitalization, surgery, or incarceration (Regan et al., 2012; Shi and Warner, 2010; Thibodeau et al., 2010), but to our knowledge have never been studied in a military population. All service branches have tobacco bans in training, potentially impacting hundreds of thousands of people every year.

In contrast to cigarette smoking intentions, there is a dearth of research on demographic and psychosocial variables associated with smokeless tobacco (ST) use intentions. Among adolescents, male gender was associated with increased risk for cigarette smoking intentions in

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some (McCabe et al., 2017; Moore et al., 2016; Polanska et al., 2016; Trinidad et al., 2017), but not all (Dube et al., 2013; Gregoire et al., 2016; Ladapo et al., 2014; Ling et al., 2007) studies. Moreover, Hispanic nonsmoking youth were more likely to report cigarette smoking intentions (Dube et al., 2013; El-Toukhy et al., 2016; Gottlieb et al., 2004; Ling et al., 2007; Trinidad et al., 2017), but other studies revealed a lack of racial/ethnic differences (Ladapo et al., 2014). Adolescent ever smokers are at increased risk for reporting future smoking intentions compared to never smokers (Cai et al., 2015; Gregoire et al., 2016; McCabe et al., 2017; Polanska et al., 2016; Trinidad et al., 2017). Limited research among adolescents and young adults indicates that gender may moderate the influence of cigarette smoking status on smoking intentions (Gottlieb et al., 2004; Ling et al., 2007).

There is evidence that social-environmental factors influence cigarette smoking intentions, especially peer smoking (Aslam et al., 2014; Ball et al., 2018; Cai et al., 2015; Dube et al., 2013; Gottlieb et al., 2004; Moore et al., 2016; Nagarkar and Gadhave, 2015; Polanska et al., 2016; Scalici and Schulz, 2014) (see also Seo and Huang (2012) for review). Ladapo et al. (2014) found that the influence of peer smoking was greater among ever smoking youth (36%) than among never smokers (7%). Other social influences associated with smoking intentions include having at least one parent who smokes (see Lochbuehler et al. (2016) for review) and household second-hand smoke exposure (Ball et al., 2018). Most previous research included gender as a covariate in multivariate models, and few reported gender-specific results (e.g., Huang et al., 2012) or examined potential gender interaction effects (e.g., Guindon et al., 2008).

The current study examined demographic and social-environmental risk factors for tobacco use intentions among a sample of USAF Technical trainees after an involuntary tobacco abstinence period. We extend prior research by examining factors associated with ST use intentions, as well as the moderating role of gender on social-environmental variables for predicting cigarette smoking and ST use intentions. Based on an integrative model (Fishbein and Yzer, 2003) from social cognitive theory (Cohen, 2004) and theory of reasoned action (Fishbein and Ajzen, 1975), and drawing from research findings described above, we hypothesized that social-environmental influences and tobacco use before BMT would be associated with tobacco use intentions. Additionally, we examined interactions of gender and tobacco use before BMT, and social-environmental factors on tobacco use intentions.

2. Methods

2.1. Design

A cross-sectional baseline survey of USAF trainees was conducted as part of a study of tobacco use between the University of Virginia and the USAF. Data were collected from 2011 to 2013.

2.2. Participants

Participants were Airmen, called “Airmen” regardless of rank or gender, undergoing Technical Training, on Lackland and Fort Sam Houston in San Antonio, TX. Data were collected from 14,826 Airmen, of which 13,514 responded to questions on future intentions to smoke cigarettes and/or use ST, and form the basis of this report.

2.3. Procedures

Study procedures were approved by the 59th Medical Wing Institutional Review Board. Airmen complete 8½ weeks of BMT during which they are required to be abstinent from tobacco. After graduation, Airmen enter Technical Training where they acquire advanced skills and are required to remain from tobacco for the first four weeks. We examined tobacco use intentions at the beginning of the four-week Technical Training abstinence period.

Written informed consent was provided prior to survey administration and no compensation was provided. Study staff emphasized that participation was voluntary and that there were no personal or professional risks imposed for non-participation, and reviewed confidentiality procedures. A self-completed 37-item questionnaire was provided by trained research staff to groups of up to 50 Airmen as part of their Technical Training curriculum, who were encouraged to sit “at ease” during its administration (about 15 min) whether or not they chose to participate. To reduce coercion, supervisory leadership was not allowed access to the study location. The survey response rate was 73%.

2.4. Measures

2.4.1. Demographics

Characteristics assessed were gender (male, female), age group (18–19, 20–24, 25–40), marital status (single, married), education (high school diploma/GED, some education beyond college or 4-year degree or more), race (White, Black/African American, other, more than one race), and Hispanic ethnicity (yes, no). Participants self-reported height and weight from which body mass index (BMI) was calculated.

2.4.2. Social-environmental influences

Two questions assessed the participants' social environment: (1) Prior to BMT, if they lived with someone who smoked cigarettes, used ST, or both, with response options: yes or no; and (2) How many of their close friends smoke, use ST or both, with response options: none, few (< 20%), some (20–49%), many (50–79%), or almost all (80% or more).

2.4.3. Tobacco use

Participants were tobacco-free when surveyed; therefore questions addressed tobacco use before BMT included cigarette smoking, use of ST (chew, snuff, snus, or dissolvables), cigar, and Hookah use. We used six categories (Klesges et al., 2011): (1) Non-users: reported none of these tobacco products in the month before BMT; (2) Infrequent users of cigarettes and/or ST: used in the month before BMT but reported use less than once per month; (3) Regular cigarette smoker and (4) Regular ST users: use in the month before BMT and at least once per month; (5) Dual users: both a regular cigarette smoker and a regular ST user; and (6) Exclusive cigar/Hookah users: reported one or both of these products in the month before BMT and were infrequent or regular users.

2.4.4. Tobacco use intentions

Participants were asked “Once you get out of Tech school, which of these describes you?” with response options: I plan to remain tobacco-free, I am thinking about using tobacco products, or I will definitely use tobacco products. Those indicating they planned to remain tobacco-free were classified as no tobacco use intentions. Consistent with prior studies (Gregoire et al., 2016; Ladapo et al., 2014), participants indicating they were thinking about or definitely planning to use tobacco were classified as tobacco use intentions and were asked to indicate if they intended to smoke cigarettes, use ST, or both (dual use).

2.5. Statistical analysis

Our analytic approach used a multivariable logistic regression model to assess significant associations between pre-specified risk factors and intentions to smoke cigarettes and/or use ST (dichotomized dependent variable: yes/no). We pre-specified potential risk predictors based on the results of univariate analyses and previously known published risk factors. We further conducted variable clustering analysis (Harrell, 2015), using all pre-specified risk predictors listed in Table 1, to determine which risk predictors to include in the final model based on an appropriate similarity matrix of the candidate predictors. Thus, the final model included demographics (age, gender, BMI, race/

Table 1
Demographics and social environmental characteristics of Air Force trainees by intentions to smoke cigarettes and/or use smokeless tobacco after technical training (N = 13,514).

Variable	Tobacco use intentions[a]	
	No (n = 11,252)	Yes (n = 2262)
Age group (y, n = 13,514)		
18–19	5072 (45%)	1083 (48%)
20–24	5105 (45%)	1040 (46%)
25–40	1075 (10%)	139 (6%)
BMI (n = 13,491)	23.8 (22.3, 23.7, 25.2)	24.1 (22.4, 23.9, 25.5)
Gender (n = 13,514)		
Male	8035 (71%)	1860 (82%)
Female	1860 (29%)	402 (18%)
Race (n = 13,512)		
White	7270 (65%)	1814 (80%)
Black or African American	1974 (18%)	125 (6%)
Other single race	1183 (11%)	185 (8%)
More than one race	823 (7%)	138 (6%)
Hispanic (n = 13,512)		
Yes	1789 (16%)	235 (10%)
No	9461 (84%)	2027 (90%)
Education (n = 13,488)		
High school graduate/G.E.D.	5670 (50%)	1279 (57%)
Some education after high school	4714 (42%)	874 (39%)
4-year degree or more	847 (8%)	104 (5%)
Marital status (n = 13,510)		
Single	10,054 (89%)	2050 (91%)
Married	2050 (11%)	211 (9%)
Prior to BMT, lived with someone who smoked cigarettes (n = 13,512)		
Yes	4344 (39%)	1159 (51%)
No	6906 (61%)	1103 (49%)
Prior to BMT, lived with someone who used ST (n = 13,512)		
Yes	1748 (16%)	676 (30%)
No	9502 (84%)	1586 (70%)
Prior to BMT, lived with someone who regularly smoked cigarettes and used ST (n = 13,512)		
Yes	804 (7%)	282 (12%)
No	10,446 (93%)	804 (88%)
Number of close friends who smoked cigarettes (n = 13,512)		
None	2190 (19%)	90 (4%)
Few	4336 (39%)	460 (20%)
Some	2496 (22%)	639 (28%)
Many or almost all	2228 (20%)	1073 (47%)
Number of close friends who used ST (n = 13,510)		
None	4471 (40%)	366 (16%)
Few	3853 (34%)	630 (28%)
Some	1650 (15%)	521 (23%)
Many or almost all	1274 (11%)	745 (33%)
Number of close friends who both smoked cigarettes and used ST (n = 13,508)		
None	4697 (42%)	507 (22%)
Few	3811 (34%)	730 (32%)
Some	1577 (14%)	449 (20%)
Many or almost all	1162 (10%)	575 (25%)
Tobacco use status prior to BMT (n = 13,512)		
Non-user	7567 (67%)	114 (5%)
Regular cigarette smoker[b]	647 (6%)	845 (37%)
Regular ST user[b]	193 (2%)	580 (26%)
Dual user[c]	107 (1%)	375 (17%)
Infrequent cigarette smoking and/or ST use[d]	1205 (11%)	321 (14%)
Exclusive cigar or/and Hookah use[e]	1531 (14%)	27 (1%)

Note: Univariate logistic regression analyses indicated that all risk predictors except marital status were highly associated with tobacco use intentions ($p \leq 0.0001$). A continuous variable was displayed as mean (1st quartile, median, 3rd quartile). BMT = basic military training; ST = smokeless tobacco; BMI = body mass index.

[a] Excluded intention to use cigars/Hookah and multiple forms of tobacco.
[b] Regular use: used in month before BMT and reported use at least once per month.
[c] Both regular cigarette smoker and regular use of ST use.
[d] Infrequent use: used in month before BMT but reported use less than once per month.
[e] Use of one or both of these products in the month before BMT with reported infrequent or regular use.

Table 2
Interaction effects between gender and peer influences and prior tobacco use in predicting probability of intentions to smoke cigarettes and/or use smokeless tobacco after technical training among Air Force trainees.

Variable	Odds ratio	95% CI	*p*-Value	Bonferroni corrected 95% CI	Bonferroni corrected *p*-value
Tobacco use prior to BMT[a]					
Dual use: female vs. male	0.85	0.29–2.54	0.773	0.18–3.99	0.999
Regular cigarette smoking or ST use: female vs. male	0.81	0.54–1.22	0.316	0.45–1.45	0.999
Infrequent cigarette and/or ST use: female vs. male	1.19	0.77–1.85	0.438	0.63–2.22	0.999
Exclusive cigar/Hookah use: female vs. male	2.72	1.19–6.22	0.018	0.84–8.77	0.159
No tobacco use: female vs. male	2.21	1.37–3.57	0.001	1.12–4.35	0.011
Males & tobacco use prior to BMT[a]					
Dual use vs. no use	189.36	134.73–266.15	< 0.0001	116.99–306.51	< 0.0001
Regular cigarette smoking or ST use vs. no use	119.03	91.34–155.12	< 0.0001	81.84–173.13	< 0.0001
Infrequent cigarette and/or ST use vs. no use	18.67	14.07–24.77	< 0.0001	12.51–27.86	< 0.0001
Exclusive cigar/Hookah use vs. no use	1.08	0.62–1.86	0.795	0.49–2.34	0.999
Females & tobacco use prior to BMT[a]					
Dual use vs. no use	72.96	25.44–209.25	< 0.0001	16.43–323.94	< 0.0001
Regular cigarette smoking or ST use vs. no use	43.63	30.03–63.39	< 0.0001	25.72–74.01	< 0.0001
Infrequent cigarette smoking and/or ST use vs. no use	10.05	6.69–15.10	< 0.0001	5.65–17.87	< 0.0001
Exclusive cigar/Hookah use vs. no use	1.32	0.68–2.60	0.413	0.51–3.43	0.999
Number of close friends who smoke cigarettes					
None: female vs. male	0.96	0.46–2.03	0.923	0.35–2.68	0.999
Few: female vs. male	2.21	1.37–3.57	0.001	1.14–4.27	0.008
Some: female vs. male	1.86	1.06–3.13	0.029	0.87–3.83	0.202
Many or almost all: female vs. male	2.77	1.63–4.69	0.0002	1.34–5.71	0.0014
Males & number of close friends who smoke cigarettes					
Few vs. none	1.06	0.76–1.48	0.735	0.67–1.68	0.999
Some vs. none	1.38	0.99–1.93	0.058	0.87–2.19	0.406
Many or almost all vs. none	1.28	0.92–1.79	0.145	0.81–2.02	0.999
Females & number of friends who smoke cigarettes					
Few vs. none	2.43	1.23–4.81	0.011	0.95–6.20	0.076
Some vs. none	2.62	1.29–5.30	0.007	1.00–6.89	0.050
Many or almost all vs. none	3.68	1.84–7.34	0.0002	1.42–9.49	0.0014
Number of close friends who use ST					
None: female vs. male	2.21	1.37–3.57	0.001	1.14–4.27	0.008
Few: female vs. male	1.69	1.02–2.79	0.040	0.85–3.36	0.281
Some: female vs. male	1.48	0.84–2.60	0.179	0.68–3.22	0.999
Many or almost all: female vs. male	1.06	0.58–1.94	0.853	0.46–2.42	0.999
Males & number of close friends who use ST					
Few vs. none	1.09	0.88–1.37	0.431	0.81–1.49	0.999
Some vs. none	1.40	1.10–1.79	0.007	1.00–1.95	0.048
Many or almost all vs. none	1.71	1.34–2.18	< 0.0001	1.23–2.38	< 0.0001
Females & number of close friends who use ST					
Few vs. none	0.84	0.60–1.16	0.284	0.53–1.31	0.999
Some vs. none	0.93	0.62–1.40	0.743	0.54–1.63	0.999
Many or almost all vs. none	0.82	0.52–1.28	0.377	0.44–1.51	0.999

Note: The model was also adjusted for age, gender, race/ethnicity, education, marital status, body mass index, living with someone who smoked cigarettes prior to BMI, living with someone who used ST prior to BMI, number of friends who smoke cigarettes, and number of friends who use ST. BMT = basic military training; ST = smokeless tobacco.

[a] Non-user: no tobacco used in month prior to BMT, Regular user: used in month before BMT and reported use at least monthly; Dual user: both regular cigarette smoker and regular use of ST; Infrequent user: used in month before BMT but reported use less than once per month; Exclusive cigar/Hookah use: use of one or both of these products in the month before BMT with reported infrequent or regular use.

ethnicity, education, marital status), tobacco use status before BMT, and social-environmental influence factors (lived with someone who smoked cigarettes before BMT, lived with someone who used ST before BMT, number of friends who smoke cigarettes, number of friends who use ST). We also assessed potential two-way interaction effects between participants' demographic information and social-environmental factors. Internal model validation was determined by bootstrap model validation (Harrell, 2015), a method to assess how accurately the tested model would predict outcomes for a new sample of data. A bootstrapped corrected C-index or area under the receiver operative characteristic (ROC) curve was utilized as a measure of overall predictive discrimination, which is defined in this study as the ability to separate participants with tobacco use intentions from those who did not. To control type I error due to multiple comparisons, Bonferroni multiple comparisons adjustment was used for comparisons of primary interests. The significance level was specified at 0.05. All analyses were performed in R3.4.1 (R Foundation for Statistical Computing 2017).

3. Results

3.1. Participants

Participants (N = 13,514) were primarily male (73%) and 91% were aged 18–24 years, 90% were single, and 51% reported only a high school education. Thirty-three percent were racial minorities and 15% were of Hispanic ethnicity. Before BMT, 41% lived with someone who smoked cigarettes, 18% lived with someone using ST, and 8% lived with someone using both. Only 17% reported that none of their close friends smoked cigarettes. Fifty-seven percent were classified as non-tobacco users before BMT.

3.2. Tobacco use intentions

Overall, 17% (n = 2262) reported intentions to smoke cigarettes and/or use ST after Technical Training (see Table 1). Intentions for future tobacco use were less prevalent among non-users before BMT

(1%) than those reporting any tobacco use (37%). The majority (67%) of those reporting no tobacco use intentions were non-users before BMT. Fifty-two percent of regular cigarette smokers before BMT reported intentions to smoke cigarettes, 74% of regular ST users before BMT reported intentions to use ST, and 17% of both regular cigarette and ST users before BMT reported intentions to use both products (see Supplementary Table S1).

3.3. Multivariable predictors of tobacco use intentions

Due to relative small number of regular ST users before BMT who reported no intentions to use either cigarettes or ST, we collapsed regular ST users only with regular cigarette smokers only before BMT in the statistical modeling. From the multivariable logistic regression model there were significant main effects in predicting tobacco use intentions for age ($p = 0.014$), gender ($p < 0.0001$), race ($p = 0.030$), Hispanic ethnicity ($p = 0.041$), number of close friends who smoke cigarettes ($p = 0.0003$), number of close friends who use ST ($p = 0.0001$), and tobacco use before BMT ($p < 0.0001$). Significant two-way interactions effects were also detected between gender, and tobacco use before BMT ($p = 0.0001$), and number of close friends who smoked ($p = 0.018$), and number of close friends using ST ($p = 0.029$).

Among females who were dual users, regular cigarette smokers or regular ST users, or using these two tobacco products infrequently before BMT, were 73.0 (Bonferroni corrected 95% CI: 16.4 to 323.9, $p < 0.0001$), 43.6 (Bonferroni corrected 95% CI: 25.7 to 74.0, $p < 0.0001$) and 10.1 (Bonferroni corrected 95% CI: 5.7 to 17.9, $p < 0.0001$) times likely to have tobacco use intentions than non-users, respectively (see Table 2). Among males who were dual users, regular cigarette smokers or regular ST users, or using these two tobacco products infrequently before BMT were 189.4 (Bonferroni corrected 95% CI: 117.0 to 306.5, $p < 0.0001$), 119.0 (Bonferroni corrected 95% CI: 81.8 to 173.1, $p < 0.0001$), and 18.7 (Bonferroni corrected 95% CI: 12.5 to 27.9, $p < 0.0001$) times likely to have tobacco use intentions than non-users, respectively. Interestingly, among non-users, females were more than twice as likely as males to report tobacco use intentions (OR = 2.2, Bonferroni corrected 95% CI: 1.1 to 4.4, $p = 0.011$). However, among any type of tobacco user before BMT (i.e., dual use, regular or infrequent cigarette smoking or ST use, or exclusive cigar/Hookah use), significant gender differences were not observed in predicting tobacco use intentions (Bonferroni corrected $p > 0.05$).

Among either males or females, except for exclusive cigar/Hookah users, tobacco use before BMT was highly associated with greater likelihood of tobacco use intentions compared to non-use (Bonferroni corrected $p < 0.0001$, respectively, also see Table 2 for detailed comparisons).

From the interaction effects of gender and social-environmental influence factors, we observed how number of close friends using tobacco influenced females and males differently in predicting any tobacco (cigarette smoking and/or ST) use intentions (see Table 2). Among participants reporting few close friends who smoked cigarettes, females were more than twice as likely to report tobacco use intentions than males (OR = 2.2, Bonferroni corrected 95% CI: 1.1 to 4.3, $p = 0.008$); among participants who had many/almost all close friends who smoked, females were nearly three times more likely to report tobacco use intentions than males (OR = 2.8, Bonferroni corrected 95% CI: 1.6 to 4.7, $p = 0.001$). Among females, having some or many/almost all close friends who smoked were 2.6 and 3.7 times more likely to report tobacco intentions than those with none, respectively (Bonferroni corrected 95% CI: 1.0 to 6.9, $p = 0.05$; 95% CI: 1.4 to 9.5, $p = 0.001$, respectively; also see Table 2 for comparisons among males). However, there were no significant differences in predicting tobacco use intentions among males when comparing those with few, some, many/almost all with no close friends who smoked cigarettes. Thus, number of friends who smoke seemed to influence females more than males.

In contrast, number of friends using ST had little influence among females, but seemed to have significant influence among male participants. Males reporting some or many/almost all close friends used ST were 1.4 (Bonferroni corrected 95% CI: 1.0 to 2.0, $p = 0.048$) and 1.7 (Bonferroni corrected 95% CI: 1.2 to 2.4, $p < 0.0001$) times more likely to report tobacco use intentions than none of close friends used ST, respectively. There were no significant gender differences among those with few or some or many/almost all close friends using ST. However, among those reporting that none of their close friends used ST, females were more than twice as likely as males to report tobacco use intentions (OR = 2.2, Bonferroni corrected 95% CI: 1.1 to 4.3, $p = 0.008$; also see Table 2 for comparisons among females).

The bootstrapped corrected C-index from the internal model validation was 0.93, which indicated that our final multivariable model has excellent predictive discrimination power, and also had some utility in predicting tobacco use intentions of individual subjects.

4. Discussion

This study examined intentions to use tobacco after a forced period of abstinence among USAF trainees. In this sample, 17% reported future intentions to use tobacco. Our findings are innovative and extend the literature by examining the potential moderating role of gender and social-environmental variables, and tobacco use status prior to BMT, on tobacco use intentions. Key findings from this investigation are that the influence of peer tobacco use was different for males and females according to type of tobacco used among close friends. That is, females were more influenced to use tobacco in the future by friends who smoke and males by friends using ST. For example, among participants with many/almost all close friends who smoked cigarettes, women were nearly three times more likely (OR = 2.8, $p = 0.001$) to report tobacco use intentions than males. Another new and interesting finding is that among the subgroup of trainees with no tobacco use before BMT, females were more than twice as likely (OR = 2.2, $p = 0.011$) to report tobacco use intentions compared to males. In contrast, no gender differences were observed for those who used any tobacco before BMT (Bonferroni corrected $p > 0.05$, respectively).

Not surprisingly, we observed that for either males or females, any tobacco use prior to BMT (reported by 43% of the sample) was highly associated with increased risk of future tobacco use intentions compared to those not using tobacco before BMT (Bonferroni corrected $p < 0.0001$, respectively). This finding is consistent with previous research indicating that never cigarette smokers have decreased risk of smoking intentions than ever smoking youth (e.g., Trinidad et al., 2017). However, few studies included adult samples (Ling et al., 2007; Setodji et al., 2013). Our results add to the literature with the observation that most of prior ST users before BMT reported intending to use ST (74%) and most of prior cigarettes smokers before BMT reported intending to smoke cigarettes (52%). Prior tobacco use needs consideration in the design of future prevention interventions. Qualitative research might uncover psychosocial reasons (e.g., negative affect, desire to control body weight) for susceptibility to use tobacco among the sub-group of females reporting no tobacco use before BMT (Freedman et al., 2012; World Health Organization, 2010). Inconsistent with our results, two prior studies, one in young adults (Ling et al., 2007) and one in adolescents (Gottlieb et al., 2004), found no gender differences in future smoking intentions among never smokers, but differences among ever experimental or daily smokers (males having greater likelihood of intentions in one study (Ling et al., 2007) and females in the other (Gottlieb et al., 2004)). It is noteworthy that smoking onset has become increasingly concentrated in the young adult years especially among women (Freedman et al., 2012; Thompson et al., 2015).

Study findings highlight the importance of examining gender in-

fluences in both theoretical and analytical models of tobacco intentions, and suggest that gender-specific strategies targeting social norms about tobacco use (Valente, 2012) may be warranted. Greater understanding of cultural influences or identity as part of the Air Force, including social norms regarding tobacco for men (ST use) and women (cigarette smoking) would be useful information to gather for designing such interventions (Mead et al., 2014). The DOD health survey (Barlas et al., 2013) found that tobacco use was reported by military personnel as facilitating social interaction and networking. Although new military friends would have also been exposed to a tobacco ban, they could engage in social interactions that alluded to or referenced tobacco use. Unlike prior studies (Bunnell et al., 2015), the presence of household smokers or ST users did not emerge as an important correlate of tobacco intentions in contrast to number of close friends using tobacco. This may be because household tobacco use was assessed in reference to before BMT, whereas close friends were assessed as current, more proximal influences. However, it is possible that respondents answered the question on close friends in reference to before BMT as it was asked after the household tobacco use question.

This study has several strengths including the large sample size. Our final multivariable model had excellent predictive discrimination power, and also had some utility in predicting tobacco use intentions of individual subjects. Thus, personalized preventive interventions could be developed based on individual subjects' risk scores. The sample comprised non-college attending young adults (91%) along with middle aged adults 25–40 years (9%), and included both tobacco users and non-users before BMT.

This study does have limitations one being sample characteristics. We surveyed new recruits of only one service branch in the U.S. military, although after the Army, the USAF is the second largest of the service branches. All military branches have similar protracted periods of required tobacco abstinence, thus our results should generalize to all service branches. However, the sample is not representative of civilian populations. Two, we cannot determine causality from this cross-sectional survey. Having friends who use tobacco may prompt Airmen to think about or plan to use tobacco, but it is also possible that individuals affiliate with these friends based on their tobacco use status, i.e., through social network processes (Christakis and Fowler, 2008). Three, a key limitation is that we did not assess other tobacco products or e-cigarette use intentions. Among never tobacco users, use of e-cigarettes has been strongly associated with increased initiation of and intentions for future cigarette smoking (Bunnell et al., 2015; McCabe et al., 2017; Moore et al., 2016; Zhong et al., 2016).

Despite these limitations, our findings can inform messaging, education, and preventive tobacco control efforts for reducing tobacco use uptake and resumption of prior tobacco use among male and female USAF trainees, along with gender-specific preventive interventions (Bauer et al., 2000; Chassin et al., 2014). Given that the DOD is the nation's largest employer, with 3.2 million employees, of which 1.4 million are active duty personnel (Chang, 2015), the public health implications of an effective prevention intervention for this tobacco use disparity group is considerable.

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Declaration of interests

None.

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