Cigar Smoking: Overview and Current State of the Science

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Cigars were one form of Native American tobacco use observed by Columbus and early European settlers. A long, thick bundle of twisted tobacco leaves wrapped in a dried palm or maize leaf was used by Native Americans as a primitive cigar. Smoking of cigars is recorded on artifacts of the Mayas of the Yucatan region of Mexico, and the Mayan verb "sikar," meaning to smoke, became the Spanish noun "cigarro."

Among early English colonists of the 1600's, tobacco was used predominantly in the form of smokeless tobacco or smoked in pipes, although tobacco was also smoked as cigars at this time. Records dating from the late 1700's suggest that most cigars were imported from the West Indies and Cuba during the Colonial period.

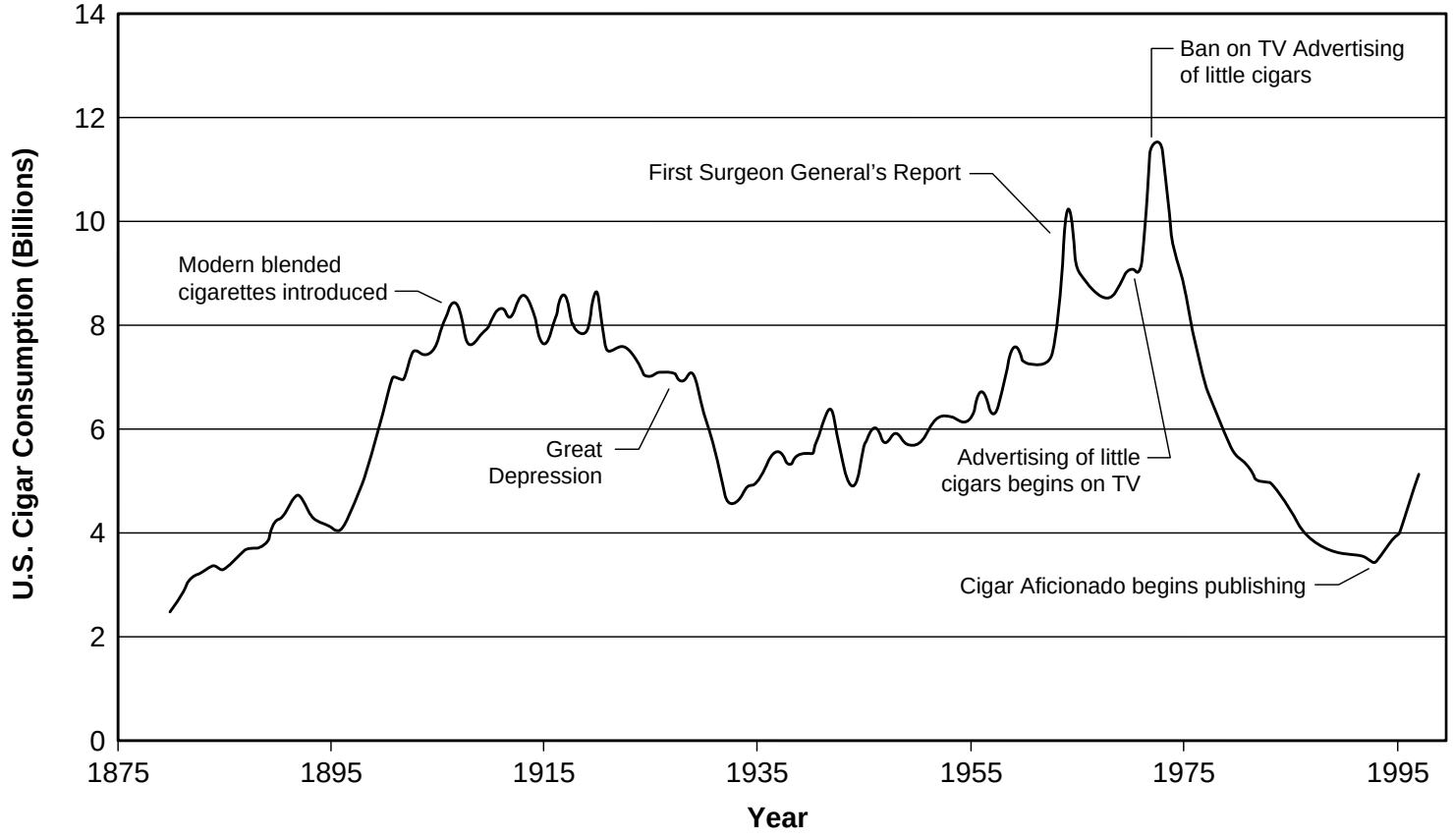
The first U.S. cigar factory was established in Connecticut in 1810. Cigar manufacturing spread to other parts of the U.S. as cigar use slowly gained in popularity. Through the 1880's and early 1900's, cigars remained a popular form of tobacco use, with most cigars made of locally grown tobacco and marketed locally. By 1900, tobacco used in the form of cigars accounted for 2.0 of the 7.5 pounds of tobacco consumed per adult in the U.S., second only to chewing tobacco's 3.5 pounds per adult (USDA 1997, Burns et al 1997). However, the amount of tobacco consumed as cigars declined as the popularity of cigarettes increased around the time of World War I.

Tobacco used to manufacture cigars is different from that used in cigarettes and other tobacco products. Tobacco contained in cigar filler, binder and wrappers is predominantly air-cured tobacco in contrast to the flue-cured tobacco common in cigarettes. Cigar tobacco is then aged and subjected to a multi-step fermentation process that can last several months, and this process is largely responsible for the flavor and aroma characteristic of cigars. Small cigars on the U.S. market have straight bodies and weigh between 1.3 and 2.5 grams each. Large cigars vary markedly in size and shape, with the most common dimensions being 110-150 mm long and up to 17 mm in diameter, and they contain between 5 and 17 grams of tobacco (Chapter 3). By contrast, the most popular brands of cigarettes are 85 mm long and contain less than one gram of tobacco.

TRENDS IN CONSUMPTION

Since 1993, cigar sales in the U.S. have increased by almost 50%, with the largest increase occurring in sales of large cigars (USDA, 1997). Figure 1 presents U.S. cigar consumption from 1880 through 1997 and shows that cigar consumption declined following the introduction and marketing of modern blended cigarettes in 1913, and this decline was accelerated by the Great Depression beginning in 1929. Cigar consumption remained below that found at the turn of the century until 1964 when it increased dramatically, possibly as a response to the publication of the first Surgeon General's report with its warning about the disease risks of smoking cigarettes.

Figure 1
Total U.S. cigar consumption 1880-1997 and significant events in the use of cigars



A loop-hole in the 1969 law banning advertising of cigarettes on television and radio allowed the introduction and television advertising of small cigars, which look and smoke much like cigarettes. Small cigar consumption increased rapidly until these ads were also banned from television and radio in 1973, and cigar consumption then began a steady decline lasting almost 20 years. Marketing approaches to cigar sales linking cigar smoking to wealth and success as portrayed in magazines such as Cigar Aficionado, and utilizing events such as cigar nights at popular restaurants, gained widespread prominence beginning in 1992. Sales of cigars, particularly large cigars, have increased substantially since that time. Accompanying this marketing has been the suggestion that cigars, particularly premium cigars, have minimal if any disease risk associated with their use as long as they are used in "moderation" (Shanken, 1997).

The recent change in tobacco use raises a number of important public health questions. What are the disease consequences of cigar smoking? What is the risk of addiction to nicotine from this form of tobacco use? Are the marketing practices that underlie this change in cigar consumption resulting in adolescent use of cigars? What are the risks of environmental tobacco smoke exposure from cigar smoking?

DISEASE RISKS The smoke from both cigars and cigarettes is formed largely from the incomplete combustion of tobacco, and therefore it comes as no surprise that cigar smoke is composed of the same toxic and carcinogenic constituents found in cigarette smoke (Chapter 3). Cigars have more tobacco per unit; and correspondingly, take longer to smoke and generate more smoke per unit. Additionally, the lower porosity of cigar wrappers results in more of carbon monoxide per gram of tobacco burned; and the higher nitrate content of cigar tobacco results in higher concentrations of nitrogen oxides, carcinogenic N-nitrosamines and ammonia. When bioassayed in animals, the tar of cigar smoke is more carcinogenic than cigarette smoke tar (Davies and Day, 1969). There is little evidence from what is known about the tobacco content and manufacture of premium cigars to suggest that they are less hazardous than other cigars. Clearly, cigar smoke is as, or more, toxic and carcinogenic than cigarette smoke; and differences in disease risks produced by using cigarettes and cigars relate more to differences in patterns of use, and differences in inhalation, deposition and retention of cigarette and cigar smoke than to the differences in smoke composition.

The similarities of cigar and cigarette smoke suggest that similar patterns of diseases should occur among individuals with similar intensities and durations of smoke exposure. When cigar smokers who have never used other tobacco products are compared to individuals who have never used any tobacco product, a clear pattern of excess disease emerges that can be related to the frequency of cigar use and the pattern of inhalation (Chapter 4). Demonstration of a close association between the intensity of cigar smoke exposure and rates of excess disease provide compelling evidence for a causal association between cigar smoking and disease occurrence. Most of the cancers caused by cigarette smoking occur at increased rates among

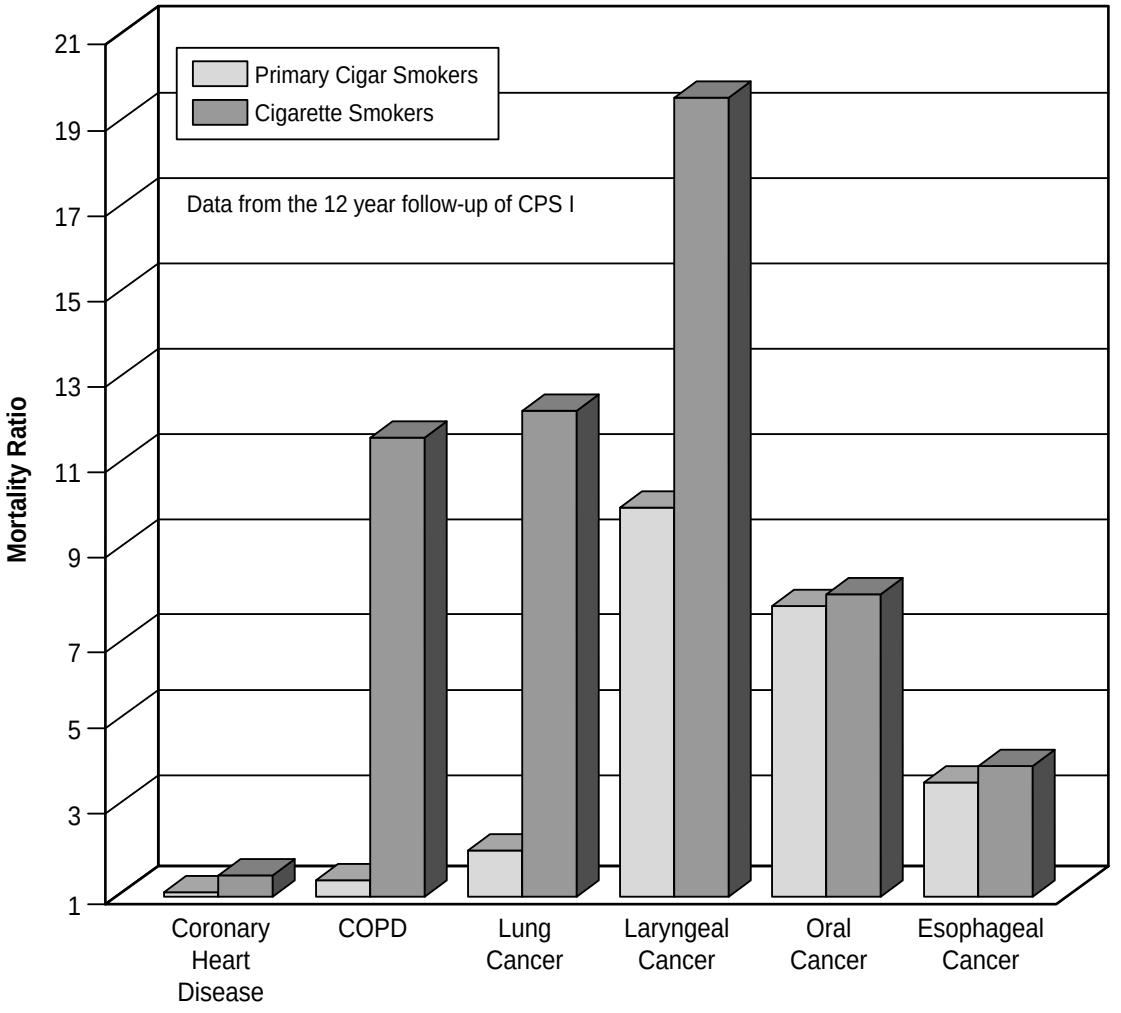
regular cigar smokers. Cigar smokers who inhale deeply, particularly those who smoke several cigars per day, have higher rates of coronary heart disease and chronic obstructive pulmonary disease (COPD).

Figure 2 presents mortality ratios (ratio of the death rate in smokers compared to never smokers) among male cigar and cigarette smokers for some of the diseases associated with cigarette smoking. The ratios presented are for smokers of all numbers of cigarettes or cigars combined. The mortality data were derived from the American Cancer Society Cancer Prevention Study I (CPS-I) a twelve year follow-up of over 1 million men and women (Garfinkel, 1985). These data were provided by the American Cancer Society and define relative risks for those who have smoked exclusively cigars and those who have smoked exclusively cigarettes, with each group of smokers being compared to those who have never smoked any tobacco product. All of these mortality ratios, except those for COPD, are statistically significantly increased among cigar smokers (Chapter 4). The figure demonstrates that tobacco smoke generated by cigars can lead to many of the same diseases produced by tobacco smoke from cigarettes.

However, the pattern of excess disease risk among cigar smokers is not identical to that observed in cigarette smokers. Mortality ratios among cigarette smokers are much higher than those among cigar smokers for coronary heart disease, COPD and lung cancer. In contrast, mortality ratios for oral and esophageal cancer are similar among cigarette and cigar smokers. The mortality ratio for laryngeal cancer is intermediate between these two patterns. Table 1 presents mortality ratios, and their 95 percent confidence intervals, for the major causes of excess mortality among cigar smokers. The risk ratios are presented by number of cigars smoked per day and depth of inhalation to demonstrate the dose-response relationships evident for cigar smoking and these diseases; and similar data are presented for cigarette smokers to allow comparison of the magnitude of the effects.

INHALATION An explanation for the difference in mortality pattern between cigarette smokers and cigar smokers lies in differences in the depth and likelihood of inhalation of tobacco smoke between these two groups of smokers. Most cigarette smokers report inhaling the smoke into their lungs, while over three-quarters of the males in CPS-I who have only smoked cigars report that they never inhale (Chapter 4). This difference in inhalation is likely due to the more acidic pH of cigarette smoke. The smoke of most cigars has an alkaline pH; and as a result, nicotine contained in the smoke can be readily absorbed across the oral mucosa without inhalation into the lung (Chapter 3). The more acidic pH of cigarette smoke produces a protonated form of nicotine which is much less readily absorbed by the oral mucosa, and the larger absorptive surface of the lung is required for the smoker to receive his or her desired dose of nicotine. As a result, cigarette smokers must inhale to ingest substantial quantities of nicotine, the active agent in smoke, whereas cigar smokers can ingest substantial quantities of nicotine without inhaling. Inhalation substantially increases the exposure of lung tissue to tobacco smoke and increases absorption of many smoke constituents, most notably carbon monoxide (Turner et al., 1977; Wald et al., 1981).

Figure 2
Mortality ratios for tobacco induced diseases among male cigar and cigarette smokers in comparison with never smokers



The oral mucosa is exposed to similar amounts of smoke by those who do and those who do not inhale deeper into the respiratory tract. In contrast, the lung is much more heavily exposed in those who inhale; and absorption of many smoke constituents into the blood is greater among those who inhale. This difference in exposure to smoke by different tissues is the most likely explanation for the differences in mortality pattern among cigar and cigarette smokers. Cigar smokers who do not inhale receive a high smoke exposure to the mouth and tongue, and smoke constituents in their saliva are swallowed down their esophagus, producing the observed increased risks of oral and esophageal cancers. The lung and systemic organs such as the heart receive much less exposure to smoke constituents in those cigar

Table 1

Mortality ratios, and 95% confidence intervals, for select causes of death in male cigar only vs cigarette only smokers by amount smoked daily and depth of inhalation Cancer Prevention Study I, 12 year follow-up

		Amount Smoked Daily					
		Cigars per Day			Cigarettes per Day		
Cause of death	Nonsmoker	1-2 cigars	3-4 cigars	5+ cigars	<1 pack	1 pack	>1 pack
All causes of death	1.0	1.02 (.97-1.07)	1.08 (1.02-1.15)	1.17 (1.10-1.24)	1.46 (1.43-1.49)	1.69 (1.66-1.71)	1.88 (1.85-1.91)
Cancer of buccal cavity & pharynx combined*	1.0	2.12 (0.43-6.18)	8.51 (3.66-16.77)	15.94 (8.71-26.75)	5.93 (4.28-8.02)	6.85 (5.37-8.62)	12.04 (9.81-14.63)
Cancer of esophagus	1.0	2.28 (0.74-5.33)	3.93 (1.43-8.55)	5.19 (2.23-10.22)	2.41 (1.61-3.46)	4.3 (3.32-5.48)	5.6 (4.35-7.10)
Cancer of larynx	1.0	6.46 (0.72-23.27)	—	26.03 (8.39-60.74)	8.7 (4.75-14.59)	25.69 (18.66-34.48)	23.59 (17.33-31.37)
Cancer of lung	1.0	0.99 (0.54-1.66)	2.36 (1.49-3.54)	3.40 (2.34-4.77)	6.75 (6.18-7.37)	12.86 (12.14-13.60)	20.23 (19.20-21.30)
Cancer of pancreas	1.0	1.18 (0.69-1.89)	1.51 (0.86-2.45)	2.21 (1.40-3.32)	1.69 (1.41-2.00)	2.17 (1.89-2.47)	2.41 (2.08-2.77)
COPD	1.0	1.39 (0.74-2.38)	1.78 (0.89-3.18)	1.03 (0.37-2.23)	8.86 (7.96-9.84)	12.51 (11.48-13.60)	15.04 (13.73-16.45)
Coronary heart disease	1.0	0.98 (0.91-1.07)	1.06 (0.96-1.16)	1.14 (1.03-1.24)	1.4 (1.36-1.45)	1.58 (1.54-1.62)	1.65 (1.60-1.69)

Table 1 *(continued)*

Cause of death	Nonsmoker	Self-Reported Depth of Inhalation					
		Cigars			Cigarettes		
		None	Slight	Moderate to Deep	None, Slight	Moderate	Deep
All causes of death	1.0	1.04 (1.00-1.08)	1.19 (1.09-1.30)	1.6 (1.38-1.84)	1.54 (1.50-1.57)	1.65 (1.63-1.67)	1.9 (1.86-1.94)
Cancer of buccal cavity & pharynx combined*	1.0	6.98 (4.13-11.03)	7.83 (1.57-22.88)	27.88 (5.60-81.46)	6.26 (4.47-8.53)	8.43 (7.00-10.06)	12.48 (9.61-15.94)
Cancer of esophagus	1.0	3.4 (1.90-5.61)	1.9 (0.02-10.58)	14.84 (2.98-43.37)	2.94 (1.97-4.23)	4.06 (3.30-4.94)	4.95 (3.55-6.72)
Cancer of larynx	1.0	10.6 (3.87-23.07)	—	53.26 (0.70-296.32)	22.19 (14.74-32.07)	13.49 (10.01-17.78)	27.54 (18.44-39.56)
Cancer of lung	1.0	1.97 (1.48-2.57)	1.89 (0.81-3.72)	4.93 (1.80-10.72)	9.33 (8.61-10.10)	13.13 (12.53-13.75)	17.11 (16.00-18.28)
Cancer of pancreas	1.0	1.55 (1.12-2.07)	2.16 (0.99-4.10)	2.26 (0.45-6.60)	1.99 (1.66-2.36)	2.01 (1.79-2.25)	2.38 (1.98-2.83)
COPD	1.0	1.09 (0.66-1.70)	2.05 (0.66-4.77)	4.52 (0.91-13.22)	8.8 (7.85-9.85)	12.28 (11.42-13.18)	16.07 (14.49-17.78)
Coronary heart disease	1.0	1.01 (0.96-1.07)	1.23 (1.07-1.41)	1.37 (1.07-1.75)	1.45 (1.41-1.50)	1.52 (1.49-1.55)	1.71 (1.66-1.76)

**excludes salivary gland*

smokers who do not inhale; and correspondingly, non-inhaling cigar smokers have lower rates of coronary heart disease, COPD and lung cancer than inhaling cigar smokers or cigarette smokers. The larynx, which connects the lung and oral cavity, has a pattern of disease intermediate between that of the lung and the mouth.

The importance of dose and inhalation for lung cancer risk among cigar smokers are presented in Figure 3 where modeled lung cancer risk data from CPS-I for cigar smokers of different numbers of cigars per day and different patterns of inhalation are compared to the risks for a one pack per day cigarette smoker (Chapter 4). When cigar smokers don't inhale or smoke few cigars per day, the risks are only slightly above those of never smokers. Risks of lung cancer increase with increasing inhalation and with increasing number of cigars smoked per day, but the effect of inhalation is more powerful than that for number of cigars per day. When 5 or more cigars are smoked per day and there is moderate inhalation, the lung cancer risks of cigar smoking approximate those of a one pack per day cigarette smoker. As the tobacco smoke exposure of the lung in cigar smokers increases to approximate the frequency of smoking and depth of inhalation found in cigarette smokers, the difference in lung cancer risks produced by these two behaviors disappears.

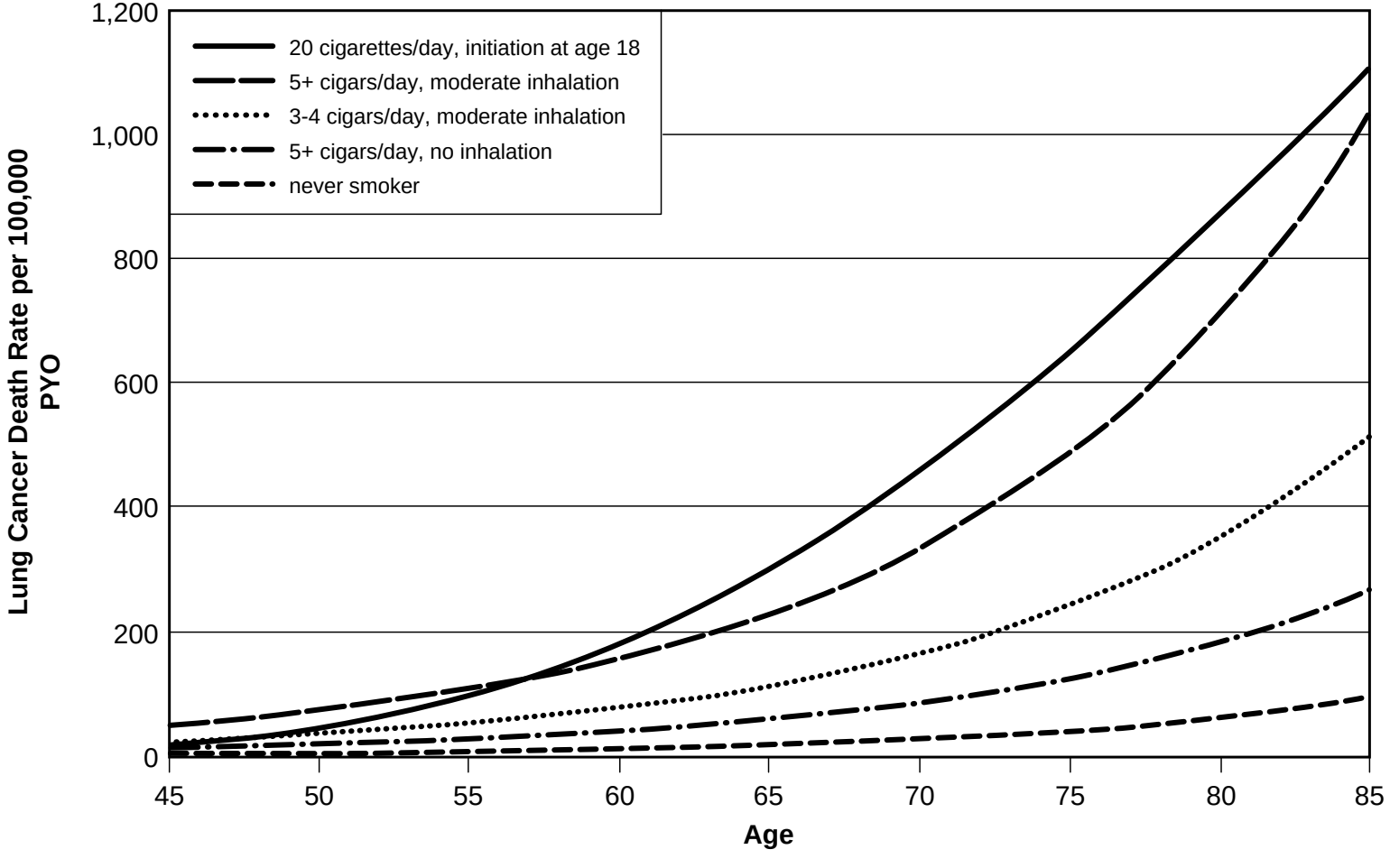
The claim has been made that cigar smokers who smoke few cigars or do not inhale have no increased risk of disease (Shanken, 1997). A more accurate statement would be that the risks experienced by cigar smokers are proportionate to their exposure to tobacco smoke.

Among regular cigar smokers who had never smoked cigarettes in the CPS-I study and who did not inhale, statistically significant increased risks for cancers of the lung, oral cavity, larynx, pancreas and esophagus are observed (Chapter 4). Risks for coronary heart disease are significantly elevated only for smokers of 3 or more cigars per day or those who inhale. Relative risks for COPD increase with increasing inhalation, but the risks do not reach statistical significance for the CPS-I data. It should also be noted that increased risks of lung cancer and heart disease have been reported for nonsmokers at levels of tobacco smoke that occur with environmental tobacco smoke exposure (EPA, 1992; Cal EPA, 1997).

Risks among occasional cigar smokers are difficult to measure because of the wide variability in frequency of smoking among occasional cigar smokers and the marked variation in the amounts of tobacco contained in different cigars. However, it is reasonable to assume that the risks for occasional cigar smokers lie somewhere between those for individuals whose only exposure to tobacco smoke is environmental tobacco smoke and those of regular cigar smokers. As occasional cigar smokers smoke more frequently or inhale more deeply, their exposure to tobacco smoke increases, and with that increased exposure comes a proportionate increase in disease risks.

Figure 3

Lung cancer death rates for cigar smokers with different patterns of inhalation and number of cigars per day compared with one pack per day cigarette smokers



The relationship of cigar smoking and alcohol consumption, particularly for oral cancers, has not been evaluated; but the established interaction between cigarette smoking and alcohol consumption for oral cancers and the frequent association of cigar smoking with alcohol consumption raise the question of an increased risk from the combination of these two behaviors.

Cigarette Smokers Who Switch to Cigars

As described earlier, a number of cigarette smokers may have switched to cigars in response to health warnings following release of the first Surgeon General's Report in the belief that smoking cigars resulted in a lower disease risk (Chapter 2). Data from the CPS-I study demonstrate the limitations of this approach to risk reduction. Cigar smokers who have previously been cigarette smokers report higher rates of inhalation of tobacco smoke than do cigar smokers who have never smoked cigarettes (Chapter 4). These former cigarette smokers also have higher rates of most smoking induced diseases in CPS-I than do cigar smokers who have never smoked cigarettes, and their rates remain above those for smokers who stop using all tobacco products (Higgins et al., 1988). It is not possible to define the independent contributions of their past cigarette smoking and current cigar smoking behaviors with regard to these disease risks, but it is clear that the risks remain above those for cigar smokers who have never smoked cigarettes. Existing data suggest that any reductions in disease risks that accompany switching from smoking cigarettes to smoking cigars are conditional on a reduction in exposure to tobacco smoke with the change in tobacco product smoked. Individuals who have previously smoked cigarettes are more likely to inhale cigar smoke when they switch to smoking cigars, and this increased inhalation may reduce or eliminate any risk reduction with the change from cigarettes to cigars, particularly if cigars are smoked daily or as a means of satisfying an addiction to nicotine.

Risks Among Women

Almost all of the disease risk data for cigar smoking are based on observations among males, but it is reasonable to assume that risks among females would also be proportionate to the intensity and duration of their exposure. In several European countries where women have smoked cigars for many years, it appears that the risks for smoking related diseases are similar for male and female cigar smokers. The lower prevalence and frequency of use among females in the U.S. would be expected to translate into lower rates of chronic disease due to cigar smoking in the female population, particularly given the long duration of use required to produce these diseases. However, cigarette smoking among women has been shown to increase the fetal and maternal complications of pregnancy (USDHHS, 1990), and these complications result from smoking during the comparatively short duration of the pregnancy. Data on the risks of cigar smoking during pregnancy are not sufficient to define the risks, but there is no reason to expect that cigar smoke would be any less toxic for the mother or fetus. Regular cigar smoking, particularly with inhalation, should be presumed to have risks similar to that of cigarette smoking for the pregnant smoker.

NICOTINE ADDICTION Cigars can deliver nicotine to the smoker in concentrations comparable to those delivered by cigarettes and smokeless tobacco (Chapter 6). However, the alkaline pH of cigar smoke, and the tendency of cigar smokers not to inhale, result in the nicotine being absorbed predominantly across the oral mucosa rather than in the lung. This route of absorption leads to a slower rise and lower peak of the arterial levels of nicotine delivered to the brain compared to the absorption that occurs across the alveolar-capillary surface of the lung in most cigarette smokers. The rapidity of absorption and rate of rise in arterial nicotine levels may be important determinants of the potential for nicotine ingestion to lead to addiction (Jasinski et al., 1984). However, nicotine absorbed across the oral mucosa is capable of forming a powerful addiction as demonstrated by the large number of individuals addicted to smokeless tobacco (USDHHS 1988); and cigar smoke can be inhaled into the lung where it would be absorbed as readily as cigarette smoke

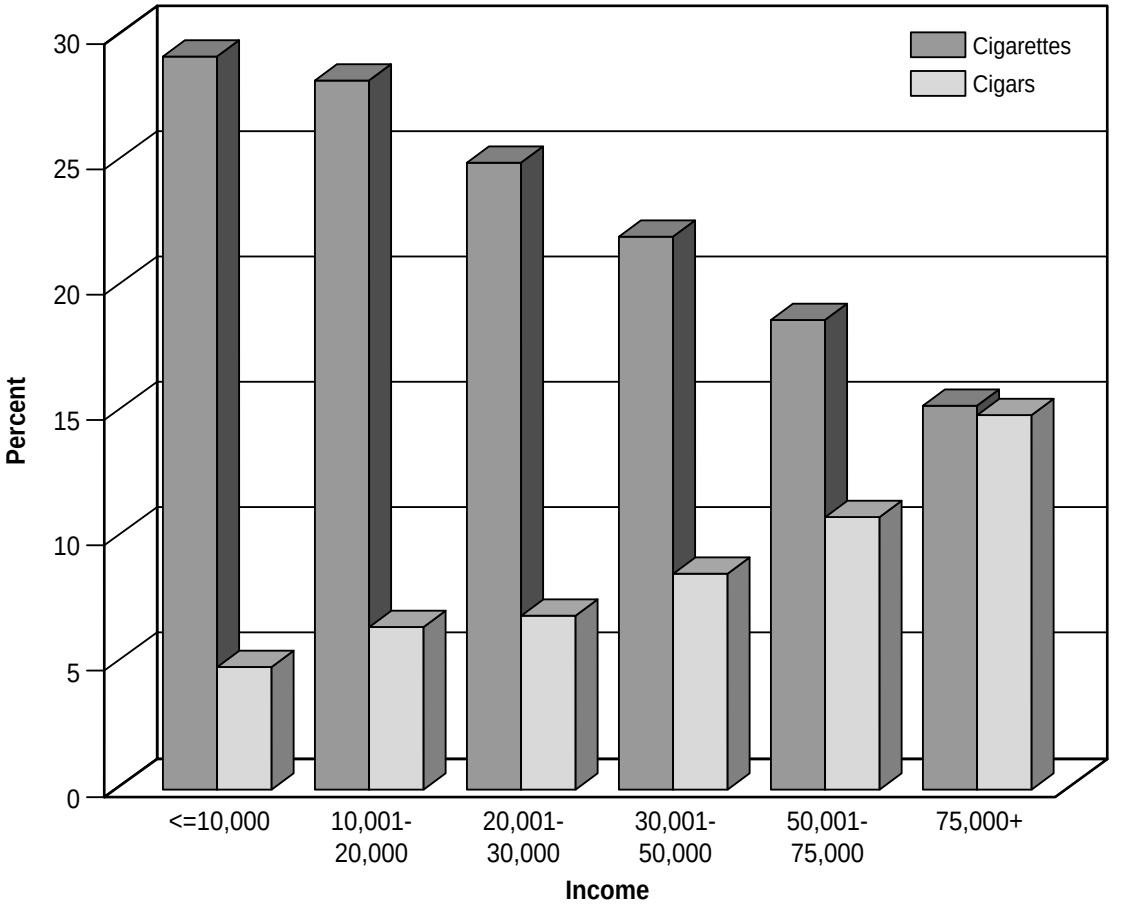
ADULT USE The pattern of use of cigars also sheds some light on the addictive nature of cigar smoking in comparison with other forms of tobacco use, at least for adults. The fraction of adult cigar smokers who smoke cigars every day is much smaller than the fraction of cigarette or smokeless tobacco users who use every day (Chapter 2). This suggests that cigar smoking among adults, while probably able to cause addiction to nicotine, is less likely to do so than cigarette smoking or smokeless tobacco use. Data from California, which show that the recent change in cigar use among adults is largely an increase in occasional use, also suggests that the addictive potential of cigars is lower than that for cigarettes (Gerlach et al., 1998).

Whatever reassurance is provided by the largely occasional use of cigars among adults must be tempered by spread of this behavior among groups who have traditionally had low rates of cigarette use. The prevalence of current cigar and cigarette smoking by income level for adult males in California is presented in Figure 4, and it is apparent that the recent increase in cigar smoking is largely among the affluent in contrast to the marked decline in cigarette smoking that occurs with increasing income (Chapter 2). A similar picture is evident with educational attainment, with the highest rates of cigar use and lowest rates of cigarette use occurring among those with the highest educational attainment. Increasing numbers of women, who historically have had very low rates of cigar use, are also currently smoking cigars.

The spread of cigar smoking into groups with low rates of cigarette use is accompanied by a dramatic increase in cigar use among never smokers. Among adult California males in 1996, forty percent of current cigar smokers have smoked less than 100 cigarettes in their entire life which is the definition typically used to define a never smoker.

Increasing cigar use among upper income and educational level adults raises concern that the success in reducing smoking among these groups may be at risk of reversal. This may be particularly true if the use of cigars by these groups enhances the norms created by cigar marketers that portray cigar use as a socially acceptable, sophisticated and relatively safe behavior. Anecdotal

Figure 4
Prevalence of current cigarette and cigar smoking among California males of different incomes, 1996



observation suggests that cigars are currently smoked in situations where cigarette smokers are reluctant to light up, a marked reversal of the norm banning cigar smoking even in environments where cigarette smoking was allowed.

Use of cigars by adults who have never used cigarettes, or by former cigarette smokers, raises a concern that use of cigars and the nicotine ingestion that accompanies cigar smoking may lead to cigar smokers initiating or relapsing to cigarette smoking. The fraction of tobacco used as cigarettes expanded rapidly in the early years of this century at the expense of pipes, cigars and smokeless tobacco, in part because cigarettes were a convenient method of getting a rapid intense dose of nicotine in a short interval of time (Burns et al., 1997). The potential for current cigar smokers to begin seeking the psychoactive effects of nicotine on a more regular basis through the more convenient form of a cigarette is a real risk based on our

historical experience with these two tobacco products. Concern about relapse to cigarette smoking by former cigarette smokers who start smoking cigars is heightened by the observation in California adults that among those who were former cigarette smokers one year ago, cigar smokers are twice as likely to have relapsed to smoking cigarettes as former cigarette smokers who do not use cigars (Chapter 2). This observation does not separate the likelihood that cigar smoking leads to relapse of cigarette smoking from the possibility that relapsing cigarette smokers take up smoking cigars as well, but it raises a concern that cigar use may place former cigarette smokers at risk of relapse.

Of equal concern is the observation that the fraction of male adult never smokers who began smoking cigarettes in the last two years is over two times higher among current cigar smokers than among those who don't smoke cigars (Chapter 2). Again, it is impossible to separate the likelihood of cigar smoking leading to initiation of cigarette smoking from the possibility that those who initiate cigarette smoking are also likely to smoke cigars; but the commonality in both of these behaviors is nicotine ingestion, and it would not be surprising if use of cigars predisposed an individual to the use of cigarettes.

ADOLESCENT USE

Data on cigar use among adolescents is also alarming (Chapter 2). Few data on past adolescent cigar use are available, largely because it was a behavior felt to be uncommon enough not to be worthy of examination until recently. However, several recent surveys of adolescents show a substantial fraction of both male and female adolescents who report both ever and current use of cigars (CDC, 1997a; Chapter 2). Male cigar smoking prevalence still exceeds that for females among adolescents, but the gender difference is less than for adults. Table 2 presents the prevalence of cigar use among adolescents in Massachusetts by educational grade level, and it is clear that there is a substantial level of cigar use, even prior to high school.

Addiction to nicotine is a process that occurs almost exclusively during adolescence and young adulthood (USDHHS, 1994). The age of initiation of cigar smoking, prior to the recent increase in cigar use, was much older than that for cigarette smoking (Chapter 2); and this difference in age of initiation may be partially responsible for the lower addictive potential of cigars, as manifest by the high rate of occasional, as compared to daily, cigar smoking among adults. Now that initiation of cigar smoking is common among adolescents, whatever resistance to addiction is offered by an older age of initiation would be expected to disappear. The reassurance provided by the low rate of daily cigar smoking among adults may be illusionary now that initiation of cigar smoking is extending into those age groups where development of addiction to nicotine is common. Several generations of adolescents have become addicted to tobacco products that allow nicotine to be absorbed through the lung (cigarettes) and to tobacco products that allow nicotine to be absorbed through the oral mucosa (smokeless tobacco). Cigars can deliver nicotine through both of these routes, and large numbers of adolescents are currently being exposed to nicotine through use of cigars. It is premature to conclude that current generations of adolescents who are

Table 2
Prevalence of cigar use in the last year, and all forms of tobacco use in the last 30 days by school grade, Massachusetts, 1996

	Grade						
	6	**7**	**8**	**9**	**10**	**11**	**12**
Past Year Use of Cigars	5.0 (4.2-5.8)	8.3 (6.6-10.0)	20.3 (17.7-22.9)	20.6 (18.1-23.1)	29.6 (26.9-32.3)	31.8 (28.7-34.8)	31.3 (28.2-34.4)
Past 30-Day Use of Cigars	2.0 (1.1-2.9)	4.4 (1.3-7.5)	10.9 (8.9-12.9)	10.4 (8.5-12.3)	16.0 (13.8-18.2)	18.4 (15.9-20.9)	13.4 (11.0-15.8)
Males							
Cigarettes	10.7 (8.0-13.4)	13.7 (10.7-16.7)	24.6 (20.8-28.4)	27.2 (23.2-31.2)	32.2 (28.3-36.1)	35.5 (31.0-40.0)	45.1 (40.3-49.9)
Smokeless	2.6 (1.2-4.0)	2.5 (1.2-3.8)	5.7 (3.7-7.7)	4.4 (2.5-6.3)	10.9 (8.3-13.5)	14.3 (11.0-17.6)	13.6 (10.3-16.9)
Cigars	3.2 (1.6-4.8)	4.3 (2.6-6.0)	13.0 (10.0-16.0)	14.9 (11.7-18.1)	24.9 (21.3-28.5)	30.3 (25.9-34.7)	23.7 (19.6-27.8)
Females							
Cigarettes	5.7 (3.7-7.7)	19.0 (15.5-22.5)	27.5 (23.3-31.7)	33.0 (29.1-36.9)	35.3 (31.1-39.5)	42.0 (37.6-46.4)	36.6 (32.2-41.0)
Smokeless	0.1 (-0.8-1.0)	0.2 -0.2-0.6)	0.8 (0.0-1.6)	1.3 (0.4-2.2)	1.2 (0.2-2.2)	0.5 (-0.1-1.1)	0.6 (-0.1-1.3)
Cigars	0.8 (-1.5-3.1)	4.6 (2.7-6.5)	8.4 (5.8-11.0)	6.6 (4.5-8.7)	6.1 (4.0-8.2)	7.7 (5.3-10.1)	4.1 (2.3-5.9)

ingesting nicotine from cigars will not become addicted simply because older generations of cigar smokers, who began smoking as adults, were less likely to become addicted.

Current cigarette smoking prevalence rates among adults have remained relatively unchanged over the last few years (CDC, 1997b), ending four decades of decline in prevalence; and the prevalence of cigarette smoking among adolescents has increased recently (CDC, 1996). The contribution of increasing cigar use among both adults and adolescents to these trends remains unexplored, but the temporal association of these two phenomena suggests that it should be a high priority for future investigation.

MARKETING Recent marketing efforts have promoted cigars as symbols of a luxuriant and successful lifestyle. Endorsements by celebrities including athletes, elaborate cigar smoking events and the resurgence of cigar smoking in movies have all contributed to the increased visibility of cigar smoking in society and probably have lowered barriers to cigar use in public. Publication of cigar lifestyle magazines such as “Cigar Aficionado”, which began in 1992, antedate

the increase in cigar consumption which began in 1993. Linkage of cigar smoking to an opulent and powerful lifestyle, and the featuring of highly visible women smoking cigars, is a core element of cigar promotion; and it has been successful in increasing cigar consumption among men and initiating cigar smoking as a behavior among women (Chapter 7).

Evaluation of the effects of cigar promotional efforts on adolescent cigar smoking is only just beginning due to the recent nature of this phenomenon, but cigars are not the first tobacco product to be heavily promoted in ways likely to influence adolescent use. Celebrity endorsements by popular heroes, including athletes, were a prominent part of the mass marketing of cigarettes during the first half of this century (Kluger, 1996).

By the late 1940's and early 1950's, print and television advertising commonly featured athletes and movie stars describing the pleasures of smoking individual brands of cigarettes (Figure 5). The individuals portrayed here are only a tiny fraction of those who endorsed cigarette smoking. In response to the concern about the disease consequences of smoking, the tobacco industry adopted a voluntary code of advertising during the mid 1960's that prohibited the use of endorsements by athletes and other celebrities perceived to appeal to youth (USDHHS, 1994). Denied celebrity

Figure 5
Popular sport figures in tobacco advertisements circa 1940's-1960's

endorsement in their advertising, the cigarette companies developed lifestyle and image related advertising, most notably the Marlboro cowboy and "Smooth Joe Camel" ads that have allowed these two brands to capture the majority of adolescent smokers (CDC, 1994). Virginia Slims advertisements linked cigarette smoking to independence and power as well as to thinness. Cigarette promotion through events like the Cool Jazz Festival and Formula One auto racing linked cigarettes to a glamorous and exciting lifestyle, while sponsorship of cultural events linked cigarettes to sophistication and provided borrowed credibility. One outcome of these marketing approaches is that the overwhelming majority of cigarette smokers begin smoking, and become addicted, during adolescence (USDHHS, 1994).

Intensive marketing of smokeless tobacco began in the 1970's and was followed by a dramatic rise in use of these products (USDHHS, 1993). Smokeless tobacco products were marketed then, as cigars are being marketed now, despite strong scientific evidence that they cause disease. The difference in risk between the enormous risks of cigarette smoking and the more moderate risks of smokeless tobacco and cigar use is touted to reassure the users that the products "used in moderation" have little risk. At the same time, advertising in the print media and on television (where cigarette advertising was banned) featured endorsements by celebrities and athletes, and smokeless tobacco promoted lifestyle and image related events that linked smokeless tobacco use with rodeo and auto racing. Once again, adolescent males responded to these promotional approaches; and it was only after a generation of young males became addicted to smokeless tobacco that endorsement by athletes was discontinued because of its appeal to youth. Again, the advertisement for smokeless tobacco portrayed here (Figure 6) represents only a few of the athletes that promoted smokeless tobacco use.

Figure 6

Having twice demonstrated that image related advertising and celebrity endorsement could create a new market for little used tobacco products, it should not be surprising that those involved in the cigar trade would utilize the same approaches. The use of celebrities like Demi Moore and Arnold Schwarzenegger (Figure 7) to endorse cigar smoking along with the images of Michael Jordan and Madonna smoking cigars are an important part of creating a lifestyle image for cigar use (Chapter 7). Athletes are also once again endorsing cigar use including such prominent super stars as Wayne Gretzky (Figure 8). Having demonstrated the success of this approach in influencing adolescent tobacco use twice in this century, we should not be surprised by the current high rates of cigar use among adolescent males and females.

Figure 7

Figure 8

The use of endorsements to allay health fears associated with cigar smoking is also as old as the Camel Campaign that touted "More doctors smoke Camels". The eerie similarity of two quotes sixty years apart in time make the point that the message of reassurance is the same, it is only the product that is different.

"For a good sense of deep-down contentment – just give me Camels. After a good man-sized meal, that little phrase 'Camels set you right' covers the way I feel. Camels set me right whether I'm eating, working – or just enjoying life. All the years I've been playing, I've been careful about my physical condition. Smoke? I smoke and enjoy it. My cigarette is a Camel."

Baseball Legend Lou Gehrig, The Saturday Evening Post of April 24, 1937

"The enjoyment of a cigar after a hard week gives me a feeling of well-being and relaxation that a Valium could not match. While there may be a more ideal form of stress reduction, I haven't yet discovered anything else as effective and easy"

Ear Nose and Throat Surgeon M. Hal Pearlman, M.D., Cigar Aficionado, Spring 1993

Marketing a product is intended to increase the use of the product, and it is probably naïve to assume that cigar manufacturers would not adopt marketing approaches proven to increase the use of other tobacco products, absent a regulatory prohibition. The "intent" of the marketers may be to reach adults, but it is hard to ignore the fact that twice before in this century this same "intent" to reach adults has grabbed children.

ENVIRONMENTAL TOBACCO SMOKE

One highly visible approach to cigar marketing has been the cigar smoking event. These events commonly include meals and entertainment, and are marketed as a means of experiencing fine cigars (Chapter 7). Individuals attending these events may smoke cigars only at the event and may smoke only a few cigars per year. However, employees who work these events, and who are exposed to the environmental tobacco smoke generated at them, may have much more frequent exposure. These events, and the re-emergence of cigar smoking in public areas frequented by nonsmokers, raise the question of the contribution of cigar smoking to environmental tobacco smoke (ETS) exposure.

Comparison of the contribution of cigarettes and cigars to ETS requires consideration of three issues: Differences in the composition of cigarette and cigar smoke, differences in the emission rates per minute between cigarettes and cigars, and differences in the mass of tobacco burned (and corresponding duration of smoking) between cigars and cigarettes. Tobacco smoke produced by cigars contains most of the same toxic and carcinogenic constituents found in cigarette smoke (Chapter 3). There is marked variation in the relative

concentrations of these constituents present in cigar smoke across different types and sizes of cigars. In general however, large cigars produce more carbon monoxide, as well as higher amounts of nitrogen oxides and carcinogenic N-nitrosamines, per gram of tobacco burned, and the free ammonia in tobacco smoke is higher due to the more alkaline pH of the smoke (Chapter 3). It is likely this difference in free ammonia that results in the more pungent smell of cigar smoke.

Cigars generate slightly lower amounts of respirable suspended particulates (RSP) per minute compared to cigarettes (Chapter 5), but somewhat higher amounts of carbon monoxide (CO). The major difference between cigarettes and cigars is the amount of tobacco contained in each product. Cigarettes generally contain less than one gram of tobacco and are smoked for about 7-8 minutes, with a substantial interval between cigarettes. Large cigars commonly contain 5-17 grams of tobacco, and are smoked over intervals as long as 60-90 minutes. Thus cigars, while generating similar amounts of ETS per minute compared to cigarettes, continue generating smoke for a much longer period of time; and therefore, the total amount of ETS generated by a single large cigar is much greater than that by a single cigarette.

Continued generation of ETS by cigar smoking may be of particular importance at cigar smoking events where most of the attendees smoke cigars. It is likely that the number of individuals generating ETS at any point in time would be higher at these events because of the longer time required to finish a cigar. The shorter time required to finish a cigarette, and the interval between cigarettes, would result in fewer individuals smoking at any point in time.

Concern about increased generation of smoke at cigar events is born out by measurements of smoke constituents at these events. Levels of CO in the air at these events are similar to those on a crowded California freeway (Repace et al., 1998). These data confirm the belief that cigars can contribute substantial amounts of tobacco smoke to the indoor environment; and, when large numbers of cigar smokers congregate together in a cigar smoking event, the amount of ETS produced is sufficient to be a health concern for those regularly required to work in those environments (Chapter 5).

REGULATION AND TAXATION

Cigars are treated separately from cigarettes and smokeless tobacco for purposes of taxation and often for purposes of regulation. Traditionally they have been taxed at lower rates, and are not covered by the currently proposed FDA regulations for tobacco (Chapter 8). In contrast, cigar smoking was eliminated in airplanes and other locations well ahead of the time that cigarette smoking was eliminated. More recently, a number of States have increased the taxes on cigars; but the norms against cigar smoking in public locations seem to be changing in favor of allowing cigar smoking in more areas, including areas where cigarette smoking is not considered acceptable.

OVERALL CONCLUSIONS

1. Cigar smoking can cause oral, esophageal, laryngeal and lung cancers. Regular cigar smokers who inhale, particularly those who smoke several cigars per day, have an increased risk of coronary heart disease and chronic obstructive pulmonary disease.

2. Regular cigar smokers have risks of oral and esophageal cancers similar to those of cigarette smokers, but they have lower risks of lung and laryngeal cancer, coronary heart disease and chronic obstructive pulmonary disease.

3. Cigar use in the U.S. has increased dramatically since 1993. Adult prevalence of cigar use in California has increased predominantly among occasional cigar smokers. A substantial number of former and never smokers of cigarettes are currently smoking cigars. In contrast to cigarettes, much of the increased use of cigars appears to be occurring among those with higher incomes and greater educational attainment.

4. Adolescent cigar use is occurring at a substantial level and is currently higher that that recorded for young adults prior to 1993. Currently, cigar use among adolescent males exceeds the use of smokeless tobacco in several states. This use is occurring among both males and females.

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