

RESEARCH AND PRACTICE

# Gender Differences in Smoking and Cessation Behaviors Among Young Adults After Implementation of Local Comprehensive Tobacco Control

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The young adult population is of particular interest to the tobacco industry for several reasons, many of which have been noted in recent analyses of tobacco industry documents. First, because young adults function as role models for adolescents, marketing to young adults may indirectly promote smoking to adolescents.<sup>1</sup> Second, the transitional nature of young adulthood provides opportunities for experimentation and the establishment of addiction.<sup>2</sup> Finally, although most smokers try their first cigarette before age 18 years,<sup>3,4</sup> the transition from experimental or occasional smoking to daily smoking often occurs in young adulthood.<sup>5</sup> Evidence shows that marketing efforts to this group may successfully encourage a shift from occasional smoking to regular smoking.<sup>6</sup> Thus, as smoking among youth (younger than 18 years) and young adults (aged 18 to 24 years) continues to decline,<sup>7</sup> the young adult population will likely continue to be targets of already aggressive tobacco marketing.<sup>1,6</sup>

Although national increases in smoking by young adults during the 1990s were cause for concern,<sup>8,9,10</sup> since 2002 young adult smoking appears to have declined.<sup>11,12</sup> A better understanding of cessation strategies that are effective for this population is needed to accentuate successes and may counteract any increase in marketing to this population by the tobacco industry. Research shows that smoking cessation at earlier ages is associated with reduced risk of premature death.<sup>13,14</sup> Studies also show that the period of young adulthood is associated with increased likelihood of quit attempts and success in quitting.<sup>15</sup> It is, therefore, prudent for tobacco control programs to broaden their understanding of successful cessation strategies for young adults overall and for subgroups in need of targeted intervention.

**Objectives.** We sought to study gender differences in young adult smoking declines and enrollment in populationwide cessation services.

**Methods.** The New York City (NYC) Department of Health and Mental Hygiene implemented populationwide cessation programs to distribute free nicotine replacement therapy (NRT); demographic data were collected from enrollees. Smoking prevalence was assessed using data from the Community Health Survey, an annual population-based survey.

**Results.** Between 2002 and 2005, smoking among young adults in NYC declined from 23.8% to 18.8%, which was explained entirely by a 41.8% decline among young adult women (23.2% to 13.5); prevalence remained at 24% among young adult men. More young adult women enrolled in cessation services than did men, although once enrolled, the likelihood of using NRT was high among both groups.

**Conclusions.** Among young adults, women have been responsive to comprehensive tobacco control, but men require more-intensive strategies. Populationwide NRT distribution can be effective with young adults overall; however, additional resources need to be devoted to identifying successful outreach strategies for young adult men. (*Am J Public Health.* 2008;98:XXX–XXX. doi:10.2105/AJPH.2006.101758)

The New York City Department of Health and Mental Hygiene (DOHMH) implemented a comprehensive, 5-point tobacco control program in 2002. This program, which includes taxation, legislation, education, cessation services, and evaluation efforts, resulted in a 1-year decline in smoking prevalence among New York City adults from 21.6% in 2002 to 19.2% in 2003, which was maintained in 2005 (18.9%).<sup>16,17</sup> The cessation services component of the New York City program included physician outreach and education, support of quit smoking clinics, and 3 populationwide giveaways of nicotine replacement therapy (NRT) patches in 2003, 2005, and 2006. In response to evidence that smokers who use NRT are more likely to quit than those who don't,<sup>18,19</sup> NRT distribution has been a primary focus of New York City's cessation services. An evaluation of the 2003 DOHMH patch giveaway showed that smokers who received patches through the program were significantly more likely to be smoke-free at

6 months than were smokers who did not receive patches.<sup>20</sup>

We examined declines in smoking prevalence among young adults and participation in the citywide NRT distribution program (including patterns of enrollment and use of patches) by gender. We also make recommendations for targeting populationwide NRT distribution to address these disparities.

## METHODS

Implemented annually since 2002, the Community Health Survey (CHS) is a population-based, random-digit-dialed health survey of approximately 10 000 adult New York City residents. The survey is conducted by trained interviewers through computer-assisted telephone interviews. Response rates among contacted households were 64% in 2002 (n=9674), 59% in 2003 (n=9802), 59% in 2004 (n=9585), and 71% in 2005 (n=9818). Measures used to assess smoking status were the same as those used in national Behavioral

**TABLE 1—Nicotine Replacement Therapy Distribution Programs: New York City, 2003, 2005, and 2006**

Program Year	Length of Program, Days	Partner	NRT Dosage and Duration of Treatment	Total NRT Courses Distributed	NRT Courses Distributed to Young Adults, %	Follow-Up Provided
2003	43	NYC Smokers' Quitline	2 weeks, 21 mg; 2 weeks, 14 mg; 2 weeks, 7 mg	35 000	2583 (7.4%)	Calls at 3 weeks and 14 weeks to all enrollees
2005	36	NYC 311 <sup>a</sup>	6 weeks 15 mg	45 000	2685 (6.0%)	Calls at 3 weeks to smokers of 10-20 cigarettes per day
2006	34	NYC 311 <sup>a</sup>	4 weeks 21 mg; option for 2 additional wks 14 mg	35 000	2381 (6.8%)	Calls at 3 weeks to smokers of 10-20 cigarettes per day

Note. NRT = nicotine replacement therapy; NYC = New York City; NYS = New York State.

<sup>a</sup>This is NYC's nonemergency phone number.

Risk Factor Surveillance System surveys;<sup>21</sup> smoking was defined as currently smoking every day or some days and having smoked at least 100 cigarettes in one's lifetime.

In 2003, 2005, and 2006, DOHMH partnered with city and state government phone services to distribute about 40 000 courses of NRT in 5 weeks in each program year. Smokers called toll-free numbers, were screened for eligibility, and were sent NRT directly to their homes. Brief counseling calls were attempted for a subgroup of callers. About 2500 young adults enrolled in each program (Table 1). To be considered eligible, callers needed to be New York City residents who were 18 years or older, consented to have their information shared, agreed to follow-up contact, met medical eligibility criteria, confirmed they were considering quitting within the next 7 days, and smoked at least 10 cigarettes per day. Callers determined to be ineligible were referred to other smoking cessation resources.

Each New York City resident who called during the patch giveaways was asked a series of intake questions to track demographic and smoker characteristics and to ensure that there were no medical contraindications for patch use. Age and gender of participants were recorded at intake in all 3 years. In 2005 and 2006, to better understand distribution of NRT, additional questions were

asked on race/ethnicity, income, educational level, and Medicaid enrollment. Enrollment and counseling were conducted by trained interviewers in English and Spanish; enrollment using additional languages was facilitated by a translation service. Training on the enrollment application script was delivered by staff of DOHMH in 2003 and 2005 and by staff of 311, New York City's nonemergency government information line, in 2006. In 2005 and 2006, only smokers who smoked 10 to 20 cigarettes per day at intake received a counseling call 3 weeks after enrollment. Counseling calls were successfully provided to 45% of 2003 enrollees eligible for a call, 61% of eligible enrollees in 2005, and 50% of eligible enrollees in 2006. Noncompletion of counseling calls was primarily the result of inability to reach respondents; only 1% of smokers in both 2005 and 2006 refused to complete the call once reached. During the counseling, trained interviewers assessed program participants' receipt of patches, use of patches, and experience of side effects from using patches.

#### Statistical Analyses

As explained elsewhere,<sup>16</sup> CHS datasets were weighted to account for unequal selection probabilities and nonresponse. Primary weights were calculated for each respondent and consisted of the inverse of the probability

of selection. Poststratification weights were used to adjust the sample estimates according to the age, race/ethnicity, and gender composition of each sampling stratum, defined by neighborhood. All analyses were weighted; results of citywide prevalence were age standardized to the 2000 US Census population. Cells with numerators less than 6 or denominators less than 20 were suppressed, and estimates with a relative standard error greater than 30% were flagged as unstable.<sup>22</sup>

To assess current smoking trends among young adults in New York City after the implementation of comprehensive tobacco control, prevalence estimates were calculated overall and stratified by age group. Within the young adult population, trends were examined among demographic subgroups based on race/ethnicity, gender, income, student status, and birthplace. Significant changes between 2002, the first year of New York City's comprehensive tobacco control program, and 2005, the most recent year for which data are available, were assessed using the pairwise *t* test to compare prevalence estimates of each group. A correction for multiple comparisons was not calculated. To assess enrollment in the patch programs, weighted population estimates were constructed for heavy smokers (those smoking 10 or more cigarettes per day) overall, by age group, and by demographic subgroups within the young adult population. Identical demographic strata were then constructed using the patch program intake data, and program enrollment was assessed by dividing the number enrolled in each demographic strata by the population estimate of heavy smokers in that strata. Because a more limited intake script was used in 2003, it was not possible to conduct this comparison with the 2003 data. Finally, counseling call data were examined by demographic subgroup to detect differences in the use of patches by NRT program participants.

Logistic regression analyses were used to determine relationships between demographics and 2 outcomes of interest: current smoking and use of patches. To assess relationships between age group and outcomes of interest in the adult population, the odds ratio associated with each age group is reported and an adjusted odds ratio is presented that was used to control for gender,

race/ethnicity, foreign-born status, income, and student status. Demographic variables included in the adjusted model were chosen on the basis of those examined during program enrollment and those consistent with previous analyses of smoking in New York City.<sup>16</sup> To assess significant differences within the young adult population, similar logistic regression analyses were conducted within the 18- to 24-year age group and bivariate and adjusted odds ratios were calculated for the relations between each outcome and gender, race/ethnicity, foreign-born status, income, and student status. For multivariate models, all variables were included in the model simultaneously. All analyses were conducted using SAS version 9.1 (SAS Institute Inc, Cary, NC) and SUDAAN release 9.0.1 (Research Triangle Institute, Research Triangle Park, NC).

## RESULTS

From 2002 to 2005, the prevalence of current smoking among adults in New York City declined 12%, from 21.6% to 18.9% ( $P<.001$ ), which represents about 130 000 fewer adult smokers. The largest decline in smoking (21%) was among young adults aged 18 to 24 years: from 23.8% to 18.8% ( $P=.04$ ), which represents about 38 000 fewer smokers, or about 30% of the overall decline. However, within this age group, women account for nearly all of the decline; smoking among young women declined more than 40%, from 23.2% to 13.5% ( $P<.001$ ), whereas smoking among young men did not decline significantly. No demographic subgroups of young adult men showed significant declines in current smoking between 2002 and 2005 (Table 2).

Table 3 shows the demographic distribution of enrollment for the 2005 and 2006 patch programs, by age group and among young adults, compared with 2004 CHS estimates of heavy smokers (i.e., those who smoke 10 or more cigarettes per day and thus, were eligible for the program); 2004 was selected as the comparison year because it was the latest year for which these data were available. Overall, the 2005 patch program enrolled 8.3% of heavy smokers in New York City, and the 2006 patch program

enrolled 6.6% of heavy smokers in New York City. However, stratification of enrollment by demographic subgroups shows distinct disparities in patterns of enrollment. The proportion of eligible young adults estimated to have enrolled in the program (5.0% in 2005 and 4.4% in 2006) was much lower than the citywide enrollment average. Further stratification of the young adult population by gender shows that much of the underenrollment is in young adult men, of whom 3.7% were enrolled in 2005 and 3.4% were enrolled in 2006. Young adult women had estimated enrollment rates much closer to the citywide average, at 7.6% in 2005 and 6.5% in 2006. Although young adult men overall were underenrolled, much of the disparity can be explained by very low enrollment among young adult Asian men, of whom less than 1% were enrolled in each program year. Note that larger sample sizes are needed to fully interpret this finding (Table 3).

Although young adults underenrolled in the patch giveaways, data from the counseling call showed they were somewhat more likely to use the patches than were other age groups (although patch use was high among all age groups). About three quarters (76%) of young adults reported using some or all NRT patches, which is a significantly higher percentage than program enrollees overall (69.7%). Almost every subgroup defined by gender, race/ethnicity, or income showed nearly 75% use of some or all patches (Table 3).

Overall, in analyses using CHS data, current smokers were less likely to be young adults, as shown in the bivariate analyses. In a logistic regression model and adjusting for gender, race/ethnicity, income, student status, and foreign-born status, the relation between age and smoking status was no longer significant.

Within the young adult population, men were significantly more likely than were women to be current smokers (odds ratio [OR]=2.0; 95% confidence interval [CI]=0.5, 2.8). No significant bivariate relations were found between smoking and race/ethnicity, or between smoking and income. Foreign-born young adults were significantly less likely to be current smokers (OR=0.7; 95% CI=0.5, 0.9). The significant relations between gender and smoking and between foreign-born status and smoking remained in the adjusted model.

Young adults were significantly more likely to use patches than were any other age group, both in the bivariate and adjusted analyses. Among young adults, men were more likely to report using patches than were women, as were foreign-born young adults when compared with US-born young adults. In the adjusted model, men remained more likely to use patches, but no other significant relations were found. In both the unadjusted and adjusted models, the gender difference was of marginal statistical significance (Table 4).

## DISCUSSION

Our work illustrates progress in reducing smoking among young adults, although declines were seen almost exclusively in the population of young women. In New York City, the progress made in smoking cessation among young adult women (41.8% decline in smoking) far exceeds that among young adult women nationally (12.2% decline from 2002 to 2004).<sup>11</sup> Conversely, smoking prevalence among young adult men in New York City was stagnant between 2002 and 2005 but declined nationally among young adult men by 20% between 2002 and 2004.<sup>11</sup> These data suggest that some of the comprehensive tobacco control strategies implemented by New York City, such as smoke-free workplace legislation and increases in the price of cigarettes, may be more effective in young adult women than young adult men, and that some of the progress seen in New York City may be part of a secular national trend. Previous research has shown the importance of young adulthood as a time when smoking behaviors are established,<sup>2</sup> and our findings provide evidence that comprehensive tobacco control programs that deliver cessation services to young adults can be effective, although young adult men may require specific outreach.

The gender disparity in smoking declines among New York City young adult populations demonstrates a need for effective approaches to reach young adult men. Although patch use was high in most demographic subgroups, young adults in particular were more likely to use patches than people in all other age groups. This finding, together with the finding that young adults who participated in the 2003 giveaway were somewhat more

**TABLE 2—Smoking Prevalence Trends, by Age and Within Young Adult Demographic Subgroups: New York City Community Health Survey, 2002–2005**

	2002			2005			2002–2005	
	Sample Size, No.	Current Smokers, % (95% CI)	Population	Sample Size, No.	Current Smokers, % (95% CI)	Population	Smoking Prevalence Change, %	Smoking Prevalence Change, Population
Overall NYC prevalence	2 113	21.5 (20.5, 22.6)	1 280 280	1 884	18.9 (17.9, 19.9)	1 149 881	–12.1 <sup>a</sup>	–130 399
<b>Citywide analysis</b>								
Age, y								
18–24	251	23.8 (20.7, 27.2)	185 320	134	18.8 (15.5, 22.5)	147 529	–21.0 <sup>a</sup>	–37 791
25–44	1 019	24.3 (22.7, 26.0)	616 136	873	22.3 (20.7, 23.9)	582 802	–8.2	–33 334
45–64	633	23.4 (21.4, 25.6)	389 577	700	20.0 (18.4, 21.7)	337 679	–14.5 <sup>a</sup>	–51 898
≥65	166	10.0 (8.4, 11.9)	89 247	173	8.8 (7.4, 10.5)	81 870	–12.0	–7 377
<b>Young adult analysis</b>								
All young adults	251	23.8 (20.7, 27.2)	185 320	134	18.8 (15.5, 22.5)	147 529	–21.0 <sup>a</sup>	–37 791
Race/ethnicity								
Non-Hispanic White	90	31.6 (25.0, 38.9)	65 723	47	24.6 (18.1, 32.5)	49 932	–22.2	–15 791
Non-Hispanic Black	47	17.6 (12.3, 24.4)	33 005	24	14.8 (9.2, 23.0)	31 473	–15.9	–1 532
Hispanic	88	24.7 (19.8, 30.5)	67 247	51	22.6 (16.6, 30.0)	56 569	–8.5	–10 678
Neighborhood <sup>b</sup>								
Low income	110	25.8 (21.3, 31.0)	78 388	55	18.7 (13.8, 24.9)	58 208	–27.5	–20 180
Middle income	75	24.4 (18.7, 31.2)	67 970	39	14.9 (10.3, 21.1)	42 843	–38.9 <sup>a</sup>	–25 127
High income	66	19.7 150	38 962	40	24.8 (17.8, 33.5)	46 478	25.9	7 516
Student status								
Current student	49	18.0 (12.9, 24.7)	40 944	28	15.1 (10.0, 22.2)	33 173	–16.1	–7 771
Current nonstudent	201	26.2 (22.5, 30.3)	143 842	106	20.5 (16.5, 25.2)	114 357	–21.8	–29 485
Nativity								
US born	187	24.7 (21.1, 28.8)	126 168	97	21.4 (17.1, 26.4)	102 789	–13.4	–23 379
Foreign born	63	21.9 (16.5, 28.4)	58 619	37	14.7 (10.1, 20.9)	44 740	–32.9	–13 879
<b>Young adult women analysis</b>								
All young adult women	130	23.2 (19.2, 27.8)	93 086	58	13.5 (10.1, 17.8)	52 879	–41.8 <sup>a</sup>	–40 207
Race/ethnicity								
Non-Hispanic White	43	29.4 (21.0, 39.5)	33 376	20	20.6 (12.8, 31.4)	20 566	–29.9	–12 810
Non-Hispanic Black	25	13.4 (8.4, 20.6)	13 319	12	10.5 <sup>c</sup> (5.5, 19.2)	11 786	–21.6	–1 533
Hispanic	50	26.8 (20.0, 34.9)	36 687	22	15.8 (9.8, 24.5)	18 505	–41.0 <sup>a</sup>	–18 182
Neighborhood <sup>b</sup>								
Low income	59	25.8 (19.8, 32.8)	39 550	24	12.0 (7.5, 18.9)	19 439	–53.5 <sup>a</sup>	–20 111
Middle income	39	23.2 (16.1, 32.0)	33 707	16	10.9 (6.2, 18.6)	15 320	–53.0 <sup>a</sup>	–18 387
High income	32	19.4 (12.8, 28.5)	19 827	18	19.9 (12.1, 31.0)	18 121	2.6	–1 706
<b>Young adult men analysis</b>								
All young adult men	121	24.4 (19.9, 29.5)	92 234	76	24.1 (18.8, 30.3)	94 650	–1.2	2 416
Race/ethnicity								
Non-Hispanic White	47	34.2 150	32 347	27	28.5 (18.9, 40.4)	29 360	–16.7	–2 987
Non-Hispanic Black	22	22.3 (13.5, 34.7)	19 685	12	19.6 <sup>c</sup> (10.2, 34.4)	19 687	–12.1	2
Hispanic	38	22.6 (15.9, 31.1)	30 560	29	28.6 (19.3, 40.3)	38 064	26.5	7 504
Neighborhood <sup>b</sup>								
Low income	51	25.9 (19.3, 33.8)	38 837	31	25.8 (17.5, 36.4)	38 770	–0.4	–67
Middle income	36	25.8 (17.3, 36.6)	34 263	23	18.7 (11.6, 28.8)	27 524	–27.5	–6 739
High income	34	20.1 (13.8, 28.2)	19 134	22	29.5 (18.9, 42.9)	28 357	46.8	9 223

Source. All data are from the Community Health Survey 2002 and 2005.

Note. Young adults were aged 18 to 24 years.

<sup>a</sup>Significant *t* test  $\alpha < 0.05$ .

<sup>b</sup>Low-income neighborhoods had 45% to 90% of residents living below 200% of the federal poverty level; middle income was 30% to 44% of residents living below 200% of the federal poverty level; high income was less than 30% of residents living below 200% of the federal poverty level.

<sup>c</sup>This estimate should be interpreted with caution because of data variability.

**TABLE 3—Comparison of 2004 Community Health Survey (CHS) Heavy Smoker Estimates With Heavy Smokers Enrolled in the 2005 and 2006 Nicotine Patch Program: New York City (NYC)**

	2004 CHS Population	2005 Nicotine Patch Program		2006 Nicotine Patch Program	
		No. Enrolled (% of NYC Heavy Smokers Enrolled <sup>a</sup> )	Used Some or All of Patches, <sup>b</sup> %	No. Enrolled (% of NYC Heavy Smokers Enrolled <sup>a</sup> )	Used Some or All of Patches, <sup>b</sup> %
NYC Current Heavy Smoking <sup>c</sup>	541 563	45 144 (8.3%)	65.7%	35 730 (6.6%)	69.7%
<b>Young adult analysis</b>					
All young adults	54 058	2 685 (5.0%)	72.1%	2 381 (4.4%)	76.1%
Race/ethnicity					
Non-Hispanic White	17 743	1 177 (6.6%)	70.6%	962 (5.4%)	75.4%
Non-Hispanic Black	9 144	498 (5.4%)	72.3%	451 (4.9%)	68.6%
Hispanic	15 515	737 (4.8%)	73.4%	680 (4.4%)	80.1%
Asian	9 836	126 (1.3%)	75.8%	95 (1.0%)	83.7%
Neighborhood <sup>d</sup>					
Low income	16 137	840 (5.2%)	73.7%	804 (5.0%)	74.8%
Middle income	18 480	1 014 (5.5%)	69.4%	858 (4.6%)	77.4%
High income	19 441	826 (4.2%)	73.7%	714 (3.7%)	76.1%
Nativity					
US born	41 310	2 177 (5.3%)	71.5%	1 911 (4.6%)	75.9%
Foreign born	12 748	507 (4.0%)	74.1%	468 (3.7%)	76.7%
<b>Young adult women analysis</b>					
All young adult women	17 844	1 355 (7.6%)	67.5%	1 157 (6.5%)	74.7%
Race/ethnicity					
Non-Hispanic White	5 550	543 (9.8%)	64.7%	416 (7.5%)	75.6%
Non-Hispanic Black	3 221	308 (9.6%)	65.8%	276 (8.6%)	67.0%
Hispanic	7 065	401 (5.7%)	71.2%	343 (4.9%)	77.3%
Asian	744 <sup>d</sup>	44 (5.9%)	70.0%	36 (4.8%)	100.0%
<b>Young adult men analysis</b>					
All young adult men	36 214	1 330 (3.7%)	77.1%	1 223 (3.4%)	77.4%
Race/ethnicity					
Non-Hispanic White	12 194	634 (5.2%)	75.7%	546 (4.5%)	75.3%
Non-Hispanic Black	5 923	190 (3.2%)	85.3%	175 (3.0%)	71.4%
Hispanic	8 449	336 (4.0%)	76.2%	337 (4.0%)	82.8%
Asian	9 092 <sup>d</sup>	82 (0.9%)	78.6%	59 (0.6%)	75.0%

<sup>a</sup>Race/ethnicity totals may not add to 100%, because "Other" is not shown.

<sup>b</sup>Among those who completed the counseling call.

<sup>c</sup>Heavy smoking was defined as smoking 10 or more cigarettes per day; the minimum cigarettes per day to be eligible for the patch giveaway.

<sup>d</sup>This estimate should be interpreted with caution because of data variability.

<sup>e</sup>Low-income neighborhoods had 45% to 90% of residents living below 200% of the federal poverty level; middle income was 30% to 44% of residents living below 200% of the federal poverty level; high income was less than 30% of residents living below 200% of the federal poverty level.

likely to quit smoking (OR=1.4; 95% CI=0.9, 2.4) compared with the reference group of adults aged 25 to 44 years<sup>17</sup> suggests that tobacco cessation programs might wisely invest in outreach and recruitment strategies to young adults, especially men. Tobacco industry research provides ample evidence of effective methods for outreach to and recruitment of young adults.<sup>23</sup>

Young adults are being successfully targeted by the tobacco industry at entertainment venues, such as in bars and clubs, and at promotional events, such as parties, concerts, and sporting events.<sup>24–26</sup> Most bar- and club-going young adults report having seen tobacco industry promotions.<sup>27</sup> The tobacco industry has also developed marketing strategies for young adults that include interactive

Web sites, list-servs, and other new media formats.<sup>28,29</sup> Tobacco control programs need to make better use of outreach channels such as those being used effectively by the tobacco industry to reach young adults.

Resource allocation should follow epidemiological findings. Future patch giveaways in New York City will strengthen outreach to the young adult population, particularly young men in general and young Asian men in particular. Radio advertising provides an opportunity to create tailored messages. New York City will also promote giveaways in the alternative press or on Web sites visited by New York City young adults and may utilize text messaging or e-mail outreach strategies.

### Limitations

There are several limitations to this study. First, the cross-sectional nature of the CHS limits the ability to interpret causal relations. Additionally, self-reported measures of smoking may be subject to some response bias. Second, as with many analyses of changes in age-group stratified outcomes in multiple years of cross-sectional surveys, it is possible that the change demonstrated is the product of a cohort effect and not of actual changes in young adult behaviors. Because New York City has demonstrated a sharp decline in smoking among public high school students, part of the demonstrated decline may be a result of public high school students in 2002 "aging" into the 18- to 24-year-old cohort. Third, use of NRT as reported in the follow-up calls should be interpreted with some caution because of the low rate of completed calls. Finally, conclusions drawn about the use of the patch program are limited by the 3-week postenrollment follow-up evaluation. However, previously published findings on the 2003 evaluation<sup>15</sup> provide some evidence that young adults aged 18 to 24 years may have had an increased likelihood to quit. Future evaluation of the 2006 populationwide NRT distribution program will provide enhanced opportunity to further investigate this finding.

### Conclusions

Ever since the 1998 Master Settlement Agreement prohibited the tobacco industry from overtly promoting smoking to youth younger than 18, young adults have become

**TABLE 4—Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Current Smoking and Use of Nicotine Patch Program Patches, Overall and Within Young Adult Population: New York City, 2006**

	Current Smoking (citywide model n = 3 665; young adult model n = 278)		Use some or all patches (citywide model n = 8 473; young adult model n = 662)	
	Bivariate OR (95% CI)	Adjusted OR <sup>a</sup> (95% CI)	Bivariate OR (95% CI)	Adjusted OR <sup>b</sup> (95% CI)
<b>Citywide model</b>				
Age, y				
18-24 (Ref)	1.0	1.0	1.0	1.0
25-44	1.3 (1.1, 1.5)	1.3 (1.0, 1.5)	0.7 (0.6, 0.8)	0.7 (0.6, 0.8)
45-64	1.2 (1.0, 1.4)	1.1 (0.9, 1.4)	0.6 (0.5, 0.7)	0.6 (0.5, 0.7)
≥65	0.4 (0.4, 0.5)	0.4 (0.3, 0.6)	0.6 (0.5, 0.7)	0.7 (0.5, 0.8)
<b>Young adult model</b>				
Gender				
Women (Ref)	1.0	1.0	1.0	1.0
Men	2.0 (1.5, 2.8)	2.1 (1.5, 2.9)	1.5 (1.0, 2.1)	1.5 (1.0, 2.1)
Race/ethnicity				
Non-Hispanic White (Ref)	1.0	1.0	1.0	1.0
Non-Hispanic Black	0.6 (0.4, 1.0)	0.7 (0.4, 1.0)	0.9 (0.6, 1.5)	1.0 (0.6, 1.7)
Hispanic	1.2 (0.9, 1.8)	1.3 (0.8, 2.0)	1.5 (0.9, 2.3)	1.5 (0.9, 2.4)
Asian	0.8 (0.4, 1.4)	1.0 (0.5, 1.9)	3.4 (1.0, 11.3)	3.0 (0.9, 10.0)
Other	0.8 (0.3, 2.0)	1.0 (0.4, 2.5)	1.1 (0.5, 2.3)	1.0 (0.5, 2.1)
Neighborhood <sup>c</sup>				
Low income (Ref)	1.0	1.0	1.0	1.0
Middle income	0.8 (0.5, 1.2)	0.8 (0.5, 1.3)	1.0 (0.6, 1.6)	1.0 (0.6, 1.6)
High income	0.9 (0.6, 1.3)	0.9 (0.6, 1.4)	1.0 (0.6, 1.6)	1.0 (0.6, 1.6)
Nativity				
US born (Ref)	1.0	1.0	1.0	1.0
Foreign born	0.7 (0.5, 0.9)	0.6 (0.4, 0.9)	1.5 (1.0, 2.5)	1.4 (0.8, 2.2)

<sup>a</sup>Adjusted for gender, race/ethnicity, foreign born status, income, and student status.

<sup>b</sup>Adjusted for gender, race/ethnicity, foreign born status, and income; student status not available in nicotine patch program data.

<sup>c</sup>Low-income neighborhoods had 45% to 90% of residents living below 200% of the federal poverty level; middle income was 30% to 44% of residents living below 200% of the federal poverty level; and high income was less than 30% of residents living below 200% of the federal poverty level.

their primary target market. It is critically important that cessation messages reach the young adult population. Cessation programs such as populationwide NRT distribution—which serves the dual purpose of providing resources to help smokers quit and reminding smokers of the importance of quitting—remain an important component of comprehensive tobacco control. Data from the NRT giveaways show that, although citywide efforts to promote NRT giveaway enrollment may effectively reach young adult women, young adult men may require targeted outreach. Given these findings, tobacco control programs

that use NRT distribution as a major component of cessation services should consider devoting resources to enrolling young adult men, and should support continued enrollment among young adult women. Subsequent successes in young adult cessation, especially among men, will be invaluable to reduce smoking-related morbidity and mortality at the population level. ■

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#### Contributors

J. A. Ellis and S. B. Perl designed the analyses; J. A. Ellis and K. Davis conducted the analyses. J. A. Ellis and L. Vichinsky wrote the first draft of the article. All authors contributed to writing and editing the final draft of the article.

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#### Human Participant Protection

This study was approved by the institutional review board of the New York City Department of Health and Mental Hygiene.

#### References

- Ling PM, Glantz SA. Why and how the tobacco industry sells cigarettes to young adults: evidence from industry documents. *Am J Public Health*. 2002; 92(6):908–916.
- Hammond D. Smoking behaviour among young adults: beyond youth prevention. *Tob Control*. 2005; 14(3):181–185.
- Centers for Disease Control and Prevention. Cigarette smoking among high school students, 11 states, 1991–1997. *MMWR Morb Mortal Wkly Rep*. 1999; 48:686–692.
- Substance Abuse and Mental Health Services Administration. *Overview of Findings from the 2004 National Survey on Drug Use and Health*. Available at <http://www.oas.samhsa.gov/NSDUH/2k4NSDUH/2k4Overview/2k4Overview.pdf>. Accessed August 31, 2006.
- Lantz PM. Smoking on the rise among young adults: implications for research and policy. *Tob Control*. 2003;12(suppl 1):i60–i70.
- Biener L, Albers AB. Young adults: vulnerable new targets of tobacco marketing. *Am J Public Health*. 2004;94(2):326–330.
- Ellis JA, Metzger KB, Maulsby C, et al. Smoking among New York City public high school students. *NYC Vital Signs*. 2006;5(1):1–4. Available at: <http://www.nyc.gov/html/doh/downloads/pdf/survey/survey-2006teensmoking.pdf>. Accessed August 30, 2006.
- Wechsler H, Rigotti N, Gledhill-Hoyt J, et al. Increased levels of cigarette use among college students. *JAMA* 1998;280:1673–1678.
- Rigotti N, Lee JE, Wechsler H. US college students' use of tobacco products: results of a national survey. *JAMA* 2000;284:699–705.

10. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. *Monitoring the Future National Survey Results on Drug Use, 1975–2004. Volume II: College Students and Adults Ages 19–45*. Bethesda, Md: National Institutes of Health; 2005. NIH Publication No. 05–5728.
11. National Center for Health Statistics. *Current Cigarette Smoking Among Adults 18 Years of Age and Over, by Sex, Race, and Age: United States, Selected Years 1965–2004*. Available at: <http://www.cdc.gov/nchs/data/hus/06.pdf#06>. Accessed May 1, 2007.
12. Centers for Disease Control and Prevention. *Behavioral Risk Factor Surveillance System Survey Data*. Available at: <http://apps.nccd.cdc.gov/brfss/index.asp>. Accessed May 1, 2007.
13. Centers for Disease Control and Prevention. *Preventing Tobacco Use Among Young People: A Report of the Surgeon General*. Available at: [http://www.cdc.gov/tobacco/sgr/sgr\\_1994/index.htm](http://www.cdc.gov/tobacco/sgr/sgr_1994/index.htm). Accessed August 31, 2006.
14. Doll R, Peto R, Boreham J, Sutherland I. Mortality in relation to smoking: 50 years' observations on male British doctors. *BMJ*. 2004;328(7455):1519.
15. Ling PM, Glantz SA. Tobacco industry research on smoking cessation. Recapturing young adults and other recent quitters. *J Gen Intern Med*. 2004;19(5 Pt 1):419–426.
16. Frieden TR, Mostashari F, Kerker BD, Miller N, Hajat A, Frankel M. Adult tobacco use levels after intensive tobacco control measures: New York City, 2002–2003. *Am J Public Health*. 2005;95(6):1016–1023.
17. Progress stalls in fight against smoking in NYC [press release]. New York, NY: New York City Department of Health; June 13, 2006. Available at: <http://www.nyc.gov/html/doh/html/pr2006/pr046-06.shtml>. Accessed October 18, 2006.
18. Fiore MC, Bailey WC, Cohen SJ, et al. *Treating Tobacco Use and Dependence. Clinical Practice Guideline*. Rockville, Md: US Public Health Service; 2000.
19. Silagy C, Lancaster T, Stead L, Mant D, Fowler G. Nicotine replacement therapy for smoking cessation. *Cochrane Database Syst Rev*. 1996;3.
20. Miller N, Frieden TR, Liu SY, et al. Effectiveness of a large-scale distribution programme of free nicotine patches: a prospective evaluation. *Lancet*. 2005; 365(9474):1849–1854.
21. New York State Department of Health. *Tobacco Use, Cessation, and Exposure to Environmental Tobacco Smoke Among New York State Adults: Behavioral Risk Factor Surveillance System*. Available at: <http://www.health.state.ny.us/nysdoh/tobacco/reports/brfss2001.htm>. Accessed August 31, 2006.
22. Klein RJ, Proctor SE, Boudreault MA, Turczyn KM. Healthy People 2010: Criteria for Data Suppression. Hyattsville, Md: National Center for Health Statistics; 2002. Statistical Notes No. 24.
23. Katz SK, Lavack AM. Tobacco related bar promotions: insights from tobacco industry documents. *Tob Control*. 2002;11(suppl 1):I92–I101.
24. Sepe E, Ling PM, Glantz SA. Smooth moves: bar and nightclub tobacco promotions that target young adults. *Am J Public Health*. 2002;92(3):414–419.
25. Zwarun L. Ten years and 1 master settlement agreement later: the nature and frequency of alcohol and tobacco promotion in televised sports, 2000 through 2002. *Am J Public Health*. 2006;96(8):1492–1497.
26. Siegel M. Counteracting tobacco motor sports sponsorship as a promotional tool: is the tobacco settlement enough? *Am J Public Health*. 2001;91(7):1100–1106.
27. Gilpin EA, White VM, Pierce JP. How effective are tobacco industry bar and club marketing efforts in reaching young adults? *Tob Control*. 2005;14(3):186–192.
28. Ribisl KM. The potential of the internet as a medium to encourage and discourage youth tobacco use. *Tob Control*. 2003;12(suppl 1):i48–59.
29. Hong T, Cody MJ. Presence of pro-tobacco messages on the Web. *J Health Commun*. 2002;7(4):273–307.