

# Smoking on the rise among young adults: implications for research and policy

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This paper investigates hypotheses regarding the cause of the recent apparent increase in young adult smoking, compares trends in smoking among young adults with trends in the use of other substances, and considers the implications for youth tobacco control research and policy. Time series analyses of national data suggest that the recent observed increase in smoking among young adults is primarily an artefact of the almost simultaneous increase in smoking among high school students. In addition, however, it also appears that there have been real changes in smoking patterns among young adults. While many questions remain regarding recent trends in tobacco and other drug use among adolescents and young adults, what is known leads to a clarion call for increased intervention and policy action for the prevention and control of tobacco use among young adults in the USA.

ing behaviour among teenagers—that is, the apparent increase among young adults may be a *cohort effect* reflecting increased use among adolescents a few years earlier. In addition, however, these trends raise the spectre that there has been a true increase in the number of young adults initiating cigarette smoking after high school. From this, a cascade of concerns and additional questions flows. What might explain the apparent increase in the initiation of tobacco use among young adults? Is it possible that some tobacco control strategies aimed at adolescents are merely delaying or deferring initiation rather than preventing it? Have tobacco control advocates and policymakers been remiss in not focusing more resources on young adults?

The purpose of this paper is to explore the issue of recent trends in cigarette smoking among young adults in significant depth. This paper has the following objectives: (1) to review the published literature regarding trends in smoking behaviour among young adults in the USA over the past two decades, comparing college students and non-college young adults; (2) to investigate hypotheses regarding the causes of the apparent increase in smoking in the late 1990s; (3) to explore key issues that arise from a deeper understanding of these concurrent trends and various explanations regarding the causes and driving forces behind them; and (4) to make recommendations for tobacco control research and policy.

## METHODS

### Review of published literature and trend data

Much of the information presented and reviewed in this paper was obtained from published manuscripts and abstracts. In addition, information on trends in adolescent and young adult smoking was obtained from a number of published reports and public websites. A major source of information for this paper came from the Monitoring the Future project, including a recent report on substance use among college students and adults aged 19–40 years.<sup>3</sup>

### Trend analysis of Monitoring the Future data

Annual data from the Monitoring the Future project were analysed using time series analytic techniques to detect whether or not the trend toward increasing smoking among high school students in the mid 1990s is related to the subsequent increase in smoking among college students. The goal here was to explore the hypothesis

In the late 1990s, evidence from a number of different sources pointed to a disquieting trend: cigarette smoking among college students in the USA was on the rise. Wechsler *et al* sounded one of the first alarms, reporting that longitudinal data from 130 college campuses showed that the prevalence of self reported smoking in the past 30 days increased from 22.3% in 1993 to 28.5% in 1997, an increase of approximately 28%.<sup>1</sup> A 1999 follow up survey (also conducted on a nationally representative sample of four year colleges) confirmed an increase in the prevalence of cigarette smoking among college students.<sup>2</sup>

Data from the Monitoring the Future project also demonstrate that there was an increase in the prevalence of cigarette smoking among college students in the late 1990s. This upsurge, however, was observed among young adults in general—both those enrolled and not enrolled in college.<sup>3</sup> Between 1993 and 1999, the 30 day prevalence of cigarette smoking rose by 25% among college students 1–4 years beyond high school, and by about 21% for young adults 19–24 who were not in college. Although year 2000–01 data suggest a decrease in smoking among both college students and young adults not in school, these trends remain quite disturbing. At the present time, it is estimated that there are approximately 11 million smokers between the ages of 19 and 25 in the USA.<sup>4</sup>

Several questions emerging from these general trends should resonate with those interested in youth tobacco prevention and control. A primary issue is the extent to which trends among young adults are reflections of previous trends in smok-

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**Abbreviations:** CAS, College Alcohol Study; CPS, Current Population Survey; NHIS, National Health Interview Survey

that the recent increase in young adult smoking is an artefact (or cohort effect) of the observed increase in smoking among teenagers. Using time series modelling (with lag functions), an analysis was conducted to see if there is statistical evidence of such a cohort effect. The dependent variable used for this analysis was 30 day prevalence of cigarette smoking (that is, whether or not someone had smoked a cigarette in the past 30 days).

### Secondary analysis of 2000 NHIS data

Data from the 2000 National Health Interview Survey (NHIS) were analysed to assess recent trends in smoking behaviour among young adults. Following the methods of Pierce *et al.*,<sup>5</sup> adult survey respondents were classified into birth cohorts (in this case, single year birth cohorts). Analyses were performed on 18 birth cohorts from 1960 through 1977. People in these birth cohorts turned 18 from 1978 to 1995, and turned 21 from 1981 to 1998. Restricting the sample to these birth cohorts means that all subjects for these analyses were 23–40 years old at the time of the NHIS 2000 survey. Including more recent birth cohorts was possible, but given that the people in these cohorts were 18–22 years old at the time of the survey and thus had not yet completed their early adult years, results regarding tobacco use patterns during this time period would be biased (and almost certainly in the direction of underestimation).

During the NHIS interview process, respondents who report smoking 100 or more cigarettes during their lifetime are categorised as “ever smokers” and asked a series of additional questions. The main variable of interest for this analysis was the age at which “ever smokers” reported becoming regular smokers (worded as “at what age did you become a fairly regular smoker?”). Subjects responded with an age, that they never were a regular smoker, that they didn’t know, or that they refused to answer the question. Age at initiation of regular smoking was recoded to create a number of new variables including the establishing of regular smoking before age 15, before age 18, at age 18, or at ages 19–21. Other NHIS variables under analysis included ones related to current cigarette smoking status, the use of other tobacco products, and smoking cessation behaviour.

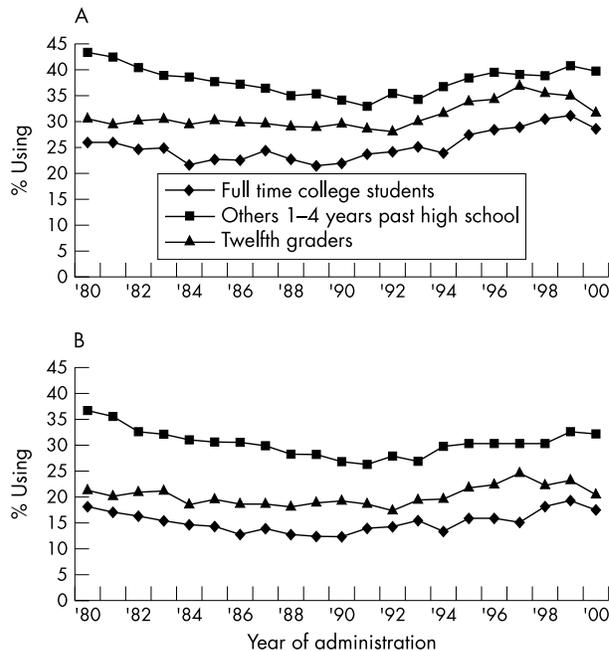
Variables of interest were analysed by birth cohort to detect any trends or changes over time. Most analyses were conducted for the entire sample and by sex. All analyses used weighted data to correct for the complex sampling design of the NHIS. The strengths of the NHIS data—which present a cross-sectional picture across a number of age groups and thus birth cohorts—are that the experiences of several cohorts can be analysed using only one year of data. A limitation, however, is that everyone is answering questions in the year 2000, when they were asked to recall specific aspects of their smoking initiation and early smoking behaviour. The further people are away from these experiences, the more likely recall bias might influence their responses. Thus, any changes observed across cohorts may reflect, in part, the fact that older cohorts are further away from the actual experiences in question.

## RESULTS

### Recent trends in smoking among young adults

#### Monitoring the Future results

A very useful and informative source of information on trends in tobacco and other drug use among American youth is the Monitoring the Future project, an ongoing research programme conducted since 1975 out of the Institute for Social Research at the University of Michigan.<sup>3,6</sup> Since 1976, a representative sample of the high school seniors participating in the Monitoring the Future surveys has received periodic follow up surveys. Thus, the Monitoring the Future project provides information on the drug related behaviour of high school students and adults through the age of 40 at the present time.



**Figure 1** Monitoring the Future trend data regarding smoking. Reproduced from Johnston *et al.*,<sup>3</sup> with permission. (A) Trends in 30 day prevalence of cigarette use. (B) Trends in 30 day prevalence of daily cigarette use.

Data available from the Monitoring the Future Project demonstrate that there has been a significant increase in cigarette use among young adults during the past decade, for both those in and not in college. Figure 1 shows trends in the 30 day prevalence of cigarette smoking (panel A) and the 30 day prevalence of daily smoking (panel B) over the past two decades, for full time college students, for others 1–4 years past high school, and high school seniors.<sup>3</sup> For all three groups, the trends are similar. There was a decrease in cigarette smoking behaviour during the 1980s. In the early 1990s, however, smoking prevalence began to increase among all three groups, with an especially strong increase among high school seniors. The 30 day prevalence of smoking continued to increase through the 1990s for high school seniors, peaking in 1997 and decreasing thereafter. The trend lines for full time college students and other young adults peaked in 1999, and showed a decrease for the first time in many years in 2000.

Regarding college students, Johnston *et al.* report: “Between 1990 and 1999, the 30-day prevalence of cigarette smoking by college students rose from 23% to 31%, or by about one-third, and daily smoking rose from 14% to 19%—or by about 40%.”<sup>3</sup> Between 1980 and 1994, female college students had higher rates of smoking than males. However, a crossover occurred in 1995, and since this time rates of smoking among college males have been slightly higher than those for females. It is believed that this crossover reflects a similar sex crossover in smoking behaviour that occurred among high school seniors a few years earlier.<sup>3</sup>

Young adults 1–4 years beyond high school but not in college have a higher prevalence of smoking than those in college, with 30 day prevalence rates in the mid to late 1990s ranging from 35–42%. Rates of heavy smoking are also significantly greater among young adults not in college. For example, in the year 2000, 23.7% of young adults not in college reported smoking a half pack or more a day, compared with 10.1% of full time college students. Despite the greater prevalence of smoking among non-college young adults, the relative increases in smoking were much greater among college students. For example, between 1990 and 1999, the 30 day prevalence of *daily* smoking increased by approximately 25%

**Table 1** Prevalence of smoking in past 30 days among young adults in major national studies

Data source	1991	1993	1995	1997	1999	2000
Harvard College Alcohol Survey		22.3%		28.5%	27.8%	
National College Health Risk Behavior Survey			29.0%			
Monitoring the Future: college students 1-4 years past high school	23.2%	24.5%	26.8%	28.3%	30.6%	28.2%
Monitoring the Future:						
All adults ages 19-20	27.6%	29.0%	33.4%	34.0%	33.9%	32.2%
All adults ages 21-22	28.3%	29.2%	31.8%	32.3%	33.7%	33.6%
All adults ages 23-24	28.5%	28.1%	28.0%	29.1%	30.9%	29.5%
National Health Interview Survey—all adults ages 18-24	22.9%	25.8%	24.8%	28.7%	27.9%	26.8%

for non-college young adults, yet by almost 60% for full time college students.<sup>3</sup>

In summary, Monitoring the Future data provide clear and credible evidence that there were significant and alarming increases in cigarette smoking among both male and female high school students and young adults during the 1990s.<sup>3,6</sup> Trends in self reported smoking behaviour are paralleled by trends in the percentage of high school seniors and young adults reporting that most or all of their friends smoke.<sup>3</sup> While the most recent data are suggestive of a decline or at least a plateau in the trend line, the results for the 1990s are unmistakable: high school students, college students, and young adults not in college all experienced a significant upsurge in cigarette smoking during the 1990s.

#### Harvard School of Public Health College Alcohol Studies

Another very useful source of information regarding trends in cigarette smoking among college students in the USA is the Harvard School of Public Health College Alcohol Study (CAS). The CAS involves a random sample of undergraduates at a nationally representative sample of four year colleges. While the primary focus of the survey is alcohol behaviour, information about cigarette smoking is included as well.

Results from the 1993 CAS included that 22.3% of full time college students had smoked in the past 30 days, with an additional 25% reporting that they were former smokers.<sup>7</sup> Wechsler *et al* looked at changes in smoking prevalence between the 1993 and 1997 surveys, and discovered the alarming finding reported above.<sup>1</sup> Over this five year period, there had been a 27.8% increase in cigarette smoking prevalence (defined as smoking during the past 30 days). In addition, it was reported that there was a decrease in smoking rates at the “extremes” of smoking behaviour: there were fewer very light smokers (< 1 cigarette per day) and fewer heavy smokers (> 20 per day).

More recently, Rigotti *et al* analyzed data from a third CAS, conducted in 1999.<sup>2</sup> Their findings included that more than 60% of college students had tried some sort of tobacco product in their life, that almost half (45.7%) had used some sort of tobacco product in the past year, and that a third (32.9%) were current users in terms of 30 day prevalence of any tobacco use.<sup>2</sup> The 30 day prevalence rate of cigarette use in 1999 was similar to the rate in 1997, suggesting a plateau in the upsurge among college students. While cigarettes accounted for the majority of tobacco ingested by college students in 1999, cigars also were a significant source of tobacco for males. Even though cigarette smoking rates were similar for males and females (28.4% *v* 28.5%, respectively), males had a higher overall rate of tobacco use in the past 30 days because of their higher use of cigars (15.7% *v* 3.9%) and smokeless tobacco (8.7% *v* 0.4%).<sup>2</sup>

#### Other studies

Selected major findings from a number of data sources are summarised in table 1. The 1995 National College Health Risk Behaviour Survey included students at both two and four year

institutions.<sup>8</sup> Nearly three quarters of the respondents (74.8%) reported that they had ever tried a cigarette, and 29% had smoked at least one cigarette in the past 30 days. Whites and those at two year institutions were more likely to report ever and recent smoking. This study was not longitudinal. Thus it cannot offer insights regarding trends.

Results from the NHIS suggest that the rate of current smoking among 18-24 year olds was 23.5% in 1991.<sup>9</sup> This rate had risen to 28.6% in 1997, a 22% increase.<sup>10</sup> Although the definition of current smoking in the NHIS changed slightly in 1992 (from having ever smoked 100 or more cigarettes and currently smoking to having ever smoked 100 or more cigarettes and now smoking every day or some days), this change is not responsible for the increase in smoking observed among 18-24 year olds during the 1990s. In fact, no other adult age group experienced an increase in smoking rates over this time; the only increase in current smoking occurred in the youngest adult age group.

Data from the NHIS also signal that, starting around 1997, the prevalence of smoking among those 18-24 years old was as high as those 25-44 years (for example, 28.7% *v* 28.6% in 1997, and 26.8% *v* 27.0% in 2000) (Gary Giovino, personal communication on unpublished NHIS results, May 2002). In prior years, NHIS results consistently showed the highest prevalence of smoking in the 25-44 age group, and significantly lower rates in the youngest adult years. This changed, however, in 1997 when two important trend lines met: while smoking rates for adults 25-44 years old were declining in the early to mid 1990s, they were simultaneously increasing among younger adults. NHIS data also suggest that, between 1997 and 2000, the prevalence of smoking among young adults 18-24 years old and those 25-44 was similar and was decreasing slightly.

NHIS results from the year 2000 (data not shown) also demonstrate that young adult males are significantly more likely to use other types of tobacco products than females, and that this pattern holds across birth cohorts. The use of cigars and bidis among males appears to have increased somewhat across birth cohorts reaching age 21 between the years of 1991 and 1998, and a significant proportion of males (over 25%) report having used smokeless tobacco products. This is alarming given the finding that smokeless tobacco use is a significant predictor of cigarette smoking initiation among young adult males.<sup>11,12</sup> Also alarming are data suggesting that the consumption of cigars increased dramatically between 1993 and 1998, with a slight decrease after that year.<sup>13</sup>

#### Major explanations for trends in young adult smoking

##### The compositional change hypothesis

There are many possible explanations for the trends in young adult cigarette smoking described above. One explanation for the increase in smoking among college students is that it is an artefact of a compositional change in the US college student population. Historically, young adults not in college have had higher rates of smoking than those of a similar age but enrolled in college.<sup>3</sup> If more young adults are attending

college, it is possible that increases in student smoking represent a change in the types of young adults attending school rather than a true increase in the prevalence of cigarette smoking. According to data from the Current Population Survey (CPS),<sup>14</sup> there has been a slight increase in the proportion of high school graduating seniors who attend college. In 1995, 62.0% of graduating high school seniors were enrolled in a college or university in the fall. This proportion climbed to 67.0% in the fall of 1997, which was a record high. In 1998, the proportion dropped to 65.6%, and fell to 62.9% in 1999 and 63.0% in 2000.

The CPS statistics suggest that the increase in the proportion of high school seniors attending college occurred at the same time that college smoking rates were increasing. Thus, it is possible that part of the increase in smoking observed among college students is due to a compositional change in the types of students who are attending college. The amount of the increase explained by such a change, however, is likely to be quite small. First, the increase in college enrolment, while certainly noteworthy, is not of such a magnitude that it would have a significant compositional effect. Second, there have been increases in smoking among young adults both in and not enrolled in college. Thus, the compositional change explanation, while worth considering, is not credible as a major explanation for the increase in young adult smoking.

#### The cohort effect hypothesis

A second hypothesis to consider is that the recent observed increase in smoking among young adults in the USA is an artefact of the almost simultaneous increase in smoking among high school students. Between 1991 and 1997, cigarette smoking among youth increased significantly according to several different data sources.<sup>3 15</sup> Monitoring the Future data suggest a 32% increase in 30 day prevalence of any smoking among high school seniors during this time period.<sup>10</sup> Longitudinal analysis of Monitoring the Future data have established the existence of cohort effects: "if a class (or birth) cohort establishes an unusually high rate of smoking at an early age relative to other cohorts, the rate is likely to remain high throughout the life cycle relative to that of other birth cohorts at equivalent ages."<sup>3</sup>

Given the significant increase in smoking among high school students in the 1990s, the observed increase in smoking among young adults is often presumed to reflect the aging of adolescent cohorts with higher smoking rates.<sup>2 3</sup> There are indeed data to support the cohort hypothesis. First, Monitoring the Future results do suggest that the increase in smoking among high school seniors predates the observed increase among young adults ages 19–24. An increase in 30 day prevalence of smoking was first observed in 1993 for high school seniors, and increases were subsequently observed for 19–20 year olds in 1994, for 21–22 year olds in 1995, and for 23–24 year olds in 1996. These results are quite suggestive of an aging cohort effect.

Second, time series modelling results suggest that the two trend lines—that is, trends in the 30 day smoking prevalence rates for high school seniors and young adults 1–4 years out of high school between 1980 and 2000—are significantly related to one another. Specifically, the results showed that rates of current smoking among high school seniors explained three quarters of the variance in the rates of smoking among all 19–20 year olds over the 21 year time period under study, using a one year lag function ( $R^2 = 0.756$ ,  $p < 0.001$ ). In addition, smoking rates among high school seniors explained two thirds of the variance in current smoking rates among all 21–22 year olds, using a three year lag function ( $R^2 = 0.67$ ,  $p < 0.001$ ). Similarly, smoking rates among high school seniors explained three quarters of the variance in smoking among college students 1–4 years out of high school, using a two year lag function ( $R^2 = 0.765$ ,  $p < 0.001$ ). Thus, rates of smoking among

high school seniors are highly correlated with and explain the majority of the variance in subsequent smoking rates among young adults.

Nonetheless, there are also some disturbing aspects of observed trends that argue against a pure cohort effect. First, when the trend lines for college students and young adults not in school are separated (fig 1), one can see that increases in 30 day prevalence of any smoking and the 30 day prevalence of daily smoking among college students really started before 1990.<sup>3</sup> As such, it appears that the increase in smoking among college students actually was apparent before the upsurge in smoking among high school seniors (which appears to have started in 1992–93).

Second, similar to trends in cigarette consumption, the use of illicit drugs increased dramatically among high school students and young adults in the USA during the 1990s.<sup>16 17</sup> Between 1980 and 1992, most illicit drugs showed a strong decrease in use among high school students, college students and young adults not in college.<sup>3</sup> After 1992, however, a number of drugs—including marijuana—showed a clear increase in use among adolescents (both males and females), with smaller increases for a number of substances among young adults. Rates of *any* illicit drug use increased in a startlingly way between 1992 and 2000 as follows: from 27.1% to 40.9% for high school seniors, from 29.7% to 39.3% for young adults ages 19–20, and from 30.0% to 36.9% for young adults ages 21–22.<sup>3 18</sup> These rates began to stabilise slightly in the late 1990s.

Monitoring the Future investigators believe that much of the increase in illicit drug use among young adults is a cohort phenomenon, the result of adolescent cohorts with significant increases in use aging into young adulthood.<sup>3</sup> However, increases in the use of some drugs occurred simultaneously among high school students and young adults (both those in and not in college), including increases in the use of marijuana, hallucinogens, and amphetamines. Interestingly, Gledhill-Hoyt *et al* report that nearly a third of college marijuana users initiated use while in college.<sup>16</sup>

Compared with other substances, trends in alcohol use are somewhat different. During the time period that smoking was significantly increasing among high school students and young adults in general, alcohol consumption was experiencing a slight increase in terms of 30 day prevalence and binge drinking.<sup>19 20</sup> These increases are especially noteworthy as they started in the mid 1990s after a nearly decade long decline.<sup>20 21</sup> Thus, while the observed increases are not as dramatic as those for smoking or for illicit drug use, these small increases represent a clear and definite shift in a trend line.

In summary, while the cohort hypothesis likely has some degree of explanatory power, it is probably not the full explanation for the observed increase in smoking among young adults. The story becomes more complex when we look at some of the details in the trend lines, and we also consider the fact that a broader phenomenon regarding other substance use among adolescents and young adults was occurring at the same time. In general it appears that increases in smoking have occurred at the same time as increases in the use of other tobacco products, binge drinking, and the use of many types of illicit drugs, including marijuana. Given the strong evidence that risk taking behaviour regarding substances in general was on the rise among youth and young adults during the 1990s, it is clear that the case of cigarette smoking should not be viewed as an isolated phenomenon.

#### The change in age at initiation or habitual smoking hypothesis

In attempting to explain the increase in cigarette smoking among young adults in the USA, it is also important to consider whether there have been any changes in the age of smoking initiation or habitual smoking. Becoming a regular or

**Table 2** 2000 National Health Interview Survey results: smoking prevalence by birth cohort

Birth cohort	Weighted n	Year age 18	Year age 21	Ever smoked 100 cigs	Current smoker	Former smoker	Never smoker
1960	850022	1978	1981	44.0	31.4	12.6	55.5
1961	915703	1979	1982	46.1	30.2	15.8	52.8
1962	763499	1980	1983	41.1	26.4	14.5	58.4
1963	843462	1981	1984	44.2	30.7	13.5	55.5
1964	726386	1982	1985	37.7	24.2	13.5	61.9
1965	709540	1983	1986	39.7	25.9	13.8	59.2
1966	653197	1984	1987	38.3	26.8	11.5	61.2
1967	735985	1985	1988	42.0	27.8	14.2	57.4
1968	620519	1986	1989	37.5	25.4	12.1	61.5
1969	667763	1987	1990	39.7	25.6	14.1	59.9
1970	713280	1988	1991	37.0	26.8	10.2	62.5
1971	660994	1989	1992	38.2	25.9	12.0	61.4
1972	492612	1990	1993	32.1	24.6	7.5	66.8
1973	547021	1991	1994	36.4	24.8	11.6	62.3
1974	532144	1992	1995	37.3	25.6	11.7	62.4
1975	636497	1993	1996	42.1	32.8	9.3	56.9
1976	626827	1994	1997	38.9	28.3	10.6	60.7
1977	698967	1995	1998	41.9	31.8	9.7	57.6

habitual smoker is described as a process or a series of transitions through several stages, starting with the first “initiating” puff on a cigarette.<sup>22, 23</sup>

The epidemiology of cigarette smoking initiation in the USA includes one clear and consistent finding: the majority of people who end up being habitual smokers initiate experimentation with smoking as children or adolescents.<sup>15</sup> Data from a variety of sources consistently have shown that the vast majority of people who try a cigarette for the first time are under 18, and that the majority who become daily smokers do so by or at age 18.

There is no doubt that, even in the face of increased smoking rates among young adults, cigarette smoking initiation remains primarily an activity of minors. Even so, there may have been changes in some aspects of the process of being a regular or habitual smoker. In particular, it may be that there have been changes in age distribution of habitual or regular smoking. Below, results from an analysis of data from the 2000 NHIS regarding smoking behaviour in early adulthood across birth cohorts (from 1960 to 1977) are presented in an attempt to shed a bit more light on the hypothesis that there have been changes in age specific smoking patterns concomitant with the observed increase in cigarette use among young adults.

#### *Trends in ever smoking 100 cigarettes*

NHIS data from 2000 show that, across the 18 age cohorts, between a third and a half of adults ages 23–40 reported that they have smoked 100 or more cigarettes in their lifetime (table 2). There does appear to have been a slight increase in the proportion of adults reporting ever smoking 100 cigarettes for more recent birth cohorts (those turning 21 between 1996 and 1998), although this change is not statistically significant. There also appears to have been a slight increase in the rate of current smokers over time, with people from younger age cohorts (those born in 1975–77) having a higher rate of current smoking than those in older cohorts. This is consistent with the findings regarding an increase in smoking prevalence among young adults described above. However, given that the NHIS findings presented here involve cross-sectional analysis only, it is possible that this pattern is explained in part by older respondents having had more time to engage in smoking cessation.

#### *Trends in age at initiation of regular smoking*

The 2000 NHIS survey data suggest that the mean and median age at which regular smoking was established did not change much over these 18 birth cohorts. On average, over time, the mean age for regular smoking has been 20.8 years (with a median of 17 years). While there was a decrease in the mean age of establishment of regular smoking for the 1973 and 1974 birth cohorts (17.5 and 18.7 years, respectively), more recent birth cohorts have average ages of initiation of regular smoking that are quite similar to the general pattern over time.

As shown in table 3, the proportion of ever smokers establishing habitual smoking habits by the age of adulthood has fluctuated some over time, but does appear to have risen somewhat for cohorts born after 1970 (that is, for those turning 18 during the early 1990s). For example, 66.8% of ever smokers in the 1970 birth cohort became regular smokers by age 18, compared with 74.5% in the 1976 birth cohort. When coupled with trends regarding the mean age at initiation, these results support a well accepted tenet in tobacco prevention circles: that most smokers initiate smoking behaviour as adolescents, and that—for the vast majority of smokers—smoking became a regular activity or habit at age 18 or younger. Data from the 2000 NHIS do not suggest any sort of significant deviation from well established and well understood patterns of regarding youth smoking in the USA.

However, the NHIS results do suggest that the rate at which ever smokers establish regular smoking between the ages of 19–21 has experienced an increase in recent years (table 3). In particular, the proportion of ever smokers who report the establishment of habitual smoking at the ages of 19, 20, or 21 appears to have increased for more recent birth cohorts, specifically the 1975–77 birth cohorts. People in these birth cohorts turned 21 between 1996 and 1998, years in which smoking among young adults was increasing. For example, 13.5% of ever smokers in the 1974 birth cohort reported becoming regular smokers in early adulthood (as opposed to age 18 or younger), compared with 17.8% in the 1975 birth cohort and 21.7% in the 1977 birth cohort (table 3). For the most recent cohorts, approximately one out of four smokers became a regular smoker between the ages of 19 and 21. Time series analysis shows that the change in the slope of this trend line is close to being significant at the 0.05 level ( $p = 0.058$ ). While more data points are needed to reach any solid conclusions, the current data do suggest that a significant proportion

**Table 3** 2000 National Health Interview Survey results: patterns in the age of initiation of regular smoking by birth cohort

Birth cohort	% regular smoker by age 15	% regular smoker by age 18	% regular smoker after age 18	% regular smoker at age 19–21	% ever smokers never regular smokers	% of ever smokers not daily smokers
1960	28.1	70.0	26.7	12.4	5.3	12.1
1961	30.5	68.1	26.6	13.3	5.7	10.1
1962	31.0	70.4	27.9	13.4	4.8	11.4
1963	32.5	71.3	24.3	14.6	5.3	9.9
1964	33.7	70.7	24.7	13.9	4.5	11.0
1965	35.1	66.1	28.7	12.1	4.4	14.1
1966	32.9	69.0	27.6	13.5	4.1	12.9
1967	34.7	69.5	25.4	16.5	4.6	14.5
1968	30.2	71.5	23.9	12.8	3.9	13.1
1969	37.2	65.7	29.0	19.6	4.2	14.3
1970	28.9	66.8	28.6	16.1	4.5	14.5
1971	32.5	70.9	24.8	14.3	4.1	13.7
1972	27.7	73.4	22.5	16.1	3.1	22.5
1973	33.4	77.4	21.6	15.3	3.4	19.6
1974	32.5	79.0	18.4	13.5	3.3	16.9
1975	28.9	73.6	21.5	17.8	4.0	21.4
1976	30.0	74.5	21.0	18.8	3.9	16.7
1977	26.3	70.8	24.3	21.7	4.4	20.8

\*Results represent the percentage of ever smokers who reported becoming a “regular smoker” at the ages indicated in column heading.

of smokers are making the transition to habitual smoking as young adults and that this appears to have increased in frequency among more recent birth cohorts.

It is also interesting to note that the proportion of ever smokers (100 or more cigarettes) who report that they never became a “habitual smoker” was similarly low (less than 6%) across the birth cohorts under study (table 3). Thus, it appears that most people who have ever had 100 cigarettes become what they consider to be a regular smoker at some point, and that the rate of experimenters who do not become regular smokers has not changed much over the past two decades. Even so, some people who smoke regularly can do so without smoking daily. These people are referred to as “intermittent smokers”.<sup>24</sup> NHIS data show that the prevalence of intermittent or non-daily smokers has increased over the birth cohorts under study, from a rate of 12.1% of ever smokers in the 1960 cohort to 20.8% in the 1977 cohort (table 3). Time series analysis revealed that there has been a significant change in the slope of this trend line ( $p = 0.001$ ), suggesting that the rate of intermittent smoking among adults is indeed higher

among more recent birth cohorts, or those who reached young adulthood during the years where smoking prevalence among young adults was increasing.

#### Sex difference

Some interesting sex differences in smoking patterns are apparent in the 2000 NHIS data (table 4). First, the proportion reporting ever smoking 100 cigarettes is higher among males than females in all birth cohorts. Second, changes in the age at regular smoking are stronger for males than females. Using the last four years of available NHIS data (representing those who turned 23 between 1997 and 2000), the proportion of males establishing regular smoking by age 18 decreased from 80.3% for the 1974 birth cohort to 67.4% for the 1977 birth cohort, compared with 77.8% and 73.6% for the 1974 and 1977 birth cohorts, respectively, for females. Similarly, the proportion of males who reported becoming a regular smoker at ages 19–21 increased by 75% comparing the 1970 birth cohort with the 1977 birth cohort (14.0% v 24.5%). The proportion for females across this same time period increased by 5.5% (with

**Table 4** 2000 National Health Interview Survey results: age at which respondent became a regular smoker by birth cohort and sex

Birth cohort	Year age 21	Ever smoked 100 cigarettes	% regular smoker by 15	% regular smoker by 18	% regular smoker at 19–21	% smokers not daily smokers
<b>Males</b>						
1970	1991	41.6	25.8	73.2	14.0	13.5
1971	1992	43.1	38.9	76.2	8.3	12.1
1972	1993	36.2	30.2	74.6	11.1	25.6
1973	1994	41.5	37.3	78.3	14.3	20.0
1974	1995	40.7	33.1	80.3	13.8	16.8
1975	1996	45.0	25.6	74.8	17.0	19.8
1976	1997	43.9	31.9	73.8	20.2	11.1
1977	1998	44.7	26.5	67.4	24.5	22.9
<b>Females</b>						
1970	1991	33.2	32.2	60.1	18.2	15.6
1971	1992	34.1	25.7	65.3	20.5	15.4
1972	1993	28.3	24.7	72.0	22.0	18.9
1973	1994	32.1	29.1	76.3	16.3	19.2
1974	1995	34.7	32.0	77.8	13.3	17.0
1975	1996	39.4	32.6	72.3	18.6	23.2
1976	1997	34.4	27.8	75.3	17.1	23.3
1977	1998	39.8	26.0	73.6	19.2	19.0

some fluctuations—see table 4). These trend data suggest that the phenomenon of an increase in the rate of habitual smoking initiation is much stronger for males.

In summary, the epidemiology of cigarette smoking indicates that smoking initiation primarily occurs during adolescence. Evidence from a number of sources suggests that this pattern has intensified during the past two decades. The majority of smokers are still trying their first cigarette in early adolescence, and making the transition to habitual smoking by age 19. However, it is also the case that a significant proportion of smokers establish regular or habitual smoking as young adults. Analyses of NHIS survey data suggest that this proportion has been sizeable for some time, and that it increased, particularly among males, during the late 1990s. In addition, the proportion of current smokers who do not smoke daily has significantly increased among younger birth cohorts.

These findings are paralleled by data from a number of other recent surveys, including results from the 1999 National Youth Tobacco Survey, which show that the proportion of 18 and 19 year olds classified as “non-daily smokers” or “experimenters” was greater than the proportion of current smokers.<sup>25</sup> In addition, trend data from the National Household Survey on Drug Abuse show that the rate of initiation of daily cigarette use among both 12–17 year olds and 18–25 year olds increased during the 1990s.<sup>26</sup> For young adults (18–25 years), the rate of initiation for daily smoking (per 1000 person years of exposure) jumped from 28.9 in 1990 to 34.7 in 1997.<sup>26</sup>

Along with a “cohort effect” (whereby cohorts with increased rates of adolescent smoking carried their smoking rates into their young adult years), the increase in smoking prevalence among young adults also appears to be occurring because there has been an increase in the rate at which young adults who have experimented with cigarettes become regular smokers. For those who turned 21 in 1998, approximately 1 out of 5 female smokers and 1 out of 4 male smokers established regular smoking after the age of 18. It appears that there have been some changes in smoking behaviour patterns among young adults above and beyond an increase in prevalence caused by a cohort effect.

### INDIVIDUAL RISK FACTORS AND SOCIAL ENVIRONMENT CONSIDERATIONS

Recent results from the 1998–99 Tobacco-Use Supplement to the CPS suggest that, among young adults ages 18–24, current smokers (26% of the sample overall) were more likely to be male (29%), white (31%) or American Indian (35%), unemployed (36%), or blue collar (34%) or services workers (32%).<sup>27</sup> There is very little in the published literature regarding risk factors for smoking among young adults not in college. In contrast, the Harvard College CAS have provided valuable insights regarding individual risk factors for smoking among college students.

Multivariable analysis of the 1993 CAS data led Emmons *et al* to conclude that other lifestyle choices are significantly associated with cigarette smoking in the past 30 days among college students.<sup>7</sup> This includes using marijuana, heavy drinking, and having multiple sex partners. The attitudes that parties are a very important or important part of college life and that collegiate athletics and religion are not very important also were significantly related to smoking. In addition, Emmons *et al* found that white students, those belonging to a fraternity or sorority, and women living in a co-ed dorm had a higher risk of smoking. Similar to findings from the 1993 CAS data, 1999 college students who used tobacco were more likely to be white and to experiment with other risky behaviours (for example, binge drinking, marijuana use, and multiple sexual partners) than non-smokers.<sup>2</sup>

Analysing predictors of “late onset smoking” (defined as establishment of smoking after high school), Ellickson *et al* found that lower parental education, worse grades in high

school, and younger age relative to others in a grade cohort were significant risk factors.<sup>28</sup> In a longitudinal study of college bound high school students who reported never experimenting with tobacco, Choi *et al* found that—four years later—14% had initiated smoking.<sup>29</sup> Risk factors for this late initiation included being white, having more depressive symptoms, attending church less often, believing that peers approve of smoking, and believing that experimenting with cigarettes is safe.

Wee *et al* found that adults younger than 30—both male and female—are more likely to smoke if they are trying to lose weight.<sup>30</sup> Weschler *et al* reported that a prominent perception among health centre directors on college campuses is that students smoke for a variety of reasons—including as a response to stress and as tool for weight control—and that many students do not believe they are addicted and that they will quit upon graduation.<sup>31</sup>

In addition, it is believed that smoking reduces and, for some people, fully relieves anxiety in a variety of social situations. Sonntag *et al* reported that social anxiety has been significantly associated with nicotine dependence in both cross-sectional and longitudinal studies.<sup>32</sup> In addition Anda *et al* claimed that their results from the Adverse Childhood Experiences Study contribute to a growing literature suggesting that “nicotine use is associated with self-medicating efforts to cope with negative emotional and social experiences”.<sup>33</sup> A significant, graded relation was found between smoking and the number of adverse childhood experiences, including emotional, physical, and sexual abuse; a battered mother; parental separation/divorce; and growing up with a substance abusing, mentally ill, or incarcerated household member.

Are adolescents and young adults smoking cigarettes more because of increased feelings of social anxiety and pressure? Are they trying to “self medicate” to relieve stress or emotional pain in some way? The myriad reasons that adolescents and young adults are smoking cigarettes and using other substances are complex and not well understood. A full review of the literature on this topic is outside of the scope of this paper. However, a prominent social environment hypothesis regarding the increase in smoking among young adults is that the tobacco industry has intensified its activity in this market segment—that is, more aggressive industry marketing activities may be partly responsible for the increase in smoking observed among college students and young adults in general.

Using tobacco industry documents that have become public in the wake of litigation, Katz and Lavack,<sup>34</sup> Sepe *et al*,<sup>35</sup> and Sepe and Glantz<sup>36</sup> have argued that changes in industry promotional tactics correspond with the increase in smoking observed among young adults. These marketing tactics have taken many forms since the late 1980s: (1) promotions in bars, nightclubs, comedy clubs, and other venues that use person-to-person interactions, free samples, free promotional accessories, contests, and games; (2) efforts to cultivate “brand presence” in bars, including company branded items (such as napkins, coasters, clothing for employees, etc), and financial incentives for owners and employees; and (3) increased use of the alternative press (especially weekly alternative newspapers in urban areas) for several purposes, including product advertisement, event promotion, and bar promotion.

Adult only facilities—such as bars and nightclubs—are exempt from the 1998 Master Settlement Agreement in terms of marketing activities. Sepe *et al* argue that tobacco industry bar and nightclub promotions “protect the industry from advertising regulations, clean indoor air laws, and accusations of marketing to adolescents. Bar promotions help the industry engineer peer influence to encourage tobacco use among young adults.”<sup>35</sup>

Sepe and Glantz wrote that young adults “are not immune to ‘late’ initiation of smoking . . . Directed marketing toward young adults in social settings such as bars and nightclubs may raise the age at initiation toward what it was in the past.

Current increases in young adult smoking, in terms of both overall prevalence and first use, suggest that this directed marketing is having an impact.<sup>36</sup> Thus, the argument is being made that observed increases in smoking among young adults are in part explained by tobacco industry promotional tactics.

There is a growing body of research literature reporting associations between exposure to tobacco industry marketing/promotions and smoking behaviours, particularly among youth.<sup>37-40</sup> Thus, it is not unreasonable to consider the hypothesis that increased efforts targeting young adults have reaped benefits for the industry. Although spending on tobacco advertising remained relatively constant between 1988 and 1998, promotional allowances tripled in size during this time period.<sup>41-42</sup> As has been argued in the past, the industry's continued investment in specific types of promotion and marketing suggests that those within the industry itself must have some evidence or reason to believe that these tactics are effective.<sup>43</sup>

Ling and Glantz have attempted to shed light on why the tobacco industry has intensified its marketing efforts among young adults. They explain:

"First, the industry views the transition from smoking the first cigarette to becoming a confirmed pack-a-day smoker as a series of stages that may extend to age 25, and it has developed marketing strategies not only to encourage initial experimentation (often as teens), but also to carry new smokers through each stage of this process. Second, industry marketers encourage solidification of smoking habits and increases in cigarette consumption by focusing on key transition moments when young adults adopt new behaviors, such as entering new workplaces, school, military, and especially leisure and social activities. Third, tobacco companies study young adults' attitudes, social groups, values, aspirations, role models, and activities, and infiltrate both their physical and social environments."<sup>44</sup>

Evidence from industry documents confirms that the tobacco industry has invested significant time and resources into studying youth and young adult development, motivations, and social environments, and that this research has helped them to divide potential and actual smokers into different markets or segments.<sup>22-40-45</sup> As described above, a number of recent articles provide provocative new evidence and ideas regarding tobacco industry strategies and trends in smoking among young adults. A note of caution, however, needs to be raised. The evidence to date is of a simple ecological nature: smoking rates among young adults rose several years after the industry first introduced promotional activities in bars, nightclubs, and other venues targeting young adults (in the late 1980s), and shortly after these types of efforts were intensified (in the early to mid 1990s). Rigotti *et al* recently found that, controlling for a number of potential confounders, those college students who report exposure to bar and campus tobacco promotional events do have higher rates of smoking, and that this association is only observed among those who became smokers as adults.<sup>46</sup> However, showing temporal associations and establishing causation are, of course, two different things. Thus, although certainly provocative and compelling, the evidence to date does not conclusively show a causal link between industry tactics and the increase in smoking among young adults.

## RESEARCH AND POLICY IMPLICATIONS

As described above, much has been written about the apparent increase in smoking among college students. Increases in smoking, however, have not been observed exclusively in the college population. Significant increases also have been witnessed among young adults in general, and importantly among high school students. There is credible evidence

that some of the observed increase among young adults is an artifactual result of the aging of cohorts with increased smoking among youth. In addition, there is information indicating that other factors may be at play as well. Recent NHIS data suggest that there was an increase in the rate at which young adults became "regular" or habitual smokers at the same time as the observed increase in smoking prevalence, especially among males. In addition, the increase in cigarette smoking has occurred concomitantly with an increase in other risk taking behaviours regarding substance use, including binge drinking and the use of marijuana and other illicit drugs.

The reasons for the increase in smoking among young adults are not clear, and there are many questions that remain unanswered at this point in time. Additional research is needed in multiple areas, including research that will help to answer the following questions:

- What sociodemographic and behavioural characteristics are associated with changes in the smoking behaviour of young adults? What subgroups are at higher risk for becoming habitual smokers as young adults? Are the characteristics or risk factors for habitual smoking initiation the same among college students and those not in school? Is the recent increase really largely a male phenomenon?
- How is the increase in cigarette smoking among young adults related to the increase in the use of other substances? Are some of the same causal factors involved across substances?
- Are there any tobacco control policies and interventions aimed at adolescents that may be delaying or deferring initiation of habitual smoking rather than preventing it?
- How do we best intervene with adults who have just "come of age"? Are young adults more like adults or adolescents in terms of their knowledge and understanding of risk, their motivations, their self perceptions, their attitudes, the social influences that affect them, etc? What needs to be understood about young adults to better inform the design of smoking prevention and control interventions?

Even in the face of these and a number of other unanswered questions, we do have sufficient information and knowledge in hand to consider a number of programmatic and policy responses. The following is a list of potential policy responses and intervention strategies that need to be investigated, debated, and discussed as the tobacco control community further develops an agenda for addressing tobacco use among young adults.

### Invest in smoking cessation interventions aimed at young adults

Although rates of smoking cessation have increased among adults over the past two decades, this has primarily been observed among adults ages 45 and older. Among young adults (ages 18-24), the percentage of ever smokers who have quit smoking has remained relatively stable, especially over the past 10 years (Gary Giovino, personal communication on unpublished NHIS results, May 2002). This does not mean, however, that young adult smokers are not interested in quitting. Results from the 1995 National College Health Risk Behaviour Survey included that 59% of current smokers had made at least one quit attempt, and that this rate was 82% among daily smokers.<sup>47</sup> Furthermore, recent results from the 2000 NHIS suggest that among those ages 18-24, over three quarters of current smokers who attempted to quit in the past still would like to quit, and that almost half (44.2%) of those who have zero quit attempts also would like to quit (Gary Giovino, personal communication on unpublished NHIS results, May 2002).

Given the prevalence of smoking and of the desire to quit among young adults, it is important that interventions and resources regarding smoking cessation be made available. According to the 2000 CPS, over 60% of young adults who

graduated from high school are enrolled in a college or university; and 80% of young adults who are not full time students are in the labour force. Thus, a significant proportion of young adults can be reached with messages and resources offered through educational institutions and work sites.

Unfortunately, there is very little evaluation literature on smoking cessation interventions aimed at young adults. Thus, it is not possible at this time to make specific recommendations regarding cessation intervention approaches that have proven effective among young adults. We also should recognise that smoking cessation interventions that have been developed for adults in general may not be the best approach to take with younger adults. Those between the ages of 18–25 may be more like adolescents than older adults in their perceptions of risk, their perceptions of themselves as “smokers” or as having an addiction, their attitudes towards different types of cessation messages, and thus their responses to behavioural interventions. Thus, simply increasing the exposure of young adults to the existing arsenal of cessation tools/interventions is likely not the best way to proceed. A significant amount of formative research needs to be conducted in this area (for a start see O’Neill *et al.*,<sup>48</sup> and Martinelli<sup>49</sup>).

Even so, at this point in time it does seem reasonable to recommend that smoking cessation interventions that have been shown to be effective with adults in general be offered through student health services on college campuses, and that they be part of employee health benefit packages and resources, including typical employment venues of young adults not enrolled in college. Interventions should be tailored to address the attitudes and tobacco use patterns of young adults, recognising that a significant proportion have only recently become regular smokers or still may be intermittent smokers, and that a non-trivial proportion of males also use tobacco products other than cigarettes. Analysis of the impact of standard smoking cessation interventions in the young adult population need to be conducted so we can have some notion of their degree of effectiveness relative to older adults.

Unfortunately, many young adults are without health insurance, and people in this age group (especially males) do not have frequent contact with health care providers. Thus, it will admittedly be a challenge to expose young adult habitual smokers to proven cessation strategies involving clinical interventions combined with nicotine replacement therapy. In addition, data suggest that adolescents and young adults are infrequently asked about their smoking status and counselled regarding cessation during encounters with primary care providers.<sup>50, 51</sup> As such, interventions that do not rely on “teachable moments” with health care providers also must be designed and evaluated.

Wechsler *et al.* conducted a survey of 393 college health centre directors to assess their attitudes about and efforts regarding student smoking.<sup>52</sup> The findings included that while 85% of directors considered smoking to be a serious problem, only 27% prohibit smoking in all indoor areas (which includes private offices and dormitories). In addition, almost half reported that there were no smoking cessation programmes available on their campus, and—among those who do provide cessation resources—the prominent perception was that demand was quite low. Similarly, a study conducted at 11 public colleges in Massachusetts found that “tobacco use among college students was not regarded as a high-priority problem by students or administrators”.<sup>53</sup> Thus, an obvious first step is to engage in efforts that will assist in making tobacco control a priority issue among college and university administrators and health care providers. It is likely that similar educational and “problem definition” efforts will have to be directed at employers and work site health managers.

#### **Invest in smoking prevention interventions aimed at young adults**

Given the epidemiology of smoking initiation, focusing prevention and control activities on youth has made great

sense.<sup>22, 37</sup> However, the view that this focus on youth may be myopic and even dangerous in some ways has been expressed. Glantz has argued that a primary focus on youth in tobacco control efforts may be counterproductive, as it reinforces tobacco industry depictions of smoking as an “adult” behaviour, and shifts attention away from more comprehensive efforts.<sup>54</sup> Hill has made a similar argument, with a primary concern being that messages that youth should not smoke are likely to reinforce adolescents’ natural rebellious attitudes toward adults.<sup>55</sup> Even if one believes that it is essential to target serious tobacco prevention efforts toward youth, an important admission is that efforts to date, involving a wide variety of interventions, programmes and policies, have been met with limited success.<sup>22, 37</sup>

Given current trends and the recognition that an increasing proportion of adult smokers initiate regular smoking after age 18, the time has come to increase prevention and control activities in the young adult population. It is still the case that the majority of smokers are fully engrained in this activity by the time they are 19. However, it appears that currently over 20% of smokers make the transition from occasional to habitual smoker as young adults. As Ling and Glantz have argued: “During the critical years of young adulthood, public health efforts dwindle while tobacco industry efforts intensify . . . Public health efforts should match tobacco industry interest in young adults. Each place where young adults adopt new behaviours also provides opportunities for public health interventions.”<sup>44</sup>

Just what these prevention interventions and policies should look like is unclear at the moment. Again, there is very little literature regarding efforts to prevent tobacco use among young adults. Ling and Glantz suggest: “public health campaigns that resonate with the psychological needs and values of both smokers and nonsmokers may improve smoking prevention and cessation efforts. Interventions that affect cigarette prices, acceptance of the tobacco industry, the social acceptability of smoking, and secondhand tobacco smoke particularly threaten the industry.”<sup>45</sup> Jacobson *et al.* suggested that public health practitioners and policymakers can learn a great deal from how the tobacco industry has skilfully marketed its products: “Just as tobacco marketing can influence smoking behaviour, social marketing is a promising approach to smoking prevention, although it does require significant resources and skillful execution.” The literature on social marketing suggests that mass media campaigns increase their chance for effectiveness if: (1) the campaign strategies are based on sound social marketing principles; (2) the effort is large and intense; (3) target groups are carefully differentiated; (4) messages for specific target groups are based on empirical findings regarding the attitudes, beliefs, needs and interests of the groups; and (5) the campaign is of sufficient duration.<sup>22</sup> Ling and Glantz recommend that media messages should not simply attempt to convince individuals not to smoke.<sup>44</sup> They also should support clean indoor air policies, social environments that challenge the social acceptability of smoking, and tobacco excise taxes.

Focusing prevention and control activities among young adults begs the question of the relative degree of focus on the college versus non-college populations. Given that smoking rates have increased more among college students than those not in school, and given the attention that the tobacco industry is giving to this market, one could argue that college students should be the number one priority. However, it is also the case that smoking rates are significantly higher among those not in school. It is likely that the most effective interventions will need to be tailored differently for these different groups of young adults. Tough discussions regarding the best use of limited prevention resources need to occur.

#### **Consider potential counterproductive effects of interventions targeting adolescents**

Even if one believes that a strong focus on youth is essential, it is possible that specific types of interventions and strategies

are having the counterproductive effect of delaying rather than totally preventing tobacco use. Thus, it is important to consider whether any current youth focused strategies are delaying, deferring, or even encouraging smoking initiation among young adults rather than preventing it. To answer this issue, we would need to review a wide range of evaluations in which the long term effects of interventions were actually tracked into the early adult years. Unfortunately, follow up periods for youth tobacco interventions rarely extend beyond adolescence. An exception to this is the work of Rigotti *et al*, who analysed 1999 data regarding tobacco use among students at public colleges in Massachusetts and found that those students from this state (and thus ostensibly exposed to the Massachusetts's youth focused tobacco control programme) had significantly lower rates of current use than those who attended high school in another state (31.5% *v* 42.6%).<sup>36</sup> These results suggest that exposure to a multiple component, comprehensive tobacco control programme as an adolescent has positive effects that last into young adulthood.

Additional information on the long term effects of youth tobacco prevention and control activities is greatly needed. In addition, it is critical that the tobacco control community invest some time and energy into considering whether or not specific types of youth focused strategies do indeed have the potential for counterproductive delaying effects. For example, it has become increasingly common for youth in possession of cigarettes to receive sanctions through the legal system (including such penalties as a ticket/fine or loss of driving privileges).<sup>22 34 37</sup> Such sanctions, of course, do not apply to adults. These negative consequences likely do not prevent experimentation with smoking, yet they may actually reduce youth access and/or persuade some minors to avoid smoking in public places. If such sanctions actually do decrease some minors' ability and/or willingness to smoke, the transition to habitual smoking may be delayed. However, the desire to be "rebellious" and to engage in what is sanctioned as adult behaviour may have been reinforced (perhaps even intensified) and may remain strong as the adolescent reaches the "legal age" for the behaviour. As such, this may lead to increased smoking among young adults. While one might consider the proposed scenario rather far-fetched, it does seem worthwhile to contemplate potential negative side effects of various types of youth focused interventions. We need to entertain the uncomfortable possibility that strategies and tactics focusing on youth tobacco control are in part contributing to the recent changes in smoking behaviour observed among young adults.

### Promote smoke-free environments

The promotion of smoke-free environments should be considered a potentially effective mechanism for decreasing smoking among young adults. These environments include work sites, campuses, restaurants, bars and nightclubs, and even homes. There is a growing amount of evidence that clean indoor air policies can have a positive effect on smokers as well as those at risk for exposure to environmental tobacco smoke.<sup>22 38</sup> Such policies create social environments that reinforce messages about the negative aspects of tobacco smoke. Such environments may also encourage current smokers to quit or reduce their consumption, and in doing so may prevent some smokers from transitioning into regular, habitual smoking.

Ling and Glantz recommend the promotion of smoke-free homes among young adults: "...educating young adults about the dangers of secondhand smoke may be particularly effective because they are starting new households and new families. Educating young adult parents (and parents to be) about the dangers of secondhand smoke will provide benefits not only for the new child (who will avoid the morbidity associated with involuntary smoking) but may also prompt cessation among the adults."<sup>44</sup>

Several people have argued for the creation of campus wide smoke-free environments (including dormitories and other

residences, eating and recreation facilities, classrooms, and private offices).<sup>5 52</sup> The results of their survey of college health centre directors suggest that some schools are attempting to counter trends in student smoking by implementing no-smoking policies. Such policies, however, must be promoted and enforced if they are to have any effect. Regarding smoke-free bars, Sepe *et al* stated that the "[c]reation of smoke-free bars—with appropriate ground-work and public education—may be a key to undermining the tobacco industry's efforts to use bars to reestablish the social acceptability of smoking and secondhand smoke".<sup>35</sup>

### Consider smoking in a broader context of risk taking behaviour

Adolescents and young adults will be done a great disservice if researchers and policy advocates do not consider tobacco use in the larger context of social environments and risk taking behaviour, in particular risky sexual behaviour and the use of alcohol and illicit drugs. A tobacco focused approach to policy and intervention is not likely to be the most effective strategy, since it is clear that a number of risky behaviours are linked with each other and with some identifiable attitudes and perspectives. The root causes of youth and young adult smoking are likely not tobacco specific, but rather things that motivate or drive people to engage in other forms of risky or rebellious behaviour. Malcolm Gladwell, in his book *The tipping point*, makes the important observation that what leads to smoking is not positive perceptions or attitudes about the act of smoking itself: "Over the past decade, the anti-smoking movement has railed against the tobacco companies for making smoking cool and has spent untold millions of dollars of public money trying to convince teenagers that smoking isn't cool. But that's not the point. Smoking was never cool. *Smokers* are cool."<sup>59</sup> Thus, it is possible that risk taking behaviours cluster together because adolescents (or young adults) are trying to project an overall image or persona of themselves that they view positively (a person who is rebellious, takes risk, is independent, etc). As such, the phenomenon may be more about a process of attempting to become a specific type of person than an isolated decision to engage in a specific type of behaviour (that is, cigarette smoking). Furthermore, while it is certainly reasonable to point fingers at the tobacco industry, insinuating sole blame on industry marketing tactics for the broad phenomenon of increased smoking among young adults is too simplistic. Efforts to reduce tobacco use among young adults need to include, but also have a broader vision and scope than, counteracting industry marketing/promotional activities

### CONCLUSION

The recent increase in smoking among young adults should be of grave concern to those engaged in tobacco prevention and control among youth. The increase is partly a residual effect of increases in cigarette smoking that have occurred among adolescents. In addition, however, the upsurge in smoking among young adults appears to be part of a broader phenomenon involving changes in substance use and risk taking behaviours among youth making the transition to adulthood. While there are many unanswered questions about recent trends in cigarette smoking and other drug use among both adolescents and young adults, what is known to date leads to a clarion call for increased intervention and policy action regarding the prevention and control of substance abuse among young adults—both on and off campus—in the USA.

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