Brief Original Report

The remarkable decrease in cigarette smoking by American youth: Further evidence

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A B S T R A C T

Objective. To examine decreases over time in cigarette smoking prevalence and intensity among American students in 8th, 10th, and 12th grades.

Methods. Data from Monitoring the Future on students’ smoking, across four measures of differing intensity of smoking, are compared over time and across grade levels. Data are available since 1975 for 12th graders and since 1991 for 8th and 10th graders.

Results. For all three grade levels, all four measures decreased substantially. The decreases became larger as the measures moved from least to most intensive (respectively, lifetime (ever) smoking and ≥1/2 pack of cigarettes per day). Decreases exceeded three-quarters for every grade for the two most intensive measures of smoking: daily smoking and ≥1/2 pack per day. For every measure, 8th graders’ percentage decreases were the largest and 12th graders’ the smallest. 12th graders’ absolute (percentage-point) decreases were the largest for every measure.

Conclusion. Cigarette smoking, the most dangerous form of tobacco use, has decreased dramatically among American students. The fact that decreases are larger for more intensive measures of smoking indicates that simply tracking 30-day prevalence, often labeled “current smoking,” significantly understates the decrease in youth smoking over time.

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Introduction

In a recent article in this journal, Kozlowski and Giovino (2014) made the important observation that the reduction in the standard measure of youth cigarette smoking – 30-day prevalence by high school seniors, often labeled “current smoking” – significantly understates the decreasing use of cigarettes by young people. The authors showed that, among 30-day smokers, the average number of days smoked and the average number of cigarettes smoked per day during the 30-day period had both fallen as well. This analysis complemented earlier work that has documented decreasing intensity of cigarette use among young people, for example the finding by Jones et al. (2011) that among current cigarette smokers, the frequency of light smoking (<1–5 cigarettes per day) had increased significantly from 1991–2009, while for heavy smoking (>11 cigarettes per day) the frequency had more than halved.

The Monitoring the Future (MTF) data used by Kozlowski and Giovino (2014) can be revisited to add further insight into this “softening” of smoking by young people. The basic MTF data tables (Monitoring the Future, 2014) provide four measures of smoking, representing increasing levels of smoking intensity: lifetime (ever) use of cigarettes (even once); 30-day prevalence (smoking even one cigarette in the past 30 days); daily smoking; and smoking ≥ one-half pack of cigarettes per day. In addition to data on 12th graders’ smoking, first collected in 1975, MTF has collected data on smoking by 8th and 10th graders since 1991. Comparison of the data on measures of intensity across each of the three grades permits a further level of examination of the softening of youth smoking documented by Kozlowski and Giovino (2014).

There is no single ideal measure of smoking. However, to rely so heavily on 30-day prevalence – the conventional measure of youth smoking rates – misses the significant changes that have been taking place among those youth included as 30-day smokers. Along with Kozlowski and Giovino’s (2014) paper, this analysis demonstrates why that is the case and suggests that we should no longer rely exclusively on 30-day prevalence when trying to evaluate smoking trends among young people.

Methods

Supported by the National Institute on Drug Abuse and directed by researchers at the University of Michigan, MTF produces annual nationally representative data on self-reported drug use by students, including cigarette smoking, for 8th, 10th, and 12th graders (Johnston et al., 2014). The survey does not cover youth who are not enrolled in...
For nearly four decades, MTF has been considered the gold standard for data on youth drug use. The findings from MTF are relied upon by researchers and federal government agencies.

MTF annually surveys nearly 50,000 students in about 420 public and private secondary schools. In the most recent years, this included approximately 18,000 8th graders in 150 schools, 17,000 10th graders in 140 schools, and 18,000 12th graders in 133 schools. The surveyors employ a three-stage randomized sampling procedure, first selecting geographic areas, then selecting schools within each area, and finally selecting classes within schools. The surveys are self-administered in students’ classrooms, with the process overseen by University of Michigan personnel. Ten days prior to the survey, students receive fliers explaining the survey’s purpose and procedure; parents are sent letters so that they have the option to decline having their child participate (Johnston et al., 2014).

For the years 2011–13, response rates were 91% for 8th graders, 87% for 10th graders, and 83% for 12th graders. The predominant reason for non-participation is the student’s being absent on the day of the survey, with upper grade students having more activities that lead them to be absent. Refusal rates are ~1%. Participation rates have varied little across time (Johnston et al., 2014).

I compare changes over time in each of MTF’s four measures of increasing intensity of smoking for each of the three grades from the peak rate of smoking for each grade through 2014. For the 8th and 10th graders, all four of the measures peaked in 1996, after rising annually from 1991, the first year students in these two grades were surveyed. For the 12th graders, three of the four measures peaked in 1977, the third year of the survey. 30-day smoking prevalence peaked in 1976. Thereafter, until 1997, rates fluctuated with occasional minor year-to-year increases until 1997. Following the years of peak prevalence, however, all four measures have declined virtually annually for all three grades. The 2014 survey found the lowest rates of smoking in the history of the surveys for every measure of smoking intensity and for all three grades. Thus, the changes reported here reflect decreases in smoking from the highest to the lowest recorded rates. For the specific year-to-year changes over the entire period that MTF collected data, see Table 1 in Monitoring the Future (2014).

**Results**

Table 1 presents the MTF estimates of smoking for each of the four measures by grade, for the peak year of smoking and in 2014, as well as the percentage decreases in each time series. In all three grades, smoking declined substantially from its peak to its 2014 level. The decreases range from slightly over half (54.6% for lifetime smoking among 12th graders) to nearly 90% (88.4% for ≥1/2 pack per day among 8th graders). The two most intensive measures – daily smoking and smoking > 1/2 pack per day – decreased by more than 75% in all three grades.

For each grade, the decreases become larger as one moves from the least intensive measure of smoking (lifetime) to the most (≥1/2 pack per day). 8th graders’ lifetime smoking rate decreased by 72.6%, while their ≥1/2 pack per day rate dropped by 88.4%. For 10th graders, the respective declines were 63.1% to 87.2%. For 12th graders, they were 54.6% to 86.6%.

The percentage decrease in every measure of smoking was greatest for the 8th graders, next largest for the 10th graders, and smallest for the 12th graders. In contrast, the absolute (percentage point) decrease (not shown) was largest for the 12th graders, next largest for the 10th graders, and smallest for the 8th graders. The difference in the two trends reflects the fact that initial levels of smoking for each measure are lowest for the 8th graders and highest for the 12th graders.

**Discussion**

The most striking finding of this study is the large decrease in smoking in all three grades and across all four measures of smoking. In 1996 – less than two decades ago – almost half of 8th graders had smoked at least one cigarette. In 2014, 13.5% had ever smoked a cigarette. In 1977, almost a fifth of high school seniors smoked at least half a pack of cigarettes daily. By 2014, the equivalent figure had dwindled to 2.6% of seniors.

The study’s findings support the results reported in other recent studies (Jones et al., 2011; Kozlowski and Giovino, 2014): Across all three grades, and with no exceptions, the decreases are larger for the more intensive measures of smoking. In each grade, the decrease in lifetime (ever) smoking, while large, is smaller than the decrease in the next most intensive measure: 30-day prevalence. In turn, the decrease in 30-day prevalence is less than that of daily smoking, and the largest decrease is among those smoking ≥1/2 pack of cigarettes per day.

Imbedded in these data is the endogeneity in the student body across grades across years: two years after they are 8th graders, those students become 10th graders, while 10th graders become 12th graders two years thereafter. Thus, we would certainly expect some consistency in trends across grades over time. Still, cohort effects are not the only operative forces. Secular trends and temporal fads can intervene. Consider rapid changes in young people’s clothing or slang. Regardless of the endogeneity, the overall trends, and the magnitudes of the changes, are unarguable.

The one other potential challenge to these findings is the possibility of changes over time in young people’s smoking reporting accuracy. Earlier research suggested a decrease in adult reporting accuracy after the Fairness Doctrine ads on TV and radio in the late 1960s (Warner, 1978), although research covering later years found no such trend (Hatzianandreou et al., 1989). If students underreport their smoking more today than in the past, that could account for some of the reported decrease in smoking. There is no evidence of such a phenomenon, however, and even if it existed it could not possibly account for the dramatic declines reported here.

The progress concerning youth cigarette smoking does not necessarily mean that we are (coming) out of the woods with regard to youth tobacco use. Students’ use of smokeless tobacco products, while declining significantly over the years, changed little in 2014. Approximately as many 12th graders reported smoking little cigars or cigarillos in the past 30 days as reported smoking cigarettes, and 6.4% reported smoking large cigars. 17.1% of 12th graders – and 8.7% of 8th graders – reported having consumed an e-cigarette in the past 30 days (Monitoring the Future, 2014; see also Arrazola et al., 2014).

**Conclusion**

Decreases in cigarette smoking – the most dangerous form of tobacco use – among young Americans have been remarkably large. Along with the findings reported by Kozlowski and Giovino (2014), Jones
et al. (2011), and others, these results support the notion that it is no longer appropriate to rely alone on 30-day prevalence as an index of what is happening in youth smoking; the measure substantially understates the decreases occurring across the board.

Conflict of interest statement

The author declares that there are no conflicts of interest.

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References

Arrazola, R.A., Neff, L.J., Kennedy, S.M., Holder-Hayes, E., Jones, C.D., 2014. Tobacco use among middle and high school students — United States, 2013. MMWR 63, 1021–1026.

Hatziandreu, E.J., Pierce, J.P., Fiore, M.C., Grise, V., Novotny, T.E., Davis, R.M., 1989. The reliability of self-reported cigarette consumption in the United States. Am. J. Public Health 79, 1020–1023.

Johnston, L.D., O’Malley, P.M., Bachman, J.G., Schulenberg, J.E., Miech, R.A., 2014. Monitoring the Future National Survey Results on Drug Use, 1975–2013: Volume I, Secondary school students. Ann Arbor: Institute for Social Research, The University of Michigan (Available at http://www.monitoringthefuture.org/pubs/monographs/mtf-vol1_2013.pdf (accessed January 17, 2015)).

Jones, S.E., Kann, L., Pechacek, T.F., 2011. Cigarettes smoked per day among high school students in the U.S., 1991–2009. Am. J. Prev. Med. 41, 297–299.

Kozlowski, L.T., Giovino, G.A., 2014. Softening of monthly cigarette use in youth and the need to harden measures in surveillance. Prev. Med. Rep. 1, 53–55.

Monitoring the Future, 2014. Drug and alcohol press release: text, figures, & tables. Available at, http://www.monitoringthefuture.org/data/14data.html#2014data-cigs (accessed January 17, 2015).

Warner, K.E., 1978. Possible increases in the underreporting of cigarette consumption. J. Am. Stat. Assoc. 73, 314–318.