Racial/Ethnic Disparities in the Use of Nicotine Replacement Therapy and Quit Ratios in Lifetime Smokers Aged 25-44

Steven S. Fu[1,2], **Molly M. Kodl**[1], **Anne M. Joseph**[2], **Dorothy K. Hatsukami**[2], **Eric O. Johnson**[3], **Naomi Breslau**[4], **Baolin Wu**[2], and **Laura Bierut**[5]

[1]*Center for Chronic Disease Outcomes Research (a VA HSR&D Center of Excellence), Minneapolis Veterans Affairs Medical Center, Minneapolis, MN*

[2]*University of Minnesota, Minneapolis, MN*

[3]*Research Triangle Institute International, Research Triangle Park, NC*

[4]*Michigan State University, East Lansing, MI*

[5]*Washington University School of Medicine, St. Louis, MO*

Abstract

We examined racial/ethnic variations in the use of nicotine replacement therapy (NRT) and quit ratios among Caucasian, African American, Asian, and Latino lifetime smokers aged 25-44. We conducted cross-sectional analyses using data from individuals (N=27,031) screened for enrollment in the Collaborative Study of the Genetics of Nicotine Dependence (COGEND). Participants were randomly sampled from three Midwestern metropolitan areas using HMO membership lists in Detroit, MI and Minneapolis, MN, and a driver's license registry in St. Louis, MO from March, 2003 through August, 2005. A telephone survey collected information on smoking history, previous quit attempts, and sociodemographic characteristics. Among lifetime smokers (n=9216), univariate analysis indicated that African Americans (22%) and Latinos (22%) were significantly less likely to report having ever used NRT for smoking cessation than Caucasians (31%). Asians (22%) also reported lower rates of using NRT than Caucasians, but this difference was marginally significant (*p*=.06). These disparities persisted in multivariate analysis for African Americans (adjusted OR=0.76, 95% CI=0.63, 0.91, *p*<0.01) but not for Latinos (adjusted OR=0.76, 95% CI=0.54, 1.06, *p*=0.11) or Asians (adjusted OR=0.98, 95% CI=0.60, 1.60, *p*=0.95). As measured by the quit ratio, African Americans (35%) were less likely to have quit smoking than Caucasians (52%). This disparity persisted in multivariate logistic regression (adjusted OR=0.66, 95% CI=0.56, 0.78, *p*<0.001). Asian and Latino smokers were as likely as Caucasians to report smoking cessation. Future prospective studies are needed to assess whether lower utilization of cessation treatments such as NRT contribute to the observed disparity in quit ratios for African Americans.

Keywords

Smoking cessation; nicotine replacement therapy; disparities; race/ethnicity; African Americans; Latinos; Asian Americans

---

Corresponding author: Steven S. Fu, MD, MSCE, Center for Chronic Disease Outcomes Research (CCDOR), VA Medical Center (152/2E), One Veterans Drive, Minneapolis, MN 55417, Phone: (612) 467-2582, Fax: (612) 467-5699, Email: Steven.Fu@va.gov.

Introduction

Increasing evidence indicates the presence of racial/ethnic disparities in tobacco use cessation rates (1,2). For example, Latino, Asian, and African American smokers are more likely to attempt cessation than Caucasian smokers, but they do not report having higher successful cessation rates (1). In 2000, smoking cessation rates as indicated by the quit ratio (i.e., percentage of lifetime smokers who have quit smoking) were lower among African Americans (37.5%) and Hispanics (42.9%), compared to Caucasians (50.4%) (2). These lower cessation rates do not appear to be explained by socioeconomic factors (3). Potential explanations for these racial/ethnic differences include, among others, different patterns of smoking behavior (e.g., differences in nicotine dependence) and utilization of evidence based cessation treatments, such as nicotine replacement therapy (NRT) (4,5). There is, however, a lack of information regarding the methods that different racial/ethnic minority groups use to stop smoking, especially among younger smokers.

Smoking cessation conveys tremendous health and economic benefits and the benefit yielded is greater for those who quit at a younger age. It is estimated that most of the excess mortality from smoking could be avoided by quitting by age 35 (6). In the United States, smoking rates peak in the 25-44 year age bracket. In 2005, the current smoking rate was 24.1% among adults aged 25-44 compared to 20.9% overall, a rate far higher than the *Healthy People 2010* objective of less than 12% (7). Current national smoking cessation guidelines recommend nicotine replacement therapy as a first-line therapy to increase the likelihood of successful cessation during a quit attempt (8). The nicotine patch, nicotine gum, and nicotine lozenge are available over-the-counter without a prescription. Despite the increased availability of NRT and other cessation treatments, trends in the quit ratio among adults aged 25-44 stopped increasing in the 1990's and actually decreased from 37.1% in 1992 to 34.8% in 2000 (2).

There is also growing evidence of racial/ethnic disparities in tobacco treatment, including lower utilization of evidence-based treatment such as NRT (4,5,9,10), lower rates of physician advice, and physician assistance to quit smoking (11-13). The first study to document disparities in NRT was an analysis of the 1996 California Tobacco Survey (9). African Americans, Latinos, and Asians were 2-3 times less likely to use NRT than Caucasians, but there was no adjustment for potential confounding from differences in sociodemographic factors and smoking history. Two subsequent studies verified disparities in NRT use adjusting for sociodemographic factors and smoking history, but one study only compared Latinos to Caucasians (5). While it included a diverse sample of veterans, the other study was conducted primarily among male older smokers over 50 (4). No study has been conducted among a diverse sample of younger smokers. This represents a significant gap in the literature, especially given the importance of targeting younger smokers for smoking cessation interventions.

The purpose of the present cross-sectional analysis was to examine racial/ethnic variations in the utilization of NRT and quit ratios among a diverse, population-based sample of younger lifetime smokers aged 25-44. We examined the use of NRT because it is recommended by national smoking cessation guidelines for all smokers to aid quit attempts (8) and is the most common treatment utilized by smokers during aided cessation attempts (9). We tested the hypotheses that racial/ethnic minorities would be less likely to have ever used NRT for smoking cessation and less likely to have quit smoking as measured by the quit ratio. To address the limitations of prior studies that examined racial/ethnic differences, we conducted multivariate analyses controlling for racial/ethnic group differences in smoking history, including age of smoking initiation and nicotine dependence level, as well as sociodemographic characteristics.

Methods

Study Design and Sample

We conducted a cross-sectional analysis using baseline data from adults (N=27,031) screened for enrollment in the Collaborative Study of the Genetics of Nicotine Dependence (COGEND), a case-control study on the genetics of nicotine dependence. Individuals aged 25-44 years from three metropolitan areas in the Midwest were randomly sampled using Health Maintenance Organization (HMO) membership lists in Detroit, MI and Minneapolis, MN, and a driver's license registry in St. Louis, MO. The response rate for the screening survey was 40% overall and similar across the three sites. For the present analysis, the sample was limited to lifetime smokers (i.e., individuals who had ever smoked more than 100 cigarettes) who were of Caucasian (n = 7907), African American (n = 955), Latino (n = 246), and Asian (n = 108) race/ethnicity. Lifetime smokers who were multiracial or of other race (n = 387) were excluded.

Measures

Outcome Variables—The main outcome variables of interest for the present analyses were 1) prior use of nicotine replacement therapy (e.g., the nicotine patch or gum) and 2) smoking status (as indicated by cigarette smoking in the past month).

Main Independent Variable—The main independent variable of interest was race/ethnicity, self-reported, and classified in the following categories: White/Caucasian, African American/Black, Hispanic/Latino, and Asian. Race and ethnicity were assessed as two separate questions on the telephone survey. Participants who indicated multi-racial status or other race were coded as "other" and were not included in this analysis (n=387). In this analysis, participants who indicated they were of Hispanic/Latino ethnicity were classified as Hispanic/Latino regardless of race.

Covariates—Covariates included age, gender, years of education, marital status (dichotomized as married or not married), employment (categorized as full time, out of work/disabled/retired, and part-time/homemaker/student). Smoking history and nicotine dependence were measured with several items, including the number of cigarettes per day at the time when participants were smoking the most, the duration of time to first morning cigarette (categorized as within or greater than 30 minutes), age of initiation of regular smoking, and the time of transition between first experimentation with cigarettes and regular smoking. Use of tobacco products, other than cigarettes and nicotine replacement products, such as cigars, was also measured.

Statistical Analysis—Presented first are the sample demographic and smoking history characteristics, stratified by race/ethnicity. A series of logistic regression models were then estimated to examine the unadjusted effects of race/ethnicity, demographics and smoking history on the use of nicotine replacement therapy and on the likelihood of quitting smoking. To evaluate the independent contribution of race/ethnicity two stepwise multivariate logistic regression models with backward elimination (criterion of $p < .05$) were used to model the links between race/ethnicity, demographic, and smoking history variables on the use of NRT and on the likelihood of quitting smoking. Only variables significantly associated with use of NRT or quitting smoking in univariate analyses were considered in the final backward selection models, with the exception of age and gender, which were forced into these multivariate models.

Results

There were 27,031 participants who were screened for participation in the COGEND case-control study. Of these, 9603 (36%) were lifetime smokers and 4764 (18%) were current smokers. The final sample included in this analysis consisted of 9216 lifetime smokers and 86% were Caucasian, 10% African American, 3% Latino, and 1% Asian.

Almost all (97%) of the lifetime smokers aged 25-44 had health insurance. The sample characteristics, stratified by participant race/ethnicity, are presented in Table 1. There were numerous demographic and smoking history differences by race/ethnicity. The average age of lifetime smokers was 36.4 years (SD = 5.3) and the majority were female, with the exception of Asian lifetime smokers who were mostly male. African Americans were less likely to be married and less likely to have advanced education. African Americans and Asians reported a significantly later age of initiation of regular smoking than Caucasians. Caucasians reported the heaviest levels of smoking, as compared to other participants; however, African Americans were more likely to report a shorter amount of time to their first cigarette of the day.

Use of Nicotine Replacement Therapy

Prior use of NRT was significantly associated with race/ethnicity, demographics and smoking history in univariate analyses. For example, Caucasians were significantly more likely to report use of NRT than were African Americans and Latinos (see Table 2). Caucasians also reported higher rates of NRT use than Asians, but this difference was marginally significant ($p = .06$). Participants who were older, had ever used other tobacco products, and had higher levels of nicotine dependence when they were smoking the most, as indicated by an earlier time to first cigarette and heavier smoking, were also more likely to report use of NRT. To evaluate the independent effect of race/ethnicity variables with significant univariate associations with quitting smoking were considered in a multivariate stepwise model (Table 3). All possible interactions for the selected variables were tested, but were not significant at the 0.05 level. The final model indicated that African Americans (adjusted OR = 0.76, 95% CI = 0.63, 0.91, $p < .01$) were less likely to have ever used NRT products for smoking cessation than Caucasians. The differences between Latinos and Asians compared to Caucasians observed in univariate analysis were no longer present. Both heavier smoking and an earlier time to first cigarette increased the odds of using NRT. Other independent factors associated with increased likelihood of use of NRT included female gender, having ever used other tobacco products, and higher levels of education.

Smoking Cessation/Quit Ratio

Among lifetime smokers, significant factors negatively associated with smoking cessation in univariate analysis were African American race/ethnicity, higher levels of nicotine dependence when they were smoking the most, and being out of work, disabled, or retired (see Table 4). Significant factors positively associated with smoking cessation were older age, being married, and having more years of education. The final adjusted multivariate logistic regression model showed that African Americans were significantly less likely to quit smoking than were Caucasians (OR = 0.66, 95% CI = 0.56, 0.78, $p < .001$, Table 5). Asians and Latinos lifetime smokers were as likely as Caucasians to report smoking cessation. Nicotine dependence level was negatively related to cessation. Participants whose first daily cigarette was smoked within 30 minutes of wakefulness were nearly half as likely to have quit smoking (OR = 0.55, 95% CI = 0.50, 0.61, $p < .001$). Higher levels of cigarettes per day during a participant's peak period of smoking was associated with reduced odds of cessation (OR = 0.81, 95% CI = 0.76, 0.86, $p < .001$). In addition, higher levels of education, older age, being married, and male gender were independently associated with increased likelihood of cessation.

Discussion

Data regarding racial/ethnic variations in use of NRT among smokers aged 25-44 years, a critical age for intervention, are lacking. In this sample of lifetime smokers aged 25-44, African American smokers were significantly less likely than Caucasian smokers to have ever used NRT for smoking cessation. This disparity persisted even after controlling for sociodemographic factors and smoking history (e.g., nicotine dependence). Although Latino and Asian smokers were less likely to use NRT in unadjusted analyses, this finding did not persist after controlling for sociodemographic factors and smoking history.

Our findings provide further evidence of racial/ethnic disparities in tobacco treatment by being consistent with findings of previous population-based studies documenting disparities in the use of nicotine replacement therapy (9-10). Our findings are also consistent with a study of veterans receiving care from the Veterans Health Administration, an equal access healthcare system (4). This study consisted primarily of male smokers over the age of 50 and found that African American smokers were significantly less likely to use NRT than Caucasian smokers after adjusting for sociodemographic factors, smoking history, psychological factors, and health status (adjusted OR 0.53, 95% CI 0.34-0.83). Our study, however, did not replicate the findings of a study using data from the 2001 Colorado Tobacco Attitudes and Behaviors, which observed that Latino smokers were less likely than non-Latino smokers to use NRT (adjusted OR 0.31, 95% CI, 0.17-0.57) (5). In our study, the number of Latinos was relatively small and the point estimate of the effect was in the same direction but not-statistically significant.

Compared to national samples (e.g., the national health interview survey), our study sample consisted primarily of individuals with health insurance with lower than national average rates of lifetime and current smoking. This may limit generalizeability of the study findings as individuals in this study likely have greater access to health care than national samples. Despite this, we still observed significant racial/ethnic disparities, suggesting that factors beyond access to care are responsible for the observed disparities in NRT utilization. Provider and system level factors are likely sources. Even though guidelines recommend that health care providers address tobacco use at every clinical visit, there is often a lack of skill, interest, and time to deliver quality tobacco cessation interventions. Time constraints also limit actual delivery of cessation services during busy clinic visits and providers may be less likely to intervene with racial/ethnic minority smokers who may have more competing demands and "more pressing" medical concerns. In addition, physicians' interpersonal behaviors have a profound effect on patient utilization, adherence, and outcomes (14). This is especially relevant for racial/ethnic minorities. Studies of disparities in quality of provider interpersonal behavior repeatedly demonstrate lower encounter quality when Caucasian physicians are interacting with non-Caucasian vs. Caucasian patients (15). For example, low income and African American race are predictive of physicians adopting a "narrowly biomedical" communication pattern, characterized by low patient control of communication, high levels of physician biomedical information giving, and close-ended question-asking(16). Interventions addressing provider and system barriers to delivery of smoking cessation treatments for racial/ethnic minority populations are sorely needed.

Recent findings suggest that patient beliefs, attitudes, and preferences may also be important determinants of decisions to use smoking cessation treatment. Audrain-McGovern et al. (17) examined correlates of participation in a smoking cessation trial among younger adults (aged 18 to 30). Race was a significant predictor of participation in the trial and Caucasians, as compared to non-Caucasians, were six times more likely to participate in the behavioral smoking cessation interventions. Thus, even when smoking cessation care is available, minority smokers may be less likely to utilize it. Potential reasons that may contribute to minority smokers' decisions to not use treatment include mistrust of physicians, negative

attitudes towards treatment, skepticism about their effectiveness, lack of knowledge regarding the functional benefits of treatment (e.g., medications can be used to relieve withdrawal symptoms), and concerns about medication side effects (18). More research is needed to understand the role of patient beliefs, attitudes, and preferences in decisions to utilize smoking cessation care and to identify effective strategies for increasing consumer demand for evidence-based cessation treatments.

Our study is also consistent with prior research that African American smokers are less likely to quit smoking (1,2,19,20), independent of sociodemographic factors (3), and adds to this research because we also controlled for smoking history (e.g., nicotine dependence and age of initiation). However, other studies indicate that controlling for population differences in age of smoking initiation (21) or sociodemographic factors (22,23) dramatically attenuates or eliminates observed differences between African Americans and Caucasians. For example, an analysis of the CARDIA study, a longitudinal study of young adults (18-35 years) observed markedly lower 10-year cessation rates among African Americans than Caucasians (25% vs 35%, crude OR 0.62 for women; 19% vs. 31%, crude OR 0.52 for men), but these differences were no longer significant after adjustment for socioeconomic factors (22). A recent analysis of the National Health Interview Survey 1990-2000 found that in each year Caucasians were more likely to quit smoking than African Americans (23). The differences between Caucasians and African Americans diminished after 1994 and were substantially attenuated after controlling for sociodemographic factors, though still significant with adjusted odds ratios near 1.5. It is possible that the racial/ethnic differences in our study findings are related to differences in sample size or in study design as we conducted a cross-sectional study while the CARDIA study was longitudinal and the King et al. study analyzed multiple years of cross-sectional data.

Possible explanations for the observed differences in the smoking cessation quit ratio between African Americans and Caucasians include differences in smoking patterns. African Americans are more likely to smoke menthol cigarettes that are higher in tar and nicotine and hence, may be more addictive and more difficult to quit smoking compared to plain cigarettes (24). In the United States, 69% of African Americans smoke menthol cigarettes compared to 23% of Caucasians, 29% of Latinos, and 29% of Asians (25). Further, menthol smoking rates are particularly high among younger smokers. It has been suggested that menthol cigarette smoking may contribute to the existing tobacco-related health disparities between African Americans and Caucasians (26). However, only a few studies have examined the association between menthol cigarette smoking and cessation (24,27-29). The findings from these studies are inconclusive. A recent secondary analysis of a randomized controlled trial of bupropion among 600 African Americans found that menthol smoking was associated with lower short-term (6 weeks) cessation, but not long-term (6 months) cessation (30). Of note, the decreased short-term cessation rates for menthol smokers was only observed for participants who were less than 50 years of age and who had received bupropion.

Another possible explanation for the observed racial/ethnic differences in quit ratios is differences in access and utilization of smoking cessation care. In this study we observed significant racial/ethnic disparities in the use of NRT, which raises the question of whether lower rates of NRT use contribute to lower smoking cessation rates among African Americans. Our study, however, is not able to address this question. A clear temporal sequence cannot be established due to the cross-sectional nature of the study design. If we attempted to examine the association between prior use of NRT and quit ratios, we would not know whether we are examining the effect of using NRT on cessation versus the effect of continuing to smoke on likelihood of using NRT.

The strengths of this study include the size and diversity of the study sample, particularly for African Americans, as data regarding smoking cessation behaviors in racial/ethnic minority

groups are sparse. However, the cell sizes for Latinos and Asians were relatively small and limit reaching firm conclusions about these latter two groups. Another strength of the study is that we controlled for smoking history (e.g., nicotine dependence level), as well as sociodemographic factors in our multivariate analysis. Our study, however, has several potential limitations. First, in regard to the use of race/ethnicity in this analysis, the operational definition allows racial comparisons (e.g., African American vs. White) to be disentangled from ethnicity. However, because Latino ethnicity is not exclusive to one particular race, for comparisons between Caucasians and Latinos, one is not able to separate out the independent contribution of Hispanic/Latino ethnicity from race. Second, we relied on self-reported assessment of use of NRT and smoking status, but previous studies indicate that misreporting rates are low in minimal intensity studies such as those involving surveys (31). Third, the overall response rate for the screening survey was 40% and there is potential for non-response bias. However, we would expect non-respondents to be more disadvantaged than respondents, and if response bias was present, it would likely have a null effect on our findings. In other words, if bias is present, the observed racial/ethnic differences may be an underestimate.

An interesting observation was that education and use of NRT was inversely associated in unadjusted analyses but positively associated in multivariate analysis. We suspect that this association between education and NRT use in unadjusted analyses is confounded by nicotine dependence level. Education and nicotine dependence are strongly associated in that individuals with lower education have higher nicotine dependence levels (i.e., higher cigarettes per day and shorter time to first cigarette). After adjusting for nicotine dependence, education is positively associated with use of NRT. In previous research, higher education has been observed to be associated with greater likelihood of using NRT (32).

In conclusion, further research is needed to assess the potential factors contributing to the observed racial/ethnic disparities in utilization of NRT and smoking cessation quit ratios. For example, research is needed examining the patient, provider, and system-level factors that contribute to racial/ethnic disparities in use of NRT. Future prospective studies are needed to assess whether lower utilization of cessation treatments such as NRT contribute to the observed disparity in quit ratios for African Americans. In addition, the role of menthol cigarette smoking and its effect on cessation should be examined in prospective studies. Environmental, social, cultural, and genetic factors may also be important. Current national smoking cessation guidelines recommend that all smokers be offered tobacco cessation treatment that includes pharmacotherapy. In particular, the 25-44 year age group should be a priority target population for cessation interventions because this age group has 1) high rates of smoking, and 2) stands to yield the greatest health benefits. However, due to being relatively young and healthy, this age group may have less frequent health care provider visits where most cessation interventions may occur. Therefore, alternative approaches for tobacco cessation intervention outside the health care setting should be considered. Finally, culturally appropriate interventions need to be developed to increase use of evidence-based pharmacologic and behavioral treatments during attempts to quit smoking by racial/ethnic minority smokers.

References

1. U.S. Department of Health and Human Services. Tobacco Use Among U.S. Racial/Ethnic Minority Groups- African Americans, American Indians and Alaska Natives, Asian Americans and Pacific Islanders, and Hispanics: A Report of the Surgeon General. Atlanta, GA: U.S Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1998.

2. Giovino GA. Epidemiology of tobacco use in the United States. Oncogene 2002;21:7326–40. [PubMed: 12379876]

3. Novotny TE, Warner KE, Kendrick JS, Remington PL. Smoking by blacks and whites: socioeconomic and demographic differences. Am J Public Health 1988;78:1187–9. [PubMed: 3407817]

4. Fu SS, Sherman SE, Yano EM, Van Ryn M, Lanto AB, Joseph AM. Ethnic disparities in the use of nicotine replacement therapy for smoking cessation in an equal access health care system. Am J Health Promot 2005;20:108–16. [PubMed: 16295702]

5. Levinson AH, Perez-Stable EJ, Espinoza P, Flores ET, Byers TE. Latinos report less use of pharmaceutical aids when trying to quit smoking. Am J Prev Med 2004;26:105–11. [PubMed: 14751320]

6. Taylor DH Jr, Hasselblad V, Henley SJ, Thun MJ, Sloan FA. Benefits of smoking cessation for longevity. Am J Public Health 2002;92:990–6. [PubMed: 12036794]

7. CDC. Tobacco use among adults--United States, 2005. MMWR 2006;55:1145–8. [PubMed: 17065979]

8. Fiore, MC.; Bailey, WC.; Cohen, SJ., et al. Clinical Practice Guideline. Rockville, MD: U.S. Department of Health and Human Service, Public Health Service; 2000. Treating Tobacco Use and Dependence.

9. Zhu SH, Melcer T, Sun J, Rosbrook B, Pierce JP. Smoking cessation with and without assistance: A population-based analysis. Am J Prev Med 2000;18:305–11. [PubMed: 10788733]

10. Thorndike AN, Biener L, Rigotti NA. Effect on smoking cessation of switching nicotine replacement therapy to over-the-counter status. Am J Public Health 2003;92:437–42. [PubMed: 11867326]

11. Hymowitz N, Jackson J, Carter R, Eckholdt H. Past quit smoking assistance and doctors' advice for white and African- American smokers. J Natl Med Assoc 1996;88:249–52. [PubMed: 8648661]

12. Doescher MP, Saver HG. Physician's advice to quit smoking- The glass remains half empty. J Fam Pract 2000;49:543–7. [PubMed: 10923556]

13. Collins, KC.; Hughes, DL.; Doty, MM.; Ives, BL.; Edwards, JN.; Tenney, K. Findings from the Commonwealth Fund 2001 health care quality survey. New York, NY: The Commonwealth Fund; 2002. Diverse communities, common concerns: Assessing health care quality for minority Americans.

14. Roter DL, Hall JA, Katz NR. Relations between physicians' behaviors and analogue patients' satisfaction, recall, and impressions. Med Care 1987;25:437–51. [PubMed: 3695654]

15. Cooper LA, Roter DL, Johnson RL, Ford DE, Steinwachs DM, Powe NR. Patient-centered communication, ratings of care, and concordance of patient and physician race. Ann Intern Med 2003;139:907–15. [PubMed: 14644893]

16. Roter DL, Stewart M, Putnam SM, Lipkin M Jr, Stiles W, Inui TS. Communication patterns of primary care physicians. JAMA 1997;277:350–6. [PubMed: 9002500]

17. Audrain-McGovern J, Halbert CH, Rodriguez D, Epstein LH, Tercyak KP. Predictors of participation in a smoking cessation program among young adult smokers. Cancer Epidemiol Biomarkers Prev 2007;16:617–9. [PubMed: 17337647]

18. Fu SS, Burgess D, Van Ryn M, Hatsukami DK, Solomon J, Joseph AM. Views on smoking cessation methods in ethnic minority communities: a qualitative investigation. Prev Med 2007;44:235–40. [PubMed: 17175016]

19. Royce JM, Hymowitz N, Corbett K, Hartwell TD, Orlandi MA. Smoking cessation factors among African Americans and Whites. COMMIT Research Group. Am J Public Health 1993;83:220–6. [PubMed: 8427327]

20. Pederson LL, Ahluwalia JS, Harris KJ, McGrady GA. Smoking cessation among African Americans: what we know and do not know about interventions and self-quitting. Prev Med 2000;31:23–38. [PubMed: 10896841]

21. McGrady GA, Pederson LL. Do sex and ethnic differences in smoking initiation mask similarities in cessation behavior? Am J Public Health 2002;92:961–5. [PubMed: 12036790]

22. Kiefe CI, Williams OD, Lewis CE, Allison JJ, Sekar P, Wagenknecht LE. Ten-year changes in smoking among young adults: are racial differences explained by socioeconomic factors in the CARDIA study? Am J Public Health 2001;91:213–8. [PubMed: 11211629]

23. King G, Polednak A, Bendel RB, Vilsaint MC, Nahata SB. Disparities in smoking cessation between African Americans and Whites: 1990-2000. Am J Public Health 2004;94:1965–71. [PubMed: 15514238]

24. Okuyemi KS, Ebersole-Robinson M, Nazir N, Ahluwalia JS. African-American menthol and nonmenthol smokers: differences in smoking and cessation experiences. J Natl Med Assoc 2004;96:1208–11. [PubMed: 15481749]

25. Giovino GA, Sidney S, Gfroerer JC, et al. Epidemiology of menthol cigarette use. Nicotine Tob Res 2004;6(Suppl 1):S67–81. [PubMed: 14982710]

26. Clark PI, Gardiner PS, Djordjevic MV, Leischow SJ, Robinson RG. Menthol cigarettes: setting the research agenda. Nicotine Tob Res 2004;6(Suppl 1):S5–9. [PubMed: 14982704]

27. Hyland A, Garten S, Giovino GA, Cummings KM. Mentholated cigarettes and smoking cessation: findings from COMMIT. Community Intervention Trial for Smoking Cessation. Tob Control 2002;11:135–9. [PubMed: 12035007]

28. Muscat JE, Richie JP Jr, Stellman SD. Mentholated cigarettes and smoking habits in whites and blacks. Tob Control 2002;11:368–71. [PubMed: 12432163]

29. Pletcher MJ, Hulley BJ, Houston T, Kiefe CI, Benowitz N, Sidney S. Menthol cigarettes, smoking cessation, atherosclerosis, and pulmonary function: the Coronary Artery Risk Development in Young Adults (CARDIA) Study. Arch Intern Med 2006;166:1915–22. [PubMed: 17000950]

30. Okuyemi KS, Ahluwalia JS, Ebersole-Robinson M, Catley D, Mayo MS, Resnicow K. Does menthol attenuate the effect of bupropion among African American smokers? Addiction 2003;98:1387–93. [PubMed: 14519175]

31. SRNT Subcommittee on Biochemical Verification. Biochemical verification of tobacco use and cessation. Nicotine Tob Res 2002;4:149–59. [PubMed: 12028847]

32. Alberg AJ, Patnaik JL, May JW, Hoffman SC, Gitchell J, Comstock GW, Helzlsouer KJ. Nicotine replacement therapy use among a cohort of smokers. J Addictive Diseases 2005;24:101–113.

Table 1

Demographic Characteristics and Smoking History for Lifetime Smokers Aged 25-44 Years by Race/Ethnicity (N = 9216)

Characteristic	Caucasian (n=7907)	African American (n=955)	Latino (n=246)	Asian American (n=108)	P value
Age, years ± SD	36.3 ± 5.3	37.1 ± 5.1	35.6 ± 5.4	35.0 ± 5.5	<.001
Age of smoking initiation, years ± SD	17.0 ± 3.5	19.6 ± 5.1	17.1 ± 3.8	18.9 ± 3.2	<.001
Time of transition to regular smoking, years ± SD	2.93 ± 3.26	3.39 ± 4.31	2.94 ± 3.30	2.57 ± 2.59	.90
	%	%	%	%	
Gender					<.001
Female	58%	60%	58%	21%	
Male	42%	40%	42%	79%	
Marital status					<.001
Married	74%	48%	72%	78%	
Not married	26%	52%	28%	22%	
Education					<.001
< 12 years	4%	10%	8%	1%	
12 years	26%	33%	33%	12%	
13-15 years	30%	40%	29%	20%	
≥16 years	40%	17%	30%	67%	
Employment status					<.001
Full-time	74%	79%	69%	89%	
Part-time/homemaker/student	22%	11%	24%	7%	
Out of work/disabled/retired	4%	10%	7%	4%	
Ever used other tobacco products					<.001
No	39%	55%	45%	38%	
Yes	61%	45%	55%	62%	
Time to first cigarette, when smoking the most					<.001
> 30 minutes after waking	53%	48%	63%	58%	
≤30 minutes after waking	47%	52%	37%	42%	
Cigarettes per day when smoking the most					<.001
10 or less	32%	54%	50%	59%	
11-20	39%	34%	32%	29%	
21-30	16%	7%	10%	7%	
31 or more	13%	5%	9%	6%	

SD, standard deviation

Table 2

Univariate Analysis of Predictors of Prior Use of NRT in Lifetime Smokers (N = 9216)[*]

Variable	Percentage Ever Used NRT	P value	OR for Ever Used NRT	95% CI	P value
Race/Ethnicity		<.001			
Caucasian	31		1.0	Reference	
African American	22		0.64	0.55, 0.75	<.001
Latino	22		0.62	0.46, 0.84	<.01
Asian American	22		0.65	0.41, 1.02	.06
Gender		.84			
Female	30		1.0	Reference	
Male	29		.99	0.91, 1.09	.82
Marital status		.32			
Not married	30		1.0	Reference	
Married	29		0.95	0.87, 1.05	.35
Employment status		<.001			<.001
Full-time	30		1.0	Reference	
Part-time/homemaker/student	28		0.90	0.81, 1.01	.08
Out of work/disabled/retired	38		1.47	1.20, 1.81	<.001
Ever used other tobacco products		.001			
No	28		1.0	Reference	
Yes	31		1.16	1.06, 1.27	<.01
Time to first cigarette, when smoking the most		<.001			
>30 minutes after waking	17		1.0	Reference	
≤30 minutes after waking	43		3.65	3.31, 4.01	<.001
Cigarettes per day, when smoking the most[†]	na		2.10	2.00, 2.20	<.001
Age	na		1.02	1.01, 1.03	<.001
Age of smoking initiation	na		0.94	0.93, 0.95	<.001
Time of transition to regular smoking	na		0.97	0.95, 0.98	<.001
Education[‡]	na		0.86	0.82, 0.91	<.001

NRT, nicotine replacement therapy; OR, odds ratio; CI, confidence interval; na, not applicable

[*] Percentages and Odds Ratios are unadjusted.

[†] Cigarettes per day treated as an ordinal variable.

[‡] Education treated as an ordinal variable.

Table 3

Logistic Regression Analysis Predictors of Use of NRT in Lifetime Smokers Aged 25-44 (N = 9216)

Model[§]	OR	95% CI	*P* value
Use of NRT			
Race/Ethnicity			
Caucasian	1.0	Reference	
African American	0.76	0.63, 0.91	<.01
Latino	0.76	0.54, 1.06	.11
Asian American	0.98	0.60-1.60	.95
Gender			
Female	1.0	Reference	
Male	0.73	0.65-0.82	<.001
Ever used other tobacco products			
No	1.0	Reference	
Yes	1.19	1.07, 1.35	<.01
Time to first cigarette, when smoking the most			
> 30 minutes after waking	1.0	Reference	
≤30 minutes after waking	2.13	1.91, 2.38	<.001
Cigarettes per day, when smoking the most [**]	1.76	1.66, 1.86	<.001
Age	1.00	0.99-1.01	.34
Education[††]	1.07	1.01, 1.13	.02

NRT, nicotine replacement therapy; OR, odds ratio; CI, confidence interval

[§]Logistic regression models controlled for site. All possible interactions for the variables selected for the multivariate model were tested, but were not statistically significant at the 0.05 level. A forced-entry simultaneous model of the significant covariates with race/ethnicity showed similar results.

[**]Cigarettes per day treated as an ordinal variable.

[††]Education treated as an ordinal variable.

Table 4

Univariate Analysis of Predictors of Quitting Smoking (Quit Ratio) in Lifetime Smokers (N = 9216)[‡‡]

Variable	Percentage Quit Smoking	P value	OR for Quit Smoking	95% CI	P value
Race/Ethnicity		<.001			
Caucasian	52		1.0	Reference	
African American	35		0.49	0.42, 0.56	<.001
Latino	49		0.87	0.67, 1.12	.27
Asian American	54		1.06	0.72, 1.54	.78
Gender		<.05			
Female	52		1.0	Reference	
Male	49		0.91	0.84, 0.99	<.05
Marital status		<.001			
Not married	36		1.0	Reference	
Married	57		2.37	2.16, 2.60	<.001
Employment status		<.001			
Full-time	49		1.0	Reference	
Part-time/homemaker/student	59		1.46	1.31, 1.61	<.001
Out of work/disabled/retired	31		0.47	0.38, 0.58	<.001
Ever used other tobacco products		.83			
No	51		1.0	Reference	
Yes	50		0.99	0.91, 1.08	.83
Time to first cigarette, when smoking the most		<.001			
> 30 minutes after waking	61		1.0	Reference	
≤30 minutes after waking	39		0.42	0.38, 0.45	<.001
Cigarettes per day, when smoking the most[§§]	na		0.70	0.67, 0.73	<.001
Age	na		1.02	1.01, 1.02	<.001
Age of smoking initiation	na		0.99	0.98, 1.00	.08
Time of transition to regular smoking	na		1.02	1.00, 1.03	.02
Education[***]	na		1.56	1.48, 1.63	<.001

OR, odds ratio; CI, confidence interval; na, not applicable.

[‡‡]Percentages and Odds Ratios are unadjusted.

[§§]Cigarettes per day treated as an ordinal variable.

[***]Education treated as an ordinal variable.

Table 5

Logistic Regression Analysis Predictors of Quitting Smoking (Quit Ratio) in Lifetime Smokers Aged 25-44 (N = 9216)

Model[†††]	OR	95% CI	*P* value
Quit Smoking			
Race/Ethnicity			
Caucasian	1.0	Reference	
African American	0.66	0.56, 0.78	<.001
Latino	0.84	0.63, 1.12	.24
Asian American	0.85	0.55, 1.30	.45
Gender			
Female	1.0	Reference	
Male	1.13	1.03, 1.25	.01
Marital status			
Not married	1.0	Reference	
Married	1.87	1.69, 2.08	<.001
Employment status			
Full-time	1.0		
Part-time/homemaker/student	1.31	1.16, 1.48	<.001
Out of work/disabled/retired	0.67	0.53, 0.85	.001
Time to first cigarette when smoking the most			
> 30 minutes after waking	1.0	Reference	
≤30 minutes after waking	0.55	0.50, 0.61	<.001
Cigarettes per day, when smoking the most[‡‡‡]	0.81	0.76, 0.86	<.001
Age	1.06	1.05, 1.07	<.001
Age of smoking initiation	0.96	0.95, 0.97	<.001
Education[§§§]	1.41	1.34, 1.49	<.001

OR, odds ratio; CI, confidence interval

[†††]Logistic regression models controlled for site. All possible interactions for the variables selected for the multivariate model were tested, but were not statistically significant at the 0.05 level. A forced-entry simultaneous model of the significant covariates with race/ethnicity showed similar results.

[‡‡‡]Cigarettes per day treated as an ordinal variable.

[§§§]Education treated as an ordinal variable.