Original Report:
Cancer

Web-Based Tobacco Cessation Interventions and Digital Inequality across US Racial/Ethnic Groups

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Introduction: Internet-based tobacco cessation programs have increased in use and popularity in recent years. To examine evidence for racial/ethnic digital inequality in web-only tobacco cessation services offered by US tobacco quitlines, we conducted an analysis of quitline enrollees in five states. We hypothesized that racial/ethnic minorities would demonstrate lower enrollment and utilization of a web-only tobacco cessation program.

Methods: The sample includes enrollees into five state quitlines whose service options included a web-only program in 2015 (N=32,989). Outcomes included web-entry into the quitline, web-only enrollment, establishment of a web account, and the number of times users logged into the program. Regression models tested associations with race/ethnicity.

Results: Compared with Whites, African Americans, Hispanics, American Indians/Alaska Natives, and "others" were less likely to enter the quitline via the web (Ps<.01) and enroll in a web-only (vs counseling) program (Ps<.01). Among web-only program enrollees, all racial/ethnic minority groups were significantly less likely than Whites to establish an online account (Ps<.03), and African Americans were less likely than Whites to log in to the web-only service (P<.01).

Conclusions: This study suggests that digital inequalities exist in web-based tobacco cessation services. Findings have implications for the development and implementation of digital tobacco interventions for racial/ethnic minority communities. The proliferation of digital tobacco interventions could increase disparities, as members of racial/ethnic minority groups may not engage in these interventions.

Introduction

The use of the internet has become almost ubiquitous in the United States.[1] Most adults (80%) report utilization of the internet for health information,[2,3] and more than one-third also use the internet to self-diagnose health problems or seek online support.[2] Access to the internet has become an important entrée to tobacco cessation interventions. Internet-based tobacco cessation programs have increased in use and popularity in recent years – and high-quality, interactive web interventions demonstrate comparable effectiveness to other tobacco cessation treatments.[4] Benefits of these interventions include reduced access barriers (eg, time, clinic visits, transportation, distance), lower per-smoker costs, and high dissemination potential.[5] Online interventions are also standardized and are not subject to human biases, implicit or explicit.[6] Given the persistence of racial/ethnic differences in tobacco cessation,[7] and lower utilization of evidence-based treatments,[8] improving our understanding of the use of internet-based tobacco interventions in underrepresented populations is essential to reducing and eliminating disparities.

Evidence for the "digital divide," or population-level differences in access to internet access and use[9] is equivocal. While some research indicates a narrowing of the racial/ethnic digital divide,[10-13] other recent studies suggest that the divide remains.[14-17] Calhoun et al found evidence of a digital divide in smok-

Implications: The proliferation of digital interventions has the potential to increase tobacco-related disparities, as members of racial/ethnic minority groups may not enroll in, or engage in, such interventions. As the field moves to digitize tobacco interventions, we must remain cognizant of persistent digital inequalities and the potential for widening racial/ethnic tobacco cessation disparities. *Ethn Dis.* 2019;29(3):495-504; doi:10.18865/ed.29.3.495

Keywords: Tobacco; Tobacco Cessation; Internet Interventions; Digital Inequality

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ing cessation effectiveness research, such that African Americans were less likely to have home internet access compared with Whites.[18] Moreover, "digital inequalities," or differences in the ability to engage effectively with electronic content even when access is present,[19] may increase the complexity of health disparities. Indeed, research has identified racial/ethnic differences in the level of mobile health technology use,[14] registration and use of electronic patient portals,[15] and internet use to search for health information[17] – all suggesting less use among racial/ethnic minority groups. Thus, despite growth trends in internet use, the proliferation of digital interventions has the potential to increase tobacco-related disparities.

The present study aimed to examine racial/ethnic differences in web-based quitline services.

Publically funded tobacco cessation quitlines can be conceptualized as equity-based intervention systems. They are available to smokers in all 50 states and, in many cases, offer evidence-based multi-session counseling and nicotine replacement therapy (NRT). They eliminate many of the most common barriers to care (eg, 24/7 access, telephone-delivery, and no cost). Web-based interventions have been offered in conjunction with quitline counseling in some states since the early 2000s, and by 2012, 27 states were offering stand-alone web interventions.[20] Research examining the selection and use of web-only quitline services is limited. Initial evidence suggested that when given access to both counseling calls and the web-service, engagement with counseling calls was greater than with the web.[21] Two studies that have examined the association between race/ethnicity and selection of web-only tobacco quitline service found that, compared with non-Hispanic Whites, African Americans were less likely to choose a web-only option.[22,23] Selection of the web-only program was also lower among enrollees with low education levels, who were unemployed, older, American Indians/Alaska Natives, and those who self-identified as bi/multi-racial.[23] However, differences in the selection of web-only vs telephone counseling were likely underestimated due to the underrepresentation of African Americans and other racial/ethnic minority groups, and study attrition.[23]

Initial evidence suggests that African American tobacco users may be less inclined to select a web-based program (vs counseling), and little is known about other racial/ethnic minority groups. The present study aimed to examine racial/ethnic differences in web-based quitline services. Specifically, we were interested in evidence of digital inequality, comparing the mode of quitline service initiation, enrollment in the web-only program, and uptake of the web-based tobacco cessation service across US racial/ethnic groups. The study included all tobacco users who enrolled into quitline services in 2015 in one of five state-sponsored quitlines that offered phone counseling and web-based services. Based on the previous literature, we hypothesized that racial/ethnic minorities would be less likely to enroll in the web-only program and would demonstrate less engagement with the website. Findings have implications for digital inequalities in tobacco interventions, equity, and access to evidence-based treatment.

Methods

Optum is the leading provider of tobacco quitline services in the United States, operating 25 state quitlines and delivering more than 350,000 coaching calls per year. We obtained all 2015 enrollee sociodemographic and utilization data from five states that offered a web-only quit coaching program (Kansas, Louisiana, Missouri, New Mexico and North Carolina). This analysis included all enrollments (N = 32,989), excluding those where racial/ethnic group was unknown (n=2165; 6.2%). The sample was 60% (n=19,910) White/Caucasian, 23% (n=7,558) African American/Black, 11% (n=6,661) Hispanic (any race), 3% (n=913) American Indian/Alaska Native, .4% (n=132) Asian American/Pacific Islander, and 1.4% (n=815) "other" race/ethnicity. This study was declared exempt from IRB approval at the lead author's institution. The dataset was derived from data obtained by the state quitlines as per usual business and only de-identified data were provided for analysis.

Measures

Demographics

Quitline enrollees reported sex, age, income, education, and race/ethnicity (White/Caucasian, African American/Black, Hispanic [any race], American Indian/Alaska Native, Asian American/Pacific Islander, or "other" race/ethnicity).

Web Entry

Individuals can be connected with the quitline through several channels, including fax referrals, telephone (inbound, outbound, re-enrollment), electronic referral, or via the state quitline website. We coded whether smokers initiated quitline enrollment via the website (coded as web entry – 0) or other entry method (1).

Web Coach Enrollment

We coded the type of coaching service participants were enrolled in as telephone counseling (0) or web coaching only (1).

Web Coach Account

Following enrollment in the web-only program, participants were required to establish a Web Coach account (ie, access the website to create a username and password) to begin using the service. As a measure of program engagement, we coded whether smokers who enrolled in the Web Coach program created an account (no = 0, yes = 1).

Web Coach Logins

As a measure of engagement, we tracked the frequency of logins on the Web Coach website over a 12-month period.

Interventions

Tobacco Cessation Counseling

Trained Quit Coaches® deliver up to five proactive telephone counseling sessions, following standardized protocols. Participants are encouraged to set a quit date, and subsequent calls are scheduled around that date. Topics covered include developing a quit plan, the use of medication, coping skills, managing challenging situations, resolving ambivalence, and preventing relapse. Quit Coaches are available 24 hours per day to provide support in addition to proactive calls.

Web-only Tobacco Cessation Program

Web Coach®[21,23] is a private website designed for quitline enrollees. This interactive program includes evidence-based strategies for tobacco cessation, such as education, setting a quit date, developing a personalized quit plan, medication options, tracking progress, and online social support. Electronic mail delivers tailored recommendations to facilitate tobacco cessation and maintenance. Web coaching is accessible 24 hours per day and can be combined with telephone counseling or utilized as a stand-alone intervention. Of interest in this study was enrollment and engagement in the web-only option.

Statistical Analyses

We conducted descriptive statistics (means, standard deviations, proportions) followed by bivariate analyses (chi-square tests, analyses of variance) to test relationships between race/ethnicity and categorical and continuous outcomes, respectively. Variables that differed significantly by race/ethnicity (P<.05) were included as covariates in adjusted models. Chi-square tests followed by hierarchical logistic regression models tested the unadjusted and adjusted associations between race/ethnicity and: a) quitline entry method; b) enrollment in the web-only service; and c) establishment of a Web Coach account, respectively. Hierarchical multivariate regression, controlling for demographics, tested the independent association between race/ethnicity and the number of web-logins. In each multivariable model, demographics were entered in block 1, state quitline (location) was entered in block 2, and race/ethnicity was added in block 3. Of interest was the significance of the relationships between race/ethnicity and each outcome, above all other factors. Alpha was set at P<.01 for primary outcomes. Analyses were conducted using SPSS version 24.

Results

The characteristics of the sample are shown in Table 1. Overall, participants were middle-aged and mostly female. Participants were mostly low income and completed a minimum of high school. We found differences in age by race/ethnicity, $F(5, 32{,}969) = 64.34$, P<.001. Asian Americans/Pacific Islanders were significantly younger than all other racial/ethnic groups (P<.05), and African Americans were older than all other groups (P<.05). Hispanics and enrollees who identified as "other" were significantly younger than Whites, African Americans, and American Indians/Alaska

Natives. Across racial/ethnic groups, males were least likely to self-identify as African American; females were most likely to be African American, X^2 (10, N = 32,989) = 169.38, P < .001. Hispanics reported the lowest income level (P<.001) compared with all other racial/ethnic groups, X^2 (40, N = 32,989) = 1902.65, P<.001. African Americans and American Indians/Alaska Natives were less likely to report an annual income of $75,000 or greater compared with non-Hispanic Whites. Hispanics and American Indians/Alaska Natives were more likely to report less than a high school education compared with the other racial/ethnic groups, X^2 (35, N = 32,989) = 577.02, P<.001. More Asian American/Pacific Islanders completed college or a university degree \ compared with all other racial/ethnic groups.

Unadjusted Associations between Race/Ethnicity and Web Coaching

Within the overall sample, 11% of enrollees initiated contact with the quitline via the website (ie, web-entry) and 13.5% enrolled in the web-only (Web Coach) program. Among individuals who enrolled in the web-only program, 55% established a Web Coach account. The average number of logins to the web-coaching program was 3.03 (SD = 33; Median = 0).

We observed racial/ethnic differences in web-entry into the quitline, X^2 (5, N = 32,989) = 557.23, P<.001. As shown in Table 2, compared with all other groups, African Americans were least likely to initiate contact through the internet. Web entry was significantly greater among Asian American/Pacific Islanders compared with non-Hispanic Whites, African Americans, American Indians/Alaska Natives, and those who self-identified as "other" race/ethnicity. We also observed racial/ethnic differences in enrollment into the web-only program, X^2 (5, N = 32,989) = 454.30, P<.001. As shown in Table 2, compared with all other groups, African Americans

Table 1. Sample characteristics, N=32,989

		Race/Ethnicity					
	Overall	**White**	**African American/ Black**	**Hispanic**	**American Indian/ Alaska Native**	**Asian American/ Pacific Islander**	**Other**
	N = 32,989	**n = 19,110**	**n = 7,558**	**n = 3,661**	**n = 913**	**n = 132**	**n = 2.3**
Age, years, mean (SD)	47.6 (13.2)	47.7 (13.6)[a]	48.5 (12.8)[b]	44.2 (14.4)[c]	47.0 (13.6)[a]	40.3 (13.41)[d]	45.1 (14.73)[c]
Sex, %(n)							
Male	39 (12962)	39 (7734)[a]	36 (2713)[b]	47 (1709)[c]	39 (354)[a,b]	63 (83)[d]	45 (369)[c]
Female	61 (20016)	61 (12166)[a]	64 (4844)[b]	53 (1952)[c]	61 (559)[a.b]	37 (49)[d]	55 (446)[c]
Total annual household income, %(n)							
<$10,000	19 (6429)	17 (3416)[a]	18 (1377)[b]	33 (1210)[c]	21 (195)[d]	21 (27)[a,b,d]	25 (204)[d]
<$25,000	20 (6611)	19 (3825)[a]	17 (1265)[b]	32 (1171)[c]	16 (149)[a,b,d]	23 (31)[a,b,d]	21 (170)[b]
<$50,000	9 (2857)	9 (1860)[a]	6 (439)[b]	12 (466)[c]	5 (44)[a,c,d]	9 (12)[d]	9 (72)[d]
<$75,000	2 (717)	3 (515)[a]	1 (98)[b]	2 (76)[a,c]	2 (13)[b,c]	2 (2)[a,b,c]	2 (13)[a,b,c]
≥$75,000	2 (523)	2 (403)[a]	1 (40)[b]	2 (58)[a,c]	1 (7)[b,c]	3 (4)[a]	1 (11)[a,c]
Unknown	48 (15816)	50 (9891)[a]	57 (4339)[b]	19 (680)[c]	55 (505)[b]	42 (56)[a,d]	42 (345)[d]
Education, %(n)							
Less than high school	21 (6855)	19 (3720)[a]	24 (1773)[b]	26 (946)[c]	28 (257)[c]	11 (15)[d]	18 (144)[a,d]
GED	7 (2460)	8 (1694)[a]	5 (376)[b]	7 (263)[c]	7 (62)[a,c]	7 (9)[a,b,c]	7 (56)[a,c]
High school	26 (8692)	25 (4930)[a]	31 (2350)[b]	27 (979)[c]	24 (218)[a,c,d]	17 (22)[d]	24 (193)[a,c,d]
Some college or university	24 (7820)	24 (4847)[a]	23 (1736)[b,c]	22 (805)[b,c]	21 (189)[c]	29 (38)[a,b]	25 (205)[a,b]
Some technical/trade school	1 (415)	1 (248)[a]	1 (97)[a]	1 (44)[a]	1 (12)[a]	1 (2)[a]	1 (12)[a]
Technical/trade school degree	3 (865)	3 (574)[a]	2 (161)[b]	3 (88)[a,b]	2 (23)[a,b]	2 (2)[a,b]	2 (17)[a,b]
College or university degree	16 (5174)	18 (3506)[a]	12 (923)[b,c]	11 (419)[c]	14 (127)[b]	32 (42)[d]	19 (157)[a]
Unknown	2 (708)	2 (391)[a]	2 (142)[a]	3 (117)[b]	3 (25)[a,b]	1 (2)[a,b]	4 (31)[b]

Different superscripts (a,b,c,d) indicate statistically significant differences (P<.05).
GED, graduate equivalency diploma.

Table 2. Web coaching entry, enrollment, and web coach accounts by race/ethnicity (N=32,989)

		Race/ethnicity					
	Overall	**White**	**African American/ Black**	**Hispanic**	**American Indian/ Alaska Native**	**Asian American/ Pacific Islander**	**Other**
	N = 32,989	**n = 19,110**	**n = 7,558**	**n = 3,661**	**n = 913**	**n = 132**	**n = 815**
Web entry to QL, %(n)							
No	89 (29,363)	87 (17,276)[a]	96 (7,259)[b]	86 (3,133)[a,c]	93 (846)[d]	80 (105)[c]	91 (744)[d]
Yes	11 (3,626)	13 (2,634)[a]	6 (299)[b]	14 (528)[a,c]	7 (67)[d]	20 (27)[c]	9 (71)[d]
Web coach enrollment, %(n)							
No	87 (28,543)	84 (16,793)[a]	94 (7,069)[b]	83 (3,050)[a]	89 (816)[c]	75 (99)[d]	88 (716)[c]
Yes	13 (4,446)	16 (3,117)[a]	6 (489)[b]	17 (611)[a]	11 (97)[c]	25 (33)	12 (99)[c]
Web coach account, %(n)							
No	45 (15,008)	42 (8,437)[a]	52 (3,895)[b]	48 (1,765)[c]	54 (492)[b]	39 (51)[a]	45 (368)[a,c]
Yes	55 (17,981)	58 (11,473)[a]	48 (3,663)[b]	52 (1,896)[c]	46 (421)[b]	61 (81)[a]	55 (447)[a,c]

Different superscripts (a,b,c,d) indicate statistically significant differences (P<.05).
QL, quitline.

were least likely to enroll in the program, while Asian Americans/Pacific Islanders were the most likely to enroll in web-only services. The difference between non-Hispanic Whites and Hispanics was not significantly different, but web-only program enrollment was greater in these groups compared with American Indians/Alaska Natives, self-identified "others," and African Americans. Among web-only enrollees, we also observed racial/ethnic differences in establishing a Web Coach account, X^2 (5, N = 32,989) = 28.68, P<.001. Across racial/ethnic groups, American Indians/Alaska Natives and African Americans were the least likely to log in to the online platform to set-up a Web Coach account. Asian Americans/Pacific Islanders, non-Hispanic Whites, and "others" were the most likely to establish a Web Coach account. Finally, we found racial/ethnic differences in logins to the web-coaching program, F(5, 18,638) = 3.79, P<.01. As shown in Table 3, the number of logins to the web-program was significantly fewer among African Americans, compared with non-Hispanic Whites. There were no other significant racial/ethnic differences in the frequency of web logins.

Multivariable Associations between Race/Ethnicity and Web Coaching

We tested the independent relationships between race/ethnicity and web-entry into the quitline, enrollment in the web-only program, and establishment of a Web Coach account, controlling for sex, age, education, annual income, and location (Table 4). We found significant associations between race/ethnicity and web-entry into the quitline. Compared with non-Hispanic Whites, African Americans, Hispanics, American Indians/Alaska Natives, and individuals who self-identified as "other" race/ethnicity were less likely to initiate quitline services via the website. The association between non-Hispanic Whites and Asian Americans/Pacific Islanders was not significant. In addition, we identified other demographic factors that were associated with the likelihood of web-entry to the quitline. Specifically, the odds of web-entry were greater among females, individuals with at least a graduate equivalency degree (GED), and those with an annual income of more than $10,000. In contrast, web-entry was inversely associated with age, and was less likely in Missouri, North Carolina, Louisiana, and Kansas (compared with New Mexico).

We found a significant independent association between race/ethnicity and enrollment into the web-only coaching program (Table 4). Compared with non-Hispanic Whites, African Americans, Hispanics, American Indians/Alaska Natives, and individuals who self-identified as "other" race/ethnicity were less likely

Table 3. Average number of web logins by race/ethnicity, N=18,644

	N	Mean	Std. deviation	95%CI for Mean	
				Lower bound	Upper bound
White	11891	3.77	40.723	3.04	4.50
African American/Black	3723	1.28	6.677	1.07	1.50
Hispanic	2040	2.45	13.218	1.87	3.02
American Indian/Alaska Native	445	1.62	5.937	1.06	2.17
Asian American/Pacific Islander	81	4.40	11.005	1.96	6.83
Other	464	1.59	5.638	1.07	2.10
Total	18644	3.03	32.999	2.55	3.50

Note: The mean difference between African Americans and non-Hispanic Whites is statistically significant (P<.05). No other pairwise comparisons are significant.

to enroll in the web-only program. There was no association with web-only enrollment among non-Hispanic Whites or Asian Americans/Pacific Islanders. We also identified other demographics that were associated with web-only program enrollment. Analysis by sex indicated greater odds of web program enrollment among females. Compared with individuals with less than a high school education, there was a gradient increase in web-only enrollment, with college graduates most likely to enroll. Relative to those with an annual income of less than $10,000, web-only enrollment was greater in all other self-reported income levels. Web-only enrollment was inversely associated with age, and was less likely in Missouri, North Carolina, Louisiana, and Kansas (compared with New Mexico).

Among web-only enrollees, we examined the association between race/ethnicity and establishing a Web Coach account (Table 4). Compared with non-Hispanic Whites, all other racial/ethnic groups were less likely to create an online account. After controlling for demographics, Asian Americans/Pacific Islanders were less likely to establish a Web Coach account. We also identified other demographics that were independently associated with setting up an online account. Analysis by sex indicated greater odds of establishing a Web Coach account among females. Compared with individuals with less than a high school education, there was a gradient increase in establishing a Web Coach account, with college graduates most likely to set up the account. Relative to those with an annual income of less than $10,000, the odds of establishing a Web Coach account was greater in all other self-reported income levels. Setting up a Web Coach account was inversely associated with age, and was less likely in Missouri, Louisiana, and Kansas (compared with New Mexico).

Finally, we conducted a multivariable test of racial/ethnic differences in web coaching engagement (ie, the number of program logins). Results demonstrated a significant association between race/ethnicity and logins to the web-coaching program, $F(5, 18{,}638) = 3.52$, $P<.01$. Compared with non-Hispanic Whites, the number of logins among web-only enrollees was significantly fewer among African Americans ($P<.001$). There were no other significant racial/ethnic differences. Education was positively associated with the number of web logins, while younger age was inversely associated.

Discussion

State quitlines are an exemplar of an equity-based intervention system. They have the potential to reduce or eliminate disparities by removing barriers to accessing evidence-based treatment (eg, cost, location, and time). We used state tobacco quitlines as a population-based intervention model to examine patterns of self-selection into internet-based tobacco cessation programs and engagement across racial/ethnic populations. The underlying goal was to examine evidence for digital inequality. We found that a minority of enrollees sign-up online for services and/or opt for the web-only program (vs telephone counseling or counseling plus web coaching), and only about half take the required next step and establish a Web Coach® account. Controlling for income, education, and location, we found the same pattern of associations between race/ethnicity and web-entry and enrollment. Hispanics, American Indian/Alaska Natives, and

Table 4. Associations between race/ethnicity and web service among quitline enrollees

Hierachical Logistic Regression						
	AOR	**(95 CI)**	**AOR**	**(95 CI)**	**AOR**	**(95 CI)**
	Web Entry to QL		**Web Coach Enrollment**		**Web Coach Account**	
Male	Reference		Reference		Reference	
Female	1.22	(1.13-1.32)	1.19	(1.11-1.28)	1.33	(1.26-1.39)
Age	.96	(.95-.96)	.96	(.96-.97)	.96	(.95-.96)
Education						
Less than high school	Reference		Reference		Reference	
Graduate equivalency degree (GED)	2.41	(2.04-2.84)	1.89	(1.62-2.20)	1.97	(1.78-2.17)
High school	1.34	(1.17-1.55)	1.53	(1.36-1.72)	1.79	(1.67-1.92)
Some college or university	2.66	(2.33-3.03)	2.38	(2.12-2.66)	3.66	(3.40-3.94)
Some technical/trade school	3.52	(2.61-4.75)	2.35	(1.76-3.14)	3.00	(2.43-3.71)
Technical degree/trade school	3.69	(2.98-4.58)	2.51	(2.04-3.08)	3.15	(2.70-3.67)
College or university degree	2.84	(2.47-3.27	2.55	(2.26-2.89)	5.11	(4.69-5.56)
Unknown	1.47	(1.09-1.99)	1.24	(.93-1.65)	.96	(.95-.96)
Annual Income						
<$10,000	Reference		Reference		Reference	
<$15,000	1.16	(1.00-1.35)	1.20	(1.06-1.37)	1.30	(1.18-1.42)
<$20,000	1.39	(1.19-1.64)	1.50	(1.31-1.73)	1.61	(1.44-1.80)
<$25,000	1.74	(1.47-2.06)	1.68	(1.44-1.95)	1.80	(1.59-2.04)
<$35,000	1.73	(1.46-2.05)	1.71	(1.48-1.99)	2.26	1.99-2.56)
<$50,000	2.15	(1.82-2.55)	1.98	(1.70-2.31)	2.75	(2.39-3.17)
<$75,000	2.45	(1.99-3.03)	2.33	(1.93-2.82)	3.24	(2.67-3.93)
≥$75,000	2.34	(1.85-2.96)	1.90	(1.53-2.37)	3.36	(2.66-4.24)
Unknown	1.76	(1.49-2.07)	1.17	(1.00-1.37)	1.01	(.90-1.13)
Location						
New Mexico	Reference		Reference		Reference	
Missouri	.21	(.18-.24)	.44	(.39-.49)	.69	(.63-.76)
North Carolina	.23	(.19-.27)	.33	(.28-.39)	1.12	(.99-1.26)
Louisiana	.35	(.30-.39)	.51	(.45-.56)	.82	(.75-.90)
Kansas	.60	(.51-.70)	.62	(.54-.72)	.86	(.76-.98)
Race/Ethnicity						
White	Reference		Reference		Reference	
African American/Black	.39	(.34-.44)	.49	(.44-.55)	.79	(.74-.84)
Hispanic	.53	(.47-.60)	.59	(.53-.66)	.66	(.61-.73)
American Indian/Alaska Native	.53	(.41-.69)	.68	(.54-.85)	.66	(.57-.76)
Asian American/Pacific Islander	.89	(.57-1.38)	1.04	(.69-1.58)	.64	(.44-.95)
Other race/ethnicity	.47	(.36-.60)	.59	(.47-.73)	.77	(.66-.90)

Results were unchanged when other states were used as a reference for location.

"other" race/ethnicity were less likely than non-Hispanic Whites to initiate quitline services through the website or enroll in the web-only program. African Americans were least likely to enter via the web or enroll in the web-only program. These associations did not differ between non-Hispanic Whites and Asian Americans/Pacific Islanders. Among web-only enrollees, all racial/ethnic minority groups were less likely than non-Hispanic Whites to establish a web-coach account. Finally, the number of logins to the web-program was significantly fewer among African Americans compared with non-Hispanic Whites.

Findings from this study are consistent with and extend previous research. Zbikowski, Hapgood, Smucker Barnwell, McAfee [21] tracked utilization of a comprehensive integrated telephone counseling/web quitline program and found greater engagement in telephone counseling compared with the web-program. However, this study did not report utilization by race/ethnicity. Consistent with the current study, Nash, Vickerman, Kellogg, Zbikowski[23]

found that the web-only service was less likely to be selected in the overall sample, and that web-only enrollees were least likely to be African American, compared with non-Hispanic Whites, Hispanics, and "other" racial/ethnic backgrounds. We extended this result by reporting findings for each of the major US racial/ethnic populations, and showing that both web-entry and enrollment was lower across US, racial/ethnic minority groups, with the exception of Asian Americans/Pacific Islanders.

Hispanics, American Indian/Alaska Natives, and "other" race/ethnicity were less likely than non-Hispanic Whites to initiate quitline services through the website or enroll in the web-only program. African Americans were least likely to enter via the web or enroll in the web-only program.

The reasons for not establishing a Web Coach account, which was more prevalent across all racial/ethnic minority groups, are likely complex and unable to be addressed by the current analysis. These individuals selected and enrolled in the web-only program yet did not take the subsequent step needed to gain access. Having access to an internet-enabled device does not necessarily translate to use of the internet for health purposes. Other factors such as preferences, equipment, social support, and willingness to use digital modalities[15] also lead to digital inequalities. McCloud, Okechukwu, Sorensen, Viswanath[16] found that digital connectivity differences by socioeconomic position represents a second-tier inequality that deepens the barriers to accessing online health information among those willing to utilize this medium. This may apply to the quitline population, which tends to report low levels of income and education. Previous research has also found that African Americans and Hispanics are more likely to own a mobile phone as their only device able to access the internet,[24] limiting the ease of interacting with web interventions. In addition, Lin et al[12] found higher levels of internet efficacy (ie, confidence in internet skills) among non-Hispanic Whites compared with racial/ethnic minority participants. This suggests that the use and potential benefits of digital and internet-based services, which are becoming a standard component of our health care system, may not be distributed equally across populations. Future research among web-only enrollees, perhaps using qualitative methods, may elucidate the reasons for this finding.

Compared with non-Hispanic Whites, African Americans who enrolled in the web-only service were less likely to log in. This suggests that even with access and the selection of a web-only intervention, African Americans may underutilize online support. This inference is consistent with previous research.[25] Despite high interest in using digital interventions across populations,[14] internet use patterns may differ by race/ethnicity, such that activity among African Americans is more likely to include employment searches and entertainment, and less likely to include searching for health information and communicating with health care providers.[25] One study examining the use of the internet by young women found that Hispanic women were less likely to report any internet use, and among those who did use the internet, African American women were less likely to use it for health-related reasons.[26] This was confirmed by a 2017 report that showed that non-Hispanic Blacks and Hispanics (of any race) were least likely to use the internet to access online health resources.[27] Moreover, preferences for culturally specific interventions (eg, designed to integrate the cultural values of the community)[28] and support (eg, face-to-face, highly personal)[25] may lead to disengagement after initial interest.

This study contributes to the literature on digital tobacco interventions among primarily low-income individuals. We included a large sample drawn from a real-world context with adequate representation from US racial/ethnic groups, and that provided the option for both telephone and web services. We also controlled for SES indices and the location of the services in multivariate tests. Nevertheless, findings are limited by a few factors. First, these data provide a one-year snapshot of the variables assessed (in 2015); thus, causality can-

not be inferred. With rapid changes in technology, access, and comfort using digital applications, these associations may differ within a short-time frame. These findings, however, are consistent with studies published a decade ago, which offers confidence in their validity. Second, factors that may have influenced enrollment (eg, internet access, technology literacy) and engagement (eg, motivation, tobacco cessation status) are unknown. We do, however, have some indication of users' initial preferences, as the data on self-selection into the web-only vs counseling program were identical to actual enrollment (data not presented). Third, while the number of logins to the web program indicates engagement to some degree, we do not know the amount of time spent on the website. Furthermore, we were not able to examine the association between tobacco cessation rates to use of services, as the dataset did not include cessation outcomes.

Conclusion and Public Health Implications

This study provides a signal toward digital inequality among treatment-seeking tobacco users. There is a trend for quitlines and other service providers to digitize programs. These digital modalities go beyond interactive web-delivered interventions, to include mobile apps, email, text messaging, digital coaching, and video-based interventions. Nationally, quitline budgets are decreasing,[29] and digital interventions may reduce costs and increase reach to younger tobacco smokers.[30] Findings from this study suggest that the increasing development, testing, and implementation of digital interventions for tobacco cessation has the potential to leave behind communities facing digital inequality.

Conflict of Interest

No conflicts of interest to report.

Author Contributions

Research concept and design: Webb Hooper, Carpenter, Salmon; Acquisition of data: Carpenter, Salmon; Data analysis and interpretation: Webb Hooper, Carpenter, Salmon; Manuscript draft: Webb Hooper, Carpenter; Statistical expertise: Webb Hooper; Administrative: Salmon

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