Gender differences in utilization of services and tobacco cessation outcomes at a state quitline

Alicia M. Allen,¹ Nicole P. Yuan,² Betsy C. Wertheim,³ Laurie Krupski,² Melanie L. Bell,⁴ Uma Nair²

¹Department of Family & Community Medicine, College of Medicine, University of Arizona, Tucson, AZ 85714, USA

²Department of Health Promotion Sciences, Mel & Enid Zuckerman College of Public Health, University of Arizona, Tucson, AZ 85724, USA

³University of Arizona Cancer Center, Tucson, AZ 85719, USA

⁴Department of Epidemiology & Biostatistics, Mel & Enid Zuckerman College of Public Health, University of Arizona, Tucson, AZ 85724, USA

Correspondence to: A Allen, aliciaallen@email.arizona.edu

Cite this as: *TBM* 2019;9:663–668
doi: 10.1093/tbm/iby083

© Society of Behavioral Medicine 2018. All rights reserved. For permissions, please e-mail: journals.permissions@oup.com.

Abstract

Research suggests that women may have poorer tobacco cessation outcomes than men; however, the literature is somewhat mixed. Less is known about gender differences in cessation within quitline settings. This study examined gender differences in the utilization of services (i.e., coaching sessions, pharmacotherapy) and tobacco cessation among callers to the Arizona Smokers' Helpline (ASHLine). The study sample included callers enrolled in ASHLine between January 2011 and June 2016. We tracked number of completed coaching sessions. At the 7-month follow-up, callers retrospectively reported use of cessation pharmacotherapy (gum, patch, or lozenge), as well as current tobacco use. Associations between gender and tobacco cessation were tested using logistic regression models. At month 7, 36.4% of women (3,277/9,004) and 40.3% of men (2,960/7,341) self-reported 30-day point prevalence abstinence. Compared to men, fewer women reported using pharmacotherapy (women: 71.4% vs. men: 73.6%, $p = .01$) and completed at least five coaching sessions (women: 35.1% vs. men: 38.5%, $p < .01$). After adjusting for baseline characteristics, women had significantly lower odds of reporting tobacco cessation than men (OR = 0.91, 95% CI: 0.84 to 0.99). However, after further adjustment for use of pharmacotherapy and coaching, there was no longer a significant relationship between gender and tobacco cessation (OR: 0.96, 95% CI: 0.87 to 1.06). Fewer women than men reported tobacco cessation. Women also had lower utilization of quitline cessation services. Although the magnitude of these differences were small, future research on improving the utilization of quitline services among women may be worth pursuing given the large-scale effects of tobacco.

Keywords

Cessation, Tobacco, Smoking, Gender differences

INTRODUCTION

Promoting tobacco cessation among women is a public health priority. Despite having lower prevalence of cigarette smoking than men (14% vs. 17%) [1], women in the USA are more likely to suffer smoking-related health consequences [2–5]. Women are also the most common source of secondhand smoke exposure in children, resulting in increased health risks among children including acute (e.g., ear infections) and chronic (e.g., asthma) conditions, as well as death (e.g., sudden infant death syndrome) [2,3,5–7]. Women may have more difficulty than men in achieving cessation, though the findings on this topic are mixed. For example, some national and

Implications

Practice: Encouraging the uptake of quitline services may improve cessation outcomes, particularly for women.

Policy: Quitlines should consider tailoring interventions to subgroups including women, for example, encouraging the uptake of quitline services to improve smoking cessation outcomes.

Research: Future research is needed to identify strategies for improving engagement with services offered by quitlines.

international population-based datasets indicate that men and women had comparable smoking cessation rates [8], whereas others, especially in clinical trials, indicate greater cessation rates among men than women [9,10].

Quitlines are arguably the most broad-reaching and cost-effective community-based smoking cessation intervention [11–13] and are an essential component to comprehensive tobacco control programs [14]. Quitlines are telephone-based helplines that offer cessation assistance, often in the form of coaching and access to nicotine replacement therapy (NRT). To date, research on gender differences in quitline settings is limited to a small group of studies with mixed results. Two quitline studies documented improved cessation outcomes among men compared to women [15,16], one observed a trend suggesting that women had improved cessation outcomes compared to men [17], and three additional studies failed to observe gender differences in smoking cessation outcomes among quitline callers [18–20]. One possible explanation of these inconsistent results may be gender differences in the utilization of quitline services (i.e., coaching sessions, use of pharmacotherapy), as these have been implicated as predictors of cessation outcomes in prior research [21,22]. Thus, the goals of this study were to: (1) examine gender differences in tobacco cessation among callers to Arizona's state quit line—Arizona Smokers' Helpline

(ASHLine) and (2) explore gender differences in the utilization of quitline services (i.e., coaching sessions, use of pharmacotherapy) as it relates to cessation outcomes.

METHODS

Arizona Smokers' Helpline (ASHLine) services

Individuals who enrolled in ASHLine services between January 2011 and June 2016 were included in this study with the exception of those who were repeat callers or those who reported tobacco abstinence at the time of enrollment. ASHLine procedures have been previously reported elsewhere [23]. In brief, callers completed an enrollment survey (e.g., demographics, smoking behavior) and received weekly telephone sessions with ASHLine coaches for up to 90 days. Depending on the caller's health insurance, ASHLine also provided up to 4 weeks of free NRT in the form of patches, gum, or lozenges (per caller preference). Regardless of compliance with the cessation intervention, all callers received a 7-month follow-up telephone survey to assess cessation outcomes.

Study measures

Demographic characteristics obtained during enrollment included gender, age, race/ethnicity, education level, and health insurance status. Additional health characteristics included chronic health condition(s) (including asthma, chronic obstructive pulmonary disease, diabetes, heart disease, high blood pressure, or cancer) and mental health condition(s) (e.g., anxiety disorder, depression disorder, bipolar disorder, alcohol/drug abuse, or schizophrenia). Three smoking-related variables were collected on the enrollment survey: (1) recent (<12 months) quit attempt (yes/no), (2) confidence to quit for 24 hr as assessed via the question, "How sure are you that you will be able to quit using tobacco for at least 24 hours?" with response options on a five-point scale ranging from "not confident" to "extremely confident," and (3) Fagerström Test of Nicotine Dependence [24], which provides a score of 0–10, with higher values indicating greater nicotine dependence.

The 7-month follow-up questionnaire included the use of any smoking cessation pharmacotherapy (yes/no). Smoking cessation was assessed with self-reported 7- and 30-day point prevalence by asking callers, "Have you used tobacco in the last seven (or 30) days?" (yes/no). The number of coaching calls before the 7-month follow-up assessment was obtained from the ASHLine database.

Statistical analysis

Baseline characteristics of ASHLine callers with known 7-month quit status were compared across genders using chi-square tests for categorical variables and *t*-tests for continuous variables. Crude

differences in medication or coaching sessions by gender were tested using chi-square tests. The association between gender and self-reported 7- and 30-day abstinence at 7 months was estimated using logistic regression, yielding odds ratios (ORs) and 95% confidence intervals (CIs). Models were adjusted for the following potential confounders: age, race/ethnicity (non-Hispanic white vs. non-Hispanic black vs. non-Hispanic other vs. Hispanic), education (≤high school vs. >high school), health insurance status (Medicaid or uninsured vs. private insurance), chronic health condition (any vs. none), mental health condition (any vs. none), number of quit attempts in the past 12 months (any vs. none), confidence to quit for 24 hr (not confident or somewhat confident vs. confident, very confident, or extremely confident), and Fagerström Test of Nicotine Dependence score (continuous). An additional set of models was further adjusted for smoking cessation medication use (yes/no) and number of completed coaching sessions (0, 1–2, 3–4, 5+) to determine if they were mediators of the gender-quit relationship following recommended methods [25]. Due to the nonlinearity of age with the logit of cessation, we used restricted cubic splines with five knots [26]. Due to the high levels of missing data among covariates, multiple imputation with chained equations was employed to fill in the gaps, as a sensitivity analysis [27]. The imputation model included all covariates listed above. A total of 25 complete datasets were constructed, analyzed, and combined. All statistical analyses were performed using Stata 15.1 (StataCorp, College Station, TX).

RESULTS

Study sample

Of 49,284 individuals in the ASHLine database, 19,330 (39%) had available information on 7-month quit outcomes. Of these, 2,985 were excluded because they had previously enrolled in ASHLine services ($n = 1,860$), reported smoking abstinence at time of enrollment ($n = 999$), or were missing data on gender ($n = 126$), yielding a final sample size of 16,345 (Fig 1). Compared to those who were not included in the final sample, those who were included were older (47.0 ± 14.2 years vs. 51.5 ± 13.7 years; $p < .001$), more likely to be male (42.5% vs. 44.9%, $p < .001$), non-Hispanic white (64.8% vs. 68.1%, $p < .001$), have more than a high school diploma (54.6% vs. 52.3%, $p < .001$), more likely to have a chronic health condition (54.0% vs. 58.4%, $p < .001$), less likely to have a mental health condition (37.9% vs. 36.8%, $p = .03$), more likely to have private health insurance (52.5% vs. 44.6%, $p < .001$), more likely to have confidence to quit for 24 hr (85.8% vs. 84.8%, $p < .01$), and were less nicotine dependent per Fagerstrom Test of Nicotine Dependence scores [24] (4.7 ± 2.3 vs. 4.8 ± 2.3 , $p < .05$).

Fig 1 | Participant flow diagram

Slightly over half of the final study sample ($n = 16,345$) were women (55.1%). Women tended to be older than men, with more education and higher chance of having a chronic or mental health condition (Table 1). Men were more likely than women to have private health insurance and confidence to quit for 24 hr.

Gender difference in tobacco cessation

More men than women reported tobacco cessation based on 30-day point prevalence (40.3% vs. 36.4%) at the 7-month follow-up (Table 2). In unadjusted models, women had significantly lower odds of

tobacco abstinence (OR: 0.85, 95% CI: 0.79 to 0.90). After adjusting for baseline characteristics, the effect was slightly attenuated (OR: 0.91, 95% CI: 0.83 to 0.99). Results from the 7-day point prevalence and the sensitivity analysis using multiple imputation were similar (7-day OR: 0.88, 95% CI: 0.82 to 0.93; 30-day OR: 0.88, 95% CI: 0.83 to 0.94).

Gender differences in utilization of services and tobacco cessation

Women were less likely than men to use tobacco cessation pharmacotherapy (71.4% vs. 73.6%, $p = .006$). Women were also less likely than men to complete

Table 1 | Baseline characteristics of ASHLine callers who completed the first intake questionnaire by gender*

Characteristic	Women $n = 9,004$ (55.1%)	Men $n = 7,341$ (44.9%)	p value**	Missing data
Age at enrollment (years)	52.3 $\pm$ 13.4	50.4 $\pm$ 14.0	<.001	0.8%
Race/ethnicity			<.001	15.9%
Non-Hispanic white	5,458 (71.8)	1,480 (68.1)		
Non-Hispanic black	497 (6.5)	352 (5.7)		
Non-Hispanic other	304 (4.0)	278 (4.5)		
Hispanic	1,341 (17.6)	1,328 (21.6)		
Education level (>high school)	5,022 (57.2)	3,660 (51.3)	<.001	2.7%
Private health insurance	4,599 (51.3)	3,944 (53.9)	.001	0.4%
Chronic health condition	5,266 (61.2)	3,841 (55.0)	<.001	4.6%
Mental health condition	3,840 (44.2)	1,962 (27.8)	<.001	3.7%
Recent quit attempt (< 12 months)	4,933 (63.5)	3,753 (60.3)	.003	14.4%
Confidence to quit for 24 hr	6,570 (84.6)	5,510 (87.4)	<.001	13.9%
Fagerström Test of Nicotine Dependence score	4.7 $\pm$ 2.3	4.8 $\pm$ 2.3	<.001	15.3%

*Presented as mean $\pm$ standard deviation or n (%). ** p values were calculated using t -tests for continuous variables and chi-square tests for categorical variables.

Table 2 | Associations between gender and smoking cessation 7 months after enrollment

Outcome	Women <i>n</i> (%)	Men <i>n</i> (%)	Model 1 ^a OR (95% CI)	Model 2 ^b OR (95% CI)
7-day point prevalence abstinence				
No	5513 (61.2)	4192 (57.1)	1.00	1.00
Yes	3491 (38.8)	3149 (42.9)	0.84 (0.79–0.90)	0.90 (0.83–0.98)
30-day point prevalence abstinence				
No	5727 (63.6)	4381 (59.7)	1.00	1.00
Yes	3277 (36.4)	2960 (40.3)	0.85 (0.79–0.90)	0.91 (0.84–0.99)

^aUnadjusted. ^bAdjusted for age (restricted cubic splines), race/ethnicity, education, health insurance, chronic health condition, mental health condition, previous quit attempt, confidence to quit for 24 hr, and Fagerström Test of Nicotine Dependence score.

five or more coaching sessions (35.1% vs. 38.5%, $p < .001$). After adjusting for pharmacotherapy use and number of coaching sessions, the association between gender and tobacco cessation was no longer significant (7-day OR: 0.96, 95% CI: 0.87 to 1.06; 30-day OR: 0.96, 95% CI: 0.87 to 1.06), indicating possible mediation by quitline services use. However, the sensitivity results employing multiple imputation were marginally statistically significant (7-day OR: 0.92, 95% CI: 0.86 to 0.99; 30-day OR: 0.93, 95% CI: 0.87 to 0.997).

DISCUSSION

The findings from the current study suggest that gender differences in tobacco cessation outcome may exist among the quitline population; however, the differences are small and the statistical significance may be a result of the large sample size. We observed that among ASHLine callers, women reported lower rates of 30-day cessation at the 7-month follow-up than men. This observation concurs with some prior research, including the work by Kerkvliet and colleagues which also observed women to be at 0.90 times lower odds of tobacco cessation at 7 months [15]. Our findings further suggest that utilization of both NRT and coaching partially mediated the relationship between gender and tobacco cessation, as the association between gender and cessation was attenuated after including these service variables in the models.

The existing literature on gender difference in smoking cessation outcomes has largely been mixed. For instance, Jarvis and colleagues analyzed data from nearly 100,000 smokers from population-based datasets collected in the USA, Canada, and Great Britain and concluded that men and women had comparable smoking cessation rates in real-world settings [8]. In contrast, a recent review paper conducted by Smith and colleagues documented gender differences in published smoking cessation studies [9]. Briefly, in a comparison of 126 efficacy and effectiveness trials, 47% of the trials indicated that significantly more men than women quit smoking, whereas 2% indicated that significantly more women than men quit smoking. Jarvis and colleagues have argued that the gender differences observed in clinical trials are not translatable to real-world settings [8].

However, Smith and colleagues concluded that gender differences in smoking cessation exist in real-world contexts with or without treatment [9], although only four community-based interventions were included in their review. These community-based interventions included two that demonstrated significantly greater cessation rates in men than women [28,29] and two that observed similar rates between men and women [30,31]. In sum, most of these observations suggest that women may be less likely than men to successfully quit smoking in community-based interventions.

One possible explanation for observed gender differences is the utilization of services as our observations suggest. Our findings concur with previous work showing that the utilization of pharmacotherapy and engagement with coaching sessions influence cessation outcomes, especially among women. A study based on the International Tobacco Control Four Country Surveys (ITC-4) documented that rates of quitting were lowest among women who did not use any smoking cessation medication [10]. There were no gender differences among medication users. The same study also showed that there were gender differences in the efficacy of specific types of smoking cessation medications on quitting with stronger efficacy of nicotine patch in men compared to women, and greater efficacy of varenicline in women compared to men. Furthermore, in terms of engagement with coaching sessions, nonadherence to quitline services is well-documented among all callers, especially among women [32]. One study showed that almost half of all enrolled quitline callers completed only one coaching session, and being female was one of several demographic characteristics that predicted completion of only one coaching session [32]. According to the North American Quitline Consortium best practice protocols [33], callers should complete five or more coaching sessions. Therefore, if quitlines developed novel strategies or interventions designed to enhance engagement with coaching sessions, cessation rates in quitline callers may be improved, especially among female callers.

Quitlines provide an ideal setting to provide tobacco treatment by integrating pharmacotherapy with tailored behavioral strategies to enhance the likelihood of cessation among specific groups

of callers, including women. Women face unique barriers to cessation such as smoking-related weight concerns [34,35] and menstrual cycle effects [36]. Thus, a number of arguments exist for tailoring smoking cessation programs to address concerns that may be particularly relevant for women. For example, Bush and colleagues compared simultaneous and sequential timing for combining weight control interventions with standard tobacco cessation protocols and found it to be acceptable to quitline participants [37]. Quitline protocols may also be tailored based on menstrual cycle per the burgeoning evidence of the influence of menstrual phase and/or sex hormones in cessation outcomes [36], yet there has been a dearth of studies in this area. Regarding pharmacotherapy, quitlines may want to consider improving caller access to specific medications, such as varenicline, the most effective smoking cessation pharmacotherapy for women [38]. Indeed, Biazzo and colleagues observed that female quitline callers had higher odds of using varenicline over NRT, and varenicline use was associated with higher odds of abstinence in quitline callers [20].

A strength of this study was the large and relatively diverse sample, as well as its prospective nature. However, the large sample size also allowed the small gender differences to be significant, and thus the findings should be interpreted with caution and replicated with additional quitline research. It is also likely that not all confounding was adjusted for, including the effect of mental health conditions on the relationship between gender and cessation outcomes. In our study, mental health conditions was measured by a single item that asked callers if they had ever been diagnosed or received treatment for anxiety disorder, depression disorder, bipolar disorder, alcohol/drug abuse, or schizophrenia. A more comprehensive measurement of mental health conditions may have resulted in a more accurate account of the full impact of that factor on tobacco cessation. Other limitations include a two-option response (male or female) for gender. This may have led to potential misclassification and limited generalizability to others (e.g., transgender individuals). Next, tobacco use was a self-reported measure. It is possible that some of our endpoints were misclassified, as callers who were still using tobacco may have reported abstinence. However, the collection of self-reported data is common practice among quitline settings [33]. Also, we were unable to assess type of pharmacotherapy used. Although NRT was provided to some participants, it is possible that some callers used tobacco cessation pharmacotherapies other than NRT (e.g., varenicline) that they received from other sources. Further, we did not obtain data on the length of medication use and reasons for not using or discontinuing use of medication, which may have provided insights into the barriers experienced among female quitline callers.

In summary, fewer female ASHLine callers reported tobacco abstinence than men did; however, lower utilization of quitline services by women may be driving this disparity. Although the observed gender differences are small, these differences may translate into important benefits for women on a population-level given the widespread and significant impacts of tobacco use. Future quitline research should investigate strategies for enhancing the utilization of services—nonadherence of medication use and completion of coaching session—among all callers, but also among female callers in particular. Given that women appear to experience barriers to both, such research may inform gender-specific protocols and strategies aimed at improving cessation outcomes among women.

Acknowledgements: We thank Evelyn Rens for her editorial assistance. This research was supported by Arizona Department of Health Services grants ADHS13-026130, ADHS11-007339, and HS160051-0/E1H37741 and the National Cancer Institute of the National Institutes of Health under award number P30 CA023074. The content is solely the responsibility of the authors and does not necessarily represent the official views of the funding agencies or the University of Arizona.

Compliance with Ethical Standards

Ethical Approval: This study was granted an exempt status by the University of Arizona's Institutional Review Board because it used de-identified data and therefore informed consent was waived. No human rights were violated. No animals were involved in this study.

Conflict of Interests: There are no conflicts of interest for any of the authors. These findings have not been reported elsewhere and the manuscript is not under review elsewhere, these data have not been presented elsewhere though they were presented at the annual Society for Research on Nicotine and Tobacco conference in February 2018 and will be presented at the College on Problems of Drug Dependence annual conference in June 2018, the authors have full control of all primary data and agree to allow the journal to review the data if requested.

References

1. Jamal A, King BA, Neff LJ, Whitmill J, Babb SD, Graffunder CM. Current cigarette smoking among adults - United States, 2005-2015. *MMWR Morb Mortal Wkly Rep*. 2016;65(44):1205-1211.
2. Allen AM, Oncken C, Hatsukami D. Women and smoking: the effect of gender on the epidemiology, health effects, and cessation of smoking. *Curr Addict Rep*. 2014;1(1):53-60.
3. Office on Smoking and Health (US). *Women and Smoking: a Report of the Surgeon General*. Atlanta, GA: Centers for Disease Control and Prevention. Department of Health and Human Services; 2001.
4. Lee JY, Ko YJ, Park SM. Factors associated with current smoking and heavy alcohol consumption among women of reproductive age: the Fourth Korean National Health and Nutrition Examination Survey 2007-2009. *Public Health*. 2013;127(5):473-481.
5. Office on Smoking and Health (US). *A Report of the Surgeon General The Health Consequences of Smoking: 50 Years of Progress*. Atlanta, GA: Centers for Disease Control and Prevention. Department of Health and Human Services; 2014.
6. Office on Smoking and Health (US). *Surgeon General's Report—The Health Consequences of Involuntary Exposure to Tobacco Smoke*. Atlanta, GA: Centers for Disease Control and Prevention. Department of Health and Human Services; 2006.
7. Office on Smoking and Health (US). *How Tobacco Smoke Causes Disease: the Biology and Behavioral Basis for Smoking-Attributable Disease. A Report of the Surgeon General*. Atlanta, GA: Department of Health and Human Services; 2010.
8. Jarvis MJ, Cohen JE, Delnevo CD, Giovino GA. Dispelling myths about gender differences in smoking cessation: population data from the USA, Canada and Britain. *Tob Control*. 2013;22(5):356-360.

9. Smith PH, Bessette AJ, Weinberger AH, Sheffer CE, McKee SA. Sex/gender differences in smoking cessation: a review. *Prev Med*. 2016;92:135–140.
10. Smith PH, Kasza KA, Hyland A, et al. Gender differences in medication use and cigarette smoking cessation: results from the International Tobacco Control Four Country Survey. *Nicotine Tob Res*. 2015;17(4):463–472.
11. Zhu SH, Anderson CM, Tedeschi GJ, et al. Evidence of real-world effectiveness of a telephone quitline for smokers. *N Engl J Med*. 2002;347(14):1087–1093.
12. Hollis JF, McAfee TA, Fellows JL, Zbikowski SM, Stark M, Riedlinger K. The effectiveness and cost effectiveness of telephone counselling and the nicotine patch in a state tobacco quitline. *Tob Control*. 2007;16 (Suppl 1):i53–i59.
13. Stead LF, Hartmann-Boyce J, Perera R, Lancaster T. Telephone counselling for smoking cessation. In: Stead LF, ed. *Cochrane Database of Systematic Reviews*. Chichester, UK: John Wiley & Sons, Ltd; 2013:CD002850.
14. Anderson CM, Zhu SH. Tobacco quitlines: looking back and looking ahead. *Tob Control*. 2007;16(Suppl 1):i81–i86.
15. Kerkvliet JL, Wey H, Fahrenwald NL. Cessation among state quitline participants with a mental health condition. *Nicotine Tob Res*. 2015;17(6):735–741.
16. Hayward LM, Campbell HS, Sutherland-Brown C. Aboriginal users of Canadian quitlines: an exploratory analysis. *Tob Control*. 2007;16(Suppl 1):i60–i64.
17. Mermelstein R, Hedeker D, Wong SC. Extended telephone counseling for smoking cessation: does content matter? *J Consult Clin Psychol*. 2003;71(3):565–574.
18. Hebert KK, Cummins SE, Hernández S, Tedeschi GJ, Zhu SH. Current major depression among smokers using a state quitline. *Am J Prev Med*. 2011;40(1):47–53.
19. Bush T, Zbikowski S, Mahoney L, Deprey M, Mowery PD, Magnusson B. The 2009 US federal cigarette tax increase and quitline utilization in 16 states. *J Environ Public Health*. 2012;2012:314740.
20. Biazzo LL, Froshaug DB, Harwell TS, et al. Characteristics and abstinence outcomes among tobacco quitline enrollees using varenicline or nicotine replacement therapy. *Nicotine Tob Res*. 2010;12(6):567–573.
21. Stead LF, Lancaster T. Combined pharmacotherapy and behavioural interventions for smoking cessation. In: L. F. Stead, ed. *Cochrane Database of Systematic Reviews*. Vol. 10. Chichester, UK: John Wiley & Sons, Ltd; 2012:CD008286.
22. Stead LF, Perera R, Lancaster T. A systematic review of interventions for smokers who contact quitlines. *Tob Control*. 2007;16(Suppl 1):i3–i8.
23. Jung AM, Schweers N, Bell ML, Nair U, Yuan NP. Tobacco use cessation among quitline callers who implemented complete home smoking bans during the quitting process. *Prev Chronic Dis*. 2017;14:E105.
24. Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The fagerström test for nicotine dependence: a revision of the fagerström tolerance questionnaire. *Br J Addict*. 1991;86(9):1119–1127.
25. Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *J Pers Soc Psychol*. 1986;51(6):1173–1182.
26. Harrell FE. *Regression Modeling Strategies: with Applications to Linear Models, Logistic Regression, and Survival Analysis*. New York: Springer; 2001.
27. Azur MJ, Stuart EA, Frangakis C, Leaf PJ. Multiple imputation by chained equations: what is it and how does it work? *Int J Methods Psychiatr Res*. 2011;20(1):40–49.
28. Korhonen HJ, Niemensivu H, Piha T, et al. National TV smoking cessation program and contest in Finland. *Prev Med*. 1992;21(1):74–87.
29. Hymowitz N, Cummings KM, Hyland A, Lynn WR, Pechacek TF, Hartwell TD. Predictors of smoking cessation in a cohort of adult smokers followed for five years. *Tob Control*. 1997;6(Suppl 2):S57–S62.
30. Matheny KB, Weatherman KE. Predictors of smoking cessation and maintenance. *J Clin Psychol*. 1998;54(2):223–235.
31. Wiśniewska M, Kowalska A, Szpak A. Factors influencing the maintenance of nicotine abstinence among the habitants of the region of Łódź and Kalisz in the years 1996–2003. *Rocz Akad Med Białymst*. 2005;50(Suppl 1):238–240.
32. Burns EK, Levinson AH, Deaton EA. Factors in nonadherence to quitline services: smoker characteristics explain little. *Health Educ Behav*. 2012;39(5):596–602.
33. North American Quitline Consortium. Quitline Service Offering Models: a Review of the Evidence and Recommendations for Practice in Times - North American Quitline Consortium. Available at <http://www.naquitline.org/news/88491/Quitline-Service-Offering-Models-A-Review-of-the-Evidence-and-Recommendations-for-Practice-in-Times.htm>. Accessibility verified November 28, 2017.
34. Copeland AL, Martin PD, Geiselman PJ, Rash CJ, Kendzor DE. Smoking cessation for weight-concerned women: group vs. individually tailored, dietary, and weight-control follow-up sessions. *Addict Behav*. 2006;31(1):115–127.
35. Jeffery RW, Hennrikus DJ, Lando HA, Murray DM, Liu JW. Reconciling conflicting findings regarding postcessation weight concerns and success in smoking cessation. *Health Psychol*. 2000;19(3):242–246.
36. Weinberger AH, Smith PH, Allen SS, et al. Systematic and meta-analytic review of research examining the impact of menstrual cycle phase and ovarian hormones on smoking and cessation. *Nicotine Tob Res*. 2015;17(4):407–421.
37. Bush TM, Levine MD, Magnusson B, et al. Impact of baseline weight on smoking cessation and weight gain in quitlines. *Ann Behav Med*. 2014;47(2):208–217.
38. Smith PH, Weinberger AH, Zhang J, Emme E, Mazure CM, McKee SA. Sex differences in smoking cessation pharmacotherapy comparative efficacy: a network meta-analysis. *Nicotine Tob Res*. 2017;19(3):273–281.