Do we believe the tobacco industry lied to us? Association with smoking behavior in a military population

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Abstract

Despite the dangers of smoking, tobacco companies continue to impede tobacco control efforts through deceptive marketing practices. Media campaigns that expose these practices have been effective in advancing anti-industry attitudes and reducing smoking initiation among young people, yet the association between knowledge of industry practices and smoking cessation and relapse has not been studied. In a large military sample entering Air Force Basic Military Training (BMT), where tobacco use is prohibited, we investigated (i) the prevalence of agreement with a statement that tobacco companies have misled the public about the health consequences of smoking and (ii) the association of this acknowledgement with smoking status upon entry into BMT ($N = 36\,013$). At baseline, 56.6% agreed that tobacco companies have been deceptive, and agreement was a strong predictor of smoking status [smokers less likely to agree, odds ratio (OR) = 0.39, $P < 0.01$]. At 12-month follow-up, we examined the association between industry perception at baseline and current smoking status ($N = 20\,672$). Recruits who had been smok-

ing upon entry into BMT and who had acknowledged industry deception were less likely to report current smoking (OR = 0.84, $P = 0.01$). These findings suggest that anti-industry attitudes may affect smoking relapse following cessation.

Introduction

The dangers of cigarette smoking have been exhaustively documented, yet nearly one in five young adults in the United States currently smokes cigarettes [1] and more are at risk for future smoking [2]. Public health researchers continue to document both the tobacco industry's attempts to impede public health efforts and their success in doing so [3–23]. For decades, tobacco companies have used deceptive research and marketing practices to cast doubt on legitimate scientific evidence connecting tobacco use with serious disease [3, 8], to foster misperceptions about the safety [7], social acceptability [6] and addictiveness [10, 24, 25] of tobacco, to downplay the dangers of secondhand tobacco smoke [4, 8, 19–22] and to undermine tobacco control media campaigns [9, 23]. Examination of internal industry documents has exposed the intent to deceive consumers with illusions of safety and reassurance [7], as well as the attempts to alleviate concerns by introducing new products as viable alternatives for health-conscious smokers [26–29]. Low-yield 'light' cigarettes were marketed as such although product design allowed for delivery of the same levels of tar and nicotine found in regular cigarettes [30], and tobacco companies knew that the machine-measured concentrations on which

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they based their claims were inaccurate (for review, see Hammond *et al.* 11). To date, people still perceive low-yield cigarettes to be safer than regular cigarettes [28, 31, 32]. Similarly, potential reduced-exposure products were introduced with advertised claims of enhanced safety [33], despite no solid scientific evidence for such claims [34]. The tobacco industry has also confused the issue of addictiveness [35, p. 193] even though the accumulation of scientific evidence ultimately led to the 1988 Surgeon General's conclusion that nicotine is as addictive as heroin or cocaine [36]. Despite the evidence, chief executive officers from the largest US tobacco companies later testified under Congressional oath that they did not believe nicotine to be addictive [24]. Tobacco litigation continues to involve disputed definitions of 'addiction' [10, 25].

Young people hold many misperceptions about the dangers and addictiveness of tobacco. For example, adolescents tend to overestimate the prevalence of teen smoking [37, 38] and perceive light cigarettes as a safer, less addictive alternative [39]. Such misperceptions make smoking initiation more likely [39] and reflect the effectiveness of tobacco marketing and promotion strategies aimed at youth [40]. Challenging persuasive and attractive marketing images is key, and anti-smoking campaigns that expose deceptive industry practices have been very effective [40]. Mistrust for the tobacco industry is strongly related to reduced smoking [41] in both adolescents [42, 43] and young adults [44]. Additionally, among adults who already smoke, intentions to quit have been associated with anti-industry attitudes [45] and awareness of industry manipulation [46].

One of the most effective anti-smoking campaigns has been the American Legacy Foundation's 'truth' campaign, which illuminates the tobacco industry's efforts to target teenagers and to deceive and manipulate consumers [42, 47]. This counter-industry strategy is thought to elicit a psychological reactance that compels teens to rebel against Big Tobacco by choosing not to smoke [48] or perhaps inoculates them against persuasive marketing images [49]. States employing such counter adver-

tising have seen declines in smoking initiation, with negative attitudes toward the tobacco industry significantly associated with reduced smoking in youth [42, 47, 48, 50, 51].

We explored the association between perceptions of tobacco industry practices and smoking behavior in a large sample of young military personnel. Specifically, we investigated the prevalence of agreement that tobacco companies have misled the public, the association between perceptions of tobacco industry deception (in addition to other correlates) and baseline smoking status and the association between perceptions of industry deception and later smoking initiation and relapse following a period of mandated cessation.

Method

Study overview

This study was part of a large randomized controlled trial designed to investigate the efficacy of a forced tobacco cessation program combined with a tobacco prevention intervention in a population of Air Force recruits. The outcomes of this clinical trial are reported elsewhere [52]. Data presented were obtained at baseline and 12-month follow-up.

Participants and procedures

Participants were 36 013 Air Force recruits who entered Basic Military Training (BMT) at Lackland Air Force Base in San Antonio, TX, over a 12-month period during 1999 and 2000. Baseline surveys were administered during the second week of BMT in groups of 1–2 flights (Air Force equivalent of platoons); each flight contained ~50 recruits. Follow-up questionnaires were mailed 12 months later with follow-up phone calls to recruits not responding to the mailed questionnaire.

Measures

At baseline, recruits answered 68 questions that covered demographics, tobacco exposure and history of tobacco use, alcohol use and lifestyle attitudes and behavior. Because tobacco was prohibited during BMT, smoking status was assessed retrospectively

with the question: 'What was your history of cigarette smoking just prior to basic military training?'. Response options were (i) 'I have never smoked, not even one puff', (ii) 'I smoked only on one or two occasions in the past', (iii) 'I smoked regularly (at least once per day) but quit in the past 6 months', (iv) 'I smoked regularly (at least once per day) but quit between 6 months and one year ago', (v) 'I smoked regularly (at least once per day) but quit more than a year ago', (vi) 'I smoked, but not every day' and (vii) 'I smoked every day'. Responses fell into one of five categories: never smoker, experimental smoker (smoked only on one or two occasions), former smoker (quit at some point before BMT), non-daily smoker and daily smoker. Recruits characterized their alcohol intake during the 30 days prior to BMT with one of the following response options: 'No intake at all', 'Drank once in that month', 'Drank 2–4 times that month', 'Drank at least once a week', 'Drank almost every day' or 'Drank every day'. Binge drinking was assessed by asking recruits if they had consumed five or more drinks on one occasion during that 30-day period. Risk-taking attitudes and behaviors were measured with questions about taking dangerous but legal risks (e.g. rock climbing), dangerous illegal risks (e.g. driving 100 mph), gambling, frequency of aggressive driving (e.g. weaving through traffic) or angry driving (e.g. fist pumping, obscene gestures), drinking and driving practices, firearm ownership and practices and frequency of serious verbal altercations and physical fights during the year prior to BMT. Recruits were also asked whether they would describe themselves as rebellious and if they felt sad most of the time. Two tobacco-related questions measured whether they thought the smoking ban should be extended beyond BMT and whether they owned any tobacco-sponsored items (e.g. cap or shirt). Date of survey was coded into one of three survey periods: 1999, January to June 2000 and July to December 2000. Finally, recruits were asked to indicate their level of agreement with the following statement: 'Tobacco companies have consistently lied and misled the public about the health consequences of smoking'. The original response categories were (i) 'strongly agree', (ii) 'agree', (iii) 'neutral', (iv) 'disagree' and

(v) 'strongly disagree'. These were collapsed into three categories: 'agree', 'neutral' and 'disagree' to simplify analyses and interpretation.

At 12-month follow-up, point prevalence tobacco use was assessed by self-report. Recruits indicated whether they had smoked cigarettes in the past seven days.

Statistical analysis plan

Two sets of logistic regression analyses were performed with SAS version 9.1.3 (SAS Institute, Inc., Cary, NC).

In the primary analysis, a logistic regression model was fitted to establish baseline predictors of being a current (daily or non-daily) smoker relative to a never smoker. For the sake of brevity in describing results, recruits who reported daily or non-daily smoking at baseline are labeled 'current' smokers. The main independent variable of interest was response to the baseline question about tobacco industry deception. Other covariates were age, gender, ethnicity, education, income, relationship status, smoking status of parents and friends, ownership of tobacco-sponsored items, attitude toward extending the smoking ban beyond BMT, alcohol use, attitude toward legal and illegal risk-taking, gambling, aggressive driving, angry driving, drinking and driving behavior, weapon ownership and practices, argument behavior, fighting, rebelliousness, sad mood and survey period. Univariate results were examined for each covariate and those significant at $P < 0.25$ were retained for consideration in the multivariate logistic regression model. The multivariate model was fitted with backward stepwise logistic regression until the final model contained covariates that were significant at $P < 0.05$ [53]. This model was then used for three additional comparisons: experimental smokers versus never smokers, former smokers versus never smokers and current smokers versus former smokers.

In the longitudinal analyses, the outcomes of interest were smoking initiation and smoking relapse (following forced cessation during BMT), as determined by 7-day point prevalence cigarette use at 12-month follow-up. Smoking initiation was evaluated in two groups: baseline never smokers

($N = 6556$) and baseline experimental smokers ('I smoked only on one or two occasions in the past') ($N = 5206$). Smoking relapse was assessed in two groups: baseline current smokers (daily and non-daily) ($N = 7788$) and baseline former smokers ($N = 1122$). Covariates established in the baseline model were included in these analyses.

Results

Preliminary analyses

Table I presents participant demographics for the entire baseline cohort ($N = 36\ 013$). The mean age was 20.1 years (standard deviation = 2.3), ranging from 16.8 to 36.5 years. Most recruits were single (88%; $N = 31\ 767$) and male (74%; $N = 26\ 743$). Ethnic minorities made up 36% of the sample. Nearly one in four recruits (24%) reported education beyond high school. Nearly one in three recruits smoked cigarettes daily (22%) or non-daily (9%) prior to BMT, and more than one-third of recruits (34%) reported that they were lifelong non-smokers.

Table II presents the baseline distribution of responses, by smoking status, to the statement, 'Tobacco companies have consistently lied and misled the public about the health consequences of smoking'. Overall, 56.6% of participants either agreed (30.2%) or strongly agreed (26.4%), whereas only 17.6% either disagreed (13.3%) or strongly disagreed (4.3%) with the statement about tobacco industry deception. Agreement with this statement varied markedly by smoking status. Among those who agreed, 67.9% were non-smokers while only 38.6% were daily smokers [$\chi^2(1) = 741.09$, $P < 0.01$]. Non-smokers were more than three times as likely to strongly agree with the statement [36.8% vs. 12.1%, $\chi^2(1) = 1131.58$, $P < 0.01$], and daily smokers were much more likely to disagree with the statement [29.4% vs. 11.5%, $\chi^2(1) = 904.07$, $P < 0.01$].

Primary analysis

In the primary analysis, we examined predictors of baseline smoking status. First, we fitted a logistic

Table I. Participant demographics for the baseline cohort ($N = 36\ 013$)

Characteristic	
Age, M (standard deviation)	20.1 (2.3)
Gender, N (%)	
Male	26 743 (74.3)
Female	9270 (25.7)
Ethnicity, N (%)	
Caucasian	23 089 (64.1)
African-American	6612 (18.4)
Hispanic	3486 (9.7)
Other	2826 (7.8)
Annual family income (US dollars), N (%) ^a	
$\leq 25\ 000$	9169 (25.5)
$> 25\ 000$ but $\leq 45\ 000$	9215 (25.6)
$> 45\ 000$ but $\leq 70\ 000$	9167 (25.5)
$> 70\ 000$	8461 (23.5)
Education, N (%) ^b	
Less than high school	366 (1.0)
High school graduate or GED ^c	27 094 (75.2)
Some college	8549 (23.7)
Marital status, N (%) ^a	
Single	31 767 (88.2)
Living with partner	583 (1.6)
Married	3336 (9.3)
Separated/divorced/widowed	326 (0.9)
Smoking status, N (%) ^a	
Never smoker	12 212 (33.9)
Experimental smoker	9563 (26.6)
Former smoker	2800 (7.8)
Non-daily smoker	3344 (9.3)
Daily smoker	8093 (22.4)
Survey period, N (%)	
July to December 2000	13 294 (36.9)
January to June 2000	15 842 (44.0)
1999	6877 (19.1)

^aOne missing case.

^bFour missing cases.

^cGED = General Equivalency Diploma.

regression model to compare (i) current smokers versus never smokers; we then used the resultant model to compare (ii) experimental smokers versus never smokers, (iii) former smokers versus never smokers and (iv) current smokers versus former smokers.

Baseline results are presented in Table III. One of the strongest predictors for smoking status was attitude toward the tobacco industry. Recruits who agreed with the statement about tobacco industry deception were less likely to be current smokers

Table II. Response distribution for 'Tobacco companies have consistently lied and misled the public about the health consequences of smoking'

Response	Never smokers, N (%)	Daily smokers, N (%)	Total ^a , N (%)
Strongly agree	4499 (36.8)	981 (12.1)	9491 (26.4)
Agree	3799 (31.1)	2143 (26.5)	10 893 (30.2)
Neutral	2513 (20.6)	2586 (32.0)	9282 (25.8)
Disagree	1076 (8.8)	1709 (21.1)	4784 (13.3)
Strongly disagree	325 (2.7)	674 (8.3)	1563 (4.3)
	N = 12 212	N = 8093	N = 36 013

^aTotal includes former smokers and non-daily smokers as well as never smokers and daily smokers

[odds ratio (OR) = 0.39, confidence interval (CI) 0.35–0.42, $P < 0.01$] relative to never smokers. Recruits who were neutral about the statement were also less likely to be current smokers rather than never smokers (OR = 0.66, CI 0.60–0.74, $P < 0.01$). The odds of being a current smoker were slightly higher for older recruits (OR = 1.02, CI 1.00–1.03, $P = 0.04$) and females (OR = 1.12, CI 1.03–1.21, $P = 0.01$). The odds of current smoking were lowest among African-Americans (OR = 0.28, CI 0.25–0.30, $P < 0.01$), followed by Hispanics (OR = 0.57, CI 0.50–0.64, $P < 0.01$) and other ethnic minorities (OR = 0.85, CI 0.74–0.96, $P = 0.01$). Recruits with an annual family income $> \$70\ 000$ also showed increased odds for current smoking (OR = 1.23, CI 1.11–1.36, $P < 0.01$) relative to never smoking. Recruits who acknowledged owning at least one tobacco promotional item were more than twice as likely to be current smokers (OR = 2.32, CI 2.11–2.54, $P < 0.01$), and recruits who agreed that the Air Force should extend the smoking ban beyond BMT showed decreased odds of being a current smoker (OR = 0.09, CI 0.08–0.10, $P < 0.01$). Current smokers were more likely to have engaged in recent binge drinking (OR = 3.98, CI 3.70–4.28, $P < 0.01$), to report they enjoy dangerous but legal risk-taking (OR = 1.28, CI 1.19–1.38, $P < 0.01$) and to admit to instances of angry driving (OR = 1.34, CI 1.24–1.44, $P < 0.01$) and physical fighting (OR = 1.60, CI 1.43–1.78, $P < 0.01$) within the past year.

Finally, compared with recruits surveyed in the last six months of 2000, the odds of being a current smoker over a never smoker were higher for recruits surveyed in the first six months of 2000 (OR = 1.31, CI 1.21–1.41, $P < 0.01$) or during the previous year (OR = 1.18, CI 1.07–1.29, $P < 0.01$).

As shown in Table III, similar effects were found at baseline when comparing former smokers to never smokers. Former smokers were less likely to agree with the statement about tobacco industry deception (OR = 0.59, CI 0.52–0.67, $P < 0.01$) or to hold a neutral opinion (OR = 0.76, CI 0.65–0.87, $P < 0.01$) relative to never smokers. The pattern for experimental smokers versus never smokers was also similar. Experimental smokers were less likely to agree that tobacco companies had been deceptive relative to never smokers (OR = 0.77, CI 0.71–0.84, $P < 0.01$), but did not differ in neutral responses (OR = 0.98, CI 0.89–1.08, $P = 0.74$). No gender difference was found between experimental smokers and never smokers (OR = 0.97, CI 0.90–1.03, $P = 0.30$), and the only ethnicity difference was African-Americans who were less likely to be experimental smokers (OR = 0.58, CI 0.54–0.62, $P < 0.01$). Finally, in the comparison between current smokers and former smokers, the odds of being a current smoker were lower for recruits who agreed with the statement about tobacco industry deception (OR = 0.64, CI 0.57–0.72, $P < 0.01$) or who held a neutral opinion (OR = 0.87, CI 0.77–0.99, $P = 0.04$). In addition, the likelihood of being a current smoker rather than a former smoker decreased with age (OR = 0.94, CI 0.92–0.96, $P < 0.01$). Current smokers were less likely than former smokers to endorse extending the smoking ban beyond BMT (OR = 0.29, CI 0.26–0.33, $P < 0.01$), more likely to own a tobacco-sponsored item (OR = 1.40, CI 1.26–1.55, $P < 0.01$) and more likely to enjoy taking risks (OR = 1.12, CI 1.02–1.23, $P = 0.01$). In addition, current smokers were more likely than former smokers to have engaged in recent binge drinking (OR = 1.43, CI 1.31–1.56, $P < 0.01$), angry driving (OR = 1.14, CI 1.04–1.25, $P < 0.01$) and physical fights (OR = 1.22, CI 1.07–1.39, $P < 0.01$). Survey period was not a significant predictor of being a current smoker versus a former smoker.

Table III. Baseline multivariate logistic regression models

Variable	Daily/non-daily smokers (vs. never smokers)			Experimental smokers (vs. never smokers)			Former smokers (vs. never smokers)			Daily/non-daily Smokers (vs. former smokers)		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
Tobacco industry lied and misled the public												
Disagree	1.00			1.00			1.00			1.00		
Neutral	0.66	0.60–0.74	<0.01	0.98	0.89–1.08	0.74	0.76	0.65–0.87	<0.01	0.87	0.77–0.99	0.04
Agree	0.39	0.35–0.42	<0.01	0.77	0.71–0.84	<0.01	0.59	0.52–0.67	<0.01	0.64	0.57–0.72	<0.01
Age	1.02	1.00–1.03	0.04	1.01	1.00–1.02	0.08	1.07	1.05–1.09	<0.01	0.94	0.92–0.96	<0.01
Gender												
Male	1.00			1.00			1.00			1.00		
Female	1.12	1.03–1.21	0.01	0.97	0.90–1.03	0.30	1.13	1.01–1.25	0.03	1.09	0.98–1.21	0.09
Ethnicity												
Caucasian	1.00			1.00			1.00			1.00		
African-American	0.28	0.25–0.30	<0.01	0.58	0.54–0.62	<0.01	0.24	0.21–0.28	<0.01	1.16	0.99–1.36	0.06
Hispanic	0.57	0.50–0.64	<0.01	1.02	0.94–1.12	0.60	0.62	0.53–0.73	<0.01	0.92	0.78–1.09	0.33
Other	0.85	0.74–0.96	0.01	0.90	0.81–1.00	0.05	0.84	0.71–0.99	0.03	1.01	0.86–1.18	0.93
Annual family income												
\$25 000 or less	1.00			1.00			1.00			1.00		
>\$25 000 to \$45 000	0.90	0.82–0.99	0.04	1.12	1.03–1.20	0.01	0.92	0.81–1.04	0.19	0.98	0.86–1.11	0.72
>\$45 000 to \$70 000	0.96	0.87–1.05	0.38	1.09	1.00–1.18	0.04	0.98	0.86–1.12	0.79	0.92	0.82–1.04	0.21
>\$70 000	1.23	1.11–1.36	<0.01	1.18	1.09–1.28	<0.01	1.18	1.03–1.34	0.01	1.01	0.89–1.14	0.86
Own tobacco promotional item												
No	1.00			1.00			1.00			1.00		
Yes	2.32	2.11–2.54	<0.01	1.18	1.08–1.29	<0.01	1.64	1.45–1.86	<0.01	1.40	1.26–1.55	<0.01
Air Force should extend smoking ban beyond BMT												
Neutral/disagree	1.00			1.00			1.00			1.00		
Agree	0.09	0.08–0.10	<0.01	0.57	0.54–0.60	<0.01	0.31	0.28–0.34	<0.01	0.29	0.26–0.33	<0.01
Binge drinking in past 30 days (5+ drinks)												
None	1.00			1.00			1.00			1.00		
At least once	3.98	3.70–4.28	<0.01	2.22	2.09–2.37	<0.01	2.76	2.51–3.04	<0.01	1.43	1.31–1.56	<0.01
Fun to take (legal) risks												
Neutral/disagree	1.00			1.00			1.00			1.00		
Agree	1.28	1.19–1.38	<0.01	1.09	1.03–1.16	<0.01	1.12	1.02–1.24	0.02	1.12	1.02–1.23	0.01
Angry driving past 12 months												
Not at all	1.00			1.00			1.00			1.00		
Sometimes	1.34	1.24–1.44	<0.01	1.26	1.19–1.34	<0.01	1.18	1.07–1.30	<0.01	1.14	1.04–1.25	<0.01
Physical fights past 12 months												
Not at all	1.00			1.00			1.00			1.00		
Sometimes	1.60	1.43–1.78	<0.01	1.26	1.15–1.39	<0.01	1.27	1.10–1.47	<0.01	1.22	1.07–1.39	<0.01
Baseline survey period												
July to December 2000	1.00			1.00			1.00			1.00		
January to June 2000	1.31	1.21–1.41	<0.01	1.21	1.14–1.29	<0.01	1.40	1.26–1.55	<0.01	0.96	0.87–1.06	0.37
1999	1.18	1.07–1.29	<0.01	1.12	1.04–1.22	<0.01	1.19	1.04–1.35	0.01	0.95	0.84–1.08	0.44
Hosmer and Lemeshow goodness of fit [53]	$\chi^2(8) = 11.34, P = 0.18$			$\chi^2(8) = 14.87, P = 0.06$			$\chi^2(8) = 1.88, P = 0.98$			$\chi^2(8) = 12.58, P = 0.13$		

Odds ratios in bold are significant $P < .05$.

Longitudinal analysis of change in smoking status

In the follow-up analyses, independent variables identified in the baseline model were examined in relation to smoking initiation and smoking relapse at 12-month follow-up ($N = 20\,672$). Smoking relapse was examined among baseline current smokers ($N = 7788$) and baseline former smokers ($N = 1122$). Results for these two models are presented in Table IV. Smoking initiation was examined among baseline non-smokers ($N = 6556$) and baseline experimental smokers ($N = 5206$) and results are presented in Table V.

Smoking relapse following forced cessation during BMT was less likely among baseline smokers who agreed that the tobacco industry misled the public (OR = 0.84, CI 0.74–0.96, $P = 0.01$). Relapse among baseline smokers was less likely for females (OR = 0.76, CI 0.67–0.85, $P = 0.01$), African-Americans (OR = 0.60, CI 0.50–0.71, $P < 0.01$) and Hispanics (OR = 0.62, CI 0.51–0.75, $P < 0.01$), and less likely among recruits who agreed with a smoking ban extension beyond BMT (OR = 0.72, CI 0.60–0.86, $P < 0.01$) and who enjoyed legal risk-taking (OR = 0.88, CI 0.79–0.98, $P = 0.02$). Relapse was more likely among baseline smokers who owned a tobacco-sponsored item (OR = 1.45, CI 1.29–1.63, $P < 0.01$). Finally, plans to stay quit after BMT were predictive of smoking relapse. Compared with smokers who indicated they planned to stay quit after BMT, those who reported they did not plan to stay quit or were merely thinking about staying quit were more likely to relapse (OR = 1.71, CI 1.45–2.02, $P < 0.01$; OR = 1.48, CI 1.32–1.67, $P < 0.01$, respectively). Similarly, among baseline former smokers, relapse was more likely among those who did not plan to stay quit (OR = 3.03, CI 1.12–8.21, $P = 0.03$) or were only thinking about staying quit (OR = 1.66, CI 1.11–2.47, $P = 0.01$), relative to former smokers with plans to remain abstinent.

Smoking initiation was less likely in females and with increasing age in both never smokers (OR = 0.66, CI 0.51–0.86, $P < 0.01$; OR = 0.75, CI 0.69–0.82, $P < 0.01$, respectively) and experi-

mental smokers (OR = 0.62, CI 0.51–0.75, $P < 0.01$; OR = 0.83, CI 0.79–0.87, $P < 0.01$, respectively). In never smokers, initiation was less likely in African-Americans (OR = 0.64, CI 0.48–0.85, $P < 0.01$) and more likely in other ethnic minorities (OR = 1.49, CI 1.06–2.10, $P = 0.02$) with the exception of Hispanics (OR = 1.00, CI 0.72–1.39, $P = 0.99$). No ethnic differences emerged for experimental smokers. Never smokers and experimental smokers were less likely to start smoking if they had agreed that the Air Force should extend the smoking ban (OR = 0.59, CI 0.48–0.73, $P < 0.01$; OR = 0.61, CI 0.52–0.72, $P < 0.01$, respectively). Never smokers who had engaged in binge drinking at least once in the 30 days before BMT were at increased risk of smoking initiation (OR = 1.46, CI 1.13–1.88, $P < 0.01$), as were those who had engaged in a fight in the year prior to BMT (OR = 1.47, CI 1.07–2.03, $P = 0.02$). Conversely, experimental smokers who had been in a fight were less likely to initiate smoking (OR = 0.72, CI 0.56–0.93, $P = 0.01$), and the association with binge drinking was not significant (OR = 1.15, CI 0.98–1.35, $P = 0.09$). Attitude toward the tobacco industry was not a significant predictor of smoking initiation among either baseline never smokers or experimental smokers.

Secondary analysis

Given that the 'truth' campaign was launched nationally in early 2000, we explored whether perception of industry practices differed by survey period. Results showed that agreement with the statement about industry deception increased over time (55.5% in 1999, 56.6% in the first six months of 2000 and 57.1% in the last six months of 2000). Univariate logistic regression analyses indicated these differences were significant. Relative to recruits surveyed in 1999, those surveyed January to June 2000 were 1.09 times more likely to agree (OR = 1.09, CI 1.01–1.18, $P = 0.02$) and those surveyed July to December 2000 were 1.15 times more likely to agree (OR = 1.15, CI 1.06–1.25, $P < 0.01$). The difference between the first and second half of 2000 was not significant (OR = 1.05, CI = 0.99–1.12, $P = 0.11$).

Table IV. Multivariate logistic regression results: smoking relapse in baseline smokers and former smokers at 12-month follow-up

Baseline variable	Daily/non-daily smokers (N = 7788) ^a			Former smokers (N = 1122) ^b		
	OR	95% CI	P	OR	95% CI	P
Tobacco industry lied and misled the public						
Disagree	1.00			1.00		
Neutral	0.92	0.80–1.06	0.27	0.98	0.67–1.41	0.89
Agree	0.84	0.74–0.96	0.01	0.99	0.72–1.38	0.97
Age	1.00	0.97–1.03	0.84	0.97	0.92–1.03	0.38
Gender						
Male	1.00			1.00		
Female	0.76	0.67–0.85	<0.01	0.76	0.55–1.04	0.09
Ethnicity						
Caucasian	1.00			1.00		
African-American	0.60	0.50–0.71	<0.01	0.92	0.56–1.50	0.73
Hispanic	0.62	0.51–0.75	<0.01	0.90	0.57–1.41	0.63
Other	1.18	0.95–1.45	0.14	1.07	0.67–1.72	0.78
Annual family income						
\$25 000 or less	1.00			1.00		
>\$25 000–\$45 000	0.98	0.84–1.13	0.75	1.05	0.73–1.50	0.79
>\$45 000–\$70 000	1.02	0.88–1.18	0.80	1.13	0.79–1.61	0.50
>\$70 000	0.87	0.75–1.00	0.06	1.05	0.74–1.50	0.78
Own tobacco promotional item						
No	1.00			1.00		
Yes	1.45	1.29–1.63	<0.01	0.98	0.72–1.33	0.89
Air Force should extend smoking ban beyond BMT						
Neutral/disagree	1.00			1.00		
Agree	0.72	0.60–0.86	<0.01	0.89	0.67–1.18	0.41
Binge drinking in past 30 days (5+ drinks)						
None	1.00			1.00		
At least once	0.92	0.82–1.02	0.13	0.93	0.72–1.20	0.58
Fun to take (legal) risks						
Neutral/disagree	1.00			1.00		
Agree	0.88	0.79–0.98	0.02	1.08	0.84–1.40	0.55
Angry driving past 12 months						
Not at all	1.00			1.00		
Sometimes	0.91	0.82–1.02	0.10	0.88	0.68–1.15	0.35
Physical fights past 12 months						
Not at all	1.00			1.00		
Sometimes	0.94	0.82–1.09	0.43	1.02	0.68–1.51	0.94
Baseline survey period						
July to December 2000	1.00			1.00		
January to June 2000	1.09	0.97–1.23	0.14	1.01	0.76–1.35	0.94
1999	1.21	1.05–1.40	0.01	1.21	0.85–1.72	0.29
After BMT ^c						
I plan to stay quit	1.00			1.00		
I am thinking about staying quit	1.48	1.32–1.67	<0.01	1.66	1.11–2.47	0.01

Table IV. *Continued*

Baseline variable	Daily/non-daily smokers (<i>N</i> = 7788) ^a			Former smokers (<i>N</i> = 1122) ^b		
	OR	95% CI	<i>P</i>	OR	95% CI	<i>P</i>
I do not plan to stay quit	1.71	1.45–2.02	<0.01	3.03	1.12–8.21	0.03
N/A	—	—	—	0.63	0.48–0.83	<0.01
Hosmer and Lemeshow goodness of fit	$\chi^2(8) = 9.86, P = 0.28$			$\chi^2(8) = 11.60, P = 0.17$		

Odds ratios in bold are significant $P < .05$.

^aSix missing cases due to missing data on one or more variables.

^bOne missing case due to missing data on one or more variables.

^cA total of 570 former smokers responded to this question; 522 were coded N/A.

Discussion

Among the >30 000 recruits surveyed, only about half agreed with the truthful statement that tobacco companies have consistently lied and misled the public about the health consequences of smoking. Nearly 18% disagreed with the statement and over 25% expressed no opinion one way or the other. Although recruits who had never smoked were more aware or accepting of the statement about tobacco industry tactics in contrast to smokers, nearly one-third either disagreed with the statement (11.5%) or held no opinion (20.6%). Notably, these data were collected about the time that the nationwide counter-industry ‘truth’ campaign was launched in February 2000 [54].

We found that attitude toward the tobacco industry was a strong predictor of baseline smoking status; recruits who agreed that the tobacco industry had engaged in deception were much more likely to be never smokers relative to current or former smokers. Although we did not detect an association between perception of the tobacco industry and smoking initiation, we did find an association between perception of industry practices and smoking relapse following forced cessation, consistent with evidence that an increase in anti-industry sentiment may be associated with sustained abstinence following smoking cessation [45]. In addition, we found that baseline smokers surveyed in 1999 were 1.21 times more likely to relapse than recruits who were surveyed several months after the nationwide launch of the ‘truth’ campaign.

Our finding that recruits surveyed in the latter half of 2000 were more likely than recruits from the year before to acknowledge industry deception underscores the relative lack of knowledge about tobacco industry tactics that existed prior to a national counter-industry campaign [50]. Media campaigns that emphasize messages such as ‘The tobacco industry is exploiting you’ [55] have since been particularly effective in decreasing the prevalence of smoking in youth [42], yet guaranteed funding for the ‘truth’ campaign ended in 2003 as tobacco companies completed their 5-year Master Settlement Agreement obligation to finance such efforts [56]. Counter-industry public health efforts are worthy of continued support [57], and future research should further explore whether a greater emphasis on tobacco industry deception affects the odds of people quitting smoking and sustaining abstinence.

This study has several strengths, including a very large sample size (at both baseline and 12-month follow-up) and the ability to simultaneously test several independent risk factors for smoking behavior. However, all participants were military personnel from one service branch (the US Air Force), so generalization to civilians or to other service branches is unknown. In addition, our sample was overrepresented with younger adults relative to the US adult population. These sample characteristics should be considered while interpreting the results. It is recommended that similar studies be conducted in other populations.

For the tobacco industry to survive, new consumers must be initiated given that many current users

Table V. Multivariate logistic regression results: smoking initiation in baseline never smokers and experimental smokers at 12-month follow-up

Baseline variable	Never smokers (N = 6556)			Experimental smokers (N = 5206)		
	OR	95% CI	P	OR	95% CI	P
Tobacco industry lied and misled the public						
Disagree	1.00			1.00		
Neutral	0.85	0.58–1.24	0.40	0.96	0.76–1.22	0.75
Agree	0.97	0.70–1.36	0.86	0.88	0.70–1.08	0.22
Age	0.75	0.69–0.82	<0.01	0.83	0.79–0.87	<0.01
Gender						
Male	1.00			1.00		
Female	0.66	0.51–0.86	<0.01	0.62	0.51–0.75	<0.01
Ethnicity						
Caucasian	1.00			1.00		
African-American	0.64	0.48–0.85	<0.01	0.83	0.66–1.04	0.10
Hispanic	1.00	0.72–1.39	0.99	0.96	0.76–1.22	0.74
Other	1.49	1.06–2.10	0.02	1.03	0.77–1.36	0.86
Annual family income						
\$25,000 or less	1.00			1.00		
>\$25 000–\$45 000	0.98	0.73–1.32	0.90	0.95	0.77–1.18	0.65
>\$45 000–\$70 000	1.26	0.94–1.68	0.12	1.16	0.94–1.44	0.17
>\$70 000	1.28	0.94–1.74	0.12	0.88	0.70–1.10	0.26
Own tobacco promotional item						
No	1.00			1.00		
Yes	1.23	0.90–1.68	0.19	1.16	0.94–1.43	0.16
Air Force should extend smoking ban beyond BMT						
Neutral/disagree	1.00			1.00		
Agree	0.59	0.48–0.73	<0.01	0.61	0.52–0.72	<0.01
Binge drinking in past 30 days (5+ drinks)						
None	1.00			1.00		
At least once	1.46	1.13–1.88	<0.01	1.15	0.98–1.35	0.09
Fun to take (legal) risks						
Neutral/disagree	1.00			1.00		
Agree	1.16	0.94–1.44	0.17	1.16	1.00–1.36	0.06
Angry driving past 12 months						
Not at all	1.00			1.00		
Sometimes	0.81	0.64–1.03	0.08	0.98	0.84–1.15	0.81
Physical fights past 12 months						
Not at all	1.00			1.00		
Sometimes	1.47	1.07–2.03	0.02	0.72	0.56–0.93	0.01
Baseline survey period						
July to December 2000	1.00			1.00		
January to June 2000	1.18	0.93–1.51	0.17	1.03	0.87–1.23	0.71
1999	0.90	0.68–1.20	0.48	1.07	0.87–1.31	0.51
Hosmer and Lemeshow goodness of fit	$\chi^2(8) = 11.39, P = 0.18$			$\chi^2(8) = 4.12, P = 0.85$		

Odds ratios in bold are significant $P < .05$.

die as a result of cigarette use. As late as 2007, R. J. Reynolds launched its new Camel No. 9 product, clearly aimed at young females, described as 'light and luscious' with a name reminiscent of cologne or love potions [58]. Other public health efforts that counteract such messages by highlighting industry tactics may be beneficial in discouraging initiation and helping smokers quit. One approach may be to develop more active and aggressive cigarette warning labels. The four warning labels currently required on all cigarette packages and advertisements have not changed since 1984 [59] despite strong evidence that more effective labeling is needed [60–64]. Warnings are more likely to be noticed and rated as effective if they include text and graphic warning labels, are larger and more salient and are changed periodically [60–64]. In a four-country study, the current warning labels in the United States were found to be least effective [60].

In summary, two-thirds of non-smokers acknowledged that tobacco companies have historically misled the public regarding the health consequences of smoking, yet little more than one-third of daily smokers acknowledged this fact and two-thirds either disagreed or expressed no opinion. Current smokers were less likely to agree with the statement about industry deception, as were experimental smokers and former smokers, relative to never smokers. Finally, at 12-month follow-up, baseline smokers who had agreed with the statement about the tobacco industry were less likely to report recent smoking. Sustained efforts are needed to increase public knowledge about the history of tobacco industry practices.

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Conflict of interest statement

None declared.

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