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## Use and Effectiveness of Quitlines Versus Web-Based Tobacco Cessation Interventions Among 4 State Tobacco Control Programs

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### Abstract

**BACKGROUND**—Comparative effectiveness studies of state tobacco quitlines and Web-based tobacco cessation interventions are limited. In 2009, the US Centers for Disease Control and Prevention undertook a study of the comparative effectiveness of state quitlines and Web-based tobacco cessation interventions.

**METHODS**—Standardized questionnaires were administered to smokers who enrolled exclusively in either quitlines or Web-based tobacco cessation services in 4 states in 2011–2012. The primary outcome was the 30-day point prevalence abstinence (PPA) rate at 7 months both between and within interventions.

**RESULTS**—A total of 4086 participants were included in the analysis. Quitline users were significantly older, more heterogeneous in terms of race and ethnicity, less educated, less likely to be employed, and more often single than Web-based users. The 7-month 30-day PPA rate was 32% for quitline users and 27% for Web-based users. Multivariate models comparing 30-day PPA rates between interventions indicated that significantly increased odds of quitting were associated with being partnered, not living with another smoker, low baseline cigarette use, and more interactions with the intervention. After adjustments for demographic and tobacco use characteristics, quitline users had 1.26 the odds of being abstinent in comparison with Web-based users (95% confidence interval, 1.00–1.58;  $P = .053$ )

**CONCLUSIONS**—This is one of the largest comparative effectiveness studies of state tobacco cessation interventions to date. These findings will help public health agencies develop and tailor evidence-based tobacco cessation programs. Further research should focus on users of Web-based cessation interventions sponsored by state health departments and their cost-effectiveness.

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#### CONFLICT OF INTEREST DISCLOSURES

The authors made no disclosures.

Additional supporting information may be found in the online version of this article.

## Keywords

comparative effectiveness research; health care economics and organizations; intervention studies; social media; tobacco use cessation

## INTRODUCTION

Tobacco cessation is an essential component of tobacco control for preventing the morbidity and mortality caused by tobacco use.<sup>1–3</sup> Tobacco causes 12 different types of cancer, including lung cancer, which is the leading cause of cancer death in the United States.<sup>3,4</sup> Cigarette smoking accounts for 83% of all US tobacco use (excluding cigar and pipe tobacco use).<sup>5</sup> Population-level tobacco cessation programs have traditionally relied on quitlines (telephone-based counseling), and the odds of tobacco abstinence are increased by approximately 60% with quitline usage.<sup>6</sup> Although all 50 states, the District of Columbia, Puerto Rico, and Guam currently provide quitline services, only 1% to 2% of adult tobacco users in the United States access quitlines each year.<sup>7,8</sup> The low reach of quitlines has been attributed to insufficient funding coupled with a lack of interest or belief in the efficacy of quitlines by users.<sup>1,9</sup>

The Internet plays an expanding role in helping people to stop smoking. In 2012, an estimated 255 million people (82% of the US population) had access to the Internet, and 65% of adult Internet users had used a social media Web site.<sup>10</sup> In 2004, an estimated 7% of Web users (approximately 8 million US adults) reported having visited a smoking cessation Web site.<sup>11</sup> As of July 2013, 51 of 53 US state or territorial tobacco control programs (96%) sponsored smoking cessation Web sites, 38 of these 51 Web sites (75%) offered self-help tools, and 31 of these 51 sites (61%) offered interactive counseling online.<sup>12</sup> Increased access to both the Internet and Web-based cessation services has contributed to a 2.6-fold increase in registrants for Web-based interventions that were integrated with quitlines between 2009 and 2012.<sup>12</sup> Yet, sustained use of Web-based interventions is low, with most users visiting some cessation Web sites fewer than 3 times.<sup>13</sup>

Several randomized trials of individually tailored Web-based smoking cessation programs have reported responder quit rates of 17% to 32% at 6 months' follow-up; these rates approximate those reported by quitlines.<sup>13–16</sup> Some studies have reported a dose-response relationship between Web site utilization (eg, the number of logins and features used) and successful quitting.<sup>13,17–19</sup> Conversely, other studies have not found significant differences in cessation rates in Web-based programs in comparison with or as an adjunct to quitline interventions.<sup>20,21</sup> As a result of these inconsistencies, both Cochrane and Community Guide to Preventive Services reviews indicate that it is inconclusive whether Web-based tobacco programs are effective in tobacco cessation.<sup>2,22</sup>

Few studies have compared quitline interventions with Web-based interventions, and fewer yet have looked at populations served by state tobacco cessation services. Zbikowski et al<sup>23</sup> studied 11,143 proactively recruited health plan members 6 months after they had enrolled in a cessation program. They found that each additional telephone call increased the odds of quitting by 56% versus 14% for each login. Swan et al<sup>24</sup> recruited 1202

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health plan members and found no significant differences between 7-day point prevalence abstinence (PPA) outcomes for Web interventions, quitlines, and quitlines combined with Web interventions at 6 months' follow-up. Graham et al<sup>25</sup> compared the cessation success of 2005 US smokers recruited via the Internet. Participants were enrolled in a non-tailored Web intervention, enhanced (individually tailored) Web intervention, or enhanced Web intervention combined with a quitline. There were no significant differences in 30-day PPA rates between these interventions when they were measured at 18 months' follow-up. Yet, the 30-day PPA rate was significantly greater with the combined enhanced Web/telephone option versus the enhanced Web-alone option when they accounted for the repeated measurement of 30-day PPA for an individual subject throughout the study. Finally, An et al<sup>26</sup> reported a comparison of quitlines and Web-based interventions in uninsured cessation program users in Minnesota. These researchers recruited 1706 uninsured users of state quitline and Web-based cessation services. Users enrolling via a quitline had 2.23 the odds of being abstinent for 30 days in comparison with Web-based enrollees (95% confidence interval [CI], 1.35–3.67) when they were measured at 6 months' follow-up in a multivariate model.

Unfortunately, a majority of tobacco cessation comparative effectiveness studies published to date have focused on individuals with private insurance, and this indicates a gap in the understanding about populations using state cessation services.<sup>23,24</sup> Although more effective tobacco cessation interventions managed by states, tribes, and territories can improve efforts to address the disproportionate prevalence of smoking and smoking-related disease in these populations, little information exists to help inform their decisions. Existing comparative effectiveness studies largely focus on health plan-based cessation activities or are limited to a single state. With limited funding for tobacco control and expanding public access to the Internet, it is essential that public health practitioners understand the comparative effectiveness of publicly managed quitline and Web-based tobacco cessation interventions. In 2011, the US Centers for Disease Control and Prevention (CDC) received funding from the American Recovery and Reinvestment Act to compare the effectiveness of traditional and innovative cessation services in multiple states.<sup>27</sup> This is one of the largest comparative effectiveness studies in state-based user populations to date. This study sought to describe differences between users in the 2 interventions with respect to demographics, smoking and quitting behaviors, smoking abstinence rates, and predictors of successful quitting.

## MATERIALS AND METHODS

All study materials were reviewed and approved by the appropriate institutional review boards. The target recruitment population was tobacco users who, of their own initiative and with only the normally available incentives, visited or called a state tobacco cessation Web site or quitline. All CDC-funded tobacco control programs that followed the North American Quitline Consortium (NAQC) Minimum Data Set recommendations and had sufficient staff resources to support study participation were invited to apply to participate in the study. Four programs were selected from interested applicants: Alabama, Arizona, Florida, and Vermont.

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Each program offered a variety of services at the time of the study. Alabama offered counseling quitline services in multiple languages during the day from Monday through Saturday. Web-based users in Alabama had access to interactive counseling as well. Users of either intervention in Alabama received 2 weeks of free nicotine replacement therapy (NRT). In Arizona, counselors who spoke English or Spanish were available to both quitline users and Web-based users during the day from Monday through Thursday and on Saturday. Users of either intervention also could get 2 weeks of free NRT. In Florida, users of either the quitline or Web-based interventions could have up to 5 sessions with counselors who spoke English or Spanish 24 hours a day, 7 days a week. Users of either intervention in Florida could receive up to 4 weeks of free NRT. In Vermont, users of either intervention had access to up to 5 sessions with counselors as well as up to 8 weeks of NRT. Web-based users in Vermont also had access to social networks of former smokers.

The study sought to recruit 4000 participants for each type of intervention (8000 total); it assumed an  $\alpha$  value of .05, a power of 0.80, equal sample sizes, and a 50% response rate to be able to determine a 3% difference between quitline and Web-based PPAs.<sup>28</sup> Participants enrolling in either intervention were offered information when they enrolled about the potential to participate in the study. All users in Alabama, Arizona, and Vermont as well as every fourth person to register in each intervention in Florida (because of the large number of potential participants from Florida) were offered information about participating. Participants who indicated an interest in participating upon registration were contacted 7 months after registration to consent to release self-reported information collected at intake and to participate in a follow-up survey.

The self-report questionnaires that were used for intake and follow-up data used NAQC Minimum Data Set–recommended questions. The intake survey (administered through the mode of the intervention) consisted of 37 questions, including basic demographic information (eg, date of birth, sex, race, ethnicity, and education), the reason for enrolling in quitline or Web-based services, the referral source, and smoking-related questions (current tobacco use by type, frequency/intensity of use, prior quit attempts, and intention to quit). The follow-up survey consisted of 44 questions related to demographic information (marital status, race, ethnicity, and education), smoking-related factors in their environment, use of technology, access to a landline/cellular telephone or ever use of the Internet, satisfaction with cessation services, quitting behaviors, intention to quit, self-reported abstinence from smoking, and current tobacco use. The frequency of interaction with the service, as noted by logins or calls, was obtained from the tobacco cessation programs. In some cases, the same demographic information was collected at both intake and follow-up.

Follow-up data were collected between February and September 2012. In an effort to balance the number of participants by state, the study attempted to follow up all consenting users in Vermont and Alabama and a random selection of users in Florida. Lower than anticipated participation rates for users in Vermont and Alabama in combination with large volumes of users in Arizona and Florida resulted in the need to adjust sampling schemes for Arizona from a cohort-based method to a random selection method for quitline users and vice versa for Web-based users during the recruitment period. This resulted in the overall analytic sample having proportionately more respondents from Arizona and Florida versus

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Alabama and Vermont. Recruitment for follow-up was based on a sequential approach that attempted contact first through e-mail and subsequently through postal mail. If there was no response within 2 weeks, attempts were made via computer-assisted telephone interviews. This is an approach similar to that reported by and Groves et al<sup>29</sup> and Biemer and Lyberg.<sup>30</sup> Participants were offered \$40 at the follow-up call to compensate them for their time. From June 19, 2012 onward (approximately halfway through data collection), an express mail service, instead of postal mail, was used to enhance recruitment of the Web-based intervention users; this was a procedure reported by Dillman.<sup>31</sup>

The primary outcome for the analysis was 30-day PPA at 7 months' follow-up as recommended by the NAQC.<sup>12</sup> Analyses were conducted with SAS 9.3 (SAS Institute, Inc, Cary, NC) and the rms package (version 4.1-0) in R 3.0.2 (R Foundation for Statistical Computing, Vienna, Austria). Any users reporting use of both quitlines and Web services during the intervention period, those who did not make a quit attempt, and those reporting no interactions with the intervention were excluded from the primary analyses. Continuous variables were reported as means or medians with ranges and/or 25th and 75th percentiles. Discrete variables were reported as percentages. The comparison of categorical variables involved the Cochran-Mantel-Haenszel general association test. The Kolmogorov-Smirnov 2-sample test for nonparametric analyses was used for bivariate analyses of continuous variables because no continuous variables were normally distributed according to the Shapiro-Wilk test. Differences in data collection did not allow meaningful comparisons between responders and nonresponders. Response rates for those receiving or not receiving the express mailers were compared. Only participants with responses for the outcomes of interest (eg, self-reported abstinence at 30 days measured 7 months after enrollment) were considered for analysis in accordance with the NAQC recommendation to use a responder rate modeling approach.<sup>32</sup>

Multivariate logistic regression models comparing abstinent users and non-abstinent users within and between interventions were developed with demographics (state, age, sex, race, ethnicity, and marital status), socioeconomic characteristics (education and employment status), smoking characteristics (living with a smoker at baseline and baseline number of cigarettes smoked per day), and smoking cessation-related service use (intention to quit at enrollment, total number of interactions with the service, use of NRT, use of services beyond the state-based interventions, and use of counseling during intervention) as independent variables. The linearity assumption for continuous variables was assessed with restricted cubic spline functions.<sup>33-35</sup> The relation between age and smoking cessation was found to be linear, and age was treated as a linear effect in the final models. Baseline cigarettes per day and the total number of interactions with the intervention were non-linear and were transformed with 3-knot tail restricted cubic spline functions. The cutoff for significance in all analyses was  $P < .05$ .

## RESULTS

A total of 16,332 participants were eligible for follow-up, and the study recruited 7901 participants for an overall response rate of 48% at follow-up. The average length of follow-up was 7.3 months from the time of intake. Among the 3102 participants who received

the express mailer, 1166 (38%) completed the follow-up, whereas 226 of the 1485 (15%) who did not receive the express mailer completed the follow-up ( $P < .001$ ). A total of 4086 participants were available for analysis after the exclusion of those self-reporting the use of both quitline and Web-based services or missing this information on the follow-up survey (n = 2616), those reporting no interactions with the service or missing this information (n = 1175), and those who did not make a quit attempt (n = 24). A chart outlining the study population sizes from recruitment and exclusion and for the final analyses is available online as supporting information.

Table 1 presents the demographics and tobacco use characteristics of each intervention population. Approximately 60% of the users of either intervention were female. Quitline users were significantly older (mean age for quitline users, 47.0 years; mean age for Web-based users, 39.8 years). The predominant user population for both interventions was non-Hispanic white, but this proportion was significantly lower among quitline users (74%) versus Web-based users (86%). However, proportionately more quitline users self-identified as non-Hispanic black (12% of quitline users vs 4% of Web-based users), American Indian/Alaska Native (2% of quitline users vs <1% of Web-based users), or multiracial (4% of quitline users vs 2% of Web-based users). More quitline users were single in comparison with Web-based users (60% vs 47%,  $P < .001$ ), but significantly lower proportions of quitline users were employed in comparison with Web-based users (37% vs 61%). Significantly fewer quitline users had education beyond high school in comparison with Web-based users. The proportion of participants for each modality from each state varied significantly ( $P < .001$ ), with 45% of quitline users coming from Arizona and 77% of Web-based users coming from Florida.

Significant differences between quitline and Web-based users were found for the following tobacco use and cessation characteristics: cigarettes smoked per day at intake (mean, 19.0 for quitline users vs 18.3 for Web-based users), smoking within 5 minutes of waking (47% for quitline users vs 38% for Web-based users), another smoker in the household (37% for quitline users vs 44% for Web-based users), and intention to quit (97% for quitline users vs 89% for Web-based users). The median number of interactions was 2 for each intervention, but there were statistically significant differences in the frequency distribution across interventions. At 7 months' follow-up, the 30-day PPA rate was 32% for quitline users and 27% for Web-based users.

Comparing the 2 interventions, Table 2 reports the multivariate model results with successful cessation at 30 days as measured at 7 months' follow-up as the outcome; adjustments were made for multiple variables. The significant factors associated with 30-day PPA at 7 months were as follows: being partnered versus being single (odds ratio [OR], 1.41; 95% CI, 1.20–1.64), not having another smoker in the house (OR, 2.35; 95% CI, 2.00–2.77), baseline cigarettes per day, and total interactions with the intervention (both nonlinear relationships with  $P$  values  $< .001$ ). Controlling for all other variables, we found that quitline users had 1.26 the odds of reporting tobacco abstinence over the prior 30 days at 7 months' follow-up in comparison with Web-based users (OR, 1.26; 95% CI, 1.00–1.58), and this did not meet the criteria for statistical significance ( $P = .053$ ).

In the multivariate model, higher baseline cigarette usage was associated with a lower 30-day PPA rate up to approximately 20 cigarettes per day (Fig. 1). Above this point, higher cigarette usage per day was associated with a higher 30-day PPA rate. Total interactions with an intervention up to approximately 12 interactions were associated with a higher 30-day PPA rate. Total interactions beyond approximately 12 interactions were not associated with a higher 30-day PPA rate.

Additional multivariate analyses comparing factors within each intervention resulted in largely the same variables as those in the between-intervention comparison being significant (see online supporting information).

## DISCUSSION

The bivariate and multivariate results of this comparative effectiveness study provide valuable insights for state tobacco cessation and cancer control programs. This study found that users of state-sponsored tobacco cessation quitlines or Web sites were different with respect to demographic and smoking characteristics. Quitline users were older, had a different racial distribution (although both were mainly non-Hispanic white), were less likely to be employed, were less educated, were more likely to be single, were less likely to have access to the other modality, and were heavier smokers than Web-based users. These findings largely reinforce similar differences in the same direction noted by An et al<sup>26</sup> yet on a larger scale.

The multivariate model that accounted for demographic and smoking characteristics indicated that marital status and the presence of another smoker in the household were most strongly associated with 30-day PPA. Other studies have reported similar findings.<sup>24–26</sup> Clients exclusively using a quitline had increased odds of cessation in comparison with those using the Web-based intervention, although this did not meet the criteria for statistical significance. Because there is a strong evidence base to support the effectiveness of quitlines, one interpretation of these findings is that, although the demographic profiles of users of quitlines and Web-based interventions are different, these 4 state Web-based tobacco cessation programs were nearly as effective in promoting tobacco cessation as quitlines among comparable populations. This novel finding, in comparison with previous smaller studies, indicates the need for further evaluation of specific Web-based interventions sponsored by state health departments that may help to improve tobacco cessation services offered via the Internet.

Although 30-day PPA has been associated with baseline cigarette consumption in previous studies, the U-shaped curve associated with 30-day PPA and baseline cigarette consumption found here appears to be novel, but the interpretation is unclear, and more research needs to be conducted for this finding. Finally, there was an increasing 30-day PPA rate with increasing interactions with the interventions that was attenuated after approximately 12 interactions. The attenuation observed in this study is consistent with other studies.<sup>6</sup> A number of studies have indicated that the baseline smoking frequency and intervention use are key factors related to quit success.<sup>36</sup> A complementary analysis of this data set that compared users of both interventions with those who just used quitlines or Web-based

interventions reinforces these findings and indicates that the use of both interventions enhances the odds of quit success.<sup>37</sup>

Overall, the characteristics of the study participants in both interventions mirrored those of 2013 NAQC quitline user populations in terms of age distribution, sex (mean for female sex, 58% for NAQC vs 60% for this study), education (mean for education high school, 81% for NAQC vs 87% for this study), ethnicity (mean for Hispanic, 10% for NAQC vs 7% for this study), and race distribution (approximately equal) as reported in the CDC State Tobacco Activities Tracking and Evaluation system.<sup>38</sup> These similarities indicate that some of the results of this study may be of use to other state-based tobacco cessation and cancer control programs.<sup>39</sup>

This study was 1 of 3 undertaken by the CDC that compared the effectiveness of tobacco cessation at the individual, community, and state levels. All 3 studies have indicated that collaborative efforts between tobacco and other disease-specific programs are key to focusing tobacco control efforts and efficiently using resources within states, tribes, territories, and local communities. The CDC and its partners continue to work across disease- and risk factor-specific areas to improve tobacco control nationwide. One example is a collaborative by the CDC's National Comprehensive Cancer Control Program and Tobacco Control Program to jointly fund several national networks to provide technical assistance to their grantees to reduce tobacco- and cancer-related disparities among their populations.<sup>40</sup> This support and similar efforts throughout the CDC help to make efficient use of existing resources and supply continuity of knowledge about attitudes and practices for tobacco cessation to prevent cancer and other chronic diseases.

The limitations of this study include focusing on self-selected, state-based tobacco users of just 1 cessation intervention type. Most notably, the quitline population was predominantly from Arizona (45%), whereas the Web-based population was predominantly from Florida (77%). Although multivariate modeling likely adjusted for many inherent differences between user populations in these states versus others in each intervention, it is possible that the results may not be representative of all populations. Although this article is focused exclusively on single-intervention users, it is clear that many cessation program participants use multiple services to stop smoking, and a separate analysis of information from dual users collected in this study reinforces these previous findings.<sup>11,37,41</sup> Unfortunately, differences in data collection did not allow a proper comparison of responders and nonresponders, and this limits our ability to interpret any biases that may be associated with responding to the follow-up survey.

In conclusion, the results presented here will allow cancer, chronic disease, and tobacco control programs to better tailor their interventions to users with specific demographics and tobacco use characteristics to more effectively reach and help tobacco users quit. Web-based tobacco cessation services are increasingly prevalent and more frequently used than before. This is one of the first studies to find no significant difference in 30-day PPA at 7 months' follow-up for Web-based users versus quitline users in multivariate models. Yet, the study did not collect enough information about the specific intervention approaches in each state for Web-based users to fully evaluate this finding. These results indicate the need for more

in-depth analyses related to what components of Web-based interventions work in specific populations as well as a better understanding of factors associated with quit success in these populations to expand the evidence base for effective tobacco cessation interventions.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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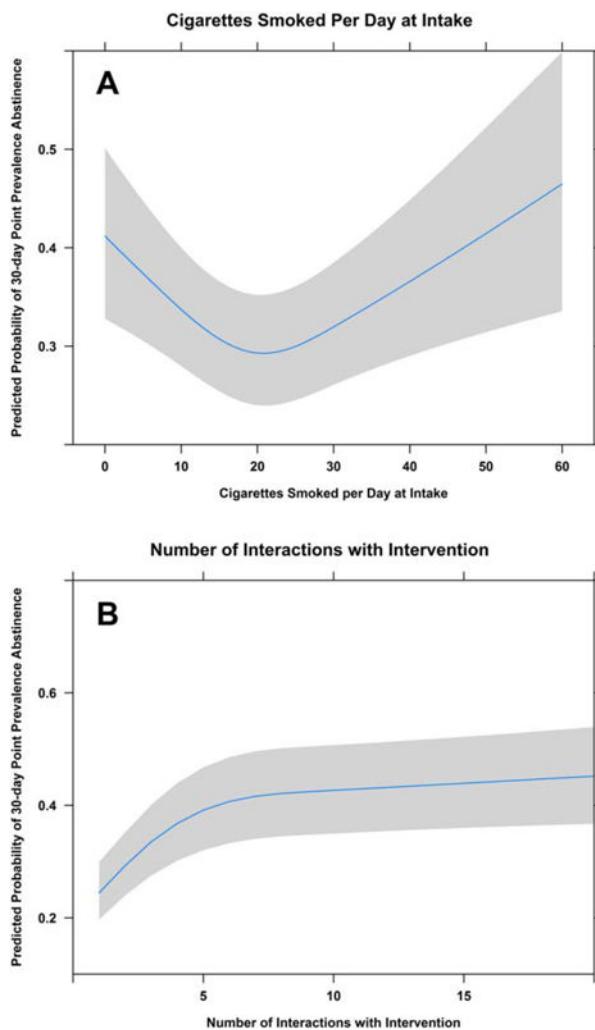
The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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**Figure 1.**

Adjusted probability of 30-day PPA by (A) the number of cigarettes at the baseline and (B) the number of interactions with the intervention in 4 states, February to September 2012. In the multivariate model, higher baseline cigarette usage was associated with a lower 30-day PPA rate up to approximately 20 cigarettes per day. Above this point, higher cigarette usage per day was associated with a higher 30-day PPA rate. Total interactions with an intervention up to approximately 12 interactions were associated with a higher 30-day PPA rate. Total interactions beyond approximately 12 interactions were not associated with a higher 30-day PPA rate. Abbreviation: PPA, point prevalence abstinence.

**TABLE 1**

Demographics and Tobacco Use Characteristics of Quitline Users and Web-Based Cessation Program Users in 4 States, February to September 2012

Characteristic	Total (n = 4086 or 100%)	Quitline Users (n = 2238 or 55%)	Web Users (n = 1848 or 45%)	P for Quitline Users vs Web Users
Age, mean (range), y	43.8 (17–85)	47.0 (17–85)	39.8 (18–82)	<.001
Sex: female, %	60	60	61	.652
Race/ethnicity, % <sup>a</sup>				<.001
White, non-Hispanic	80	74	86	<.001
Black, non-Hispanic	9	12	4	<.001
Hispanic	7	7	7	.343
American Indian/Alaska Native	1	2	<1	<.001
Asian	<1	<1	<1	.271
Multiple races	3	4	2	.001
Education, %				<.001
<High school graduate	12	17	7	
High school graduate/GED	28	31	26	
Some college	38	35	42	
College degree or more	21	17	26	
Employment status, %				<.001
Employed	48	37	61	
Unemployed	12	12	12	
Disabled	18	27	6	
Retired	8	12	4	
Other	14	12	17	
Marital status: single, %	54	60	47	<.001
Location of intervention, %				<.001
Alabama	18	20	15	
Arizona	26	45	4	
Florida	50	28	77	
Vermont	5	6	4	
Cigarettes per day at intake				<.001
Mean	18.7	19.0	18.3	
Range	0–200	0–200	1–65	
25th–75th percentiles	11–20	10–20	12–20	
First cigarette within 5 min of waking at intake, %	43	47	38	<.001
Intention to quit smoking in next 30 d at intake, %	94	97	89	<.001
Presence of other smoker in household, %	40	37	44	<.001
Interactions with intervention (calls/login)				<.001
Median	2	2	2	
Range	1–166	1–92	1–166	

Characteristic	Total (n = 4086 or 100%)	Quitline Users (n = 2238 or 55%)	Web Users (n = 1848 or 45%)	P for Quitline Users vs Web Users
25th–75th percentiles	2–4	1–4	2–5	
Abstinent for 30 d at 7-mo follow-up, %	32	32	27	<.001

Abbreviation: GED, general education degree.

<sup>a</sup>Percentages are rounded to nearest whole number so they may not sum to exactly 100%. Race/ethnicity comparisons used the race reported at follow-up and compared the race in that row with the other races combined (eg, white, non-Hispanic vs all other races and black, non-Hispanic vs all other races).

**TABLE 2**

Multivariate Analyses With an Outcome of 30-Day Point Prevalence Abstinence at 7 Months' Follow-Up Between Interventions: A Comparison of Quitline Users and Web-Based Users in 4 States, February to September 2012 (n = 3545)

Characteristic	OR (95% CI) <sup>a</sup>	P
Age (5-y difference)	0.97 (0.93–1.00)	.073
Sex		.300
Male	Reference	
Female	0.92 (0.79–1.08)	
Race/ethnicity		.801
White, non-Hispanic	Reference	
Black, non-Hispanic	0.95 (0.72–1.25)	
Hispanic	1.14 (0.86–1.51)	
American Indian/Alaska Native	1.22 (0.64–2.35)	
Asian	0.62 (0.19–2.02)	
Multiple races	1.12 (0.73–1.72)	
Education		.403
<High school graduate	Reference	
High school graduate/GED	1.10 (0.85–1.42)	
Some college	0.94 (0.73–1.22)	
College degree or more	0.94 (0.74–1.25)	
Employment status		.537
Employed	Reference	
Unemployed	0.87 (0.68–1.11)	
Disabled	0.88 (0.70–1.12)	
Retired	1.09 (0.80–1.50)	
Other	0.97 (0.77–1.22)	
Marital status		<.001
Single (never married, divorced)	Reference	
Partnered (married or living as married)	1.41 (1.20–1.64)	
Presence of other smoker in household		<.001
Yes	Reference	
No	2.35 (2.00–2.77)	
Use of any nicotine replacement therapy		.917
No	Reference	
Yes	1.01 (0.82–1.24)	
Use of medication to stop smoking		.071
No	Reference	
Yes	0.83 (0.67–1.02)	
Use of any other behavioral interventions		.508
No	Reference	
Yes	0.93 (0.73–1.17)	

Characteristic	OR (95% CI) <sup>a</sup>	P
Intention to quit in next 30 d (at enrollment)	.663	
No	Reference	
Yes	0.93 (0.69–1.27)	
Time to first cigarette	.102	
5 min	Reference	
>5 min	1.15 (0.97–1.35)	
Baseline cigarettes per day	Nonlinear	.001
Total interactions with intervention	Nonlinear	<.001
Intervention	.053	
Web	Reference	
Quitline	1.26 (1.00–1.58)	

Abbreviations: CI, confidence interval; GED, general education degree; OR, odds ratio.

Observations with information missing for at least 1 variable were excluded from the multivariate model, and this resulted in lower numbers of observations than reported for bivariate analyses.

<sup>a</sup>The multivariate models were adjusted for age, race/ethnicity, education, employment status, marital status, living with a smoker at the baseline, use of nicotine replacement therapy during the quit attempt, use of medication to stop smoking, use of services beyond the state-based interventions, intention to quit during enrollment, use of counseling during the intervention, state, and time to first cigarette as well as the baseline number of cigarettes smoked per day and total interactions with the service, which were transformed with 3-knot tail-restricted cubic spline functions.