

# NICOTINE REPLACEMENT THERAPY USE AMONG ADOLESCENT SMOKERS SEEKING CESSATION TREATMENT

**Objective:** To examine the correlates of prior nicotine replacement therapy (NRT) in an urban sample of adolescent smokers seeking smoking cessation treatment.

**Design:** Adolescents were recruited via radio, TV and print advertisements for participation in treatment studies. Participants completed a structured interview using a prescreening questionnaire.

**Setting:** Data were collected via a telephone interview by trained research personnel.

**Participants:** A sample ( $N=1879$ ) cessation treatment-seeking volunteer boys (38.2%) and girls (61.8%) aged 12 to 17 years, from a diverse ethnic background residing in the Baltimore, Maryland metropolitan area.

**Interventions:** No interventions were used in this observational study.

**Main Outcome Measures:** Use of NRT in adolescents stratified by age, Fagerstrom Test of Nicotine Dependence (FTND), and race/ethnicity.

**Results:** The sample had a mean FTND score of 5.7 ( $SD = 2.2$ ). About 41% smoked 11 to 20 cigarettes per day. Adolescent smokers who had used NRT were statistically but only marginally older than those who had not (15.9 vs 15.7 years;  $t$ -test =  $-2.60$ ,  $P=0.01$ ). FTND score, a measure of nicotine dependence, was higher among those who had used NRT (6.0 vs 5.6;  $t$ -test =  $-3.37$ ,  $P= .001$ ). African American adolescents were less likely to have used NRT than their European American counterparts (33.0% vs 61.2%;  $\chi^2=16.09$ ,  $P<.003$ ). After stepwise logistic regression analyses, age, FTND and race/ethnicity remained predictors of NRT use.

**Conclusion:** Our results show differences in NRT use patterns based on age, FTND, and race/ethnicity. European American youths are more likely than their 'other' counterparts to use NRT, after adjusting for age and smoking severity, whereas, African American youth are less likely than their 'other' counterparts to use NRT. These findings suggest racial/ethnic disparities in accessing smoking cessation modalities among adolescents. Further research is needed to fully elucidate factors contributing to these differences in order to facilitate increased smoking cessation rates among all adolescents. (*Ethn Dis.* 2010;20:180-184)

**Key Words:** Nicotine Dependence, Adolescents, Nicotine Replacement Therapy, Treatment, Health Disparities

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## INTRODUCTION

The prevalence of cigarette smoking in adolescents, despite its recent decline, remains a cause for concern.<sup>1</sup> The onset of nicotine dependence symptoms among adolescents may occur within one month of initiating smoking.<sup>2</sup> According to Mermelstein,<sup>3</sup> based on unassisted quit rates among youth, smoking cessation interventions, such as nicotine replacement therapies (NRTs), are needed early in the career of a smoker and have not been widely available to youth over the past few decades.<sup>4,5</sup> In contrast, NRTs are used by a substantial proportion (~30%) of successful adult quitters.<sup>6,7</sup>

Over-the-counter NRT products, such as a nicotine patch and nicotine gum, are the first lines of treatment for smoking cessation among adults while inconclusive evidence from clinical trials in youth has limited their prescription to tobacco-dependent adolescents.<sup>8</sup> The safety of the nicotine patch has been demonstrated and at least one trial showed the efficacy of the patch for adolescent heavy smokers.<sup>9,10</sup> In addition, some research has documented the use of NRT in the pediatric primary

care setting; pediatricians who prescribed cessation aids to adolescent smokers were likely to prescribe transdermal patches, nicotine gum, or bupropion.<sup>11</sup>

To date, more research on NRT use has been performed among adult smokers<sup>12,13,14</sup> than among adolescents.<sup>10,15,16</sup> Among adolescents seeking treatment, prior NRT use was linked to more quit attempts but not ability to remain quit for a week. Moolchan and Schroeder conducted an earlier analysis with part of the sample used in the present study.<sup>16</sup> In the present study a broader sample of adolescent smokers was used thus extending the early findings for greater generalizability. The previous study found that most adolescents had tried to quit before and approximately one quarter of the sample had used NRT in the past; half the entire sample was able to stay quit for at least one week. Important ethnic differences emerged in quit attempt profiles and use of NRTs. African American adolescents were less likely to have made a prior quit attempt or to have used NRT compared to their European Americans counterparts.<sup>16</sup> Similar ethnic differences have been observed among adult smokers as reported from the 2005 National Health Interview Survey; Blacks and Hispanics had lower odds of having used NRT products.<sup>17</sup>

The prevalence of NRT use is also varied by intensity of adolescent smoking status. One study found that past NRT use was most prevalent among current daily smokers, followed by former smokers, current infrequent smokers (<1 cigarette per week), light smokers (1-6 cigarettes per week), experimental smokers, and never smokers.<sup>15</sup> As such, adolescent NRT use may not carry the smoking intensity corre-

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lates seen among adult smokers. One reason for this may be that despite the relative access to and availability of cessation aids to adolescent smokers, few trials have shown their efficacy and they have remained infrequently prescribed.<sup>11</sup>

Limited knowledge of the profiles of adolescents who use NRT is available. A better understanding of the predictors of the use of pharmacological smoking cessation aids by adolescents might help to develop interventions that increasingly address their needs for assistance with quitting. The purpose of this article was thus to examine the demographic and smoking-related characteristics of an urban, predominantly biethnic sample of adolescent smokers requesting cessation treatment who had and had not used NRT, a modality they seem to access quite easily in their attempts to quit smoking.<sup>4,15</sup>

## METHODS

### Participants

Participants recruited for this study were boys and girls aged 12 to 17 years who resided in the Baltimore, Maryland metropolitan area. Youth responded via telephone to advertisements for two smoking cessation treatment trials: one that combined pharmacological (random assignment to a NRT patch, gum,

or placebo group) and cognitive behavioral group therapy to quit smoking; the other trial randomized participants to bupropion vs placebo with brief advice (modified 5 A's to accommodate treatment readiness). The studies were broadly advertised through a variety of media including radio, television, word-of-mouth, clinical referrals, and print. All participants who had complete data for the variables of interest were included in this analysis.

### Procedures

The screening protocol was approved by the National Institute on Drug Abuse, Intramural Research Program, and Institute Review Board (IRB 06-DA-N322). All participants who called were phone screened by trained research staff. Because the phone-screening protocol presented no risk and to maintain participant confidentiality, a waiver of parental consent was granted. At the beginning of the phone-screening interview, adolescents granted permission to use their data for research purposes.<sup>18</sup> If the participant qualified for the treatment trial, on-site adolescent assent and parental permission were later obtained.

### Measures

The screening protocol included demographic questions (race, age, sex), and the six-question Fagerstrom Test for Nicotine Dependence (FTND).<sup>18,19</sup> Similar to Moolchan and Schroeder,<sup>16</sup> if adolescents responded affirmative to their use of nicotine gum and/or nicotine patch, they were categorized as have tried NRT to quit. Parent support for medication trial participation was measured with the question, "Can your parent or guardian come in with you for the first visit?" The phone interviews lasted about 20 minutes on average.<sup>18</sup>

### Statistics

First, bivariate analyses were conducted to compare adolescents, on

demographic and smoking characteristics, who had and had not previously used NRT. Chi-square tests were used when the independent variables were dichotomous or ordinal, and *t*-test analysis of variance was used when the independent variables were continuous. Next, the variables that were significantly ( $P < .05$ ) associated with prior NRT use were entered into a multiple logistic regression model, where prior NRT use was the dependent variable. A stepwise model-fitting procedure was used; only independent variables that were significantly ( $P < .05$ ) associated with NRT use were retained. Data analyses were performed using SAS version 9.1 (SAS Institute, Cary NC).

## RESULTS

### Sample Characteristics

A total of 1879 adolescents aged 12 to 17 years called the recruitment line for the Teen Tobacco Addiction Treatment Research Clinic between September 1999 and April 2006 seeking to participate in a smoking cessation treatment study. Only seven subjects refused to participate. As shown in Table 1, the mean age of the sample was 15.7 (SD=1.3) years indicating mid-adolescence. The mean FTND score of 5.7 (SD=2.2) indicates substantial dependence and heavy smoking is suggested by the mean number of cigarettes per day. More girls than boys sought to participate in the cessation treatment trials (61.8% vs 38.2%, respectively) as did more European American as compared to African American and other race/ethnic minority groups (53.1%, 41.3%, and 5.6% respectively). The other race/ethnicity category comprised Native American, Asian American, Hispanic, and mixed ethnicity individuals. Around half (43.7%) of the total sample reported smoking fewer than 10 cigarettes per day (CPD); similarly to those reporting smoking between 11 and 20 CPD (41.4%). Only 5.7% reported smoking more than 31 CPD. The majority

**Table 1. Participant characteristics by prior nicotine replacement use among adolescent smokers (N=1879 unless otherwise noted)**

Characteristic	Entire sample	NRT use		Statistic; (df)	P value
		Prior use n=425 (22.6%)	No use n=1454 (77.4%)		
		Mean (SD)			
Age, years	15.7 (1.3)	15.9 (1.3)	15.7 (1.3)	t-test=-2.60;(1877)	.01
FTND score (N=1828)	5.7 (2.2)	6.0 (2.0)	5.6 (2.3)	t-test=-3.37;(749)	.001
Sex		n (%)		$\chi^2=0.95; (1)$	.32
Boys	718 (38.2)	171 (40.2)	547 (37.6)		
Girls	1161 (61.8)	254 (59.8)	907 (62.4)		
Race/ethnicity				$\chi^2=16.09; (2)$	.003
European American	998 (53.1)	260 (61.2)	738 (50.8)		
African American	776 (41.3)	140 (33.0)	636 (43.7)		
Other	105 (5.6)	25 (5.9)	80 (5.5)		
Cigarettes per day (n=1835)				$\chi^2=6.71; (3)$	.08
0-10	802 (43.7)	161 (39.0)	641 (45.1)		
11-20	760 (41.4)	180 (43.6)	580 (40.8)		
21-30	169 (9.2)	48 (11.6)	121 (8.5)		
31 +	104 (5.7)	24 (5.8)	80 (5.6)		
Parents participation				$\chi^2=-2.89; (2)$	.24
No	216 (11.5)	50 (11.8)	166 (11.4)		
Yes	1361 (72.4)	318 (74.8)	1033 (71.7)		
Did not answer	302 (16.1)	57 (13.4)	245 (16.9)		

FTND= Fagerstrom Test for Nicotine Dependence; Other in race/ethnicity refers to Native American, Asian American, Hispanic and mixed; SD= standard deviation; NRT=nicotine replacement therapy.

(72.4%) of the adolescents received support from their parents to participate in the smoking cessation study.

**Bivariate analyses**

Bivariate analyses showed that age, FTND, and race/ethnicity were significantly associated with prior NRT use. A trend was also noted for cigarettes per day (P=.08). Adolescents who had used NRT were statistically significantly older than those who had not. (15.9 vs 15.7 years; t-test=-2.60, P=.01). Those who had used NRT had higher tobacco dependence, shown by the FTND measure, than those with no prior NRT (6.2 vs 5.6; t-test=-3.37, P=.001). African American adolescents were less likely to have used NRT than their European American counterparts (33.0% vs. 61.2%;  $\chi^2=16.09, df=2, P<.003$ ) (Table 1).

**Logistic regression**

The FTND score, race/ethnicity, and age were entered into a stepwise

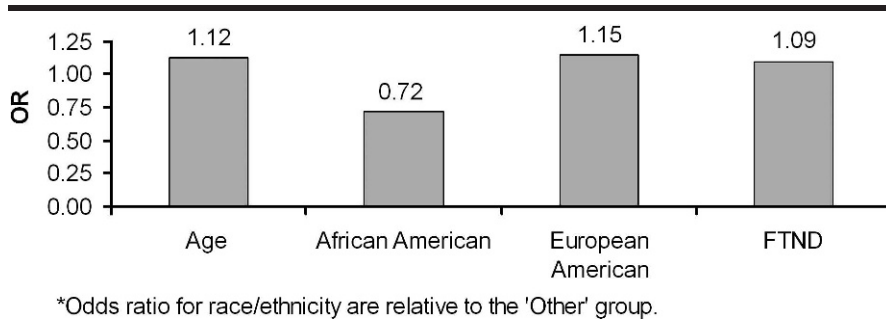
logistic regression model, and all remained significant predictors of prior NRT use (Figure 1). Prior NRT use was more likely for older adolescents and for those with higher levels of smoking severity. The FTND score was a predictor of prior NRT use among adolescents (OR=1.09; 95% CI =1.03-1.15). In addition, older adolescents were more likely to have ever used NRT (OR=1.12; 95% CI=1.03-1.22).

Race/ethnicity remained a significant predictor of prior NRT use after adjusting for age and smoking severity. African American were less likely to have tried NRT products (OR=.72; 95% CI=.43-1.21) and European Americans were more likely to have tried NRT use (OR=1.15; 95% CI=.70-1.89) compared to adolescents of other/mixed ethnicity. The overall effect of race/ethnicity was statistically significant (Wald Chi-Square = 14.42; P=.0007) even though the 95% confidence intervals for the individual odds

ratios for the race/ethnic groups included 1.

**DISCUSSION**

The main finding of this study is that adolescents presenting for cessation treatment were more likely to have used NRT if they were older and were nicotine dependent, as measured with the FTND. Moreover, the statistical significance in the effect of race/ethnicity after controlling for age and FTND suggests that the relationship of race/ethnicity and NRT use might be partially explained by differences in age and FTND score. Interestingly, this finding is consistent with previous research on prior NRT use conducted among adult smokers that shows ethnic differences in the use of NRT.<sup>13,17,20</sup> In addition, our findings extend a previous analysis conducted with a smaller sample that found sex and ethnic differences in adolescent quit attempts and NRT



**Fig 1. Odds ratio of the prior use of nicotine replacement therapy among adolescent smokers ( $n=1805$  participants with complete data). All effects were statistically significant ( $P>.01$ ) via Wald chi square tests**

use.<sup>16</sup> The reasons that might explain why NRT use varies across ethnicity need to be further explored given that ethnic differences in smoking cessation rates have been observed among adult samples<sup>21</sup> and are potentially linked to disparities in tobacco-attributable deaths and disease later in life among minorities.

The current study among adolescents found a significant association between previous NRT use and age. However, the magnitude of this mean age difference was small (approximately three months) and therefore of dubious clinical significance. Nonetheless, characterizing the channels and contextualizing the degree to which adolescents have access to NRT products would seem important for future research. Federal law prohibits the sale of NRT products to minors; nonetheless, many minors have access to them without being asked for proof of age.<sup>22</sup>

The results presented here might suggest that European American adolescents have fewer barriers to accessing NRT products than their minority counterparts. The apparent ethnic disparity in access to the most commonly used pharmacotherapies for cessation underscores the need for alternative modalities to treat nicotine addiction in addition to making NRTs available to older and tobacco-dependent adolescents. It is possible that socioeconomic status (SES) differences contributed to the ethnic differences in NRT use

observed in this sample as it did among adult smokers.<sup>12</sup> Prior research has shown that smokers with low SES are less likely to use NRT than smokers with high or moderate SES;<sup>23</sup> in addition, NRT users are more likely to be educated,<sup>12</sup> and to have higher income and health insurance.<sup>3</sup> Because it was designed to be adolescent-friendly and brief, assessment of SES in this sample of convenience was not included in the questionnaire.

The findings of age and FTND in the use of NRT products among adolescents might also carry implications for their participation in smoking cessation treatment. Clinicians should be aware that older adolescents and those with high levels of nicotine dependence might more readily access NRT. In addition, the effect of race/ethnicity, suggests that European Americans might have self-selected their use of NRT because of higher FTND scores and greater difficulty in quitting (sug-

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gesting greater dependence) than their counterparts of other ethnicities. From a self-selection bias standpoint, minority youth using NRT for quitting might be less likely to have volunteered and been screened for this study. Lastly, unequal proportions of successful quitters among NRT users from the two groups may have biased our comparison.

The present study has some limitations. Given our brief phone interview, we were unable to obtain such detailed information such as language spoken and immigration status that can affect relationships with health care providers. Our analysis also did not distinguish healthcare provider vs self-prescribed NRT use, which may have implications for the clinical impact of such use. More work is needed to elucidate the influence of SES, education, and other individual and smoking history variables on NRT use among adolescents.

Given that tobacco-related health disparities develop incrementally and in this regard cumulatively over the lifespan, our findings of ethnic differences among youths, together with the ethnic differences in NRT use and quit rates observed among adult smokers, uncover a continuum of potential under-use of NRT by minorities that is important to address within the context of mitigating health disparities.

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