

## Original Investigation

# Intermittent and light daily smoking across racial/ethnic groups in the United States

Dennis R. Trinidad, Eliseo J. Pérez-Stable, Sherry L. Emery, Martha M. White, Rachel A. Grana, & Karen S. Messer

## Abstract

**Introduction:** Limited research exists examining the prevalence of intermittent (nondaily) and light daily (1–5 cigarettes/day) smoking across racial/ethnic groups in the United States using nationally representative data. These analyses would be informative in guiding targeted cessation strategies.

**Methods:** Using logistic regression models controlling for age, gender, and education, we examined the prevalence of intermittent and light daily consumption among current smokers across racial/ethnic groups from the 2003 Tobacco Use Supplement to the Current Population Survey. We also examined the association of these demographic factors with consumption within each racial/ethnic group separately.

**Results:** Black (odds ratio [OR] = 1.82, 95% CI = 1.59–2.07), Asian/Pacific Islander (OR = 1.62, 95% CI = 1.29–2.04), and Hispanic/Latino (OR = 3.2, 95% CI = 2.75–3.74) smokers were more likely to smoke intermittently compared with non-Hispanic Whites. Black (OR = 2.69, 95% CI = 2.27–3.18), Asian/Pacific Islander (OR = 2.99, 95% CI = 2.13–4.19), and Hispanic/Latino (OR = 4.64, 95% CI = 3.85–5.58) smokers also were more likely to have light daily consumption compared with non-Hispanic Whites. Hispanic/Latino intermittent smokers smoked fewer days per month and fewer cigarettes per day compared with non-Hispanic White smokers. We found no significant gender differences across racial/ethnic groups in intermittent smoking, but male smokers were significantly less likely to have light daily consumption for all racial/ethnic groups.

**Discussion:** These results have implications for the understanding of the tobacco dependence, the development of prevention and cessation strategies, and the applicability of harm-reduction techniques for racial/ethnic minorities.

## Introduction

Despite the current climate of increasing tobacco control in the United States, relatively few studies have examined smokers who report intermittent and light smoking (Evans et al., 1992; Gilpin, Cavin, & Pierce, 1997; Husten, McCarty, Giovino, Chrismon, & Zhu, 1998). In part, this may be because of the perception that intermittent smoking is less harmful and that these smokers are less “addicted” than regular smokers. In this report, we define intermittent smokers as current smokers who do not smoke daily and light daily smokers as those current daily smokers who consume 1–5 cigarettes/day. Few studies to date have examined intermittent and light daily smoking among racial/ethnic groups in the United States using recent, nationally representative data. Even less research has been conducted comparing the effects of age, gender, and education between and within racial/ethnic groups on intermittent and light smoking. It is important to report on intermittent and light daily smoking behaviors across racial/ethnic groups at the national level; such information has implications for understanding the tobacco dependence and the development of smoking prevention and cessation strategies for racial/ethnic minorities.

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## Intermittent and light daily smoking in the United States

Considerable population-level heterogeneity exists in overall smoking patterns across racial/ethnic groups in the United States (Centers for Disease Control and Prevention, 2004b; U.S. Department of Health and Human Services, 1998). Also, state-level studies have shown that a large proportion of smokers from minority racial/ethnic groups are light and intermittent smokers (Gilpin et al., 1997; Husten et al., 1998). Husten et al. (1998) used data from the 1991 National Health Interview Survey to show that racial/ethnic minority smokers were more likely than non-Hispanic Whites to have never smoked daily. They further reported that college graduates were more likely to have been never-daily smokers compared with those who had less than a college education (Husten et al., 1998). Gilpin et al. (1997) reported that adult never-daily smokers in California during the early 1990s were more likely to be Hispanics/Latinos. More recently, in concordance with those data, Zhu, Pulvers, Zhuang, and Baezconde-Garbanati (2007) used the California Health Interview Survey to show that approximately 70% of Hispanic/Latino smokers in California are intermittent and light smokers. Data from a nine-city survey that included Hispanics/Latinos from five national origin groups indicated that light and intermittent smoking patterns are not restricted to Mexican Americans (Pérez-Stable et al., 2001).

Building on these previous findings, we report on both intermittent and light smoking behaviors across racial/ethnic groups because of the substantial proportions of smokers in these categories among racial/ethnic minorities (e.g., Zhu et al., 2007). Further, the consideration of only one of these categories of smokers would limit the scope of this report. Thus, the present analysis focuses on the population percentages of young to middle-aged intermittent and light smokers across racial/ethnic groups from the 2003 Tobacco Use Supplement to the Current Population Survey (TUS CPS), which are the most recently available data. We examined racial/ethnic differences in intermittent and light smoking in logistic regression models that controlled for age, gender, and education. We then performed within-group analyses to examine the effects of age, gender, and education for each racial/ethnic group.

## Methods

### Data source

We analyzed data from the 2003 TUS CPS, a large, nationally representative, federally sponsored household survey. The CPS is a continuous survey (more than 56,000 households/month) conducted by the U.S. Bureau of the Census, primarily to monitor labor force indicators for the civilian noninstitutionalized U.S. population aged 15 years or older. The complete CPS methodology is published elsewhere (Bureau of Labor Statistics and U.S. Census Bureau, 2002). Briefly, the CPS uses a monthly multistage area probability sample, with an overall response rate of more than 92%. The 2003 TUS was included with CPS surveys in February, June, and November and included both proxy and self-response data, with a self-response rate of more than 61%. Only self-reported data were used in this report.

We considered the population aged 20–50 years at the time of the survey for the present analyses. We focused on this age group because smoking patterns are typically not fully established

before age 20 (given that smoking patterns among adolescents are generally more sporadic), and smoking behaviors begin to stabilize and become more regular as adolescents transition into adulthood. Also, Black and Asian/Pacific Islander smokers may be more likely to initiate as older adolescents and young adults compared with non-Hispanic Whites (Trinidad, Gilpin, Lee, & Pierce, 2004a, 2004b; Trinidad et al., 2007). We also selected age 50 as a cutoff due to differential mortality rates across racial/ethnic groups and varying levels of education past this age (Centers for Disease Control and Prevention, 2004a; Pappas, Queen, Hadden, & Fisher, 1993).

### Smoking and demographic measures

We limited consideration to those who reported a lifetime consumption of 100 or more cigarettes because we were interested in established smokers only (Pierce, Fiore, Novotny, Hatzianandreu, & Davis, 1989). TUS CPS survey respondents were asked, “Have you ever smoked 100 cigarettes?” and respondents were considered to be ever-established smokers if they answered yes to this question. Ever-established smokers were further asked, “Do you now smoke every day, some days, or not at all?” Those who reported smoking every day were considered to be current daily smokers, whereas those who reported smoking on some days were considered to be current intermittent smokers. Other researchers also have classified this latter group of smokers as occasional smokers or nondaily smokers (Evans et al., 1992; Gilpin et al., 1997). Intermittent smokers were asked for the number of cigarettes they smoked on the days that they smoked. Daily smokers also were asked the number of cigarettes they smoked each day. We refer to light daily smokers as those established daily smokers who reported smoking five or fewer cigarettes daily.

Demographic measures included age, gender, level of education, and self-reported race or ethnicity. We used the following categorizations for educational level: less than high school, high school graduate (including general education development), some college, and college graduate. We used the U.S. Census categories that defined Hispanic/Latino ethnicity and then identified the respondents’ race as non-Hispanic White, Black, Asian/Pacific Islander, or American Indian/Native American.

### Data analyses

All estimates were computed using the published TUS CPS survey weights, which account for selection probabilities from the sampling design and adjust for survey nonresponse (Bureau of Labor Statistics and U.S. Census Bureau, 2002; U.S. Department of Commerce, Census Bureau, National Cancer Institute, and Centers for Disease Control and Prevention, 2001–2002). Variance estimates and 95% CI were computed using standard jackknife methodology for the CPS, using the published weights with Fay’s balanced repeated replication (Bureau of Labor Statistics and U.S. Census Bureau, 2002; Judkins, 1990). We used SAS-callable SUDAAN version 9.0.1 using PROC CROSSTABS to calculate weighted proportions and PROC RLOGIST for weighted logistic regression models. These models controlled for age, gender, and education and were fit to examine associations between race/ethnicity and various smoking levels. We then performed within-group analyses to examine the effects of age, gender, and education for each racial/ethnic group.

## Results

### Demographics

Based on the 2003 TUS CPS sample of respondents aged 20–50 years of age, an estimated 12.3% were Blacks, 5.1% were Asian/Pacific Islanders, 15.3% were Hispanics/Latinos, and 66.0% were non-Hispanic Whites. It appears that among Blacks, women were more likely to be sampled than men (54.9% ± 0.2% vs. 45.1% ± 0.2%). Hispanics/Latinos were slightly younger than other racial/ethnic groups. Approximately 17.3% ± 0.9% of Blacks in this sample had graduated from college compared with about 53.6% ± 2.0% of Asian/Pacific Islanders, about 11.2% ± 0.7% of Hispanics/Latinos, and about 33.2% ± 0.6% of non-Hispanic Whites.

### Proportions of intermittent and light smoking

Table 1 shows that among the general U.S. population aged 20–50 years, approximately one-quarter (24.5% ± 0.5%) of non-Hispanic Whites were current smokers. This finding is in contrast to 20.3% ± 1.1% of Blacks, 12.3% ± 1.3% of Asian/Pacific Islanders, and 14.2% ± 0.7% of Hispanics/Latinos. A difference between genders in current smoking prevalence was particularly evident among racial/ethnic minorities, with much higher rates of current smoking among men than women (Black: 23.6% ± 1.8% vs. 17.7% ± 1.2%; Asian/Pacific Islander: 18.5% ± 2.0% vs. 6.6% ± 1.4%; and Hispanic/Latino: 17.4% ± 1.1% vs. 10.6% ± 0.8%). In contrast, such a gender differential was less

**Table 1. Demographics and detailed smoking information, by race/ethnicity, adults aged 20–50 years, 2003 TUS CPS**

	Sample size	Overall Percent (95% CI)	Black Percent (95% CI)	Asian American/ Pacific Islander Percent (95% CI)	Hispanic/Latino Percent (95% CI)	Non-Hispanic White Percent (95% CI)
<b>Demographic information</b>						
Total sample	104,569		12.3	5.1	15.3	66.0
Gender, percent men		49.4 (±0.1)	45.1 (±0.2)	47.9 (±0.5)	52.6 (±0.1)	49.5 (±0.1)
Age, years (mean)		35.5 (±0.0)	35.0 (±0.1)	34.8 (±0.1)	33.5 (±0.0)	36.1 (±0.0)
<b>Education level</b>						
Less than high school	10,773	12.0 (±0.3)	13.1 (±0.9)	7.3 (±1.2)	37.8 (±1.4)	6.1 (±0.2)
High school graduate	31,543	29.5 (±0.4)	36.2 (±1.2)	17.0 (±1.6)	29.0 (±1.1)	29.3 (±0.5)
Some college	31,721	29.9 (±0.3)	33.5 (±1.1)	22.2 (±1.5)	22.0 (±1.0)	31.4 (±0.4)
College graduate	30,532	28.7 (±0.5)	17.3 (±0.9)	53.6 (±2.0)	11.2 (±0.7)	33.2 (±0.6)
Ever-smokers	39,274	36.0 (±0.5)	28.5 (±1.1)	21.1 (±1.5)	23.3 (±0.9)	41.2 (±0.5)
<b>Prevalence of current smoking</b>						
Overall	23,563	21.9 (±0.4)	20.3 (±1.1)	12.3 (±1.3)	14.2 (±0.7)	24.5 (±0.5)
Males	11,339	24.1 (±0.6)	23.6 (±1.8)	18.5 (±2.0)	17.4 (±1.1)	26.1 (±0.6)
Females	12,224	19.8 (±0.4)	17.7 (±1.2)	6.6 (±1.4)	10.6 (±0.8)	22.9 (±0.5)
<b>Percentages at a specific consumption level among current smokers</b>						
<b>Overall</b>						
Intermittent	4,334	19.7 (±0.7)	23.8 (±2.1)	29.7 (±4.3)	35.7 (±2.9)	16.6 (±0.7)
Daily, ≤5	1,581	7.5 (±0.4)	11.9 (±1.3)	14.1 (±3.7)	18.9 (±2.2)	5.1 (±0.4)
Daily, 6–10	4,929	20.8 (±0.6)	30.8 (±2.1)	27.8 (±4.3)	21.8 (±2.2)	18.7 (±0.6)
Daily, 11–19	2,766	11.3 (±0.5)	9.6 (±1.5)	9.8 (±3.1)	7.3 (±1.4)	12.2 (±0.6)
Daily, 20+	9,777	40.7 (±0.7)	23.9 (±1.8)	18.7 (±4.5)	16.3 (±1.9)	47.5 (±0.9)
<b>Males</b>						
Intermittent	2,145	20.6 (±1.1)	25.3 (±3.2)	30.1 (±5.4)	37.5 (±3.8)	16.6 (±1.1)
Daily, ≤5	636	6.5 (±0.5)	8.7 (±1.8)	12.7 (±3.8)	17.2 (±2.9)	4.1 (±0.5)
Daily, 6–10	1,922	17.6 (±0.9)	28.2 (±3.3)	28.3 (±4.7)	20.5 (±2.8)	14.9 (±0.9)
Daily, 11–19	1,238	10.4 (±0.8)	10.0 (±2.2)	9.9 (±3.7)	7.3 (±1.8)	11.1 (±0.8)
Daily, 20+	5,307	44.9 (±1.0)	27.8 (±2.7)	19.1 (±5.3)	17.5 (±2.7)	53.4 (±1.3)
<b>Females</b>						
Intermittent	2,189	18.7 (±0.8)	22.1 (±2.7)	28.8 (±9.8)	32.5 (±4.0)	16.6 (±0.8)
Daily, ≤5	945	8.7 (±0.6)	15.5 (±2.2)	17.5 (±7.8)	22.0 (±2.9)	6.2 (±0.6)
Daily, 6–10	3,007	24.5 (±0.8)	33.7 (±3.0)	26.6 (±8.2)	24.1 (±3.9)	23.0 (±0.8)
Daily, 11–19	1,528	12.3 (±0.7)	9.1 (±1.8)	9.5 (±5.5)	7.1 (±2.4)	13.4 (±0.9)
Daily, 20+	4,470	35.7 (±1.1)	19.6 (±2.6)	17.6 (±7.4)	14.3 (±2.6)	40.8 (±1.2)

TUS CPS, Tobacco Use Supplement to the Current Population Survey.

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pronounced among non-Hispanic Whites ( $26.1\% \pm 0.6\%$  of men vs.  $22.9\% \pm 0.5\%$  of women).

Among current smokers, a higher proportion of minorities reported smoking intermittently compared with non-Hispanic Whites: Almost one-quarter of Black smokers ( $23.8\% \pm 2.1\%$ ) were intermittent smokers, as were about one-third of Asian/Pacific Islander ( $29.7\% \pm 4.3\%$ ) and Hispanic/Latino ( $35.7\% \pm 2.9\%$ ) smokers compared with only about one-sixth of non-Hispanic White ( $16.6\% \pm 0.7\%$ ) smokers. We report the prevalence of daily smoking among current smokers by consumption level. Only  $5.1\% \pm 0.4\%$  of non-Hispanic White smokers reported smoking daily five or fewer cigarettes per day (CPD). However, over twice as many Black smokers reported this level of light daily consumption ( $11.9\% \pm 1.3\%$ ). Furthermore, almost three times as many Asian/Pacific Islander ( $14.1\% \pm 3.7\%$ ) and almost four times as many Hispanic/Latino ( $18.9\% \pm 2.2\%$ ) smokers reported smoking daily five or fewer CPD.

By contrast, almost half of non-Hispanic White current smokers ( $47.5\% \pm 0.9\%$ ) reported smoking at least a pack a day ( $\geq 20$  cigarettes) compared with only  $23.9\% \pm 1.8\%$  of Black smokers,  $18.7\% \pm 4.5\%$  of Asian/Pacific Islander smokers, and  $16.3\% \pm 1.9\%$  of Hispanic/Latino smokers. We found similar patterns of differences in consumption among smokers by gender, with larger percentages of both racial/ethnic minority men and women smokers reporting lower consumption levels, whereas larger percentages of non-Hispanic White smokers reported smoking a pack or more per day.

### Mean number of days smoked and number of CPD among smokers

Table 2 shows that, of all intermittent smokers, Hispanics/Latinos reported smoking on fewer days out of the past 30 days compared with non-Hispanic Whites ( $11.7 \pm 0.6$  vs.  $13.0 \pm 0.3$ ). Also, on the days that intermittent smokers did smoke, Hispanics/

Latinos reported smoking fewer CPD compared with non-Hispanic Whites ( $3.7 \pm 0.4$  vs.  $5.1 \pm 0.2$ ). Among daily smokers (combining consumption levels), ethnic minorities, especially Hispanics/Latinos, reported smoking fewer CPD on average than their non-Hispanic White counterparts: Black daily smokers smoked  $12.8 \pm 0.4$  CPD; Asian/Pacific Islanders,  $11.9 \pm 1.0$  CPD; Hispanics/Latinos,  $10.8 \pm 0.5$  CPD; and non-Hispanic Whites,  $17.9 \pm 0.2$  CPD.

### Intermittent and light daily consumption among smokers from different racial/ethnic groups

Table 3 presents results from separate logistic regression models that compared the prevalence of each of three consumption levels (A: intermittent; B: daily,  $\leq 5$  CPD; and C: daily,  $20+$  CPD) among smokers of different races/ethnicity, adjusted for age, education, and gender. Smokers from racial/ethnic minority groups were significantly more likely than non-Hispanic Whites to be intermittent or light daily smokers. Model A shows that Black (odds ratio [OR] = 1.82, 95% CI = 1.59–2.07) and Asian/Pacific Islander (OR = 1.62, 95% CI = 1.29–2.04) smokers were significantly more likely than non-Hispanic Whites to smoke intermittently, whereas Hispanic/Latino smokers were over three times more likely than non-Hispanic Whites to be intermittent smokers (OR = 3.20, 95% CI = 2.75–3.74). Model B shows that Hispanic/Latino smokers were also over four-and-a-half times more likely to be light daily smokers compared with non-Hispanic Whites (OR = 4.64, 95% CI = 3.85–5.58), whereas Black (OR = 2.69, 95% CI = 2.27–3.18) and Asian/Pacific Islander (OR = 2.99, 95% CI = 2.13–4.19) smokers were about three times more likely. Conversely, Model C shows that smokers from racial/ethnic minority groups were significantly less likely than non-Hispanic Whites to smoke a pack per day after adjusting for the aforementioned factors: Blacks (OR = 0.29, 95% CI = 0.26–0.32), Asian/Pacific Islanders (OR = 0.28, 95% CI = 0.2–0.38), and Hispanics/Latinos (OR = 0.17, 95% CI = 0.14–0.20).

Younger adult smokers aged 20–34 years were more likely to smoke at lower levels: OR = 1.58, 95% CI = 1.45–1.71 for intermittent consumption (Model A) and OR = 1.52, 95% CI = 1.32–1.76 for light daily consumption (Model B). Conversely, younger adult smokers in this age group also were only half as likely to smoke a pack or more per day (OR = 0.5, 95% CI = 0.47–0.54; Model C). Although we found no significant gender difference in prevalence of intermittent consumption, male smokers were about 63% more likely to smoke a pack or more per day (OR = 1.63, 95% CI = 1.52–1.75). Also, smokers with lower levels of education were more likely to consume a pack or more per day compared with those who had graduated college: OR = 3.85, 95% CI = 3.35–4.42 for those with less than a high school education; OR = 2.99, 95% CI = 2.69–3.33 for high school graduates; and OR = 1.93, 95% CI = 1.72–2.16 for those with some college education.

### Examination of intermittent and light daily consumption within each racial/ethnic group

We then examined the association of age, gender, and education with each consumption level (i.e., intermittent; light daily; daily,  $20$  CPD) for smokers within each racial/ethnic group separately

**Table 2. Consumption levels by race/ethnicity among smokers aged 20–50 years, 2003 TUS CPS**

Mean (95% CI)	
Mean number of days smoked in last 30 days (intermittent smokers)	
Black	14.1 ( $\pm 0.8$ )
Asian/Pacific Islander	13.6 ( $\pm 1.5$ )
Hispanic/Latino	11.7 ( $\pm 0.6$ )
Non-Hispanic White	13.0 ( $\pm 0.3$ )
Mean number of cigarettes smoked per day (intermittent smokers)	
Black	4.8 ( $\pm 0.6$ )
Asian/Pacific Islander	4.4 ( $\pm 0.7$ )
Hispanic/Latino	3.7 ( $\pm 0.4$ )
Non-Hispanic White	5.1 ( $\pm 0.2$ )
Mean number of cigarettes smoked per day (daily smokers)	
Black	12.8 ( $\pm 0.4$ )
Asian/Pacific Islander	11.9 ( $\pm 1.0$ )
Hispanic/Latino	10.8 ( $\pm 0.5$ )
Non-Hispanic White	17.9 ( $\pm 0.2$ )

TUS CPS, Tobacco Use Supplement to the Current Population Survey.

**Table 3. Logistic regression models comparing intermittent and light daily consumption between smokers from different racial/ethnic groups**

	(A) Intermittent smokers	(B) Daily, $\leq 5$ CPD	(C) Daily, 20+ CPD
	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
Age group (years)			
20–34	1.58 (1.45–1.71)	1.52 (1.32–1.76)	0.5 (0.47–0.54)
35–50	Reference	Reference	Reference
Gender			
Male	1.09 (0.99–1.19)	0.65 (0.58–0.72)	1.63 (1.52–1.75)
Female	Reference	Reference	Reference
Education			
Less than high school	0.27 (0.23–0.31)	0.69 (0.55–0.86)	3.85 (3.35–4.42)
High school graduate	0.32 (0.28–0.36)	0.61 (0.51–0.74)	2.99 (2.69–3.33)
Some college	0.51 (0.45–0.58)	0.84 (0.69–1.01)	1.93 (1.72–2.16)
College graduate	Reference	Reference	Reference
Race/ethnicity			
Black	1.82 (1.59–2.07)	2.69 (2.27–3.18)	0.29 (0.26–0.32)
Asian/Pacific Islander	1.62 (1.29–2.04)	2.99 (2.13–4.19)	0.28 (0.2–0.38)
Hispanic/Latino	3.2 (2.75–3.74)	4.64 (3.85–5.58)	0.17 (0.14–0.2)
Non-Hispanic White	Reference	Reference	Reference

Note. CPD = cigarettes per day.

(Table 4). For all racial/ethnic groups, younger smokers were significantly more likely to smoke intermittently. We found no significant gender differences in intermittent smoking for any groups. However, Black ( $OR=0.53$ , 95%  $CI=0.39-0.71$ ), Hispanic/Latino ( $OR=0.7$ , 95%  $CI=0.53-0.91$ ), and non-Hispanic White ( $OR=0.66$ , 95%  $CI=0.56-0.78$ ) male smokers were less likely to have a light daily smoking pattern than were female smokers.

The association of education with intermittent smoking was significant only for smokers from Asian/Pacific Islander and non-Hispanic White ethnic groups. For these groups, as education level increased, the odds of higher cigarette consumption decreased. Asian/Pacific Islander smokers who had less than a high school education had 12% odds of being intermittent smokers ( $OR=0.12$ , 95%  $CI=0.04-0.37$ ) and were over two-and-a-half times more likely to smoke a pack or more per day ( $OR=2.58$ , 95%  $CI=1.17-5.66$ ) compared with college graduates. Similarly, Asian/Pacific Islander smokers with a high school education had only 26% odds of being intermittent smokers ( $OR=0.26$ , 95%  $CI=0.15-0.45$ ) and were over three times more likely to smoke a pack or more per day ( $OR=3.15$ , 95%  $CI=1.6-6.21$ ) compared with college graduates. Non-Hispanic White smokers with less than a high school education had only 14% odds of being intermittent smokers ( $OR=0.14$ , 95%  $CI=0.11-0.17$ ) and were over five times more likely to smoke a pack or more per day ( $OR=5.25$ , 95%  $CI=4.46-6.18$ ) compared with college graduates. Non-Hispanic White smokers with a high school education had only 27% odds of being intermittent smokers ( $OR=0.27$ , 95%  $CI=0.24-0.31$ ) and were over three times more likely to smoke a pack or more per day ( $OR=3.31$ , 95%  $CI=2.96-3.7$ ).

## Discussion

Our analyses of intermittent and light consumption patterns among smokers from different racial/ethnic groups based on recent, nationally representative data indicate that Black, Asian/

Pacific Islander, and Hispanic/Latino smokers were more likely to be intermittent and light daily smokers compared with non-Hispanic Whites, even after controlling for age, gender, and education level. This was particularly true of Hispanic/Latino smokers, who were over three times more likely to smoke intermittently and over four-and-a-half times more likely to smoke daily five or fewer CPD as compared with non-Hispanic White smokers. Furthermore, Hispanic/Latino intermittent smokers smoked fewer days per month and smoked fewer CPD on the days they did smoke compared with non-Hispanic Whites.

Interestingly, we found no apparent gender difference among smokers across racial/ethnic groups in the prevalence of intermittent smoking, but male smokers were significantly less likely to be light daily smokers and more likely to smoke heavily ( $\geq 20$  CPD). Another noteworthy finding is that the association of education with intermittent smoking within racial/ethnic groups was significant only among smokers of Asian/Pacific Islander and non-Hispanic White race/ethnicity. However, these findings, particularly on the lack of significant gender differences across racial/ethnic groups, may be due to small sample sizes for current smokers within some of the racial/ethnic groups (see Table 1). More local or specific studies focusing on a particular racial or ethnic group may be helpful in understanding factors related to these findings.

Across racial/ethnic groups, smokers aged 20–34 years were significantly more likely to be intermittent smokers than those 35–50 years old. Together with the findings by Messer, Trinidad, Al-Delaimy, and Pierce (2008) indicating that young adult smokers are more likely to quit, this finding suggests that increased efforts to promote cessation among younger racial/ethnic minority smokers may be worthwhile.

Nicotine metabolism has been found to be slower among Chinese Americans (Benowitz, Pérez-Stable, Herrera, & Jacob, 2002) and African Americans (Pérez-Stable, Herrera, Jacob, &

**Table 4. Logistic regression models comparing intermittent and light daily consumption by demographic factors for smokers within racial/ethnic groups**

	Black	Asian/Pacific Islander	Hispanic/Latino	Non-Hispanic White
	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)	Odds ratio (95% CI)
<b>Intermittent smokers</b>				
Age group (years)				
20–34	1.34 (1.09–1.65)	1.87 (1.18–2.97)	1.28 (1.04–1.56)	1.66 (1.50–1.84)
35–50	Reference	Reference	Reference	Reference
Gender				
Male	1.20 (0.94–1.52)	0.92 (0.49–1.74)	1.22 (0.96–1.55)	1.03 (0.93–1.15)
Female	Reference	Reference	Reference	Reference
Education				
Less than high School	0.76 (0.47–1.23)	0.12 (0.04–0.37)	0.83 (0.55–1.26)	0.14 (0.11–0.17)
High school graduate	0.83 (0.53–1.28)	0.26 (0.15–0.45)	0.66 (0.43–1.01)	0.27 (0.24–0.31)
Some college	0.81 (0.52–1.25)	0.39 (0.20–0.73)	0.83 (0.54–1.29)	0.49 (0.43–0.56)
College graduate	Reference	Reference	Reference	Reference
<b>Daily smokers: ≤5 CPD</b>				
Age group (years)				
20–34	1.19 (0.89–1.60)	0.94 (0.51–1.73)	1.20 (0.91–1.57)	1.91 (1.59–2.30)
35–50	Reference	Reference	Reference	Reference
Gender				
Male	0.53 (0.39–0.71)	0.70 (0.37–1.31)	0.70 (0.53–0.91)	0.66 (0.56–0.78)
Female	Reference	Reference	Reference	Reference
Education				
Less than high school	0.62 (0.33–1.16)	1.19 (0.36–4.00)	1.05 (0.61–1.80)	0.46 (0.32–0.66)
High school graduate	0.83 (0.47–1.46)	0.90 (0.42–1.94)	0.72 (0.42–1.22)	0.53 (0.43–0.66)
Some college	1.17 (0.69–1.99)	1.38 (0.61–3.14)	0.78 (0.44–1.38)	0.75 (0.59–0.97)
College graduate	Reference	Reference	Reference	Reference
<b>Daily Smokers: 20+ CPD</b>				
Age group (years)				
20–34	0.73 (0.58–0.92)	0.80 (0.45–1.42)	0.65 (0.49–0.87)	0.47 (0.44–0.51)
35–50	Reference	Reference	Reference	Reference
Gender				
Male	1.55 (1.24–1.93)	1.21 (0.66–2.23)	1.33 (0.98–1.81)	1.68 (1.57–1.81)
Female	Reference	Reference	Reference	Reference
Education				
Less than high school	1.06 (0.70–1.62)	2.58 (1.17–5.66)	1.10 (0.61–2.00)	5.25 (4.46–6.18)
High school graduate	1.10 (0.72–1.69)	3.15 (1.60–6.21)	1.37 (0.80–2.38)	3.31 (2.96–3.70)
Some college	0.84 (0.54–1.32)	1.43 (0.66–3.10)	1.28 (0.74–2.20)	2.09 (1.85–2.35)
College graduate	Reference	Reference	Reference	Reference

Note. CPD = cigarettes per day.

Benowitz, 1998). However, Hispanics/Latinos were shown not to differ from Whites in nicotine metabolism and cotinine clearance (Benowitz et al., 2002). Despite these metabolism differences, the same studies found that Blacks had a higher intake of nicotine per cigarette than did non-Hispanic Whites and Hispanics/Latinos, whereas Chinese participants had a lower intake of nicotine per cigarette. Thus, metabolism differences do not appear to account for the observed differences in smoking behavior.

Because the focus of this report is on the most recent nationally representative data available from a smoking survey, we presented results based on the 2003 TUS CPS. However, although not presented here, we encountered similar results when analyzing data from the 1995–1996, 1998–1999, and 2001–2002 TUS CPS. This finding, combined with earlier reports from the 1990s (Gilpin et al., 1997; Husten et al., 1998; Kabat, Morabia, &

Wynder, 1991; Okuyemi, Ahluwalia, Richter, Mayo, & Resnicow, 2001), suggests that the ethnic differences reported here are genuine and have persisted at least since the 1990s. Furthermore, these results support findings from the early 1990s by Husten et al. (1998) and build on state-level results reported by Gilpin et al. (1997) and Zhu et al. (2007).

The results presented here also are consistent with those reported by Hassmiller, Warner, Mendez, Levy, and Romano (2003). Based on analyses of the 1998–1999 TUS CPS, Hassmiller et al. (2003) also reported that ethnic minorities were more likely to be intermittent smokers, especially Hispanics/Latinos. In addition, Hassmiller et al. reported that younger smokers were more likely to be intermittent smokers compared with older age groups. The research presented here builds on these findings by making use of a more recent TUS CPS dataset, by

considering light daily consumption among current smokers, and by focusing primarily on comparing consumption levels between smokers from different ethnic groups. Our findings have particular significance for tailoring smoking cessation campaigns to racial/ethnic minorities and to young adults.

## Limitations

An important limitation to consider is that our results for Asian/Pacific Islanders and Hispanics/Latinos are based on an examination of each racial/ethnic group as a whole. However, each of these groups includes populations of several national origins. For example, Asian/Pacific Islanders can include Chinese, Filipinos, Japanese, Koreans, and Vietnamese, all of whom speak different languages. Although most Hispanics/Latinos speak Spanish or English, at least 20 national origin groups come from Latin America, although Mexicans constitute about 65% of the total. Smoking behavior patterns and cultural norms surrounding smoking appear to be similar among Hispanics/Latinos of different national origins especially when the Spanish language is dominant (Marin, Pérez-Stable, & Marin, 1989; Marin, Pérez-Stable, Otero-Sabogal, Sabogal, & VanOss Marin, 1989; Pérez-Stable, Marin, & Posner, 1998). However, similar research among Asian/Pacific Islanders has not been conducted or has been restricted to language-specific national origin groups.

In the TUS CPS, smoking status was ascertained by self-report and not validated with biochemical tests. Pérez-Stable, Marin, Marin, Brody, and Benowitz (1990) have found that Mexican-American smokers who self-reported to be light smokers underreported the true quantity they smoked when compared with serum cotinine levels. However, based on data from the National Health and Nutrition Examination Survey, more than 95% of non-Hispanic White, Mexican American, and Black current smokers had serum cotinine levels consistent with active smoking, although intensity levels were not analyzed (Caraballo et al., 1998). Thus, misclassification of smoking status by using self-report only is uncommon.

Although the focus of these analyses was on young to middle-aged adults (20–50 years), this restriction may artificially inflate the smoking prevalence if adults older than 50 years were considered in the analyses. We also acknowledge that those categorized as intermittent smokers (established smokers who smoke on some days) may have been exposed to more cigarettes per month compared with daily smokers. Therefore, the categorization of intermittent smoking does not necessarily equate with low smoking levels, and researchers may consider using a measure of “monthly cigarette exposure” to better quantify tobacco use among light and intermittent smokers.

## Conclusions

The present results have implications for the understanding of tobacco dependence and the development of smoking prevention and cessation strategies for racial/ethnic minorities. This includes the focus of cessation strategies used by health professionals and the media and the applicability of harm-reduction techniques for racial/ethnic minorities.

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## Declaration of Interests

None declared.

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## References

- Benowitz, N. L., Pérez-Stable, E. J., Herrera, B., & Jacob, P., III. (2002). Slower metabolism and reduced intake of nicotine from cigarette smoking in Chinese-Americans. *Journal of the National Cancer Institute, 94*, 108–115.
- Bureau of Labor Statistics and U.S. Census Bureau. (2002). *Current Population Survey: Design and methodology*. Washington, DC: U.S. Department of Commerce. (Technical paper 63RV).
- Caraballo, R. S., Giovino, G. A., Pechacek, T. F., Mowery, P. D., Richter, P. A., Strauss, W. J., et al. (1998). Racial and ethnic differences in serum cotinine levels of cigarette smokers: Third National Health and Nutrition Examination Survey, 1988–1991. *The Journal of the American Medical Association, 280*, 135–139.
- Centers for Disease Control and Prevention. (2004a). Disparities in premature deaths from heart disease—50 states and the District of Columbia, 2001. *MMWR Morbidity and Mortality Weekly Report, 53*, 121–125.
- Centers for Disease Control and Prevention. (2004b). Prevalence of cigarette use among 14 racial/ethnic populations—United States, 1999–2001. *MMWR Morbidity and Mortality Weekly Report, 53*, 49–52.
- Evans, N. J., Gilpin, E. A., Pierce, J. P., Burns, D. M., Borland, R., Johnson, M., et al. (1992). Occasional smoking among adults: Evidence from the California Tobacco Survey. *Tobacco Control, 1*, 169–175.
- Gilpin, E., Cavin, S. W., & Pierce, J. P. (1997). Adult smokers who do not smoke daily. *Addiction, 92*, 473–480.
- Hassmiller, K. M., Warner, K. E., Mendez, D., Levy, D. T., & Romano, E. (2003). Nondaily smokers: Who are they?. *American Journal of Public Health, 93*, 1321–1327.
- Husten, C. G., McCarty, M. C., Giovino, G. A., Chrismon, J. H., & Zhu, B. (1998). Intermittent smokers: A descriptive analysis of persons who have never smoked daily. *American Journal of Public Health, 88*, 86–89.

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- Judkins, J. R. (1990). Fay's method for variance estimation. *Journal of Official Statistics*, 6, 223–239.
- Kabat, G. C., Morabia, A., & Wynder, E. L. (1991). Comparison of smoking habits of Blacks and Whites in a case-control study. *American Journal of Public Health*, 81, 1483–1486.
- Marin, G., Pérez-Stable, E. J., & Marin, B. V. (1989). Cigarette smoking among San Francisco Hispanics: The role of acculturation and gender. *American Journal of Public Health*, 79, 196–198.
- Marin, G., Pérez-Stable, E. J., Otero-Sabogal, R., Sabogal, F., & VanOss Marin, B. (1989). Stereotypes of smokers held by Hispanic and White non-Hispanic smokers. *International Journal of the Addictions*, 24, 203–213.
- Messer, K., Trinidad, D. R., Al-Delaimy, W. K., & Pierce, J. P. (2008). Smoking cessation rates in the United States: A comparison of young adult and older smokers. *American Journal of Public Health*, 98, 317–322.
- Okuyemi, K. S., Ahluwalia, J. S., Richter, K. P., Mayo, M. S., & Resnicow, K. (2001). Differences among African American light, moderate, and heavy smokers. *Nicotine & Tobacco Research*, 3, 45–50.
- Pappas, G., Queen, S., Hadden, W., & Fisher, G. (1993). The increasing disparity in mortality between socioeconomic groups in the United States, 1960 and 1986. *The New England Journal of Medicine*, 329, 103–109.
- Pérez-Stable, E. J., Herrera, B., Jacob, P., III., & Benowitz, N. L. (1998). Nicotine metabolism and intake in Black and White smokers. *The Journal of the American Medical Association*, 280, 152–156.
- Pérez-Stable, E. J., Marin, B. V., Marin, G., Brody, D. J., & Benowitz, N. L. (1990). Apparent underreporting of cigarette consumption among Mexican American smokers. *American Journal of Public Health*, 80, 1057–1061.
- Pérez-Stable, E. J., Marin, G., & Posner, S. F. (1998). Ethnic comparison of attitudes and beliefs about cigarette smoking. *Journal of General Internal Medicine*, 13, 167–174.
- Pérez-Stable, E. J., Ramirez, A., Villareal, R., Talavera, G. A., Trapido, E., Suarez, L., et al. (2001). Cigarette smoking behavior among US Latino men and women from different countries of origin. *American Journal of Public Health*, 91, 1424–1430.
- Pierce, J. P., Fiore, M. C., Novotny, T. E., Hatziandreu, E. J., & Davis, R. M. (1989). Trends in cigarette smoking in the United States. Projections to the year 2000. *The Journal of the American Medical Association*, 261, 61–65.
- Trinidad, D. R., Gilpin, E. A., Lee, L., & Pierce, J. P. (2004a). Do the majority of Asian-American and African-American smokers start as adults? *American Journal of Preventive Medicine*, 26, 156–158.
- Trinidad, D. R., Gilpin, E. A., Lee, L., & Pierce, J. P. (2004b). Has there been a delay in the age of regular smoking onset among African Americans? *Annals of Behavioral Medicine*, 28, 152–157.
- Trinidad, D. R., Messer, K., Gilpin, E., Al-Delaimy, W., White, M., & Pierce, J. (2007). The California Tobacco Control Program's effect on adult smokers: (3) Similar effects for African Americans across states. *Tobacco Control*, 16, 96–100.
- U.S. Department of Commerce, Census Bureau, National Cancer Institute, and Centers for Disease Control and Prevention. (2001–2002). *Co-sponsored Tobacco Use Supplement to the Current Population Survey (2001–2002): Current Population Survey, June 2001, November 2001, and February 2002: Tobacco Use Supplement File technical documentation: Appendix 17*, Retrieved 19 October 2005, from <http://www.census.gov/apsd/techdoc/cps/cps-main.html>.
- U.S. Department of Health and Human Services. (1998). *Tobacco use among U.S. racial/ethnic groups—African Americans, American Indian and Alaska Natives, Asian Americans and Pacific Islanders, and Hispanics: A report of the surgeon general*. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention.
- Zhu, S. H., Pulvers, K., Zhuang, Y., & Baezconde-Garbanati, L. (2007). Most Latino smokers in California are low-frequency smokers. *Addiction*, 102(Suppl. 2), 104–111.