

stroke, preventive strategies that include lowering blood cholesterol should not be tempered because of concerns about a possible increased risk of haemorrhagic stroke.

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## Smoking, obesity, and their co-occurrence in the United States: cross sectional analysis

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### Abstract

**Objectives** To describe the prevalence of obesity, smoking, and both health risk factors together among adults in the United States.

**Design** Cross sectional analysis of a national health interview survey.

**Setting** United States.

**Participants** 29 305 adults (aged  $\geq 18$ ) in 2002.

**Main outcome measures** Prevalence of adults who are obese (body mass index  $\geq 30$ ), who smoke, and who are obese and smoke. Prevalence was stratified by age, sex, ethnic group, education, and income.

**Results** 23.5% of adults were obese, 22.7% smoked, and 4.7% smoked and were obese.

**Conclusions** Although the proportion of adults who smoke and are obese is relatively low, this subgroup is concentrated among lower socioeconomic groups.

### Introduction

Obesity and cigarette smoking are primary risk factors for several chronic conditions and early death in a large number of people in the United States. The prevalence of smoking among adults is 22.5% (45.8 million people).<sup>1</sup> The proportion of obese adults is also high—about 31% of adults have a body mass index of 30 or more.<sup>2</sup> Although smoking and obesity are public health priorities in the US,<sup>3</sup> the overlap between the two conditions has not been measured at population level. Because the presence of these two conditions together probably carries an increased risk to health, statistics on how these conditions overlap could help in the development of an effective policy for prevention and treatment.

### Methods

We used data from the 2002 national health interview survey (NHIS) to conduct a cross sectional analysis of 29 305 adults ( $\geq 18$  years) and estimate the proportion of adults in the US who smoke and are obese. Prevalence was stratified by various sociodemographic factors. Rubin's multiple imputation procedure was used to replace missing values of family income. We analysed all data with Stata software, version 8 and adjusted the results with sampling weights to derive population estimates from the survey sample.

### Results

Nearly 41.5% of adults (81 million aged  $\geq 18$  years) in the US are obese or smoke, and about 4.7% (9 million) smoke and are obese (table). Overall, 5.3% of men and 4.2% of women smoke and are obese. This proportion is higher in African Americans (7.0%) than in other racial or ethnic groups. A greater proportion of people with lower income and education levels smoke and are obese. With the exception of the over 65 age group, in which the prevalence of both conditions is low (1.1%; probably because these risk factors are associated with early death), little variation occurs across age groups.

### Discussion

Although the proportion of adults who smoke and are obese in the US is relatively low (4.7%), the total number is 9 million. Each condition carries an independent health risk, and the presence of both

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Prevalence of obesity, smoking, and both risk factors among adults (≥18 years): US National Health Interview Survey, 2002. Values are percentages (95% confidence intervals)

| Characteristics                     | Sample size |             | Obese*<br>(weighted n=45 398 794) | Smoker†<br>(weighted n=43 710 065) | Obese and smoker<br>(weighted n=9 087 068) |
|-------------------------------------|-------------|-------------|-----------------------------------|------------------------------------|--|
|                                     | Actual      | Weighted    |                                   |                                    |  |
| Age (years):                        |             |             |                                   |                                    |  |
| 18-24                               | 3 176       | 25 998 063  | 14.9 (13.4 to 16.5)               | 28.8 (26.8 to 30.9)                | 4.5 (3.7 to 5.6)                           |
| 25-34                               | 5 520       | 34 991 228  | 22.2 (20.9 to 23.5)               | 24.8 (23.5 to 26.2)                | 5.7 (5.0 to 6.5)                           |
| 35-44                               | 6 130       | 41 605 141  | 25.0 (23.7 to 26.3)               | 26.9 (25.6 to 28.4)                | 6.1 (5.5 to 6.9)                           |
| 45-54                               | 5 161       | 36 827 949  | 27.1 (25.7 to 28.6)               | 25.0 (23.7 to 26.4)                | 6.0 (5.2 to 6.8)                           |
| 55-64                               | 3 752       | 24 214 894  | 28.7 (27.1 to 30.4)               | 20.0 (18.7 to 21.4)                | 4.0 (3.4 to 4.7)                           |
| ≥65                                 | 5 566       | 31 542 770  | 22.1 (20.9 to 23.4)               | 9.2 (8.4 to 10.1)                  | 1.1 (0.9 to 1.5)                           |
| Sex:                                |             |             |                                   |                                    |  |
| Male                                | 12 989      | 95 502 862  | 24.1 (23.2 to 25.0)               | 25.3 (24.5 to 26.3)                | 5.3 (4.8 to 5.8)                           |
| Female                              | 16 316      | 99 677 183  | 23.0 (22.2 to 23.8)               | 20.2 (19.4 to 21.1)                | 4.2 (3.9 to 4.6)                           |
| Ethnic origin:                      |             |             |                                   |                                    |  |
| White                               | 19 493      | 143 822 860 | 22.2 (21.5 to 22.9)               | 23.8 (23.0 to 24.6)                | 4.6 (4.2 to 5.0)                           |
| Black                               | 3 965       | 22 269 346  | 35.1 (33.3 to 37.0)               | 23.1 (21.4 to 24.8)                | 7.0 (6.1 to 8.1)                           |
| Hispanic                            | 4 785       | 20 590 479  | 25.2 (23.7 to 26.8)               | 17.1 (15.9 to 18.4)                | 4.2 (3.6 to 5.0)                           |
| Other                               | 1 062       | 8 497 360   | 11.8 (9.3 to 14.7)                | 17.9 (15.5 to 20.6)                | 3.0 (1.9 to 4.7)                           |
| Education:                          |             |             |                                   |                                    |  |
| Did not finish high school          | 5 498       | 31 611 890  | 27.5 (26.1 to 29.0)               | 29.6 (28.3 to 31.0)                | 6.1 (5.3 to 6.9)                           |
| High school graduate or equivalent  | 8 412       | 57 704 002  | 26.0 (24.8 to 27.2)               | 28.6 (27.5 to 29.7)                | 6.1 (5.5 to 6.8)                           |
| AA± degree or college but no degree | 8 374       | 56 576 273  | 24.1 (22.9 to 25.3)               | 22.9 (21.7 to 24.1)                | 5.0 (4.4 to 5.7)                           |
| Bachelor degree                     | 6 808       | 47 900 038  | 17.4 (16.4 to 18.4)               | 10.8 (10.0 to 11.6)                | 1.8 (1.5 to 2.3)                           |
| Annual family income:               |             |             |                                   |                                    |  |
| <\$20 000                           | 7 303       | 35 271 941  | 25.8 (24.6 to 27.1)               | 29.8 (28.4 to 31.2)                | 6.5 (5.8 to 7.3)                           |
| ≥\$20 000                           | 20 288      | 148 527 413 | 23.1 (22.3 to 23.8)               | 21.3 (20.6 to 22.0)                | 4.5 (4.1 to 4.9)                           |
| Overall                             | 29 305      | 195 180 045 | 23.5 (22.9 to 24.2)               | 22.7 (22.1 to 23.4)                | 4.7 (4.4 to 5.1)                           |

\*Body mass index of ≥30.0.

†Has smoked >100 cigarettes and smokes either every day or some days.

‡Associate of Arts degree: two year course that covers the first two years of a four year bachelor degree.

conditions may have increased risks, but little is known about the best treatment for people who smoke and are obese.<sup>4 5</sup> Average weight gains of 2.8 to 4.4 kg for men and 3.8 to 5.0 kg for women occur when people stop smoking,<sup>6 7</sup> but a high proportion of people who stop smoking have large and persistent weight gain. The benefits of stopping smoking are thought to outweigh the risk of weight gain in the overall population,<sup>6</sup> but the effects on people who are obese are unclear. It is not known whether people who smoke and are obese are less, more, or equally likely to gain weight than people who are not obese. Conversely, it is not known how restricting dietary intake affects attempts to stop smoking and relapse among obese people. Currently, most programmes for stopping smoking do not encourage simultaneous attempts at weight control because interventions aimed at changing several health behaviours have not been very successful.<sup>8</sup>

Treatments for people who smoke and who are obese need to be investigated. Clinical trials should monitor the effects of programmes aimed at simultaneously stopping smoking and weight control to document and respond to any unintended consequences. These results could be used to develop protocols for the optimal clinical management of this population.

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### What is already known on this topic

Smoking and obesity are two of the leading causes of mortality and morbidity in the United States

Lower socioeconomic groups are disproportionately affected by smoking and obesity

### What this study adds

The overlap of smoking and obesity among adults in the US is low (4.7%), but the total number of people affected is 9 million, and this subgroup is concentrated among lower socioeconomic groups

Statistics on the overlap of these two conditions could help inform clinical interventions