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## Cigarette Smoking Among Inmates by Race/Ethnicity: Impact of Excluding African American Young Adult Men From National Prevalence Estimates

Sara M. Kennedy, MPH<sup>1</sup>, Saida R. Sharapova, MD, MPH<sup>2</sup>, Derrick D. Beasley, MPH<sup>3</sup>, and Jason Hsia, PhD<sup>2</sup>

<sup>1</sup>Biostatistics and Epidemiology Division, RTI International, Atlanta, GA

<sup>2</sup>Office on Smoking and Health, Centers for Disease Control and Prevention, Atlanta, GA

<sup>3</sup>Rollins School of Public Health, Emory University, Atlanta, GA

### Abstract

**Introduction**—Cigarette smoking prevalence is more than two times greater among incarcerated adults, a population usually excluded from national health surveys. African American young adult (18–25) men are less likely to smoke cigarettes than their white counterparts. However, they are two and a-half-times more likely to be incarcerated. This study estimated smoking prevalence with noninstitutionalized and incarcerated samples combined to determine if excluding incarcerated adults impacts smoking prevalence for certain populations.

**Methods**—The Bureau of Justice Statistics last fielded the Survey of Inmates in State and Federal Correction Facilities in 2003–2004. We combined data from Survey of Inmates in State and Federal Correction Facilities ( $n = 17\,910$ ) and the 2003 and 2004 National Health Interview Survey ( $n = 61\,470$ ) to calculate combined cigarette smoking estimates by race/ethnicity, sex, and age.

**Results**—Inmates represented the greatest proportion of smokers among African American men. Among African American young adult men, inmates represented 15.2% of all smokers in the combined population, compared to 2.0% among white young adult men. Cigarette smoking prevalence was 17.6% in the noninstitutionalized population of young adult African American men and 19.7% in the combined population. Among white young adult men, cigarette smoking prevalence was 29.8% in the noninstitutionalized population, and 30.2% in the combined population. There was little difference in estimates among women.

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Corresponding Author: Sara M. Kennedy, MPH, Biostatistics and Epidemiology Division, RTI International, 2951 Flowers Road South, Suite 119, Atlanta, GA 30341-5533, USA. Telephone: 770-488-5049; sarakennedy@rti.org.

Declaration of Interests

None declared.

Disclaimer

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**Conclusions**—The exclusion of incarcerated African American young adult men may result in a small underestimation of cigarette smoking prevalence in this population. Increasing access to smoking cessation support among inmates may reduce smoking prevalence in disproportionately incarcerated segments of the US population.

**Implications**—The exclusion of incarcerated adults from national survey data should be considered when examining differences in cigarette smoking prevalence estimates between African American and white young adult men. Approximately one in six African American young adult men who smoke were incarcerated. Increasing access to smoking cessation support among inmates may reduce smoking prevalence among disproportionately incarcerated segments of the population.

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## Introduction

Although African American young adults (18–25) report initiating cigarette smoking at lower rates and later ages than whites, African American adults have similar cigarette smoking prevalence compared to whites.<sup>1–4</sup> The exclusion of incarcerated populations from national surveys may contribute to this apparent inconsistency. It is generally accepted that excluding approximately 2.2 million incarcerated adults<sup>5</sup> from national smoking prevalence estimates does not substantially impact estimates because less than one percent of adults are incarcerated<sup>6</sup>; however, the impact among specific race/ethnicities is less certain. The number of inmates in state and federal prison increased from 368 000 in 1980 to more than 1.5 million in 2013.<sup>7</sup> In 2013, nearly 3% of African American adult men were incarcerated compared to 0.5% of white men.<sup>7</sup> In 2003 and 2004, when cigarette smoking data were most recently captured among inmates, 9.3% and 8.4% of African American men aged 20–39 years were incarcerated in state and federal prison, respectively.<sup>8,9</sup>

Estimated smoking prevalence among inmates was approximately 50% in 2003–2004, compared to 21% among noninstitutionalized adults.<sup>10–12</sup> Because a larger proportion of African American young adult men are incarcerated relative to other racial/ethnic groups, excluding this population from national surveys may result in a meaningful underestimation of smoking prevalence, if those who are incarcerated are substantially more likely to smoke than those who are not. To explore this, we assessed cigarette smoking prevalence estimates among noninstitutionalized and incarcerated populations, by race/ethnicity, to determine if excluding incarcerated adults impacts smoking prevalence for certain populations.

## Methods

### Data Sources

**Survey of Inmates in State and Federal Correctional Facilities**—The Bureau of Justice Statistics conducted the Survey of Inmates in State and Federal Correction Facilities (SISFCF) most recently from October 2003–May 2004. The sample design was a stratified two-stage selection, with prisons selected in the first stage and inmates selected in the second. Data were collected through computer assisted personal interviewing and face-to-face interviews. The overall response rates for state and federal inmates were 89.1% and 84.6%. Detailed information about the SISFCF is reported elsewhere.<sup>13</sup>

**National Health Interview Survey**—The National Health Interview Survey (NHIS) is a cross-sectional household interview with multistage design and oversampling of minority populations. The sampling frame does not include persons incarcerated in the prison system, active duty military, patients in long-term care facilities, and US nationals residing abroad. Information was collected through in-person and computer-assisted interviews. To match the sampling time frame of the SISFCF, data from the 2003 and 2004 Sample Adult files were used. The response rate was 74.5% in 2003 and 72.7% in 2004. More detailed information about NHIS is reported elsewhere.<sup>14</sup>

### Study Population

The study population included African American and white adults aged 18 years or older with smoking data. To be consistent with terminology used in this special supplement, African American was defined as participants who self-identified as non-Hispanic black, and no additional race; white was defined as participants who self-identified as non-Hispanic white, and no additional race. Young adults included those aged 18–25 years. The study sample included 61 470 noninstitutionalized respondents, 14 301 state prisoners, and 3609 federal prisoners. To maintain the complex sample design, Hispanics and those who reported other race/ethnicities were retained in the sample.

### Measures

The SISFCF did not capture current smoking among inmates who reported smoking was not permitted in their prison; therefore, we used smoking status in the 30 days before arrest as a proxy for current smoking status. This measure was identical to the measure from NHIS. Respondents were asked if they have smoked at least 100 cigarettes in their lifetimes. Respondents who said yes were asked if they smoked “every day,” “some days,” or “not at all” in the 30 days prior to their arrest (SISFCF) or currently (NHIS). Respondents who reported smoking “every day” or “some days” were classified as current smokers. To provide a measure of time since inmates reported pre-arrest smoking status, we calculated median years since arrest.

### Data Analysis

SISFCF public use data were analyzed using SAS version 9.3 (SAS Institute, Inc, Cary, NC). We used sample weights provided by the Bureau of Justice Statistics to account for nonresponse and to yield a nationally representative estimate. Variance was calculated in Microsoft Excel using the generalized variance estimate parameters and formulas provided in the SISFCF survey documentation. State and federal inmate samples were analyzed separately, as the public release datasets did not provide variance estimate information for state and federal inmates combined. NHIS data were analyzed using SAS version 9.3 with callable SUDAAN version 11.0 (RTI International, Research Triangle, NC) to adjust for the complex survey design.

To calculate the combined prevalence of smoking, we applied the following method:

$$p_{A \cup B \cup C} = p_A \frac{n_A}{n_A + n_B + n_C} + p_B \frac{n_B}{n_A + n_B + n_C} + p_C \frac{n_C}{n_A + n_B + n_C},$$

where *A* represented the noninstitutionalized population, *B* represented state inmates, *C* represented federal inmates,

$p$  was the estimated prevalence, and  $n$  was the sample size. We evaluated the proportion of incarcerated smokers among smokers in the combined population by calculating the weighted number of smokers from the incarcerated samples, divided by the weighted number of smokers from combined noninstitutionalized and incarcerated sample. These calculations were done with Microsoft Excel. The larger this percentage, the greater the impact of excluding incarcerated adults on cigarette smoking prevalence estimates. We were not able to calculate the variance of combined estimates because we combined data from multiple sources with different mechanisms for calculating variance.

## Results

Noninstitutionalized adults were 99.38% of the weighted sample, state inmates were 0.56% and federal inmates were 0.06%. African Americans represented 11.0% of the noninstitutionalized population compared to 40.4% and 43.1% of the state and federal inmate samples, respectively (Table 1). More than 90% of the inmates were male. Young adults represented larger proportions of the inmate populations.

The prevalence of current cigarette smoking was 21.2% among noninstitutionalized adults, 64.7% among state inmates, and 45.2% among federal inmates (Table 2). Prevalence of current smoking for the combined sample was 21.5%, 0.3 percentage points higher than in the noninstitutionalized sample, as inmates represented 1.8% of the smokers in the combined estimate. The combined versus noninstitutionalized estimates of smoking prevalence estimates were 21.6% versus 20.8% among African Americans and 22.6% versus 22.4% among whites. Inmates represented 6.1% of all smokers in the combined African American estimate versus 1.0% among whites.

Among African American men, current smoking prevalence was 24.6% among noninstitutionalized adults, 59.7% among state inmates, 37.9% among federal inmates, and 26.2% in the combined population. Inmates represented one in 10 (10.4%) of all African American male smokers in the combined estimate. Among white men, current smoking prevalence was 24.2% among noninstitutionalized adults, 74.7% among state inmates, 61.8% among federal inmates, and 24.5% in the combined population. Inmates represented 1.7% of white male smokers in the combined population estimate. Estimates for women did not vary substantially after the inclusion of inmates, as inmates represented less than 1% of smokers in the combined population.

Smoking prevalence estimates were lower among both noninstitutionalized and incarcerated African American young adult men compared to whites; however, including inmates resulted in a 0.8 percentage point increase in smoking prevalence among African Americans compared to 0.2 among whites. Specifically, among African American young adult men, current cigarette smoking prevalence was 17.6% among noninstitutionalized adults, 57.0% among state inmates, 45.9% among federal inmates, and 19.7% in the combined population. Inmates represented 15.2% of smokers in the combined estimate. Among white young adult men, current cigarette smoking prevalence was 29.8% among noninstitutionalized adults, 82.5% among state inmates, 66.8% among federal inmates, and 30.2% in the combined population. Inmates represented 2.0% of smokers in the combined estimate. In the

noninstitutionalized sample, current smoking prevalence was 12.2 percentage points lower among African American young adult men compared to white young adult men, whereas, in the combined sample, the difference was 10.5 percentage points lower. Inmates represented 13.8% and 12.4% of smokers in the combined population for African American men aged 26–34 years and 35–49 years, respectively, compared to 2.6% and 2.0% among white men aged 26–34 years and 35–49 years.

## Discussion

The exclusion of incarcerated individuals from national cigarette smoking prevalence estimates may result in an underestimation of cigarette smoking prevalence in the African American male population, particularly among young adults. In 2003–2004, it accounted for a two percentage point absolute difference in cigarette smoking prevalence between young adult African American and white men. This suggests that the difference in cigarette smoking estimates between groups is real, but due to the disproportionate incarceration of African American young adult men, may not be as great as national health surveys that exclude inmates suggest. The smoking prevalence estimates for the overall US population were less impacted by excluding incarcerated adults. Estimates were also less impacted among women, as inmates represented less than 1% of smokers in the combined population. However, among African American young adult men, inmates represented 15.2% of all smokers in the combined population. This suggests that to accurately capture smoking prevalence among African American young adult men, more frequent surveillance of incarcerated populations is warranted.

Inmates are a vulnerable, high-risk population with greater prevalence of cigarette smoking, mental illness, and several smoking attributable chronic diseases compared to the noninstitutionalized population.<sup>10,15,16</sup> Inmates make quit attempts at the same rate as noninstitutionalized adult smokers and cessation interventions have achieved quit rates comparable to those conducted in the community.<sup>17–19</sup> However, many inmates do not have access to cessation interventions.<sup>20</sup> Therefore, increasing smoking cessation access among inmates is a potential strategy to reduce smoking among disproportionately incarcerated segments of the US population. Future surveillance efforts may be improved by measuring current smoking status in smoke-free prisons, as this would inform evaluations of smoke-free policy implementation. Recent reports of specialty e-cigarettes being marketed for use in prisons suggest surveillance should also include these products.<sup>21</sup>

This report has some limitations. First, data for this analysis were collected more than 10 years ago and cigarette smoking prevalence may have changed among state and federal inmates, as it has declined in the general population.<sup>22</sup> Second, the SISFCF did not capture current smoking among inmates who reported that smoking was not permitted in their prison. At the time of the survey, 72.5% of state and 98.4% of federal inmates reported they could smoke in their facilities. Since 2003–2004, many prisons have adopted more restrictive smoke-free policies that prohibit all smoking by inmates.<sup>20,23,24</sup> However, several small studies have found between 20% and 76% of inmates smoke in violation of these policies.<sup>25–31</sup> Our estimates differ from Binswanger et al. because they treated all inmates in smoke-free prisons as nonsmokers whereas we used pre-arrest smoking status. Third, we

assessed different time frames for current smoking between the incarcerated (30 days prior to arrest) and noninstitutionalized populations (past 30 days). However, adults who smoke prior to incarceration in a smoke-free facility and do not receive smoking cessation assistance are likely to smoke following release.<sup>18,32</sup> Therefore, inmate smoking status 30 days prior to arrest was considered a reasonable reflection of smoking status. Fourth, because we combined data from multiple sources with different mechanisms for calculating variance, we were unable to calculate variance of the combined estimates. Finally, though the combined population estimates included state and federal inmates, they do not include other populations excluded from national health surveys (eg, persons held in jails, active duty military, and patients in long-term care facilities).

In conclusion, the exclusion of incarcerated individuals from national survey data should be considered when examining differences in cigarette smoking prevalence estimates between African American and white young adult men. As cigarette smoking prevalence estimates decrease among the general population, the impact of excluding incarcerated smokers from national estimates may increase in the future, particularly if incarceration rates do not decline. Because African American young adult men are disproportionately represented in US prisons, there may be a small underestimation of smoking prevalence for this population. Efforts to accurately estimate smoking prevalence among African American young adult men could be improved by considering race-specific incarceration rates and smoking prevalence estimates among inmates. Since approximately one in six African American young adult men who smoke were incarcerated, increasing access to smoking cessation support among inmates may reduce smoking prevalence among disproportionately incarcerated segments of the population.

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**Table 1**

Weighted Distribution of African American and White Noninstitutionalized, State Inmate, and Federal Inmate Study Populations by Sex and Age

	<u>Noninstitutionalized</u>		<u>State inmates</u>			<u>Federal inmates</u>		
	%	95% CI	%	95% CI	Median years since arrest	%	95% CI	Median years since arrest
Total	99.4		0.6		3.7	0.1		4.0
African American	11.0	10.4, 11.5	40.4	39.1, 41.8	4.0	43.1	39.8, 46.4	4.8
Male	44.3	42.8, 45.7	94.4	93.4, 95.4	4.1	94.8	92.7, 97.0	4.9
18–25	19.0	16.8, 21.2	22.2	20.4, 24.0	2.5	13.4	9.9, 16.8	2.8
26–34	18.6	16.8, 20.3	29.3	27.3, 31.2	4.3	44.0	39.0, 49.0	4.8
35–49	31.4	29.4, 33.4	40.6	38.4, 42.7	5.4	34.8	29.9, 39.6	6.1
50	31.1	28.9, 33.2	8.0	6.8, 9.1	8.2	7.8	5.1, 10.6	7.6
Female	55.7	54.3, 57.2	5.6	5.1, 6.0	2.5	5.2	4.2, 6.1	3.4
18–25	17.8	16.4, 19.2	16.7	13.5, 19.8	2.4	12.8	6.3, 19.4	2.3
26–34	17.5	16.3, 18.6	28.3	24.6, 32.1	2.5	30.0	21.0, 39.0	3.3
35–49	32.3	30.6, 33.9	49.0	44.8, 53.2	2.6	40.8	31.2, 50.4	3.8
50	32.5	30.7, 34.3	6.0	4.0, 7.9	3.3	16.3	9.1, 23.5	3.8
White	71.6	70.9, 72.4	35.3	33.8, 36.7	3.6	26.2	23.4, 29.1	3.6
Male	47.9	47.4, 48.5	91.4	90.0, 92.7	3.8	92.1	88.8, 95.3	3.6
18–25	13.6	12.8, 14.4	17.9	15.9, 19.8	2.4	8.8	5.3, 12.3	2.5
26–34	14.6	14.0, 15.3	26.7	24.4, 28.9	3.5	23.0	17.8, 28.2	2.8
35–49	30.8	30.0, 31.6	41.3	38.8, 43.9	4.3	45.0	38.8, 51.2	3.8
50	41.0	40.1, 41.9	14.1	12.3, 15.9	7.3	23.2	18.0, 28.4	5.2
Female	52.1	51.5, 52.6	8.6	8.0, 9.2	2.4	7.9	6.5, 9.4	2.8
18–25	12.7	12.0, 13.4	17.2	14.5, 20.0	1.9	10.0	4.1, 15.9	1.8
26–34	13.9	13.4, 14.5	26.6	23.4, 29.8	2.4	26.4	17.7, 35.0	2.6
35–49	29.1	28.4, 29.8	48.8	45.1, 52.4	2.5	43.2	33.5, 52.8	2.9
50	44.3	43.4, 45.2	7.4	5.5, 9.3	5.9	20.5	12.6, 28.4	3.1

CI = confidence interval.

**Table 2**

Prevalence of Current Cigarette Smoking Among African American and White Noninstitutionalized Adults, State and Federal Inmates, and Combined Noninstitutionalized-Inmate Population, by Gender and Age Group

	<u>Noninstitutionalized</u>		<u>State inmates</u>		<u>Federal inmates</u>		<u>Combined population<sup>d</sup></u>	<u>% of incarcerated smokers in the combined population</u>
	<u>%</u>	<u>95% CI</u>	<u>%</u>	<u>95% CI</u>	<u>%</u>	<u>95% CI</u>	<u>%</u>	
Total	21.2	20.7, 21.7	64.7	63.3, 66.1	45.2	42.4, 48.0	21.5	1.8
African American	20.8	19.5, 22.1	60.0	57.8, 62.1	37.9	32.9, 42.9	21.6	6.1
Male	24.6	22.8, 26.5	59.7	57.6, 61.8	37.9	33.0, 42.9	26.2	10.4
18–25	17.6	13.5, 22.7	57.0	52.4, 61.6	45.9	32.1, 59.7	19.7	15.2
26–34	25.9	22.2, 30.0	53.5	49.4, 57.5	30.0	23.0, 37.0	27.7	13.8
35–49	28.0	24.8, 31.5	64.3	61.1, 67.6	43.0	34.5, 51.5	30.1	12.4
50	24.8	21.9, 27.9	66.5	59.2, 73.9	46.4	28.3, 64.4	25.3	3.2
Female	17.8	16.4, 19.2	64.5	60.5, 68.5	37.1	27.6, 46.5	17.9	0.8
18–25	13.6	11.3, 16.3	53.4	43.2, 63.7	<i>b</i>	<i>b</i>	13.7	0.8
26–34	17.6	14.8, 20.7	61.8	54.1, 69.4	<i>b</i>	<i>b</i>	17.7	1.2
35–49	22.0	19.7, 24.6	69.1	63.5, 74.6	46.1	30.8, 61.3	22.2	1.1
50	15.9	13.7, 18.3	70.3	54.6, 86.0	<i>b</i>	<i>b</i>	15.9	0.2
White	22.4	21.8, 23.0	74.9	72.7, 77.2	62.3	56.1, 68.4	22.6	1.0
Male	24.2	23.4, 25.0	74.7	72.5, 77.0	61.8	55.7, 67.8	24.5	1.7
18–25	29.8	27.2, 32.5	82.5	77.9, 87.1	66.8	47.1, 86.5	30.2	2.0
26–34	29.7	27.7, 31.9	76.2	72.0, 80.5	67.1	54.9, 79.2	30.2	2.6
35–49	28.1	26.8, 29.5	75.4	72.0, 78.8	67.1	58.4, 75.8	28.4	2.0
50	17.4	16.4, 18.4	60.2	53.5, 66.8	44.2	31.4, 57.0	17.5	0.7
Female	20.8	20.1, 21.5	77.1	74.0, 80.1	67.9	58.8, 77.0	20.8	0.2
18–25	27.1	24.8, 29.5	87.1	81.2, 93.0	78.0	52.4, 103.7	27.1	0.2
26–34	25.6	23.9, 27.3	77.6	71.7, 83.5	74.4	57.8, 91.0	25.6	0.3
35–49	25.5	24.2, 26.8	77.1	72.7, 81.5	68.8	55.0, 82.6	25.5	0.2
50	14.4	13.7, 15.1	51.7	38.3, 65.0	52.8	31.2, 74.4	14.4	0.0

CI = confidence interval. Current cigarette smoking defined as smoking 100 cigarettes in lifetime and smoking at “some days” or “every day” in the past 30 days, smoking status for inmates based on 30 days prior to arrest.

<sup>a</sup>Because we combined data from multiple sources with different mechanisms for calculating variance, we were not able to calculate the variance of our combined estimates.

<sup>b</sup>Relative standard error (RSE) of point estimate > 30%; estimate not presented as it does not meet standard of statistical reliability and precision.