

Original investigation

Correlates of Converted and Native Nondaily Smoking

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Abstract

Objectives: Nondaily smokers represent a growing proportion of current smokers in the United States. However, little is known about which characteristics are important in distinguishing between nondaily smokers who are former daily smokers (converted nondaily) and nondaily smokers who never smoked daily (native nondaily). This study contrasts converted and native nondaily smokers on demographic, psychosocial, tobacco-related characteristics and quit intentions and behaviors in a tri-ethnic sample (Blacks, Whites, and Latinos) of smokers.

Methods: Smokers were recruited for a web-based survey using an online panel survey company. Participants were 1,201 nondaily smokers (904 converted nondaily smokers and 297 native nondaily smokers). A multivariable logistic regression was conducted to assess the associations between demographic, smoking-related, and psychosocial variables with converted versus native nondaily smoking.

Results: Logistic regression indicated that number of years smoking, years as a nondaily smoker, number of days smoked in a month, smoking dependence, identity as a smoker, and number of smoking cessation methods used were correlates of being converted nondaily smokers versus native nondaily smokers.

Conclusions: Clinicians and researchers should consider characteristic variations in nondaily smokers when designing and implementing intervention efforts targeting this smoking population.

Introduction

Nondaily smoking has increased as a proportion of current smokers in the U.S. population and this trend is likely to continue.¹ Nondaily smokers have also been referred to as intermittent or occasional smokers.^{2–4} During smoking uptake, initiators often smoke nondaily until becoming established smokers, hence, this level of smoking is common among adolescent and young adult smokers.⁵ However, nondaily smoking can also be a stable pattern of smoking that may be long-term.⁶ Previous studies have documented trajectories of nondaily smokers to include increasing smoking to daily smoking, quitting, or maintaining their smoking pattern.^{7,8}

Nondaily smokers can be characterized as former daily smokers (converted nondaily smokers) and never daily smokers (native nondaily smokers).⁹ Converted nondaily smokers have lower income and less education compared to native nondaily smokers.¹⁰ Converted nondaily smokers are more likely than native nondaily smokers to smoke on more days per month, smoke more cigarettes per day (cpd),^{3,6,7,11} smoke menthol cigarettes, identify as smokers, and have higher dependence.¹² Converted nondaily smokers are more motivated to quit, more likely to successfully quit smoking, and have higher utilization of behavioral and pharmacological aids smoking cessation aids than native nondaily smokers.^{13–15} While several

studies have contrasted converted and native nondaily smokers, little is known about the relative importance of the characteristics distinguishing between converted versus native nondaily smokers. Identifying those behavioral characteristics, beliefs, and tobacco use behaviors that best account for differences between converted and native nondaily smokers will inform future interventions that could be targeted to these groups.

Converted nondaily smokers have reduced their smoking frequency to become nondaily smokers but may continue to differ from native nondaily smokers as a result of this smoking history. According to a recent study by Shiffman and others, converted nondaily smokers have greater exposure to nicotine and cigarette constituents than native nondaily smokers. They smoke more cpd than native nondaily smokers, have higher levels of urinary cotinine, and higher carbon monoxide (CO) levels.¹⁶ However, there were no statistically significant differences in cotinine levels and CO when controlling for linear cpd and quadratic cpd (i.e., the steep curve for cotinine by cpd seen up to 15–20 cpd). Additionally, they may be more successful at quitting smoking than native nondaily smokers,¹⁵ possibly because of their previous success in reducing their cigarette use. Research with daily smokers show that those who reduce by at least 25%–50% have an increased likelihood of successful quitting over time relative to other daily smokers.^{17,18} In light of these findings, converted nondaily smokers' smoking history continues to influence their levels of cigarette use and may have implications for their quitting success. Determining differences that persist even among stable nondaily smokers may assist researchers in understanding motivational and behavioral distinctions between these groups.

The aim of this study was to examine differences between converted and native nondaily smokers on demographic, tobacco-related characteristics, quit intentions and behavior, and psychosocial variables with a large, sample of Black, Latino, and White adult nondaily smokers. This study builds on previous studies that compared converted and native nondaily smokers by identifying influential correlates using multivariate analyses and including an ethnically diverse sample. Based on findings from earlier studies we hypothesized that compared to native nondaily smokers, converted nondaily smokers will: (a) have less education and lower income, (b) be less likely to use alternative tobacco products, (c) be more likely to use menthol cigarettes, (d) be more likely to self-identify as smokers, (e) report greater nicotine dependence, (f) be more likely to smoke while drinking, and (g) have higher utilization of smoking cessation assistance. Additionally, we conducted exploratory analyses for the association between converted versus native nondaily smoking and depression, perceived vulnerability to smoking-related illness, carrying cigarettes, cigarette purchasing behavior, and intention to quit.

Methods

Participants

Daily and nondaily smokers were recruited over a 6 week period (July 5, 2012 to August 15, 2012) using an online panel survey company, Survey Sampling International (SSI). SSI maintains access to an online panel of 1.5 million people in the United States, who indicated willingness to participate in online surveys on a variety of topics. SSI uses non-probability sampling to recruit participants into the panel and recruits potential panelists through a variety of websites, online communities, and social networks.¹⁹

For this study, eligible participants self-identified as belonging to one of the three largest racial and ethnic groups in the United States,

Black, White, or Latino (of any race), and were English-speaking. Eligibility criteria were established to identify stable smokers at their current smoking level and included: having smoked at least 100 cigarettes in total, smoking for at least 1 year, and smoking at their current rate (i.e., daily or nondaily) for at least 6 months. Nondaily smokers smoked at least one cigarette during 4–24 days in the past 30 days; persons who smoked three or fewer days out of the past 30 days were excluded from the study in order to sample nondaily smokers who were smoking consistently.³ The minimum age for participation was 25 years in order to exclude individuals recently initiating cigarette use, particularly among Blacks who tend to have later smoking onset.²⁰ Additional exclusion criteria included participating in any smoking cessation treatment in the past 30 days. Women who were currently pregnant or breast-feeding were also ineligible because they are likely to make at least short-term changes in their smoking.²¹

For the parent study, non-proportional quota sampling was used to obtain equal numbers of daily smokers (further stratified to light and moderate/heavy) and nondaily smokers for each of the three racial/ethnic groups. Of the 2,408 participants who completed the survey, 1,207 were daily smokers and 1,201 were nondaily smokers (i.e., 904 converted nondaily smokers and 297 native nondaily smokers). The present study sampling frame is the 1,201 nondaily smokers.

Procedures

All procedures were approved by the University of Minnesota Institutional Review Board. SSI used preliminary questions (e.g., smoking frequency) and existing participant information (e.g., race/ethnicity, age) to direct smokers to this study. Potential participants directed to the study were presented with the informed consent page. Once they provided consent, they were asked screening questions to determine eligibility. If the quota for one of the nine subgroups (three race/ethnicity groups and three smoking levels) was filled, participants with those characteristics were no longer recruited. Eligible participants were then presented with the survey questions. Additional details on the study procedures are reported elsewhere.²²

Measures

Demographics

Demographic questions assessed participants' age, race and ethnicity, gender, highest level of education, and monthly household income (dichotomized to <\$1,800, and ≥\$1,800).

Tobacco-Related Characteristics

Participants reported the number of days they smoked in the past month, average cpd on the days smoked in the past 7 days, and whether they typically smoked mentholated or non-mentholated cigarettes. Participants were asked to indicate the length of time they had been smoking cigarettes, the length of time smoking on "some days" of the month, and whether they had ever smoked daily for at least 6 months. Participants who had smoked daily for at least 6 months were categorized as converted nondaily smokers and those who had not were categorized as native nondaily smokers.

Participants reported whether they used each of the following forms of tobacco products in the past 30 days: cigars, cigarillos, little cigars, smokeless tobacco, pipes, hand rolled cigarettes, hookah. These responses were summed to calculate the total number of other forms of tobacco used in the past month. Participants were also asked whether they used e-cigarettes in the past 30 days.

Social smoking was assessed using a single-item that asked “In the past 30 days, did you smoke...” followed by three response options: “mainly when you were with others,” “mainly when you were alone,” and “as often by yourself as with others.”²³ Using the same categorization as Moran et al.,²³ we identified social smokers as those who smoked mainly with others.

Participants were asked whether they usually carry cigarettes²⁴ (yes/no) and how often they buy versus borrow cigarettes from other people.

Identity as a smoker was assessed using a two-item measure: “I consider myself a smoker” and “If someone casually asked if I was a smoker, I would say yes.”²³ Response options for these items ranged from 1 “Strongly Disagree” to 10 “Strongly Agree.” Scores for the two items were summed and scale scores ranged from 2 to 20, higher scores indicate stronger identity as a smoker.

Concurrent alcohol and tobacco use was assessed by asking “How often do you smoke cigarettes while drinking alcoholic beverages?”²⁵ Responses options ranged from 1 “never” to 4 “always.” These responses were collapsed into two categories: never/rarely and frequently/always.

Perceived vulnerability to smoking-related illness was assessed using participant’s responses to three questions, “If you continue to smoke, how likely do you think it is that you will develop...”: (a) “lung cancer,” (b) “other lung diseases,” and (c) “heart disease.”²⁶ Responses options ranged from 1 “no chance” to 7 “certain to happen.”

Nicotine dependence was assessed using two single-item indicators and the Brief Wisconsin Inventory of Smoking Dependence Motives (WISDM).²⁷ Time to first cigarette was dichotomized (smoking ≤ 30 min after waking, and smoking > 30 min); smoking within 30 min of waking denotes nicotine dependence.^{28,29} Using an item from the Cigarette Dependence Scale, participants were asked to report their level of perceived addiction to cigarettes on a scale of 0 “I am not addicted to cigarettes at all” to 100 “I am extremely addicted to cigarettes.”³⁰

The Brief WISDM is a 37-item measure consisting of 11 subscales.²⁷ For each item, participants indicated their responses on a 7-point Likert scale with anchors of “not true of me at all” = 1 and “extremely true of me” = 7 and subscale scores were calculated from the mean of corresponding items. The subscales were used to calculate an overall smoking dependence score (using the sum of all 11 subscale scores), a Primary Dependence Motives Scale (PDM), and a Secondary Dependence Motives Scale (SDM). The WISDM PDM is comprised of four subscales that assess smoking that requires little conscious control and is marked by strong cravings; this scale score was calculated using the mean of the corresponding four subscales. The WISDM SDM is comprised of the remaining seven subscales that assess instrumental and contextual effects of smoking (e.g., weight control, social/environmental goals) and the scale score is the mean of the seven subscales. Internal consistency reliabilities across three studies were 0.81–0.89 for PDM, 0.76–0.86 for SDM, and 0.84–0.91 for the WISDM total score.²⁷

Quit Intentions and Behavior

Intention to quit was assessed using a single-item measure that asked participants “What describes your intention to stop smoking completely, not even a puff? Would you say you...” response options were “Never expect to quit,” “may quit in the future, but not in the next 6 months,” “will quit in the next 6 months,” “will quit in the next 30 days.”³¹ Participants reported number of quit attempts in

the past year that lasted at least 24 hr, and longest attempt in the past year.

Participants reported whether they had ever used each of the following methods to quit: standard methods including nicotine replacement such as gum, lozenge, patch, inhaler or nasal spray, bupropion, varenicline, other medications, health care profession, class, online, and telephone counseling. Responses (yes/no) were summed to indicate the total number of smoking cessation assistance methods used.

Psychosocial Variables

The two-item Patient Health Questionnaire (PHQ-2)³² was used to assess depressive symptoms over the past 2 weeks. The first item assessed loss of interest or pleasure in doing things and the second assessed feeling down, depressed, or hopeless. Responses options for these items are “not at all,” “several days,” “more than half the days,” and “nearly every day.” Scores are summed and possible total scores range from 0–6, higher scores indicating more frequent depressive symptoms. A score of 3 or higher indicates possible depression and has a sensitivity of 61% and specificity of 92% for major depression.³³

The Alcohol Use Disorders Identification Test (AUDIT-C)³⁴ was used to assess heaviness of alcohol use. The AUDIT-C is a three-item screening measure for detecting heavy drinking and/or alcohol abuse. Responses for the three items are summed and scale scores range from 0–12. Scores of 3 or greater for women and 4 or greater for men indicates risky drinking.³⁵ This measure has demonstrated good sensitivity and specificity for detecting alcohol misuse among Blacks, Latinos, and Whites.³⁶

Analyses

Descriptive statistics were used to summarize participant characteristics by nondaily smoking history (i.e., converted vs. native). The primary goal of the analyses was to examine the association between smoking history and demographic, tobacco-related characteristics, quit intentions and behavior, and psychosocial variables using multiple logistic regressions. As some of our analyses were exploratory, we first conducted a series of analyses to describe sample differences on each variable. In order to adjust for race/ethnicity because we oversampled Black and Latino nondaily smokers, a series of multivariate analyses controlling for race were used to identify differences between native and converted nondaily smokers on each of the demographic, tobacco-related behaviors and beliefs, quit intentions and behaviors, and psychosocial characteristics (depression, alcohol use) in this sample. Multivariate logistic regressions were conducted for each variable controlling for race and adjusted *p* values are reported in Table 1.

Secondly, we created a multivariable model using logistic regression to examine the relative associations among the demographic, smoking-related, and psychosocial variables with converted versus native nondaily smoking. WISDM PDM and SDM were entered into the multivariate model as measures of nicotine dependence because previous findings showed that the WISDM scales, particularly PDM, had the strongest associations with dependence outcomes.¹² We screened all variables to be included in the logistic regression for multicollinearity and found that the perceived vulnerability items and WISDM PDM and WISDM SDM were highly correlated with each other (variance inflation factor ≥ 5). Since they assessed perceived vulnerability to different smoking-related illness and differing aspects of smoking dependence, they were allowed to remain in the

Table 1. Demographic and Smoking Characteristics for Converted and Native Nondaily Smokers

| | Total, N = 1,201 | Converted nondaily, n = 904 | Native nondaily, n = 297 | Adjusted <i>p</i> value |
|---|--------------------|-----------------------------|--------------------------|-------------------------|
| | % (n) or mean (SD) | | | |
| Demographic variables | | | | |
| Age, M (SD) | 41.38 (12.37) | 41.90 (12.37) | 39.81(12.24) | .011 |
| Race, % (n) | | | | |
| Black | 33.4 (401) | 32.63 (295) | 35.69 (106) | NA |
| Latino | 33.3 (400) | 33.19 (300) | 33.67 (100) | |
| White | 33.3 (400) | 34.18 (309) | 30.64 (91) | |
| Female, % (n) | 55.8 (670) | 56.19 (508) | 54.55 (162) | .636 |
| Education, % (n) | | | | |
| ≤High school | 24.15 (290) | 24.12% (218) | 24.24 (72) | .995 |
| ≥Some college | 75.85 (911) | 75.88% (686) | 75.76 (225) | |
| Monthly household income, % (n) | | | | |
| <\$1,800 | 37.0 (419) | 36.98% (314) | 36.97 (105) | .873 |
| ≥\$1,800 | 63.0 (714) | 63.02% (535) | 63.03 (179) | |
| Tobacco-related behavior and beliefs | | | | |
| Days smoked/past month, M (SD) | 14.52 (5.91) | 14.99 (5.85) | 13.11 (5.91) | <.001 |
| CPD on days smoked, M (SD) | 5.40 (5.25) | 5.78 (5.58) | 4.25 (3.86) | <.001 |
| Years smoking cigarettes, M (SD) | 15.99 (12.31) | 17.03 (12.69) | 12.86 (10.49) | <.001 |
| Years smoking nondaily, M (SD) | 11.45 (11.22) | 11.92 (11.70) | 10.01 (9.51) | .015 |
| Number of other forms of tobacco used in the past 30 days, M (SD) | 1.17 (1.42) | 1.20 (1.46) | 1.08 (1.29) | .166 |
| Used e-cigarettes in the past 30 days, % (n) | 9.66 (116) | 10.51% (95) | 7.07 (21) | .09 |
| Smoke menthol cigarettes, % (n) | 59.7 (717) | 60.07% (543) | 58.59 (174) | .301 |
| Usually carry cigarettes, % (n) | 57.2 (687) | 60.84% (550) | 46.13 (137) | <.001 |
| Buy vs. borrow cigarettes, % (n) | | | | |
| Buy all of their cigarettes | 48.5 (582) | 50.44 (456) | 42.42 (126) | .033 |
| Buy most of their cigarettes | 32.0 (384) | 31.42 (284) | 33.67 (100) | |
| Buy as many as borrow | 6.8 (82) | 6.31 (57) | 8.42 (25) | |
| Borrow most | 9.0 (108) | 7.85 (71) | 12.46 (37) | |
| Borrow all of their cigarettes | 3.7 (45) | 3.98 (36) | 3.03 (9) | |
| Social smoker, % (n) | 38.13 (458) | 36.50 (330) | 43.10 (128) | .094 |
| Identity as a smoker, M (SD) | 13.09 (5.31) | 13.82 (5.10) | 10.86 (5.29) | <.001 |
| Concurrent alcohol use and cigarette smoking, % (n) | | | | |
| Never/rarely | 25.23 (303) | 25.55 (231) | 24.24 (72) | .366 |
| Sometimes/always | 74.77 (898) | 74.45 (673) | 75.76 (225) | |
| Perceived vulnerability to: | | | | |
| Lung cancer, M (SD) | 4.33 (1.35) | 4.42 (1.34) | 4.05 (1.33) | <.001 |
| Lung diseases, M (SD) | 4.41 (1.38) | 4.51 (1.36) | 4.10 (1.37) | <.001 |
| Heart disease, M (SD) | 4.41 (1.39) | 4.50 (1.39) | 4.14 (1.35) | <.001 |
| Smoking dependence: | | | | |
| WISDM total, M (SD) | 37.91 (16.74) | 39.87 (17.08) | 31.94 (14.09) | <.001 |
| WISDM PDM, M (SD) | 3.20 (1.71) | 3.42 (1.75) | 2.53 (1.37) | <.001 |
| WISDM SDM, M (SD) | 3.50 (1.51) | 3.66 (1.54) | 3.03 (1.31) | <.001 |
| Time to first cigarette <30 min, % (n) | 61.7 (741) | 76.1 (226) | 57.0 (515) | <.001 |
| Perceived addiction, M (SD) | 40.79 (30.89) | 44.48 (31.50) | 29.52 (25.92) | <.001 |
| Quit intention and attempts | | | | |
| Intend to quit ≤6 months, % (n) | 29.1 (350) | 29.87 (270) | 26.94 (80) | .315 |
| Number of 24 hr quit attempts in the past 12 months, M (SD) | 4.52 (10.45) | 4.70 (10.53) | 4.00 (10.18) | .283 |
| Longest quit attempt in the past year (days), M (SD) | 75.31 (71.80) | 74.07 (70.56) | 80.46 (76.86) | .622 |
| Number of smoking cessation methods, M (SD) | 0.52 (0.98) | 0.61 (1.06) | 0.25 (0.60) | <.001 |
| Psychosocial variables | | | | |
| PHQ-2, M (SD) | 1.99 (1.80) | 2.10 (1.83) | 1.67 (1.68) | <.001 |
| AUDIT-C, M (SD) | 4.07 (2.83) | 4.01 (2.85) | 4.23 (2.76) | .213 |

Note. AUDIT-C = Alcohol Use Disorders Identification Test; CPD = cigarettes per day; PHQ-2 = Patient Health Questionnaire; WISDM = Wisconsin Inventory of Smoking Dependence Motives; WISDM PDM = Wisconsin Inventory of Smoking Dependence Motives Primary Dependence Motives Scale; WISDM SDM = Wisconsin Inventory of Smoking Dependence Motives Secondary Dependence Motives Scale. *p* values adjusted for race.

initial pool of independent variables and we used forward stepwise logistic regression in order to only include variables that improved the model. We also ran separate models with each of the perceived vulnerability and WISDM subscales entered individually and compared the findings.

The logistic regression model used stepwise entry to determine which factors were most strongly associated with a history of daily smoking, each set of variables were entered in blocks beginning with demographic variables. The model was adjusted for possible confounders including age, gender, and race/ethnicity. In order to control for age, gender, and race/ethnicity, these were entered into the model first using forced entry, then the remaining groupings of variables were entered using forward stepwise entry in the following order: (a) demographic variables entered first (education, monthly household income), (b) tobacco-related behaviors and beliefs (cpd, days smoked in the past 30 days, years smoking, years smoking nondaily, number of other forms of tobacco used, e-cigarette use, use of menthol cigarettes, carrying cigarettes, buying vs. borrowing cigarettes, social smoking, identity as a smoker, concurrent alcohol and smoking, perceived vulnerability to lung cancer, other lung disease, and heart disease, WISDM PDM and SDM), (c) quit intentions and attempts (intention to quit in the next 6 months, number of quit attempts in the past year, longest quit attempt in the past year, and number of smoking cessation methods used), and (d) psychosocial variables (PHQ-2 scores for depressive symptoms and AUDIT-C scores for disorder alcohol use). Differences on income and education have been found between native and nondaily smokers in previous studies^{3,10} and, nationally, smoking prevalence differs on these variables.¹ Therefore, demographic variables were entered first as they were expected to have a robust association with nondaily smoking history. We also expected tobacco-related behaviors and beliefs to have a strong association with smoking history,^{3,6,7,11} followed by quit intentions and attempts,¹⁵ and finally psychosocial variables.³ Nonsignificant variables (>0.05) were excluded from the final model with the exception of the control variables, age, gender, and race. Analyses were conducted using SPSS 20.0.0 (IBM, 2012).

Results

Bivariate Comparisons

All bivariate comparisons were adjusted for race. As shown in Table 1, converted nondaily smokers were slightly older than native nondaily smokers (41.90 [$SD = 12.37$] vs. 39.81 [$SD = 12.24$], $p = .011$) but there were no differences by gender, education, monthly household income, use of menthol cigarettes, or use of other forms of tobacco ($ps > .05$). In terms of tobacco-related behaviors and beliefs, converted nondaily smokers reported smoking more days per month (14.99 [$SD = 5.85$] vs. 13.11 [$SD = 5.91$], $p < .001$), more cpd on the days smoked (5.78 [$SD = 5.58$] vs. 4.25 [$SD = 3.86$] $p < .001$), more total years smoking cigarettes (17.03 [$SD = 12.69$] vs. 12.86 [$SD = 10.49$], $p < .001$), and more years smoking nondaily than native nondaily smokers (11.92 [$SD = 11.70$] vs. 10.01 [$SD = 9.51$], $p = .015$). However, there were no differences between converted and native nondaily smokers in the number of other tobacco products used in the past 30 days, use of e-cigarettes in the past 30 days, or use of menthol cigarettes ($ps > .05$).

Converted nondaily smokers were significantly more likely to report carrying cigarettes (60.84% vs. 46.13%, $p < .001$), and buying versus borrowing cigarettes compared to native nondaily smokers (50.44% of converted nondaily smokers bought all their

cigarettes vs. 42.42% for native nondaily smokers, $p = .033$). Converted nondaily smokers were no more likely to be social smokers than native nondaily smokers ($p = .094$). They had higher scores on smoker identity (13.82 [$SD = 5.10$] vs. 10.86 [$SD = 5.29$] for converted and native, respectively; $p < .001$). Converted nondaily smokers perceived themselves as being at higher risk for developing lung cancer (4.42 [$SD = 1.34$] vs. 4.05 [$SD = 1.33$], $p < .001$), other lung diseases (4.51 [$SD = 1.36$] vs. 4.10 [$SD = 1.37$], $p < .001$), and heart disease (4.50 [$SD = 1.39$] vs. 4.14 [$SD = 1.35$], $p < .001$) if they continued to smoke compared to native nondaily smokers.

Converted nondaily smokers reported greater smoking dependence than native nondaily smokers on the WISDM total (39.87 [$SD = 17.08$] vs. 31.94 [$SD = 14.09$], $p < .001$), PDM (3.42 [$SD = 1.75$] vs. 2.53 [$SD = 1.37$], $p < .001$), and SDM (3.66 [$SD = 1.54$] vs. 3.03 [$SD = 1.31$], $p < .001$). Converted nondaily smokers were also more likely than native nondaily smokers to report smoking within the first 30 min of waking than native nondaily smokers (76.1% vs. 57.0%) and were more likely to perceive themselves as addicted (44.48 [$SD = 31.50$] vs. 29.52 [$SD = 25.92$]). Converted nondaily smokers reported using more smoking cessation methods than native nondaily smokers (0.61 [$SD = 1.06$] vs. 0.25 [$SD = 0.60$], $p < .001$) but did not differ on intention to quit, number of previous quit attempts, or longest quit attempt in the past year ($ps > .05$).

Converted nondaily smokers had more depressive symptoms than native nondaily smokers (PHQ-2 mean scores of 2.10 [$SD = 1.83$] vs. 1.67 [$SD = 1.68$], $p < .001$). Average scores on the AUDIT-C assessing heavy alcohol use did not differ between the two groups ($p = .213$).

Multivariate Model

Results for each block of variables were entered using forward stepwise multiple logistic regression analysis are reported in Table 2. Model 1 included gender, age, and race/ethnicity (this block used forced entry to adjust for these variables), in Model 2 variables from the set of tobacco-related characteristics were added, and in Model 3 variables from the set of quit intentions and behavior variables were added. No variables were entered from the blocks of demographic variables or psychosocial variables after adjusting for age, gender, and race.

The final multivariate model (Model 3) was adjusted for gender ($OR = 1.35$, 95% $CI = 1.00$ – 1.82 , $p = .05$), age ($OR = 1.00$, 95% $CI = 0.98$ – 1.01 , $p = .62$), and race/ethnicity ($OR = 1.08$, 95% $CI = 0.90$ – 1.29 , $p = .39$). Participants who smoked on a greater number of days in the past month ($OR = 1.03$, 95% $CI = 1.00$ – 1.06 , $p = .02$) were marginally more likely to be converted nondaily smokers relative to native nondaily smokers. Converted nondaily smokers were more likely to smoke for a greater number of years ($OR = 1.07$, $CI = 1.04$ – 1.10 , $p < .01$) but fewer years as a nondaily smoker ($OR = 0.97$, $CI = 0.94$ – 0.99 , $p = .01$). Stronger identity as a smoker was also associated with converted versus native nondaily smoking ($OR = 1.05$, $CI = 1.01$ – 1.08 , $p = .01$). Each unit increase in smoking dependence on the WISDM PDM increased the odds of being a converted versus native nondaily smoker by 32% ($OR = 1.32$, 95% $CI = 1.16$ – 1.50 , $p < .01$). The odds of being a converted versus native nondaily smoker increased by 30% for each additional cessation method participants' reported using ($OR = 1.30$, 95% $CI = 1.05$ – 1.62 , $p = .02$). Changes in the adjusted odds ratios between models were small, notably the magnitude of the relationship for converted versus native nondaily smoking and gender increased from Model 1 to Model 2 but was only marginally significant, and the association

Table 2. Stepwise Multivariate Logistic Regression Model for Converted Nondaily Versus Native Nondaily Smoking

| Variables | Model 1 | | Model 2 | | Model 3 | |
|-------------------------------------|------------------|----------------|------------------|----------------|------------------|----------------|
| | AOR (95% CI) | <i>p</i> value | AOR (95% CI) | <i>p</i> value | AOR (95% CI) | <i>p</i> value |
| Gender | 0.99 (0.76–1.30) | .96 | 1.34 (1.00–1.81) | .05 | 1.35 (1.00–1.82) | .05 |
| Age | 1.02 (1.00–1.03) | .01 | 1.00 (0.98–1.01) | .66 | 1.00 (0.98–1.01) | .62 |
| Race/ethnicity | 1.10 (0.93–1.30) | .24 | 1.08 (0.90–1.29) | .42 | 1.08 (0.90–1.29) | .39 |
| Days smoked/past month | | | 1.03 (1.00–1.06) | .02 | 1.03 (1.00–1.06) | .02 |
| Years smoking cigarettes | | | 1.07 (1.04–1.10) | <.01 | 1.07 (1.04–1.10) | <.01 |
| Years smoking nondaily | | | 0.96 (0.94–0.99) | .01 | 0.97 (0.94–0.99) | .01 |
| Identity as a smoker | | | 1.04 (1.01–1.08) | .01 | 1.05 (1.01–1.08) | .01 |
| WISDM PDM | | | 1.40 (1.25–1.58) | <.01 | 1.32 (1.16–1.50) | <.01 |
| Number of smoking cessation methods | | | | | 1.30 (1.05–1.62) | .02 |

Note. AOR = adjusted odds ratio; CI = confidence interval; WISDM PDM = Wisconsin Inventory of Smoking Dependence Motives Primary Dependence Motives Scale. The logistic regression model was adjusted for gender, age, and race/ethnicity. Models represent each block of variables entered into the regression.

with WISDM PDM showed a modest decrease when number of smoking cessation methods was added to the model (Model 3). A backward stepwise regression was also tested and yielded a similar final model.

Due to the presence of multicollinearity, we also assessed separate multivariate models with perceived vulnerability for developing (a) lung cancer, (b) other lung diseases, and (c) heart disease entered individually and achieved the same results. When we assessed the multivariable model using WISDM PDM and WISDM SDM individually, the model with WISDM PDM yielded the same results; however, the results differed for WISDM SDM. When WISDM SDM was used as the measure of nicotine dependence, perceived vulnerability to lung cancer remained in the final model ($OR = 1.13$, 95% CI = 1.02–1.26, $p = .03$) and the nicotine dependence association with converted versus native nondaily smoking was reduced (WISDM SDM, $OR = 1.17$, 95% CI = 1.03–1.33, $p = .02$). These findings support the final model including WISDM PDM as this scale has a stronger association with converted versus native nondaily smoking in the multivariate model.

Discussion

The purpose of this study was to identify correlates of converted versus native nondaily smokers. We utilized a multivariate model in order to identify variables that best distinguished between the two groups of nondaily smokers. This study adds to the literature by examining demographic, psychosocial, and smoking-related correlates of native and converted nondaily smoking in a large sample of stable nondaily smokers using a multivariable approach. After adjusting for race, age, and gender, the following variables emerged as important correlates of being a converted versus native nondaily smoker: smoking on more days in a month, greater number of years smoking, fewer years as a nondaily smoker (when controlling for number of years smoked), stronger identity as a smoker, higher dependence scores on the WISDM Primary Dependence Motives scale, and using more smoking cessation methods. Notably, the strongest associations for converted nondaily smoking versus native nondaily after controlling for other demographic, psychosocial, and tobacco-use related variables were smoking dependence and number of cessation methods used. These associations were found despite the smokers in this study averaging over a decade of nondaily smoking. Therefore, differences on important smoker characteristics between converted and native nondaily smokers occur even among well-established nondaily smokers.

The results of the bivariate analyses showed that after adjusting for race and ethnicity, there were no differences between converted and native nondaily smokers on education or monthly household income, use of other tobacco products, or use of menthol cigarettes. As hypothesized converted nondaily smokers were more likely to self-identify as smokers and reported greater nicotine dependence. They were no more likely to smoke while drinking and there were no differences in terms of risk for alcohol abuse. Although use of smoking cessation methods was low among both groups, converted nondaily smokers had used more cessation methods compared to nondaily smokers. Our exploratory bivariate analyses showed that converted nondaily smokers reported slightly more depressive symptoms, greater perceived vulnerability to lung cancer, other lung diseases, and heart disease, were more likely to carry and to purchase cigarettes. There were no differences between the two groups on use of e-cigarettes in the past month or intention to quit. Interestingly, no racial or ethnic differences were observed in the proportions of converted versus native nondaily smokers in this sample. Given that population surveys show that there are higher proportions of nondaily smoking among Black and Latino smokers than White smokers,³⁷ future studies should describe transitions in smoking status and quitting by racial ethnic groups in order to identify how the composition of current smokers is changing.

In the multivariable model, number of years smoking, years as a nondaily smoker, number of days smoked in a month, smoking dependence, identity as a smoker, and number of smoking cessation methods used were retained as correlates of converted versus native nondaily smoking. Converted nondaily smokers had a longer overall smoking history by approximately four years even though there was only a 2 year difference in average age. This suggests that converted nondaily smokers started smoking at a younger age than native nondaily smokers consistent with previous findings.³ Compared to native nondaily smokers, converted smokers were somewhat more frequent smokers, smoking on two more days in the past 30 days. While these differences are not large, our findings are consistent with the literature.^{3,7,8,11} Converted nondaily smokers also endorsed greater smoking dependence on the WISDM Primary Dependence Motives scale, which assesses smoking dependence-related motives related to cravings and loss of control over smoking. These results corroborate the findings from Shiffman, Ferguson et al.¹² who found converted nondaily smokers to be heavier smokers and more dependent than their native nondaily counterparts. These finding in our sample of adult smokers (average age 41 years) underscore the differences between converted and native nondaily smokers, regardless of their duration

of smoking (i.e., these differing cigarette consumption patterns could be identified even in participants who have been long-term nondaily smokers).

In our sample converted nondaily smokers were more likely to self-identify as smokers, and identification as a smoker has been associated with attempting to quit among nondaily smokers college students.^{38,39} However, there were no differences between converted and native nondaily smokers in terms of their number of quit attempts in the past 12 months or their intention to quit in the next 6 months. Notably, converted nondaily smokers reported greater use of smoking cessation assistance. Given that there were no differences in past year quitting behaviors or current plans to quit, greater use of smoking cessation assistance could be an artifact of having reduced from daily smoking. However, our sample included only stable nondaily smokers who had been smoking at the current rate for at least 6 months and does not describe converted nondaily smokers who successfully transitioned to quitting or recently relapsed.

In addition to sampling White nondaily smokers, this study substantively represents Latinos and Blacks who have a high prevalence of nondaily smoking. The current study is not without limitations. First, the use of an online survey panel means that the participants were limited to those who have access to the internet. One in five U.S. adults do not use the internet; individuals with less than a high school education, annual household income less than \$20,000, and age 65 years and older are least likely to use the internet.⁴⁰ However, one in four SSI panelists reporting income indicated an annual household income of less than \$20,000 and 10% have completed some high school,⁴¹ suggesting that these socioeconomic levels are represented in proportions comparable to the U.S. population.^{42,43} Also, among the Latinos, only those Latinos who were fluent in English could participate, as the survey was self-administered in English. We used non-proportional quota sampling to obtain equal groups of Black, Latino, and White nondaily smokers in order to be able to make inferences about smokers across these racial and ethnic groups. Using national estimates among current smokers, 23.8% of Blacks, 35.7% of Latinos, and 16.6% of Whites are nondaily smokers.³⁷ However, given our sampling strategy, the unadjusted findings may not generalize to the broader population of nondaily smokers with lower proportions of ethnic minorities. We would expect the associations observed in the adjusted analyses to replicate across Black, Latino, and White stable nondaily smokers. Lastly, self-report was the only method that was used to assess smoking pattern and is therefore subject to social desirability and recall bias. Despite these limitations, we assessed important distinguishing characteristics that make it possible to identify converted and native smokers in the broader group of nondaily smokers.

In conclusion, the most important correlates in distinguishing between converted and native nondaily smokers is that converted nondaily smokers are heavier, more dependent smokers within the context of nondaily smoking. Thus pharmacological aids for smoking cessation could potentially be differentially effective compared to native nondaily smokers. Future research should explore the effectiveness of pharmacotherapy for nondaily smokers taking into account differences in nicotine dependence and smoking history. Given that converted nondaily smokers also report more depressive symptoms, future studies should determine whether pharmacotherapy such as bupropion or counseling that addresses depression may assist these smokers in quitting. Additionally, converted nondaily smokers have a modestly higher perception of risk of developing smoking-related illness, health care providers should encourage daily

smokers who have reduced to nondaily smoking to quit entirely, and emphasize the decreasing risk of tobacco-related disease that is associated with continued abstinence.

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Declaration of Interests

None declared.

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