



ORIGINAL ARTICLES: VARIOUS TOPIC

Smoking Practices in New York City: The Use of a Population-Based Survey to Guide Policy-Making and Programming

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ABSTRACT *To inform New York City's (NYC's) tobacco control program, we identified the neighborhoods with the highest smoking rates, estimated the burden of second-hand smoke exposure, assessed the early response to state taxation, and examined cessation practices. We used a stratified random design to conduct a digit-dialed telephone survey in 2002 among 9,674 New York City adults. Our main outcome measures included prevalence of cigarette smoking, exposure to second-hand smoke, the response of smokers to state tax increases, and cessation practices. Even after controlling for sociodemographic factors (age, race/ethnicity, income, education, marital status, employment status, and foreign-born status) smoking rates were highest in Central Harlem and in the South Bronx. Sixteen percent of nonsmokers reported frequent exposure to second-hand smoke at home or in a workplace. Among smokers with a child with asthma, only 33% reported having a no-smoking policy in their homes. More than one fifth of smokers reported reducing the number of cigarettes they smoked in response to the state tax increase. Of current smokers who tried to quit, 65% used no cessation aid. These data were used to inform New York City's smoke-free legislation, taxation, public education, and a free nicotine patch giveaway program. In conclusion, large, local surveys can provide essential data to effectively advocate for, plan, implement, and evaluate a comprehensive tobacco control program.*

KEYWORDS *Smoking prevalence, Tobacco control, Tobacco use cessation, Community health surveys, Health policy, Taxation.*

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INTRODUCTION

Smoking is the leading preventable cause of death in the United States, accounting for approximately 440,000 deaths each year nationwide.¹ Public health initiatives such as taxation, smoke-free legislation, and public education have been shown to be effective in reducing cigarette consumption and smoking-related deaths.²⁻⁴ New York City (NYC) intensified its tobacco control program beginning in 2002, with a \$1.42 tax increase in July 2002, a sweeping smoke-free air act implemented in April 2003, and a free nicotine patch program in April–May 2003. However, to plan and monitor this multifaceted tobacco control program, local data were needed to understand the scope of the problem in NYC, advocate for legislative initiatives, inform targeting of interventions, and set a baseline for evaluation.

To meet these and other local data needs, the NYC Department of Health and Mental Hygiene (DOHMH) conducted a population-based random digit-dialed telephone survey of nearly 10,000 NYC adults from May to July 2002. The survey's large sample size and study design allowed for a detailed assessment of major health conditions and risk factors, including smoking practices, throughout NYC and in each of its 33 neighborhoods.

METHODS

Data Collection and Sample

Data were collected through computer-assisted telephone interviews of adult NYC residents. To provide neighborhood estimates, a quota of 300 interviews was set for each of 33 neighborhood strata defined by zip code aggregation. The sampling frame was constructed through a list of random digit telephone numbers provided by a commercial vendor; 10 attempts were made to reach each telephone number. Potential respondents were asked their zip codes, and interviews were discontinued if the quota for the neighborhood had been met. One adult (age ≥ 18) was randomly selected from each participating household. Our final sample ($N=9,764$) represented 64% of the eligible households contacted.⁵

Survey Instrument

The survey instrument was adapted from the Centers for Disease Control and Prevention's Behavioral Risk Factor Surveillance System (BRFSS)⁶ and National Health Interview Survey.⁷ An expanded tobacco module included detailed questions on current smoking practices, exposure to second-hand smoke, response to recent taxation, and smoking cessation.⁸ As in the BRFSS, individuals were asked if they had ever smoked more than 100 cigarettes in their lifetime, and whether they currently smoked on some days, all days, or no days. Those who smoked cigarettes on some or all days were categorized as current smokers. Those who had smoked more than 100 cigarettes in their lifetime, but were not current smokers, were categorized as former smokers. Second-hand smoke exposure at home (work) was ascertained by asking individuals "how often are you around people who smoke in your home (at your workplace)." Response to the April 2002 increase in the state cigarette excise tax was recorded by asking individuals "How has the increase in cigarette prices (since April 3) affected your smoking?" The study was approved by the DOHMH's Institutional Review Board. Surveys were pretranslated into Spanish, Chinese, Greek, Korean, Russian, Yiddish, Polish, and Haitian Creole.

Statistical Analysis

Survey data were weighted to account for unequal selection probabilities and non-response. Primary weights consisted of the number of adults in each household divided by the number of residential telephone lines. Poststratification weights were used to adjust the sample estimates according to the precise age, race/ethnicity, and gender composition of each neighborhood. Of the 9,764 surveys conducted, 45 were excluded from analysis due to missing data that were required to generate sample weights (final N=9,719). All univariate and bivariate analyses were age-standardized to the 2000 US census population.

First, we examined the prevalence estimates of current and former smoking by age and gender. Using these data and age- and gender-stratified cause-specific deaths for 2002 (obtained from the NYC DOHMH Bureau of Vital Statistics), smoking-attributable mortality, years of potential life lost, and economic cost in NYC were calculated according to the Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC) methodology of the Centers for Disease Control and Prevention.⁹

We next examined bivariate relationships between sociodemographic risk factors and the following dependent variables: current smoking, exposure to second-hand smoke, response to taxation, and quit attempts. Finally, we conducted multivariate logistic regression analyses predicting these outcomes. Models were built in a forward stepwise manner and individual variables were added in order, on the basis of their significance in bivariate analyses and the literature. Independent variables that did not contribute significantly to the model (at the $\alpha=.05$ level) were individually deleted. Neighborhood was included in the model as a fixed effect, with the neighborhood with the lowest rate of smoking as the referent category. The SAS (Cary, NC) statistical package was used for data management, and SAS-callable SUDAAN (RTI, NC) was used for all analyses.

RESULTS

Prevalence of Smoking

About one-fifth (21.6%) of adults in NYC were current smokers and 20.3% were former smokers; 61.9% of all current smokers were “light smokers,” reporting consumption of fewer than 10 cigarettes per day.

Smoking-Attributable Mortality and Economic Cost

In 2002, there were 59,651 deaths in NYC, and we estimate that smoking contributed to 8,480 of those deaths and 146,000 years of potential life lost (an average of 17 years per smoking-attributable death), not including the burden of second-hand smoke exposure. The predicted value of lost earnings from these deaths is \$2 billion per year, with another \$2 billion per year in direct medical expenditures.

High-Risk Populations

Neighborhood-level smoking rates ranged from 12.9% to 29.2%, with the highest prevalence of smoking in the South Bronx and Central Harlem. A multivariate analysis found that divorce or separation, lower household income, unemployment, US-born status, and younger age were independently predictive of current smoking (Table 1). In addition, even after adjusting for these sociodemographic factors, the likelihood of being a current smoker varied with neighborhood of residence, with residents of the South Bronx [odds ratio(OR)=2.2] and Central Harlem (OR=1.8) among the most likely to smoke (Fig. 1). Foreign-born women and US-born college

TABLE 1. Smoking prevalence among New York City adults: selected factors and multivariate analysis

		Current smokers			
	% (SE)*	Weighted population†	Age-adjusted OR*‡	Fully adjusted OR‡	Fully adjusted 95% CI
Marital status					
Married/partnered	19.3 (0.9)	538,000	Reference	Reference	Reference
Divorced/separated/widowed	28.0 (1.9)	305,000	1.6	1.5	1.2–1.8
Never married	23.3 (1.1)	454,000	1.0	1.2	1.1–1.5
Income (\$)					
<25,000	24.1 (1.0)	412,000	1.4	1.3	1.1–1.6
25,000–50,000	23.5 (1.1)	397,000	1.4	1.3	1.1–1.5
>50,000	18.4 (1.0)	320,000	Reference	Reference	Reference
Employment status					
Employed	20.9 (0.7)	816,000	Reference	Reference	Reference
Unemployed	26.3 (1.8)	165,000	1.4	1.3	1.0–1.6
Retired/student/housewife	20.3 (1.1)	314,000	1.0	0.9	0.7–1.1
Country of origin					
Foreign-born	15.8 (0.8)	403,000	Reference	Reference	Reference
Male	20.9 (1.3)	267,000	2.3	2.3	1.8–3.0
Female	10.7 (0.9)	135,000	Reference	Reference	Reference
High school or less	16.7 (1.2)	196,000	1.1	1.1	0.8–1.5
Some college	15.3 (1.9)	80,000	1.0	1.1	0.7–1.6
College or more	15.0 (1.5)	124,000	Reference	Reference	Reference
US-born					
Male	25.9 (0.7)	901,000	1.8	1.8	1.3–2.5
Female	25.5 (1.1)	405,000	1.0	1.0	0.9–1.2
High school or less	26.3 (0.9)	495,000	Reference	Reference	Reference
Some college	33.0 (1.3)	402,000	2.3	2.2	1.8–2.8
College or more	29.2 (1.5)	256,000	1.9	1.9	1.5–2.4
	18.2 (1.1)	236,000	Reference	Reference	Reference

Table 1. *Continued*

		Current smokers				
		% (SE)*	Weighted population†	Age-adjusted OR*‡	Fully adjusted OR‡	Fully adjusted 95% CI
Age						
18–24		23.8 (1.7)	185,000	2.8	1.5	0.8–2.7
White		31.7 (3.7)	63,000	2.2	2.7	1.5–4.9
African American		17.7 (3.1)	33,000	Reference	Reference	Reference
Hispanic		24.1 (2.7)	65,000	1.5	1.0	0.4–2.3
25–44		24.3 (0.8)	616,000	2.9	2.1	1.3–3.3
White		27.9 (1.4)	258,000	1.5	1.9	1.4–2.5
African American		20.2 (1.5)	113,000	Reference	Reference	Reference
Hispanic		24.5 (1.6)	159,000	1.3	1.1	0.7–1.7
45–64		23.4 (1.1)	390,000	2.8	3.1	1.9–4.9
White		22.7 (1.6)	166,000	0.8	0.9	0.5–1.4
African American		25.9 (2.2)	104,000	Reference	Reference	Reference
Hispanic		24.1 (2.1)	81,000	0.9	0.7	0.4–1.4
65 plus		10.0 (0.9)	89,000	Reference	Reference	Reference
White		10.3 (1.2)	55,000	0.8	0.9	0.6–1.3
African American		12.6 (2.1)	22,000	Reference	Reference	Reference
Hispanic		6.5 (2.0)	8,000	0.5	0.5	0.1–2.4
		Average: 21.6 (0.5)	Total: 1,280,000			

CI, confidence interval; OR, odds ratio.

*Age-adjusted except for variables including age.

†Estimated to the nearest 1,000 persons.

‡Fully adjusted odds ratios are the result of a multivariate analysis, controlling for neighborhood of residence ($P = .003$) (see Fig. 1).

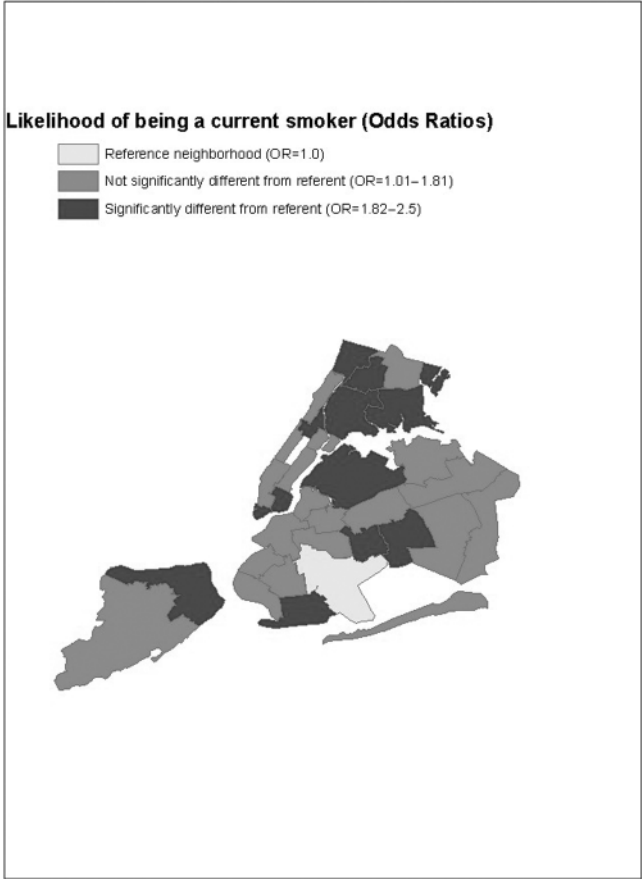


FIGURE 1. Current smoking in New York City. Odds ratios are the result of a multivariate model, adjusting for the variables shown in Table 1.

graduates were less likely to smoke than other New Yorkers. Smoking was less common among African Americans compared to Whites, but only in younger age groups (Fig. 2). The gap in ever-smoking between Whites and African Americans is smaller in the older age-groups compared to those 18–24, while in every age group a smaller proportion of African American ever-smokers are former smokers (the quit ratio) when compared to Whites. Overall, 51.1% of White ever-smokers and 39.3% of African American ever-smokers had quit smoking ($P < .0001$).

Most New Yorkers reported that they had purchased their cigarettes in NYC (73.8%). Purchases from sales channels outside of NYC included 4.6% who reported buying cigarettes elsewhere within New York State, 7.3% in other states, and 1.9% on the Internet. Internet purchases were more common among heavy smokers compared with light smokers (3.6% vs. 1.4%, $P = .004$) and those with a college education or higher compared with those with a high school education or less (4.1% vs. 1.1%, $P = .003$).

Second-Hand Smoke

One in seven nonsmoking New Yorkers reported being around people who smoke, either at home (8.5%) or at work (8.9%), most or all of the time. Among nonsmokers who worked indoors, a higher proportion (13%) reported frequent workplace exposures;

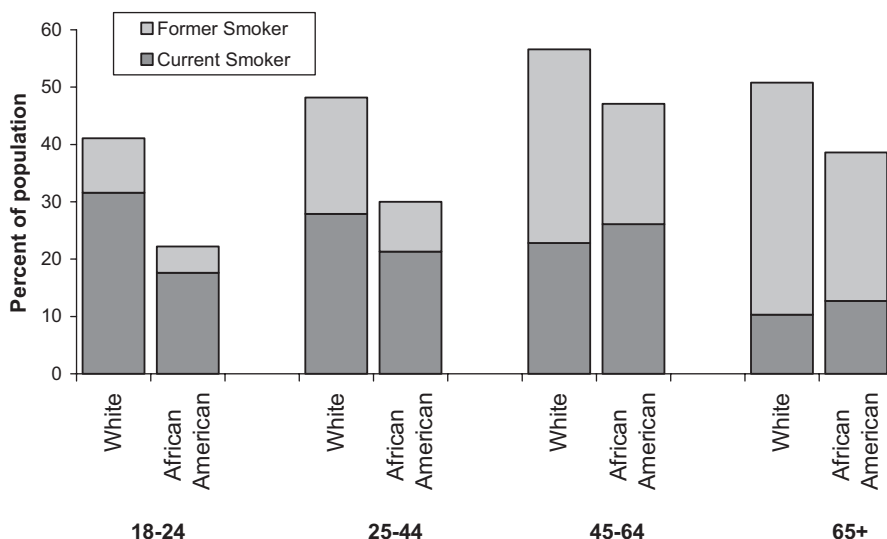


FIGURE 2. Prevalence of current and former smoking by age and race.

in a multiple regression model, not having a workplace smoking policy, younger age, and lower education were significant independent predictors of this hazard (Table 2). In 2002, 20% of all indoor workers reported not having a smoke-free policy at work.

Among smokers, 27.3% reported having a no-smoking policy in their homes. Only 38.7% of smokers with a child, and 32.5% of smokers with a child with asthma, reported having such a policy.

Response to Increase in Taxation

When asked specifically about their response to the state tax increase, 21.9% of individuals who had smoked cigarettes in the past 3 months reported that they had reduced the number of cigarettes they smoked. This response varied by income level, from 27.2% of those with low incomes (<\$25,000) to 11.0% of those with high incomes (>\$50,000) ($P < .0001$). In addition, 5.6% of all recent smokers indicated that they had thought about quitting, 4.0% tried to quit, and 2.8% quit smoking in response to the 39-cent price increase.

Smoking Cessation Practices

Most current smokers (57.0%) reported at least one quit attempt in the past year. Of current smokers who tried to quit, 19.1% used nicotine replacement therapy, 7.4% used counseling, 3.4% used a prescription antidepressant, and 5.3% used a self-help line. Multiple methods were often used (11.2%), but 64.8% used no cessation aids.

In a multivariate analysis, quit attempts were associated with younger age, lower income, lighter smoking, and absence of second-hand smoke exposure at home (Table 3). Being advised to quit smoking by a health care provider was a significant predictor of quit attempts among light smokers.

DISCUSSION

In this large, population-based study of smoking behavior, we defined the scope of the problem in New York City, identified the neighborhoods and populations with

TABLE 2. Exposure to second-hand smoke (SHS) among nonsmokers

	Percent exposed (SE)*	Weighted population†	Age-adjusted OR**	Fully Adjusted OR‡	95% CI
Total exposure to SHS	16.2 (0.6)	741,000			
Exposure to SHS at home	8.5 (0.4)	388,000			
Exposure to SHS at work	8.9 (0.4)	407,000			
Exposure to SHS at work among those who work indoors	3.0 (0.8)	309,000			
Age§					
18–24	20.4 (2.5)	69,000	4.1	2.8	1.2–6.7
25–44	14.1 (1.0)	157,000	2.6	2.3	1.0–5.2
45–65	12.2 (1.4)	78,000	2.2	1.8	0.8–4.2
>65	5.9 (2.1)	6,000	Reference	Reference	
Smoke-free policy at work§					
Yes	8.3 (0.7)	157,000	Reference	Reference	
No	32.1 (2.5)	157,000	5.4	4.9	3.7–6.4
Education§					
High school or less	19.5 (1.5)	133,000	2.9	2.0	1.4–3.0
Some college	15.1 (1.9)	87,000	2.0	1.6	1.1–2.3
College or more	7.6 (0.9)	92,000	Reference	Reference	

Table 2. *Continued*

	Percent exposed (SE)*	Weighted population†	Age-adjusted OR**	Fully Adjusted OR‡	95% CI
Income level (\$)§					
<25,000	15.8 (1.5)	91,000	1.9	1.0	0.7–1.5
25,000–49,999	14.7 (1.5)	102,000	1.6	1.1	0.8–1.6
≥50,000	10.7 (1.3)	89,000	Reference	Reference	
Race§					
White	10.1 (1.0)	93,000	Reference	Reference	
African American	15.5 (1.5)	96,000	1.8	1.2	0.9–1.8
Hispanic	14 (1.3)	83,000	1.8	1.2	0.8–1.8
Asian	13.9 (4.2)	29,000	1.0	0.9	(0.5,1.6)

OR, odds ratio; CI, confidence interval.

*Age adjusted, except for age.

†Estimated to the nearest 1,000 persons.

‡Fully adjusted odds ratios are the result of a multivariate analysis; race and income were included because they were found to be confounders.

§Among those who work indoors most of the time.

TABLE 3. Multivariate logistic regression model predicting quit attempts (among current smokers)

	Percent attempted (SE)*	Weighted population†	Age adjusted OR	Fully adjusted OR‡	95% CI
Age					
18–24	68.6 (3.7)	127,000	2.1	2.5	1.5–4.3
25–44	58.6 (2.0)	361,000	1.4	1.7	1.1–2.6
45–64	53.0 (2.6)	206,000	1.1	1.4	0.9–2.1
65+	51.3 (4.7)	46,000	Reference	Reference	
Income					
<\$25,000	62.2 (2.4)	261,000	1.7	1.5	1.1–2.1
\$25,000–\$50,000	56.0 (2.7)	228,000	1.3	1.2	0.9–1.7
>\$50,000	49.5 (3.4)	165,000	Reference	Reference	
Not exposed to SHS at home	68.8 (2.6)	245,000	1.6	1.7	1.2–2.2
Advised to quit by physician (number of cigarettes per day)					
Yes (1–10)	71.6 (2.4)	257,000	3.4	3.0	2.1–4.4
Yes (11+)	48.0 (2.9)	132,000	1.2	1.2	0.8–1.8
No (1–10)	56.6 (2.9)	244,000	1.7	1.6	1.1–2.3
No (11+)	44.0 (4.2)	77,000	Reference	Reference	
	Average: 57.0 (1.4)	Total: 750,000			

SHS, second-hand smoke.

*Age-adjusted except for age.

†Estimated to the nearest 1,000 persons.

‡Fully adjusted odds ratios are the result of a multivariate analysis.

the highest prevalence of smoking, estimated the burden of second-hand smoke exposure and assessed the response to taxation and cessation practices. These data were essential to plan and advocate for the NYC tobacco control program and, in conjunction with planned follow-up surveys, will be indispensable in determining the success or failure of these initiatives. While this is not currently a standard practice, health authorities should consider conducting population-based surveys when implementing intensive tobacco control programs.

Local data can be very effective in advocating for legislation. For example, the magnitude of smoking-attributable mortality and the burden of workplace second-hand smoke exposure were powerful arguments for the need for smoke-free workplace legislation in NYC in 2002.¹⁰ By the end of that year, NYC had passed legislation protecting virtually all workers from indoor exposure to second-hand smoke.¹¹

These data can also be used to inform public education campaigns. Almost 400,000 nonsmoking adult New Yorkers report of being exposed to second-hand smoke at home. Second-hand smoke has been associated with cardiovascular disease in adults,¹² and respiratory illness in adults and children,^{13,14} as well as an increased childhood risk of sudden infant death syndrome.¹⁵ In our survey, more than 60% of smokers who live with children indicated that they did not have a policy about smoking in the house, including 67% of smokers who live with children with asthma. Household smoking bans have also been associated with increased quit attempts among adult smokers.^{16,17} Encouragement of no-smoking policies at home by health care providers and through mass media can be important in reducing the harm caused by smoking and second-hand smoke.

The survey's stratified design and large sample size also made it useful for program planning. The finding of extremely high rates of smoking in the South Bronx and Central Harlem, even after adjusting for other factors, led DOHMH to target these high-risk neighborhoods in an anti-smoking billboard campaign. In addition, most current smokers who had attempted to stop smoking had done so without the benefit of effective cessation aids.¹⁸ Consequently, in April, 2003, the NYC DOHMH provided 34,000 New Yorkers with a free full 6-week course of nicotine replacement therapy, as well as brief follow-up phone counseling, with more intense outreach to communities with high rates of smoking but initially low uptake of nicotine replacement therapy.¹⁹

Furthermore, the survey found a higher prevalence of smoking in older African Americans compared to younger age groups, and lower quit ratios in African Americans of all ages, compared to White New Yorkers. These lower quit rates, potentially associated with the later initiation of smoking among older African Americans,²⁰ are the impetus behind a current DOHMH research initiative aimed at understanding and mitigating these disparities.

Our data also point to issues requiring national attention, particularly around taxation policy. Previous research has found a reduction in smoking after price increases, especially among youth and those with lower income.²¹⁻²³ In our survey, nearly one in four smokers reported reducing their cigarette consumption shortly after the tax increase, whereas 2.8% of smokers reported quitting smoking. This response to the 13% price increase corresponds to a prevalence price elasticity of 0.22, consistent with prevalence price elasticities estimated from nominal price increases (0.15).²⁴ However, tax evasion through cross-border and Internet cigarette purchases could blunt the effectiveness of local tax increases and argue for a national cigarette tax increase (as proposed by the United States Subcommittee on Cessation of the Interagency Committee on Smoking and Health²³) and congressional legislation restricting untaxed Internet tobacco sales.²⁵

STRENGTHS AND LIMITATIONS

This study used a large, population-based survey, which was conducted in nine languages and was broadly representative of the population of NYC. Nevertheless, the study has limitations. The survey represents only noninstitutionalized NYC adults with working residential telephones. Because it used a cross-sectional design, these data only represent one point in time. Consequently, the temporality of some associations cannot be inferred, and self-reported causality (e.g., stated response to the state tax increase) cannot be confirmed. All data are self-reported, and there is the danger of a social response bias, although anonymous surveys can reduce socially desirable responding.²⁶ Furthermore, the reliability and validity of smoking-related questions in the BRFSS have been shown to be relatively high.^{27,28}

CONCLUSION

Large, local surveys can provide essential data to effectively advocate for, plan, implement, and evaluate a comprehensive tobacco control program. Our data were used to advocate for public health policies (such as increased tobacco taxation and the Smoke-Free Air Act) and initiate programs (such as cessation aid distribution) that targeted populations at highest risk. Even after 40 years of tobacco control efforts there are many remaining opportunities for evidence-based state and local public health interventions to reduce the burden of smoking, which remains the leading preventable cause of death in the United States.

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