

The Tobacco Epidemic:

Lessons from History

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Abstract-Tobacco has caused the greatest epidemic of the twentieth century, which is beginning to wane in the United States, but is still growing in much of the world. The epidemic developed as a result of innovations in the tobacco industry and larger cultural changes over the 75 years prior to the introduction of Camel cigarettes in 1913. Factors that set the stage for the epidemic include the development of flue-cured and Burley tobaccos, the mechanization of cigarette production with its consequent concentration of capital in a few companies, the safety match, efficient transportation systems, and innovative advertising. Between 1913 and 1963, the cigarette industry experienced almost unbroken growth in the United States. However, since the early 1950s, increasing evidence that cigarettes cause lung cancer and other diseases has dictated that product innovation concentrate on the appearance of safety. In the late 1960s and for a sustained period since 1973, cigarette consumption has declined in the United States, but in the developing world the epidemic curve of cigarette use is still on the upswing. As tobacco use declines in the United States, it is crucial that the production of tobacco products as well as their consumption be reduced. Otherwise, attempting to control the problem in the United States will not result in a net reduction in mortality around the world.

Keywords-international promotion, tobacco consumption, tobacco history, tobacco industry

Cigarettes cause one in six deaths in the United States (U.S. Department of Health and Human Services 1989). An estimated 390,000 people died in 1985 from complications of cigarette smoking, far more than died of any other preventable cause of death (see Table 1). The scale of this carnage is difficult to fathom: Millions and millions of people have died because of smoking, giving nicotine dependence the macabre distinction of having caused the greatest epidemic in twentieth century America. The epidemic of death from smoking can be traced from the rise in cigarette consumption, which began in the second decade of this century (see Figure 1).

Over the past generation, there have been dramatic changes in the patterns of cigarette consumption. Overall rates of nicotine dependence have fallen markedly among better educated groups, and since 1977, new users of cigarettes (i.e., teenagers) are more likely to be female, reversing the male predominance always observed previously (U.S. Department of Health and Human Services 1989). If this trend continues, before the year 2000 more women will smoke than men. The rate of lung cancer among White men has stabilized and is actually beginning to decline (Horm & Kessler 1986). On the other hand, lung cancer has now surpassed breast cancer as a cause of death among women (U.S. Department of Health and Human Services 1989). The poor, the less educated, and minority groups have not experienced the same degree of reduction in smoking rates as have the White upper classes, and the burden of disease from cigarettes increasingly falls on these groups.

Peto (1989) has estimated that cigarettes cause two and a half million deaths per year worldwide. More than

five trillion cigarettes are produced each year, and production is rising faster than the population at 2.1 % per year (Chandler 1986). The epidemic is in varying stages of development around the world. Tragically, developing countries are now recapitulating the West's experience with this scourge.

TABLE I
DEATHS CAUSED BY CIGARETTES IN THE UNITED STATES IN 1985*

Diagnostic Category	Deaths (Thousands)
Coronary heart disease	115
Chronic obstructive pulmonary disease	57
Cerebrovascular disease	27.5
Other vascular and pulmonary diseases	45
Lung cancer	108
Other cancers	31.6
Infant and neonatal deaths	2.5
Lung cancer in nonsmokers	3.8
Deaths from fires caused by cigarettes	1.7
Total	390.1

*Adapted from U.S. Department of Health and Human Services. 1989. *Reducing the Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General*. Washington, D.C.: U.S. GPO.

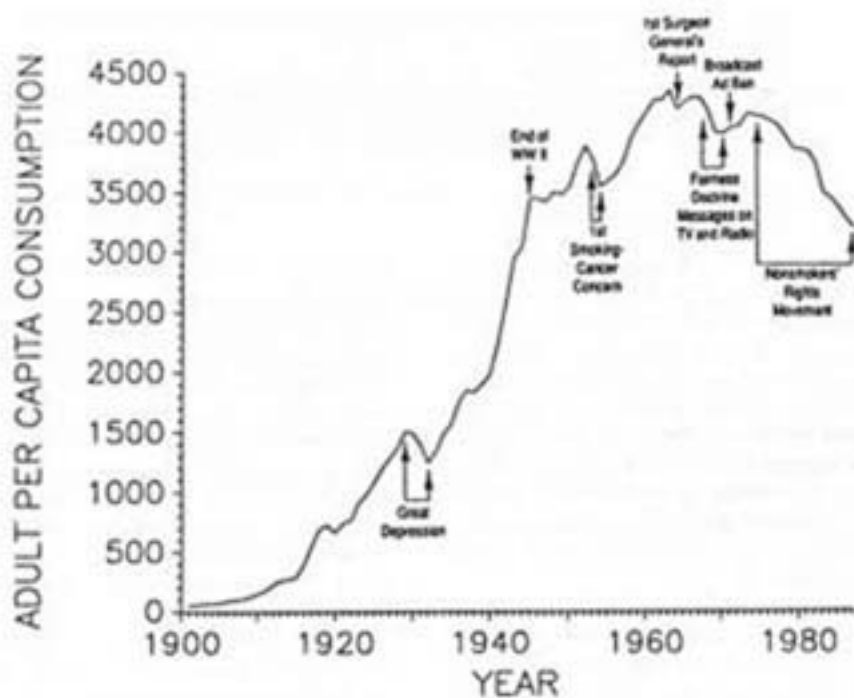


Figure 1. Per capita cigarette consumption, ages 18 and over, and major smoking-and-health events affecting the curve. Adapted from: Warner, K.E. 1985. Cigarette advertising and media coverage of smoking and health. *New England Journal of Medicine* Vol. 312: 384-388.

The present article explores key developments that set the stage for the cigarette epidemic and reviews the major ways the tobacco industry responded to the evidence that their chief product produces illness and death with frightening efficiency and regularity. The article concludes with some observations on how the tobacco epidemic is evolving in developing parts of the world with the assistance of the major multinational firms.

NINETEENTH CENTURY INNOVATIONS

Background

Tobacco was unknown to Europeans prior to Columbus' voyages of discovery (Brooks 1952). Amerindians cultivated tobacco and developed the major ways of consuming the herb that are in use today: cigars, cigarettes, chewing tobacco, and pipes. Spanish and Portuguese sailors took the plant with them on voyages of exploration and trade so that well before the beginning of the eighteenth century, tobacco was grown around the world.

For the most part, European governments set up lucrative state-run monopolies to manage tobacco. The wealthy French tobacco monopoly helped finance the American Revolution (Brooks 1952). In England, the tobacco trade was organized as private enterprise, with the government receiving income from excise taxes. British farmers were not permitted to grow tobacco because their produce could not be taxed.

John Rolfe introduced *Nicotiana tabacum* to the Jamestown colony in Virginia from the Spanish Main in 1612 (Brooks 1952). Virginia leaf found a ready market in England, and this crop became the economic base for Britain's southern colonies in North America. This commodity has remained a major cash crop throughout the history of the republic. Its importance to the young nation is memorialized in the Old Senate Rotunda of the U.S. Capitol Building, built in 1818: Tobacco leaves and flowers decorate each column supporting the dome.

The tobacco grown commercially through the middle of the nineteenth century was mainly used for chewing tobacco, smoking in pipes or for cigars. Nearly all tobacco leaves in this era had a dark color, but two important varieties of light colored, blonde tobacco were developed in the middle of the century. The significance of these two varieties, flue-cured tobacco and Burley tobacco, and their later importance to the cigarette epidemic, will be evident on review of nicotine absorption across biologic membranes.

Nicotine has a somewhat alkaline pKa of 8.0 (U.S. Department of Health and Human Services 1988). The alkaloid is largely nonionized at alkaline pH and is ionized in acidic environments. Absorption across biologic membranes is optimal in the nonionized form, and the pH of cigar smoke and pipe smoke is alkaline. Accordingly, the nicotine in pipe and cigar smoke is readily absorbed across the oral mucosa, and inhalation is not necessary for a drug effect. Chewing tobacco delivers nicotine to the bloodstream by producing an alkaline solution of nicotine in the mouth. Indeed, tobacco for chewing may be mixed with lime (e.g., the betel quid of India), and commercial moist snuff manufacturers buffer the pH of their products, thereby insuring optimal nicotine absorption (Benowitz 1988; Connolly et al. 1986).

Alkaline nicotine is very irritating to the human pharynx (U.S. Department of Health and Human Services 1988). Thus, most people find it aversive to inhale pipe or cigar smoke. An aerosol of acidic nicotine is far less irritating and can be inhaled. The respiratory epithelium is so efficient that the fact that the inhaled nicotine is ionized does not interfere with absorption. Transport of nicotine to the brain is more rapid through the pulmonary alveoli (seven seconds from ingestion to brain) than it is through the oral mucosa, because the drug enters a systemic capillary bed in the mouth and must traverse the entire pulmonary circuit before entering the systemic arterial circulation (U.S. Department of Health and Human Services 1988). In addition, inhalation of nicotine directly stimulates the brain through neural, probably vagal, pathways (less than 1.5 seconds from ingestion to central nervous system effect) (Ginzel 1987).

New Varieties

Between 1840 and 1870, farmers in North Carolina learned how to cure tobacco by using flues: Heat was forced from wood fires through curing barns without smoking the tobacco leaves (Tilley 1948). This process cured the tobacco at temperatures in excess of 150°F and resulted in relatively more carbohydrate in the finished product and less nitrogenous material than was to be found in traditionally cured leaf (Tso 1972). The paucity of nitrogenous material and the abundance of sugars in the blonde leaf created an acidic effluent when this variety of tobacco was smoked. Accordingly, its smoke was easier to inhale than the alkaline smoke from traditional, dark-leaved tobacco.

The developments that led to the flue-curing process are credited to tobacco farmers in Caswell County, North Carolina. Of paramount importance was the discovery by a slave named Bill on the Abisha Slade farm in 1839 that intense heat during curing would produce a golden leaf (Tilley 1948). Further developments included the widespread use of thermometers to measure curing temperatures in the 1850s and the perfection of flues in the 1870s. The resulting "flue-cured" tobacco has a golden or blonde color that gives rise to

the name “bright tobacco.” (Despite its origin in the Carolinas, this variety is also known as “Virginia tobacco.”) Flue-cured tobacco became a popular smoking tobacco throughout the country shortly after the Civil War; an early national brand was Bull Durham.

While North Carolina farmers were learning how to cure tobacco with intense heat and flues, another variety of tobacco had been discovered in Brown County, Ohio, in 1864 (Robert 1949). Burley tobacco, the other blonde variety, is an air-cured variety, but its leaves ferment to a light color. Burley became especially popular with the plug tobacco manufacturers because its relatively large cellular structure permitted it to soak up more sugared flavorings (casings) than other tobaccos without becoming soggy. Despite being air-cured, after Burley tobacco is cased, it has a relatively high carbohydrate content. Developed as a chewing tobacco, sugared Burley tobacco burns with an acidic smoke as well. Both flue-cured and Burley tobaccos were to be of major importance in the development of the American-blend cigarette.

The Bonsack Machine

Until 1884, cigarette manufacture was labor intensive. A good roller could produce 2,500 to 3,000 cigarettes in a day (Robert 1949). Factories employing Russian immigrants and women in New York and in Richmond, Virginia, dominated the market, and cigarettes were a relatively expensive, upper-class luxury.

A cigarette department was part of the Duke factory in Durham, North Carolina (Wagner 1971). James Bonsack of Virginia had developed a machine by 1881 to manufacture cigarettes, but it was not perfected. James Buchanan “Buck” Duke contracted with Bonsack in 1883 to give his company preferential licenses in exchange for further developmental work on the machine. By 1884, the machine was capable of making 120,000 cigarettes in a day. Today, a machine that churns out 8,000 cigarettes per minute is commonplace in cigarette factories around the world, and machines capable of producing 10,000 per minute are coming on-line.

With the mechanization of cigarette manufacture, prices fell, and the industry became capital intensive. Duke had a preferred access to the means of production, and he was able to coerce his competitors into becoming part of the American Tobacco Company. By the 1890s, cigarette manufacture had become a monopoly in the United States. It remained so until 1911 when it was dismantled into the oligopoly so familiar today.

Mechanization also led to excess manufacturing capacity. This, in turn, put pressure on the manufacturers to expand the market for cigarettes. An identical need for market expansion exists today for American cigarette manufacturers, although this time the excess capacity has resulted from declining domestic cigarette consumption.

Other Developments

Tobacco chewing was the major form of tobacco consumption prior to the development and spread of the match, and remained dominant through the early twentieth century. Pipes and cigars need to be relit frequently because the burning tobacco tends to extinguish itself when left unattended. Because of the need for a convenient source of flame, smoking was only convenient near an established fire until the match was perfected. Chemical knowledge and the technology for matches developed gradually over several centuries. An Englishman, John Walker, invented the first practical friction match in 1827 (Beaver 1985). However, it was not until red, amorphous phosphorus was substituted for white phosphorus on the friction surface in 1845 and Johan Lundstrom included chlorate of potash in the matchhead in 1852 that the safety match was perfected (Beaver 1985). Mass-production machinery was invented and refined between 1870 and 1900 (Chandler 1977). Matches permitted smoking virtually anywhere and were a necessary adjunct to the successful spread of the cigarette.

By the end of the nineteenth century, the rail network throughout the United States was extensive (Chandler 1977). The development of efficient rail transportation made it possible to rapidly distribute a perishable product made at a single location throughout the nation. Similarly, railroads made it easier for factories to utilize raw materials from distant locations in greater quantity.

Advertising and promotion were key to successful, national marketing of cigarettes in the post-Civil War era. The cigarette card was originally a utilitarian object to stiffen a cigarette pack (London Cigarette Card Company 1982). Under the leadership of Major Lewis Ginter, the Richmond-based firm of Alan and Ginter developed the cigarette card into a striking array of “puzzles, maps, pictures of boats, flags, actors and actresses in numbered sets” (Wagner 1971). Buck Duke developed a similarly dazzling assortment of illustrated series for American Tobacco’s brands. These early efforts foreshadow the promotions used in cigarette marketing today, such as Philip Morris’ giveaway in early 1989 of a compact disc of popular music with the purchase of three packs of Parliaments. Not unlike today’s tobacco companies, Duke was not reluctant to invest heavily in marketing. In 1889, for example, his firm spent \$800,000 on promotion (Wagner 1971).

THE CAMEL

Richard Joshua Reynolds founded his tobacco company in Winston, North Carolina, in 1874 for the manufacture of plug tobacco (Tilley 1985). Reynolds was an innovator throughout his career. For example, he was the first to sweeten his products with saccharine in 1891. The chemical could sweeten flue-cured tobacco to the levels characteristic of brands that used Burley leaf without making the fluecured product soggy. Furthermore, the resulting product had a longer shelf life as it was less apt to become moldy (Tilley 1985).

Although Reynolds made several small brands for smoking in the 1890s (including one packaged with cigarette papers), these products were secondary and seem to have been mostly a means to use scrap left over from plug tobacco manufacture (Tilley 1985). The company's first major, national smoking tobacco brand was introduced in 1907. By that time, Reynolds could see that chewing tobacco was on the decline at the expense of smoking. Several brands were produced, but the most famous was a Burley product for pipes and cigarettes, Prince Albert. Promotional literature for these brands declared that, through a patented process for sterilizing leaf in a licorice casing, Reynolds had produced "the most delightful and harmless tobacco for cigarettes and pipe smokers" (Tilley 1985).

The Tobacco Trust was dismantled in 1911. Reynolds, whose company had been incorporated into the Trust in 1899, was then free to expand his product line in direct competition with American Tobacco. Reynolds began to make cigarettes. At the time, there was no dominant formula for cigarettes. Various products included cigarettes made of Turkish (Oriental) leaf, flue-cured leaf, blends of these two, and uncased (unflavored) Burley tobacco. Reynolds imitated the Turkish and flue-cured varieties in several brands launched in 1913 (e.g., Reyno, Osman, and Red Kamel), but he also devised a completely novel formula for Camel cigarettes (Tilley 1985).

Camel's packaging boasted of a "Turkish and Domestic Blend." Turkish tobacco provided desirable flavor and aroma characteristics, while cased Burley tobacco added flavor, and flue-cured tobacco working in combination with the sugared Burley produced a smoke with a mildness (low pH) characteristic of flue-cured brands, which facilitated inhalation. Maryland tobacco was added to the blend in 1916 to improve the cigarette's burning qualities (Tilley 1985), that is, to reduce the possibility that a lit cigarette would go out when left unattended.

The brand was sold at 10 cents for twenty cigarettes, while competitive brands were pegged at 15 cents for twenty. Despite the 33% discount, the consumer was advised on the back of Camel packages, "Do not look for premiums or coupons as the cost of the tobaccos blended in Camel Cigarettes prohibits the use of them."

George Washington Hill of the American Tobacco Company later credited Reynolds with revolutionizing the cigarette industry (Tilley 1985). The novel formula, which has become known as the American blend, was an immediate success. Aggressive pricing, the elimination of premiums, and imaginative advertising combined to propel Camel to phenomenal increases in sales in a short period of time. In 1913, the company produced 1.1 million Camels. Production was 2.3 billion in 1915 and reached 20.8 billion by 1919 (Tilley 1985). Within two years of its introduction, the brand had captured 12% of the cigarette market. By 1919, during a period of rapid growth in the industry, a phenomenal 38.7% of all cigarettes manufactured in the country were Camels (Tilley 1985; U.S. Dept of Commerce 1975).

The American Tobacco Company responded in short order with a Camel-style cigarette called Lucky Strike, and Liggett and Myers reformulated Chesterfield to meet the upstart competition (Tilley 1985). Lorillard was late in producing an American-blend cigarette: Old Gold was not introduced until 1926. Before Reynolds introduced Camel, many brands competed in what would later be recognized to have been a relatively small market. Camels changed the fundamental dynamics of cigarette sales. Each company came to concentrate on a single national brand, and premiums were dropped in favor of more efficient mass advertising. The pattern established over 70 years ago persisted until very recently when there was a return to a multitude of brands and brand extensions combined with a huge increase in promotional activities at the expense of spending on conventional advertising (Davis 1987).

THE CIGARETTE EPIDEMIC IN THE UNITED STATES

Figure 1 traces per capita cigarette consumption from 1900 (Warner 1985), when per capita consumption was only 54 cigarettes per person per year (Tobacco Institute 1988). A sharp inflection is evident at the time Camels were introduced, and this dramatic rise continued with seldom a pause through the end of the World War II. The decline seen during the Depression years was associated with an increase in the use of roll-your-own tobaccos, which are not counted in the governmental tax figures on which Figure 1 is based. The reduction in consumption in the early 1950s was triggered by an article in Reader's Digest

that summarized emerging knowledge about cigarettes and lung cancer (Warner 1985). The cigarette manufacturers successfully dealt with their public relations problems (but not the public health problem they had created), and cigarette consumption resumed its rise into the 1960s, peaking at 4,345 cigarettes per person aged 18 and older in 1963.

A brief downward inflection in 1964 was associated with the publication of the first Surgeon General's Report prepared by a special committee assembled by Luther Terry, the U.S. Surgeon General at the time.

TABLE II
PREVALENCE OF CIGARETTE SMOKING IN THE UNITED STATES IN 1985*

Group	Prevalence (Percent)
Overall Population	30.4
Sex	
Males	33.2
Females	28.0
Race	
Whites	29.9
Blacks	36.0
Educational Level	
Less than high-school graduate	35.7
High-school graduate	34.2
Some college	28.1
College degree	18.4

* Adapted from U.S. Department of Health and Human Services. 1989. *Reducing the Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General.* Washington, D.C.: U.S. GPO.

Although the cigarette manufacturers were given a veto over the composition of the committee, the industry still found the conclusions unacceptable (Terry 1983). The industry made a successful, albeit brief, recovery from the fallout over the 1964 report, but consumption began to slide again in the late 1960s. This corresponded exactly with the counteradvertising campaigns mandated by the Federal Communications Commission in response to a petition by John Banzhaf attorney who now directs Action on Smoking and Health in Washington, D.C. - that voluntary health agencies were able to air on television under the Fairness Doctrine from 1967-1970 (Warner 1986). At their peak, the counterads were allotted only a third of the airtime given over to cigarette advertising. When the ban on broadcast cigarette advertising was imposed on January 2, 1971, the counterads were forced off the air, as well and cigarette consumption immediately began to rise.

Per capita cigarette consumption has fallen every year since 1973; the decline is presently about two percent per year. Overall prevalence of cigarette smoking has fallen from 52.6% among men (peak year 1955) and 34.1% among women (peak year 1965) to 31.7% for men and 26.8% for women in 1987 (U.S. Department of Health and Human Services 1989; Warner 1986).

The reduction in smoking has not been uniform throughout society. Most of the decline in smoking has occurred among better educated groups and has been more pronounced among Whites. Table II depicts smoking prevalence for major groups in 1985 (U.S. Department of Health and Human Services 1989). Among people with other serious chemical dependencies, there has been no decline in smoking prevalence since 1960 (Kozlowski 1989). About 80% of the people who present for treatment of alcohol dependence are also dependent on nicotine (Joseph 1988).

QUEST FOR A SAFE CIGARETTE

Cigarette manufacturers have employed two complementary strategies to deal with the public relations problems resulting from the massive evidence that their products are highly addictive and frequently fatal to their customers. The defensive strategy has been the development of an aggressive lobbying organization, epitomized by the Tobacco Institute, which was formed on the advice of the public relations firm Hill and Knowlton in the mid-1950s (Wagner 1971), and the support of research on health effects through an industry-controlled committee formed in 1954. Industry supported research has often documented serious health consequences of smoking. In fact, industry-sponsored inhalation studies have produced an animal model for the production

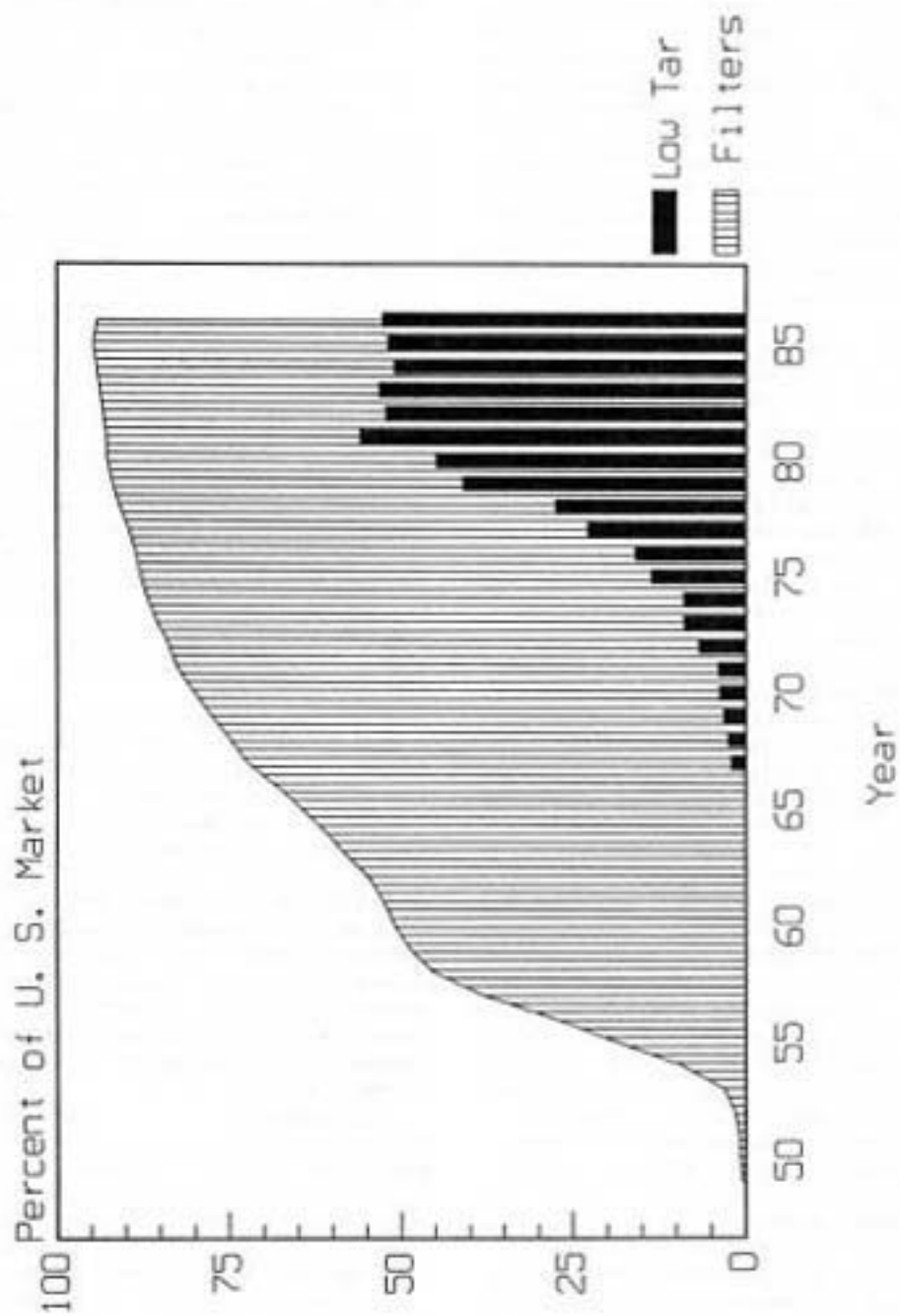


Figure 2. Market share for filter cigarettes and cigarettes with Federal Trade Commission tar yield of less than 15 mg.

of laryngeal cancer by cigarette smoke (Bernfeld, Homburger & Russfield 1975; Homburger 1975), but the sponsors have been just as unwilling to publicly accept adverse conclusions by their own scientists as they have the conclusions of the U.S. Public Health Service.

The offensive strategy the industry has used to deal with its public relations problem has been the production and marketing of products designed to appear safe. Filter cigarette brands were heavily promoted during the 1950s: While only accounting for 0.6% of the market in 1950, 50.9% of all cigarettes sold in 1960 had filters, and today, filters command about 95% of the market (see Figure 2) (Warner 1986). These products were often marketed with overt health claims. Kent cigarettes promised “the greatest health protection ever developed” by virtue of its crocidolite asbestos filter (Slade 1988a).

By the mid-1960s, the charm of filters had begun to wane, especially since it was increasingly obvious that these devices were not actually safe. The emphasis next turned to what Alan Blum, founder of Doctors Ought to Care, has called the “low poison” brands, known in industry jargon as “low tar” brands. These brands, too, were pushed with appeals to health concerns. For example, an advertisement for True cigarettes shows an earnest young woman saying, “All the fuss about smoking got me to thinking I’d either quit or smoke True. I smoke True” (Lorillard 1985), while an ad for Vantage cigarettes asked, “How many times have you tried to give up smoking?” (Reynolds 1976). From a market share of only two percent in 1967, cigarettes with a Federal Trade Commission-rated tar yield of less than 15 mg now control more than half of the market (see Figure 2) (Federal Trade Commission 1988).

The charm of low-tar products has been short-lived, however, as evidence mounts that people can readily compensate for lower nicotine deliveries by taking deeper inhalations, smoking more cigarettes, and by blocking ventilation holes in filters (U.S. Department of Health and Human Services 1988). The low-tar cigarette did not reverse the decline in cigarette sales like the filter revolution did in the 1950s. Accordingly, alternative means for sustaining nicotine dependence have recently been sought.

The most visible of these efforts has been that of the R.J. Reynolds Company with its ill-fated, so-called “smokeless cigarette” named Premier (Slade 1988b). Designed to resemble a filter cigarette, Premier used a charcoal fuel element as the source of energy to heat a tobacco extract, glycerin, and water adsorbed onto alumina beads. Its effluent consisted largely of glycerin-water droplets with dissolved nicotine, carbon dioxide, carbon monoxide, and water vapor. Announced in September 1987, the product was test marketed for five months in Arizona and in Missouri.

Public health and medical groups opposed the marketing of Premier without prior approval of the Food and Drug Administration (FDA). Concerns were expressed about a variety of serious public health problems that could result from the unregulated marketing of this product (Slade 1988b). Its obligatory delivery of nicotine and carbon monoxide raised concern for cardiovascular disease and adverse effects on pregnancy resulting from using the device. Its appearance of safety and ease of inhalation made it a likely starter product for novice smokers. Also, it appeared to be aimed at making it more difficult for people to achieve abstinence from nicotine and it threatened to promote relapse to nicotine dependence.

The American Medical Association and the Coalition on Smoking OR Health filed petitions in April 1988 asking the FDA to regulate Premier as a drug delivery device. New Jersey, Missouri, Arizona, and Colorado held public hearings on the product. In response to repeated, broad, undocumented assertions by the R.J. Reynolds Tobacco Company that the device could not possibly be used to deliver other drugs (Reynolds 1988), scientists at NIDA demonstrated that Premier could easily be adapted to deliver crack cocaine in an *in vitro* apparatus (Cone & Henningfield 1989).

On February 28, 1989, Reynolds withdrew Premier from test markets, citing poor sales (Morris & Waldman 1989). The company had lost an estimated \$300 million on the venture. In withdrawing the product, Reynolds changed course from its original plan to tinker with and modify Premier over a period of several years to gain consumer acceptance. It is widely suspected that the leveraged buyout of Reynolds in late 1988 as well as the vocal, united opposition of the public health and medical communities contributed to the demise of Premier.

The FDA had not ruled on the petitions asking that Premier be classified as a drug prior to the product’s withdrawal, and the agency seems unlikely to do so now. However, in an unrelated case, the FDA recently ruled that a particular cigarette additive and cigarettes incorporating that additive are drugs (Michels 1989). The additive, N-Bloctin, was promoted by a company named CA Blockers, Inc., as a chemical that would prevent lung cancer caused by smoking cigarettes by interfering with the absorption of certain carcinogens in the smoke. The FDA determined that this product was a drug under the Food, Drug and Cosmetic Law. CA Blockers has subsequently indicated that it intends to file a New Drug Application for N-Bloctin, but this process will take ten or more years (Dagnoli & Freeman 1989).

Premier and N-Bloctin are two dramatic examples of products designed to deal with the cigarette industry’s ongoing public relations problem. Several more modest innovations have also recently come to market that are aimed at promoting acceptance of smoking by nonsmokers, one of which was cigarettes that produce less visible sidestream smoke. The first cigarette of this sort was a product named Passport. Utilizing a specially

treated cigarette paper to reduce visible smoke emissions, it was test marketed in Canada by Rothmans in 1985. Passport was withdrawn from the test market after scientists at the American Health Foundation observed that sidestream smoke from the cigarette contained increased levels of nitrosamines compared to conventional cigarettes (Brunnerman 1989).

Vantage Excel is the second cigarette of this genre to enter the test market. Reynolds claimed that Vantage Excel produced less visible smoke at the lit end, but it makes no claims about the total amount and variety of gases and particulates produced. Brunnerman (1989) has assayed the sidestream smoke of Vantage Excel and has found it to contain as much 1,3-butadiene, isoprene, acroline, benzene, and toluene as that produced by conventional cigarettes. There are no available data on the size distribution of particulates in sidestream smoke from Vantage Excel. It may be that smaller particles render the smoke solids in Excel not only less visible but also easier to inhale.

Reynolds is also testing a cigarette that has a built-in air freshener. Chelsea, marketed with “scratch `n sniff” advertisements and stickers on packs, contains a perfume in the cigarette paper that is supposed to mask the unpleasant odors associated with tobacco-smoke pollution. If this product actually covers up the smell of smoke, this will undermine the warning signal that the odor of tobacco smoke gives the nonsmoker. Mercaptans are added to natural gas so that people will be warned of a gas leak by an obnoxious smell. Perfuming cigarette smoke may make it more difficult for nonsmokers to recognize the presence of tobacco-smoke pollution and to protect themselves from this material.

In summary, the tobacco industry has responded to substantial evidence of harm with a variety of defensive and offensive public relations gimmicks. The charade continues, and it is safe to predict that the industry will continue to come up with still more inventive ways to promote denial that smoking is harmful both to those who smoke as well as to those around the smoker. The experience of the past 35 years indicates that this deadly, lucrative game will not stop until the industry is appropriately regulated by public health authorities, such as the FDA.

CIGARETTE EPIDEMIC IN THE DEVELOPING WORLD

The U.S. Capitol Building is not the only federal building with decorative tobacco leaves and flowers. This motif is also found in the halls of the State Department, in what are called the Treaty Rooms (Goldberger 1987). These carvings are not nineteenth-century holdovers, however. These carvings were a gift from the tobacco industry to the federal government in 1986.

As cigarette consumption declines in this country, the domestic production of cigarettes is actually rising (U.S. Department of Agriculture 1988). The export trade is booming because of the opening up of important Asian markets to foreign, largely American and British, cigarettes (Schmeisser 1988). Pressure from the United States government has forced Japan, South Korea, and Taiwan to drop restrictions on foreign cigarette imports, and this has resulted in dramatic shifts in the epidemiology of cigarette use in these countries. In Asia, smoking has been uncommon among women (Chandler 1986), but advertising now targets women as well as adolescents. New forms of promotion and aggressive use of old forms are creating new markets for cigarettes in these countries.

Throughout South Asia, the American flag is evident as red and white stripes forming the background for Winston advertisements. In Taiwan, the only valid ticket of admission for a 1988 rock concert was five empty packs of Winston. In Malaysia, the government does not permit cigarette advertising on television as a public health measure. Instead, tobacco companies promote goods and services, such as fishing gear and travel agencies that use the themes, logos, and music associated with cigarette brands. In Kuala Lumpur, for example, Marlboro Country is a travel agency, and its television and billboard ads have a nearly identical appearance to cigarette ads.

Thailand is the current target of attack by American cigarette interests (Tobacco Merchants Association 1988). The United States trade representative has been petitioned to pressure the Thai government to relax cigarette import restrictions while the smuggling of foreign brands into the country has become intense. American and British brands are widely advertised in Thailand although they are not legally available. The multinational cigarette companies have pointed out to the government that a large amount of tax revenue is being lost because black market cigarettes are not subject to excise tax.

Blonde tobaccos were not grown in most of the world until recent decades. Before that, locally grown, dark tobaccos supplied most local markets. Blonde varieties have transformed many national tobacco markets, promoting a change in taste to milder, more easily inhalable smoking blends. The multinational companies, particularly British American Tobacco, have actively encouraged this switch in local agriculture with the lure of making tobacco an export commodity. One consequence of this is that American, British, and Japanese cigarette companies have become better positioned to enter these markets in competition with local

brands by using their more sophisticated formulas based on Virginia tobacco (flue-cured) and the American blend, supported by high-powered advertising.

Flue-cured tobacco cultivation requires a large amount of energy for curing the tobacco. In most developing countries, the energy is supplied by wood, and this, in turn, contributes to deforestation (Madeley 1983). An acre of tobacco requires more than an acre of wood fuel each year for curing. The actual extent of this problem has not been well defined, although it certainly bears careful examination.

Overall, worldwide cigarette consumption doubled between 1960 and 1986 (Chandler 1986). Despite declines in the United States and Northern Europe, the industry is still growing overall, and tobacco continues to be a sound investment to the extent that companies have markets in developing countries. Already, except for Papua New Guinea and Vietnam, the leading causes of death in South Asia are cancer and heart disease (Mackay 1988). Several observers have pointed out parallels between the current tobacco trade and the nineteenth century trade of British opium from India to China. This aggressive expansion of the market for nicotine has been called the new opium war (Mackay 1988). Far more deaths are being caused by legal American tobacco exports than are caused by cocaine illegally imported into the United States.

As the tobacco epidemic comes somewhat under control in the United States, that victory will only have been worthwhile if the epidemic is not merely transferred to other parts of the world. Unfortunately, tobacco use continues to rise elsewhere, aided and abetted by a sophisticated, wealthy, and powerful drug cartel based in New York and London.

CONCLUSION

Drug addiction, including alcohol, tobacco, and other drug dependencies, is far and away the leading cause of preventable death in the United States (Foege, Amler & White 1985). Tobacco has the distinction of being the leading contributor to this horrible toll. Even with the substantial progress that has been made toward controlling the tobacco epidemic, an enormous task remains both here and abroad. The cultural history of tobacco combined with the political and economic power of the industry make this epic disease problem especially fascinating and challenging. Tobacco use can be controlled, but this will only be accomplished through a multidisciplinary attack around the world by people of good will acting both as individuals and through multiple public, private, and voluntary agencies. A thoughtful consideration of the history of this epidemic is essential preparation for the task ahead.

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