Cigarette acquisition and proof of age among US high school students who smoke

S Everett Jones, D J Sharp, C G Husten, L S Crossett

Objective: To determine how US high school students who are under 18 years of age and who smoke obtain their cigarettes and whether they are asked for proof of age.

Design and setting: Data from the Centers for Disease Control and Prevention’s 1995, 1997, and 1999 national Youth Risk Behavior Surveys which employed national probability samples of students in grades 9–12 (ages 14–18 years).

Main outcome measures: Associations of usual source of cigarettes and request for proof of age with variables such as sex, race/ethnicity, grade, and frequency of smoking.

Results: In 1999, among current smokers under age 18 years, 23.5% (95% confidence interval (CI), −4.5% to +4.5%) usually purchased their cigarettes in a store; among these students, 69.6% (95% CI −5.7% to +5.7%) were not asked to show proof of age. As days of past month smoking increased, reliance on buying cigarettes in a store (p < 0.001) and giving someone else money to buy cigarettes (p < 0.001) increased, and usually borrowing cigarettes decreased (p < 0.001). From 1995 to 1999, relying on store purchases significantly decreased (from 38.7% (95% CI −4.6% to +4.6%) to 23.5% (95% CI −4.5% to +4.5%)); usually giving someone else money to buy cigarettes significantly increased (from 15.8% (95% CI −3.6% to +3.6%) to 29.9% (95% CI −4.5% to +4.5%)).

Conclusions: Stricter enforcement of tobacco access laws is needed to support other community and school efforts to reduce tobacco use among youth. Furthermore, effective interventions to reduce non-commercial sources of tobacco, including social, need to be developed and implemented.
tobacco use, alcohol and other drug use, sexual behaviours that contribute to unintended pregnancies and sexually transmitted diseases, dietary behaviours, and physical activity. In 1995, the YRBS queried students about their usual source of cigarettes for the first time.

Each YRBS used a three stage, cluster sample design to obtain a nationally representative sample of students in grades 9 through 12 (ages 14–18 years).\textsuperscript{21–23} The target population consisted of all public and private high school students in the 50 states and the District of Columbia. The first stage sampling frame contained primary sampling units (PSUs) made up of large counties or groups of smaller adjacent counties. From this frame, PSUs were selected from 16 strata formed according to the degree of urbanisation and the relative percentages of black and Hispanic students in the PSUs. The PSUs were selected with a probability proportional to their school enrolment.

In the second stage, schools were selected from the PSUs with a probability proportional to their school enrolment. To ensure that racial or ethnic subgroups were large enough to analyse subgroup differences, schools with substantial numbers of black and Hispanic students were sampled at relatively higher rates than were other schools. The final stage consisted of randomly selecting, within each chosen school and in each of the four grades, one or two entire classes of a required subject such as English or social studies. All students in the selected classes were eligible to participate.

Procedures were designed to protect the students’ privacy by allowing for anonymous and voluntary participation and CDC’s institutional review board granted clearance for the survey. Local parental permission procedures were followed before survey administration. A questionnaire containing approximately 90 items was administered in the classroom by trained data collectors. Answers were recorded directly on a computer scannable booklet. For 1995, 1997, and 1999, the school response rates were 70%, 79%, and 77%, respectively; student response rates were 86%, 87%, and 86%; overall response rates were 60%, 69%, and 66%; and sample sizes were 10 904, 16 262, and 15 349.

**Data analysis**

In each survey, smoking status was assessed by the question: “During the past 30 days, on how many days did you smoke cigarettes?” Response options ranged from “0 days” to “all 30 days”. Students were defined as current smokers if they had smoked on one or more days. In each of the three surveys, usual source of cigarettes (both commercial and non-commercial, including social sources) was assessed by the question: “During the past 30 days, how did you usually get your own cigarettes?” Students could choose (only) one response from among the following: “I did not smoke cigarettes in the past 30 days”, “I bought them in a store such as a convenience store, supermarket, or gas station”, “I bought them from a vending machine”, “I gave someone else money to buy them for me”, “I borrowed them from someone else”, “I stole them”, or “I got them in some other way”. Proof of age was assessed in 1999 only, using the question: “When you bought cigarettes in a store during the past 30 days, were you ever asked to show proof of age?” Responses included “I did not buy cigarettes in a store during the past 30 days”, “Yes”, and “No”.

A weighting factor was applied to each student record to adjust for non-response and for the varying probabilities of selection, including those resulting from the oversampling of black and Hispanic students. The final, overall weights were scaled so that the weighted count of students equaled the total sample size, and the weighted proportions of students in each grade matched national population projections for each survey year. All estimates were based on weighted data. All analyses were subsetted among current smokers who were under age 18 (sample sizes were 2989 in 1995, 3108 in 1997, and 3631 in 1999). Racial/ethnic data are presented only for white, black, and Hispanic students because sample sizes in other minority groups were too small for meaningful analysis.

We used SUDAAN, a software package that takes into account the complex sampling design of this survey, to generate all point estimates and 95% confidence intervals (CIs), and to conduct all tests for significance (\( \alpha \) level was set at \( p < 0.05 \)). We used \( \chi^2 \) tests to assess main effects in students’ usual source of cigarettes and being asked for proof of age by sex, race/ethnicity, and grade. When significant main effects were identified, we used \( f \) tests to identify the racial/ethnic and grade differences in these variables. To examine the relation between the number of days of past month smoking and the usual source of cigarettes, a logistic regression model was used that controlled for sex, grade, and race/ethnicity, in which days of use was treated as a continuous variable.

To examine secular trends in students’ usual source of cigarettes, we combined YRBS data from 1995, 1997, and 1999 because in those years, the wording about usual source of cigarettes was identical. In combining the data sets, we recoded the strata from each survey year so that strata from one survey year were uniquely identifiable and separate from those of other survey years, essentially creating an additional stratum of “time”. In subsequent logistic regression models that controlled for sex, grade, and race/ethnicity, time was treated as a continuous variable in assessing possible linear changes in usual source of cigarettes.
RESULTS

Minors’ usual source of cigarettes

Bought them in a store. Overall, in 1999, 23.5% of current smokers usually got their cigarettes by buying them in a store (table 1). The percentage of students who usually got their cigarettes by buying them in a store varied by sex ($\chi^2 = 21.8, df = 1, p < 0.001$) and by grade ($\chi^2 = 12.6, df = 3, p < 0.01$). Males were significantly more likely than females and 12th grade students were significantly more likely than 9th grade students ($t = 6.8, p < 0.01$). 10th grade students ($t = 5.0, p < 0.01$) and 11th grade students ($t = 2.6, p = 0.01$) to buy their cigarettes in a store.

Bought them from a vending machine. Only 1.1% of current smokers usually got their cigarettes by buying them from a vending machine. This behaviour did not vary by sex, race/ethnicity, or grade.

Gave someone else money to buy them. Three of 10 (29.9%) current smokers usually got their cigarettes by giving someone else money to buy them. The percentage of students who usually gave someone else money to buy their cigarettes varied by sex ($\chi^2 = 9.0, df = 1, p < 0.01$) and by race/ethnicity ($\chi^2 = 16.4, df = 2, p < 0.001$). Females were significantly more likely than males to give someone else money to buy their cigarettes. White students were significantly more likely to report this behaviour than were black students ($t = 4.1, p < 0.01$) and Hispanic ($t = 3.2, p < 0.01$) students and Hispanic students were significantly more likely than black students to report this behaviour ($t = 2.3, p < 0.05$).

Borrowed them from someone else. Overall, 30.4% of current smokers usually borrowed their cigarettes by borrowing them. The percentage of students who usually borrowed someone else’s cigarettes by borrowing their cigarettes from someone else varied by sex ($\chi^2 = 4.3, df = 1, p = 0.05$) and by race/ethnicity ($\chi^2 = 7.8, df = 2, p < 0.05$). Significantly more females than males and significantly more black students than white students ($t = 2.2, p < 0.05$) borrowed cigarettes from someone else.

Stole them. Overall, 4.4% of current smokers usually stole their cigarettes. The percentage of students who usually stole their cigarettes varied by sex ($\chi^2 = 10.1, df = 1, p < 0.01$) and by grade ($\chi^2 = 12.6, df = 3, p < 0.01$). Males were significantly more likely than females to steal their cigarettes. Eleventh grade students ($t = 2.2, p < 0.05$) and 9th grade students ($t = 3.2, p < 0.01$) were significantly more likely than 12th grade students to report stealing their cigarettes. Ninth grade students were significantly more likely than 10th grade students to do so ($t = 3.0, p < 0.01$).

Got them in some other way. Overall, just over one in 10 (10.7%) current smokers usually got their cigarettes in “some other way”. The percentage of students who usually got their cigarettes in some other way varied by race ($\chi^2 = 8.1, df = 2, p < 0.05$). Hispanic students were significantly more likely than white students ($t = 3.0, p < 0.01$) to get their cigarettes in some other way.

Frequency of smoking and minors usual source of cigarettes

In 1999, the number of days students reported smoking increased, the likelihood of students reporting buying their own cigarettes in a store ($p < 0.01$) and giving someone money to buy cigarettes ($p < 0.01$) increased. In contrast, as the number of days of smoking increased, the less likely students were to borrow cigarettes ($p < 0.01$). Neither buying cigarettes from a vending machine nor stealing them was associated with frequency of smoking. Obtaining cigarettes in “some other way” did not demonstrate a linear pattern with smoking frequency, but students who smoked 1–2 days during the past month were significantly more likely than students who smoked 3–5 days ($t = 3.2, p < 0.01$), 6–9 days ($t = 2.8, p < 0.01$), and 20–29 days ($t = 4.5, p < 0.01$) to report getting their cigarettes in this other manner.

Secular trends in minors’ usual source of cigarettes

The percentage of current smokers who reported they usually got their own cigarettes by buying them in a store significantly decreased from 38.7% in 1995 to 23.5% in 1999 (linear trend, $p < 0.001$) (table 3). Conversely, giving someone else money

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Minors’ usual source of cigarettes in 1999, by frequency of smoking*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days smoked in past month</td>
<td>Usually bought in a store (% [95% CI])</td>
</tr>
<tr>
<td>1–2</td>
<td>6.7 [3.1]</td>
</tr>
<tr>
<td>3–5</td>
<td>11 [5.5]</td>
</tr>
<tr>
<td>10–19</td>
<td>26.3 [9.3]</td>
</tr>
<tr>
<td>All 30</td>
<td>36.8 [8.2]</td>
</tr>
<tr>
<td>Linear trend</td>
<td>$&lt;0.001$</td>
</tr>
</tbody>
</table>

*Among high school students who were current smokers (smoked cigarettes on one or more of the 30 days preceding the survey) and under age 18 years (unweighted n = 3631). Data are from the 1999 Youth Risk Behavior Survey.

<table>
<thead>
<tr>
<th>Table 3</th>
<th>Secular trends in minors’ usual source of cigarettes, 1995-1999*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Usually bought in a store (% [95% CI])</td>
</tr>
<tr>
<td>1995</td>
<td>38.7 [4.6]</td>
</tr>
<tr>
<td>1997</td>
<td>29.8 [4.6]</td>
</tr>
<tr>
<td>Linear trend</td>
<td>$&lt;0.001$</td>
</tr>
</tbody>
</table>

*Among high school students who were current smokers (smoked cigarettes on one or more of the 30 days preceding the survey) and under age 18 years (unweighted n = 2989 in 1995, 4108 in 1997, 3631 in 1999). Data are from the 1995, 1997, and 1999 Youth Risk Behavior Survey.
that active enforcement of state laws or local ordinances can be asked to show proof of age. Requests for proof of age did significantly more likely than males to report they had not

merchants has been shown in some studies to be useful in mobilisation with enforcement of access laws, retailer education, or stronger local laws may reduce acquisition from commercial sources to social sources among high school students under age 18 who were current smokers. 23.5% usually purchased their own cigarettes in a store, 29.9% usually gave someone else money to buy their cigarettes, and 30.4% usually borrowed cigarettes from someone. From 1995 to 1999, usually buying cigarettes in a store significantly declined; however, usually giving someone else money to buy cigarettes significantly increased.

Not asked proof of age when bought during past 30 days

In 1999, among current smokers under age 18 years who bought cigarettes in a store during the 30 days preceding the survey, 69.6% were never asked to show proof of age (table 4).

The percentage of students who were not asked for proof of age varied by sex (χ² = 5.8, df = 1, p < 0.05). Females were significantly more likely than males to report they had not been asked to show proof of age. Requests for proof of age did not vary across race/ethnicity or grade.

DISCUSSION

In this study, from 1995 to 1999 we found a shift in cigarette acquisition from commercial sources to social sources among high school students. Among current smokers under age 18 years, the percentage of students who usually bought their own cigarettes in a store dropped from 38.7% in 1995 to 23.5% in 1999; students who reported that they usually gave someone else money to buy cigarettes significantly increased from 15.3% to 29.9%.

Preventing minors’ access to tobacco by prohibiting retail sales to them has been advocated to help reduce initiation of tobacco use and is recommended as a component of comprehensive tobacco control programmes.13–15 It is well established that active enforcement of state laws or local ordinances can reduce the percentage of retailers who sell tobacco to minors.13–15,17–20,22 especially when compliance checks are performed several times per year.20–22 Likewise, education of merchants has been shown in some studies to be useful in decreasing the percentage of retailers who sell tobacco to minors, although such education without active enforcement loses effectiveness over time.11–15

Some studies have shown that combining community mobilisation with enforcement of access laws, retailer education, school based education, or stronger local laws may reduce the prevalence of youth smoking.11–15,17–20 but such findings are not universal. For example, in a Massachusetts study that combined retailer education and active enforcement, despite a pronounced reduction in the percentage of retailers who sold cigarettes to youth in the intervention communities, there was no difference in self reported access by youth in intervention compared to control communities.15 The authors observed that unless youth in intervention communities report decreased access to commercial sources of cigarettes, and that decrease is greater than any decrease in access that may have occurred in the control communities, it is not logical to expect reduced cigarette use among youth in the intervention communities as a result of the intervention.15

The 1999 YRBS data suggest that many young smokers who purchased cigarettes in a store were not asked for proof of age. The YRBS does not provide data on the percentage of students who tried unsuccessfully to buy cigarettes. Data from other studies show that when store personnel request proof of age for a cigarette purchase, the likelihood of a sale to an underage buyer is greatly reduced.15–30–34 Thus, merchant education programmes to reduce sales of cigarettes to minors should emphasise the need to request proof of age.

Consistent with other studies,14–40 YRBS data showed that social sources continue to be an important means of cigarette acquisition. For example, in 1999, YRBS data and National Youth Tobacco Survey14 data found that more than half of high school students usually obtained their cigarettes by either giving someone else money to buy them or borrowing them. The Tobacco Policy Options for Prevention study in Minnesota found that more than 90% of 8th–10th graders who had ever smoked cigarettes obtained their first cigarette from family members or friends.17 Likewise, Wolfson and colleagues17 found that more than two thirds of students in these grades who reported past month smoking had provided tobacco to another student during that same period. Of those students, 66% provided tobacco to a same age friend, 37% to a younger friend, 17% to a sibling, and 13% to another

Wolfson and colleagues17 as well as others16,18 have found that adolescents who are heavier smokers are the most likely to provide cigarettes to other adolescents; we found that heavier smokers were more likely to obtain their cigarettes by purchase. Thus, it is likely that the original source for a substantial percentage of cigarettes “borrowed” from other minors was from an illegal sale at a retail outlet. High compliance with access laws may consequently reduce the social as well as the commercial availability of cigarettes among youth.

However, as an additional means of addressing the social availability of cigarettes, clinical, community, and school based interventions should try to dissuade minors who smoke from providing cigarettes to other minors.

YRBS data cannot be used to discern whether students who ask someone to buy, their cigarettes, or borrow cigarettes from someone else, get their cigarettes from other minors or from people who may legally purchase tobacco. In a state wide California study, 11% of adults (≥18 years) had been asked to

Table 4 Percentage of minors not asked for proof of age when buying cigarettes in a store in 1999*

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>Not asked to show proof of age when buying in a store % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>65.7 (7.5)</td>
</tr>
<tr>
<td>Black</td>
<td>64.1 (13.0)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>60.7 (12.6)</td>
</tr>
<tr>
<td>Grade</td>
<td></td>
</tr>
<tr>
<td>9th</td>
<td>79.1 (9.9)</td>
</tr>
<tr>
<td>10th</td>
<td>67.9 (9.9)</td>
</tr>
<tr>
<td>11th</td>
<td>68.4 (13.1)</td>
</tr>
<tr>
<td>12th</td>
<td>65.0 (10.9)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>76.2 (7.9)</td>
</tr>
<tr>
<td>Male</td>
<td>65.5 (5.7)</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>65.5 (5.7)</td>
</tr>
<tr>
<td>Female</td>
<td>76.2 (7.9)</td>
</tr>
</tbody>
</table>

* Among high school students who were current smokers (smoked cigarettes on one or more of the 30 days preceding the survey), under age 18 years, and bought cigarettes in a store or gas station during the 30 days preceding the survey (unweighted n=3631). All data are presented as percentages (95% confidence intervals). Data are from the 1999 Youth Risk Behavior Survey.
provide tobacco to minors; smokers aged 18–19 years were the most likely to be asked (59%), followed by 20–24 year old smokers (39%) and 18–24 year old non-smokers (38%). Other studies suggest many adults are willing to buy cigarettes for minors. Klonoff and colleagues found that 32% of adults who were approached by youth and asked to purchase cigarettes did so. Similarly, Shive and colleagues found that 33% of college students were asked to provide tobacco to minors and of those approached, 31% did so. More research is needed to elicit detailed information on sources of borrowed cigarettes, the age and characteristics of the purchaser, and the extent to which minors are buying cigarettes for their peers.

We found that only a small percentage of current smokers rely mainly on stealing or vending machines to obtain their cigarettes (4% and 1%, respectively). More research is needed to explore what students meant by stealing which may have included shoplifting and taking cigarettes from friends, family, or other smokers. Likewise, more research is needed to identify the extent to which current smokers used vending machines to supplement their usual source of cigarettes, or whether policy changes making vending machines less available, explains why vending machines are rarely a usual source for cigarettes.

This study is subject to several limitations. Firstly, the YRBS asked students about their “usual” source of cigarettes. These data cannot identify to what extent students used multiple sources to obtain their cigarettes. Nor does the YRBS ask students how easy it is for them to obtain cigarettes from any particular source. Secondly, the question addressing whether or not the student had been asked to show proof of age when buying cigarettes was restricted to students who were current smokers and who had bought cigarettes during the 30 days preceding the survey. Thus, it is not clear what proportion of students tried to buy cigarettes but were asked for proof of age and, because of their minority status, refused the sale. Thirdly, these data apply only to adolescents who attend high school and, therefore, are not representative of all adolescents. Still, in 1996, only 5% of persons aged 14–17 years were not enrolled in school. Finally, these data are based on self reports. Although the survey questions have demonstrated good test-retest reliability in a sample of high school students, students may under report or over report these behaviours.

Conclusion
To achieve reductions in tobacco related morbidity and mortality, reducing smoking among young people must be an element of a broader comprehensive tobacco use prevention effort. To try to reduce smoking initiation among young people, Congress enacted the Synar Amendment in 1992 to require every state to enact and enforce laws prohibiting the sale of tobacco to minors. YRBS data showed a decline in the percentage of high school students who usually bought their cigarettes in a store. It is not known to what extent enforcement of access laws has led to this reduction. In contrast, retailers who sell to minors or to the shift in sources of cigarettes for minors. However, in spite of these laws, we found that one in four underage smokers rely most often on store purchases for their cigarettes. Furthermore, it remains that many minors appear to be able to buy cigarettes in a store without being asked for proof of age.

CDC has issued best practices guidelines for comprehensive tobacco control programmes that include strategies for enforcing restrictions on minors’ access to tobacco. The agency recommends that states allocate $0.43 to $0.80 per capita for enforcing youth access regulations. Best practices recommend these per capita amounts need to be added to a base amount for interagency coordination of between $150 000 and $300 000.

Although reducing commercial access to cigarettes through the enactment and enforcement of tobacco access laws is important, the effectiveness of these laws may be undermined by social sources of cigarettes. Data from the Monitoring the Future study suggest only a slight decline from 1992 to 2000 in the percentage of 10th grade students (from 89% to 87%) who perceived it would be fairly easy or very easy to get cigarettes if they wanted some. Clearly, much more needs to be done to effectively reduce minors’ overall access to tobacco. Research on effective interventions to reduce social sources is critical.

Authors’ affiliations
S Everett Jones, LS Crossett, Division of Adolescent and School Health, National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP), Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, USA
D J Sharp, C G Husten, Office on Smoking and Health, NCCDPHP, CDC, Atlanta

REFERENCES
Cigarette acquisition and proof of age among US high school students who smoke

S Everett Jones, D J Sharp, C G Husten and L S Crossett

Tob Control 2002 11: 20-25
doi: 10.1136/tc.11.1.20

Updated information and services can be found at:
http://tobaccocontrol.bmj.com/content/11/1/20

These include:

References
This article cites 29 articles, 1 of which you can access for free at:
http://tobaccocontrol.bmj.com/content/11/1/20#BIBL

Email alerting service
Receive free email alerts when new articles cite this article. Sign up in the box at the top right corner of the online article.

Notes

To request permissions go to:
http://group.bmj.com/group/rights-licensing/permissions

To order reprints go to:
http://journals.bmj.com/cgi/reprintform

To subscribe to BMJ go to:
http://group.bmj.com/subscribe/