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The Minnesota Plan for Nonsmoking and Health



Report and recommendations
of the technical advisory committee
on nonsmoking and health

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Minnesota
Department of Health

September, 1984



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September 14, 1984

Enclosed is a detailed report prepared for the Minnesota Department of Health by a special Technical Advisory Committee on Nonsmoking and Health and submitted to Sister Mary Madonna Ashton, Commissioner of Health.

The Advisory Committee's recommendations center on three goals:

- preventing young people from starting to smoke,
- encouraging and assisting smokers to quit smoking,
- and promoting clean indoor air.

If you have any questions on the report, please contact the Minnesota Center for Nonsmoking and Health.

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INTRODUCTION

INTRODUCTION

The Technical Advisory Committee on Nonsmoking and Health was appointed by the Commissioner of Health in November 1983 and had full meetings in December 1983 and January 1984. At these meetings, extensive information was provided on the epidemiologic, economic, and programmatic aspects of smoking control. Members shared thoughts, backgrounds, and varying areas of expertise and developed preliminary ideas for subcommittee work.

In January the Committee was divided into five subcommittees to begin writing the plan. At this point, additional experts and interested persons were invited to provide specialized knowledge to the subcommittees. They included: Penny Gottier, American Lung Association of Hennepin County; Carl Knutson, Minnesota Department of Education; Mary Ewert, Nonsmoking Generation; and Arlene Wilson, Minnesota Medical Auxillary. Minnesota Department of Health staff members met with and served as resources to each subcommittee.

Subcommittees began meeting in February to formulate recommendations in each of the areas. The Minnesota Center on Nonsmoking and Health provided background material and references on various topics. The subcommittees finalized their draft recommendations during April and May 1984.

The full Committee met on June 26 to vote on each of the subcommittee recommendations. The full Committee rejected some recommendations, changed or modified others, and accepted others. The staff then put the recommendations, background material, and references together in draft form. The full Committee had an opportunity to review all the material as compiled and comment on the content of the entire report. The report was officially submitted to the Commissioner of Health in September 1984.

INTRODUCTION

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MINNESOTA DEPARTMENT OF HEALTH

Charge to

THE TECHNICAL ADVISORY COMMITTEE ON NONSMOKING AND HEALTH

In 1982, a committee of public health experts convened by the Commissioner of Health concluded that cigarette smoking is one of the nine major unsolved health problems in Minnesota. Smoking accounts for approximately 4800 Minnesota deaths and a corresponding amount of disability and medical cost annually. Economic losses due to lower job productivity and to cigarette-caused fires are significant. Smokers suffer twice as much heart disease and ten times more lung cancer than nonsmokers.

The committee pointed out that increases in smoking rates among young women, if continued, may cause an epidemic of lung cancer and other conditions in middle-aged women similar to that experienced by men in the last few decades. Recent studies of filtertip cigarettes suggest that technological "fixes" may not be as effective as once hoped.

There has been a steady increase in nonsmoking rates since the mid 1960s. Seven of every ten Minnesotans over age 18 do not smoke. Evidence from polls shows that 87% of Minnesota's smokers support the Minnesota Clean Indoor Air Act which regulates smoking in public buildings, restaurants, and workplaces. More than 70% of the state's smokers have tried to quit at least once. It appears that Minnesota is ready for further well-planned steps to promote nonsmoking.

The Technical Advisory Committee on Nonsmoking and Health is to make recommendations for the promotion of nonsmoking in Minnesota -- for **individuals**, for **communities**, and for the **state** as a whole. The recommendations will be submitted to the Commissioner of Health and are expected to be used as a guide for action by a wide range of public and private organizations and by individual smokers and nonsmokers.

The Technical Advisory Committee will consist of knowledgeable people in fields related to the promotion of nonsmoking. These fields include health effects of smoking, smoking cessation and prevention, public health, medicine, nursing, wholesale/retail sales, insurance, legislation, law, advertising, community action, business, labor, local government, education, and economics of taxation.

The group will examine a wide variety of techniques for promotion of nonsmoking. These include:

1. Education for nonsmoking and smoking cessation.
2. Economic incentives and disincentives.
3. Regulatory measures.

Each possibility will be examined for its effects not only in promoting nonsmoking and health but on the economy of the state and of particular groups within Minnesota. Implementation plans will be developed for methods considered most practical and cost effective.

The objective is to produce a set of ideas which will be adopted and carried out by appropriate groups and individuals -- not merely admired and put on the shelf.

EXECUTIVE SUMMARY

The Minnesota Technical Advisory Committee on Nonsmoking and Health was composed of experts in the fields of smoking, health, public health, sales, labor, medicine, restaurants, law, business, education, legislation, nursing, insurance, economics, advertising, local government, and community action. During the period December 1983 to June 1984, the Committee and its five subcommittees developed recommendations for a coordinated statewide program to prevent young people from starting to smoke, to encourage and assist smokers to quit, and to promote clean indoor air. This program would improve the quality of life in Minnesota by eliminating the number of smoking-related deaths, improving health, and reducing economic costs of medical care and lost income from premature death and disability.

THE BENEFITS OF NONSMOKING

Nonsmoking Minnesota: Saving Lives

A Minnesota comprised of nonsmokers could expect, within 15 years, to have 4600-5000 fewer deaths per year. Smoking currently accounts for about 15% of deaths in the state, the single largest preventable cause of mortality.

Nonsmoking Minnesota: Improvements in Health

A nonsmoking Minnesota could expect to have a substantial reduction in the current 39,000 person-years of smoking-related disability. This is equivalent to 9% of total statewide disability.

Nonsmoking will decrease health consequences and discomfort for nonsmokers exposed to second-hand smoke. The link between second-hand (passive) smoking and lung cancer among nonsmokers continues to be debated. However, the relationship of passive smoking to other health consequences -- including childhood respiratory diseases, decreased lung function frequency and severity of respiratory ailments, and "minor" conditions such as eye irritation, headache, and aggravation of allergies -- is well documented.

Nonsmoking is related to increased respiratory health and to increased capacity to engage in strenuous exercise and work.

Nonsmoking is related to generally improved health, including fewer days of absence from work and fewer bed days from illness. Nonsmokers are more likely to appraise their health status as "excellent."

Nonsmoking Minnesota: Saving Dollars

Nonsmoking throughout Minnesota can reduce costs associated with smoking:

- In 1983 smoking cost Minnesota at least **\$374,600,000** in direct medical costs annually. This is:

EXECUTIVE SUMMARY

\$91 for every person in the state

\$446 for every smoker in the state (aged 18 and older)

82 cents per pack of cigarettes sold*

- In 1983 smoking cost Minnesota at least **\$303,300,000** annually in lost lifetime income costs for persons who died from smoking-related diseases. This adds another 66 cents per pack of cigarettes sold.
- These two costs combined -- **\$677,900,000** -- greatly exceed the gross income from statewide retail cigarette sales (\$450,000,000 in 1983) and amount to \$1.48 per pack sold. Loss of income from disability (not yet calculated) must be added to this figure.
- The potential saving to Minnesota from increasing the proportion of nonsmokers is at least:

Current and Potential Smokers Motivated to Abstain from Smoking		Potential Savings Per Year
(%)	(#)	(\$)
1%	8,400	\$ 6,780,000
5%	42,000	\$33,900,000
10%	84,000	\$67,800,000

The extra costs incurred by the average smoking employee are \$430-\$770 (1983 dollars) (Kristein, 1983). These costs cover many items not completely included in the medical costs and lost income presented above -- and are borne by the employer:

excess health insurance	\$ 95-\$190
worker's compensation costs	\$ 22-\$ 43
excess accident rate	\$ 25-\$ 40
excess absenteeism	\$ 50-\$100
decreased productivity due to the smoking ritual	\$100-\$210
increased health costs for nonsmokers exposed to passive smoking at the worksite	\$ 35-\$ 72

* Slightly less than the preliminary figure released in the Minnesota Department of Health Disease Control Newsletter in May 1984 (Volume 11, Number 5) because of the inclusion of updated information on disease occurrence attributable to smoking. Figures will vary slightly over time with changes in smoking and disease rates.

THE MINNESOTA PLAN FOR ACTION

If there is one lesson to be learned from the vast literature on smoking control, it is that many approaches to promoting nonsmoking are partially but not completely effective and that combined strategies are likely to be more successful than any one alone. The Technical Advisory Committee on Nonsmoking and Health has made **detailed recommendations** in each of the following areas:

School and Youth Education

- Provide six or more hours of scientifically evaluated nonsmoking education in seventh grade.
- Evaluate the use of nonsmoking contests and of joint television/classroom curricula for nonsmoking in schools.
- Regulate smoking in schools in concert with Minnesota law and in ways which deemphasize the desirability of the smoking habit.
- Reinforce school efforts through community programs.

Promotion of Nonsmoking through Marketing and Communication Techniques

- Conduct a long-term public communication campaign to market nonsmoking.
- Provide the public with more objective information on smoking and nonsmoking.
- Improve physician skills in identifying and treating smoking addiction.
- Establish model nonsmoking programs in buildings of the Minnesota Department of Health and Minnesota health care facilities.
- Support campaigns by Community Health Services Agencies and other community organizations to promote nonsmoking.
- Encourage smokers to use effective methods for quitting.
- Encourage nonsmokers to be helpful -- not moralistic or adversarial -- but to assist in implementing the Minnesota Clean Indoor Air Act.

Public and Private Regulatory Measures

- Establish model nonsmoking programs within the Minnesota Department of Health.
- Encourage model programs in Minnesota worksites.
- Urge health and public health facilities to become smokefree by 1990.

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- Encourage organizers of public events to reject contributions which result in tobacco advertising.
- Distribute clear materials on Minnesota Clean Indoor Air Act provisions for the workplace to employers and the public.
- Enforce the Minnesota Clean Indoor Air Act in the workplace.
- Develop uniform rules for implementing the Minnesota Clean Indoor Air Act in workplaces.
- Encourage restaurants to expand nonsmoking space commensurate with demand.
- Support national legislation for self-extinguishing, fire-safe cigarettes.
- Support rotating health messages on cigarette packages but recommend that federal prohibitions on state regulation of cigarette advertising be removed.
- Request that federal properties in Minnesota comply with the Minnesota Clean Indoor Air Act.
- Enact a state law against distribution of free cigarettes.

Economic Incentives and Disincentives

- Increase the state excise tax on cigarettes by ten cents per pack. Declare intentions for periodic increases in future years.
- Encourage Congress to maintain and increase current federal cigarette taxes.
- Provide funding for nonsmoking programs from a variety of sources.
- Encourage life, health, and disability insurance discounts for nonsmoking and publicize their availability.
- Encourage homeowner insurance discounts for nonsmoking households.
- Offer insurance benefits to nonsmokers through employee "cafeteria" benefit packages.
- Inform employers of the insurance savings to be obtained through increased nonsmoking by employees.
- Develop and distribute economic incentive strategies to encourage nonsmoking in the workplace.
- Advise employees that many health insurance programs cover smoking cessation costs.
- Publicize the energy costs saved in nonsmoking buildings.

Information Needs

- Provide research information on smoking and its control.
- Provide educational materials.
- Conduct scientifically-designed annual telephone surveys to assess smoking rates in Minnesota and evaluate program impact.
- Provide evaluation assistance to community nonsmoking campaigns.
- Conduct other survey work as needed for planning or evaluation.
- Evaluate the impact of major components of the statewide plan in order to plan new directions, insure that money is well spent, tell other states of the Minnesota experience, and be eligible for research grants.

These recommendations are congruent with the national public health goals, including the campaign for a smoke-free society by the year 2000 endorsed by United States Surgeon General C. Everett Koop in May 1984.

The Technical Advisory Committee on Nonsmoking and Health calls on the Minnesota state government, health care facilities, business, labor, voluntary organizations, communities, and individual smokers and nonsmokers to join together in carrying out the recommendations in The Minnesota Plan for Nonsmoking and Health.

BACKGROUND AND LITERATURE REVIEW

THE HEALTH BENEFITS OF NONSMOKING: A LIFESPAN APPROACH

THE HEALTH BENEFITS OF NONSMOKING: A LIFESPAN APPROACH

The scientific case linking cigarette smoking to premature death and excessive lifetime morbidity was first presented in the 1950s. Now in the 1980s, approximately 40,000 pieces of published research provide a solid indictment of the smoking habit. Within the scientific and medical communities, the evidence is compelling. The public may be near the saturation point for messages on the health consequences of smoking, however; and the flow of reports of the health hazards of smoking may be received with diminishing impact.

There is an alternative mode for communicating important information on the interrelationship of cigarette smoking and disease: promoting the health benefits of nonsmoking rather than the adverse effects of smoking. Portrayal of the benefits of nonsmoking is consistent with positive media images and complements other aspects of a healthful lifestyle such as exercise and sound nutrition. The merits of this approach have been considered by the Technical Advisory Committee on Nonsmoking and Health, and the active promotion of nonsmoking is a major principle of the recommendations contained within this report.

The health consequences of smoking span the entire period from fetal development to advanced age. In this presentation, the same information will be viewed from the perspective of the health benefits of nonsmoking. These potential health benefits will be cataloged into five "lifespans" to emphasize the assertion that nonsmoking enhances health along the entire continuum of age.

Interwoven throughout this lifespan approach is the tenet that nonsmoking is normative behavior. Nonsmoking has been the norm throughout human history. Only in this century have large numbers of people been exposed to tobacco smoke. Nonsmoking is once again a majority phenomenon in the United States in the 1980s, and nonsmoking is clearly the norm in Minnesota.

LIFESPAN I: FETAL DEVELOPMENT AND INFANCY

The major nonsmoking issues in the period from conception to year 1 are: (1) the provision of a smoke-free prenatal environment for the fetus provided by a nonsmoking mother and by her avoidance of passive smoke exposure during pregnancy and (2) the maintenance of a smoke-free home environment during infancy provided by nonsmoking in the home.

The potential benefits of maternal and family nonsmoking during the period of pregnancy and the first year of life include:

(1) Improved fetal growth. Research spanning 45 studies on half a million births shows that babies born to nonsmoking mothers are, on the average, 200 grams heavier than babies born to smoking mothers. The entire distribution curve is shifted toward heavier birth weights for children of nonsmoking mothers (Macmahon, Alpert, and Salber, 1966). Nonsmoking is associated with fewer births below the low birth weight criterion of 2500 grams (USDHEW, 1979; Meyer, 1978). In contrast, the risk of low birth weight babies is increased 53% for light-smoking mothers and 130% for mothers who smoke one pack per day or more (Meyer, Jonas, and Tonascia,

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1976). Heavier birth weights are associated with increased infant survival and improved health.

(2) Decreased complications of pregnancy. Maternal nonsmoking is associated with fewer complications of pregnancy. Maternal nonsmoking is associated with 31% fewer spontaneous abortions (USDHHS, 1980). Research has indicated that these abortions are due to cigarette-caused complications of pregnancy rather than to abnormalities in the fetus. Nonsmoking is associated with reduced mortality from immaturity, asphyxia, and respiratory distress syndrome. Nonsmoking is associated with fewer complications of labor and delivery such as bleeding during pregnancy, premature rupture of the membranes, and placental abruptions -- complications which carry an attendant high risk for fetal or neonatal loss (USDHHS, 1980). Nonsmoking is also associated with fewer preterm deliveries. Thus, nonsmoking among pregnant mothers should decrease the risks for fetal deaths from anoxia during the 20th to 38th weeks of gestation and decrease the risks for neonatal deaths due to preterm delivery.

(3) Promotion of infant growth and health. In the first year of life, nonsmoking in the home environment can be expected to promote infant growth and health. The rate of physical growth, assessed by both weight and height measures for specified dates, is more rapid in infants born to nonsmoking mothers. A recent review of data on the effects of passive smoking (USDHHS, 1984) indicates that bronchitis, pneumonia, and other lower respiratory illnesses occur with significantly greater frequency in children with one or two smoking parents.

(4) Possible reduction in the occurrence of Sudden Infant Death Syndrome (SIDS). Nonsmoking is associated with reduced risk for SIDS. The risk for children born to nonsmoking mothers is about one-fourth the risk for children of smoking mothers. Although socioeconomic and environmental factors may partially account for this association, between 60% and 70% of SIDS deaths occur within families where the mother smokes (Peterson, 1981; USDHHS, 1980).

(5) Increased infant survival. The chances of surviving the first 30 days of life are calculated to be 967/1000 for children of mothers who are heavy smokers, 974/1000 for children of light smokers, and 976/1000 for children of nonsmokers (Meyer, Jonas, and Tonascia, 1976).

(6) Enhanced intellectual and behavioral functioning. Using the Brazelton Behavioral Assessment Scale, children of nonsmoking mothers were distinguished by improved performance on the auditory components, improved self control, decreased irritability, and increased orientation. It is unclear whether this is a direct effect or one mediated by other factors (Saxton, 1978).

A note of caution is in order. Particularly in discussions of potential benefits of nonsmoking in the fetal, infant, and childhood stages, it is important to note that cigarette smoking rates are higher among mothers and families of lower socioeconomic status. These families have higher rates of pregnancy complications and childhood illnesses, in part related to relatively poorer nutritional, hygienic, and child care practices. The associations of cigarette smoking with higher rates of childhood disease

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and childhood mortality are partially confounded by this cluster of lifestyle practices among lower socioeconomic families which are also related to poorer infant and child health.

LIFESPAN II: CHILDHOOD (AGES 1-10)

Elimination of the consequences of chronic passive smoke exposure by providing a smoke-free home environment is the major nonsmoking goal for the childhood years (Lefcoe, et al., 1983). Nonsmoking parental and sibling models during the years when the child first learns about cigarette smoking and consistent information about the health hazards of smoking are factors in the childhood period which deter later experimentation with cigarettes. The expected benefits of nonsmoking for children include the following:

(1) Elimination of the health consequences of passive smoking in childhood. Studies of 3600 children over a five-year period, half with mothers who smoked and half with mothers who did not smoke, showed a 70% greater chance of being hospitalized for a respiratory illness among children of mothers who smoked (Rantakallio, 1978). Parental nonsmoking is associated with improved pulmonary function and with larger annual increases in standard measures of lung function (USDHHS, 1984). Recent studies by Tager et al. (1983) of 1156 children followed for seven years showed reduced rates of annual increase in one-second forced expiratory volume (FEV1) for children whose mothers smoked. This represents a 3-5% decrease in expected lung growth. While these decrements in function are small, the concern raised by these findings is that "sensitization" to smoke early in life may lead to more rapid decline in lung function in these individuals later in life (USDHHS, 1984).

(2) Possible decreases in childhood mortality. Nonsmoking is associated with decreased mortality rates, rates which are about one-third of the rates for children of smoking parents (Rantakallio, 1983). This association reflects not only the effects of parental smoking but also the multiple contributions of differences in socioeconomic status, child care practices, and hygienic and nutritional behaviors.

(3) Improved child health. Largely as a result of the elimination of the health hazard of passive smoke exposure, nonsmoking is a marker for improved child health. The nonsmoking environment is clearly health enhancing. Children living in nonsmoking households experience fewer hospitalizations for bronchitis and pneumonia, shorter lengths of stay during hospitalizations, fewer physician visits, fewer respiratory disease events, and possibly fewer childhood cancers during ages one to ten compared to children living with parents who smoke (Rantakallio, 1983). Children in nonsmoking home environments have fewer occurrences of respiratory symptoms such as coughing, wheezing, and asthma.

(4) Accelerated physical and intellectual growth. Children of nonsmoking parents are, on the average, one centimeter taller than children of smoking parents during middle-grade-school years. These children are also three to five months advanced in reading, mathematics, and general ability scales on standard developmental testing instruments (Butler and Goldstein, 1973; Davie, Butler, and Goldstein, 1972). Again, intellectual functioning

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differences may also reflect sociological differences in families with parental smoking compared to nonsmoking families in the composite.

(5) Increased knowledge of smoking health risks and decreased acceptance of the smoking habit by children in nonsmoking households. Parental nonsmoking is related to the following characteristics in young children: (a) increased depth of knowledge about the health consequences of smoking; (b) relatively negative attitudes toward smoking (compared to children of parents who smoke); and (c) less acceptance of the smoking habit as normal adult behavior. Some first smoking experiences occur by age ten. These occurrences are less frequent among children of nonsmoking parents.

LIFESPAN III: ADOLESCENCE (AGES 11-20)

Adolescence is a time of transition. It is the time of first experimentation with cigarettes and the period during which regular smoking habits are formed. Because initiation and eventual adoption of the smoking habit occur during this part of the lifespan, primary prevention of smoking onset is central to the promotion of nonsmoking.

Benefits likely to accrue from successful primary prevention efforts which effectively decrease smoking onset rates among adolescents include: (1) improved physical health throughout adolescence, (2) elimination of the acute symptoms of cigarette smoking including acute respiratory tract infections, and (3) decreased long-term health risks for chronic disease,

(1) Improved physical health. Nonsmoking among adolescents is expected to provide immediate dividends in terms of physical health status. The health consequences of passive smoking continue among adolescents living in smoking households. However, the major health consequences are associated with the adoption of the cigarette habit by the individual. Exposure to second-hand smoke from parents and direct exposure from primary smoking by the adolescent make independent contributions to decreasing pulmonary function (Tager et al., 1979). Nonsmoking is associated with fewer respiratory infections in adolescents who do not smoke and with improved lung function which is related to maximal athletic potential.

(2) Elimination of the acute symptoms of cigarette smoking. Nonsmoking adolescents avoid the multiple acute effects of direct tobacco smoke exposure -- irritation of the eyes and mucous membranes and respiratory symptoms including morning cough, chronic cough, phlegm production, and shortness of breath (Rush, 1974, 1976; USDHHS, 1984). Short-term cigarette smoking is associated with dysfunctions of the small airways and obstruction of the airflow as indicated by performance on pulmonary function tests (USDHHS, 1984). Nonsmokers show little evidence of these symptoms and the incidence of respiratory tract infections is diminished. Nonsmokers enjoy improved lung function and lung development during the adolescent period.

(3) Decreased long-term health risks for chronic disease. Chronic diseases -- notably the smoking-linked cancers, cardiovascular diseases, and chronic obstructive lung disease -- develop over several decades. Cigarette smoking accelerates the process of atherosclerosis which underlies later heart disease. Early stages of atherosclerosis are detectable in the

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coronary vessels of adolescents. Similarly, the pathological changes due to exposure to tobacco smoke which lead to cancers and chronic obstructive lung disease in late adult life begin shortly after the onset of regular smoking in adolescence. The frequency of chronic disease is related to the lifetime duration of cigarette smoking (USDHEW, 1979). Delaying the onset of smoking will diminish the frequency of chronic diseases; successful prevention of smoking onset will greatly reduce smoking-related diseases.

(4) Positive behavioral and social correlates of nonsmoking. A number of positive behavioral and psychological attributes are associated with nonsmoking. Relative to adolescents who smoke, nonsmokers frequently engage in multiple health-enhancing behaviors, including regular exercise and sound nutritional practices. Nonsmokers are more active in socially-sanctioned organizations, clubs, and activities. As a group, nonsmokers have greater social competence, less anxiety, higher self esteem, less rebelliousness, higher levels of academic performance, and higher levels of aspiration for college and career goals. Nonsmokers are less likely to engage in experimentation with alcohol and illicit drugs (Rooney and Wright, 1982; NIDA, 1982). Successful primary prevention programs, as outlined above, should not only decrease rates of adolescent cigarette smoking but could help to shift adolescents toward positive self appraisal and expand their repertoire of health-enhancing behaviors.

LIFESPAN IV: YOUNG ADULTHOOD (AGES 21-40)

Young adulthood is a time of entrance into vocations and careers. The benefits of nonsmoking include a number of occupational considerations: (1) nonsmoking at the worksite eliminates the health consequences of passive smoke exposure, (2) nonsmoking decreases the incidence and severity of smoking-related diseases which are also linked to occupational exposures, (3) nonsmoking decreases the costs incurred by industry for excessive medical care and lost time experienced by smoking employees, and (4) nonsmoking can be expected to increase lifetime income and productivity.

Although excessive illness among smokers extends throughout the lifetime, smoking-related acute illness and disability are significant even during the young adult years.

In addition to the issues of occupational considerations and excessive acute illness, young adulthood also marks a period where smoking patterns are established and reinforced by the addictive properties of tobacco smoke constituents (USDHHS, 1980). The focus of intervention shifts from primary prevention to smoking cessation strategies.

Expected benefits of the promotion of nonsmoking among young adults include the following:

A. Occupational Considerations

(1) Elimination of the health consequences of worksite passive smoking. Nonsmoking can be expected to improve the quality and healthfulness of the worksite environment for nonsmokers currently exposed to second-hand smoke.

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Nonsmoking in work environments will decrease symptoms of acute, involuntary exposure to tobacco smoke -- eye irritation, headache, nasal symptoms, cough, and lower respiratory tract infections (Lefcoe et al., 1983; USDHHS, 1984). Elimination of passive smoke exposure should improve small airways function. White and Froeb (1980) found a loss of lung function among nonsmokers chronically exposed to second-hand smoke at work equivalent to that observed among smokers of one to ten cigarettes per day. Nonsmoking at the worksite may also result in fewer symptoms among nonsmoking employees with asthma, respiratory allergies, and chronic pulmonary diseases (USDHHS, 1984).

(2) Decreased number and severity of diseases jointly related to smoking and occupational exposure. Nonsmoking at the worksite should decrease the incidence and severity of diseases related both to smoking and to specific occupational exposures. For example, nonsmoking should reduce the respiratory symptoms and diseases among workers engaged in coal mining, foundry work, flax production, and the manufacture and handling of asbestos (USDHEW, 1979). Certain occupationally-related cancers should be reduced. For example, Hammond, Selikoff, and Seidman (1973) found that the joint probability of getting lung cancer among persons who were both smokers and were occupationally exposed to asbestos was 92 times the risk to persons who were neither smokers nor exposed to asbestos. Long-term health consequences, including lung cancer, should diminish if nonsmoking policies are implemented among workers exposed to arsenic, hematite, isopropyl oil, beryllium, copper, uranium, chromate, and nickel. Reduced exposure to dangerous materials is of primary importance in such industries. There is no doubt, however, that nonsmoking reduces risks, both for those now exposed and for those exposed in the past; and the health benefits to be achieved are particularly great in industries where smoking and hazardous materials have synergistic effects.

(3) Decreased industry costs. Nonsmoking is associated with increased productivity in occupational settings and with decreased costs per employee. Estimates of the excess costs to employers for employees who smoke have ranged from several hundred to several thousand dollars per smoking employee per year (Kristein, 1983; Weis, 1981). A detailed discussion of this issue is contained in the "Economic Costs of Smoking in Minnesota" section of this report.

(4) Increased lifetime productivity and lifetime income. Nonsmokers have lower rates of lifetime illness, lower rates of uncompensated sick time, fewer and shorter periods of disability, and lower rates of premature death during the wage-earning years. The positive legacy of nonsmoking -- improved health and longevity during the working years -- translates directly to increased productivity and increased disposable income over the lifetime.

B. Nonsmoking and Decreases in Illness During Young Adulthood

(5) Decreased frequency of early chronic conditions. Nonsmoking is related to decreased frequencies of chronic respiratory infections and peptic ulcer disease which may be manifested before age 40 (USDHEW, 1979; USDHHS, 1984).

(6) Decreased frequency of acute respiratory tract infections, influenza, and pulmonary function abnormalities. Smoking is related to respiratory tract infections and influenza (Aronson et al., 1982; Kark and Lebiush, 1981). Beginning several years after the initiation of regular smoking, smokers suffer from inflammatory changes in the small airways leading to obstruction of the airways which can be detected on lung function tests. The prevalence of airflow abnormalities is dose-related; small airways dysfunction increases with age, duration of smoking, and numbers of cigarettes smoked per day (USDHHS, 1984). Initial differences between smokers and nonsmokers are observable in young adulthood.

(7) Reductions in illness disability. Nonsmoking can be expected to reduce illness disability as evidenced by fewer worker days lost, fewer days of bed disability, and fewer days of limited activity. Each of these illness indicators is higher among smokers (USDHEW, 1979).

(8) Reduction in inpatient hospitalization. Nonsmoking is related to decreased rates of inpatient hospitalization for acute respiratory conditions and for chronic diseases related to smoking (USDHEW, 1979; Vogt, 1983). Nonsmoking may also decrease rates of physician office visits and annual medical expenses.

(9) Decreased complications of pregnancy. Discussed previously under Lifespan I, this issue is also relevant to the health of women of childbearing age in the young-adult period. Nonsmoking is associated with fewer complications of pregnancy, fewer preterm births, and fewer spontaneous abortions -- conditions which impinge upon both maternal and fetal health (USDHHS, 1980).

(10) Decreased aggravation of allergies and asthma. Nonsmoking should decrease incidents of exacerbation of allergic conditions and asthma which are related both to primary smoking and to passive smoking (USDHHS, 1984).

(11) Improved self appraisal of health status. In surveys, more nonsmokers than smokers self-report their health status to be "excellent" (National Health Interview Survey, 1974).

LIFESPAN V: MATURE ADULTHOOD (AGES 41 - ADVANCED AGE)

In mature adulthood, severe disease outcomes of lifetime smoking occur. The major nonsmoking issues in the mature-adulthood era are: (1) the prevention of premature death from smoking-related diseases and (2) the reversal of physiological damage and high chronic disease risks by achieving smoking cessation and promoting other healthful lifestyle patterns. The benefits of nonsmoking in mature adulthood are: (1) reductions in rates of premature mortality from smoking-related diseases, (2) reductions in lifetime illness and disability (a continuation of the benefits discussed for young adults), and (3) reductions in the direct medical costs of excess smoking-related illness and in indirect costs of lost income and productivity.

Estimates of Minnesota smoking-attributable mortality and morbidity and Minnesota smoking-related direct and indirect economic costs are presented

THE HEALTH BENEFITS OF NONSMOKING: A LIFESPAN APPROACH

in two separate sections of this report. Highlights of the benefits of nonsmoking related to these issues will be enumerated here.

(1) Decreased all-causes mortality. Cigarette smoking is a potent risk factor for the major causes of death in the United States -- heart disease, cancer, and chronic obstructive lung disease. Societal nonsmoking can be expected to eliminate much of the 70% excess of deaths from all causes before age 75 among males who smoke (USDHEW, 1979). Nonsmoking should have the effect of increasing life expectancy (Schuman, 1971). Decreases in life expectancy are dose-related to cigarette smoking. For example, a 35-year-old two-pack-a-day smoker has a diminished life expectancy of eight to nine years compared to his nonsmoking peer. The savings of healthful years of life among the third of the population that currently smokes could potentially lengthen the average life expectancy of the entire population by about two years.

Cigarette smokers who quit experience a progressive decrease in risk of premature death. Persons who have quit from 1-14 years before have risks of dying which are intermediate between current smokers and lifetime nonsmokers and which diminish with numbers of years of cessation. After 15 years of nonsmoking, a former smoker's risk of dying is essentially identical to that of a lifetime nonsmoker (Rogot, 1974).

(2) Decreased mortality and disability from heart disease. The Surgeon General has estimated that cigarette smoking is responsible for 170,000 deaths from coronary heart disease annually (USDHHS, 1983). Nonsmoking would prevent many of these premature deaths from myocardial infarction and sudden cardiac death. Nonsmoking would also decrease deaths from other smoking-related cardiovascular diseases including aortic aneurysm, peripheral vascular disease, and certain forms of stroke (occurring prior to age 65). Cigarette smoking is related to the extent and severity of atherosclerosis -- the process of damage and blockage of the blood vessels which leads to clinical heart disease. Nonsmoking would be expected to decrease the atherosclerotic substrate in the population.

Cigarette smoking is also strongly and causally linked to nonfatal heart disease. Nonsmoking would decrease the incidence of myocardial infarction and the prolonged period of disability and intensive rehabilitation which accompanies heart attack. Furthermore, in persons who have experienced a first myocardial infarction, smoking cessation markedly decreases the probability of recurrent heart attacks (USDHHS, 1983).

(3) Decreased mortality from smoking-related cancers. The Surgeon General has estimated that 130,000 excess cancer deaths are attributable to cigarette smoking each year (USDHHS, 1982). Cigarette smoking has such importance as a risk factor for various forms of cancer that societal nonsmoking would eliminate up to one-half of cancers now experienced by male smokers and up to one-third of all cancers now experienced by female smokers (USDHHS, 1982). For Minnesota, using the methodology of Doll and Peto (1981), it is estimated that 24.35% of all cancers are smoking attributable.

Among cancers, lung cancer accounts for the majority of smoking-related deaths. Nonsmoking could reduce lung cancer cases by up to 85%. The lung cancer mortality rate has been steadily rising among males throughout this

THE HEALTH BENEFITS OF NONSMOKING: A LIFESPAN APPROACH

century and is only recently beginning to plateau as large numbers of male smokers are quitting the habit. The lung cancer mortality rate for women is rising with a steep slope and is overtaking breast cancer as the number one fatal cancer of American women. Higher smoking rates among younger females will mean continuing increases in lung cancer rates for women.

Nonsmoking would eliminate almost all death from cancers of the lip, oral cavity, and larynx for which tobacco smoke exposure is the predominant risk factor. A substantial reduction in cases of esophageal, pancreatic, kidney, and bladder cancers would be the outcome of widespread smoking cessation. Cancers of the stomach and uterine cervix bear a strong association to cigarette smoking, although a causal relationship is unproved. Some reductions in deaths from these cancers would probably be observed in a nonsmoking society.

(4) Decreased mortality and morbidity from respiratory diseases. The Surgeon General has conservatively estimated that 50,000 deaths from emphysema and chronic bronchitis or chronic obstructive lung disease are attributable to cigarette smoking on an annual basis (USDHHS, 1984). Many other individuals die after years of disability from chronic obstructive lung disease, but the death certificates do not list chronic obstructive lung disease as the primary cause of death. The Surgeon General states, "Cigarette smoking is the major cause of chronic obstructive lung disease in the United States for both men and women. The contribution of smoking to chronic obstructive lung disease morbidity and mortality far outweighs all other factors" (USDHHS, 1984).

Nonsmoking would eliminate the 80-90% of chronic obstructive lung disease morbidity and mortality which is attributable to smoking. Not only would the severe endpoints of respiratory disease -- emphysema, chronic bronchitis, chronic obstructive lung disease -- be greatly diminished but lifetime incidence of acute respiratory tract infections would be decreased. Smoking is related to excess pulmonary tuberculosis, pneumonia, and influenza (Doll, 1984). Nonsmoking would decrease the widespread decrements in lung function and the common findings of airflow obstruction among current smokers. Encouragingly, smoking cessation can lead to reversal of some of the inflammatory processes in the small airways of smokers who quit after several years of smoking. Even among long-term smokers, smoking cessation decreases the mortality rate from chronic obstructive lung disease compared to continuing smokers (USDHHS, 1984).

(5) Decreased mortality and morbidity from other smoking-related causes. Nonsmoking would be expected to decrease lifetime disability and mortality from peptic and gastric ulcers and to decrease the severity of cirrhotic liver disease (Doll, 1984). Nonsmoking may also decrease cancers of the liver and gall bladder.

Importantly, cigarette-ignited fire deaths and severe burns would be eliminated. Among one- and two-fatality fires, 35.5% are ignited by burning cigarettes (Fire Almanac, 1983). Among all residential fires, cigarettes were the fourth leading cause of ignition but the number one cause of both deaths and burn injuries. Approximately 1500 cigarette-ignited fire deaths occur annually, including 20-35 in Minnesota alone.

THE HEALTH BENEFITS OF NONSMOKING: A LIFESPAN APPROACH

(6) Decreased direct health care costs. Based on 1980 dollar figures, Rice and Hodgson (1983) have estimated that total personal health care expenditures (hospital costs, physician fees, ancillary services) attributable to smoking were \$16.1 billion nationally. Nonsmoking would greatly decrease this cost. A detailed discussion of direct cost calculations and specific Minnesota estimates are presented in a separate chapter of this report.

(7) Decreased indirect costs of lost income and productivity. Calculations have also been made of the costs of lost output from smokers who die prematurely from smoking-related diseases during their working years and lifetime higher rates of absenteeism, illness, and major disability among smokers. The 1980 estimate of indirect costs was \$19.2 billion from premature mortality and \$6.9 billion from lifetime morbidity, a total of \$26.1 billion (Rice and Hodgson, 1983). Together with direct medical costs, the economic cost of excess smoking-attributable illness and death in the United States in 1980 was estimated to be \$42.2 billion.

SUMMARY

Nonsmoking has potential benefits in each of the five lifespan eras. Large gains in measurable indicators of health would be achieved by increased nonsmoking. These benefits would be achieved at all ages and in both sexes. Smokers who quit would derive the greatest benefit, but nonsmokers would share in economic savings as well as in the reduction in passive smoking effects. As in most epidemiologic calculations, only the more objective benefits are presented. Gains in human happiness and well being are difficult to study but would be of equally great importance.

PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Nonsmoking has been normative behavior throughout human history. In Minnesota, 7 of 10 adults are nonsmokers according to a 1981 risk factor survey conducted by the Minnesota Department of Health (MDH, 1983). In the United States as well, 7 of 10 adults do not smoke according to a recently released survey conducted by the Gallup organization for the American Cancer Society (Gallup Poll, 1984).

Cigarette smoking as a mass phenomenon is truly time bound to the 20th century. Nonsmoking has been the norm throughout human history; cigarette smoking represents a very recent aberration in human behavior. Historically, tobacco was introduced to Europeans just over 400 years ago (USDHEW, 1979) and expanded into an economic enterprise during the 1600s. The cigarette was not introduced until the late 1800s; tobacco chewing was more common than cigarette smoking during the first decade of this century. Widespread adoption of cigarette smoking among men occurred after World War I, and common usage in women dates only from the World War II era. Despite the advertising image of cigarette smoking as a mature adult "custom," cigarette smoking is a very recent insertion into the lifestyle. The Marlboro Man is a mid 20th century fabrication, not a contemporary of the cowboys of the Old West.

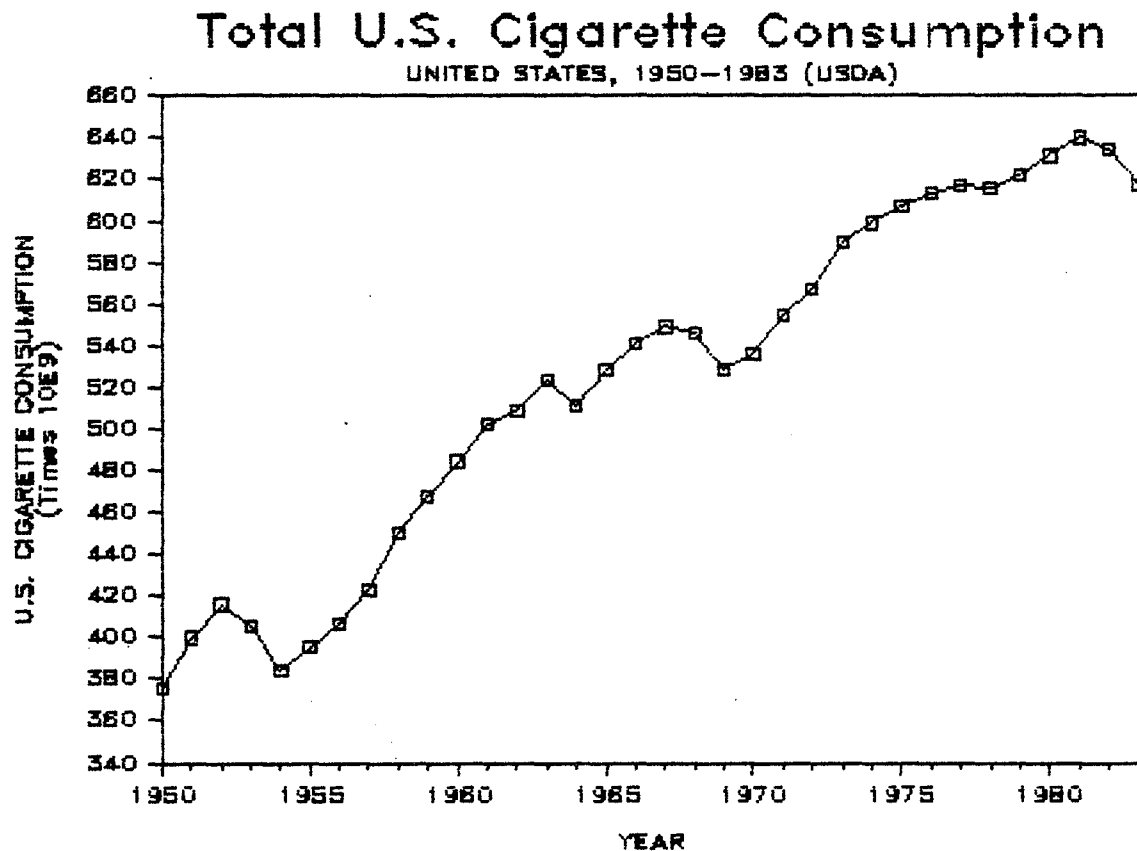
To provide perspective on the smoking situation in Minnesota, this analysis will examine available information on cigarette smoking behavior in the United States and Minnesota. Commonly used measures of cigarette smoking are: (1) total cigarette consumption, (2) per capita cigarette consumption, (3) cigarette smoking prevalence rates, (4) longitudinal smoking patterns by decade of birth, (5) smoking rates by age, (6) "ever smokers" by age, (7) nonsmokers by age, (8) smoking rates by level of education, (9) smoking rates by employment status, and (10) smoking rates by occupational category. A second section on dose-response measures of smoking briefly discusses the concept of dose response and contains discussions of: (1) numbers of cigarettes smoked, (2) age of onset, and (3) trends in the use of filtertip cigarettes.

MEASURES OF CIGARETTE SMOKING RATES: UNITED STATES AND MINNESOTA

Total Cigarette Consumption

United States. A coarse estimate of the national tobacco habit is provided by examination of total U.S. cigarette consumption. As indicated in Figure 1, total U.S. cigarette consumption has increased steadily since 1950 when 375.8 billion cigarettes were sold (Grise, 1983). This is due to population increases since per capita consumption has declined. The upward trend appears to be plateauing in the early 1980s. Total U.S. consumption for 1982 was 634.0 billion cigarettes (USDA, 1983). Estimated total 1983 consumption was 617 billion cigarettes.

FIGURE 1

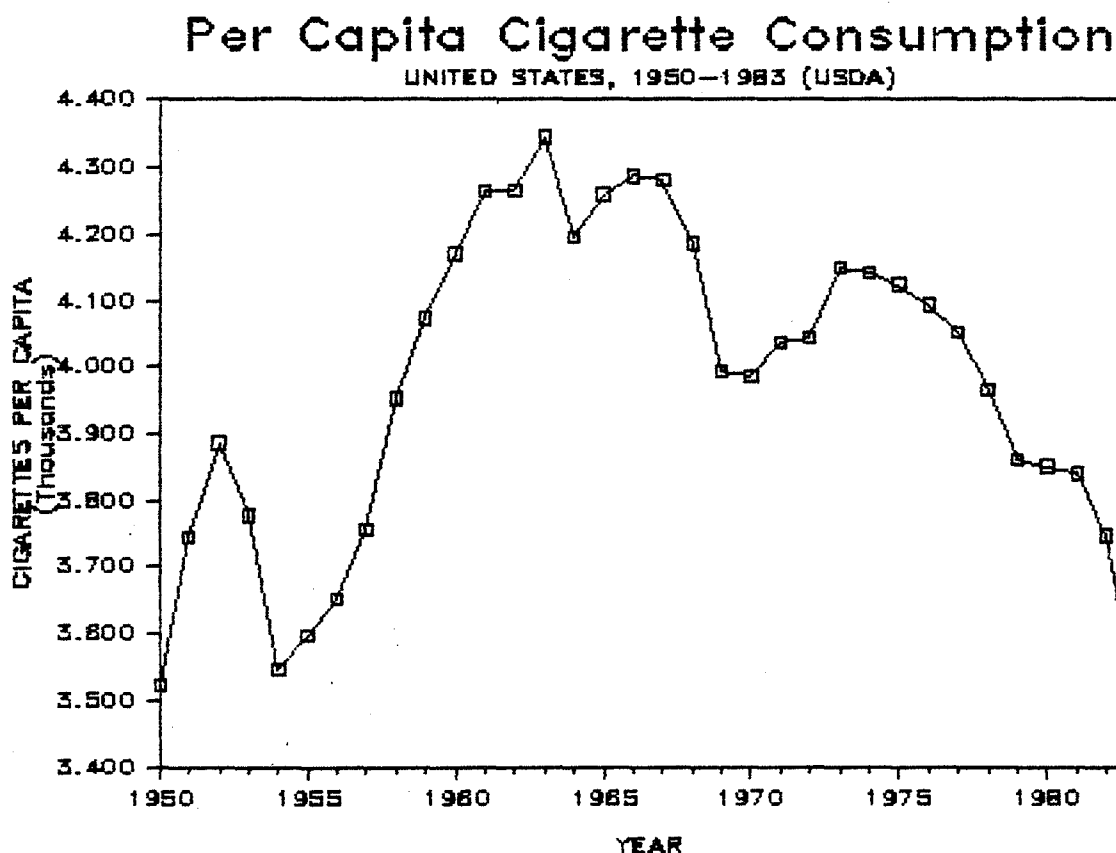


PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Per Capita Cigarette Consumption

United States. Time trends in per capita cigarette consumption for the period 1950-1984 are presented in Figure 2. Per capita consumption peaked in 1963 at 4336 cigarettes per adult (ages 18 and over). Patterns of per capita consumption have been analyzed as an indicator of the effectiveness of the total "antismoking campaign" (Warner, 1977). A sharp decrease in per capita consumption occurred in 1964 following the release of the landmark Surgeon General's report (Grise, 1983). A resurgence in per capita smoking rates occurred for the next three years. A second steep decline from 1968-1970 coincided with public service counter-advertising mandated by the Banzhaf Decision (the so-called "fairness doctrine"). The complete ban on television advertising of cigarettes in 1970 also ended the major share of counter advertising. Another resurgence of national per capita rates occurred in the early 1970s. Thereafter, annual declines in per capita consumption have occurred in all years since 1975. The 6.7% decline from 1982 (3746) to 1983 (3494) was particularly steep.

FIGURE 2



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Cigarette Smoking Prevalence Rates

United States. Cigarette smoking was virtually nonexistent in 1900. Rapid adoption of the habit occurred among men after World War I. Male cigarette smoking prevalence increased steadily during the 1920s and 1930s and continued to increase more gradually during the 1940s and early 1950s, peaking at between 60% and 70% of the male population nationally in the late 1950s (USDHHS, 1980). Male smoking rates experienced a remarkably steep decline during the decade of the 1960s -- a decline which continued throughout the 1970s to bring current male rates to the range of 31% according to recent Gallup polls (Gallup Poll, 1984).

For women, an upsurge in smoking rates appeared during the 1940s and continued into the 1960s. The later peak and the more gradual slope of declining rates since the early 1960s for women has nearly equalized male and female smoking rates. Declining males and female rates stayed parallel through the 1970s, with male rates about three percentage points above female rates. National rates for females have been recently reported at 28% (Gallup Poll, 1984).

Minnesota. Based on 1981 prevalence data, it was estimated that about 841,000 Minnesotans over age 18 were current smokers. The estimate for adolescent smokers (self-reporting daily use of cigarettes) was 81,000 for 14-18-year-old youth. These data are presented by sex in Table 1.

TABLE 1 -- Minnesota Smokers (1980 Population Data)

Age Group	Population	Percent of Current Smokers	Est Number of Current Smokers
Males:			
18	1,357,850	31.7	430,440
17-18	81,540	23.1	18,835
15-16	78,960	17.1	13,500
14	35,600	8.9	3,170
SUBTOTAL:			465,945
Females:			
18	1,465,800	28.0	410,425
17-18	80,130	29.9	23,955
15-16	74,780	23.0	17,200
14	34,370	14.1	4,845
SUBTOTAL:			456,425
Totals:			
18	2,823,650		840,860
17-18	161,670		42,795
15-16	153,740		30,700
14	69,970		8,015
GRAND TOTAL:			922,370

PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Minnesota Poll data on smoking rates in the state, compared to national smoking rate data reported in a series of Gallup Polls, displays generally lower smoking rates for Minnesota over the four decades from 1944 to the present (Figure 3). Minnesota males followed national trends, with high smoking prevalence rates in the 1950s and generally declining rates during the 1960s and 1970s (Figure 4).

FIGURE 3

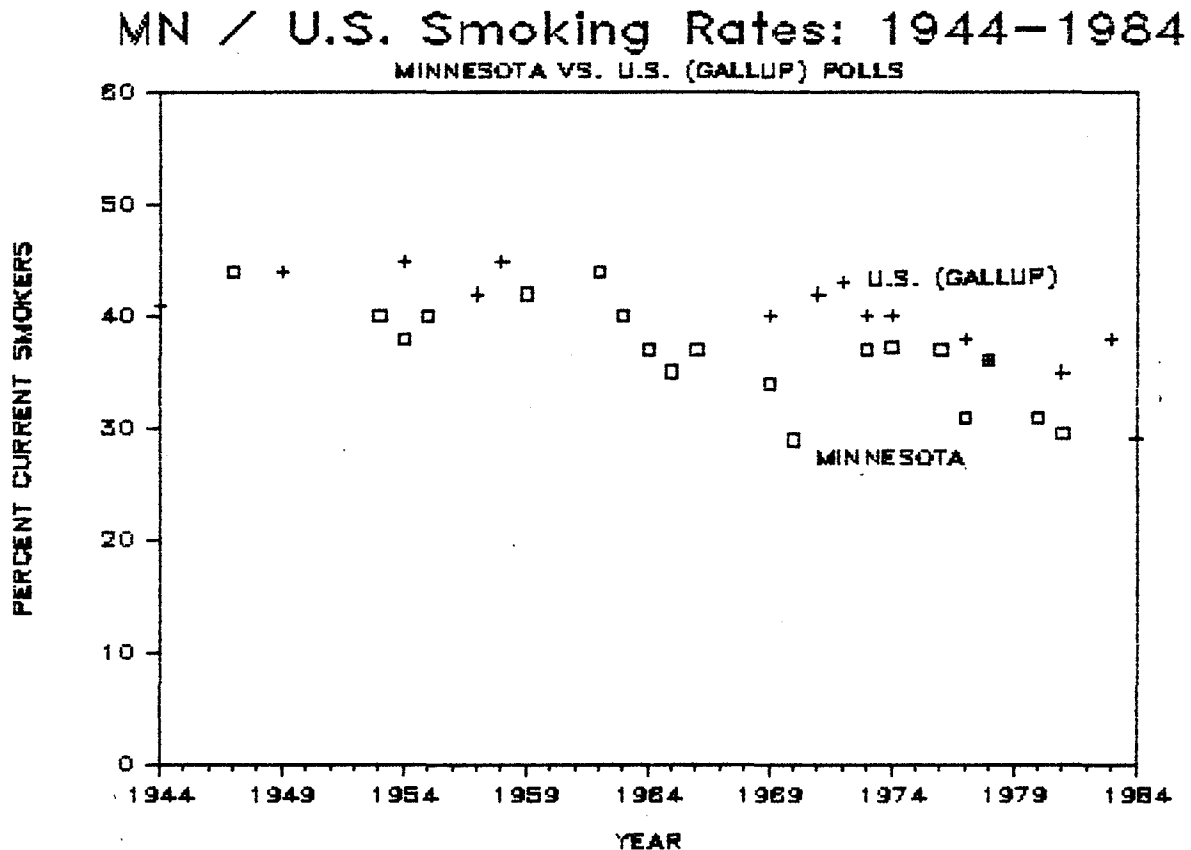
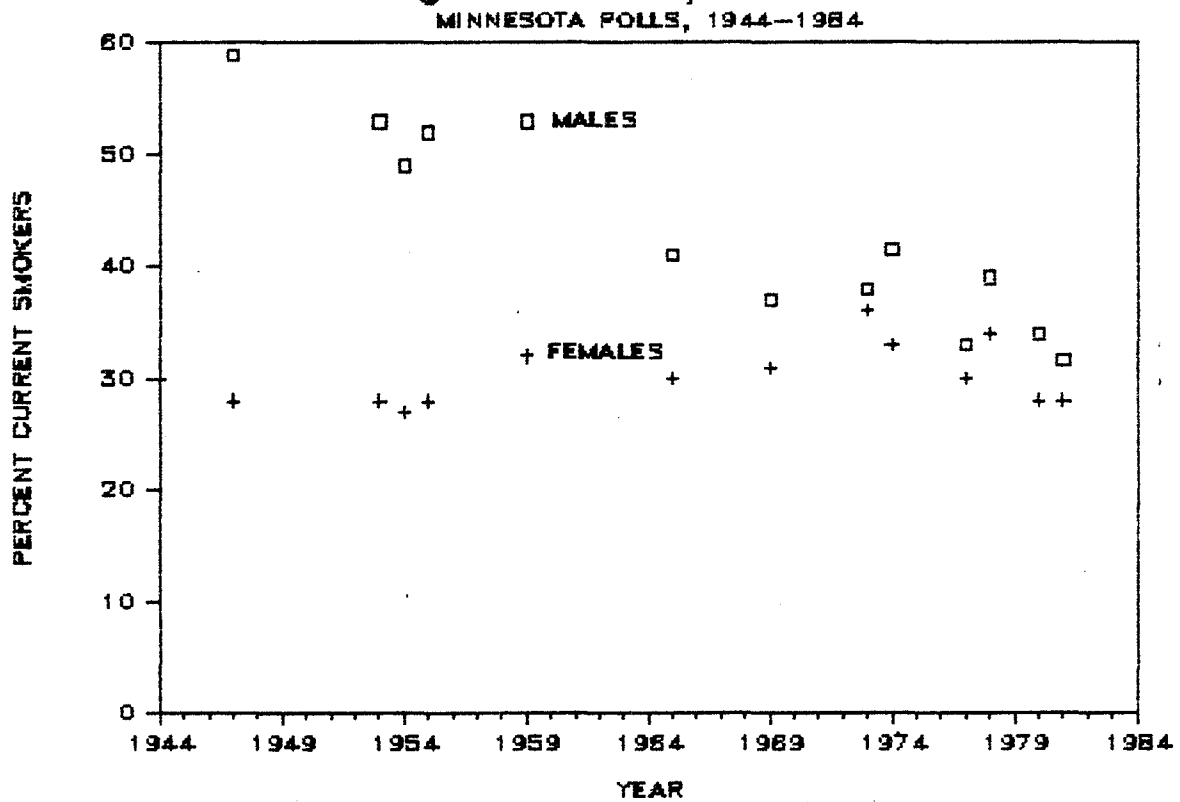


FIGURE 4

MN Smoking Rates by Sex: 1944-1984



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

In Minnesota, male cigarette smoking was reported at 59% in a single poll in 1947. Male rates were 53% in 1959, 41% in 1965, and below 40% thereafter. The recent Minnesota Risk Factor Prevalence Survey indicated that 31.7% of adult males aged 18 and over were current smokers in 1981 (MDH, 1983) (Figure 5). In 1981, 68.3% of Minnesota males were nonsmokers (Figure 6).

FIGURE 5

Smoking Status: Males MINNESOTA, 1981

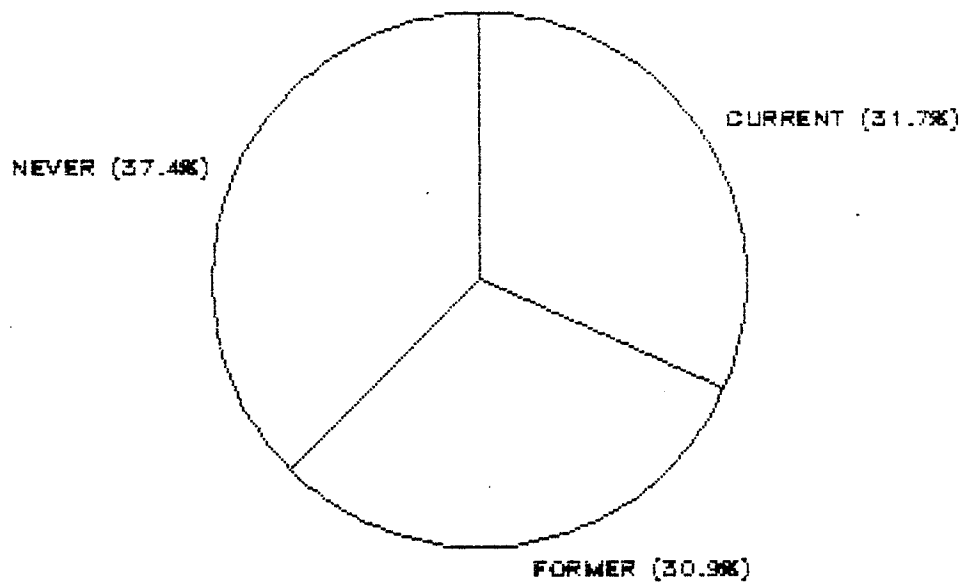
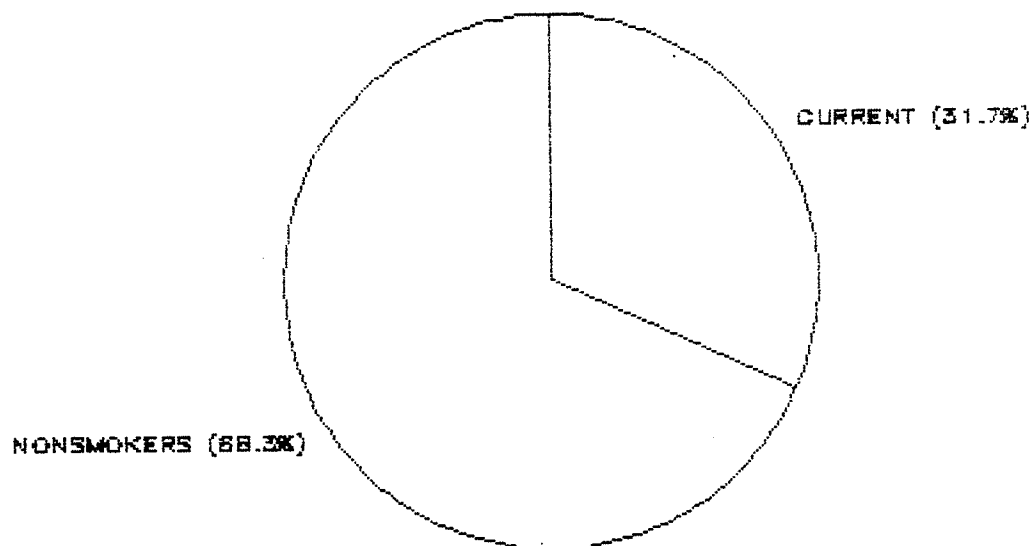


FIGURE 6

Nonsmoking in Minnesota: Males
MINNESOTA, 1981



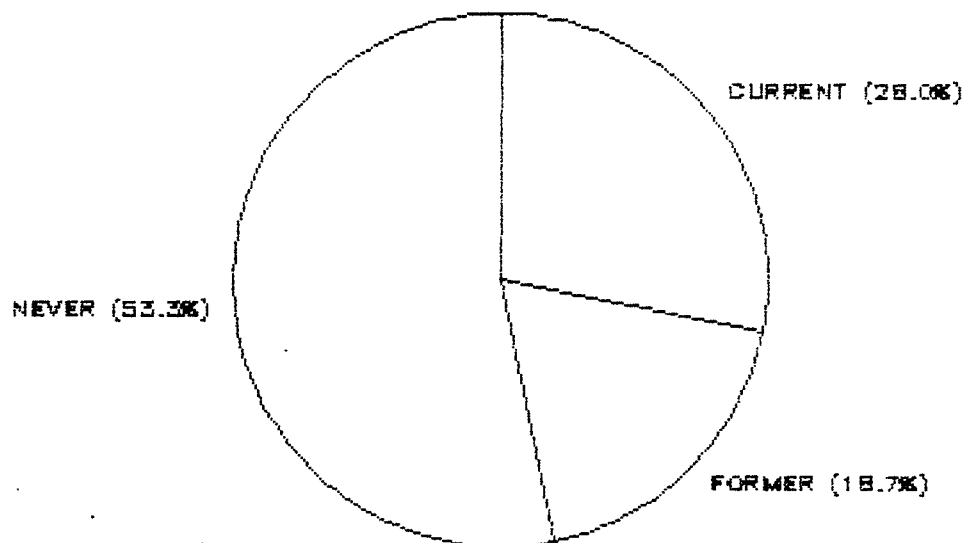
PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Minnesota Poll data does not show a marked peak in female smoking rates. Minnesota females display a relatively stable smoking prevalence rate from the 1940s to 1981, hovering close to 30% (27% to 36%) throughout this time span. This pattern contrasts with the steady increases in national female prevalence rates into the 1960s followed by a marked decline. The prevalence survey found a smoking prevalence rate of 28.0% for females in 1981 (Figure 7). In this cross-sectional survey of women aged 18 to 85, more than half of the women reported themselves to be "never" nonsmokers and 72% were nonsmokers in 1981 (Figure 8).

FIGURE 7

Smoking Status: Females

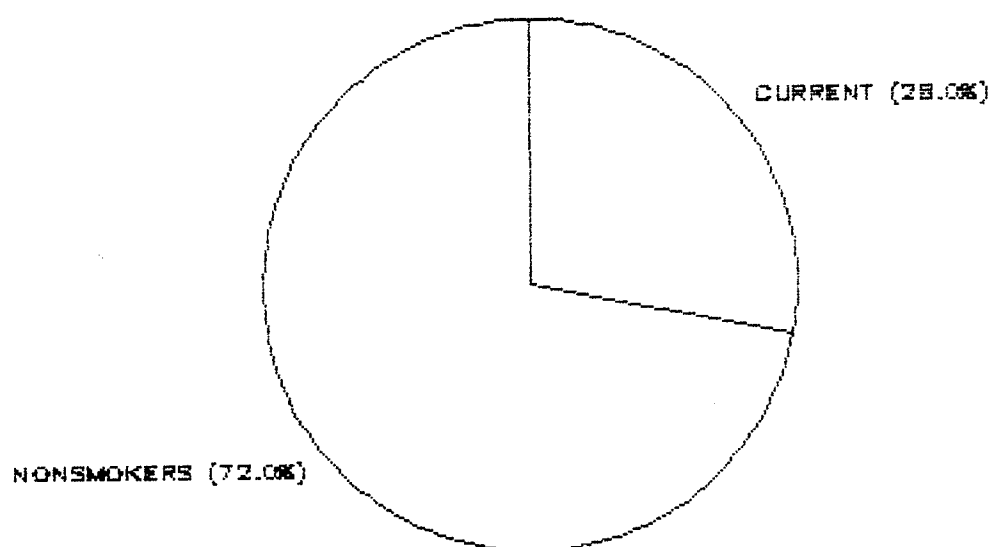
MINNESOTA, 1981



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

FIGURE 8

Nonsmoking in Minnesota: Females
MINNESOTA, 1961

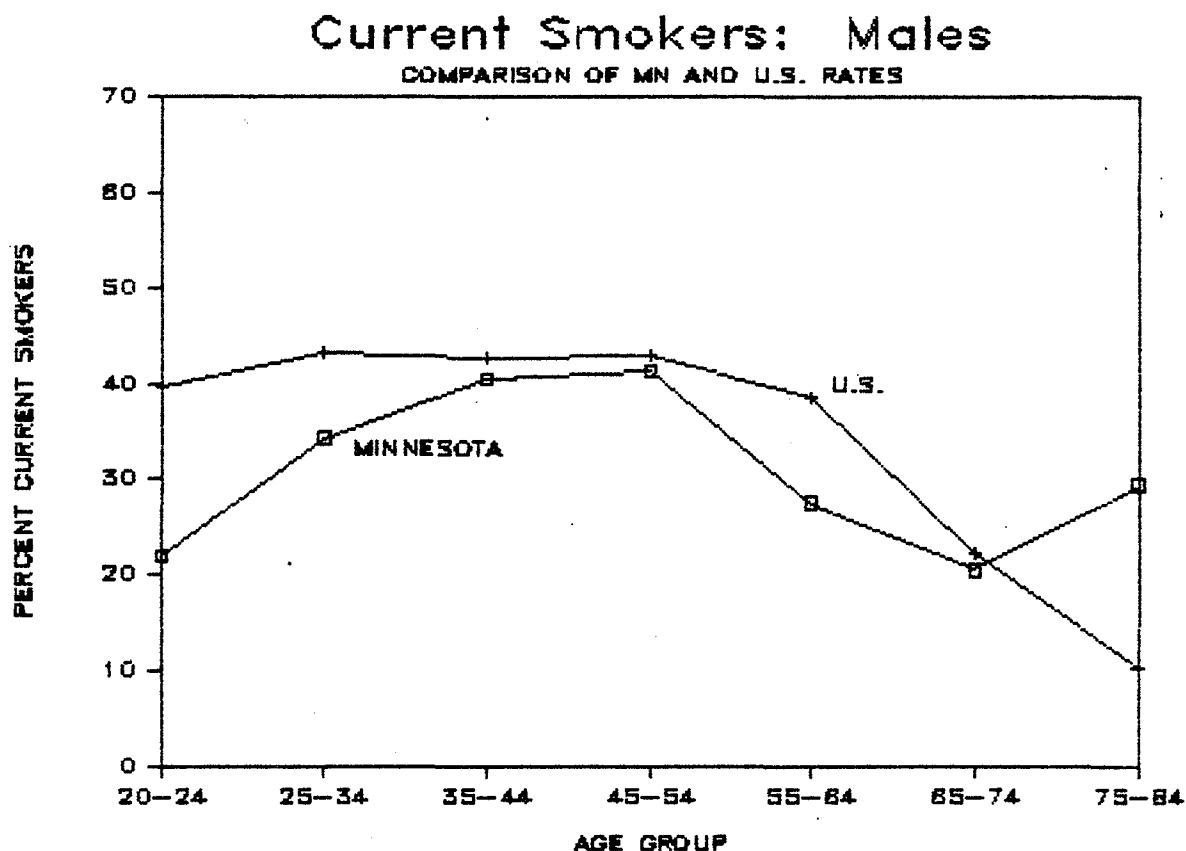


PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Within the limits of accuracy of the Minnesota Poll survey methods, it appears that a lower percentage of Minnesotans have smoked during the last 40 years compared with the U.S. population. This statement is corroborated by comparisons of smoking rates in the 1981 Minnesota Risk Factor Prevalence Survey (32.3% male and 27.7% female current smokers aged 20 and over) with the higher national rates from the 1980 National Health Interview Survey (37.9% male and 29.8% female current smokers aged 20 and over) (USDHHS, 1983). These studies are more representative and more systematically conducted than polls.

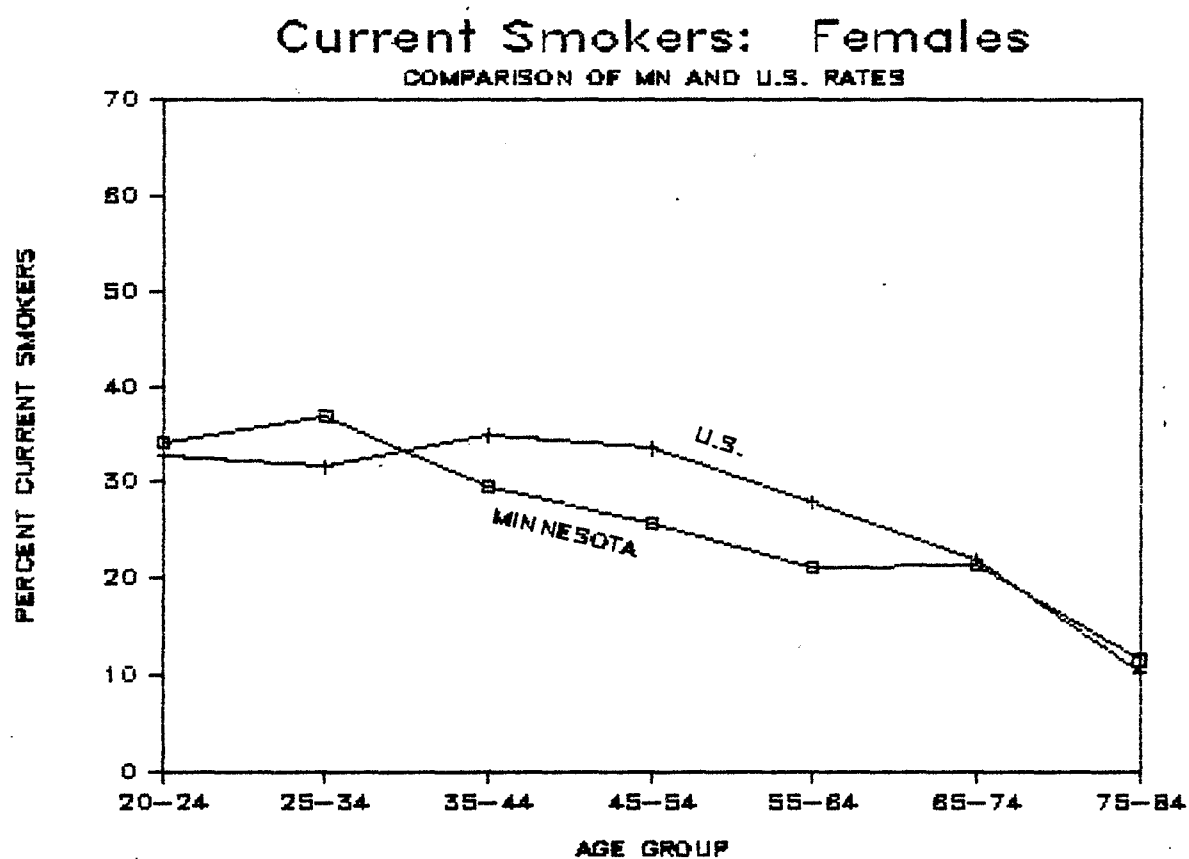
In Minnesota, lower-than-national rates are found in young men and in women over age 35 (Figures 9 and 10). Other groups appear to have rates approximately equal to the national averages.

FIGURE 9



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

FIGURE 10



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

In the combined male and female population, aged 18 and over, the 1981 smoking rate was 29.5% in the Prevalence Survey. The rate of nonsmoking in Minnesota was 70.5% in 1981, and 1984 nonsmoking rates are expected to be higher based on analysis of ongoing survey data.

Lifetime Smoking Patterns

For males, the slope of the smoking onset curve is very steep during mid to late adolescence. Most regular smokers initiate their habit before age 20, an additional several percent are added to the ranks in their early 20s, and peak smoking rates for each birth cohort are reached typically in the late 20s. Persons born in different decades of the 20th century have experienced different natural histories of smoking behavior (USDHHS, 1980; Harris, 1983). Males born between 1911 and 1920 reached the highest prevalence rates of any generation. When these males were in their late 20s, more than 70% were regular smokers. These men, currently aged 64 to 73, are now reaching the age of heaviest medical care utilization and cost. Those born from 1921 to 1930 followed similar patterns -- peaking at just under 70% smokers -- and high rates of smoking-related premature deaths in the fourth to sixth decades of life have occurred in this group. All subsequent generations ("cohorts") have displayed progressively diminishing peak prevalence rates of smoking. The peak rate plateaus for up to a decade. Thereafter, male smoking rates decline rapidly to less than 50% of the peak rates by the late 50s.

For females, three patterns provide contrast to male trends. Most notable is that female rates of smoking at all ages in all cohorts are lower than for males. Highest peak prevalence rates for females -- approaching 45% -- were found among women born in the two decades from 1921 to 1940. Second, the age of onset of female smoking was older than for males in women born early in the century. Many of these women did not start smoking until their late 20s and 30s. Women born later in the century started smoking enmasse in their mid-teens, similar to males. Third, the slope of the declining smoking rate curve after the peak is more gradual than for males, and proportionately fewer females than males quit smoking. Even 30 years after peak rates are reached, more than 50% of women smoking at the peak continue as current smokers.

Smoking Rates By Age

Minnesota Adolescents. A statewide survey of adolescent drug use, which included information on cigarette smoking prevalence rates, was conducted in 1983 (Search Institute, 1983). These rates and estimates of the number of smokers by adolescent age groups are presented in Table 2.

PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

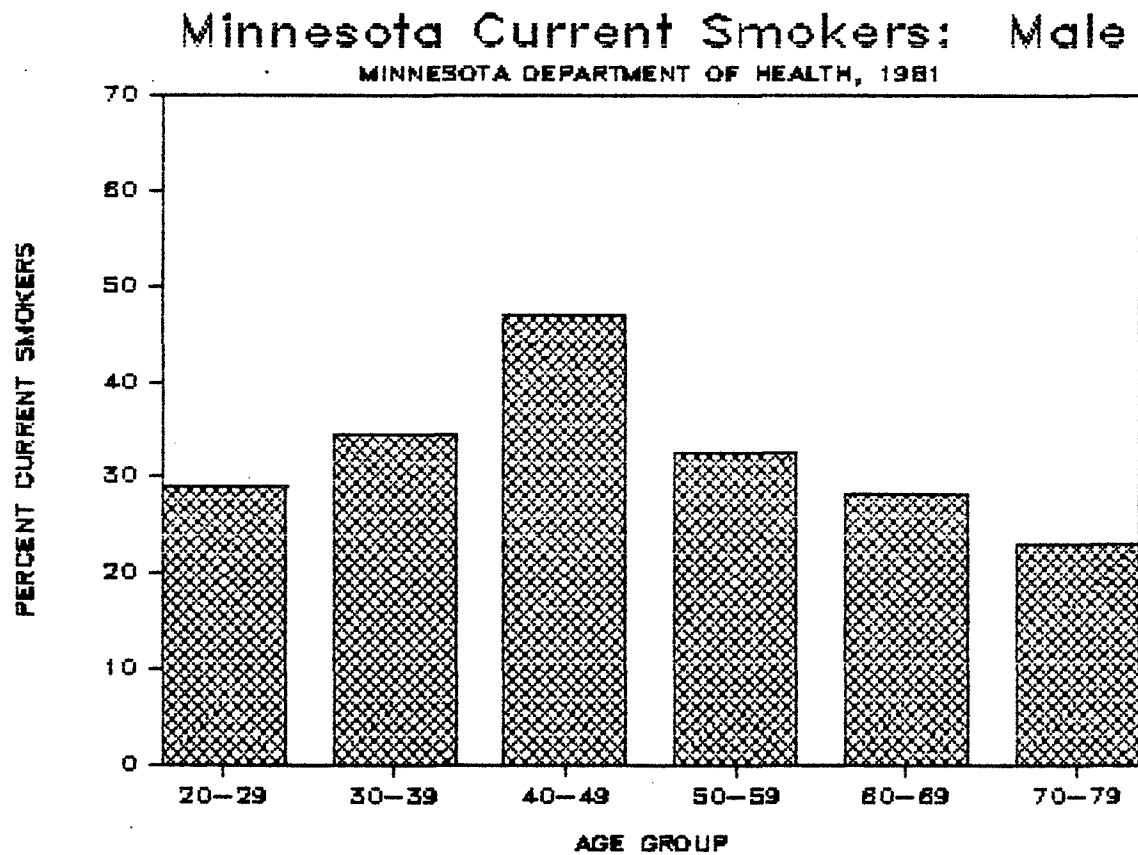
**TABLE 2 -- Adolescent Cigarette Smoking Prevalence Rates, Minnesota, 1983:
Rates for Adolescents Reporting Smoking One Cigarette Per Day or More**

Age (years)	Male (percent)	Females (percent)
13-14	8.9	14.1
15-16	17.1	23.0
17-18	23.1	29.9

It is apparent that rates of smoking are higher among females than for males in the 8th (13-14 year olds), 10th (15-16 year olds), and 12th (17-18 year olds) grades in Minnesota. These estimates are based on self-reports and may underestimate adolescent smoking rates. Using biochemical measures of cigarette smoking (carbon monoxide and thiocyanate levels in the blood or saliva) to validate self-reported smoking behavior, Mittelmarm et al. (1982) found smoking rates of 24.5% for 15-16-year-old males and 39.7% for 15-16-year-old females in suburban Minnesota schools. These are rates for adolescents reporting smoking "at least a few times" in the last month. These rates are higher than the rates for daily use in the Search Institute study because of the more liberal definition of smoking and because of the validation procedure.

Minnesota Current Adult Smokers. In 1981, the distribution curve for a cross-section of male current smokers by 10-year age groups has a peak in the 40-49 year age group (MDH, 1983) (Figure 11). Males in this age group began smoking in the mid-1950s when smoking rates reached a high point nationally. While almost 30% of males in this age group have quit smoking, nearly 50% remain current smokers. Older age groups have lower percentages of current smokers, reflecting higher proportions of quitters. For males in their 30s and particularly for males in their 20s, lower rates of smoking represent a decreasing number of males taking up the smoking habit. The smoking prevalence figures for Minnesota males aged 40 and above are comparable to national figures. For younger males, aged 20 to 39, Minnesota current smoking rates are substantially below national rates.

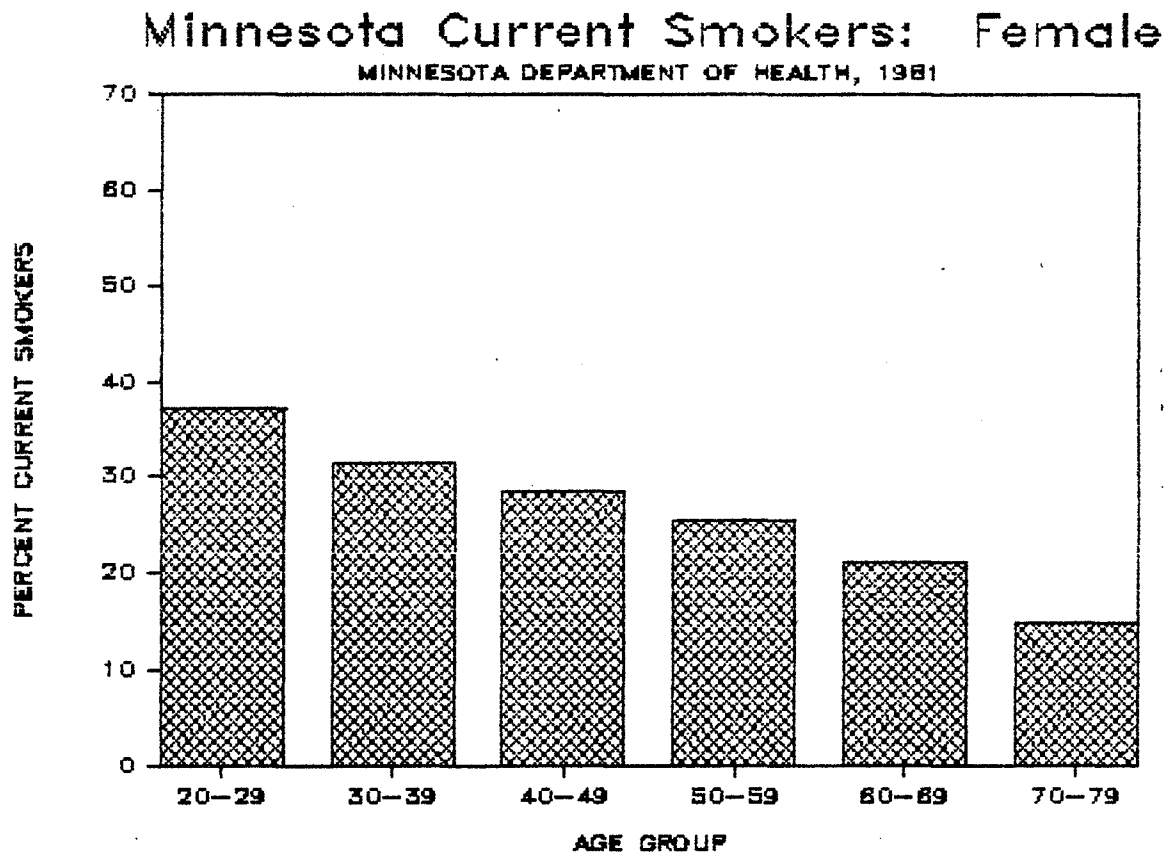
FIGURE 11



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

The corresponding pattern for women is not encouraging. Female current smoker rates decline linearly with age (Figure 12). This pattern indicates that progressively more women are adopting the smoking habit in each young age group.

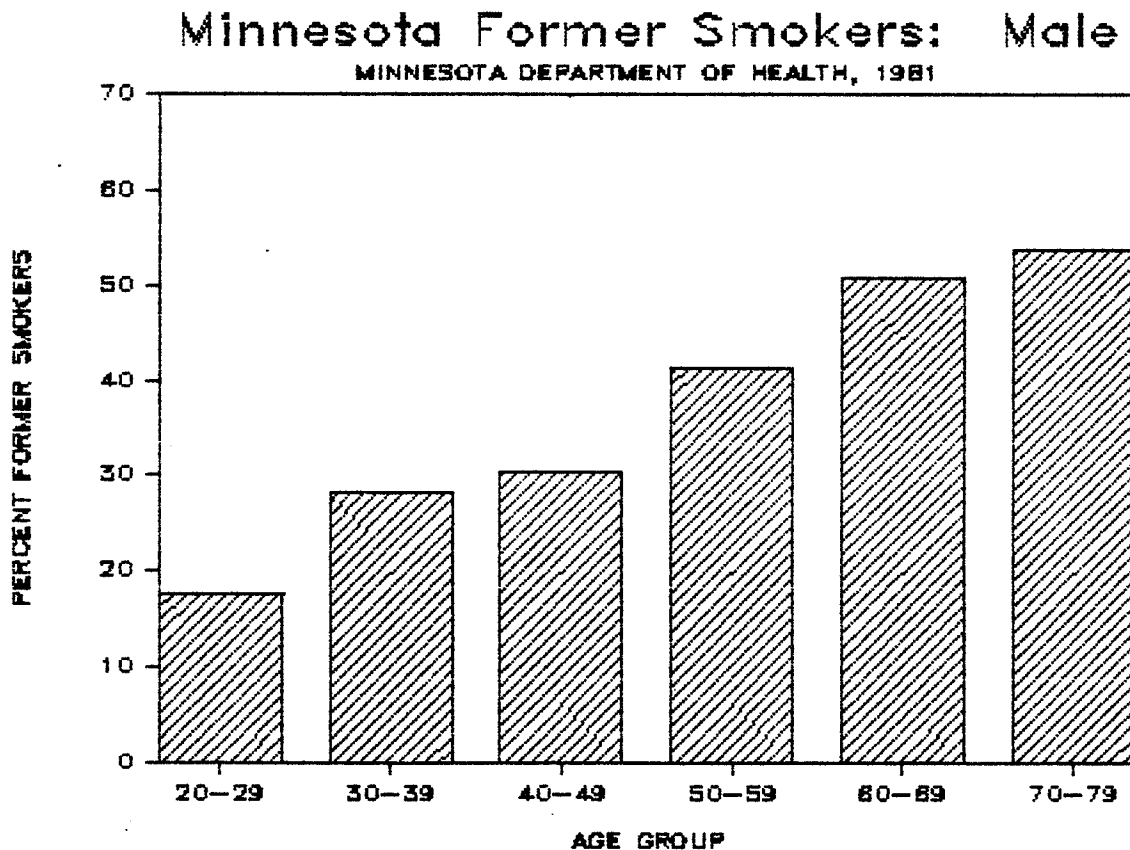
FIGURE 12



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Minnesota Former Smokers. For males, the number of current smokers increases with age (Figure 13). In younger age groups, lower percentages of former smokers reflect lower rates of smoking onset while progressively higher percentages of former smokers with increasing age indicates that male smokers have been quitting in large numbers.

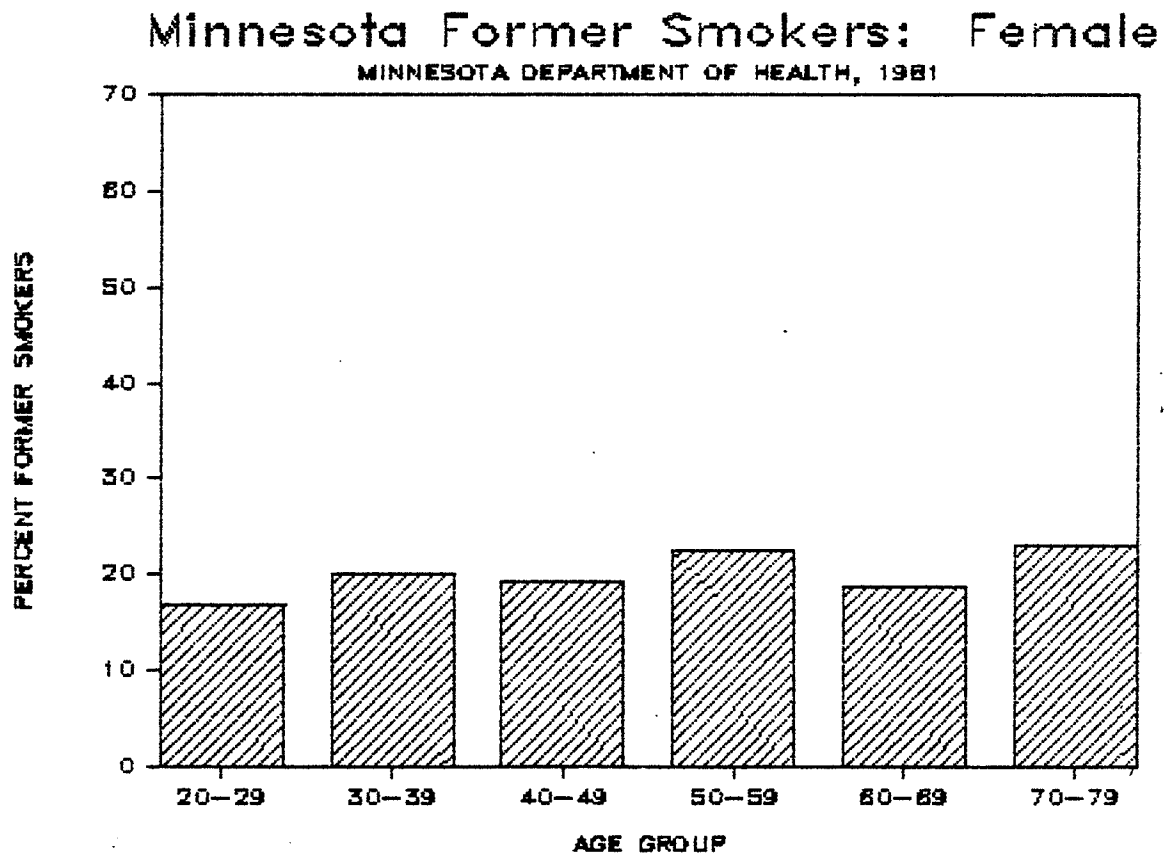
FIGURE 13



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Females display a relatively constant percentage of former smokers throughout the entire spectrum of age (Figure 14). This pattern corroborates the finding at the national level that a smaller proportion of females who adopt the smoking habit subsequently quit smoking compared to males.

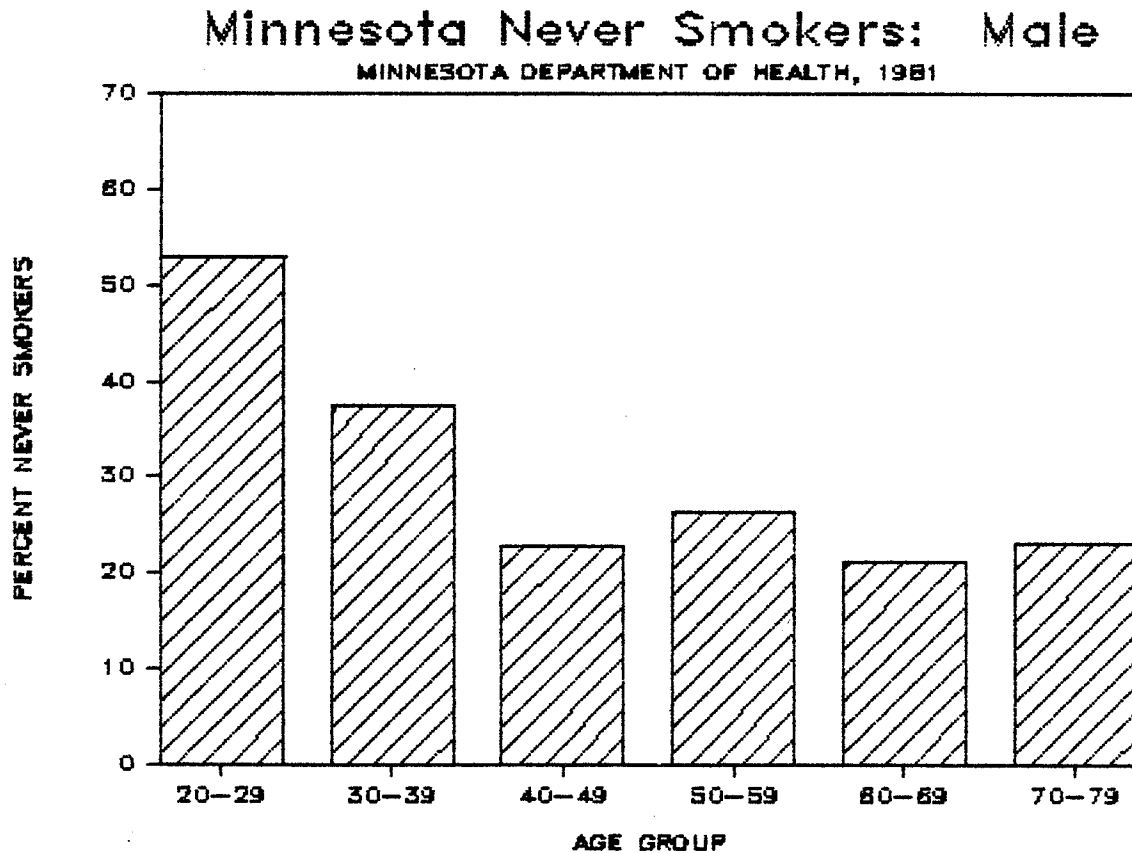
FIGURE 14



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Minnesota Lifetime Nonsmokers. The percentages of lifetime nonsmokers among males is increasing for males under age 40 (Figure 15). Almost 40% of males aged 30-39 and over 50% of males aged 20-29 report themselves to be "never smokers." For the four age categories aged 40 and over, only 20-25% of males were lifetime nonsmokers.

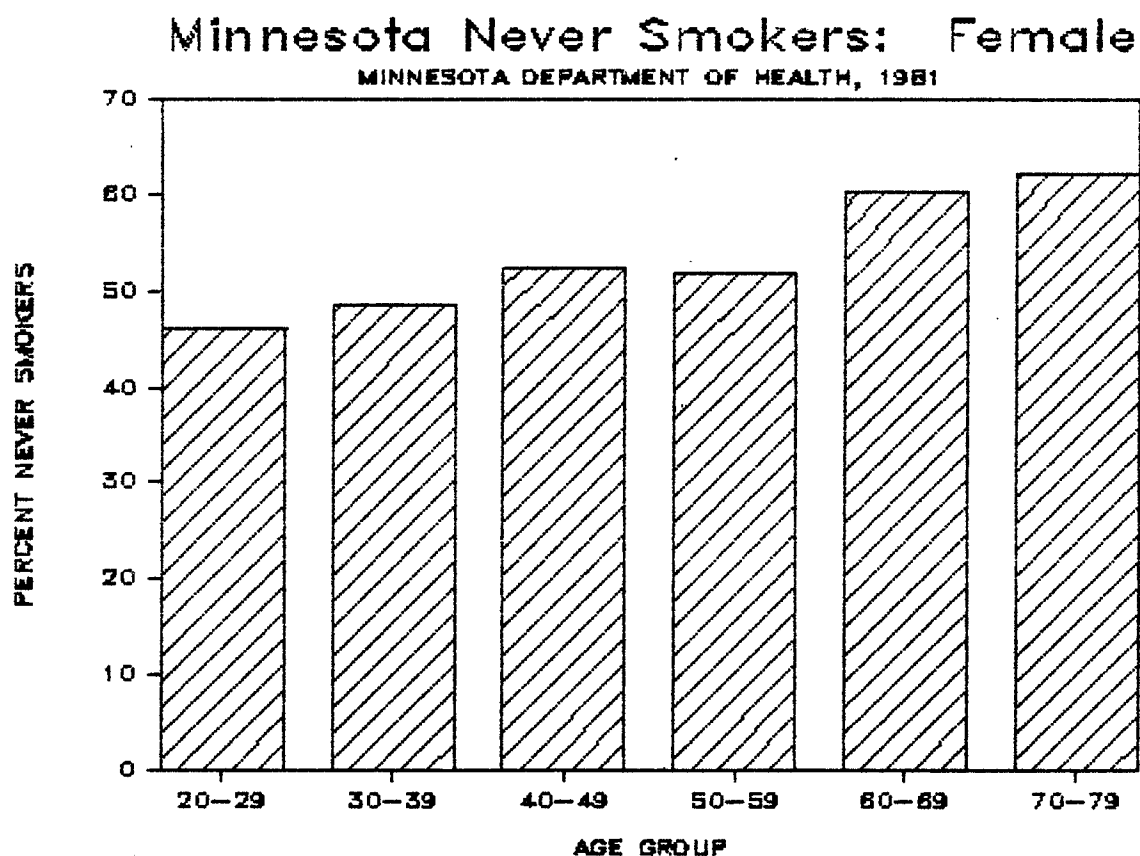
FIGURE 15



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

For females, the trend toward lower percentages of never smokers with decreasing age (Figure 16) confirms the previous findings of increasing smoking rates in younger females.

FIGURE 16

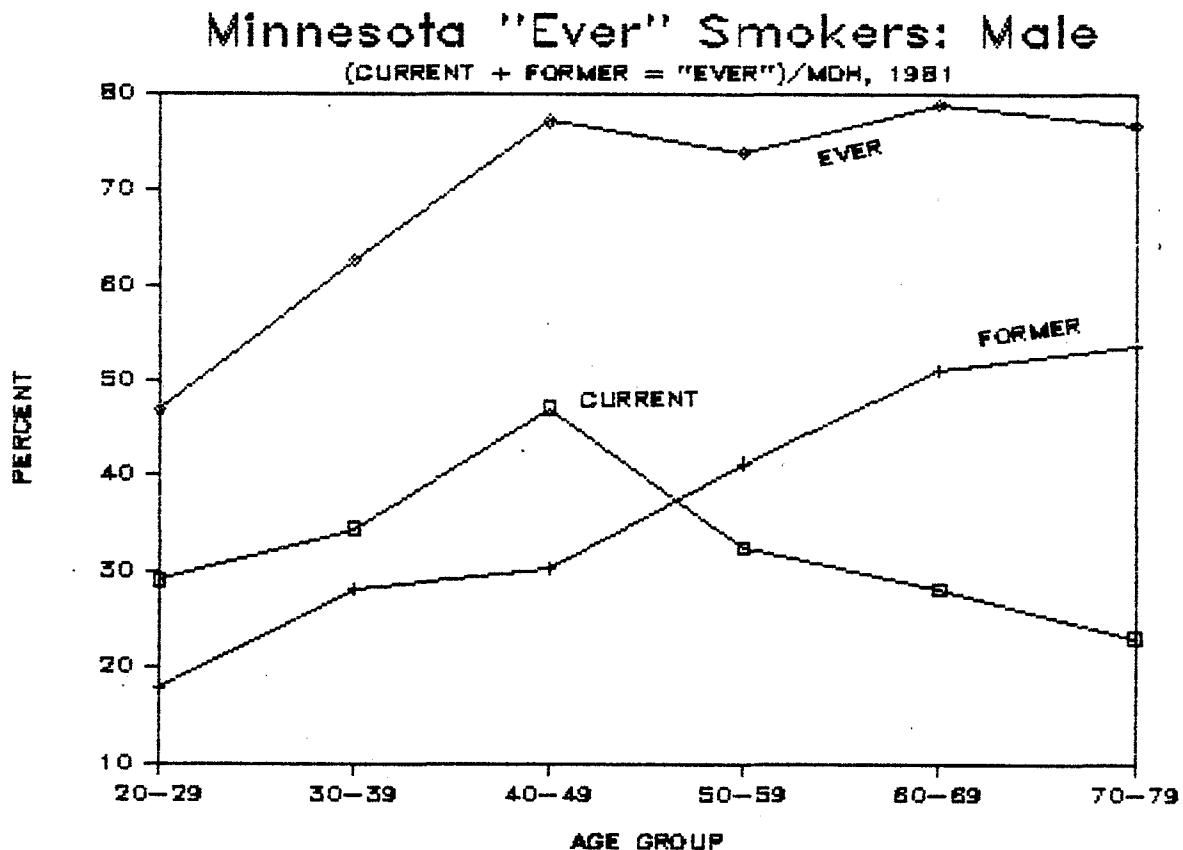


PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

"Ever Smokers" By Age

Minnesota. The sum of current and former smokers creates the category of "ever smokers" (Figure 17). This category is used to examine the percentages of the total population who adopted the smoking habit by age group. For males aged 40 and over, 70-80% of the population were regular smokers at some point. Many males have quit smoking. With increasing age, former smokers comprise an increasing share of the "ever smoker" category. For Minnesota males younger than age 40, the "ever smoker" percentage declines, largely due to declines in male current smokers with decreasing age.

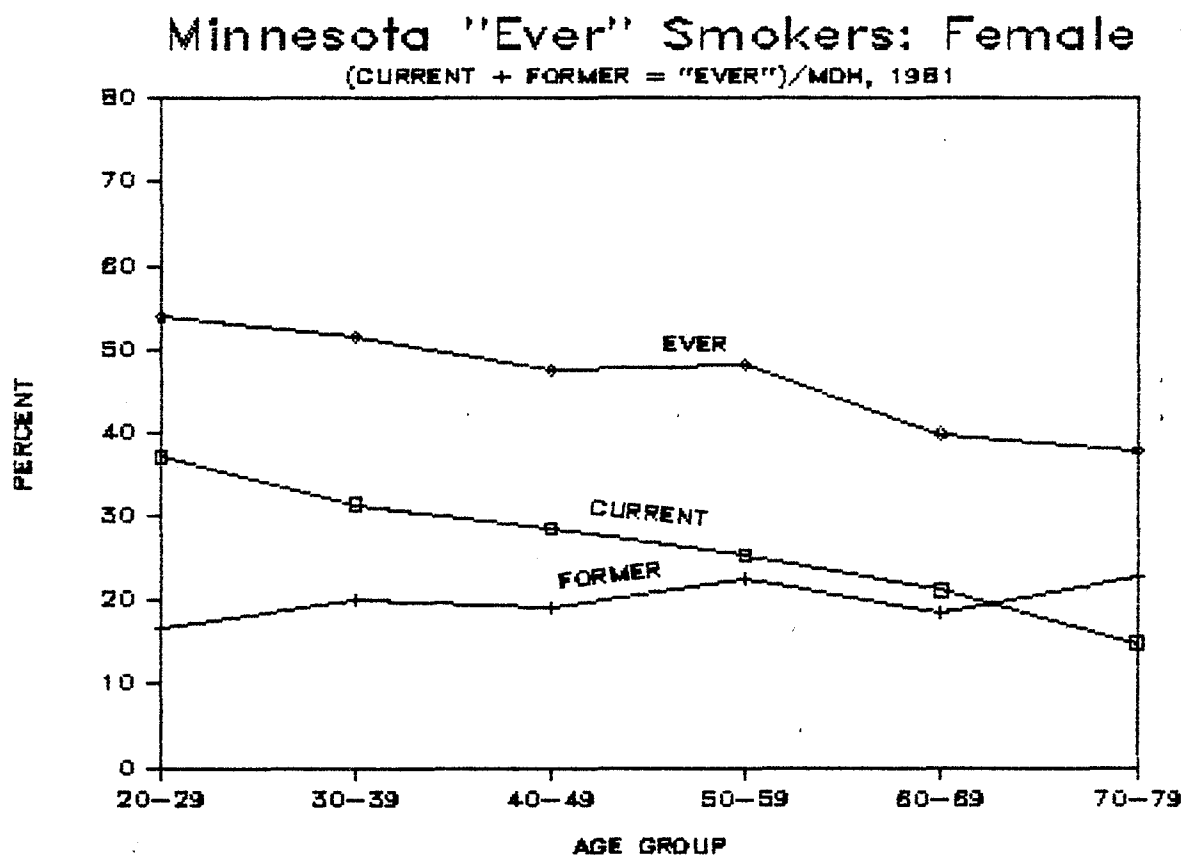
FIGURE 17



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Figure 18 indicates that the percentage of female "ever smokers" is progressively increasing with each younger age group. With similar levels of former smokers in all age groups, it is apparent that the increasing percentages of current smokers in each younger age group accounts for the observed trend in female "ever smokers."

FIGURE 18



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Among lifetime "ever" smokers, the proportion of quitters generally increases with age as illustrated in Table 3. Note that the proportion of male "ever" smokers who quit is higher than the corresponding proportion of females.

TABLE 3 -- Percentage of "Ever" Smokers Who Quit

Age	Males (%)	Females (%)
20 - 29	37.8	31.2
30 - 39	44.9	38.9
40 - 49	39.2	40.2
50 - 59	56.0	47.0
60 - 69	64.4	46.7
70 - 79	70.0	60.7

Minnesota Nonsmokers By Age

An important goal of the recommendations presented in this report is to increase the percentage of nonsmokers. Figures 19 and 20 present Minnesota nonsmoking rates by age for males and females respectively. The nonsmoker category is the sum of never smokers and former smokers for each age and sex category. The figures portray the fact that 7 out of 10 Minnesotans were nonsmokers in 1981. Further survey results will soon be available to provide updated 1984 percentages of nonsmokers in the state. Note the higher rate of nonsmoking among younger men and the lower rate of nonsmoking with each younger age group of women.

FIGURE 19

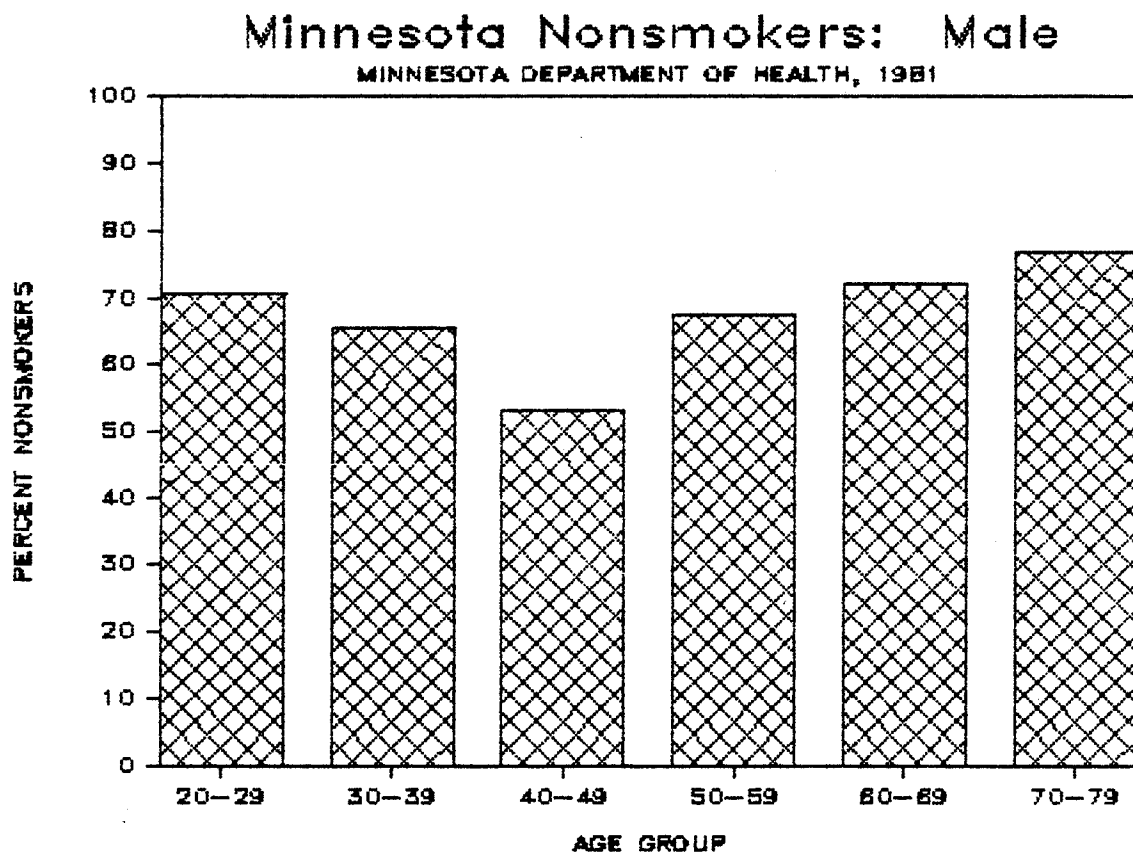
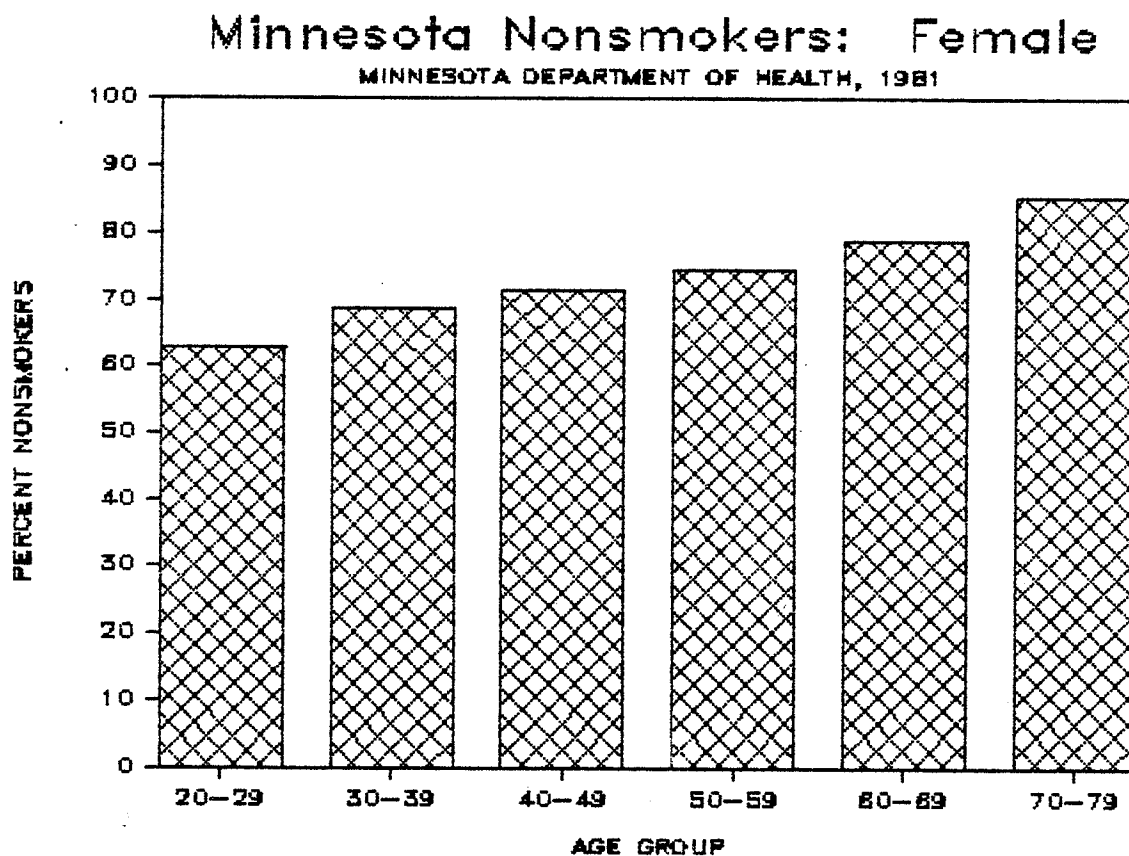


FIGURE 20

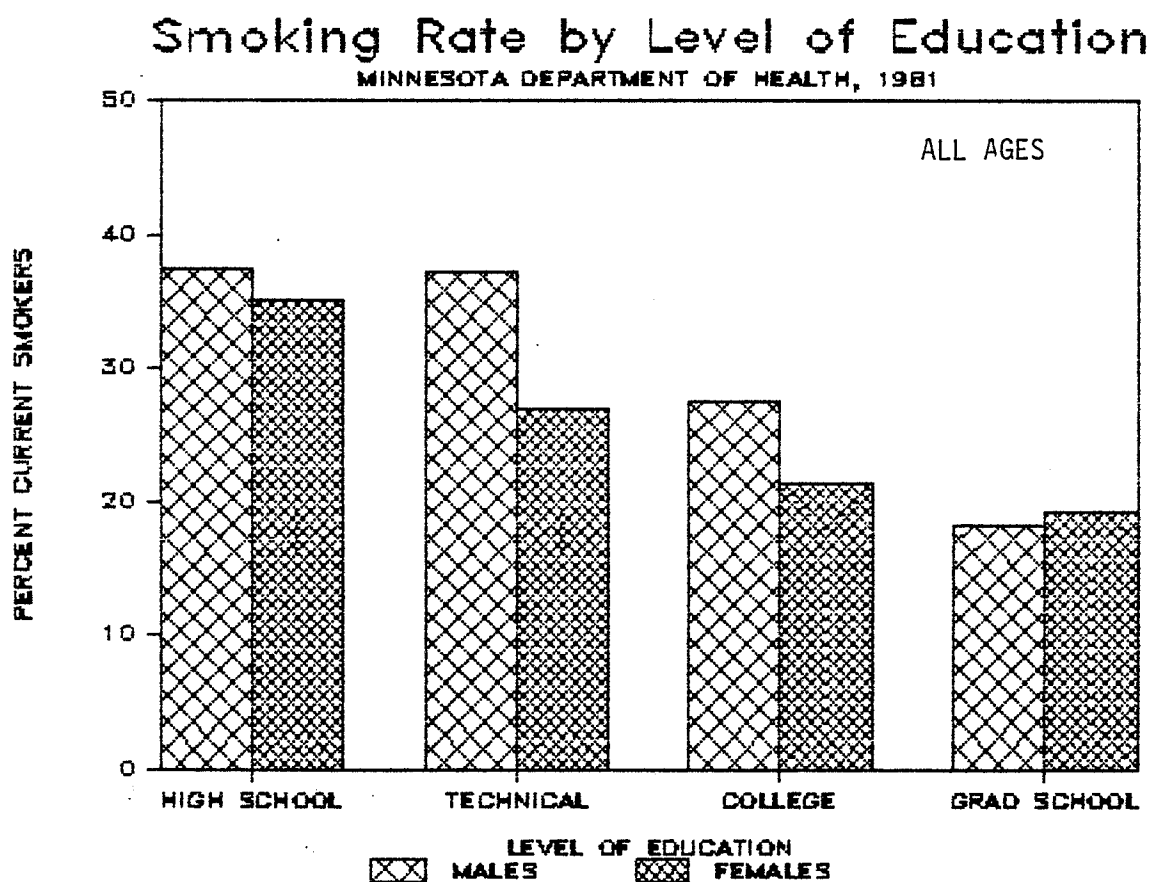


PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

SMOKING RATES BY LEVEL OF EDUCATION

Minnesota. Citizens with the most education have the lowest current smoking rates (Figure 21). For both males and females in Minnesota, the highest smoking prevalence rates occur among persons without education beyond high school. Similar relationships between smoking rates and educational level have been found in national data (Schuman, 1977).

FIGURE 21

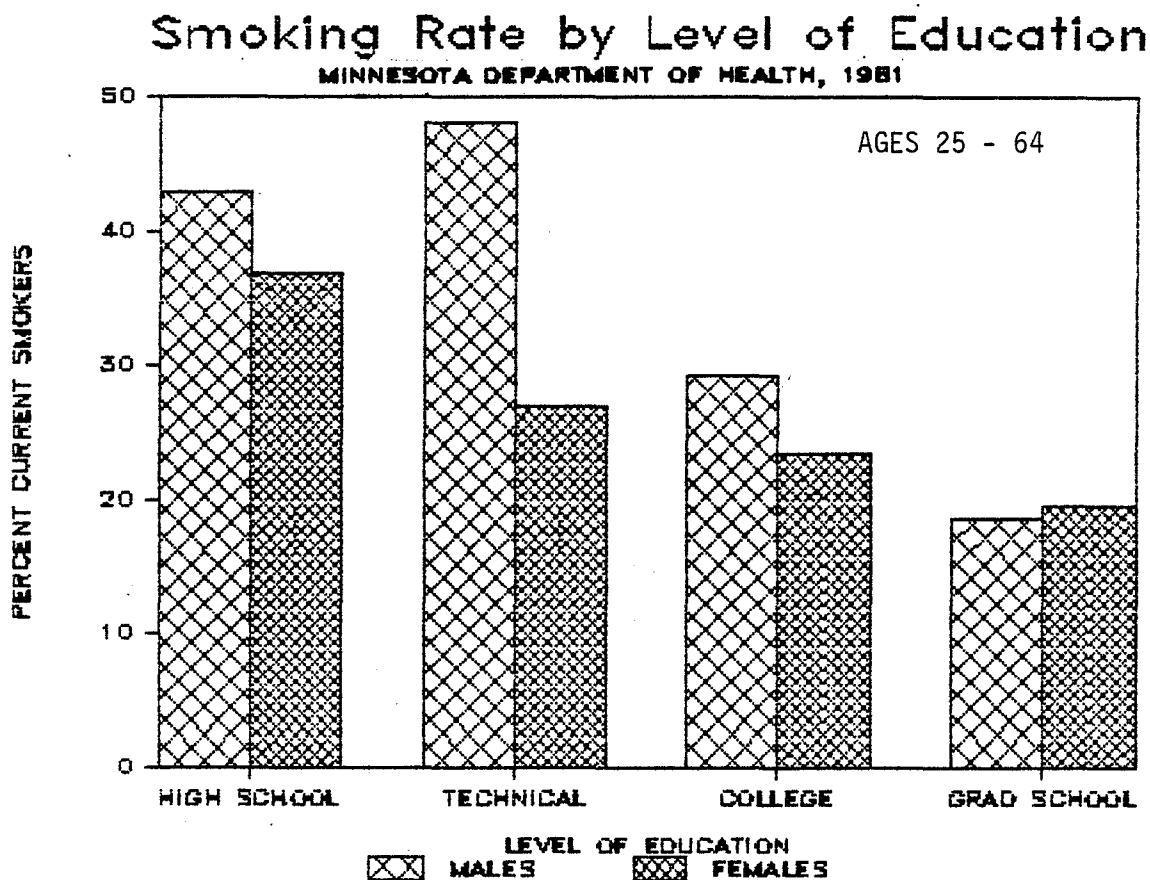


PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

A disparity in the data is noted for the small number of persons in the 1981 Minnesota Department of Health (MDH) study with only grade school education. These persons displayed lower smoking rates than persons with partial or complete high school education. Two explanations have been offered. First, these persons may have limited income and, therefore, limited access to cigarettes (Schuman, 1977). Second, these persons with limited education are a substantially older group of persons (MDH, 1983).

When analyses are restricted to ages 25-64 to capture most persons at their highest level of education and to exclude older persons who accounted for the grade school education category, the inverse relationship is found for women. For men, the highest current smoking rates occur among those with technical school training (48.1%). With this exception, the inverse pattern holds for males 25-64 (Figure 22).

FIGURE 22



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Smoking Rates By Employment Status

Minnesota. In the Minnesota smoking survey (MDH, 1983), unemployed males and females had smoking rates of 50.0% and 52.2% respectively (Figures 23 and 24). These rates exceeded those for all other employment status categories. For both males and females, the "employed full time" category ranked second. Full time employed males had a smoking rate of 32.4%, very similar to the overall mean for male current smokers. Full time employed females had a current smoker rate of 33.5%, slightly higher than the male rate and 5.5% above the overall mean for females.

FIGURE 23

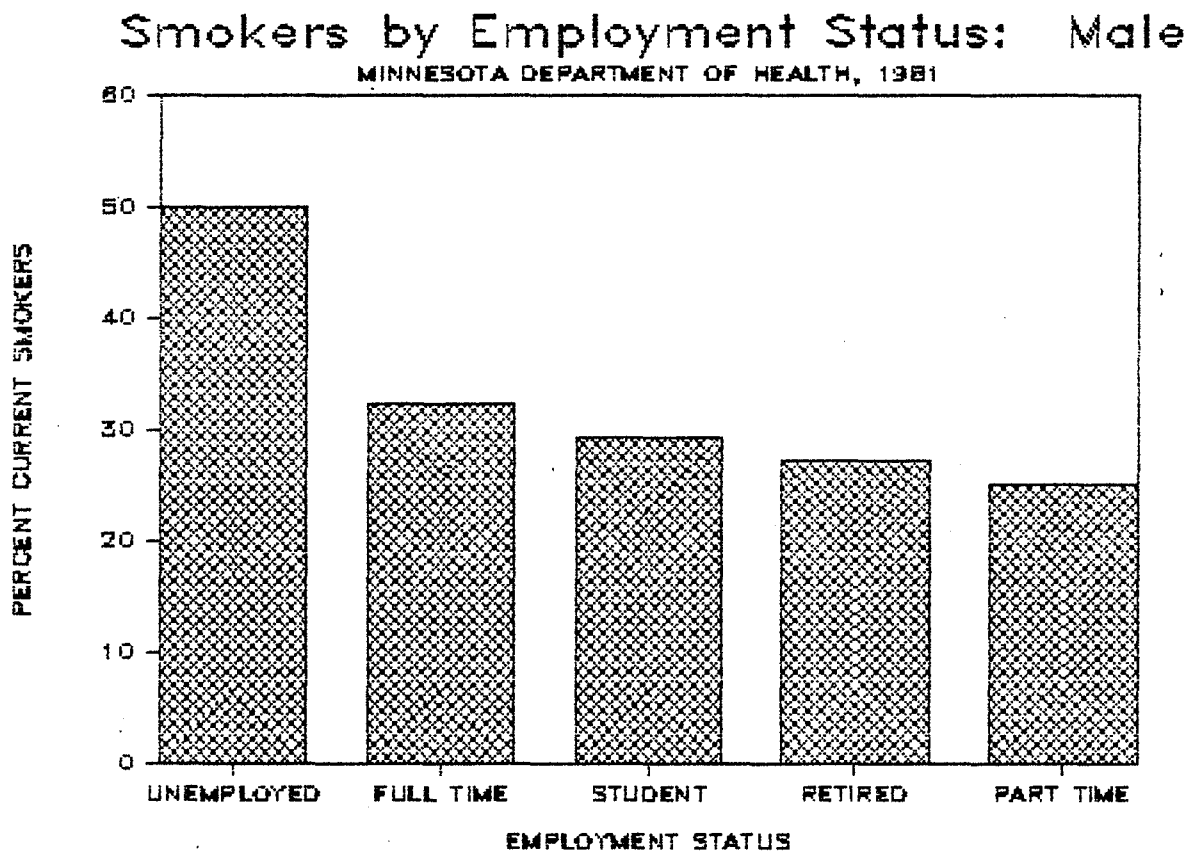
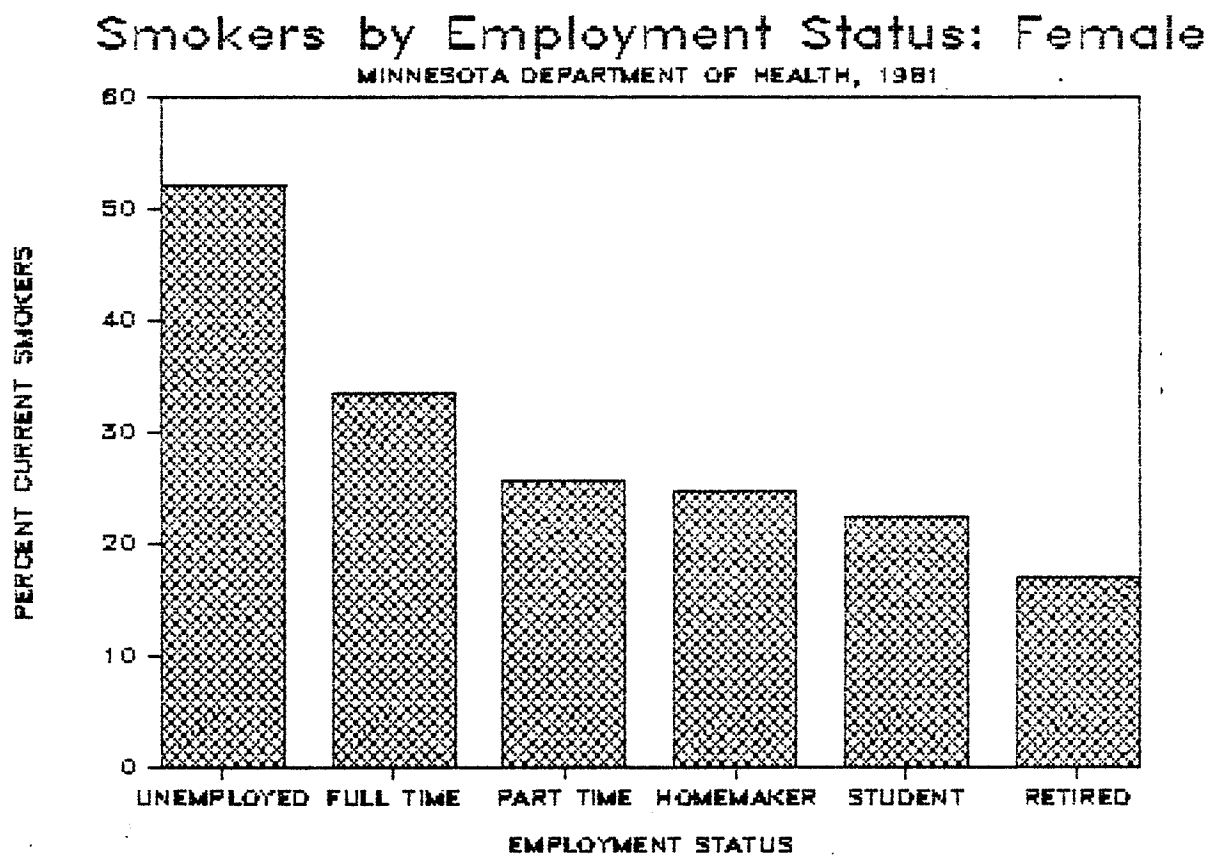


FIGURE 24



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

Smoking Rates By Occupational Category

Minnesota. Figures 25 and 26 present male and female occupational categories ranked by percent of current smokers. As expected from previous national data (USDHEW, 1979; Schuman, 1977), persons employed in the "blue collar" and clerical occupational categories have relatively high smoking rates. Very low smoking rates are evident among persons classified as professionals. However, among others in the white collar ranks, smoking rates are high. For managers and administrators, smoking rates are 39.8% for males and 40.0% for females. Among males, the highest current smoking rates were reported among sales workers (40.5%).

FIGURE 25

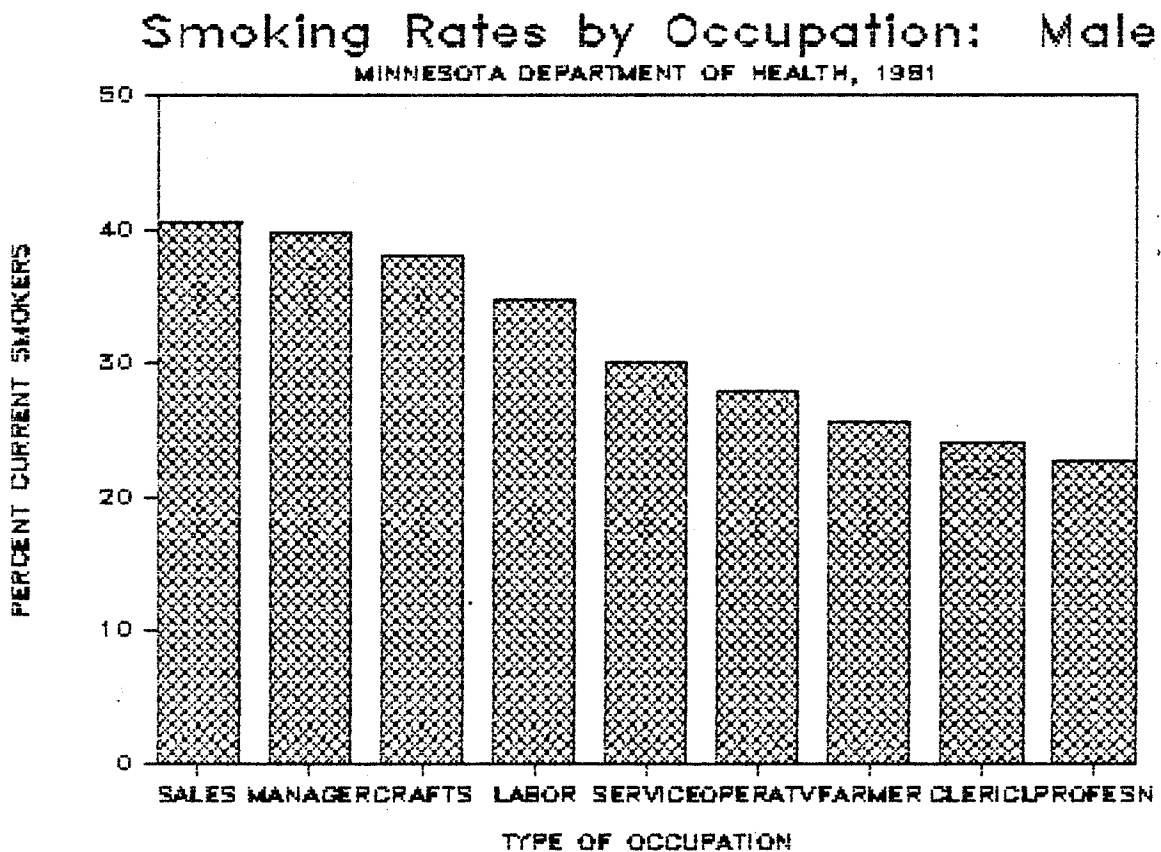
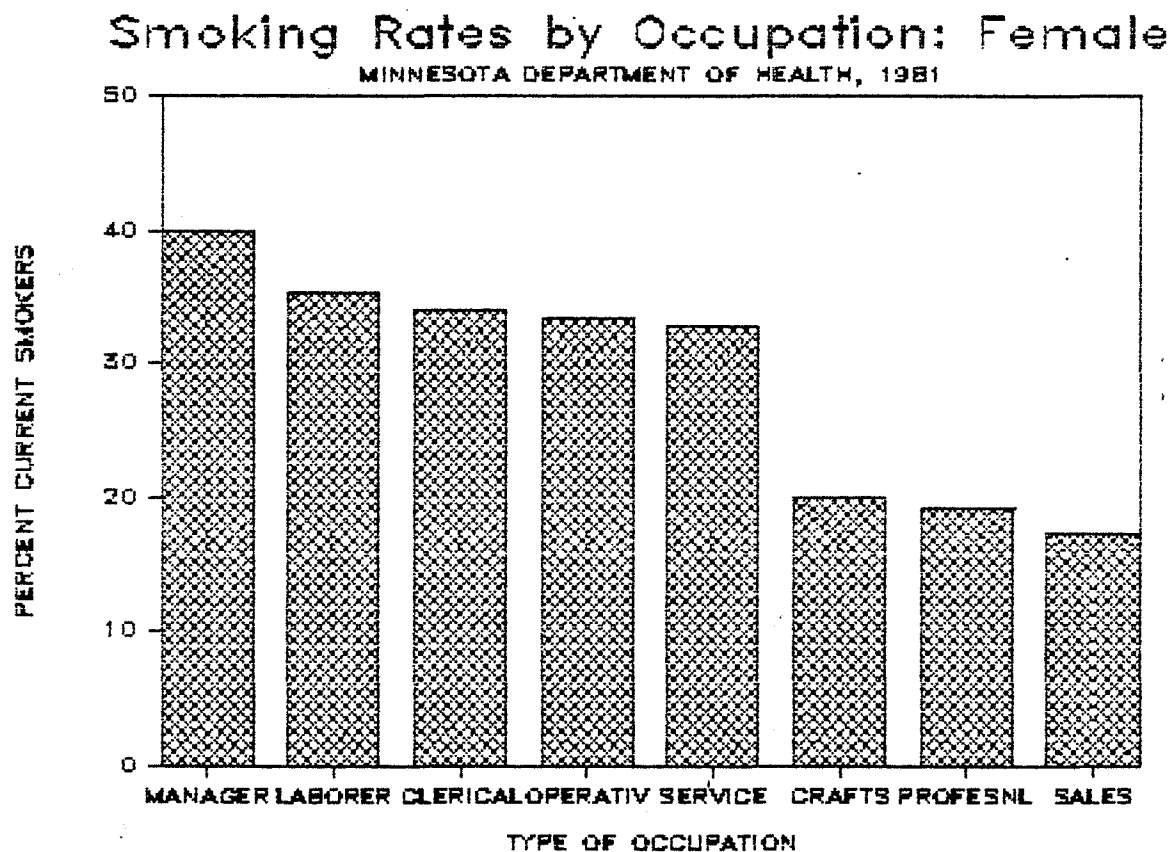


FIGURE 26



PATTERNS OF CIGARETTE SMOKING IN MINNESOTA

DOSE-RESPONSE MEASURES OF SMOKING

The concept of dose response is central to the study of the impact of cigarette smoking on health. "Dose response" refers to the finding that higher levels of lifetime exposure to cigarettes are related to higher rates and increased severity of smoking-related diseases. In the research literature, many measures have been used to rank smokers by the amount of lifetime exposure to the hazardous substances contained in tobacco smoke. The most common measures of tobacco smoke "dosage" relate to cigarette consumption -- cigarettes per day or maximum cigarettes per day during the lifetime. The time factor is brought into such dose measures as age of onset and lifetime duration of smoking. Hybrid measures such as pack-years combine the time dimension with a measure of amount smoked. Measures of exposure to tobacco constituents may be quantified by examining the tar and nicotine yield of the usual brand of cigarettes smoked. More elaborate assessment of tobacco dosage also derives from measures of smoking behavior, including depth of inhalation, puffs per cigarette, and puff volume.

Dose Response: Numbers of Cigarettes Smoked

United States. Data from recent National Health Interview Surveys indicates that, on the average, males smoke more cigarettes per day than females (23.4 and 19.7 respectively) (USDHHS, 1983). Furthermore, the numbers of cigarettes smoked per day by smokers is increasing over time (mean increases of 1.6 and 2.0 cigarettes per day from 1970 to 1980 for males and females respectively) (USDHHS, 1983). This may reflect the fact that lighter smokers are more successful quitters; persons remaining in the ranks of current smokers are heavier smokers, including a proportion of persons who have unsuccessfully attempted to quit (USDHHS, 1983). Other possible explanations include increases in daily consumption, particularly among smokers switching to lower tar and nicotine yield cigarettes and new entry of heavier smokers into the ranks of current smokers over the last decade.

Minnesota. Results of the Minnesota Risk Factor Survey (MDH, 1983) revealed that female smokers consumed fewer cigarettes than males (Table 4). Similar percentages of males and females smoked about a pack (20

**TABLE 4 -- Distribution of Current Smokers
by Cigarettes Smoked Per Day, Ages 18 and over, 1981**

Number of Cigarettes	Males (%)	Females (%)
Less than 15	18.5	31.0
15 - 24	46.5	43.0
25 or more	35.0	26.0

Source: Minnesota Department of Health, 1983.

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cigarettes) a day. For both men and women, there is a progressive decline in the percentage of current smokers reporting consumption in the "25 or more" category.

Dose Response: Age of Onset

United States. Initiation of the cigarette habit is an adolescent phenomenon. Throughout this century, the age of first cigarette use and the age of regular cigarette use have declined. Patterns of onset for men and women have converged during the past 50 years. The national mean age of onset, formerly much higher for women, was 16.1 years of age for men and 16.4 years of age for women at the time of the Minnesota risk factor survey (MDH, 1983). This represents a slight, gradual shift to younger ages for men but a marked decline in age of onset among women (USDHHS, 1980). In the 1980s, adolescents are experimenting with cigarettes at progressively younger ages. A recent national study indicates that 60% of adolescent female smokers began smoking experimentation before age 13 (Evans, 1982).

Studies indicate that the first cigarette smoking experience typically occurs in a social context and, most frequently, cigarettes are provided by other adolescents. Cigarette smoking has a strong peer orientation and onset of cigarette smoking often accompanies experimentation with alcohol. Cigarette smoking may serve as an entry behavior for other drug use (NIDA, 1982).

Minnesota. Mean ages of smoking onset in Minnesota were 17.3 and 19.0 years of age for male and female current smokers and 17.7 and 19.9 years of age for male and female former smokers (MDH, 1983). In this cross-sectional dataset, spanning ages 18 to over 85, Minnesotans began smoking later in adolescence than the national average.

Dose Response: Trends in the Use of Filtertip Cigarettes

United States. Filtertip cigarettes, introduced in the early 1950s, have progressively displaced the use of cigarettes without filters (USDHHS, 1980, 1981). For persons born in the 1900s, each successive 10-year birth cohort has experienced a longer period of smoking filtertip cigarettes. Females have always smoked filtertips in higher proportions than men. That difference in smoking behavior is rapidly disappearing. For example, for persons born between 1951 and 1954, 90% of males and 95% of females smoke filtertip cigarettes. Recent studies (USDHHS, 1981, 1983) suggest that the benefits of filtering systems and tobacco modification may be much less for the smoker than are predicted by artificial test machines in the laboratory.

SUMMARY

Rates of smoking in Minnesota have been slightly lower than for the United States for decades. Young Minnesota males and older Minnesota females have lower-than-national rates. Minnesota students emerge from high school with nearly the same rate of smoking as the rest of the adult population. In Minnesota, smoking rates are higher in the labor force (employed and

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unemployed) than in those otherwise engaged (homemakers, students, retired persons). Nonsmoking is most prevalent among the highly educated and among farmers and professionals.

SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

The disease outcomes of lifetime cigarette smoking can be measured in terms of excess deaths and disability due to smoking-related illness. Cigarette smoking in Minnesota and in the nation is the major preventable cause of premature death and lifetime morbidity.

EXCESS DEATHS ATTRIBUTABLE TO SMOKING IN MINNESOTA

Cigarette smoking is causally related to many diseases (USDHEW, 1979). The major burden of excess deaths is in three diagnostic categories: diseases of the heart, cancers, and respiratory diseases.

Diseases of the Heart

Cigarette smoking is strongly and causally related to cardiovascular diseases. Smoking is a primary risk factor for coronary heart disease (CHD), acting to precipitate fatal myocardial infarctions and sudden cardiac deaths. Smoking is related to the severity and extent of atherosclerosis, the underlying pathophysiological process for CHD. Cigarette smoking is linked to deaths from aortic aneurysm and almost universally appears in the histories of patients who die from peripheral vascular disease. Research supports a contributory link of smoking to premature death from stroke before age 65 and perhaps at older ages (USDHHS, 1983).

Estimates from the Surgeon General's report on cardiovascular diseases place total smoking-attributable deaths from CHD at 170,000 per year for the United States (USDHHS, 1983).

Coronary Heart Disease. The first Minnesota calculation of smoking-attributable deaths from CHD (ICD-9 Codes 410-414) used the statewide current smoker prevalence rate of 29.5% in 1981 and the mean relative risk for CHD from eight prospective studies (1.7) to produce an estimate of 1580 smoking-related deaths among current smokers. Applying an estimate of the additional smoking-attributable deaths among former smokers based on an earlier study in Maine, total smoking-attributable CHD deaths were estimated at 2065. Summed with smoking-attributable deaths from cardiac arrest (195 for ICD-9 Code 427.5), CHD deaths due to smoking were reported at 2260 for 1981 (MDH Disease Control Newsletter, February 1984).

Several features of the cigarette smoking/CHD relationship suggested the desirability of more sophisticated calculations. First, smoking prevalence rates and mortality rates from CHD differ by sex. Second, relative risks for CHD for the risk factor of cigarette smoking decrease with age. This phenomenon occurs at advanced age, with most lifestyle-related factors, as age becomes the predominant predictor of death. However, with CHD, relative risks for cigarette smokers decline rapidly toward 1.0 after age 65. This has particular importance because about 80% of CHD deaths in Minnesota occur after age 65. Third, cigarette smoking prevalence rates vary with age. For example, 94% of Minnesota females aged 85 and over never smoked cigarettes. Females in this age category accounted for 1387 (15%) of the 9227 CHD deaths in 1981. It would be inappropriate to attribute a substantial number of these deaths to cigarette smoking. Fourth, the contribution of cigarette smoking to CHD mortality declines

SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

rapidly in former smokers, decreasing with length of cessation (USDHHS, 1983). Calculations of smoking-attributable risk among former smokers should ideally take into account numbers of years of cessation.

CHD is the leading cause of death in Minnesota and in the nation. Therefore, it was considered important to refine the calculations of smoking-attributable CHD. Data is available from the American Cancer Society 25-State study on relative risks for smokers by 10-year age category, by sex and, on former smokers, by numbers of years of cessation. Special analyses were performed on the data from the 1981 Minnesota Risk Factor Prevalence Survey to obtain current and former smoker prevalence rates by sex for the age categories used by the American Cancer Society study. Furthermore, the distribution of former smokers by numbers of years of cessation within each age category was obtained. Age- and sex-specific calculations of smoking-attributable CHD deaths were performed for current smokers and for current and former smokers combined (using the attributable risk formula of Walter, 1976).

From these revised calculations, 1026 CHD deaths among males (19.08%) and 221 CHD deaths among females (5.77%) -- a total of 1247 deaths -- were attributed to smoking. The additional estimate of 195 deaths from cardiac arrest among current smokers was not recalculated. The discrepancy in the estimates appears to be due to fewer CHD deaths attributed to smoking among females compared to males at all ages and to fewer deaths attributed to smoking in the ages over 65.

The validity of this calculation is limited by several factors: the comparability of the Minnesota population to that of the American Cancer Society sample; the lack of age- and sex-specific relative risks for former smokers by years of cessation (which could lead to overestimates at older ages and underestimates at younger ages, analogous to the current smoker situation); and the cohort effects of estimating probabilities of smoking-related deaths in a cross-sectional sample of Minnesotans from the six-year death experience of the American Cancer Society cohort.

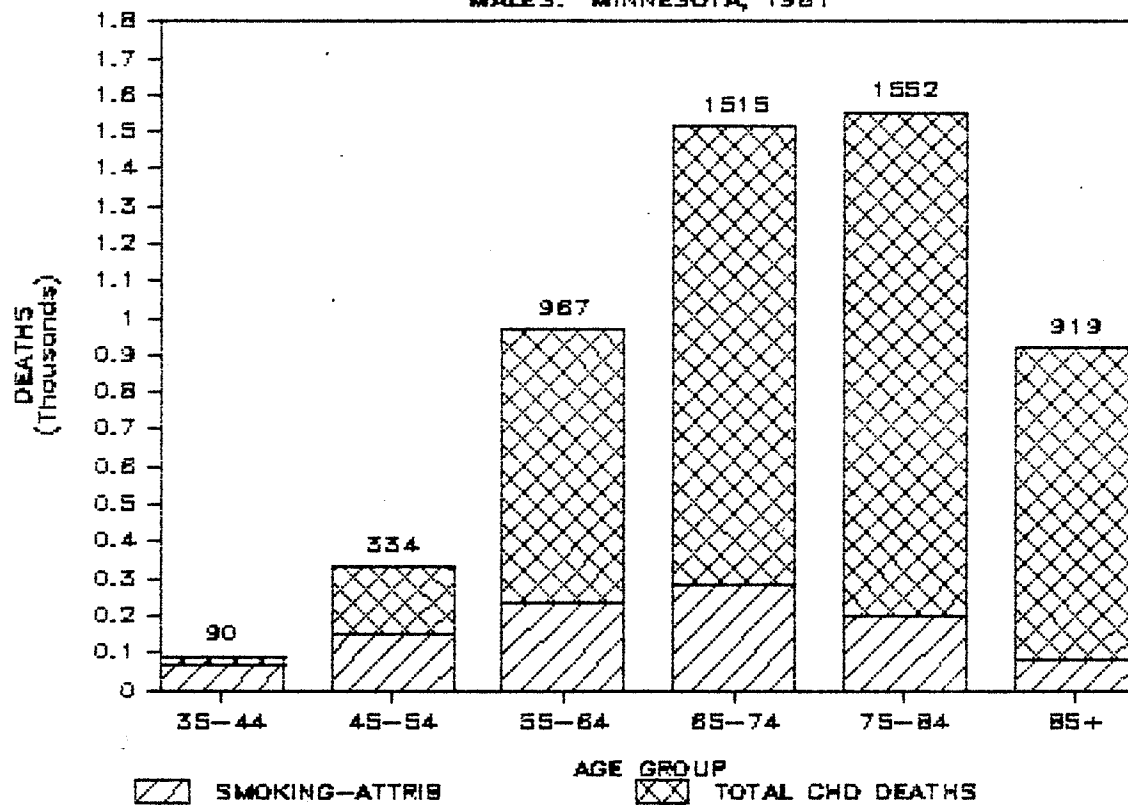
Figures 1 and 2 portray the relationship of smoking-attributable and total CHD deaths with age. The increase in total CHD deaths with the age and sex differences in total and smoking-attributable deaths are apparent. For premature CHD deaths for people under age 65, cigarette smoking is an extremely potent risk factor. For males, 32.8% of CHD deaths occurring at ages 35-64 were attributable to smoking in 1981. For females, the corresponding figure was 19.1%. For CHD deaths occurring at age 65 or later, 14.3% of male CHD deaths and 4.5% of female CHD deaths were smoking attributable.

SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

FIGURE 1

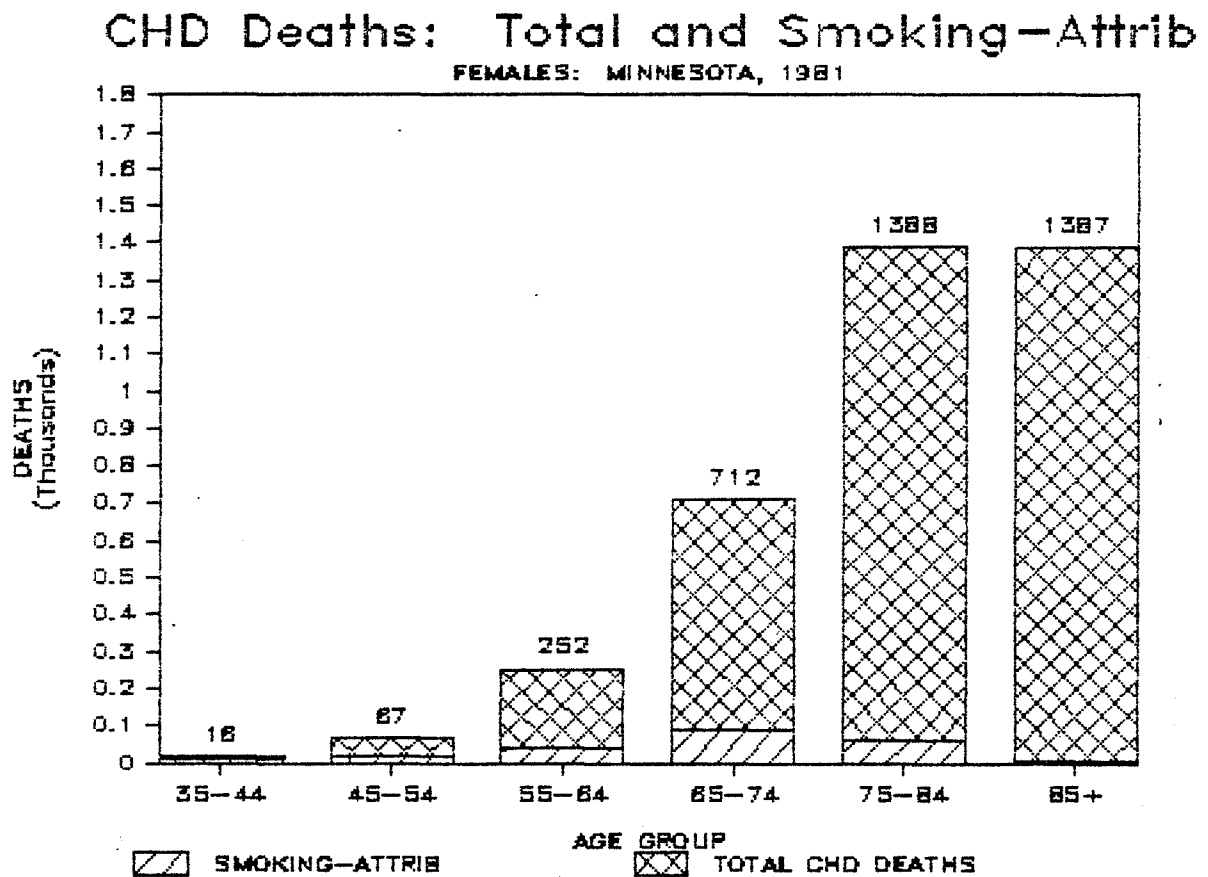
CHD Deaths: Total and Smoking-Attrib

MALES: MINNESOTA, 1981



SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

FIGURE 2



SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

Details of the CHD calculations are contained on a spreadsheet in Appendix A.

Cerebrovascular Disease. According to the 1983 Surgeon General's report on cardiovascular diseases (USDHHS, 1983), the relationship of smoking to cerebrovascular disease is equivocal. It appears that rates of stroke occurring prior to age 65 are linked to smoking. Therefore, Minnesota calculations of smoking-attributable stroke deaths were limited to deaths occurring between ages 35 and 64 for current smokers only -- a clearly conservative estimate.

In total, about 1800 Minnesota deaths from all forms of smoking-related heart disease were directly attributable to cigarette smoking in 1981. These deaths included the 1250 from CHD, 195 from cardiac arrest, 145 from arteriosclerosis, 125 from aortic aneurysm, and 80 from other conditions.

Malignant Neoplasms

Careful examination of the epidemiologic and clinical evidence has led to the conclusion that cigarette smoking is the primary cause of cancers of the lung, trachea, and bronchus; cancers of the oral cavity; laryngeal cancer; and esophageal cancer (USDHHS, 1982). Cigarette smoking is a "contributory factor" to the development of cancers of three other sites -- urinary bladder, kidney, and pancreas. Cigarette smoking is strongly, and possibly causally, associated with cancers of the stomach and uterine cervix. The hypothesis that cigarette smoking could offer protection against breast cancer through effects on estrogen levels has been disputed in a major case-control study (Rosenberg et al, 1984).

Estimation of smoking-related cancer mortality in Minnesota in 1981 followed the methods of Doll and Peto (1981) in previous calculations of national estimates. Cancer death rates by site for the United States nonsmoking population, from the American Cancer Society prospective study of over one million Americans in 25 states (Garfinkel, 1980), were applied to the age and sex distribution of the Minnesota population in 1981. From these nonsmoker rates, estimates of expected numbers of deaths from cancers in a totally nonsmoking Minnesota population were obtained. Actual numbers of cancer deaths occurring in the Minnesota population (comprised of 29.5% current smokers and 23.5% former smokers in 1981) were compared to the expected numbers; the excess deaths were attributed to smoking. Table 1 summarizes these calculations.

From these calculations, 1670 deaths from malignant neoplasms are regarded as smoking attributable. An additional 50 smoking-attributable deaths occurred from cancers of the stomach and uterine cervix, sites not included in the Doll and Peto calculations. The total -- 1720 smoking-attributable cancer deaths -- represents 24.3% of the 7074 cancer deaths from all sites in 1981. The largest contributor to smoking-related deaths was lung cancer (74% of the 1670 excess deaths). According to these calculations, 84.6% of lung cancer deaths were caused by cigarette smoking. Table 1 also portrays the fact that the majority of cancers of the oral cavity, larynx, and esophagus would be eliminated in a society of lifetime nonsmokers.

SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

TABLE 1 -- Smoking-Attributable Cancer Deaths by Site, Minnesota 1981

Cancer Site	Total Observed Deaths	Expected Deaths	Excess Deaths
Lung, Trachea, Bronchus	1453	224	1229
Oral Cavity	103	37	66
Larynx	64	9	55
Esophagus	111	29	82
Pancreas	399	251	148
Kidney	154	92	62
Bladder	137	109	28
TOTAL: SMOKING-ATTRIBUTABLE CANCER DEATHS: 1670			

Respiratory Diseases

Cigarette smoking is strongly implicated in deaths from chronic obstructive lung disease (COLD). COLD is comprised of three common diagnoses -- chronic bronchitis, emphysema, and chronic obstructive airways (pulmonary) disease. Data from eight prospective studies which examine smoking status and respiratory disease outcomes uniformly demonstrate higher death rates from COLD among male and female smokers compared to their nonsmoking peers (USDHHS, 1984). Mortality rates from COLD rise very rapidly with age, particularly after age 65.

Reviewers have suggested that mortality ratios from the major prospective studies, with a preponderance of participants younger than age 65, may underestimate the impact of smoking on COLD mortality (USDHHS, 1984). Further underestimation occurs when prospective studies recruit employed persons for study -- persons undergoing the prolonged period of disability from COLD prior to death are undersampled. Placing particular emphasis on the age-specific COLD mortality rates, these reviewers concluded that "85-90% of the COLD deaths in the United States can be attributed to cigarette smoking" (USDHHS, 1984).

Estimates of Minnesota smoking-attributable mortality from COLD used both approaches: (1) calculations using the mean relative risks for the three individual diagnoses comprising COLD derived from eight prospective studies cited in the Surgeon General's report on COLD (USDHHS, 1984) and (2) use of the 85% summary figure which was considered the lower bound of more accurate estimates of smoking's contribution to COLD mortality. Using the relative risk estimates, 550 Minnesota COLD deaths were attributed to

SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

smoking (71%); using the 85% criterion, 660 COLD deaths were attributed to smoking.

Smoking is also linked to pneumonia and influenza deaths and to deaths from asthma. These diagnoses accounted for 250 additional smoking-attributable respiratory disease deaths. In summary, 910 respiratory disease deaths were attributed to smoking in Minnesota for 1981.

Digestive Diseases

Cigarette smoking is an important risk factor for peptic ulcer disease and a contributory factor for cirrhotic liver disease. In Minnesota in 1981, 40 ulcer deaths from a total of 129 were considered to be attributable to smoking.

The situation with liver cirrhosis is more complex. Cigarette smoking bears a strong relationship to the occurrence of cirrhosis. However this relationship is confounded by the strong association of smoking and alcohol use, with alcohol as the most important risk factor for cirrhosis. Using relative risk data, it is estimated that 125 cirrhosis deaths are attributable to smoking. This is likely to be an overestimate once the alcohol contribution is subtracted. Therefore, the figure of 55 cirrhosis deaths was substituted (assuming an attributable risk of 0.15).

Perinatal Diseases

Maternal smoking during pregnancy and parental smoking in the home during the early years of life are causally associated with increased fetal death and infant mortality. Attributable risk estimates have been recently published for smoking's contribution to pregnancy complications, perinatal deaths, and infant deaths.

Minnesota estimates of smoking-attributable infant deaths are conservative, selecting only those diagnoses strongly linked to smoking and applying the overall attributable risk fraction for infant deaths to that small subset of diagnoses. From these calculations, it was estimated that 58 infant deaths in 1981 were attributable to smoking.

Cigarette-Ignited Fire Deaths

Cigarette-ignited fires are cited as the cause of death for 20-35 Minnesotans per year according to the Minnesota State Fire Marshall. Cigarettes are the number one cause of ignition of fatal residential fires.

Aggregated Smoking-Attributable Mortality Data

Minnesota 1981 smoking-attributable mortality sums to 4540 deaths using traditional mean relative risk calculations for current smokers only. Replacing these standard calculations with age- and sex-specific calculations for ischemic heart disease and for cancers and using the 0.85 attributable risk for COLD, the total of smoking-attributable deaths in

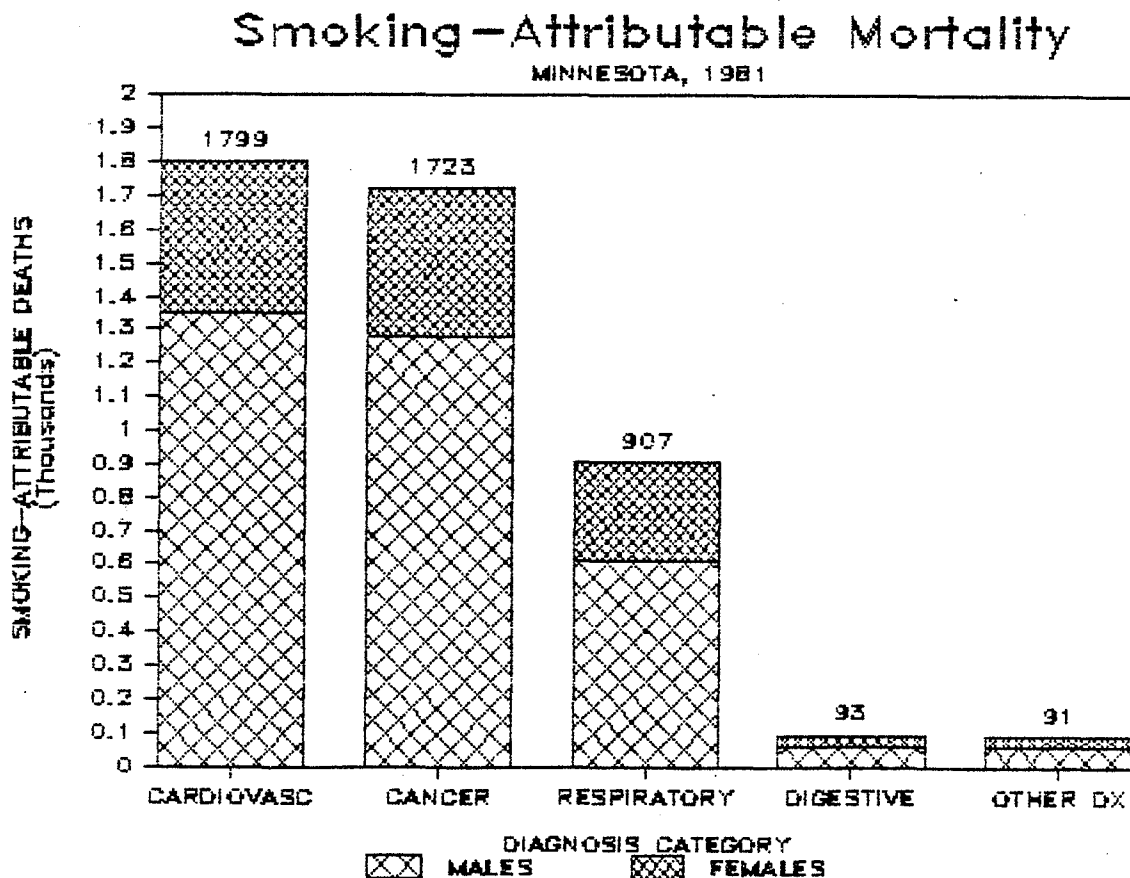
SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

Minnesota is 4615. This figure accounts for excess deaths among former smokers in the categories with special calculations. For other categories (infectious diseases, digestive diseases, diseases of the heart other than ischemic heart disease), only current smoker risks are calculated.

Both of these estimates are conservative since former smokers are excluded from some of the calculations. Inclusion of excess deaths from former smokers across all smoking-related diseases would be expected to elevate the estimate of smoking-attributable deaths to the range of 5000 deaths per year. This figure is about 15% of total statewide mortality for Minnesota. These 5000 deaths are an estimate of excess mortality -- deaths which would not have occurred in 1981 had the Minnesota population been comprised of lifetime nonsmokers.

Figure 3 and Table 2 display the distribution of smoking-attributable deaths in Minnesota in 1981 by diagnostic category and by sex. The predominance of deaths from diseases of the heart and from cancers is apparent. Larger numbers of smoking-attributable deaths occurred for males compared to females for all diagnostic categories.

FIGURE 3



SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

TABLE 2 -- Smoking-Attributable Deaths by Diagnostic Category, Minnesota, 1981

Diagnostic Category	Males	Females	Both Sexes
Heart Diseases	1350	450	1800
Cancers	1280	440	1720
Respiratory Diseases	620	290	910
Digestive Diseases	60	35	95
Perinatal Conditions/SIDS	35	25	60
Cigarette-Ignited Fire Deaths	20	10	30
TOTALS:	3365	1250	4615

Details of smoking-attributable mortality calculations using Minnesota-specific attributable risks are presented in a spreadsheet layout in Appendix C.

EXCESS DISABILITY ATTRIBUTABLE TO SMOKING IN MINNESOTA

A similar analysis can be done for smoking-related disability. Total person-years of disability have been estimated for Minnesota for major diagnostic groups (Dean et al., 1982). These 1978 estimates per 100,000 population, applied to the 1983 Minnesota population (estimated at 4,110,000), yield estimates of total Minnesota disability in 1983 of 447,000 person-years. For the diagnostic categories related to smoking, the attributable fractions for mortality from the Minnesota calculations presented above were used as multipliers of total disability for each disease grouping (Table 3). As expected, the major burden of smoking-related disability accrues from respiratory diseases and from nonfatal cardiovascular diseases.

A conservative total estimate of smoking-related disability is 39,000 person-years. This represents 8.65% of total statewide disability from all illnesses.

SUMMARY

In Minnesota, smoking is a major cause of death. Smoking-attributable mortality (5000 deaths annually) is more than eight times the number of Minnesota traffic fatalities. Smoking-related deaths from heart disease, cancers, and respiratory disease represent a high proportion of premature deaths. On the average, the life expectancy for smokers is diminished by about six years.

SMOKING-ATTRIBUTABLE DEATHS AND DISABILITY IN MINNESOTA

TABLE 3 -- Smoking-Attributable Disability by Diagnostic Category, Minnesota, 1983

Diagnostic Category	Total Disability for Category	Multiplier	Smoking-Attributable Disability
Respiratory Diseases	64,650	.385	24,390
Heart Diseases	86,310	.109	9,410
Perinatal Conditions	--	.125	-0-
Cancers	8,713	.243	2,120
Cigarette-Ignited Fires (Injuries)	47,840	.013	620
Digestive Diseases	19,934	.080	1,595
Infectious Diseases	8,220	.010	80
TOTAL SMOKING-ATTRIBUTABLE DISABILITY:			38,715 Person-Years

TOTAL DISABILITY FROM ALL CAUSES: 447,375 Person-Years

Smoking causes illness and disability throughout the lifespan. Nonsmokers and their children experience less illness at all ages. For Minnesota, smoking-related disability is estimated at 39,000 person-years annually.

Smoking-attributable mortality and morbidity estimates provide a strong case for implementing programs for nonsmoking. Estimates of the economic costs of smoking to Minnesota will be presented in the next chapter.

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

Economic analyses for estimating smoking-attributable costs in Minnesota are preceeding in stages of increasing sophistication as further data becomes available. Economic analyses follow the general format established by the work of Rice (Rice, 1966; Cooper and Rice, 1976) who divided the cost of illness into direct and indirect cost sectors. In a recent article, Rice states, "Economic costs represent foregone alternatives: direct costs are the value of resources that could be allocated to other uses in the absence of disease; indirect costs are the value of idle resources and lost output" (Rice and Hodgson, 1983).

DIRECT HEALTH CARE EXPENDITURES ATTRIBUTABLE TO SMOKING

In the analysis of smoking-attributable costs, direct costs include such medical costs as hospital charges, physician fees, nursing home costs, charges for prescription medications, and fees for ancillary services. Because a number of assumptions and approximations are necessary in calculating excess medical care costs due to smoking, three different methods were used. All three are presented for those who wish to see how the figures were derived. General readers, however, may wish to skip to the summary statement at the end of this section.

Calculation One

The first-stage estimate of Minnesota smoking-attributable direct costs was based on the frequently-cited calculations of Luce and Schweitzer (1978a, 1978b). These authors, in the first application of the economic estimates of Rice to the issue of smoking-related costs, found that 7.8% of total national direct costs (1976 cost data) were due to smoking. Luce and Schweitzer offered the opinion that their estimate was very conservative.

For Minnesota, 1981 cost data will be presented. This is the most recent year for which both cost and mortality data is available. Where appropriate, estimates in 1983 dollars will be given as updated figures. An estimate of total 1981 Minnesota direct costs is found by assuming conservatively that Minnesota per capita health expenditures are 96.5% of the national per capita figure, based on trends dating from 1966 to 1978 (Levit, 1982). For Minnesota, this per capita figure would be \$1052 for an estimated 1981 Minnesota population of 4,087,000, yielding a total direct cost estimate of \$4.30 billion (based on national per capita estimates supplied by Freeland and Schendler, 1983). As a general benchmark, 7.8% of \$4.30 billion results in an estimate of \$335,400,000 in smoking-attributable direct costs for 1981. The 1983 estimate would be \$414,200,000 after correcting for increases in health care costs during 1981-1983.

Luce and Schweitzer (1978b) and Cady (1983) generated estimates of smoking-attributable costs for broad disease categories. The smoking-attributable fractions used by Luce and Schweitzer were 25% of circulatory diseases, 40% of respiratory diseases, 20% of neoplasms, and 1.1% of injuries (burns from cigarette-ignited fires). These figures originated from working conferences on prevention at the National Institutes of Health in the mid 1970s. For Minnesota, the \$4.30 billion in direct personal health expenditures was apportioned to specific disease categories using the

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

approximation that Minnesota costs are factored identically to the most current national costs (Hodgson and Kopstein, 1984). With these assumptions, the smoking-attributable direct cost estimate was calculated for 1981 (Table 1).

**TABLE 1 -- Smoking-Attributable Direct Health Costs:
Method of Luce and Schweitzer (Calculation 1), Minnesota, 1981**

	Total Direct Costs	Attributable Fraction	Smoking-Attributable Costs
Circulatory	\$650,800,000	.25	\$162,700,000
Respiratory	\$339,400,000	.40	\$135,800,000
Neoplasms	\$267,200,000	.20	\$ 53,400,000
Injuries	\$377,500,000	.011	\$ 4,200,000
			TOTAL: \$356,100,000

In 1983 health care dollars, this amounts to \$439,700,000.

Calculation Two

Recently, Rice and Hodgson (1983) have refined this process in four ways. First, the attributable fractions used for the calculation of smoking-attributable costs were based on updated relative risk estimates reported in recent Surgeon General's reports. Second, relative risks and cost estimates were presented separately for males and females. Third, the number of diagnostic categories included was expanded. Fourth, more specific diagnostic categories were used in determining the proportion of smoking-attributable deaths. The best estimates of excessive smoking-caused deaths were summed across all diseases within a diagnostic subcategory and divided by total deaths for the category to produce the multiplier. Compared to previous methods, the multiplier was much more sensitive to differentials in smoking-related deaths for males and females and for current rates of smoking.

At this point, it is appropriate to mention basic assumptions -- and limitations -- of this type of calculation. Lacking more definitive information on morbidity rates and medical utilization patterns among smokers, an approximation is used. Rates of smoking-linked disease and disability are assumed to be approximated by the rates of excess smoking-attributable deaths. Excess morbidity in smokers is well documented for cardiovascular diseases, respiratory diseases, neoplasms, and infectious diseases, as well as for perinatal diseases in children of smokers. However, for cost estimates, the logic assumes that, for a given degree of illness, smokers and nonsmokers will utilize medical services at equal rates. This has been questioned by Vogt (manuscript in preparation) who

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

suggests that smokers may not use outpatient services more frequently than nonsmokers and that the excesses in inpatient hospital care may be less than expected from smoker/nonsmoker mortality ratios.

Calculations of direct costs for Minnesota closely followed the Rice and Hodgson methodology. The selection of diseases considered to be smoking-attributable differed slightly from their 1983 paper. Closely following Rice and Hodgson, only current smoker rates were entered into the attributable risk formulas -- a clear underestimate since death and disease rates remain higher in former smokers than never smokers for 10-15 years after cessation (USDHEW, 1979). Minnesota 1981 smoking prevalence rates, lower than national rates, were entered into the attributable risk estimates.

The attributable risk formula used is:

$$\text{Attributable Risk} = (b(r-1)) / ((b(r-1)) + 1).$$

In this formula, **b**, the proportion of the population exposed to the risk factor was represented by the **percentage of current smokers** in the 1981 Minnesota risk factor survey (MDH, 1983). These percentages are 31.7% for males, 28.0% for females, and 29.5% for males and females combined (ages 18 and over). The value **r** is the **relative risk** for smokers versus nonsmokers for a particular disease code with separate calculations for males and females.

The sequence of calculations was the following:

- (1) Diseases related to smoking were identified from a review of the Surgeon General's reports and the research literature.
- (2) For each of these diseases, mean relative risks were computed for males and females based on the average relative risks across multiple prospective studies. This methodology was used by Rice and Hodgson.
- (3) Attributable risks were calculated for each individual disease for males and females separately, inserting the smoking rates and mean relative risks into the formula presented above.
- (4) Minnesota 1981 mortality data was used to identify the numbers of deaths for males, females, and sexes combined for each of the identified diseases plus total deaths for the major diagnostic categories which included individual smoking-related diseases.
- (5) Smoking-attributable deaths were calculated separately for males and females for each disease by multiplying the attributable risk estimate by the number of deaths for the disease.
- (6) Total smoking-attributable deaths for a diagnostic category were calculated by summing across all smoking-related diseases in the category.

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

- (7) The cost multiplier was found as the ratio of total smoking-attributable deaths to total deaths in a diagnostic category.
- (8) Smoking-attributable direct costs for a diagnostic category were computed as the product of the cost multiplier and the total 1981 personal health expenditures for the diagnostic category (for males, females, and combined sexes).
- (9) Total smoking-attributable direct costs were found by summing across diagnostic categories for males and females separately and summing the subtotals.
- (10) Comparing this figure with total estimated personal health expenditures for 1981 yielded the percentage of total direct costs attributable to smoking.

For Calculation 2, mimicking the Rice and Hodgson attributable risks, the sum of the separate direct cost computations for males and females was \$407,200,000. Thus, the outcome of this more elaborate calculation was congruent with the estimate from Calculation 1 (\$439,700,000). This estimate represents 7.69% of total direct medical costs for Minnesota in 1983. This estimate is comparable to the 7.8% figure of Luce and Schweitzer. The Calculation 2 estimate, which does not include the contribution of former smokers to excess medical costs, is a conservative figure.

Summary figures from Calculation 2 are presented in Table 2. Detailed calculations are fully presented in spreadsheet format in Appendix B.

When this 1983 estimate of direct costs is compared with the 1983 statewide sales figure of 456,681,000 packs of cigarettes, the smoking-attributable direct costs are about 89 cents per pack sold.

For an estimated 1983 Minnesota population of 4,110,000, direct costs from smoking-attributable diseases amount to \$99 per person in the state.

Calculation Three

Calculation 3 is identical in methodology to Calculation 2. The only difference is that a second set of attributable risks for the same diseases was developed by substituting attributable risk estimates from Minnesota-specific calculations for coronary heart disease and for smoking-related neoplasms. These calculations have been outlined in the mortality section of this report. New attributable risk data from the recent Surgeon General's report on chronic obstructive lung disease were also inserted. For other diseases without special calculations, attributable risks were identical for both methods. The purpose of performing Calculation 3 was to substitute more accurate Minnesota age- and sex-specific estimates where available (including both current and former smokers where calculations permitted).

Thus, Calculation 3 represents estimates of smoking-attributable direct costs which correspond exactly to the estimates of Minnesota smoking-attributable mortality presented in the preceeding chapter of this report.

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

**TABLE 2 -- Minnesota Smoking-Attributable Costs in 1981:
Method of Rice and Hodgson (Calculation 2)**

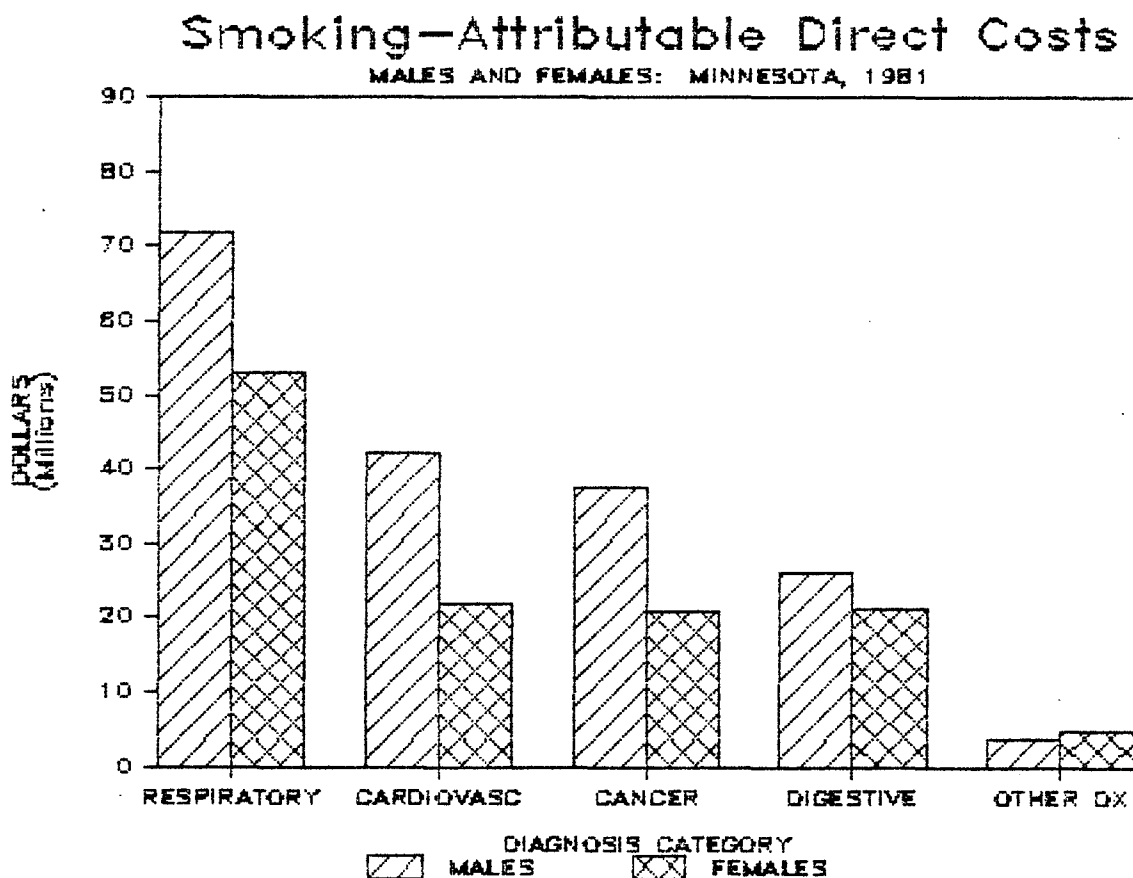
<u>MALES</u>			
Diagnostic Category	Total Direct Costs	Attributable Fraction	Smoking-Attributable Costs
Infectious	\$ 35,704,000	.01	\$ 290,000
Neoplasms	110,747,000	.27	30,087,000
Circulatory	273,257,000	.15	41,476,000
Respiratory	158,787,000	.40	62,846,000
Digestive	263,364,000	.16	43,129,000
Injuries/Accidents	191,874,000	.012	2,333,000
Other	772,267,000	.00	1,004,000
All Diseases	\$1,806,000,000	.1003	\$181,165,000
=====			
<u>FEMALES</u>			
Diagnostic Category	Total Direct Costs	Attributable Fraction	Smoking-Attributable Costs
Infectious	\$ 52,575,000	.01	\$ 631,000
Neoplasms	156,442,000	.09	13,980,000
Circulatory	377,582,000	.11	41,350,000
Respiratory	180,616,000	.26	47,388,000
Digestive	359,448,000	.11	41,127,000
Injuries/Accidents	185,637,000	.015	2,805,000
Other	1,181,760,000	.00	1,231,000
All Diseases	\$2,494,000,000	.0591	\$148,561,000
=====			
<u>COMBINED SEXES</u>			
(in 1981 dollars)	\$4,300,000,000	.0767	\$329,726,000
(in 1983 dollars)	\$5,310,000,000	.0767	\$407,200,000

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

Calculation 3 yielded a 1983 estimate of \$374,600,000 in smoking-attributable direct costs. This estimate is equivalent to 7.05% of total direct costs for 1983. This figure equates to 82 cents per pack sold or \$91 per Minnesota citizen.

Smoking-attributable direct costs by sex are displayed in Figure 1. It is evident that smoking-attributable direct costs for males exceed those for females for all major diagnostic categories. This is particularly notable because total costs within each diagnostic category is actually greater for females.

FIGURE 1



Summary results from Calculation 3 appear in Table 3. The full detail of the calculations is contained in computer spreadsheets in Appendix C.

It is interesting to compare the percentages ascribed to major diagnostic categories from the Rice and Hodgson procedure using the three methods of calculations (Table 4).

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

**TABLE 3 -- Minnesota Smoking-Attributable Costs in 1981:
Minnesota-specific attributable risks (Calculation 3)**

<u>MALES</u>			
Diagnostic Category	Total Direct Costs	Attributable Fraction	Smoking-Attributable Costs
Infectious	\$ 35,704,000	.01	\$ 290,000
Neoplasms	110,747,000	.34	37,627,000
Circulatory	273,257,000	.15	42,318,000
Respiratory	158,787,000	.45	71,985,000
Digestive	263,364,000	.10	25,998,000
Injuries/Accidents	191,874,000	.012	2,333,000
Other	772,267,000	.00	1,004,000
All Diseases	\$1,806,000,000	.1003	\$181,555,000
=====			
<u>FEMALES</u>			
Diagnostic Category	Total Direct Costs	Attributable Fraction	Smoking-Attributable Costs
Infectious	\$ 52,516,000	.01	\$ 631,000
Neoplasms	156,442,000	.09	20,943,000
Circulatory	377,582,000	.11	21,886,000
Respiratory	180,616,000	.26	52,883,000
Digestive	359,448,000	.11	21,360,000
Injuries/Accidents	185,637,000	.015	2,805,000
Other	1,181,760,000	.00	1,231,000
All Diseases	\$2,494,000,000	.0488	\$121,788,000
=====			
<u>COMBINED SEXES</u>			
(in 1981 dollars)	\$4,300,000,000	.0705	\$303,343,000
(in 1983 dollars)	\$5,310,000,000	.0705	\$374,600,000

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

TABLE 4 -- Comparison of Cost Multipliers for Diagnostic Categories

Diagnostic Category	Calculation 1 Luce & Schweitzer	Calculation 2 Rice & Hodgson	Calculation 3 Minnesota Specific
Infectious/Parasitic	----	.01	.01
Neoplasms	.20	.19	.24
Circulatory System	.25	.13	.11
Respiratory System	.40	.34	.39
Digestive System	----	.14	.08
Injuries/Accidents	.011	.013	.013
Perinatal Conditions	----	.13	.13
Signs and Symptoms (SIDS)	----	.03	.03

Striking similarities are notable for neoplasms and for accidents. Percentages attributed to smoking using the Rice and Hodgson procedure are somewhat less for respiratory diseases and remarkably lower for circulatory diseases. Several categories of digestive and infectious diseases are included in the Rice and Hodgson analyses which do not have counterparts in the earlier calculations.

In summary, economic analyses of smoking-attributable direct health care costs are being progressively refined over several iterations. The estimates are conservative and represent a lower limit of smoking-attributable costs. In 1983 dollars, the range is from \$374,600,000 to \$439,700,000, approximately equal to the total gross retail sales of cigarettes in Minnesota.

Data is currently being analyzed at the National Center for Health Statistics to allow morbidity comparisons for diseases related to smoking. Rice and Hodgson will use this information for nationwide calculations, and the same morbidity comparisons will replace mortality comparisons for Minnesota data. Simple means for relative risks will be replaced by weighted means (weighting by the inverse of the variance). A further refinement in cost estimates will be the inclusion of former smoker prevalence rates and relative risks in expanded attributable risk formulas. Finally, accuracy of direct cost estimates will be enhanced by separate calculations for different age brackets. Use of age-specific attributable risks is already reflected in major parts of Calculation 3 for Minnesota.

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

INDIRECT MORTALITY COSTS ATTRIBUTABLE TO SMOKING

Indirect costs include loss of income from premature death and from illness-related disability. Cigarette smoking causes premature mortality. Rice and Hodgson (1983) have examined the indirect lost income and productivity costs associated with smoking-attributable deaths. This methodology has been applied to 1981 Minnesota data.

For death at any age, an estimate of loss of the present value of potential future earnings can be calculated. These future earnings are discounted (typically at 4% or 6%) to account for the effects of inflation. Indirect mortality cost is the sum of the present value of future earnings for all individuals who die prematurely.

The sequence of calculations was the following:

- (1) The present value of future earnings, discounted at 4% was calculated by Rice and associates for 1980 in five-year age increments.
- (2) For each smoking-related disease, the total diagnosis-specific indirect costs were calculated by summing the products of numbers of deaths for the diagnosis times the present value of future earnings for each of the five-year increments. For chronic diseases related to smoking -- diseases of circulatory, respiratory, and digestive systems; neoplasms, and infectious diseases -- indirect cost calculations were restricted to ages 35-85+. For perinatal conditions and sudden infant death syndrome, age 0-1 was used. For cigarette-ignited burn deaths, a fraction of total injury category costs was used with no restriction on age.
- (3) Two sets of attributable risks were obtained, identical to those used in Calculations 2 and 3 for direct cost calculations.
- (4) Smoking-attributable indirect mortality costs were calculated by multiplying the total diagnosis-specific indirect costs by the smoking-attributable risk for that diagnosis for males and females separately. Two estimates were generated based on the two sets of attributable risks.
- (5) Total smoking-attributable indirect mortality costs were obtained by summing across diagnoses within males and females and then summing male and female subtotals.
- (6) Updated estimates (original calculations used 1980 earnings figures) were produced by inflating 1980 estimates by the rate of increase of per capita personal income (not health care costs as in the previous section).

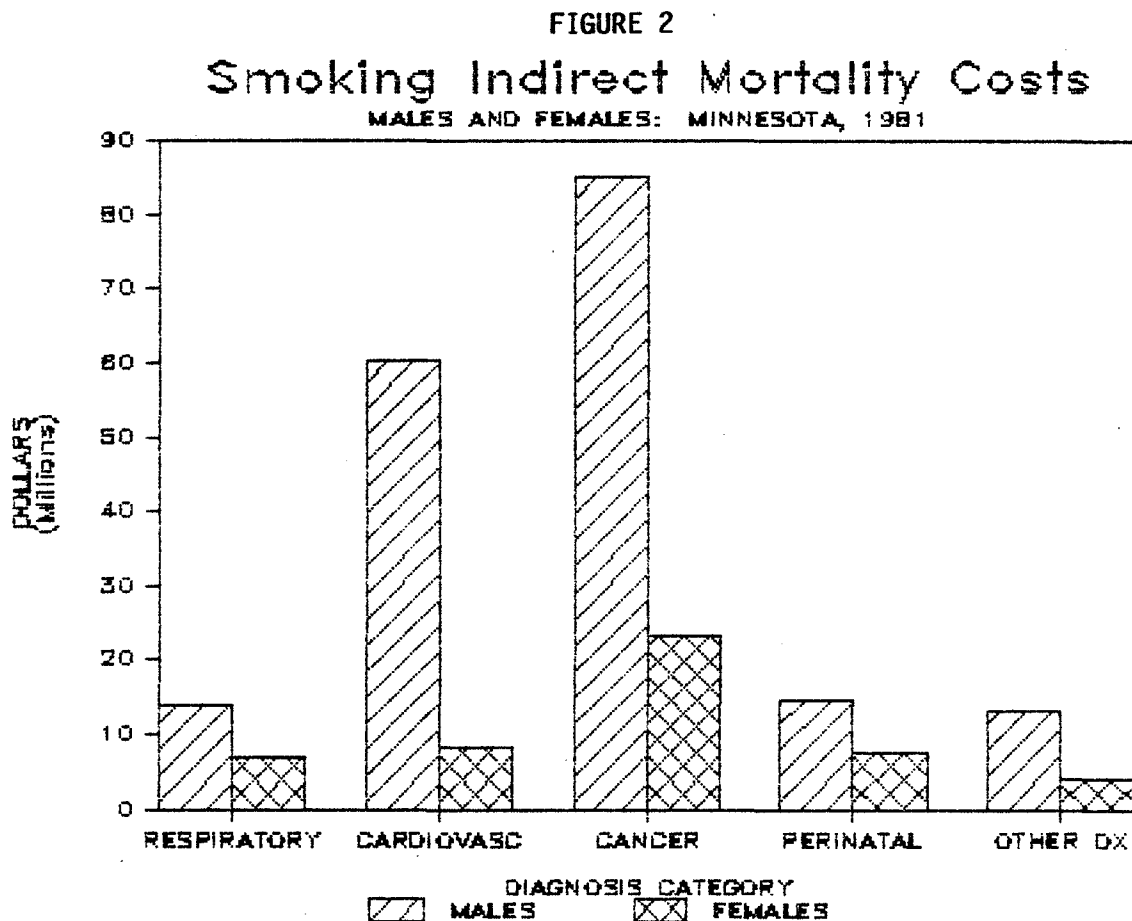
The Rice and Hodgson attributable risks (Calculation 2) resulted in an estimate of smoking-attributable indirect mortality costs of \$222,700,000 (1980 dollars). The estimate from Minnesota-specific attributable risks (Calculation 3) was \$237,000,000.

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

Inflating by 10.75% from 1980 to 1981, the estimates for Calculations 2 and 3 become \$246,600,000 and \$262,500,000. With conservative estimates of 9% and 6% increases for 1982 and 1983, the 1983 estimates are \$284,900,000 and \$303,300,000.

Thus, the lost income costs from persons who died from smoking-attributable causes in 1983 is estimated to amount to about 62 (66) cents per pack.

Smoking-attributable indirect costs by sex are presented in Figure 2. Detailed indirect cost calculations are presented in spreadsheet format in Appendices D and E for Calculations 2 and 3 respectively.



Indirect costs from smoking-attributable excesses in lifetime, nonfatal disease and disability will be calculated in the near future, pending the receipt of calculations being performed by the National Center for Health Statistics.

Counterarguments to the economic calculations of smoking costs have been presented in the medical literature. They often suggest that savings in pension and annuity payments and in social security costs will reduce the total cost to society. When examined closely and carried to a logical conclusion, however, such arguments would result in the recommendation that each citizen work until age 65 and then acquire a rapidly fatal disease. Since this is not consistent with the goals either of a health agency or of responsible government, we have not included the "savings" due to premature

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

death in our calculations. In discussing such calculations with insurance experts, it appears that the economic "benefits" of premature death would be greater to the Social Security system than to private insurance companies. The latter have a mixture of disability, pension, and life policies which, on balance, will produce greater income for the company if policyholders live longer. Social Security, having primarily a disability and pension function not funded by interest income, would show the most "benefit" from premature deaths.

Obviously, economics can lead us into some unpleasant and undesirable byways, but it seems best to be clear about the issues since such arguments have appeared in the literature.

SUMMARY

Direct medical care costs in Minnesota for 1983, calculated by several methods, approximately equal the gross retail receipts from sales of cigarettes.

The best estimate (Calculation 3) is:

\$91 per person (population: 4,110,000)

\$446 per smoker (estimated 840,000; age 18+)

82 cents per pack sold (456,681,000 packs)

\$374,600,000 total 1983 dollars

Indirect costs of lost income due to premature death are estimated at:

\$74 per person

\$361 per smoker

66 cents per pack sold

\$303,300,000 total 1983 dollars

Indirect costs of lost income due to disability have not yet been estimated but could amount to as much as an additional dollar per pack sold.

Many assumptions and approximations are involved in these calculations, and they should be regarded as an economic expression of the health statistics -- not an exact profit and loss statement. There can be little doubt about the overall conclusion from the following totals, however:

ECONOMIC COSTS ATTRIBUTABLE TO CIGARETTE SMOKING IN MINNESOTA

Retail Sales Income

\$453,000,000
for 456,681,000 packs
@ 99.2 cents per pack

Partial Health Costs

Direct \$374,600,000
Indirect \$303,300,000
(excluding disability lost income)
Total \$677,900,000

Ratios:

Retail Sales Income / Partial Health Costs = 0.7

Partial Health Costs / Retail Sales Income = 1.5

THE ECONOMICS OF TOBACCO

THE TOBACCO INDUSTRY IN THE UNITED STATES

Farming

In 1982 tobacco was the fifth largest cash crop, worth nearly \$3.4 billion. Its economic importance, however, is less than in the past. Between 1950 and 1954 tobacco accounted for 8.3% of all the market value of farm crops, but today this has shrunk to 2.4%.

Nationwide there are an estimated 200,000 tobacco-producing farms which last year harvested just under two billion pounds of tobacco on over 900,000 acres, or just over 2100 pounds per acre. (According to the Tobacco Institute, there were 12 farms producing tobacco on 63 acres in Minnesota with an estimated crop value of \$80,000 in 1982.)

Although 22 states have farms growing tobacco, six states account for over 90% of production. North Carolina is the largest tobacco-growing state as well as the leading manufacturer of cigarettes. Other major producing states are South Carolina, Georgia, Tennessee, Kentucky, and Virginia.

A majority of American tobacco is flue-cured, or bright tobacco -- the principal ingredient of cigarettes -- and is principally grown in Georgia, Virginia, South Carolina, and North Carolina. Burley tobacco -- the next largest cigarette ingredient -- is grown principally in Tennessee and Kentucky.

Tobacco is the most labor-intensive cash crop grown in the United States, requiring almost 250 man-hours per acre compared to about three hours for wheat and rice.

About 95% of the 1.5-2.0 billion pounds of tobacco grown annually is sold through competitive bidding in some 800 auction warehouses. Tobacco with no takers at the support price is sold to the government-supported co-op.

The average price per pound of the 1982 crop was approximately \$1.77 per pound, a 3% increase above 1981 prices.

Price supports. Tobacco farmers, like producers of many other farm products including milk, corn, wheat, and cotton, participate in the Federal price support programs. The Agricultural Adjustment Act of 1938 provided a comprehensive price support program for tobacco, corn, wheat, cotton, peanuts, and rice. As the Act operates for tobacco, the Secretary of Agriculture each year sets a national quota determined by current market conditions and assigns a share for individual farms based on the production history of each. These allotments become effective if two-thirds of the growers approve.

Price support is provided through Federal loans to grower cooperative associations. The cooperatives use these loans to purchase tobacco from farmers who cannot sell their crops on the open market at the approved support price level. The tobacco is then stored until a buyer is found, often on the international market at a price equal to that of the support price. Most of the tobacco is thus resold at little net cost to the Government, making the tobacco program more successful from a financial

standpoint than those for most of the other price-supported crops. In fiscal year 1982, new loans exceeded repayments by \$100 million.

Congressional revisions in the price support program are occurring. Tobacco farmers pay into a fund established in 1982 to offset any future losses and to guarantee that in the future the support program will operate at no net cost to the American taxpayer.

Manufacturing

Six companies produce virtually all the cigarettes manufactured in the United States (Table 1). In 1977, according to the Census of Manufacturers, they employed 39,000 persons and had payrolls of \$567.7 million. Just over ten years ago, most cigarette companies realized over 90% of all earnings from tobacco. These companies have now become more diversified.

**TABLE 1 -- Tobacco Products in the Corporate Structure
of United States Producers: 1979**

Company	Market Share (%)	Tobacco Earnings (%)	Other Businesses
Philip Morris	34.3	82.0	Miller Brewing Seven Up
R. J. Reynolds	31.9	79.5	Del Monte Sea Land, Inc. Aminoil USA
Brown and Williamson	11.5		Gimbel Brothers supermarkets, food products
Lorillard	9.1	22.2	CNA Insurance hotels, theaters
American Brands	8.7	58.6	Master Lock Franklin Life
Liggett Group	4.6	15.6	liquor, pet food

In 1983, these companies produced 704 billion cigarettes at 12 facilities in four states -- Virginia, North Carolina, Kentucky, and Georgia.

Cigarette manufacturing is an automated operation. One machine makes a continuous cigarette, cuts it to the required length, and attaches a filter if required. A second machine makes the packs, and a third machine makes the cartons.

THE ECONOMICS OF TOBACCO

Cigarette "tobacco" is actually a combination of ingredients -- from shredded tobacco leaves and "reconstituted sheet" made from tobacco stems and fiber to various flavoring agents, extenders, humectants, and other additives. Cigarette manufacturers are not limited as to what flavorings or other substances they may use as additives, nor are they required to label and report on what these materials are. Legislation currently being considered by Congress would require some disclosure of the most commonly used additives to the Secretary of Health and Human Services.

Wholesaling and Retailing

Approximately 1800 primary tobacco wholesalers and nearly 800 miscellaneous wholesalers distribute tobacco products worth a total wholesale value of \$18.5 billion. The nearly universal availability of tobacco products is assured by the estimated 250,000 retail outlets. Grocery stores are the largest retail outlets, accounting for 42.7% of sales.

In Minnesota approximately 100 wholesalers distribute tobacco products.

Total United States consumption, including overseas forces in 1982

- 634 billion cigarettes (31.7 billion packs)
- 3.7 billion large cigars and cigarillos
- 1.3 billion little cigars
- 33.6 million pounds of pipe and roll your own tobacco
- 88 million pounds of chewing tobacco
- 3.9 million pounds of snuff

Total Minnesota consumption based on taxed packs in 1982 was 9.8 billion cigarettes or nearly 481 million packs.

The increased health concerns of smokers and industry marketing emphasis has made "low yield" cigarettes more popular. The average sales-weighted cigarette yield has dropped from 37.9 mg tar and 2.7 mg. nicotine in 1956 to 12.5 mg tar and 0.9 mg nicotine in 1982. These low tar/nicotine cigarettes now account for 60% of cigarette sales. Of the 208 varieties of cigarettes tested by the FTC in March 1983, 157 had tar contents less than 15 mg and 145 had nicotine contents less than 1.0 mg (Tobacco International, 1983). Recent studies of the nicotine content of the blood in smokers of these products show little or no difference between smokers of cigarettes of varying 'tar' and nicotine yield (Benowitz, 1983).

ECONOMIC IMPACT OF TOBACCO

Expenditures

United States expenditures for tobacco products were estimated at \$25.3 billion in 1982. More than \$23.4 billion, or about 93%, was for cigarettes. Warner (1980) has estimated that Americans spend 40% of what they spend on cars on tobacco. Miller (1978) estimated that 1.3% of all retail expenditures were on tobacco products.

THE ECONOMICS OF TOBACCO

Total retail sales in Minnesota in 1982 for tobacco products was approximately \$350 million.

Cigarette price increases have generally not kept up with inflation. The result is that, relative to the cost of other goods and services, the average price of a package of cigarettes has decreased. The average price of a pack of cigarettes in 1967 was 31.6 cents. This increased in 1972 to 36.5 cents (in 1967 dollars). The real average price in January of 1983 was 28.5 cents, a decrease of 8 cents or 21.9% since 1972. (The Twin Cities cigarette price increase was used as the deflator of the average retail prices) (Minnesota Department of Revenue).

Breakdown of consumer expenditures for tobacco (1977):

Taxes	36.6%
Distribution	26.2%
Manufacturing	22.0%
Farming	6.7%
Marketing	4.9%
Other	3.6%

Economic Benefits to Minnesota

Net Minnesota state cigarette tax collections by year:

1950	\$11.1 million
1960	\$19.5 million
1970	\$49.1 million
1980	\$84.6 million
1981	\$86.2 million
1982	\$86.3 million
1983	\$82.5 million

Total state tax collections for all taxes in 1982 was \$4.2 billion. Cigarette taxes supplied approximately 2% of the total tax income (Comprehensive Annual Financial Report for the State of Minnesota 1982, p. 22).

Tobacco's contribution to the economy of Minnesota includes primarily the tax revenues and wages paid to persons in wholesaling, retailing, and support industries. In 1982 this total was approximately \$134 million.

Economic Costs to Minnesota

Bootlegging. Minnesota may be experiencing minor losses due to cigarette smuggling. No hard estimates are available but they are less than the estimated \$7 million per year during the 1970's (Minnesota Department of Revenue).

Health-related costs. Economic costs to Minnesota include increased direct and indirect health-related costs related to increased mortality, morbidity, and subsequent loss of productivity. Smoking-related direct health care costs to the state have recently been estimated to be \$374.6

million per year. The state's largest loss comes from productivity losses with associated reductions in income taxes collected and increases in workman's compensation costs. Lost income costs from premature smoking-related mortality alone have been estimated to be \$303.3 million per year (see page 80).

Marketing Issues

An estimated \$1.2 billion was spent on advertising of cigarettes in 1982. Since January 2, 1971, it has been illegal to advertise cigarettes on television or radio. Prior to this, the cigarette companies were heavy users of the air media; since then they have become heavy users of newspapers, magazines, and outdoor advertising. Total advertising expenditures more than doubled between 1970 and 1978 from \$361-\$864 million. Cigarettes are believed to account for 32% of all outdoor advertising and 9% of all magazine advertising.

The U.S. is the leading exporter of tobacco. In 1982, about 29% of the U.S. crop was exported with a value of \$2.8 billion. Cigarette sales abroad are six times larger than in the U.S. and are growing faster -- 4% per year overall and faster in developing countries.

Advertising bans do not restrict television and radio ads for smokeless tobacco products (chewing tobacco and snuff). Sales of such products are increasing, especially among the young (Discount Merchandiser, 1983). Industry publications cite factors favorable to the development of this segment of the industry, including the development of milder products, an increase in leisure time and outdoor activities, the emphasis on "doing your own thing," regulations which limit smoking on the job and in public places, and advances in packaging the product for easier use. A number of marketing strategies are geared towards encouraging young people to start using tobacco.

Sources for this chapter, except where noted:

Nelson JF. The Tobacco Industry: Times of Change for Americas Oldest Industry. Profits: A Bank of Virginia Business Publication, Winter, 1981.

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METHODS FOR THE PROMOTION OF NONSMOKING

METHODS FOR THE PROMOTION OF NONSMOKING

Methods to reduce the level of tobacco use include efforts to prevent young people from starting to smoke; to help current smokers quit or reduce the amount of smoking; to discourage smoking by making it more expensive; and to regulate various aspects of public smoking, cigarette sales, and advertising. The resulting programs and policies can be categorized in three general areas: educational and behavioral interventions, economic strategies, and regulatory strategies.

Educational and behavioral interventions have been primarily concerned with prevention and cessation. Prevention efforts are aimed at delaying or preventing the onset of smoking by teaching the health risks of smoking along with psychosocial skills which can help combat the social pressures to smoke. Cessation efforts utilize a variety of behavioral techniques aimed at reducing the number of current smokers. Economic strategies -- primarily increases in cigarette taxes -- have also been used to reduce levels of smoking while at the same time maintaining or raising tax revenues. Other economic incentives, such as differential insurance rates for nonsmokers, may also affect attitudes about smoking and reinforce nonsmoking. Finally, regulatory strategies which restrict smoking in certain areas and which limit the advertising of some tobacco products reflect changing societal norms regarding the rights of nonsmokers and the tobacco industry. The following is an attempt to summarize the available data concerning how and why people start and continue to smoke and the current status of efforts in these three areas of smoking control with particular attention to the current status in Minnesota.

EDUCATIONAL AND BEHAVIORAL INTERVENTIONS

Development of the Smoking Habit

There are three stages of smoking:

- a) initiation -- trying the first cigarette
- b) experimental smoking -- less than weekly
- c) regular smoking -- at least weekly

The highest rates of initiation occur during junior high school years (7th and 8th grades). Recent increases in the number of girls starting to smoke seem to be levelling off. The number of girls starting to smoke now approximates the rate for boys (Gallup Poll, 1981).

The development of a regular smoking pattern (at least once a week) does not always follow an initial smoking experience, but data suggest that 70-90% of teenagers who try four or more cigarettes will become regular smokers (McKenna and Thomas, 1967).

Among adults who smoke, 95% began to smoke between the ages of 12 and 21 (CDC, 1976).

There are several factors associated with development of adolescent smoking (Botvin, 1982):

1. Sociodemographic variables.

- Smoking status of friends. Probably the single strongest predictor of adolescent smoking. Teenage smokers tend to have friends who smoke. In a 1974 survey, 87% of teenage smokers reported that at least one of their friends was a smoker (DHEW, 1976).
- Smoking status of family members. Smokers generally have at least one parent that smokes. If both parents smoke, the child is more likely to smoke than if only one parent smokes.
- Socioeconomic status. In general, there is an inverse relationship between socioeconomic status and smoking behavior among teens. There is also an inverse relationship between smoking and both parental education and educational aspirations of the teenager.

2. Personality variables.

Adolescent smokers have been shown to differ from non-smokers in that they tend to show an external locus of control, high impulsivity, and impatience. Smokers, in general, also may differ in sense of identity and self-image. Smoking has been associated with low self-esteem, dissatisfaction, and low self-confidence (Evans, Henderson, Hill, and Raines, 1979).

3. Behavioral variables.

- Academic performance. Smokers do not differ from non-smokers in intelligence but they are less academically successful, reflecting a difference in orientation or motivation.
- Leisure activities. Smokers are less involved in extra-curricular activities and organized sports or clubs.
- Antisocial tendencies. Smokers are more likely to engage in antisocial activities such as fighting, swearing, lying, cutting class, gambling, and drinking. They are more often disciplinary problems and are more likely to indulge in risk-taking behaviors.
- Work experience. Teenagers who work full or part time are twice as likely to smoke as those who do not work.
- Moral development. In the teenage years, changes in moral orientation and declining influence of parents and authority figures appear to promote a more tolerant attitude toward smoking. Cigarette use may serve as a means of identifying with a particular reference group, rebelling against authority, or establishing a sense of identity.

Prevention Strategies

The prevalence of smoking among teenagers in this country has prompted the design of a wide variety of strategies to reduce levels of smoking in young people. For the most part, smoking prevention programs for youth can be divided into two types. The first includes the traditional educational approach, providing students with information regarding the long-term health effects of smoking. The second includes more recent approaches to smoking prevention, which have focused on the learning of social and psychological skills to combat the pressures to start smoking.

Informational approaches in youth anti-smoking programs are based on the premise that, if students are supplied with enough information regarding the hazards of smoking, they will choose not to smoke. Such information is typically included as part of a general health education curriculum in elementary and junior high schools. To a great extent these programs have been diverse, inconsistent, and incompletely evaluated.

The usefulness of several adaptations of the informational approach has been studied. These include the use of feedback on the immediate physiological effects of smoking such as heart rate, changes in skin temperature, and carbon monoxide in expired air. Initial results suggest that this type of information may be more useful in deterring smoking than information on the long-term effects, and feedback on the immediate physiological effects of smoking has been incorporated into some multi-component programs. Peer- and older-student-led programs have been developed to test the assumption that students are more receptive to anti-smoking messages from fellow students than to similar messages from teachers or other authority figures.

Informational approaches are able to increase smoking-related health knowledge and, in some instances, alter attitudes and beliefs about smoking, but they do not seem to have a significant impact on actual smoking behavior in adolescents (Evans et al., 1979).

The lack of impact on smoking behavior of informational programs has inspired others to focus on the social and psychologic factors that appear to influence a student's decision to smoke. Several pilot programs with reliable evaluation data have been developed and assessed in the past few years (Evans, 1976; McAlister, Perry, and Maccoby, 1979; Botvin and Eng, 1982; Perry et al., 1980). The successful programs all utilized social-psychological theory and were school based with emphasis on 7th grade students.

Programs used or in use in Minnesota. Minnesota state law mandates the teaching of drug abuse prevention education in elementary and secondary schools. The existing law requires each school district to develop program objectives regarding health education, including drug abuse prevention. Tobacco use is not expressly mentioned in the law, and no information is available on the number of programs statewide which specifically address smoking issues. The State Department of Education has developed a list of objectives for use by the state school districts. The state encourages each district to develop their own curriculum to achieve these goals tailored to their own specific needs. Current class time requirements for health education are: 60 minutes per week in grades 1-6;

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60 hours of instruction in grade 7, 8, or 9; and 60 hours of instruction in grade 10. Current state appropriations to school districts for drug abuse prevention programs are \$1.00 per student (minimum of \$1000), which totals \$850,000 for fiscal year 1983.

- Primary Grades School Health Curriculum Project (Seattle Program) and the School Health Curriculum Project (Berkeley Program). These are perhaps the most widely used information-based programs. In 1982, approximately 10% of Minnesota students in grades 1, 2 and 3 participated in the Seattle Program (141,363 students in 87 schools in 8 school districts); and 4% of students in grades 4, 5, and 6 participated in the Berkeley Program (5990 students in 67 schools in 41 school districts) (American Lung Association, 1983).
- Robbinsdale Anti-smoking Project (Hurd, Johnson, and Pechacek, 1980). A study was conducted in Minnesota to assess the relative effectiveness of different program components. Seventh grade students participated in five one-hour sessions. The various program components included physiological measurement of the immediate effects of smoking, social consequences, peer opinion leaders, and public commitments to the program. Results indicated that the social consequences curriculum had no effect but that adding peer opinion leaders and public commitments enhanced the success of the program. Follow-up testing using self-report and saliva thiocyanate at 1-1/2 and 2-1/2 years continues to show significantly decreased smoking (33% less in the intervention group compared to the control group). Although the groups were not entirely similar when the program began, this seems to indicate a degree of success from a program consuming only five curriculum hours.
- Adolescent Family Health Education Project--Buffalo, MN. A program involving peer leaders, social skills training, group discussion, modeling, and family involvement was conducted with 6th, 7th, and 8th graders. At one year follow up, there was no difference in smoking rates between control and intervention groups.
- Biomonitoring Smoking Education Program (BSEP). This program demonstrates the immediate effects of smoking on heart rate, skin temperature, hand tremor, and carbon monoxide in expired air. Over 2200 students in grades 7 to 12 participated during the 1982 school year. The percentage of self-reported smokers dropped from 10.7% to 7.6% over the five months of the program. Positive results were also noted on students' knowledge and attitudes regarding smoking and its physiological effects.

Summary. Many smoking prevention programs have failed to include evaluation components, yet the existing evidence indicates that approaches which address events related to the acquisition of smoking and which teach students coping skills do seem to be able to produce behavioral change. These approaches are promising for future implementation, with most showing reduced onset rates of from 30% to 50% which are maintained over at least one year.

The traditional health education approach to adolescent cigarette smoking has focused on the delivery of factual information regarding the long-term health effects. These programs have often increased the students' knowledge of the dangers of smoking and changed their attitudes toward smoking. However, the relationship between knowledge and attitudes on the one hand and behavior on the other is not a direct one, and measurable changes in attitudes can and do occur without behavioral change.

These findings do not suggest that a focus on health risks is ineffectual but rather that they need to be part of a more comprehensive approach to smoking prevention, one which includes a more social approach to the problem.

Research on attitude change suggests that health risk education typically improves the knowledge and motivation to change without producing actual or lasting behavior change. It is essential that the general public be well informed on the facts regarding smoking. This may not in and of itself affect smoking behavior, but it is a condition for further action. (For suggested educational objectives, see WHO, 1979.)

The Nature of the Smoking Addiction

Smoking is one of many often-repeated behaviors which individuals find difficulty in avoiding despite negative long-term consequences. Two predominant but not mutually exclusive theories of the habitual nature of smoking include: 1) smoking as compulsive drug-seeking behavior which prevents nicotine withdrawal and 2) smoking as a way to administer nicotine to control arousal and manipulate psychological state. Both theories regard nicotine as being of central importance.

The addictive nature of smoking is a central issue in the smoking controversy. Evidence has accumulated since 1942 that nicotine self-administration via smoking shares many of the characteristics of other classic forms of drug dependency, such as heroin and barbiturate dependence. Broadly stated, the criteria for an "addictive" behavior include:

1. Excessive or inappropriate use (usually defined as daily use); 95% of smokers smoke daily.
2. Loss of control over use (difficulty quitting); 75-80% of smokers have tried to quit and failed. Relapse rates for smoking are similar to those for alcohol and heroin.
3. Harmful consequences; negative health and economic effects on individual smokers and on society as a whole have been well documented.

A fourth criterion which is not essential for classification but which has been used is the development of tolerance and of withdrawal symptoms when the substance is no longer administered. About 2/3 of quitters report experiencing some withdrawal discomfort.

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Smoking meets the criteria for addictive behavior in the population as a whole. For each individual smoker, the critical determinant is whether or not the person has tried to quit and failed. In the United States, there may be as many as 45 million addicted smokers.

Official medical recognition of the addictive nature of tobacco use occurred in 1978 when the American Psychiatric Association acted to reclassify smoking from a "drug dependence" to a "drug addiction" in the Diagnostic and Statistical Manual.

The reinforcement of smoking by nicotine is central to its addictive nature.

Nicotine is a powerful stimulant drug in the same pharmacological class as amphetamine and cocaine and stimulates areas in the brain related to pleasure and reward. The strength of any reward is partially determined by the number of times it is received and the time lag between the administration of the reward and when its effects are felt. The cigarette puffing response is incredibly frequent compared to other drugs--at ten puffs per cigarette, a pack-a-day smoker receives approximately 70,000 doses of nicotine a year. The latency between the cigarette puff and its effects is also very short. It has been estimated that it takes less than eight seconds for nicotine to reach the brain after smoke inhalation (compared to around 14 seconds for intravenous heroin and several minutes for orally-ingested alcohol). In some individuals, cessation is followed by a withdrawal or abstinence syndrome characterized by a variety of symptoms including craving, irritability, anxiety, headache, restlessness, difficulty concentrating, fatigue, and gastrointestinal disturbances.

Nicotine acts as a psychological tool, in some circumstances having a stimulant effect and, in others, a sedative effect. There is evidence that smoking maintains performance under conditions requiring sustained vigilance and may improve retention and later recall of learned material. A few studies have shown that disruption due to stressful experimental conditions is reduced after smoking. Smokers will self-report reasons for smoking which include both stimulant and depressant effects. The differential effects may depend upon the baseline state of arousal, dose of nicotine, and expectations of the smoker.

Other factors contributing to the addictive nature of nicotine:

- It does not cause acute impairment or toxicity compared to other drugs.
- The negative consequences are mostly far removed in time.
- Smoking poses little, although potentially significant, danger to others.
- Tobacco is legal, readily available, and relatively low in cost.

Cessation Strategies (Pechacek, 1979)

Self-initiated quitting (Fisher, 1982). Of the approximately 32 million Americans who have quit smoking, it has been observed that a large majority (from 70-95%) report quitting on their own, that is, without the assistance of a formalized treatment program (McAlister, 1975; USDHEW, 1979).

Survey data clearly indicate that most smokers who are motivated to quit are less interested in formal programs than do-it-yourself methods. These methods include brief TV messages, taped telephone messages, self-study books, and mail-order programs.

Despite the prevalence of self-quitting, research has focused primarily on formal treatment programs. In one of the few studies of self-change, self-quitters did not differ from quitters who went through treatment in smoking habits, demographics, quit attempts, or personality variables. Self-quitters were also as successful as the treatment groups in maintaining cessation after five months (DiClemente and Prochaska, 1982).

Large-scale mass media interventions can produce low but significant rates of abstinence. Such programs may be relatively cost effective when compared to other more intensive programs and may serve to reach a subject population which would otherwise not be reached.

General Educational Interventions. Public information and education programs include a range of activities aimed at changing knowledge, attitudes, and, subsequently, behavior regarding smoking in the public at large and within subgroups in the community. Public education and information programs should be construed as essential components of a larger community program.

The public media approach which has received perhaps the greatest amount of publicity is the "Great American Smokeout" sponsored by the American Cancer Society. A Gallup Poll survey after the 1980 smokeout indicated a high level of public awareness of the program, with 85% of those being interviewed reporting having heard of the event. Approximately 30% of the smokers interviewed participated, with 9% reporting abstinence on that day and 21% reporting reducing the amount of smoking.

Another mass media approach has been the televising of cessation programs. Such interventions are difficult to evaluate but suggest small but significant effectiveness. The extremely large audiences reached by such programs make them potentially very cost effective. One program in North Karelia, Finland, found that a televised cessation clinic produced abstinence rates of about 2% for three months to one year. This equalled between 10,000 and 30,000 people; and the authors estimated a cost per abstinent smoker of about \$1.00.

Public health information efforts have produced changes in public knowledge regarding the health effects of smoking and may be responsible for significant changes in smoking behavior. Data from the Minnesota Poll show that the percent of adult Minnesotans who believe that smoking is a health hazard has increased steadily over the last 30 years.

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Year	Percent Believing Smoking is Hazardous
1954	24
1957	36
1959	55
1962	69
1965	80
1969	93
1980	96

The fact that physicians have low smoking rates and have decreased their smoking in recent years (30% of physicians smoked in 1967 and 21% in 1975) suggests that facts alone may be powerful motivators in some groups (Rosen and Ashley, 1978). Warner (1977) estimates that the cumulative effect of specific events and policies, such as the Surgeon General's Reports and the FTC equal time provision for anti-smoking messages on TV, has reduced cigarette consumption by 20-30% below its predicted level.

Although public awareness of the effects of smoking has grown since 1964, a surprising number of Americans still do not know basic facts regarding major health effects. A recent FTC staff report (Myers et al., 1981) indicates that approximately 20% of Americans do not know that smoking causes cancer, over 30% are unaware of the relationship between smoking and heart disease, and nearly 50% of all women do not know that smoking during pregnancy increases the risk of stillbirth and miscarriage. Fifty percent of teenagers do not realize that smoking may be addictive. Among smokers, only about half (49.5%) believe that smoking is "really as dangerous as people say"; and only one in seven (13.8%) realize that smoking causes more deaths than road accidents (Eiser et al., 1979). Such gaps in knowledge about the effects of smoking reveal a great need for further public information campaigns.

Public service smoking cessation programs, such as those of the American Cancer Society, American Lung Association, and Church of the Seventh Day Adventists, have reached more smokers than any other organized effort. These and other smaller scale clinics use a variety of techniques including a varying number and duration of sessions, informational content, and focus. The limited evaluation data from these and other clinics report similar outcomes--approximately 20% of smokers completing the program remain abstinent after one year.

Results of for-profit clinics have not been widely evaluated. As of 1979 only one evaluation study (SmokEnders) was available which reported a 30% abstinence rate after four years. Subsequent reassessment of the data suggested that the actual success rate was 27% -- a rate comparable to other types of programs (Schwartz and Rider, 1977).

Physician counseling effectiveness is somewhat lower than that of smoking programs for general practice patients. However, considering the brevity of such contacts and the fact that general-practice patients usually do not

seek aid for smoking cessation from their doctors, the results are promising. Effectiveness of advice is enhanced if the patient exhibits current respiratory or cardiac disease symptoms. A recent study in England (Russell et al., 1979) found that 5% of smoking patients who quit within one month remained abstinent for one year after being given advice to quit, a pamphlet to help them, and a single follow-up. The authors suggest that a similar method, if followed by all general practitioners in England, could equal the success of 10,000 withdrawal clinics at a markedly reduced cost.

Worksite prevention and cessation programs are increasing in number. A recent survey (NISCH, 1981) showed that 50% of United States businesses had a policy restricting smoking at work, 15% offered some form of education program, and 33% wanted to expand or develop a smoking cessation program. Orleans and Shipley (1982) conclude that worksite programs are about as efficacious as other programs outside the workplace but that results might be expected to exceed general results if the special resources available -- namely a cohesive social support network and potential incentives -- are incorporated into a program.

Current state of research in behavioral strategies.

Drug treatment. Strategies to help smokers quit have included attempts to substitute for the pharmacological effects of nicotine. Lobeline, a drug with similar chemical structure to nicotine, and meprobamate, a tranquilizer, have been shown to be no more effective than placebo. Nicotine-containing chewing gum, however, has been shown to effectively reduce initial withdrawal symptoms and may improve abstinence rates when used as part of a broader program.

Hypnosis. Controlled studies suggest that the long-term (one year) effectiveness of hypnosis alone in smoking cessation is comparable to a placebo response -- approximately 20% abstinence. However, hypnosis may enhance the effectiveness of group counseling in those subjects susceptible to hypnosis.

Behavioral Self-Control. A variety of behavioral self-control treatments have been developed which attempt to provide the subject first with increased awareness of the target behavior (smoking) and then with training in specific techniques to control that behavior. Self-monitoring, systematic desensitization, and meditation procedures have been shown, in general, to produce the common pattern of temporary reduction but rapid relapse.

Aversion strategies. These procedures reduce the probability of smoking through the use of aversive conditioning techniques. Major stimuli used include electric shock, covert sensitization, or cigarette smoke. A 1977 review of similar procedures (Danaher, 1977) documented variable follow-up rates in subsequent research with abstinence rates from 0-50%.

Multi-component Interventions. Comprehensive programs utilizing some combination of behavioral self-control techniques and aversion techniques have shown promising results (35-62% abstinence at three months to one year after treatment). Further modification and refinement of treatment combinations have been recommended as promising for future research.

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Research has not yet determined what techniques are most helpful for a particular individual; offering a package from which a smoker may choose a program may be the best approach.

Maintenance of nonsmoking. A finding of essentially all smoking reduction techniques is that abstinence rates begin to decrease immediately after the treatment program and fall to about 25% from three to six months later. It is necessary to develop procedures to help ex-smokers maintain abstinence. A number of maintenance techniques have been reported and include reinforcement or incentive procedures, self-management procedures, differential levels of therapeutic contact, individualizing treatment to client characteristics, identifying and treating antecedents of relapse, and social support. Some techniques which have been used are telephone messages or follow-up calls and contingency contracting, in which subjects deposit money for later return based on attainment of abstinence goals. More research is needed to define the types of maintenance procedures which are needed and when and how they can be most effectively administered.

Programs in Minnesota. A recent Minnesota Department of Health county survey (1981) lists approximately 110 smoking cessation programs in the state. These programs represent a variety of types, but a majority are based on the programs developed by the American Lung Association and the American Cancer Society. Approximately two-thirds (67) of the programs are within the seven-county metropolitan area.

ECONOMIC STRATEGIES

Increasing the Cost of Cigarettes

Tax rates on cigarettes.

Federal Excise Tax:

- 16 cents per package in United States
(due to decrease to 8 cents in 1985)
- 42 cents per package in Canada

State Excise Taxes.

State/Province	Tax	Date of Last Change
Minnesota	\$0.18	1971
Wisconsin	\$0.25	1982
Iowa	\$0.18	1981
North Dakota	\$0.18	1983
South Dakota	\$0.15	1981
Ontario	\$0.63	1982
Manitoba	\$0.43	1982

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Average of 14.5 cents for all states, ranging from 2 cents (North Carolina) to 26 cents (Massachusetts and Connecticut) per package. Canadian provincial taxes are much higher.

Minnesota Excise Tax.

Year	Tax
1950	\$0.04
1960	\$0.055
1962	\$0.07
1963	\$0.08
1969	\$0.13
1971	\$0.18

States increasing excise tax rate since 1982 (21 states).

State	Former Rate (cents)	Current Rate (cents)
Arizona	17.75	21
Colorado	10	15
Connecticut	21	26
Kansas	11	16
Maine	16	20
Massachusetts	21	26
Michigan	11	21
Missouri	9	13
Montana	12	16
Nebraska	14	18
Nevada	10	15
New Hampshire	12	17
New Jersey	24	25
New York	15	21
North Dakota	12	18
Oregon	16	19
Rhode Island	18	23
Utah	10	12
Vermont	12	17
Washington	20.8	23
Wisconsin	20	25

Effect of price on consumption. Cigarette taxation has been imposed primarily for revenue generation and, in fact, the tobacco-producing states as a group levied such taxes before the other states, on the average. The number of state excise tax increases has fluctuated from year to year since the 1964 Surgeon General's Report, and the emphasis has shifted recently

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toward reducing cigarette consumption for health reasons as well as raising revenue.

Most national estimates of price elasticity for cigarettes are between -0.4 and -0.5. This means that for a 10% increase in cost, overall cigarette consumption will decrease by 4-5%. Moderate price increases will decrease cigarette consumption and increase cigarette tax revenues.

Different groups of smokers are not equally sensitive to price changes. Price has its greatest effect on the smoking behavior of young males and it operates primarily via the decision to begin smoking regularly rather than on the quantity smoked. Women over the age of 25, on the other hand, are relatively insensitive to cigarette price changes (Lewit, Coate, Grossman, 1981).

The price elasticity of demand for cigarettes in Minnesota, calculated from prices in recent years, is within the range of -0.2 to -0.4. Although this implies that Minnesota smokers decrease their consumption of cigarettes only slightly when the real price is increased, the range of prices "tried" has been very modest. It is possible that considerably higher prices would have a different price elasticity.

In Minnesota from January 1982 to January 1983, cigarette prices increased 15.6 cents, or about 19% (adjusting for inflation). A comparison of the number of cigarette packs sold in Minnesota from January through September 1983 and the number of packs sold during the same period in 1982 shows a decrease in consumption of 4.8% (339.4 million in 1983, 365.4 million in 1982). This reduction suggests a price elasticity of -.26 (Minnesota Department of Revenue, 1984).

USDA figures for national consumption for the first six months of 1983 show a decline of 7.0% from the levels one year ago. This decrease in consumption may be partially a reaction to the doubling of the Federal excise tax to 16 cents in January 1983.

The tax indexing system in Canada provides for twice yearly increases in cigarette tax rates in five Canadian provinces. From December 1982 to December 1983 tax and manufacturer's price increases resulted in a 23% increase in cigarette prices. With the national inflation rate of 5%, this leaves a real price increase of 18% over the year. Cigarette consumption for the first ten months of 1983 compared to 1982 is down 3.7% (Ontario Bureau of Tobacco Control, 1984).

Incentive Programs

Insurance. An economic strategy which may motivate smokers to quit or nonsmokers to remain so is the growing practice of the insurance industry of extending preferred rates of insurance premiums to nonsmokers. Since 1964 when the first nonsmoker policy was offered, 54 companies have begun to offer premiums to nonsmokers at lower-than-standard rates. In Minnesota, approximately two dozen nonsmoker life insurance policies exist with rate discounts up to one third. More recently, other types of insurance have begun to offer nonsmoker discounts for automobiles, homeowners, and, very recently, health insurance. Blue Cross Blue Shield

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of Minnesota now offers discounts for nonsmokers of between 5% and 20% for major medical coverage.

Workplace Incentives. One to three percent of businesses have offered incentives to help encourage people to quit, including raffle tickets for quitters and nonsmokers who recruit quitters, covering "bets" that employees could quit, and cash bonuses for quitters (Orleans and Shipley, 1982). A California company, Speedcall Corporation, pays all nonsmoking employees an extra \$7 per paycheck. Within a month after the program's initiation, the percentage of employees who smoked at work declined from 67% to 43% (Shepherd, 1982) and remained lower over a four-year period. Such incentive programs may not produce high quit rates, but they may increase motivation to quit and provide an environment of social support.

Contests. An innovative approach for the recruitment of participants into quit smoking programs is the use of contests or lotteries. Quitters, or nonsmokers who recruit quitters, earn a lottery chance for winning one of several prizes. Preliminary evidence from a study here in Minnesota suggests that cessation success is comparable and that recruitment rates may be higher than in other programs. A similar lottery program was incorporated into the Minnesota D-day program in November 1983.

REGULATORY/LEGISLATIVE STRATEGIES

Worldwide Smoking Legislation (WHO, 1982)

By 1982, 57 countries had enacted some type of smoking related laws.

Type of Legislation	Number of Countries
control of advertising and sales	47
health warnings and content labeling	37
control of harmful substances in tobacco	4
restrictions on sales to adults	4
restrictions on smoking in public places	31
restrictions on smoking in the workplace	4
preventing young people from smoking	13
mandatory health education	15

Advertising restrictions cover a range from moderate restrictions, such as limited radio and TV ads, to total bans on all advertising, such as in Norway and Finland.

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Health warnings range from a traditional, single warning ("Tobacco is harmful") to alternate, rotating warnings. For example, Sweden has 16 different warning labels which appear at different times on packages. In the United States, a law requiring four rotating warnings has been proposed.

Legislation to control harmful substances in tobacco ranges from general statutes empowering governments to control the composition of tobacco to specific legislation providing for governmental inspection or the setting of maximum levels of tar, nicotine, and carbon monoxide. In 1979, Finland set maximum levels of these substances (tar, 23 mg; nicotine, 1.6 mg; and carbon monoxide, 20 mg).

Restrictions on sales to adults have occurred in two types of laws, one prohibiting sales in health institutions and the second restricting vending machine sales.

Laws restricting smoking in public have been in response to mounting evidence of the health effects of passive smoke and the pressure for nonsmokers' rights. Three legislative approaches have been tried: prohibition of smoking in a few types of public places, in a wide range of public places, and in all public places unless specifically allowed. It is too early to have evidence of the comparative efficacy of these approaches. Indeed the effectiveness of such legislation in causing changes in smoking may never be known because: (1) they are generally part of a broad program of smoking initiatives including educational, economic, and other restrictive measures and (2) such laws may be the result of increased demand toward smoking reduction. (The Minnesota Clean Indoor Air Act has attracted much attention around the United States and the world as a model piece of legislation and will be discussed later.)

An extension of restrictions on smoking in public places to the workplace has been recommended for two reasons: 1) workers spend much more time at work than at other public places and 2) smoking may act synergistically with toxic agents in the workplace to cause a much more profound effect than expected from the individual influences of the agents and smoking.

Legislation aimed specifically at preventing smoking by young people takes several forms:

- prohibiting sales to minors
- prohibiting children and adolescents from smoking in public
- specific educational requirements for high risk groups
- allocation of financial support for health education programs

Federal Actions on Smoking in the United States

Federal legislative action has been primarily in two areas -- advertising restrictions and taxation. Other major regulatory action has been taken primarily by the Civil Aeronautics Board (CAB).

Chronology of Major Federal Actions on Smoking and Health:

- 1964 - Surgeon General's Advisory Committee on Smoking and Health released its report entitled Smoking and Health which concluded that cigarette smoking is a health hazard.
- 1965 - The Federal Cigarette Labeling and Advertising Act required warning label "Caution: cigarette smoking may be hazardous to your health." Also prohibited FTC and States from requiring warning in ads until 1969.
- 1967 - The FCC applied the "fairness doctrine" requiring broadcast stations carrying cigarette advertising to also carry a significant volume of anti-smoking messages.
- 1970 - Public Health Cigarette Smoking Act banned radio and TV advertising. Required tar and nicotine content on labels and in ads. Changes warning label to the current "The Surgeon General has determined that cigarette smoking is dangerous to your health." Also prohibited any further state regulation of advertising.

On July 22, 1969, after the House of Representatives had passed this bill, the tobacco industry offered to discontinue cigarette advertising voluntarily by September 1970, when major contractual arrangements were due to expire, or earlier if the broadcasting industry would agree to terminate existing contracts.
- 1973 - CAB approved a regulation requiring commercial airlines to provide "no smoking" areas aboard aircraft.
- 1978 - Health Services and Centers Amendments funded research and demonstration projects to deter smoking among children.
- 1982 - Federal excise tax increased from 8 cents to 16 cents per package until 1985.

There are currently two major smoking related bills which have received the most interest. One is the Cigarette Safety Act which would require that burning cigarettes self-extinguish if left unsmoked. The second is the Comprehensive Smoking Prevention Education Act which would require rotating warnings to appear on cigarette packs and ads; would transfer the enforcement of the labelling requirements and testing for tar, nicotine, and carbon monoxide from the Federal Trade Commission to the Department of Health and Human Services; and would give the Department of Health and Human Services the power to subpoena information on cigarette ingredients. Currently, no agency of the federal government has oversight authority over the ingredients which tobacco companies may use in the manufacture of cigarettes. A recent voluntary agreement will provide the Surgeon General with a list of some common additives but only if they are used in "large amounts" by at least three of the six major companies.

There is little direct evidence of the effects of these actions on smoking prevalence, but Warner (1982) has estimated that the general effects of the

anti-smoking campaign have prevented increases in per capita consumption. There is also evidence that the counter advertising required by the FCC from 1968 to 1971 exerted downward pressure on smoking rates.

State Actions

State legislation on smoking has focused in four areas: a) taxation, b) education, c) minors, and d) restriction on sales and smoking in public places.

State excise taxes. In 1921 Iowa became the first state to impose a tax on cigarettes. Today all states impose such a tax. Taxes may serve to reduce smoking levels to the extent to which they contribute to price increases. They may also impose some reliance on cigarette sales for continued state revenue.

In New Jersey, cigarette tax revenues will begin financing cancer research under a new law increasing the state tax five cents and establishing a nine-member commission on cancer research.

Education. In 1980, 35 states had mandated health education material on alcohol, drugs, and tobacco; 12 other states had legislation encouraging such education. Most legislation, including Minnesota's (as discussed earlier), is somewhat ambiguous as to content, amount, and timing of educational materials and program content specific to tobacco products.

Minors. Many states have statutes regulating use of tobacco products by minors. These are often not well enforced. In Minnesota it is a misdemeanor to furnish tobacco products to anyone under 18. It is also a petty misdemeanor for anyone under 18 to possess tobacco products (Minnesota Criminal Code of 1963, 609.685).

Restriction of smoking in public places. In 1970, five states had laws restricting some aspect of smoking in public. In 1978, the number had grown to 36 states. Newer laws are more restrictive; that is, they have broader coverage of sites inhabited by larger numbers of people. One legal basis for such laws is based on the state's constitutional use of police powers to protect citizens' health and safety. There is also a consideration of the 14th Amendment due process and equal protection clauses. Legal bases upon which the validity of nonsmoking restrictions have been upheld include: reduction of fire hazards; restriction of smoking as a public nuisance; and regulation and protection of public health (c.f., fluoridation, vaccinations).

The Minnesota Clean Indoor Air Act of 1975 is considered by many to be a model of comprehensive state legislation regulating smoking in public places. It prohibits smoking except in designated areas in "any enclosed indoor area used by the general public or serving as place of work, including, but not limited to, restaurants, retail stores, offices, and other commercial establishments, public conveyances, educational facilities, hospitals, nursing homes, auditoriums, arenas, and meeting rooms but excluding private enclosed offices occupied exclusively by smokers even though such offices may be visited by nonsmokers."

The effect of the Minnesota Clean Indoor Air Act on cigarette consumption is difficult to assess. Minnesota's current smoking rate is about 8-10% below the national level. Some or all of this effect could be attributed to the Act, but it also demonstrates that even this highly visible measure is not a panacea. The effect of the Act in resetting social norms in Minnesota has not been measured but may be significant.

The impact on attitudes toward such restrictions, however, was illustrated by a 1980 Minnesota poll which found that 92% of all adults and 87% of the heaviest smokers favored the law. In addition, over half of all smokers and nonsmokers believed that it could be enforced more strongly (Minneapolis Tribune, 1980). The law could be clarified and strengthened by designating responsibility for enforcement in areas other than restaurants or including bans on smoking in certain locations, such as hospitals.

Summary. There is little information on the general effects of restriction on cigarette consumption. Warner (1982) discusses a time-series analysis of cigarette use and concludes that the growth in the number of laws restricting smoking correlates with decreased per capita consumption but that this does not appear to reflect causation. It is important to interpret this information carefully as restrictive measures could be serving as barometers of public sentiment, while consumption declines may reflect behavioral responses to the anti-smoking campaign as a whole.

Smoking in the workplace. While almost half (49%) of employers in a nationwide survey had a policy restricting or prohibiting smoking in the workplace in 1979, most restrictions affected only blue collar work areas and were established to meet safety-related health regulations. These regulations primarily relate to the manufacture and handling of flammable materials or the use of equipment in sterile work areas (NISCH, 1981). Many companies may be addressing the smoking issue in response to safety requirements rather than to the related health hazards.

Many businesses have enacted stricter regulations on smoking by employees because of evidence that smoking may act synergistically with toxic agents in the workplace to cause increased health risk. For example, in several northern Virginia counties, the fire departments adopted a nonsmoking policy because smoking raises the normal occupational risks of smoke exposure and because Virginia State Law requires fire fighters to be free of respiratory and coronary problems when hired. Also, Johns Manville Corporation prohibited smoking in all its asbestos-using sites because asbestos workers who smoke have been found to have a greatly increased risk for developing lung cancer (92 times the normal risk).

Smoking in the workplace has become a concern for several reasons. Recent calculations of the increased cost to industry of smoking due to excess health insurance costs, increased absenteeism, and loss of productivity have ranged from \$274 to as much as \$4611 per smoker per year (Kristein, 1983; Weis, 1981). While the magnitude of this range of cost estimates reflects the subjective nature of some of the assumptions underlying the cost assesment, there does seem to be a general consensus that reducing smoking will result in reduced costs to employers.

METHODS FOR THE PROMOTION OF NONSMOKING

Smoking in the workplace has become more than an issue of personal preference or economic cost to employers and has become a legal issue. A growing number of courts have heard cases on protection of nonsmokers' rights based on a variety of legal issues:

- Common law -- Employers must provide a work environment free of recognized hazards.
- Rehabilitation Act of 1973 -- Employers must make "reasonable accommodations" for handicapped employees.
- Administrative Law -- Unemployment and workers compensation have been used as a basis for claims for passive smoking illnesses and loss of jobs. Disability retirement benefits have been claimed when employers have not found suitable work environments for employees. It is unlawful to dismiss employees for complaining about smoking.

Regarding questions of employers' liability if smoking is restricted or in hiring policies, the American Lung Association reports that there is no legal precedent for a smoker's prevailing in a case defining the right to smoke when the court has considered the potential harm to coworkers from others smoking. According to the American Lung Association, the current legal consensus is that, when no labor contract exists, the employer has the right to eliminate smoking on company premises and even to hire only nonsmokers.

Increasing numbers of employers and employees are becoming concerned about their rights and responsibilities relating to smoking in the workplace. The general area of nonsmokers' rights is a rapidly changing one and the worksite is becoming the arena for dialogue and legal establishment of new policy. Recent compensation awards to nonsmokers has formed a legal basis for the establishment of smoking policies.

Worksite Policies in Minnesota.

A 1981 survey of workplace health promotion programs found that approximately 20% of the 316 companies employing over 200 people offered smoking cessation programs for their employees. A national survey in 1979 found that about 15% of companies employing over 50 people had an employee smoking cessation program. Of those 316 out of 583 businesses, industries, school districts, and hospitals which responded to the survey, the following had these policies in place:

METHODS FOR THE PROMOTION OF NONSMOKING

Policy	Number of Employers	Percent of Employers
Nonsmoking areas in production facilities	186	59
Nonsmoking area in cafeteria	167	53
Posted written no-smoking policy	145	46
Separate smoke-free environment for nonsmokers	142	45
Smoking prohibition in all of production facility	102	32
Smoking prohibition in entire cafeteria	23	7

Smoking was banned in 1984 in all public and patient care areas of the Park Nicollet Medical Center, one of the country's largest urban multispecialty clinics. Employee smoking will be permitted in lounges for that purpose.

The Minnesota Medical Association (MMA) has adopted a motion to:

- prohibit smoking by participants in MMA meetings;
- request that physicians representing the MMA in the community not smoke;
- consider a smoking cessation program for MMA employees who smoke;
- consider incentives in the salary schedule for MMA employees who do not smoke; and
- encourage MMA employees not to smoke while they are within the MMA office or when they are representing MMA.

RECOMMENDATIONS FOR
THE PROMOTION OF NONSMOKING
IN MINNESOTA

School and Youth Education

Public Education

Public and Private Regulatory Measures

Economic Incentives and Disincentives

Information and Evaluation Needs

MINNESOTA TECHNICAL ADVISORY COMMITTEE ON NONSMOKING AND HEALTH

RECOMMENDATIONS FOR PROMOTION OF NONSMOKING
THROUGH
SCHOOL AND YOUTH EDUCATION

THE SCHOOL CURRICULUM

- Provide six or more hours of scientifically-evaluated nonsmoking education in seventh grade.
- Evaluate the use of nonsmoking contests and of joint television/classroom curricula for nonsmoking in schools.

* * *

THE SCHOOL ENVIRONMENT

- Regulate smoking in schools in concert with Minnesota law and in ways which deemphasize the desirability of the smoking habit.

* * *

THE SCHOOL AND THE COMMUNITY

- Reinforce school efforts through community programs.

MINNESOTA TECHNICAL ADVISORY COMMITTEE ON NONSMOKING AND HEALTH

THE SCHOOL CURRICULUM

- RECOMMENDATION:** Schools in Minnesota should expose students at the seventh grade level to six or more curriculum hours of nonsmoking education, using techniques shown through studies to be effective in reducing smoking rates. One such method is the "peer-led" technique. Follow-up material including "how-to-quit" techniques should be included in the high school curriculum.
- a. Workshops and consultation should be provided to one or more teachers in each school. These should be conducted by experts in nonsmoking education.
 - b. Minnesota colleges and universities should include training in nonsmoking education for future teachers.
 - c. Evaluation of results by rigorous scientific methods should be done in a sample of participating and non-participating schools to assure that methods are actually having an effect.

Background and Rationale

The most successful approaches to adolescent smoking prevention focus on the environmental or social pressures that influence the decision to smoke (Arkin et al., 1981; Botvin and Eng, 1982; Evans et al., 1981; Flay et al., 1983; Luepker et al., 1983). Such programs place information about smoking in a context more understandable and meaningful to young people (such as the short-term health effects). Similar programs have been evaluated in Texas, New York, Minnesota, and Ontario and, despite individual variations, share the basic premise that it is of primary importance to develop and teach young people strategies to counter pressures to smoke. The successful programs attempt to reinforce group norms against smoking and undermine the belief that smoking is desirable. Many programs identify and refute the arguments for smoking, believing that exposure to such arguments will reduce future susceptibility to smoking pressures. Such programs use role-playing to teach, reinforce resistance techniques, and promote self esteem and self confidence. By acting out specific situations in which they might be offered a cigarette, adolescents can be taught a repertoire of "coping" behaviors for dealing with real situations.

The informational approaches assume that young people use drugs because they lack information about their negative effects and therefore see the provision of such information as the solution. Information-only programs frequently increase knowledge about drugs but less often lead to attitude change or, even more rarely, to actual drug use changes. Adaptations of the informational approach offer some results which suggest that specific types of information, such as feedback on the immediate physiological effects, may be more useful than others.

Most of the successful adolescent anti-smoking programs have used fellow students (peers) as leaders. Where the effectiveness of peer-led, as opposed to adult-led, classes has been evaluated, the peers appear to be more effective. Recent evidence suggests that slightly older peers may be more effective than same-age peers in such programs. These methods depend

RECOMMENDATIONS FOR SCHOOL AND YOUTH EDUCATION

on the idea that adolescents are influenced by other adolescents, especially those who are a little older, more than an "adult" figure. These programs are school based and targeted primarily at the seventh grade student and provide evidence that programs based on the social pressures model reduce smoking onset rates among adolescents. Some specific components of seventh grade programs shown to be effective have included the following elements:

- * Election of peer leaders by the students.
- * Training of the peer leaders to conduct classes.
- * Discussion of long- and short-term consequences of smoking, including social effects.
- * Discussion of why students begin smoking (peer pressure, wanting to look older); why members of the group don't want to become regular cigarette smokers.
- * Guessing how many in the class smoke and comparing this with the actual figures.
- * Learning about social pressure using typical situations.
- * Role playing methods of resisting social pressure.
- * Understanding cigarette advertising.
- * Creating a non-smoking advertisement.
- * Individual public commitment to maintain non-smoking status.

Some educators question the use of smoking rates as a criterion for evaluating curricula. They suggest that programs which seek to achieve a certain behavior may infringe on freedom of choice by the students. There are several answers to this objection.

Nonsmoking is a skill like playing basketball and can only be learned by practice--not by didactic instruction. Successful learning of new skills involves participation. The objective facts are simply not enough to learn a behavioral skill. In order to learn to be a nonsmoker, one must actually practice the skills of refusing peer pressure, seeing beyond advertising, and incorporating alternative lifestyle elements like exercise. Similarly, one cannot learn to play basketball from lectures; schools regularly require students to participate in the game. Whether or not they wish to play basketball in later life is a matter of free choice, but all are required to play the game in physical education class and demonstrate that the skills have been acquired.

In this same sense, the proper goal of a nonsmoking education program is to maximize the number of nonsmoking students. Ignoring this criterion would prevent distinguishing between effective lifestyle education and mere gestures in that direction. Nonsmoking is a positive behavior just as scholarship, good writing, obedience to the law, and other behaviors traditionally valued in school settings are positive behaviors. Few

RECOMMENDATIONS FOR SCHOOL AND YOUTH EDUCATION

teachers would accept poor writing or speeding tickets as valid results of English or driver training classes merely because they represent gestures of "personal decision making." In similar fashion, it appears that the best way to distinguish between effective and less effective curricula related to smoking is to measure (anonomously) the percentage of students who successfully adopt nonsmoking as a way of life.

A study conducted here in Minnesota assessed the relative effectiveness of different program components (Hurd, Johnson, and Pechacek, 1980). The program components included physiological measurement of the immediate effects of smoking, a social consequence curriculum, peer opinion leaders, and public commitments to the program. Results indicated that the social consequences curriculum alone had no effect but that adding peer opinion leaders and public commitments enhanced the success of the program. Follow-up testing, using self report and saliva thiocyanate at 1-1/2 and 2-1/2 years, continue to show significantly decreased smoking (33% less in the intervention group compared to the control group). Although the groups were not entirely similar when the program began, this seems to indicate a significant degree of success from a program consuming only five curriculum hours (Luepker et al, 1983).

A six-session program using peer leaders, public commitments, and skills training in seventh grade classes in three Minnesota communities was part of a larger community-based demonstration project to reduce cardiovascular disease (Perry et al, 1983). When compared to control schools, there were equal numbers of smokers present at the beginning of the school year; but there were significantly fewer smokers (approximately 1/3 fewer) in the program schools at the end of the year, suggesting that the program was effective.

Minnesota state law mandates the teaching of drug abuse prevention education in elementary and secondary schools. The existing law requires each school district to develop program objectives regarding health education, including drug abuse prevention. Tobacco use is not expressly mentioned in the law, and no information is available on the number of programs statewide which specifically address smoking issues. The State Department of Education has developed a list of objectives for use by the state school districts. The state encourages school districts to develop their own curriculum to achieve these goals tailored to their own specific needs. Current class time requirements for health education are: 60 minutes per week in grades 1-6; 60 hours of instruction in grade 7, 8, or 9; and 60 hours of instruction in grade 10. Current state appropriations to school districts for drug abuse prevention programs are \$1.00 per student (minimum of \$1000), which totals \$850,000 for fiscal year 1983.

There are currently no curriculum-based smoking programs being used in a majority of schools on a statewide basis. The Primary Grades School Health Curriculum Project (Seattle Program) and the School Health Curriculum Project (Berkeley Program) are the most widely used information-based programs in the state. In 1982, approximately 10% of Minnesota students in grades 1, 2, and 3 participated in the Seattle Program; and 40% of students in grades 4, 5, and 6 participated in the Berkeley Program (American Lung Association, 1983).

RECOMMENDATIONS FOR SCHOOL AND YOUTH EDUCATION

RECOMMENDATION: The contest approach used in Sweden, in which students and teachers are awarded plaques and public recognition for attaining a completely nonsmoking class, should be evaluated for use in Minnesota. Other approaches to nonsmoking, particularly through student organizations, should be encouraged and evaluated. A classroom and television curriculum in which parents watch jointly with children at home has shown promise and should be further evaluated.

Background and Rationale

One program which utilizes mass media and peer pressure components is the Non-Smoking Generation program. This program was started in Sweden five years ago and uses a brief school curriculum to discuss reasons for smoking and prevalence of smoking in 8-14 year olds. Class certificates are presented to each individual class that decides to become a nonsmoking class for the year. In this way, peer pressure toward nonsmoking is created. Nonsmoking classes then become eligible for other activities, such as becoming pen pals with children in other countries who are participating. The nonsmoking image is also reinforced by other mass media components such as tee shirts, posters of famous role models, and music concerts. Evaluation of this particular program has been limited but has shown changes in the direction of more positive attitudes toward nonsmokers after the program. There is also limited data suggesting that smoking rates in Sweden in the last five years have decreased for 15-year-old boys (36% to 20%) and girls (40% to 27%) (Horn, 1984).

Another recent study which incorporated both classroom and mass media components was conducted in Los Angeles (Flay, 1983). In this study, five 5-minute segments on smoking prevention were broadcast on consecutive evenings on a local news program. A coordinated 5-day classroom curriculum modeled after the successful peer-led programs described above was conducted. In addition, the junior high students were given homework assignments to watch the news programs and to discuss them with an adult. During the following week, five-minute segments were broadcast on smoking cessation; and written guides to quitting were distributed to parents.

The results were promising. Besides measurable changes in attitudes and intentions regarding smoking in the program group, only half as many students (7%) who participated tried their first cigarette in the two-month follow-up period than students in the control group (14%). There was also an effect on smokers in the students' households, with 14% of smokers in program students' homes, but only 4% of smokers in control students' homes, not smoking at one-month follow up. These results compare favorably with those of other school-based prevention programs and show improved results over previous television-based cessation programs. The authors attribute the success of this program to overcoming three problems inherent in most media-based prevention programming: 1) program dissemination, or how effectively the message is communicated; 2) message selectivity, or what groups are sensitive to what messages; and 3) interpersonal communication, or how to assure that the target group accepts, internalizes, and communicates the message to its members.

THE SCHOOL ENVIRONMENT

RECOMMENDATION: Regulation of smoking in schools should be conducted in a way which deemphasizes the importance, prestige, maturity, and desirability of the smoking habit.

- a. The Minnesota Clean Indoor Air Act should be thoroughly known and implemented in schools.
- b. The focus on nonsmoking in the schools should be kept positive and rule environment firm and consistent but not oppressive.

Background and Rationale

The Minnesota Clean Indoor Air Act (MCIAA) forbids smoking in schools (as public places) except in designated areas. Management is not required to designate any smoking areas; but, if a smoking lounge is created, for example, a similar facility must be available for nonsmokers. Common areas used by all, such as hallways, stairways, and elevators, must be nonsmoking.

There is a credibility problem in schools when students are prohibited from smoking and told that it is bad for the health, but teachers and others smoke freely in lounges. Regulations that restrict smoking to adults only may make it more attractive for adolescents to smoke. Students are allowed to smoke in some schools and the presence of smoking areas may encourage larger numbers of students to begin smoking. In a study comparing two high schools similar in size and socioeconomic status, it was found that the school which provided a smoking area for its students had a greater prevalence of smoking (33% vs 20%) than the school without a smoking area (Crow, 1984).

The committee feels that smoking should be reduced and gradually eliminated in schools by educating school administrators, faculty, staff, and students about the MCIAA and other existing laws regarding smoking and youth; implementing the MCIAA and establishing other rules which encourage or require nonsmoking by all students; and utilizing other positive approaches toward nonsmoking, such as peer-lead curricula, student organizations, televised curricula watched by students and parents, encouraging teachers and staff to quit, and other promotional methods.

Studies have shown that, as a group, teenagers who smoke tend to be noncompliant and antagonistic to "the system." Making smoking a point of controversy may aggravate rather than improve the problem and is contrary to the spirit of the MCIAA which in many ways protects the rights of both smokers and nonsmokers by providing adequate separation. Since much of a teenage smoker's socializing centers around smoking, development of alternative behaviors would tend to be a positive approach toward reducing smoking. Some alternatives would be organizations such as 4-H and Outward Bound, expanding the social repertoire of smokers by developing alternate reinforcers or "natural highs," and emphasizing the benefits of athletics and their incompatibility with smoking. Behavioral research shows that, if an addictive behavior can be replaced by another "healthy" behavior, the likelihood of permanent behavioral change is enhanced.

THE SCHOOL'S RELATIONSHIP WITH THE COMMUNITY

RECOMMENDATION: Informational, regulatory, and economic measures to promote nonsmoking in the community should be designed to reinforce, supplement, and utilize programs within the schools.

Background and Rationale

The success of nonsmoking initiatives in schools would be enhanced by supportive nonsmoking influences in the community. The total environment should be conducive to behavior change by the support of smoking prevention and cessation programs, general acceptance of the health dangers of tobacco use, promotion of nonsmoking through mass media advertising, and governmental involvement in establishing legislation supportive of nonsmoking (Schwartz and Dubitzky, 1968). Indeed, parental support is required for the implementation and successful operation of nonsmoking programs in the schools. Likewise, the school cannot be solely responsible for enforcement of community laws on smoking. School programs should be part of a larger comprehensive community-based program of informational, regulatory, and economic measures in order to have the maximum benefit.

One example of such a comprehensive community-oriented program is the Minnesota Heart Health Program. This community-based project is designed to enhance cardiovascular health in several Minnesota communities by improving several lifestyle-related factors. Smoking is a specific targeted behavior within a larger effort to promote health in school-aged children. Besides curriculum-based programs within the schools, there were several components of the program which were incorporated into community programs.

An example was a contest encouraging smokers to quit and thereby qualify for a drawing for several prizes (Pechacek et al, 1983). Adolescents become involved in this campaign by interviewing adults in the community about smoking and quitting. Elementary school children were also instructed on how to encourage their parents and relatives to join the contest.

During the month of the contest, 750 interviews were conducted and 544 pledges to quit smoking were obtained. Fifty-seven percent of these were still not smoking by the end of January and 34% were estimated to be nonsmokers after 10 weeks. The possibilities of children and adolescents as active-change agents for adult behavior should be part of a comprehensive nonsmoking effort.

As part of the community organization component of the project, sixth grade students were elected as health council representatives to serve as liaisons between the project personnel, student peers, and parents. The health council promoted the smoking campaign activities by making class presentations and writing a newspaper for distribution to all sixth grades in the community (Perry et al., 1983).

RECOMMENDATIONS FOR PROMOTION OF NONSMOKING
THROUGH

PUBLIC EDUCATION

PROMOTION OF NONSMOKING THROUGH MARKETING AND COMMUNICATION TECHNIQUES

- Conduct a long-term public communication campaign to market nonsmoking.
- Provide the public with more objective information on smoking and nonsmoking.

* * *

THE HEALTH CARE SYSTEM AS TEACHER AND ROLE MODEL

- Improve physician skills in identifying and treating smoking addiction.
- Establish model nonsmoking programs in buildings of the Minnesota Department of Health and Minnesota health care facilities.

* * *

THE ROLE OF THE COMMUNITY

- Support campaigns by Community Health Services Agencies and other community organizations to promote nonsmoking.

* * *

ADVICE FOR SMOKERS

- Encourage smokers to use effective methods for quitting.

* * *

ADVICE FOR NONSMOKERS

- Encourage nonsmokers to be helpful -- not moralistic or adversarial -- but to assist in implementing the Minnesota Clean Indoor Air Act.
-

MINNESOTA TECHNICAL ADVISORY COMMITTEE ON NONSMOKING AND HEALTH

PROMOTION OF NONSMOKING THROUGH MARKETING AND COMMUNICATION TECHNIQUES

RECOMMENDATION: The Minnesota Department of Health should sponsor a long-term public communications campaign to promote nonsmoking using social marketing principles. The marketing of nonsmoking should be carefully coordinated with regulatory, economic, and health-information measures to achieve a combined effect.

Background and Rationale

According to Kotler and Zaltman (1971), "the core idea of marketing lies in the exchange process. Marketing does not occur unless there are two or more parties, each with something to exchange and both able to carry out communications and distribution."

Looked at somewhat differently, marketing proceeds by offering a solution to a problem which the target audience already perceives or can be made to perceive. Thus advertising for snowblowers may communicate with both blue collar workers and professors through the problem they have in common -- a driveway full of snow.

Cigarettes are sold to the public through well planned marketing programs extending over multiyear periods. Smoking is presented by cigarette advertising as a solution to many types of human problems. Marketing plans obtained from industry sources through subpoena by the Federal Trade Commission (FTC) describe plans to associate particular brands with a life style that is "masculine, contemporary, confident, daring, adventurous, mature" (FTC, 1981, pp. 2-14). One plan advises the industry that, to teach young "starters,"

"Present the cigarette as one of the few initiations into the adult world."

"Relate the cigarette to 'pot', wine, beer, sex, etc."
(Myers et al., 1981).

Current advertising offers images of virility, sex appeal, athletic prowess, relaxation, and wilderness scenes in association with cigarettes.

As the basis for a strategy for marketing of nonsmoking, survey and other research offers a wealth of possibilities--in marketing terms, the problems which are to be solved by the nonsmoking product. Research shows that smokers (and potential smokers) must cope with at least four main problems:

1. Smokers have the problem of SOCIAL ISOLATION.
 - a. Despite the high prevalence of smoking in some age and sex groups, smoking is rapidly becoming a minority activity. Minnesota rates were 29.5% in 1981 and can be predicted to be considerably lower now.

RECOMMENDATIONS FOR PUBLIC EDUCATION

- b. Smokers must cope with bad breath, stained teeth, and other handicaps to social life.
 - c. The MCIAA provides for separation between smokers and nonsmokers and provides for nonsmoking during part of the day for many smokers. In surveys, 92% of nonsmokers and 87% of pack-a-day smokers favor the Act (Minnesota Poll, Minneapolis Tribune, 1980).
 - d. Nonsmokers and even smokers are increasingly inconvenienced by and impatient with smoke-containing air, ashtrays, etc.
2. Smokers have the problem of knowing the HEALTH EFFECTS of smoking.
 - a. More than 9 out of 10 Americans believe that smoking is hazardous to a smoker's health, and a majority believe it is probably hazardous to others around the smoker (Roper Organization Inc., 1978).
 - b. Two-thirds of current smokers would like to quit (Roper Organization Inc., 1978).
 - c. Nearly half the public thinks that smoking is an addiction (Roper Organization Inc., 1978).
 - d. News articles concerning adverse effects of smoking appear with considerable frequency.
 3. Smokers have the problem of COST of cigarettes and their health effects.
 - a. The cost per pack of \$.90 to \$1.25, although it is lower relative to inflation than in 1972, represents a considerable expense.
 - b. There is increasing availability of nonsmokers discounts for life and other types of insurance.
 - c. Employers are looking more carefully at the insurance, ventilation, safety, and other costs associated with smoking as the number of smokers decreases and smoking becomes more an anomaly than a part of society. One carefully done study (Kristein, 1983) puts excess yearly cost to businesses at \$336-\$601 per smoking employee (in 1980 dollars).
 4. Smokers and nonsmokers want an enhanced SELF-IMAGE. In addition to the problems imposed by smoking, the smoker carries the set of problems which may have offered an entry point for cigarette advertising originally.
 - a. Surveys of smokers and nonsmokers among teenagers show that smokers generally tend to get lower grades in

RECOMMENDATIONS FOR PUBLIC EDUCATION

school, participate less in organized extra-curricular activities, and are more likely to engage in antisocial behavior than nonsmokers (Botvin, 1984).

- b. It may be surmised from cigarette advertising that virility, sex appeal, relaxation, natural beauty, and other images have great appeal to smokers and that lack of these qualities is the problem being addressed by the smoking product "solution." The same images may, with even more plausibility (and considerable scientific evidence), be associated with nonsmoking.

Nonsmoking and smoking cessation offer very attractive alternatives to the problems smokers have. They are marketable in the same way other products and behaviors are marketable -- by using modern communication techniques to strengthen the images in the public's mind of nonsmoking as a solution to one or more of the four kinds of problems.

Promotion of nonsmoking (or any product) must be a long-term program with continuity of messages, images, goals, and implementations. Temporary funding or a few well-meaning public service announcements will not be adequate. Background survey research and evaluation should be built into marketing efforts so that the strategy is based on solid information and is able to demonstrate results within a reasonable period of time. These results will include attitude changes in the short run and increased nonsmoking behavior over a longer period.

It is important to distinguish the positively-oriented marketing of nonsmoking from more traditional public health educational information on adverse health effects. The latter should be continued and intensified via the news media but kept separate from the marketing material. Marketing is primarily directed toward feelings and actions; information is directed toward intellectual understanding. The two may or may not achieve the same effect depending upon the audience and the type of message.

The Minnesota Department of Health (MDH) would conduct a marketing communications program designed to change the (smoking) behavior of current and potential smokers. The phrase "marketing of nonsmoking . . ." is a relatively new concept in the battle against smoking. It is appropriate to focus on marketing as it is the key discipline used by competition (cigarette manufacturers) to create a billion dollar industry. In order to counter their effort, marketing should become the focus of any nonsmoking effort. The cigarette manufacturer's marketing program has relied heavily on behavioral research. Its communication (advertising and promotion) has been designed to cause a change in behavior favorable to the use of tobacco products.

Marketing images should focus on nonsmoking as a desirable activity. The images should be positive rather than negative, and health consequences and other negative aspects of the "competing product" (smoking) should not be featured except by implication. The Nonsmoking Generation campaign in Sweden is a successful example of this approach, using rock stars, T-shirts and images of healthy people to associate nonsmoking with popular teenage themes, including an element of rebellion against the (by implication) older "smoking" generation. This and most other successful marketing

RECOMMENDATIONS FOR PUBLIC EDUCATION

campaigns use primarily positive images, rather than the "morbidity-and-mortality" or "knock-the-competing-product" approach used in less professional efforts.

Special Target Groups

The largest groups of smokers in Minnesota are:

Women Age 20-29:	141,000
Men Age 20-29:	110,000
Men Age 30-39:	97,000
Women Age 30-39:	88,000
Men Age 40-49:	91,000
Women Age 40-49:	56,000
Men Age 50-79:	124,000
Women Age 50-79:	105,000
TOTAL	812,000

Those who have quit include: 262,000 women and 404,000 men aged 20-79 or a total of 666,000.

Clearly, young women are a major target; but it would be difficult to exclude any group by age or sex since current male smokers of middle age have the greatest risk of heart attack and lung cancer. Risks of developing both of these diseases come back to normal after 10-15 years of nonsmoking.

Occupational Target Groups

The highest smoking rates are among the unemployed, managers/administrators, male sales workers, female clerical employees, operations, crafts, laborers, and service workers. Professional/technical workers and farmers have rates considerably below the state average but are important because of their influence on others. Neither rates nor absolute numbers suggest that white collar or blue collar workers should be targeted at the expense of the other.

IMPLEMENTATION

Market Situation Analysis

Gather, analyze, and segment pertinent marketing information from a wide variety of published sources. It is important to understand the findings and activities of other organizations involved in nonsmoking activities. There needs to be an information clearinghouse to avoid duplication of effort.

RECOMMENDATIONS FOR PUBLIC EDUCATION

Research

A search would be made for available nonsmoking behavioral research. Using this as a starting point, a custom behavioral research study would be developed to determine what communication stimuli will cause a literal change in smoking behavior. This becomes the foundation of the communication program. It must be emphasized that this research would be designed to determine what people will actually do, not what they say they will do.

Goals

These would be specific and measurable. The following are examples:

- Reduce the incidence rate of new smokers in the under-18 age bracket from 3-1/2% per year to 2% per year by 1990.
- Change the perception of smoking among women smokers age 20-29 by 1990.
- Obtain a smoking cessation rate of 50% among the adult smoking population age 20-59 by 1990.

Strategy

An overall coordinated marketing approach would be developed for all MDH communication activities. It is important that the resources and energies of all nonsmoking activities be integrated and focused on the same goals. This will greatly enhance the degree of success.

Tactics

Communication activities would be made specific in terms of content, cost, and timing. They would include, but not be limited to:

Advertising	Display Materials
Direct Mail	(posters, banners, etc.)
Seminars	White Papers
Public Relations	Training Materials
Literature	Promotions
Audio/Visual Presentations	Media Liaison
Speakers Bureau	etc . . .

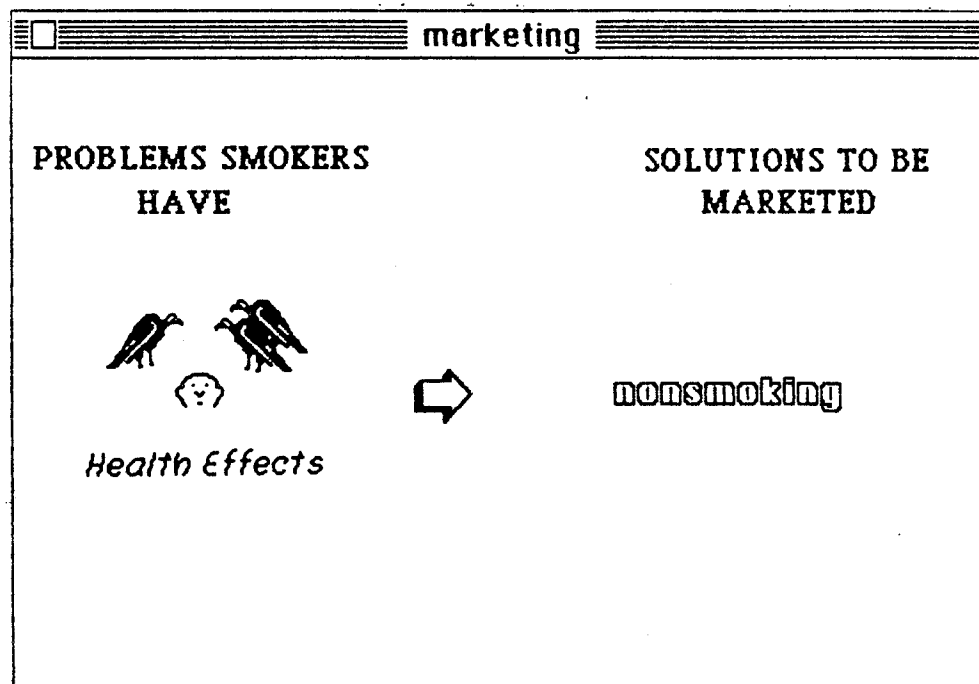
Measurement

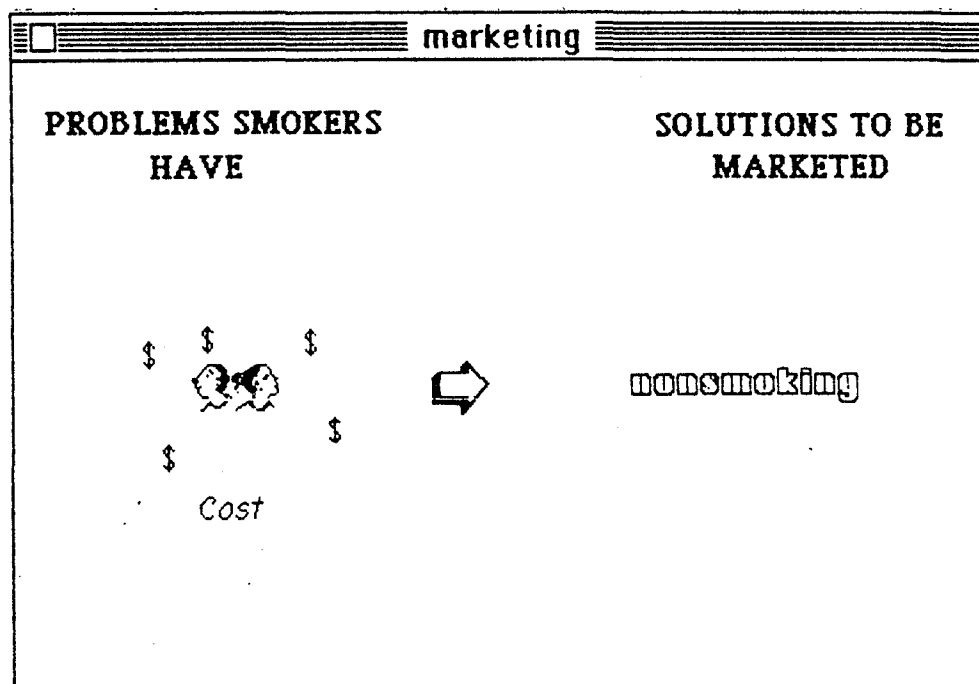
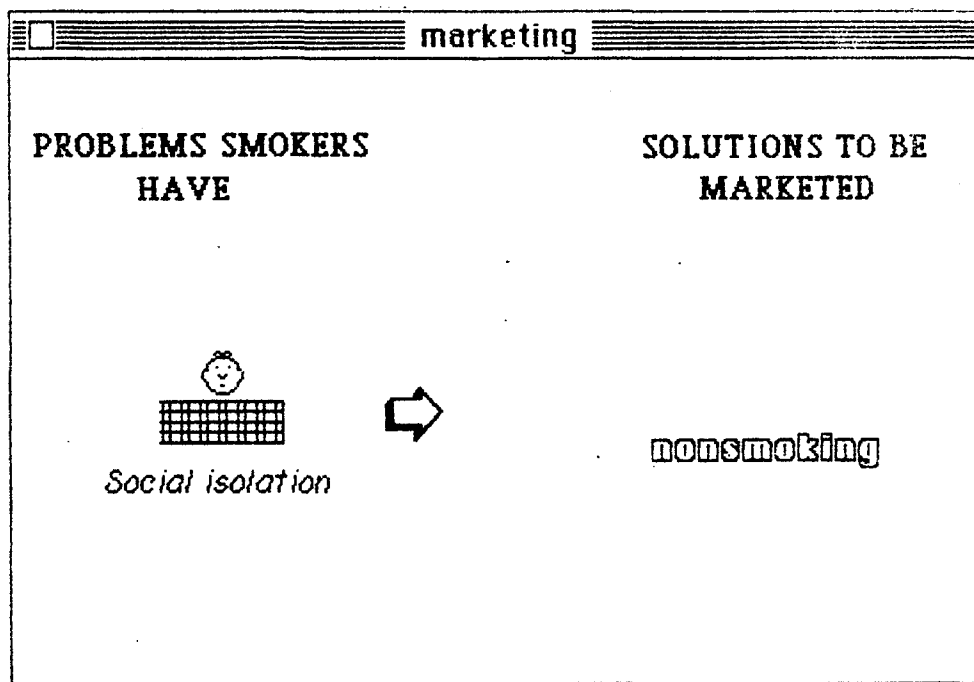
Specific measurement devices would be developed to monitor the success of the program. Measurement, of course, has its roots in the setting of clear and specific goals. Effects of a well-conceived plan will be relatively small on a year-by-year basis, however, and the effect on actual smoking rates is costly to evaluate.

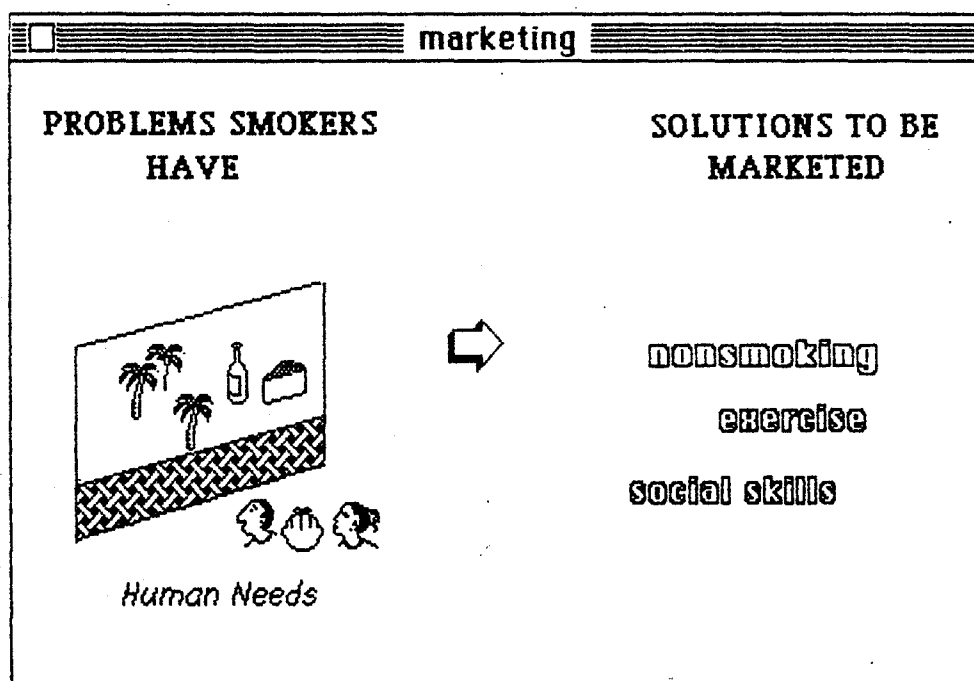
Budget, Timetable, and Responsibilities

It is estimated that, to develop and implement a complete marketing communication program (time, materials, and media) on a statewide basis, an expenditure of approximately \$1,000,000 would be needed. The program development, including research, could take from six to nine months. It is recommended that a combination of MDH staff and outside consultants be used in the preparation of this program.

The success of any nonsmoking effort will, in addition to strategy, be dependent on two factors: commitment and resources. There must be a commitment by the State of Minnesota to enter into a long-term anti-smoking program. It must be a major health care related priority. But commitment is not enough. There needs to be adequate resources allocated to effectively develop and implement the program. A well-conceived program does little good sitting on a shelf.







RECOMMENDATION: The Minnesota Department of Health should continue to provide scientific information on smoking and nonsmoking on a regular basis to the news media and other channels.

Background and Rationale

Despite a general feeling in health educational circles that information alone is not sufficient to motivate behavior, it remains a necessary minimum condition for behavior change. The reduction in smoking rates by men from 52% at the time of the 1964 Surgeon General's Report to the current 34% can be attributed largely to information distribution since the real price of cigarettes has not increased significantly since then and programs using other methods have been fitful or geographically scattered. Quit rates have been highest for physicians and others with postgraduate education, again attesting to the power of "black ink" information on the negative effects of smoking.

Survey results (Myers et al., 1981) show that 81% of the United States population connect smoking with lung cancer but that 32% do not realize the even more important connection with heart disease. Public knowledge of methods for quitting is certainly at a much lower level.

Provision of continuing information on new facts from studies through the news media, voluntary organizations, speaking opportunities, and Community Health Agencies is an essential part of the promotion of nonsmoking. The MDH should maintain a close working relationship with Minnesota research activities in the field and assist in assuring that the results of state and national studies are completely and accurately represented in the media. Since it generally is couched in a negative format, showing the

RECOMMENDATIONS FOR PUBLIC EDUCATION

adverse consequences of smoking, this information should be released through different channels and in different formats from the positive images proposed in the recommendations for advertising and marketing of nonsmoking. The informational content should shift toward methods for quitting and other "how-to-do-its" whenever possible.

THE HEALTH CARE SYSTEM AS TEACHER AND ROLE MODEL

RECOMMENDATION: Physicians should treat smoking as a serious preventable or curable health problem. Diagnostic and therapeutic techniques should be handled with the same level of professional and scientific expertise applied to other medical conditions.

Until very recently, most physicians have regarded smoking by patients as undesirable but inevitable; and successful efforts at counseling and behavior change have been unusual. Although the public looks to physicians for advice and support in smoking cessation and prevention (USDHHS, 1982), only a fourth of current smokers in one survey had ever been counseled to quit (Stewart, Brook, and Kane, 1979).

It is only in the past 15-20 years that the patient's smoking history has been recorded systematically; and almost no medical facility carries out the kind of statistical work that would be necessary to detect a quit rate of, for example, 2-5% per year. This would, however, contribute significantly to morbidity and mortality reduction over the long run, probably more so than the majority of other time spent by physicians.

A review of methods of smoking counseling has been published recently by two University of Minnesota authors (Pechacek and Grimm, 1983) and a manual is available from the National Institutes of Health called "The Physician's Guide: How to Help Your Hypertensive Patients Stop Smoking" (National High Blood Pressure Education Program, 1983). They recommend to physicians:

1. take a careful smoking history;
2. deliver a firm quit-smoking message, connected with physical or laboratory findings if relevant;
3. help the patient to set a quit date and provide answers to questions about the process of quitting; and
4. check progress at each return visit and provide guidance and reinforcement, even if the first quit attempt fails.

Additional procedures such as referral to smoking cessation clinics, provision of self-help materials for quitting, or the prescription of nicotine gum as part of an overall cessation program may also be helpful.

Minnesota has unusually rich resources for physician education in the area of smoking control, and courses have been available through the University

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of Minnesota Division of Epidemiology for several years. Recently the Department of Medicine and the Division were awarded a \$1.5 million grant from the National Cancer Institute for physician education in smoking control. Additional research, in collaboration with the Department of Psychiatry, is developing the best strategies for using nicotine gum for smoking cessation. It seems likely that Minnesota physicians will have unusual opportunities for education and research in these areas in the next few years.

THE ROLE OF THE COMMUNITY

RECOMMENDATION: Interested Community Health Services Agencies and other organizations in Minnesota communities should conduct community-wide campaigns for promotion of nonsmoking. Training sessions and materials should be provided for those who wish to learn community organization techniques.

MDH, in conjunction with the University of Minnesota, Division of Epidemiology, School of Public Health, and selected Minnesota committees should develop, pilot test, and distribute a manual describing techniques that can be used by a community agency to promote nonsmoking. The University and/or the MDH should offer training courses on community nonsmoking and other health promotion techniques.

In order to conduct a nonsmoking program, a community or community organization might choose to:

1. Obtain information on community dynamics--how decisions are made and which groups and individuals are usually involved.
2. Do or have done a survey to determine smoking rates. Obtain materials on successful nonsmoking programs in other communities.
3. Form a planning group with members chosen with regard to their influence in the community, their knowledge of various areas of community life, and their knowledge of health areas--for example, retail sales, local government, voluntary organizations, schools, churches, etc.
4. Develop and implement one or more of the following:
 - a) In collaboration with smoking cessation experts or facilities and local media, conduct radio/television or in-person smoking cessation clinics.
 - b) Participate in statewide or national quit-smoking campaigns such as "D-Day."
 - c) Obtain donations for a contest prize, such as a car or a vacation trip, and conduct a lottery-pattern contest, with

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winners chosen randomly from smokers who quit and those who help them do so (perhaps with one prize for the smoker and another for his/her "helper").

- d) In conjunction with the school system, stage contests locally for art and/or essays on nonsmoking and have the winning entries published or prominently displayed.
- e) Sponsor lectures, discussions, and social club talks on nonsmoking topics.
- f) Interest local businesses, hospitals, clinics, schools, and other organizations in taking leadership positions by establishing progressive nonsmoking policies in their buildings.
- g) Creatively explain and enforce the MCIAA in retail stores, restaurants, and work places. This usually requires identifying someone such as the sanitarian who has time to visit, educate, and enforce this Act.
- h) Other nonsmoking planning activities which may be developed by the group.

To conserve resources, maintain enthusiasm, and attract media coverage, it may be helpful to have campaigns focused around a particular season, week, or day (such as "D-Day"). It is also desirable to have a plan for a several-year period with staged programs of education and smoking cessation before regulation is pursued.

- 5. Repeat the survey of smoking prevalence and publicize the results, along with interviews about how people view the overall effort.

ADVICE FOR SMOKERS :

MOST OF THOSE WHO QUIT DO SO ON THEIR OWN.

Individual smokers who wish to quit (in the 1981 survey, 72% of Minnesota smokers had tried to quit) may find the following suggestions helpful.

Set a date to quit. Choose a day a few days to a week from now to begin a new life as a nonsmoker. Pick a day when your activities will be conducive to nonsmoking.

Learn more about your own smoking habit. Use the time between now and your "quit date" to learn more about yourself and your smoking behavior. Sit quietly and explore when, why, and where you smoke. Identify situations that trigger your desire to smoke. Are they stressful times at work, at parties, when with certain people, or . . . ? Decide which of these can be changed or avoided and make plans to do so. If you know you will feel the

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urge to smoke when with smokers, plan to stay with the nonsmokers or decide to go somewhere else. Avoiding tempting situations is particularly helpful during the first few days after quitting.

For unavoidable situations, plan what you will do instead of smoking. If you always light up after meals, for example, decide that you will get up immediately after eating and wash the dishes or take a walk.

Reward yourself. Find ways to reward yourself by planning to indulge in new interests or activities. Use the occasion to take up a hobby, join a club, or begin a new sport. Begin a program of regular physical activity, gradually working up to the level you enjoy. Exercise burns up tension, helps control weight, and provides new experiences.

Think about the kind of social support that would be helpful and try to arrange for regular contact with the right groups or individuals.

Many people worry about gaining weight after quitting. Studies have shown that weight gain, if any, is usually modest. It can be avoided by stocking your cupboard with low-calorie snacks that are high in texture and taste and low in calories. Carrots, cauliflower, rye crisp, flavorful teas, and spicy, tomato-based sauces can be added to a normal diet without danger of gaining weight.

Quit for life. Plan the rest of your life as a nonsmoker. Make a list of the reasons for quitting and review them when you are tempted to smoke. Think of any withdrawal symptoms you may have as recovery symptoms. As your body begins to clear out the tar deposits accumulated during years of smoking, you may cough more. You may feel hungrier as your sense of smell and taste improve or feel irritable and tense as the nervous system begins to function without nicotine. Making a conscious effort to experience these feelings more intensely sometimes makes them easier rather than harder to deal with.

Group Methods. Many people find that contact with a partner or group of other people who are quitting at the same time is helpful. Although surveys show that a majority of quitters do so on their own, group methods can be useful for others. This may be as informal as an agreement with a spouse or friend or a formal series of classes and discussion groups. Some people use economic incentives like an office pool in which money is placed on the success of quitting.

Many formal methods for smoking cessation are available, ranging from hypnosis to aversive conditioning to discussion groups. There is a large variation in price, and sometimes the price is part of the incentive to remain a nonsmoker. Choose a method which has been evaluated and which seems to suit your needs. You may wish to ask for the names of several "graduates" and talk to them about their experiences before deciding. Many methods succeed with a quarter to a half of participants over a one or two year period; and about the only generalization that can be made is that a wide variety are effective and no one technique stands out as clearly superior for all kinds of people. The recently licensed nicotine gum, which must be prescribed by a physician, offers another aid to quitting for people who have physical symptoms from nicotine withdrawal. It is best viewed as an additional aid to other methods.

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If you slip, use the skills you have learned and go at it again. Many people succeed after several attempts at quitting. Since nearly half the men and a third of the women who ever smoked in Minnesota -- 780,000 of them -- have quit, there is little doubt that you can succeed. It is only a question of when, not whether, you can become a nonsmoker, if you wish to. If you have setbacks, don't waste time feeling bad about it. Smoking is a tough habit to break, and it may take several tries. If you approach the problem seriously, you will learn something about yourself and your smoking behavior and acquire new skills which can eventually do the job, even if it takes more than one try.

Additional information can be obtained from the American Lung Association, the American Heart Association, and the American Cancer Association.

ADVICE FOR NONSMOKERS:

PROMOTING AND SHARING CLEAN AIR

Know the provisions of the MCIAA.

Ask the management to enforce the MCIAA rather than confronting the smoker directly. The rules of the MCIAA make it clear that the manager of a retail establishment or the employer in a worksite is responsible for requesting that patrons or employees comply with the Act. The MDH Division of Environmental Health (612-623-5336) is responsible for overall enforcement. In many cases, the local Community Health Services Agency (county or city health department) should be contacted first. Discussions between nonsmokers and smokers on the subject of compliance should be carried out courteously and with regard for the rights of both parties.

If your spouse, child, or friend smokes . . ., let others play the role of doctor, counselor, nonsmoking expert, etc. Few people are successful in "treating" their close relatives or friends directly, although they may suggest other resources that are available. Remember that smoking is not an easy habit to break, and it may take time and several attempts to succeed. You can help someone who is trying to quit by spending time together in nonsmoking settings, encouraging regular exercise, and being sympathetic to irritability or occasional setbacks.

Reinforce the positive. If you like the nonsmoking provisions in a restaurant, tell the management. If a smoker refrains for the sake of others or makes efforts to quit, express your approval and support.

**RECOMMENDATIONS FOR PROMOTION OF NONSMOKING
THROUGH
PUBLIC AND PRIVATE REGULATORY MEASURES**

BUSINESSES AND OTHER ORGANIZATIONS AS PROMOTORS OF NONSMOKING

- Establish model nonsmoking programs within the Minnesota Department of Health
- Encourage model programs in Minnesota worksites.
- Urge health and public health facilities to become smokefree by 1990.
- Encourage organizers of public events to reject contributions which lead to tobacco advertising.

* * *

MAKING THE MINNESOTA CLEAN INDOOR AIR ACT MORE EFFECTIVE

- Distribute clear materials on MCIAA provisions for the workplace to employers and the public.
- Enforce the MCIAA in the workplace.
- Develop uniform rules for implementing the MCIAA in workplaces.
- Encourage restaurants to expand nonsmoking space commensurate with demand.

* * *

RECOMMENDATIONS TO THE FEDERAL GOVERNMENT

- Support national legislation for self-extinguishing, fire-safe cigarettes.
- Support rotating health messages on cigarette packages but recommend that federal prohibitions on state regulation of cigarette advertising be removed.
- Request that federal properties in Minnesota comply with the MCIAA.

* * *

LIMITING PROMOTION OF CIGARETTES

- Enact a state law against distribution of free cigarettes.

MINNESOTA TECHNICAL ADVISORY COMMITTEE ON NONSMOKING AND HEALTH

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

BUSINESSES AND OTHER ORGANIZATIONS AS PROMOTERS OF NONSMOKING

RECOMMENDATION: The Minnesota Department of Health should establish a visible and successful nonsmoking policy for Department of Health employees which can serve as a model for other organizations.

Background and Rationale

The public looks to health care institutions for guidance and role modelling. As Assistant Surgeon General (Dr.) Michael McGinnis said in a recent speech, "It is very difficult for a physician to cure a patient of smoking when his own ashtray is full."

RECOMMENDATION: Hospitals, clinics, physicians offices, long term care institutions, voluntary health organizations, the Minnesota Department of Health, and Community Health Services Agencies should establish smoke-free buildings as soon as possible and no later than 1990.

Background and Rationale

A recent survey of patients at the University Hospital assessed patient attitudes towards a smoke-free hospital (Kottke, Hill, Heitzig, Brekke, and Casperson, 1984). Over half (53.6%) of the patients surveyed favored a smoke-free hospital, and almost three-quarters (73.2%) favored either a smoke-free hospital or smoking only with a physician's permission. A large proportion of patients (82.9%) believed that a smoke-free hospital would be an improvement in medical care. A large majority (84.6%) also believed that hospital staff members should set an example for non-employees by not smoking.

Health care institutions should, therefore:

- 1) develop and publicize policies promoting nonsmoking, such as that of the Minnesota Medical Association and Park Nicollet Clinic;
- 2) join resources with the Minnesota Department of Health, the Minnesota Hospital Association, and other health care industry representatives to develop policies and recommendations for visible and effective enforcement of the MCIAA in health care facilities; and
- 3) eliminate cigarette sales from their premises.

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

RECOMMENDATION: Minnesota employers are encouraged to set nonsmoking policies in the worksite which are broader than the minimum provisions of the Minnesota Clean Indoor Air Act. Employers may implement a range of stronger policies, including the establishment of a smoke-free worksite. The acceptability of such policies is demonstrated by successful examples in health institutions and individual Minnesota corporations.

Background and Rationale

Worksite smoking policies and programs can play a vital role in decreasing prevalence of smoking and smoking related diseases. The workplace is especially important for several reasons. First, most individuals spend more time at their job than at any other public place; secondly, the social environment, including the existing supportive network, enhances the potential for effective long-term behavior change (Orleans and Shipley, 1982); and third, there is a well established interaction between tobacco smoke exposure and exposure to other substances at the workplace resulting in increased risk of disease (USPHS, 1979).

In recent years there has been considerable interest focused on the workplace as an important site for health promotion activities. Many pilot programs -- which include smoking and encompass a wide range of disease prevention activities (e.g., exercise, nutrition) -- have been developed by various businesses, and a rapidly growing literature confirms the growing importance of the worksite for health promotion (NICSH, 1980; Hays, 1982).

While Minnesota is one of 36 states with laws placing limitations on smoking in public, it is one of only seven which has laws specifically dealing with smoking in the workplace (USDHHS, 1983). Several cities also have recently passed ordinances which cover smoking in the workplace (Mawson, 1984). While Minnesota's law provides minimum standards of protection from tobacco smoke, there is no provision in the law which prevents any organization from establishing more stringent policies on smoking. Concern about the health, social, legal, and economic effects of smoking has prompted many organizations and businesses, both local and national, to adopt smoking policies which afford greater protection than local or state law requires (Dupont and Basen, 1980). Such policies should be encouraged.

In a 1981 survey of Minnesota businesses, for example, 7% prohibited smoking entirely in the cafeteria and 32% prohibited smoking in all of their production facilities (MDH, 1982). In a nationwide survey in 1979, almost half (49%) of employers had a policy restricting or prohibiting smoking in the workplace (NICSH, 1981). However, most restrictions affected production areas and were established to meet required safety regulations. These regulations primarily relate to the manufacture and handling of flammable materials or the use of equipment in sterile work areas (NICSH, 1981). Many existing policies may be addressing the smoking issue in response to safety requirements rather than to the related health hazards.

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

Several companies have established strict and comprehensive nonsmoking policies, however. These companies are generally small and the smoking policy is established in response to management concern about the health risks of smoking, often based on a personal experience or belief of a powerful individual within the company (MDH, 1984; NICSH, 1980). Employers and employees are becoming concerned about their rights and responsibilities relating to smoking in the workplace. Employers have begun to become aware of the potential economic costs of smoking in the workplace (Kristein, 1983; Weis, 1981) and the legal issues stemming from their obligations to provide safe work environments (Brody, 1982). Some employers have banned smoking entirely or established hiring policies which use nonsmoking status as a job requirement (Thimmesch, 1983). According to the American Lung Association, the current legal consensus is that, when no labor contract specific to smoking exists, the employer has the right to eliminate smoking on company premises and even to hire only nonsmokers (Lowenberg, 1983). An employer may inform job applicants that the company does not allow smoking while the employee is at work or representing the company at meetings.

RECOMMENDATION: At least eighty percent of Minnesotans have contact with physicians and/or health care facilities in a given year. Health care institutions should become more effective educational resources and image makers by:

- a. developing and publicizing definite policies promoting nonsmoking, such as that recently instituted by the Minnesota Medical Association.
- b. The Minnesota Department of Health, the Minnesota Hospital Association, the Minnesota Nursing Association, and other representatives of the Health Care Industry should jointly develop policies and recommendations for visible and effective enforcement of the Minnesota Clean Indoor Air Act in hospitals. Long-term goals promoting nonsmoking in health care settings beyond the requirements of the Act should be encouraged, but not legislated at present, with the exception that sale of cigarettes in health care institutions is incongruent with the facts on smoking and health and should be eliminated by either voluntary or legislative means.

Background and Rationale

Some health care institutions, such as the Minnesota Medical Association (MMA) and the Park Nicollet Clinics here in Minnesota, have taken aggressive steps in reducing smoking. The MMA has recently adopted a motion to prohibit smoking in meetings, encourage employees to not smoke while on the job or representing the MMA, and encourage employees to quit by offering cessation programs and incentives. Smoking was banned in all public and patient care areas of the Park Nicollet Clinics, one of the nation's largest urban multi-specialty clinics, as of January 1, 1984. Employee smoking is restricted to lounge areas designated as smoking areas. Long-term plans are to eliminate smoking entirely. Such policies should

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

receive wide publicity in order to increase their potential effectiveness as role models and trendsetters in establishing no smoking policies.

The study of the effectiveness of innovative change in institutions, such as health care facilities and businesses, is an important but neglected area of research. Such institutions form social structures through which people interact and, as such, can exert powerful influences on individuals. Little is known, however, about the factors which lead medical and non-medical organizations to initiate, implement, and continue or discontinue programs (D'Onofrio, 1981). Research on the "diffusion of innovations" has identified the principles which affect imitation and adoption of change. The main elements in the diffusion of new ideas are the innovation, which is communicated through certain channels, over time, among the members of a social system. The characteristics of an innovation which determines its adoption are:

- 1) relative advantage -- the degree to which an innovation is perceived as better than the idea it supercedes;
- 2) compatibility -- the degree of consistency with existing values, experiences, and needs;
- 3) complexity -- the degree to which an innovation is perceived as difficult to understand and use;
- 4) trialability -- the degree to which an innovation may be experimented with on a limited basis; and
- 5) observability -- the degree to which the results of an innovation are visible to others (Rogers and Shoemaker, 1971).

Health promotion activities, in general, and smoking policies and programs, in particular, within organizations are innovative, and the degree to which they are adopted, initiated, and maintained is a function of these principles and will affect their effectiveness as role models for other organizations.

RECOMMENDATION: Organizers of public events should reject contributions and sponsorship monies which result in advertising for cigarettes and other tobacco products.

Background and Rationale

Sponsorship of public events by tobacco companies result in promotion of tobacco products. Tobacco companies spend an estimated \$1.5 billion every year on the advertising and promotion of tobacco products. Since the broadcast media ban on cigarette ads in 1971, the tobacco companies have redirected the focus of their promotional efforts and are now among the largest users of print media and outdoor advertising. More recently, tobacco companies have begun sponsoring other public events such as sporting events, music concerts, and cultural exhibitions such as art shows. Concern about the effects of such promotional activities on encouraging smoking, especially among adolescents and teenagers, has

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

prompted several suggestions from public health groups on ways to reduce this impact. The committee feels that organizers of such events should be informed about the potential effects of such promotion and urged to reject such contributions.

MAKING THE MINNESOTA CLEAN INDOOR AIR ACT MORE EFFECTIVE

The MCIAA is a highly successful legislative measure. Its acceptance by Minnesota restaurants and other businesses and by the public is partially due to its gradual implementation over a period of years. The application of the MCIAA in the workplace is still not universally understood by employers or the public.

RECOMMENDATION: Clear materials in the form of questions and answers on this topic should be prepared by the Minnesota Department of Health and be widely distributed through channels which will effectively reach both employers and the public.

Background and Rationale

The MCIAA, passed in 1975, was the first comprehensive statewide act to separate nonsmoking and smoking areas in public places and has served as a model for legislation and local ordinances elsewhere (Kahn, 1983).

"The purpose of sections 144.411 to 144.417 is to protect the public health, comfort and environment by prohibiting smoking in public places and at public meetings except in designated smoking areas."

Minnesota Clean Indoor Air Act
Laws 1975, c.21,1.

"'Public place' means any enclosed, indoor area used by the general public or serving as a place of work... excluding private, enclosed offices occupied exclusively by smokers even though such offices may be visited by nonsmokers."

Minnesota Clean Indoor Air Act
Laws 1975, c.21,1.

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

"No person shall smoke in a public place or at a public meeting except in designated smoking areas."

Minnesota Clean Indoor Air Act
Laws 1975, c.21,1.

Minnesota is one of 36 states which regulate or restrict smoking in public areas to some degree (USDHHS, 1983). The MCIAA is one of the strongest existing statewide laws. The MCIAA bans smoking in public places except in areas where it is specifically permitted. It has the support of a large majority of 92% of nonsmokers and 87% of pack-a-day smokers (Minnesota Poll, 1980). Its acceptance by restaurants, retail stores, and the general public appears to be due to gradual implementation over a period of years and the realization that its provisions make a business more attractive to most customers.

However, even though the law has been generally accepted in retail settings, the application of the MCIAA in the workplace is not universally understood by employers or the public. A MDH survey of health promotion activities in worksites in Minnesota found that less than half (45%) of 115 businesses surveyed provided separate smoke-free environments for nonsmoking employees and only 53% of businesses provided nonsmoking areas in cafeterias (MDH, 1982). There is a need for a public information campaign to inform employees and employers that the requirements of the law apply not only to restaurants (which have received the most media attention to date) but to all public places, including places of work. The committee recommends that an effort be made to improve public and employer awareness about the MCIAA and other smoking-related issues through development and dissemination of appropriate materials directed to the media, employers, and employees.

DOES THE MCIAA APPLY WHERE I WORK?

The purpose of the MCIAA is to protect the health, comfort, and environment of the general public in public places. Public places include "any enclosed, indoor area used by the general public, or serving as a place of work, regardless of the type of ownership of the area." The only areas exempt from the provisions of the law are private, enclosed offices occupied exclusively by smokers.

WHAT ARE THE REQUIREMENTS OF THE LAW FOR WORKPLACES?

In general, as in any other public place, smoking is not permitted except in designated smoking areas. Smoking areas may be designated by an employer except in certain areas in which smoking is prohibited by the fire marshall or other law, ordinance, or regulation. The employer must also provide "acceptable smoke-free" areas. The size and location of any smoking permitted area must be arranged to minimize the toxic effects of smoke in adjacent smoke-free areas.

WHAT IS AN "ACCEPTABLE SMOKE-FREE AREA"?

An acceptable smoke-free area is an area free of toxic levels of second-hand smoke. This smoke-free space must be a complete section of an office area, 200 square feet or larger, where there is no smoking. The smoke-free area must be separated from any "smoking permitted" area by a continuous, physical partition at least 56 inches high or a space at least four feet wide unless the ventilation system in the room provides at least six air changes per hour.

DOES THE LAW GUARANTEE ME THE RIGHT TO A SMOKE-FREE WORKSTATION?

If you have a private office, you may declare it smoking permitted or nonsmoking. In a group office, the entire area may be designated smoking only if all occupants agree; otherwise an acceptable smoke-free area must be provided. The law requires that, in public places consisting of a single room (such as a group office), the smoking permitted area may not be more than proportionate to the preference of users of that location for a smoking permitted area, with the minimum nonsmoking area defined as above.

IS IT LEGAL TO MAKE THE ENTIRE OFFICE A SMOKING AREA?

Only if the office is not normally visited by the public and all occupants agree.

**IS IT LEGAL TO MAKE THE ENTIRE AREA NONSMOKING
AND LIMIT SMOKING TO LOUNGES AND PRIVATE OFFICES?**

Yes. The law states that the employer may designate smoking permitted areas but that smoking is prohibited otherwise.

CAN AN EMPLOYER ENTIRELY BAN SMOKING?

Yes, except in private offices.

HOW ARE "SMOKING PERMITTED" AND "NO SMOKING" AREAS IDENTIFIED?

The MCIAA requires that "Smoking Permitted" signs be placed conspicuously in the appropriate places and, furthermore, that a sign saying "Smoking is prohibited except in designated areas" be posted at every major entrance. It is recommended that "No Smoking" signs be posted as reminders, however. If smoking is prohibited throughout an establishment, a sign saying "No Smoking In This Entire Establishment" must be posted at all major entrances. The lettering of the signs must be easy to read and the boundaries between "smoking" and "no smoking" areas must be clearly defined except in areas where only employees and escorted visitors are allowed. In these areas, the law permits notification of the boundaries of "smoking" and "no smoking" areas in some other fashion.

ARE THERE ANY AREAS THAT MUST BE NONSMOKING?

In general, common areas used by everyone in the course of performing normal job-related activities must be designated nonsmoking. Such areas include hallways, common files, workstations used by several employees, and stairways.

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

WHAT ABOUT LOUNGES, RESTROOMS, BREAK ROOMS, AND RECEPTION AREAS?

If two or more rooms are used for the same activity, one entire room may be designated as smoking permitted as long as a portion of one other comparable room is designated a no smoking area and meets the requirements for an acceptable smoke-free area and the size of the designated smoking-permitted area is not proportionately larger than the number of persons expressing a preference for smoking areas.

If only a single room exists for such an activity, the area must be designated no smoking if it is less than 200 square feet and not all users of the area express a preference for a smoking-permitted area. If it is larger than 200 square feet, smoking permitted and no smoking areas may be designated as described above.

Since a reception area is generally accessible and used by the general public, the receptionist area should be nonsmoking. The designation of a smoking permitted area is dependent upon the size of the reception area. The nonsmoking area must meet the requirements for an acceptable smoke-free area described above.

ARE THERE ANY PROVISIONS FOR RESTRICTING SMOKING DURING MEETINGS?

Meetings can be defined as temporary extensions of the individual's workstation to another location. Rules applying to offices and workstations should also apply to meeting rooms. In general, if all participants agree, smoking would be permitted. If all do not agree, an acceptable smoke-free area must be provided. In reality, since all but the largest meeting rooms would not meet the space requirements for provision of both "smoking permitted" and "no smoking" areas, smoking should not be permitted unless all participants agree.

RECOMMENDATION: The Minnesota Department of Health currently offers consultation and information on the Minnesota Clean Indoor Air Act in the workplace only through response to inquiries or complaints, usually by means of letters or telephone calls. The Department should expand its consultation, information and enforcement program for the Act in the workplace and make this activity widely known through public information channels.

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

RECOMMENDATION: Enforcement of rules under the Minnesota Clean Indoor Air Act has recently been centralized in the Minnesota Department of Health. All workplaces should be included in a uniform set of rules.

Background and Rationale

The Division of Environmental Health of the MDH has the responsibility for handling complaints and requests for information regarding the MCIAA. Enforcement in restaurants is done by sanitarians during routine inspections. Enforcement in public places other than restaurants has been done on an ad hoc basis since no staffing was provided by the original 1975 MCIAA legislation. Legislation in 1984 transferred responsibility for "warehouses and factories not frequented by the general public" from the Department of Labor and Industry to the MDH. The MDH program for consultation, promotion, and enforcement should be expanded to effectively handle the increased promotional efforts and anticipated increases in requests and complaints resulting from the proposed educational initiatives. The rules for "factories, warehouses, and similar places of work," which have been separate until recently, should be repealed and the rules of the MDH clarified or amended in order to provide uniform standards of protection in all types of worksites. Staff members of state and community health departments should be assigned to provide enforcement and/or consultation to worksite settings so that the MCIAA can be implemented uniformly throughout the state.

RECOMMENDATION: Restaurant owners should be encouraged to increase the size of nonsmoking sections beyond the 30% required by law if necessary to accommodate all patrons desiring nonsmoking areas.

Background and Rationale

The rules for the MCIAA require that restaurants provide a minimum of 30% of seating in a nonsmoking area and that those with controlled seating inquire about the smoking or nonsmoking preferences of patrons before seating. The 30% requirement was included as an amendment to rules of the MDH in 1980. Before that time, restaurants were required only to set aside an unspecified area as nonsmoking. In response to concern about inadequate nonsmoking areas, the change noted above was made to guarantee at least 30% of seating in a nonsmoking area. Given the facts that 70% of Minnesotans over 18 years old are nonsmokers (Minnesota Poll, 1980) and nearly 50% of restaurant customers don't eat out more often because of drifting smoke (Gallup, 1984), the 30% requirement may be inadequate. Restaurant operators should be encouraged to gather information regarding smoking preferences of their patrons and to respond accordingly by expanding smoke-free areas when appropriate. Since the MCIAA rules allow a four-foot gap between tables to serve as a barrier, methods can be devised which allow the nonsmoking areas to expand or contract to meet customer demand hour by hour if necessary.

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Even though the segregation of smokers and nonsmokers may not have an easily measurable and pronounced acute effect on the health of the general public, there is an increasing scientific literature which suggests that, especially in those with early respiratory and cardiovascular disease symptoms and others with hypersensitivity to smoke, as well as children, passive smoking may have detrimental health effects (Shephard, 1982; Lefcoe, 1984; U.S. Department of Health and Human Services, 1984). Perhaps a more important result of such regulations is the role which they play in establishing and reinforcing nonsmoking as a socially preferred behavior. By establishing larger and larger areas as smoke-free, restaurants, workplaces, and other public areas can more equitably respond to the preferences of their clientele and employees. Initially, perhaps the most important effect of such an action would be to counter the public impression that smoking is an activity in which a large majority of adults partake. By more realistically reflecting the proportion of smokers and nonsmokers, this impression could effectively be countered. Recent polls suggest that approximately 30% of adult Minnesotans smoke (Minnesota Poll, 1980).

RECOMMENDATIONS TO THE FEDERAL GOVERNMENT

RECOMMENDATION: Cigarettes which self extinguish in five minutes or less are highly desirable for fire safety and indoor air quality. National legislation to effect this is recommended. This recommendation should be transmitted through a variety of means to Minnesota's Congressional delegation.

Background and Rationale

Cigarette-ignited fires cause death, injury, and property loss. It has been estimated that each year in the United States cigarette-ignited fires kill over 2000 men, women, and children; burn over 5000 others; and cause over \$300 million in property damage (NFIRS, FEMA, 1981). Cigarette-caused fires are the leading cause of fire fatalities. Approximately 25 deaths per year in Minnesota are caused by cigarette-ignited fires. In recent years there has been increasing interest in reducing the number of such fires. One possibility is to require the production of cigarettes which will not smolder long enough to ignite upholstered furniture, a so-called "fire-safe" cigarette.

The first study done on the feasibility of fire-safe cigarettes was done in 1974 by Arthur D. Little, Inc. The conclusion of their report was that, if cigarettes extinguished within ten minutes of being placed on furniture, ignition would most likely not occur (McGuire, 1983). Subsequent studies have compared the relative fire-igniting propensity of various brands. In one study, More and Nat Sherman cigarettes were found to stop burning in less than five minutes while Benson & Hedges burned for an average of 80 minutes (reported in Sullivan, 1983). National standards for fire-safe cigarettes have not been established but several states have proposed

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

legislation which would prohibit the sale of cigarettes which do not extinguish in less than five minutes.

In order to promote burning in an unpuffed cigarette, various chemical substances are added to the cigarette to make it burn longer. Two byproducts of these additives are increased fire hazard and increased air pollution from cigarettes left unattended in ash trays. Both may be reduced through changing the manufacturing processing and leaving out the burn-promoting chemicals. Apparently the effects of leaving out burn-promoters, other than length of burning, are not significant.

Federal and state efforts to enact legislation in these areas have increased in the last several years. Representative John Moakley of Massachusetts introduced the Cigarette Safety Act in 1983 into the United States Congress. As of 1983, eight states had "fire-safe" cigarette legislation introduced.

The committee feels that, ideally, such legislation should be enacted at the Federal level so that uniform standards can be established across the entire country. However, given the large and to-date successful counter lobbying effort by the tobacco industry against Federal legislation, the committee recognizes and encourages the state level initiatives.

"Fire-safe" cigarettes are one of three possible ways to reduce cigarette-caused fires. Smokers can be educated about the dangers, but, since half of all cigarette fire victims are intoxicated, educational efforts are of limited usefulness. Furniture can be made less flammable and much has already been done by furniture manufacturers to establish standards of fire resistance, but this approach also has limitations. For example, polyurethane is smolder resistant and is used in furniture, but, once it starts, it burns rapidly and emits toxic fumes. Since furniture has a long, useful life and is expensive, it would be decades before all furniture in a state could be replaced with any new product proposed,

RECOMMENDATION: National legislation should be enacted which would:

- a. remove the restrictions on state regulation of tobacco advertising required by the Cigarette Labelling Act, and**
- b. require that cigarette warning labels be clear, specific, and rotated periodically.**

Background and Rationale

The only existing law regulating tobacco advertising is the Federal Cigarette Labelling Act of 1979. This law requires that the Surgeon General's warning regarding the harmful effects of smoking be written on each pack of cigarettes and on advertisements. The further regulation of advertising or promotion of tobacco products by the state is prohibited by this same legislation. This preemption states that:

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

"No requirement or prohibition based on smoking and health shall be imposed under state law with respect to the advertising or promotion of any cigarettes, the packages of which are labelled in conformity with the provisions of the chapter."

The warning label contributes to the tobacco industry's escape from liability from health effects due to the use of their products (Garner, 1980). The broad applicability of the clause on State regulation of advertising could be challenged. Such an effort, however, would probably be time consuming and expensive and the outcome uncertain.

Efforts to have the prohibition removed or clarified as applicable only to package labelling at the Federal level are recommended. A challenge by the State legislature would be welcome if further legal research shows that this is feasible. Such legislation could take the form of restrictions on advertising of cigarettes as has been done in Sweden. In that country, ads are permitted only in certain publications and are restricted in size and content. Pictorial displays are limited to:

"a particularly moderate representation of the finished product, individual packages, and the brand name or some comparable symbol. The remainder of the pictorial matter shall not be of more than one shade of color and shall be neutral, i.e., it may not contain any suggestive, decorative, or other element which may give rise to any concrete associations."

Thus, no human beings or beautiful scenery may be illustrated but only a single pack of cigarettes on a plain background (International Digest of Health Legislation, 1980).

COMMENT: Direct regulation of advertising by state legislation is forbidden by the federal legislation which requires the health hazard warning on cigarette packages. Although this provision could be challenged, the legal effort required could be extremely expensive and its outcome uncertain.

Background and Rationale

The effects of advertising restrictions on cigarette consumption is a controversial area (e.g., Bergler, 1981), but restraints are desirable for several reasons. Despite industry claims that advertising serves only to influence brand selection among smokers, there is suggestive evidence that tobacco promotion increases or at least maintains levels of smoking in adults, that it may have especially significant effects on consumption by young people, and that it creates false and misleading impressions that smoking is a wholesome activity (Roemer, 1982). Industry expenditures also suggest that promotion affects consumption. Approximately \$1.5 billion is spent yearly in the United States on promotion of tobacco products. There is an additional ethical rationale for limiting the promotion of a major public health hazard. Until there is clear evidence that tobacco promotion does not influence smoking onset rates in adolescents, such promotion is questionable from public health and ethical perspectives.

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

Health warnings are required on tobacco products in 37 countries around the world. The rationale for health warnings is related to health education; such warnings serve to inform the public about the health hazards of tobacco use, form a starting point for other health education initiatives, and are a visible sign of the government's commitment to reduce smoking levels.

Most countries requiring health warnings, including the United States, use rather general, non-specific language in describing the health hazards. Several countries, most notably Sweden, use stronger, specific messages which are periodically rotated on cigarette packages. In these rotating systems, one of the alternative messages must appear on each package, and the message must be changed on a periodic basis. When a smoker then purchases a package of cigarettes, he or she will not know in advance which message will appear. The rotational system will create curiosity so that the warning will more likely be read. Furthermore, the specific nature of the message is likely to have a greater impact on the smokers' knowledge about health effects than a general, non-specific message.

Few studies have evaluated the effectiveness of health warnings. In the United States, a 1981 study by the Federal Trade Commission concluded that the current warning, i.e., "The Surgeon General has determined that cigarette smoking is harmful to your health," is ineffective. This was attributed to four factors: 1) it is overexposed and worn out, 2) it presents no new information, 3) its abstract nature makes it difficult to recall, and 4) it is not likely to be perceived as personally relevant (Myers, et al., 1981).

At the time of this writing, the tobacco industry and health officials have agreed on a new cigarette warning label that will offer four rotating messages about the hazards of smoking. Under the proposal, beginning one year after Congressional approval, all cigarette packs will bear one of the following:

- Surgeon General's Warning: Smoking causes lung cancer, heart disease, and emphysema.
- Surgeon General's Warning: Quitting smoking now greatly reduces serious health risk.
- Surgeon General's Warning: Smoking by pregnant women may result in fetal injury and premature birth.
- Surgeon General's Warning: Cigarette smoke contains carbon monoxide.

The warnings on cigarette packs would be 50% bigger than the present ones and would be surrounded by thicker lines. Warnings would also appear in billboard and magazine ads. The warnings would be rotated, with each one appearing for three months at a time.

Evaluations of the rotational system in Sweden found that the rotated warnings were noticed, read, and had an impact on knowledge. The labelling system was also given partial credit for increasing the number of people who had stopped smoking or shifted to lower-yield brands (Ramstrom, 1980).

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

The Committee approves of specific, rotated warning labels for cigarettes and supports the Federal effort to enact a new system of four warning messages.

CONTROLLING ACCESS TO TOBACCO

RECOMMENDATION: A state law forbidding distribution of free cigarettes should be enacted.

Background and Rationale

The available data regarding the various sources of cigarette and tobacco acquisition by adolescents and teenagers is limited. Although several studies have gathered information retrospectively on the sources of cigarette acquisition (Baugh et al., 1982; Green, 1979) and much research has been focused on adolescent smoking, there is relatively little information available on where and how cigarettes are obtained. A majority of teenagers report that they are given cigarettes, and nearly 100% of 12-18 year olds report that they buy cigarettes at some time (Green, 1979).

There are currently several Minnesota State laws which pertain to the possession and sales of tobacco products to young people. Whoever furnishes tobacco to a person under 18 years is guilty of a misdemeanor. Furthermore, current statutes make it a petty misdemeanor for anyone under 18 to use tobacco or tobacco-related devices such as cigarette papers or pipes for smoking. Cigarette vending machines are required by law to be posted with a specific warning -- "Any person under 18 years of age is forbidden by law to purchase cigarettes from this machine."

Concern over one avenue of cigarette distribution to youngsters prompted the Minneapolis City Council to pass an ordinance in 1979 restricting the free distribution of cigarettes. The Council noted that cigarette promotions included the distribution of free cigarettes to individuals regardless of age and, consequently, cigarettes were being distributed to minors in violation of state law. The facts that this allowed minors easy access to cigarettes and that there was no easy way to oversee such distribution of cigarettes prompted the Council to adopt a motion which prohibited any person from distributing "cigarettes free to any person on the public malls, sidewalks, or pedestrian concourses within the city of Minneapolis" (Minneapolis ordinance 79-Or-049).

Regulation of tobacco sales and distribution to minors, coupled with visible and aggressive enforcement, probably would have little effect on the rates of experimentation with cigarettes. The limited available data suggest that between one-half and two-thirds of experimental smokers are given their first cigarette, and more than 50% of teenagers have tried cigarettes by age 17 (Baugh et al., 1982). However, the effects on the development of a sustained smoking habit are more likely to be affected by availability of tobacco.

RECOMMENDATIONS FOR PUBLIC AND PRIVATE REGULATORY MEASURES

Many authors have described the importance of social and environmental factors in determining a young person's first smoking experiences (Ahlgren et al., 1982; Evans et al., 1979; Flay et al., 1983; McAlister et al., 1979; Mittlemark et al., 1983). One factor which may serve to encourage some adolescents to smoke is the fact that tobacco is illegal. This group who strive to "be adult" and to challenge authority may be more likely to smoke in the face of such a challenge. The effects on the smoking incidence and prevalence in other groups which may be more sensitive to the legal status of tobacco use is unknown. However, it is probable that restricting availability by improving enforcement of the existing laws and forbidding free distribution will result in decreases in consumption by persons under 18 years of age.

The direct effect of advertising on cigarette consumption is a controversial area. Industry proclamations continually stress that advertising serves only to entice current smokers from one brand to another. Public health organizations contend that advertising promotes an "adult" image which encourages young people to start smoking and reinforces current smokers through effective marketing techniques. Tobacco advertising strategies have, in fact, been directed toward young audiences, according to documents subpoenaed by the Federal Trade Commission in 1981 (Myers et al., 1981).

RECOMMENDATION: The Federal Government should be asked to establish administrative policies which are consistent with the Minnesota Clean Indoor Air Act for federal properties in Minnesota.

Background and Rationale

Buildings owned or leased by the Federal government are exempt from the requirements of the MCIAA. Federal regulations do exist for buildings controlled by the General Services Administration which are compatible with the provisions of the MCIAA. The Federal Government should be asked to take administrative action to make Federal properties consistent with the provisions of the MCIAA.

RECOMMENDATIONS FOR PROMOTION OF NONSMOKING

THROUGH

ECONOMIC INCENTIVES AND DISINCENTIVES

INCREASING THE PRICE OF CIGARETTES

- Increase the state excise tax on cigarettes by ten cents per pack. Declare intentions for periodic increases in future years.
- Encourage Congress to maintain and increase current federal cigarette taxes.

* * *

FUNDING NONSMOKING PROGRAMS

- Provide funding for nonsmoking programs from a variety of sources.

* * *

RETURNING THE DOLLARS SAVED TO THE NONSMOKER THROUGH LOWER COST INSURANCE

- Encourage life, health, and disability insurance discounts for nonsmoking and publicize their availability.
- Encourage homeowner insurance discounts for nonsmoking households.
- Offer insurance benefits to nonsmokers through employee "cafeteria" benefit packages.
- Inform employers of the insurance savings to be obtained through increased nonsmoking by employees.
- Develop and distribute economic incentive strategies to encourage nonsmoking in the workplace.
- Advise employees that many health insurance programs cover smoking cessation costs.

* * *

RECOVERING VENTILATION COSTS

- Publicize the energy costs saved in nonsmoking buildings.
-

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

RAISING THE COST OF SMOKING

RECOMMENDATION: The State of Minnesota should increase the existing 18-cent excise tax on cigarettes by 10 cents during fiscal year 1986. Subsequent annual 5-cent excise tax increases should be planned for the following 5-year period.

Background and Rationale

The public health rationale for increasing the Minnesota state excise tax on cigarettes is the reduction of smoking through raising the price of cigarettes. Cigarettes are comfortably affordable and readily available to the public. Studies in Canada (Ontario Council of Health, 1982) have shown that the real price of cigarettes relative to inflation has generally declined since 1949. The real price in 1980 was 72.6 (setting 1949 = 100). More remarkable is the finding that cigarette price as a proportion of real disposable income has plummeted in these three decades to a value of 30.1 in 1980 (setting 1949 = 100). Thus, cigarettes have become relatively more affordable over time.

In Minnesota, the real price of cigarettes relative to inflation has fluctuated within a relatively narrow range during the past 30 years. Relative to reference year 1967, the price of cigarettes has remained relatively stable throughout this time period. This price stability is evident in data presented in Table 1 and displayed in Figure 1.

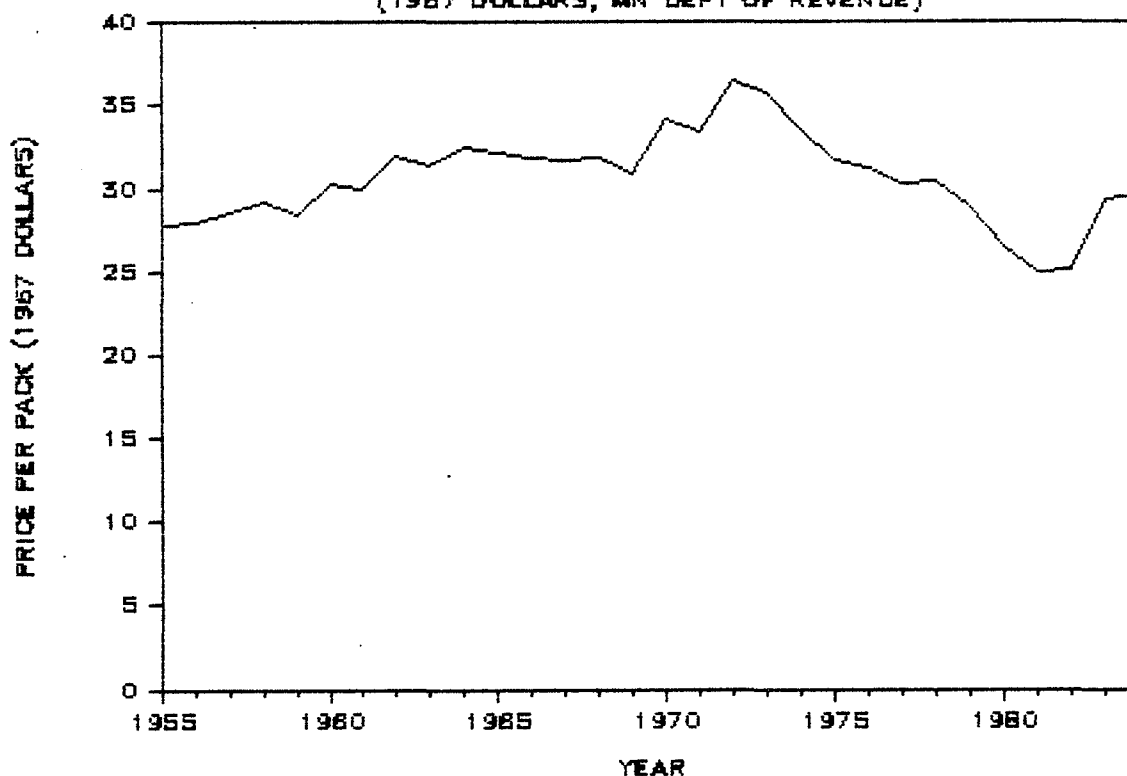
TABLE 1 -- The Real Price of Cigarettes in Minnesota
(Reference Year: 1967 = 100)

Year	Price	Year	Price	Year	Price
1955	87.7	1965	101.9	1975	100.0
1956	88.3	1966	100.6	1976	98.7
1957	90.5	1967	100.0	1977	95.6
1958	92.1	1968	100.6	1978	96.2
1959	89.9	1969	97.8	1979	91.1
1960	95.9	1970	107.9	1980	84.2
1961	94.6	1971	105.7	1981	79.1
1962	100.9	1972	115.5	1982	79.7
1963	99.4	1973	113.0	1983	93.0
1964	102.5	1974	106.0	1984	93.7

FIGURE 1

Avg. Retail Price of Cigarettes

(1967 DOLLARS, MN DEPT OF REVENUE)



The importance of the information presented in the table and graph is that cigarettes are readily available and affordable. The current pack price is less than the price of cigarettes in 1967 relative to inflation.

In late 1983, the average pack price in Minnesota was 99.2 cents. A 10-cent excise tax increase (from the current 18 cents to 28 cents) would elevate the average pack price above \$1.00 per pack. Evidence is accumulating that consumers are becoming sensitive to the higher cost of cigarettes, and the \$1.00-plus pack is not welcomed (Business Week, 1983).

The proposed 10-cent increase would raise the price of cigarettes about 10%. The price elasticity* of cigarettes has been estimated for the United States (Harris, 1980) at -0.44. This means that a 10% increase in price would produce a 4.4% decrease in tobacco use.

In 1984, a total of 456,681,000 packs of cigarettes were sold in Minnesota (USDA, 1984). A 10-cent price increase would be expected to decrease statewide consumption by 20,000,000 packs (4.4% of 456,681,000). Per capita consumption has been declining steadily since 1975. Assuming continued declines in per capita and total statewide cigarette consumption,

* The price elasticity of a commodity for a particular population is the change in average consumption that occurs with unit change in average price.

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

a conservative estimate of fiscal 1986 sales -- 400,000,000 packs -- would generate additional excise tax revenues of \$40,000,000 with a 10-cent excise tax increase. If these new revenues are devoted to special purposes, these should be in the broad area of health care costs so that savings accruing from nonsmoking could potentially balance the decreased revenue from diminished sales of cigarettes over time. The state should avoid becoming "addicted" to cigarette revenues from this excise taxation mechanism.

The economic costs to Minnesota from the smoking habit in terms of direct medical costs and indirect lost income and productivity costs greatly exceed the income from tobacco-generated jobs (primarily wholesale and retail) and from tobacco excise and sales taxation. This is detailed in the economic section of this report. Increasing the excise tax partially defrays the costs of smoking and slightly shifts the proportion of the economic burden of smoking borne by smokers.

Minnesota has not increased the excise tax on cigarettes for six years. While Minnesota is generally progressive in its legislation relative to tobacco, the current 18-cent excise tax rate is well below the highest state excise tax rate of 25 cents -- the current level in six states, including neighboring Wisconsin. A 10-cent increase will reestablish Minnesota's leadership position in the control of tobacco sales and use. A 10-cent increase in excise tax will cause a quantum increase in cigarette price since most excise tax increases are accompanied by manufacturer-imposed increases in the basic price of cigarettes. This substantial increase should impact upon per capita consumption rates.

The proposed annual five-cent increases in the state excise tax on cigarettes have two purposes. First, this legislation will guarantee that cigarette prices inflate at or above the inflation rate for personal income, thus maintaining cigarettes as an increasingly costly commodity. This should continue to place a cap on smoking rates. Second, the advance legislation will alert neighboring states to Minnesota's intentions and give them time to increase their respective excise taxes. This will have beneficial effects: 1) minimization of the threat of "bootlegging" cigarettes from states with lower excise taxes and 2) a snowballing effect of serial excise tax increases in many states radiating from Minnesota and surrounding states.

Large differentials in cigarette excise tax between states can lead to "bootlegging" or smuggling across state lines. Such smuggling is of concern when tax increases are considered. Price differentials between states has been the primary cause of cigarette bootlegging in the past (Advisory Council on Intergovernmental Relations, 1977).

Types of Smuggling

There are four distinct types of cigarette tax evasion activities that occur across the country:

1. casual smuggling. This type of bootlegging activity usually takes place across the borders of neighboring states. A resident of a high-tax state traveling in a low-tax state will buy cigarettes for personal use or

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

for funds. This type of smuggling activity is not considered a source of major revenue loss in a majority of states. It is a significant problem in high-tax states which border low-tax states with large metropolitan areas close to the state border.

2. organized smuggling. This type of bootlegging involves the transportation of larger quantities of cigarettes across state borders for profit. The scope of such activity can range from small, part-time operations dealing in carloads to large, organized businesses run by organized crime. A related problem is the counterfeiting of state cigarette stamps. Operations have been uncovered in which counterfeiters illegally purchase unstamped cigarettes in low-tax states, transport them to a high-tax state, stamp them with counterfeit stamps, and distribute them through legitimate channels.

3. mail order purchase of cigarettes. This type of smuggling involves the mailing of cigarettes from low-tax to high-tax states. Federal legislation to prevent this activity and increased Federal enforcement of mail fraud has caused a decline, although not an elimination, of such smuggling.

4. purchase of cigarettes through tax-free outlets. Untaxed cigarettes can be purchased in three ways: international points of entry, military installations, and some Indian reservations.

Bootlegging in Minnesota

The scope of the cigarette bootlegging problem in Minnesota, as around the country, is difficult to document. A nationwide study is currently underway by the Advisory Council on Intergovernmental Relations on the cigarette bootlegging problem in all states. This study, an update of a 1977 study, is expected to be published next year and should help clarify the current status of the bootlegging problem in Minnesota and other states.

In Minnesota, the Alcohol, Tobacco, and Special Taxes Division of the Department of Revenue reports that there is no evidence of organized smuggling efforts. Casual smuggling, in which a person buys cigarettes while in a low-tax state for personal consumption does exist. The effort needed to effectively police this activity and its' relatively small scale makes it a low priority concern. This limited bootlegging experience in Minnesota is due to two factors:

- 1) the impact of the Federal Cigarette Contraband law of 1978, which requires the recording of all wholesale purchases of cigarettes over 500 cartons, and
- 2) the similarity in the tax rates in surrounding states.

The Federal Cigarette Contraband Act and its enforcement by the Bureau of Alcohol, Tobacco, and Firearms (BATF) has been primarily responsible for the reduction in large scale organized bootlegging operations. This has had more impact on the problem in east coast states, which have historically been the areas where most of this activity takes place.

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

Before this law, there was some small-scale organized smuggling in Minnesota. According to the State Department of Revenue these were one or two man operations with no connection to Eastern organized crime. In a typical smuggling operation, the operator would call a cigarette wholesaler in North Carolina or Kentucky and place an order for a carload quantity of cigarettes (600 to 3500 cartons). He would then drive down and purchase them for cash. In most instances he would purchase as a wholesaler, thereby avoiding the North Carolina or Kentucky sales tax. Back in Minnesota, the operator would sell cigarettes to individuals at small plants, bowling alleys, bars, and cafes for prices ranging from \$.50 to \$1.00 per carton below retail. Apparently, the Bureau of Budget has indicated that they will not fund the BATF for enforcement activities after this year. If enforcement activity declines, there may be a resurgence of bootlegging activity around the country.

If the Minnesota tax is increased by ten cents, increased attempts to evade the tax would probably occur and there may be some increases in border hopping, mail order sales, and Indian reservation sales. Current enforcement responsibility is centered in the Bureau of Criminal Apprehension. There are four criminal investigators responsible for investigating cigarette and liquor tax matters. The potential increase in smuggling activity after a tax increase might require increased enforcement resources but the cost would be small relative to the increased tax revenue.

In 1975, before the Cigarette Contraband Act, the ACIR (1977) estimated that the total losses due to smuggling in all states was \$337 million dollars. This loss was primarily due to lost tax income when cigarettes purchased in lower tax states were resold in higher tax states. Two years after the enactment of the law, in 1980, losses decreased to \$233 million per year. In Minnesota, this same report estimated that there was a \$12.2 million dollar loss due to tax evasion in 1975. In 1980, losses had declined to \$6.8 million per year. Corresponding total cigarette tax collections for these years was \$76.6 million in 1975 and \$84.6 million in 1980 (tax burden on tobacco, 1983). Estimated tax losses due to smuggling declined as a proportion of total cigarette taxes collected over this period by 50% -- from 16% in 1975 to 8% in 1980 (Department of the Treasury, 1981).

RECOMMENDATION: The Commissioner of Health should send letters to Minnesota's congressional delegation recommending that:

- a. the temporary 8-cent increase in federal excise tax on cigarettes, effective January 1983, be made permanent and
- b. legislation for additional increases in the federal excise tax be drafted and introduced.

Background and Rationale

The public health basis for increasing excise taxes pivots on the finding that increasing tobacco prices is associated with decreased sales and per capita consumption. In particular, the effect of increasing cigarette prices has a larger impact on persons with less disposable income.

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

Adolescent males appear to be particularly susceptible to increases in price. In Canada, where large increases in federal excise taxes on cigarettes have been invoked, "price elasticity" calculations have been made which show that, for a 10% increase in cigarette price, a 4-5% reduction in per capita consumption is achieved. Following the example of Canada, cigarette price increases should be of a magnitude large enough to cause a measurable decrease in per capita consumption.

The federal excise tax on cigarettes was raised to 8 cents per pack in the early 1950s. This rate was maintained until January 1983 when the tax rate was increased to 16 cents. Although not entirely attributable to the federal tax increase, it is notable that national per capita cigarette consumption dropped by 7% in 1983. This excise tax increase is temporary and is due to lapse in 1985 unless it is renewed or amended. Federal excise tax increases impact upon the entire smoking population of the United States and are by definition more far-reaching than state excise taxes. However, passing federal tax legislation entails hurdling the very strong, well-funded, and well-organized tobacco lobby. Bills are pending which not only extend the current 16-cent rate but increase the rate to 28 cents.

The Technical Advisory Committee on Nonsmoking and Health strongly supports both continuation of the 16-cent rate and additional increases. It is recommended that the Minnesota Commissioner of Health should draft letters to Minnesota's Congressional delegation supporting legislation to extend and increase the federal excise tax rate on cigarettes.

FINANCING NONSMOKING PROGRAMS

RECOMMENDATION: Funding needs for the promotion of nonsmoking should be obtained from multiple sources including legislative appropriation.

Background and Rationale

The promotion of nonsmoking requires multiple sources of funding. Potential sources include grant support from the federal government for public education research and demonstration projects; funds from private sources, including the voluntary health agencies and private foundations; and legislative appropriations for statewide programs to implement some of the recommendations contained in this report.

With regard to the legislative channel, the Committee recommends that the appropriations measures which are submitted to fund the promotion of nonsmoking be submitted as separate measures from the legislation for increasing the state excise tax. The excise tax measure should not be considered a "dedicated tax" to fund nonsmoking programs. This allows individual pieces of legislation to be considered on their own merit and to receive separate funding. This would guarantee that funded programs would retain legislative oversight and review.

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

LOWER INSURANCE COSTS FOR NONSMOKERS

RECOMMENDATION: Chief Executives and Medical Directors of companies writing life and health/disability insurance and pensions in the State of Minnesota should be encouraged to offer nonsmokers' discounts on individual life, health, and disability insurance policies. The availability of nonsmokers' discounts on individual insurance policies should be communicated to the public through public health messages and insurance industry advertising.

Background and Rationale

Some of the insurance companies licensed to write individual life and health/disability insurance in Minnesota offer lower premium rates to nonsmokers. Some companies offer specifically-defined nonsmoker discounts. Other companies consider nonsmoking as a prerequisite for offering "preferred" rates. Annual premium price differentials for nonsmoking individuals can range from \$100 to over \$1000 depending on the face value and type of insurance purchased.

The MDH should actively inform the public of this financial incentive available to nonsmokers. Copies of this report will be distributed to the Chief Executives and Medical Directors of the 100 insurance companies with the highest volume of insurance sales in Minnesota to encourage them to establish and actively advertise nonsmoker discounts.

RECOMMENDATION: The Minnesota Department of Health and the Minnesota Insurance Information Center should encourage property/casualty companies writing homeowners insurance to consider giving discounts to nonsmoking households.

Background and Rationale

Burning cigarettes are a major cause of house fires. According to the 1983 Fire Almanac, 35.5% of one- and two-fatality fires are ignited from burning cigarettes. The most common causes of fatal fires are cigarette ignition of upholstered furniture in living areas (16.9%) and ignition of bedding in sleeping areas (15.5%). Among all residential fires, cigarettes ranked fourth among causes of fires after heating, cooking, and arson but ranked first as the cause of both deaths and injuries. The dollar cost of structural damage or loss of the dwelling plus personal property loss is very high. In 1981, cigarette-ignited fires caused a total of \$300 million in property loss nationally.

Several insurance companies have responded by offering discounted homeowners insurance rates for nonsmoking households. Other companies are encouraged to follow their example.

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

RECOMMENDATION: "Cafeteria" plans developed within the context of employee benefits programs should distinguish nonsmokers for financially rewarding options, incentives, or bonuses.

Background and Rationale

"Cafeteria" plans represent an emerging pattern of benefits services for employees that provide the opportunity to select benefits emphasis. For example, employees may select more or less life insurance, health insurance, disability income insurance, savings for retirement, dental coverage, and other options adding up to a particular maximum amount. Thus, employees, based on age, health, and other factors, may select a pattern of benefits advantageous to their needs. In some plans, the employee pays for a percentage of the benefits package.

As employers institute "cafeteria" plans for their employee benefits packages allowing employees to self-select benefits, it will be possible to design plans which offer a more favorable and comprehensive package to nonsmokers for the same allotted dollar value. The rationale is that nonsmokers, as a group, are less costly to employers. For example, life insurance could be offered at a lower rate per \$1000 coverage to nonsmokers--as it is for individual nonsmoker policies. Thus a nonsmoker would use up fewer allotted dollars for the same amount of coverage and would have more dollars remaining for other benefits. Similarly, nonsmokers could be offered increased health/disability and pension benefits per unit of cost. It is recommended that cafeteria benefit systems fairly distinguish between smokers and nonsmokers based on medical and mortality experience and that nonsmoking be rewarded.

RECOMMENDATION: Business leaders should be made aware of the reduction in insurance and employee benefits costs which are possible from reduced smoking rates among employees.

Background and Rationale

Insurance representatives can provide actuarial estimates of the savings in insurance rates for life/health/disability coverage for companies which decrease their medical cost experience through the reduction in smoking rates among the employed workforce. Comparisons are available on the medical claims experience and the mortality experience of smokers and nonsmokers which allow prediction of insurance cost savings for successfully reducing smoking rates among employees. Insurance cost savings are possible regardless of the type of benefits plan.

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

EDUCATION ABOUT ECONOMIC BENEFITS OF NONSMOKING

RECOMMENDATION: Employers should be informed about the excess costs incurred by smokers in the workforce, based on the most accurate estimates in the research literature.

Background and Rationale

Detailed estimates have been made of the annual costs of smoking for the typical smoker and the portion of that cost assigned to business. A well-documented study by Kristein places the annual excess costs to business per smoking employee in the range of \$336-\$601 (1980 dollars). The author has used conservative estimates for all costs itemized. The line items included in this analysis are: 1) excess health insurance costs (\$75-\$150), 2) worker's compensation costs due to higher rates of accidents among smoking employees (\$17-\$34), 3) excess life insurance plus early disability and early retirements benefits costs (\$20-\$33), 4) costs of excess absenteeism (\$40-\$80), 5) excess disease related jointly to occupational exposures and cigarette smoking (\$72), 6) decreased productivity due to time lost to the smoking ritual on the job (\$80-\$166), 7) costs of fire losses (smoking is estimated to account for 7-11% of business fires) (\$5-\$10), and 8) increased health costs of nonsmokers involuntarily exposed to sidestream smoke from smoking employees' cigarettes (\$27-\$56). Other estimates, examining similar variables, have calculated excess business costs at several thousand dollars per smoking employee per year.

Detailed information on the excess costs of smokers to employers should be made available through the Minnesota Department of Health. The cost information should be disseminated through public media and business communication channels. The message should convey both the cost data and recommended solutions such as providing smoking cessation programs for smoking employees and implementing a smoking ban or a restricted smoking policy at the worksite.

RECOMMENDATION: Employers should be informed of strategies to encourage nonsmoking among employees through differential benefits and financial incentives favoring nonsmokers and by offering smoking cessation programs to smokers. The respective employer organizations and societies should be encouraged to participate.

Background and Rationale

Financial incentives are potent motivators. Considering the costs of smoking to businesses, one approach to decreasing smoking rates among the workforce is to selectively reward nonsmoking through financial incentives. The incentives reflect a portion of the reduced costs to the employer of nonsmokers. Financial incentives to nonsmokers can include: 1) increased benefits per employee dollar paid for nonsmokers, 2) discounts on life and health insurance premiums toward which employees contribute for the same

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level of coverage, and 3) increased contributions to 401(k) retirement plans for nonsmokers. Such incentive programs reward nonsmoking by making nonsmoking financially attractive while not penalizing smokers.

RECOMMENDATION: Smokers should be advised to inquire whether their life and health insurance programs cover the costs of smoking cessation programs.

Background and Rationale

In Minnesota and national polls, 70-90% of current cigarette smokers express a desire to quit smoking (74% in the Minnesota Poll, April 28, 1977). Smoking cessation among employees is strongly in the interest of employers. In fact, many employers, self insureds, and group life and health insurance plans cover the costs of smoking cessation programs conducted onsite or reimburse successful quitters for programs offered in the community. This information is not widely known and should be conveyed to the large population of employed smokers who are eligible for free or low-cost smoking cessation services.

The information should be disseminated through all major media, and corporations should make employees aware of policies for subsidizing or reimbursing costs of smoking cessation programs through their internal communication channels.

RECOMMENDATION: Employers and the public should be informed about energy and dollar savings from reduced ventilation costs in buildings where smoking is prohibited or greatly restricted.

Background and Rationale

Standards for ventilation to achieve acceptable air quality have been developed by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc. (ASHRAE). "Acceptable air quality" is defined as "air in which there are no known contaminants at harmful concentrations and with which a substantial majority (usually 80%) of the people exposed do not express dissatisfaction" (ASHRAE, 1981). More than 4000 chemical constituents have been identified in the gaseous and particulate portions of cigarette smoke. The single constituent most commonly measured is carbon monoxide (CO). In an unventilated room with several smokers, air quality standards for CO (9 ppm) are easily exceeded.

Models have been developed to examine the relation of cigarette smoking, room dimensions, and ventilation system variables on the concentrations of "respirable suspended particles" (RSP) in the ambient air of work environments (Repace and Lowrey, 1980). The public health implications of passive smoking at the worksite have been established -- nonsmokers exposed to chronic forced smoking have higher rates of small airways dysfunction and more respiratory symptoms and illnesses (White and Froeb, 1980). Cigarette smoking in indoor environments is the predominant source of RSP

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

in work settings where smoking is permitted. A full-time office worker in a three-person office with one smoker will have an annual mass RSP exposure which is three times that of a person who works outside and lives in a smoke-free environment during non-work hours (Repace and Lowrey, 1980). These authors state, "Attempts to reduce RSP levels from smoking by increasing the rate of mechanical ventilation or the efficiency of filtration yield exponentially diminishing returns for linear increases in ventilation energy (and cost) . . . increased ventilation does not appear to be the solution to the problem. Indoor air is a resource whose quality should be maintained at a high level. Smoking indoors may be incompatible with this goal."

Smoking in work environments presents a dilemma -- employers must choose between increasing ventilation costs to insure air quality (with the possibility that even increased ventilation may be overwhelmed by the RSP production of smokers) or conserving energy at the expense of air quality and employee health and at the risk of violating ambient air quality standards. Employers in Minnesota, where annual energy costs are exasperated by the extreme range of annual temperature variations, should be apprised of the potential ventilation, heating, and cooling cost savings which can be expected from adopting a no-smoking or a restricted-smoking policy at their worksites.

COMMENT: Assessing special taxes on the advertising of cigarettes is not a practical way to counter the effect of advertising and is not recommended.

Background and Rationale

The assessment of special taxes on the advertising of cigarettes was proposed as a possible curb on the pervasive advertising in the State of Minnesota. Because of the financial resources of the tobacco industry, it was decided that such a tax would have negligible impact on the volume of advertising. The effort to enact such legislation also could set up an adversarial relationship with Minnesota companies engaged in outdoor, print, and mass media advertising.

COMMENT: It appears that employers could hire only nonsmokers. With regard to hiring practices, smokers are not a protected group pursuant to federal or state statutory civil rights laws.

Background and Rationale

The issue of hiring policies with regard to prospective employee's smoking status was raised during the Technical Advisory Committee on Nonsmoking and Health subcommittee proceedings. The task force sought and received a legal opinion that there is no state or federal law which prohibits an employer from asking about the smoking habits of prospective employees and subsequently using that information in a hiring decision. However, employers are advised to consult with their own legal counsel to ensure

RECOMMENDATIONS FOR ECONOMIC INCENTIVES AND DISINCENTIVES

that their specific actions do not conflict with labor contracts or court decisions.

This information may be of interest to employers concerned about excess costs incurred by employees who smoke. The Committee makes no recommendation specific to hiring of nonsmokers. Alternatives such as worksite smoking restrictions or smoking bans may be considered to be preferable strategies by many employers.

RECOMMENDATIONS FOR PROMOTION OF NONSMOKING
THROUGH
INFORMATION AND EVALUATION NEEDS

COORDINATING INFORMATION RESOURCES

- Provide research information on smoking and its control.
- Provide educational materials.

* * *

EVALUATING PROGRAM IMPACT

- Conduct scientifically-designed annual telephone surveys to assess smoking rates in Minnesota and evaluate program impact.
 - Provide evaluation assistance to community nonsmoking campaigns.
 - Conduct other survey work as needed for planning or evaluation.
 - Evaluate the impact of major components of the statewide plan in order to plan new directions, insure that money is well spent, tell other states of the Minnesota experience, and be eligible for research grants.
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MINNESOTA TECHNICAL ADVISORY COMMITTEE ON NONSMOKING AND HEALTH

RECOMMENDATIONS FOR INFORMATION AND EVALUATION NEEDS

COORDINATING INFORMATION RESOURCES

RECOMMENDATION: The Minnesota Department of Health should maintain a research database of scientific literature on cigarette smoking. The database should include information on health consequences, smoking patterns, prevention of smoking onset, smoking cessation, health economics of smoking, and policies related to smoking.

Background and Rationale

To provide scientific staff support for the Technical Advisory Committee on Nonsmoking and health, researchers in the Minnesota Center for Nonsmoking and Health have collected publications and journal articles on cigarette smoking and health. These files have been a principal resource in the preparation of this report and have provided background materials for the Committee members. The database is continuously updated from current scientific journals and from publications from the federal Office on Smoking and Health.

This database should continue to be expanded and updated. It is intended that the database be available to University of Minnesota researchers involved in behavioral research on smoking. It is also intended that the database be used by the research staff to respond to specific requests for information from government agencies, medical professionals, and the public.

RECOMMENDATION: The Minnesota Department of Health should identify and facilitate access to educational materials related to smoking; the availability of these materials to educators, health professionals, and the public through the Department and other sources should be publicized.

Background and Rationale

The Minnesota Center for Nonsmoking and Health and the Section of Health Education at the MDH have received requests for information on smoking and health topics and requests for print media smoking cessation materials. These requests for public education materials and referrals to community resources for smoking cessation are expected to increase with the advent of a coordinated statewide nonsmoking initiative as outlined in this report.

The MDH should develop a protocol for systematically handling requests for smoking-related information. This may involve preparing packets of information on smoking and health issues and distributing smoking cessation materials upon request. MDH would act as a state clearinghouse for smoking information, referring information requests to appropriate voluntary agencies and community programs by mutual agreement and collaboration.

RECOMMENDATIONS FOR INFORMATION AND EVALUATION NEEDS

EVALUATING PROGRAM IMPACT

RECOMMENDATION: The Minnesota Department of Health should conduct annual telephone surveys using random digit dialing to provide ongoing information on smoking prevalence, public knowledge and opinions, and the penetration of program efforts of sufficient accuracy for evaluation of the statewide nonsmoking program. For research purposes, the validity of surveys should be checked through biochemical measurements. Core questions should be kept constant to follow smoking trends over time.

Background and Rationale

In 1981, the MDH conducted a prevalence survey of health risk factors on a randomized statewide sample of 1440 adults over 18 years of age. The survey, which used random digit dialing to select households, included a battery of questions on cigarette smoking patterns. From this survey, a report on "Smoking Health Risks" (MDH, 1983) which detailed the smoking patterns of Minnesotans was published. This document has been a key reference for the "Patterns of Cigarette Smoking in Minnesota" section of this report.

In conjunction with the Centers for Disease Control in Atlanta, Georgia, MDH has begun an ongoing series of telephone risk factor surveys. A standard core of questions is used to facilitate accurate comparisons from year to year and among the participating states. Questions on cigarette smoking behavior are included and Minnesota smoking rates for 1984 will be available in the fall of the year for comparison with 1981 rates.

These surveys will provide an opportunity for following smoking prevalence rates over time and for examining rates separately for sex, age, education level, occupational status, and other key variables. The surveys will also provide a vehicle for assessing the awareness and impact of statewide nonsmoking programs through the inclusion of special sets of questions.

The validity of self reports of smoking behavior would be enhanced by biochemical validation procedures, using, for example, saliva samples tested for thiocyanate on a subsample of survey respondents. These methods have proven useful in obtaining accurate data on smoking rates (Luepker et al., 1981).

RECOMMENDATION: The Minnesota Department of Health should provide assistance to communities in conducting survey research prior to and after community nonsmoking campaigns.

Background and Rationale

Staff in the Minnesota Center for Nonsmoking and Health and the Minnesota Center for Health Statistics can provide assistance in the construction and conduct of surveys to assess the specific impact of community-based

RECOMMENDATIONS FOR INFORMATION AND EVALUATION NEEDS

nonsmoking campaigns using media channels, community participation, quit smoking contests, or other programs. Such surveys would be useful for increasing public awareness, assessing smoking rates before and after programs, and obtaining information necessary for planning and evaluating programs. Questions can be designed to gather both smoking rate data and public reactions to the program.

Particularly if grant funds are used to support community programs, systematic evaluation procedure are often required by the granting agency.

RECOMMENDATION: The Minnesota Department of Health should maintain resources to conduct or contract for other types of survey research such as determining location of programs, observation of behavior, compliance with the Minnesota Clean Indoor Air Act, placement of no-smoking signs, and additional survey needs.

Background and Rationale

In addition to the continuing risk factor survey process, the MDH should conduct rapid surveys to lay the groundwork for implementation of individual programs within the statewide nonsmoking campaign, to evaluate these programmatic efforts, and to answer important public policy and research questions. Such issues as knowledge about and compliance with the MCIAA can be evaluated using survey methods. Observational surveys on smoking behavior, the placement of no smoking signs, or other subjects may be desirable. Employee reaction to implementation of a corporate nonsmoking policy can be assessed through surveys. The special survey needs will become apparent as media campaigns and nonsmoking initiatives are designed and implemented at the statewide, community, worksite, and individual levels.

RECOMMENDATION: A formal research design should be used whenever possible to systematically implement recommendations included in this report. Such a structure permits detailed evaluation of program effectiveness, is desirable for program monitoring, and is essential if grant funding for programs is to be obtained.

Background and Rationale

Since programs to promote nonsmoking are relatively expensive and must be conducted over a long period to be effective, evaluation of the effect of the entire program and of its component parts is important. This will allow adjusting strategies to obtain the most cost-effective "mix" of programs.

Programs within a statewide nonsmoking campaign can be critically evaluated by using research designs. The purpose of using a research design is to be able to state that outcomes such as reduced smoking rates are the direct consequence of the nonsmoking program, legislation, or policy. To be able

RECOMMENDATIONS FOR INFORMATION AND EVALUATION NEEDS

to make a strong case for "cause and effect," it is important to have comparable groups of people who receive the program and who do not receive the program or who received different programs. Research designs also determine which segments of the population are likely to be responsive to and benefit from a particular program.

For those programs for which research grant funding is sought, a strong research design is essential. Program reviewers are typically researchers with experiences in critiquing research designs. For those programs for which Minnesota legislative funding is sought, a strong research design is important for evaluating both the outcome and the cost effectiveness of the program. This is important in accounting for the use of state appropriations.

The overall impact of Minnesota's multi-faceted program can be examined by comparing smoking rates with those of other states in which programs are less organized.

APPENDICES

APPENDIX A

Calculation of Smoking-Attributable Coronary Heart Disease Mortality

Age- and Sex-Specific Relative Risks Applied

Current and Former Smokers' Excess Risks Included in Calculations

Minnesota, 1981 Mortality Data

CALCULATION OF SMOKING-ATTRIBUTABLE CORONARY HEART DISEASE MORTALITY
 AGE- AND SEX-SPECIFIC RELATIVE RISKS APPLIED
 CURRENT AND FORMER SMOKERS' EXCESS RISKS INCLUDED IN CALCULATIONS
 MINNESOTA, 1981 MORTALITY DATA

MALES														MALES:	SMOKING	SMOKING	FEMAL
AGE	PERCENT NEVER SMOKERS	PERCENT CURRENT SMOKERS	PERCENT FORMER SMOKERS	FORMER SMOKERS: YEARS QUIT	PERCENT FORMER SMOKERS BY YEARS QUIT	FORMER SMOKERS YRS QUIT POPULATN	CURRENT SMOKER ONLY RELATIVE RISK	FORMER SMOKER ONLY RELATIVE RISK	CURRENT SMOKER ONLY ATTRIB RISK	FORMER SMOKER ONLY ATTRIB RISK	SUM OF FORMER SMOKER ATTRIB RISK	SUM OF PREVALNCE RATES X RELATIVE RISKS	CURRENT/ FORMER COMBINED ATTRIB RISK	CHD DEATHS	ATTRIB DEATHS: CURRENT SMOKERS	ATTRIB DEATHS: FORMER	AGE
35-44	32.12	40.42	27.52	<1	20.02	5.5002	8.20	1.62	0.7442	0.0330	0.0845	3.995562	0.749722	90	67	67	35-44
				1-4	30.02	8.2502		1.37		0.0296							
				5-9	15.02	4.1252		1.21		0.0086							
				10-14	30.02	8.2502		1.15		0.0122							
				15+	5.02	1.3752		1.08		0.0011							
45-54	25.42	41.32	33.32	<1	15.02	4.9952	2.81	1.62	0.4278	0.0300	0.0807	1.829947	0.453536	334	143	151	45-54
				1-4	15.02	4.9952		1.37		0.0181							
				5-9	25.02	8.3252		1.21		0.0172							
				10-14	15.02	4.9952		1.15		0.0074							
				15+	30.02	9.9902		1.08		0.0079							
55-64	23.82	27.52	48.72	<1	10.02	4.8702	1.84	1.62	0.1877	0.0293	0.0937	1.326695	0.246247	967	181	238	55-64
				1-4	10.02	4.8702		1.37		0.0177							
				5-9	15.02	7.3052		1.21		0.0151							
				10-14	20.02	9.7402		1.15		0.0144							
				15+	45.02	21.9152		1.08		0.0172							
65-74	18.02	20.52	61.52	<1	15.02	9.2252	1.45	1.62	0.0845	0.0541	0.1330	1.230317	0.187201	1515	128	284	65-74
				1-4	15.02	9.2252		1.37		0.0330							
				5-9	10.02	6.1502		1.21		0.0128							
				10-14	10.02	6.1502		1.15		0.0091							
				15+	50.02	30.7502		1.08		0.0240							
75-84	29.42	29.42	41.22	<1	10.02	4.1202	1.24	1.62	0.0659	0.0249	0.0781	1.150076	0.130492	1552	102	203	75-84
				1-4	10.02	4.1202		1.37		0.0150							
				5-9	15.02	6.1802		1.21		0.0128							
				10-14	15.02	6.1802		1.15		0.0092							
				15+	50.02	20.6002		1.08		0.0162							
85+	47.02	3.02	50.02	<1	10.02	5.0002	1.14	1.62	0.0042	0.0301	0.0930	1.0992	0.090247	919	4	83	85+
				1-4	10.02	5.0002		1.37		0.0182							
				5-9	10.02	5.0002		1.21		0.0104							
				10-14	20.02	10.0002		1.15		0.0148							
				15+	50.02	25.0002		1.08		0.0196							
SUMS:														5377	625 11.632	1026 19.082	SUMS:

FEMALES					PERCENT FORMER SMOKERS	FORMER SMOKERS YRS QUIT	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER 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SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORMER SMOKERS	PERCENT FORM
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26 SUMS:														3822	145	221
82														3.802	5.772	
														[*****][*****]		
														BOTH	SMOKING	SMOKING
														SEXES:	ATTRIB	ATTRIB
															DEATHS:	DEATHS:
														CHD	CURRENT	CURRENT+
														DEATHS	SMOKERS	FORMER
														9199	770	1247
														8.382	13.552	
														[*****][*****]		

APPENDIX B

Smoking-Attributable Mortality and
Smoking-Attributable Direct Medical Costs:

Minnesota, 1981

Calculation 2: Current Smoker-Attributable Risks
(Method of Rice and Hodgson)

SMOKING-ATTRIBUTABLE MORTALITY AND SMOKING-ATTRIBUTABLE
SMOKING-ATTRIBUTABLE DIRECT MEDICAL COSTS: MINNESOTA, 1981
CALCULATION 2: CURRENT SMOKER ATTRIBUTABLE RISKS
(Method of Rice and Hodgson)

:*****CALCULATION OF SMOKING-ATTRIBUTABLE MORTALITY BY SEX:

CALCULATION 2: CURRENT SMOKER ATTRIBUTABLE RISKS (Method of Rice and Hodgson)			BOTH SEXES	MALES	FEMALES	BOTH SEXES	MALES	FEMALES	BOTH SEXES	MALES
ICD-9 CODE	DIAGNOSIS CATEGORY	SMOKING-RELATED DIAGNOSES	TOTAL DEATHS BY DIAGNOSIS CATEGORY	TOTAL DEATHS BY DIAGNOSIS CATEGORY	TOTAL DEATHS BY DIAGNOSIS CATEGORY	TOTAL DEATHS SMOKING-REL DISEASES	TOTAL DEATHS SMOKING-REL DISEASES	TOTAL DEATHS SMOKING-REL DISEASES	SMOKING PREVALENCE RATES	SMOKING PREVALENCE RATES
000-999	ALL CONDITIONS		32813	17891	14922	19115	11586	7529	CURRENT SMOKERS:	CURRENT SMOKERS:
001-139	INFECTIOUS DISEASES		262	134	128				29.50%	31.70%
*010-012		Respiratory tuberculosis				9	3	6		
140-239	NEOPLASMS		7074	3766	3308				FORMER SMOKERS:	FORMER SMOKERS:
*140-149		Lip, oral cavity, pharynx				103	78	25		
* 150		Esophagus				111	88	23	23.50%	30.90%
* 151		Stomach				270	169	101		
* 157		Pancreas				402	204	198	NEVER SMOKERS:	NEVER SMOKERS:
* 161		Larynx				64	55	9		
* 162		Trachea, lung, bronchus				1454	1059	395	47.00%	37.40%
* 180		Cervix uteri				49	0	49		
* 188		Urinary bladder				141	91	50		
* 189		Kidney, other urinary				161	87	74		
240-279	ENDOCRINE		659	275	384					
280-289	DISEASES OF BLOOD		100	56	44					
290-319	MENTAL DISORDERS		287	131	156					
320-389	NERVOUS SYSTEM		444	239	205					
390-459	CIRCULATORY SYSTEM		16454	8723	7731					
*401-405		Hypertension				331	164	167		
*410-414		Ischemic heart disease				9227	5403	3824		
* 427.5		Cardiac arrest				522	294	228		
*430-438		Cerebrovascular disease				259	136	123		
* 440		Arteriosclerosis				607	271	336		
* 441		Aortic aneurysm				290	204	86		
* 443		Peripheral vascular disease				23	9	14		
460-519	RESPIRATORY SYSTEM		2352	1356	996					
*480-487		Pneumonia, influenza				1126	534	592		
*490-491		Bronchitis, chronic/unspec				58	37	21		
* 492		Emphysema				175	125	50		
* 493		Asthma				62	32	30		
* 496		Chronic airway obstruction				547	406	141		
520-579	DIGESTIVE SYSTEM		1163	617	546					
*531-534		Ulcers				129	64	65		
* 571		Cirrhosis				374	237	137		
580-629	GENITOURINARY SYSTEM		364	200	164					
630-676	COMPLICATIONS OF PREGNANCY		2	0	2					
680-709	DISEASES OF SKIN		28	9	19					
710-739	MUSCULOSKELETAL SYSTEM		116	36	80					
740-759	CONGENITAL ANOMALIES		232	143	89					
760-779	PERINATAL CONDITIONS		304	181	123					
* 765		Short gestation/low birth wt.				62	39	23	ATTRIBUTABLE RISK CALCULA	
* 769		Respiratory distress syn				73	47	26	USE FEMALE CURRENT SMOKER	
* 770		Respiratory cond of newborn				46	26	20	PREVALENCE RATE, AGES 20-	
780-799	SIGNS, SYMPTOMS, ILL-DEFINED		665	380	285				<35.00%	
* 798.0		Sudden infant death syn				133	79	54		
E800-E999	INJURIES		2307	1645	662	2307	1645	662		
	OTHER CONDITIONS									
	UNALLOCATED EXPENDITURES									

SEXES IN GENCE ES	MALES SMOKING PREVALENCE RATES	FEMALES SMOKING PREVALENCE RATES	MALES RELATIVE RISKS	FEMALES RELATIVE RISKS	MALES CURRENT SM ATTRIBUTABLE RISKS	FEMALES CURRENT SM ATTRIBUTABLE RISKS	BOTH SEXES SMOKING- ATTRIBUTABLE DEATHS	MALES SMOKING- ATTRIBUTABLE DEATHS	FEMALES SMOKING- ATTRIBUTABLE DEATHS	BOTH SEXES SMOKING- ATTRIBUTABLE DEATHS <BY DX CAT>	MALES SMOKING- ATTRIBUTABLE DEATHS % OF TOTAL <BY DX CAT>	FEMALES SMOKING- ATTRIBUTABLE DEATHS % OF TOTAL <BY DX CAT>	AT ATTRIBUTABLE DEATHS % OF TOTAL <BY DX CAT>
1	CURRENT SMOKERS:	CURRENT SMOKERS:					4541 [*****]	3041 ****	1500 ****	4539 [*****]	13.8322	3041 ****	16.9992
5:	29.502	31.702	28.002				3	1	2	3	1.0032	1	0.8132
5:	FORMER SMOKERS:	FORMER SMOKERS:	2.80	2.23	0.363	0.256				1319	18.6422	1023	27.1682
23.502	30.902	18.702	7.30	3.25	0.666	0.387	62	52	10				296
			4.05	4.89	0.492	0.521	55	43	12				
			1.45	1.81	0.125	0.185	40	21	19				
	NEVER SMOKERS:	NEVER SMOKERS:	2.01	1.95	0.243	0.210	91	49	42				
47.002	37.402	53.302	9.50	4.89	0.729	0.521	45	40	5				
			9.64	3.78	0.733	0.438	949	776	173				
			0.00	2.36		0.276	14		14				
			2.11	2.32	0.260	0.270	37	24	13				
			1.81	1.50	0.204	0.123	27	18	9				
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
										2171	13.1922	1324	15.1782
			1.51	1.67	0.139	0.158	49	23	26				847
			1.72	1.69	0.186	0.162	1623	1004	619				
			3.00	3.00	0.388	0.359	196	114	82				
			1.27	1.18	0.079	0.048	17	11	6				
			2.11	2.00	0.260	0.219	144	71	74				
			3.80	3.02	0.470	0.361	127	96	31				
			7.00	7.00	0.655	0.627	15	6	9				
										798	33.9292	537	39.5792
			1.89	1.76	0.220	0.175	221	118	104				261
			7.90	6.28	0.686	0.597	38	25	13				
			9.96	6.14	0.740	0.590	122	92	30				
			3.59	2.20	0.451	0.251	22	14	8				
			8.60	12.63	0.707	0.765	395	287	108				
										164	14.0592	101	16.3762
			3.07	1.80	0.396	0.183	37	25	12				62
			2.48	3.09	0.319	0.369	126	76	51				
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
										38	12.5102	24	13.0012
TABLE RISK CALCULATIONS			1.76	1.76	0.210	0.210	13	8	5				14
MALE CURRENT SMOKER			1.76	1.76	0.210	0.210	15	10	5				
PREVALENCE RATE, AGES 20-35			1.76	1.76	0.210	0.210	10	5	4				
			1.50	1.50	0.149	0.149	20	12	8	20	2.9792	12	3.0962
					0.012	0.015	30	20	10	30	1.3012	20	1.2162
											0.0002		0.0002
											0.0002		0.0002

***** CONVERSION OF 1980 NATIONAL DATA ON DIRECT COSTS INTO CELL PERCENTS BY DIAGNOSIS CATEGORY: BY SEX:

FEMALES SMOKING- ATTRIBUTABLE DEATHS (BY DX CAT)	FEMALES SMOKING- ATTRIBUTABLE DEATHS (BY DX CAT)	FEMALES SMOKING- ATTRIBUTABLE DEATHS (BY DX CAT)	ICD-9 CODE	BOTH SEXES DIRECT U.S. HEALTH CARE COSTS 1980	BOTH SEXES PERCENT OF DIRECT COSTS (BY DX CAT)	MALES DIRECT U.S. HEALTH CARE COSTS 1980	MALES PERCENT OF DIRECT COSTS (BY DX CAT)	FEMALES DIRECT U.S. HEALTH CARE COSTS 1980	FEMALES PERCENT OF DIRECT COSTS (BY DX CAT)	MALES PERCENT OF DIAGNOSIS CATEGORY	FEMALES PERCENT OF DIAGNOSIS CATEGORY	MALES PERCENT OF TOTAL DIRECT COSTS (BY DX CAT)	FEMA TOTAL COS
999Z	1500	10.053Z	000-999	\$219,400,000,000	100.00Z	\$87,618,000,000	100.00Z	\$123,525,000,000	100.00Z	41.50Z	58.50Z	41.50Z	
	XXXX			\$219,242,000,000	100.00Z	\$87,617,000,000	100.00Z	\$123,527,000,000	100.00Z			41.26Z	
313Z	2	1.201Z	001-139	\$4,498,000,000	2.05Z	\$1,820,000,000	2.08Z	\$2,677,000,000	2.17Z	40.47Z	59.53Z	0.83Z	
			010-012										
168Z	296	8.936Z	140-239	\$13,623,000,000	6.21Z	\$5,647,000,000	6.45Z	\$7,977,000,000	6.46Z	41.45Z	58.55Z	2.58Z	
			140-149										
			150										
			151										
			157										
			161										
			162										
			180										
			188										
			189										
000Z		0.000Z	240-279	\$7,656,000,000	3.49Z	\$2,354,000,000	2.69Z	\$5,302,000,000	4.29Z	30.75Z	69.25Z	1.07Z	
000Z		0.000Z	280-289	\$1,205,000,000	0.55Z	\$427,000,000	0.49Z	\$775,000,000	0.63Z	35.52Z	64.48Z	0.20Z	
000Z		0.000Z	290-319	\$20,301,000,000	9.26Z	\$9,330,000,000	10.65Z	\$10,971,000,000	8.88Z	45.96Z	54.04Z	4.26Z	
000Z		0.000Z	320-389	\$17,499,000,000	7.98Z	\$7,558,000,000	8.63Z	\$9,941,000,000	8.05Z	43.19Z	56.81Z	3.45Z	
178Z	847	10.951Z	390-459	\$33,184,000,000	15.14Z	\$13,932,000,000	15.90Z	\$19,251,000,000	15.58Z	41.99Z	58.01Z	6.35Z	
			401-405										
			410-414										
			427.5										
			430-438										
			440										
			441										
			443										
579Z	261	26.237Z	460-519	\$17,305,000,000	7.89Z	\$8,096,000,000	9.24Z	\$9,209,000,000	7.46Z	46.78Z	53.22Z	3.69Z	
			480-487										
			490-491										
			492										
			493										
			496										
376Z	62	11.442Z	520-579	\$31,755,000,000	14.48Z	\$13,428,000,000	15.33Z	\$18,327,000,000	14.84Z	42.29Z	57.71Z	6.12Z	
			531-534										
			571										
000Z		0.000Z	580-629	\$13,162,000,000	6.00Z	\$3,509,000,000	4.00Z	\$9,652,000,000	7.81Z	26.66Z	73.34Z	1.60Z	
000Z		0.000Z	630-676	--	--	--	--	--	--				
000Z		0.000Z	680-709	\$6,179,000,000	2.82Z	\$2,573,000,000	2.94Z	\$3,607,000,000	2.92Z	41.63Z	58.37Z	1.17Z	
000Z		0.000Z	710-739	\$13,645,000,000	6.22Z	\$5,053,000,000	5.77Z	\$8,592,000,000	6.96Z	37.03Z	62.97Z	2.30Z	
000Z		0.000Z	740-759	\$1,409,000,000	0.64Z	\$626,000,000	0.71Z	\$783,000,000	0.63Z	44.43Z	55.57Z	0.29Z	
001Z	14	11.787Z	760-779	--	--	--	--	--	--				
			765										
			769										
			770										
096Z	8	2.822Z	780-799	\$3,968,000,000	1.81Z	\$1,654,000,000	1.89Z	\$2,314,000,000	1.87Z	41.68Z	58.32Z	0.75Z	
			798.0										
216Z	10	1.511Z	E800-E999	\$19,248,000,000	8.78Z	\$9,783,000,000	11.17Z	\$9,465,000,000	7.66Z	50.83Z	49.17Z	4.46Z	
000Z		0.000Z		\$2,246,000,000	1.02Z	\$331,000,000	0.38Z	\$1,915,000,000	1.55Z	14.74Z	85.26Z	0.15Z	
000Z		0.000Z		\$12,359,000,000	5.64Z	\$1,496,000,000	1.71Z	\$2,769,000,000	2.24Z	35.08Z	64.92Z	1.98Z	

MALES		FEMALES		TOTAL		MALES		FEMALES		TOTAL	
PERCENT OF DIRECT COSTS		PERCENT OF DIRECT COSTS		MINNESOTA DIRECT HEALTH CARE COSTS: 1981		DISTRIBUTION OF MINNESOTA DIRECT HEALTH CARE COSTS: 1981		DISTRIBUTION OF MINNESOTA DIRECT HEALTH CARE COSTS: 1981		SMOKING-ATTRIBUTABLE DIRECT COSTS MINNESOTA, 1981<1>	
BY DX CAT>											
41.50Z	58.50Z	\$4,300,000,000						\$181,165,242	\$148,560,894	\$329,726,136	
41.26Z	58.74Z									[*****]	
0.83Z	1.22Z				\$35,703,653	\$52,515,758		\$290,399	\$630,617	\$921,016	
2.58Z	3.64Z				\$110,746,653	\$156,441,659		\$30,087,441	\$13,979,674	\$44,067,115	
1.07Z	2.42Z				\$46,169,073	\$103,988,287		\$0	\$0	\$0	
0.20Z	0.35Z				\$8,395,666	\$15,238,036		\$0	\$0	\$0	
4.26Z	5.00Z				\$182,989,573	\$215,174,556		\$0	\$0	\$0	
3.45Z	4.53Z				\$148,235,283	\$194,973,135		\$0	\$0	\$0	
6.35Z	8.78Z				\$273,256,973	\$377,581,826		\$41,475,802	\$41,350,163	\$82,825,965	
3.69Z	4.20Z				\$158,787,094	\$180,616,396		\$62,845,687	\$47,388,219	\$110,233,907	
6.12Z	8.36Z				\$263,363,772	\$359,448,007		\$43,128,665	\$41,126,513	\$84,255,178	
1.60Z	4.40Z				\$68,827,353	\$189,319,353		\$0	\$0	\$0	
1.17Z	1.64Z				\$50,456,161	\$70,732,753		\$0	\$0	\$0	
2.30Z	3.92Z				\$99,104,642	\$168,515,157		\$0	\$0	\$0	
0.29Z	0.36Z				\$12,277,757	\$15,357,003		\$0	\$0	\$0	
0.75Z	1.06Z				\$32,439,952	\$45,384,552		\$1,004,440	\$1,280,729	\$2,285,168	
4.46Z	4.32Z				\$191,874,276	\$185,637,332		\$2,332,807	\$2,804,980	\$5,137,788	
0.15Z	0.87Z				\$6,491,913	\$37,558,953		\$0	\$0	\$0	
1.98Z	3.66Z				\$85,023,816	\$157,373,627		\$0	\$0	\$0	

APPENDIX C

Smoking-Attributable Mortality and
Smoking-Attributable Direct Medical Costs:

Minnesota, 1981

Calculation 3: Minnesota-Specific Attributable Risks
(Method of Rice and Hodgson)

SMOKING-ATTRIBUTABLE MORTALITY AND SMOKING-ATTRIBUTABLE
SMOKING-ATTRIBUTABLE DIRECT MEDICAL COSTS: MINNESOTA, 1981
CALCULATION 3: MINNESOTA-SPECIFIC ATTRIBUTABLE RISKS
(Method of Rice and Hodgson)

:*****CALCULATION OF SMOKING-ATTRIBUTABLE MORTALITY BY SEX:

MINNESOTA-SPECIFIC ATTRIBUTABLE RISKS (Method of Rice and Hodgson)			BOTH SEXES	MALES	FEMALES	BOTH SEXES	MALES	FEMALES	BOTH SEXES	MALES
ICD-9 CODE	DIAGNOSIS CATEGORY	SMOKING-RELATED DIAGNOSES	TOTAL DEATHS BY DIAGNOSIS CATEGORY	TOTAL DEATHS BY DIAGNOSIS CATEGORY	TOTAL DEATHS BY DIAGNOSIS CATEGORY	TOTAL DEATHS SMOKING-REL DISEASES	TOTAL DEATHS SMOKING-REL DISEASES	TOTAL DEATHS SMOKING-REL DISEASES	SMOKING PREVALENCE RATES	SMOKING PREVALENCE RATES
000-999	ALL CONDITIONS		32813	17891	14922	19115	11586	7529	CURRENT SMOKERS:	CURRENT SMOKERS:
001-139	INFECTIOUS DISEASES		262	134	128				29.50%	31.70%
x010-012		Respiratory tuberculosis				9	3	6		
140-239	NEOPLASMS		7074	3766	3308				FORMER SMOKERS:	FORMER SMOKERS:
x140-149		Lip, oral cavity, pharynx				103	78	25	23.50%	30.90%
x 150		Esophagus				111	88	23		
x 151		Stomach				270	169	101		
x 157		Pancreas				402	204	198	NEVER SMOKERS:	NEVER SMOKERS:
x 161		Larynx				64	55	9	47.00%	37.40%
x 162		Trachea, lung, bronchus				1454	1059	395		
x 180		Cervix uteri				49	0	49		
x 188		Urinary bladder				141	91	50		
x 189		Kidney, other urinary				161	87	74		
240-279	ENDOCRINE		659	275	384					
280-289	DISEASES OF BLOOD		100	56	44					
290-319	MENTAL DISORDERS		287	131	156					
320-389	NERVOUS SYSTEM		444	239	205					
390-459	CIRCULATORY SYSTEM		16454	8723	7731					
x401-405		Hypertension				331	164	167		
x410-414		Ischemic heart disease				9227	5403	3824		
x 427.5		Cardiac arrest				522	294	228		
x430-438		Cerebrovascular disease				259	136	123		
x 440		Arteriosclerosis				607	271	336		
x 441		Aortic aneurysm				290	204	86		
x 443		Peripheral vascular disease				23	9	14		
460-519	RESPIRATORY SYSTEM		2352	1356	996					
x480-487		Pneumonia, influenza				1126	534	592		
x490-491		Bronchitis, chronic/unspec				58	37	21		
x 492		Emphysema				175	125	50		
x 493		Asthma				62	32	30		
x 496		Chronic airway obstruction				547	406	141		
520-579	DIGESTIVE SYSTEM		1163	617	546					
x531-534		Ulcers				129	64	65		
x 571		Cirrhosis				374	237	137		
580-629	GENITOURINARY SYSTEM		364	200	164					
630-676	COMPLICATIONS OF PREGNANCY		2	0	2					
680-709	DISEASES OF SKIN		28	9	19					
710-739	MUSCULOSKELETAL SYSTEM		116	36	80					
740-759	CONGENITAL ANOMALIES		232	143	89					
760-779	PERINATAL CONDITIONS		304	181	123					
x 765		Short gestation/low birth wt.				62	39	23	ATTRIBUTABLE RISK CALCUL	
x 769		Respiratory distress syn				73	47	26	USE FEMALE CURRENT SMOKE	
x 770		Respiratory cond of newborn				46	26	20	PREVALENCE RATE, AGES 20	
780-799	SIGNS, SYMPTOMS, ILL-DEFINED		665	380	285				<35.00%>	
x 798.0		Sudden infant death syn				133	79	54		
E800-E999	INJURIES		2307	1645	662	2307	1645	662		
	OTHER CONDITIONS									
	UNALLOCATED EXPENDITURES									

SEXES ING LENCE ES	MALES SMOKING PREVALENCE RATES	FEMALES SMOKING PREVALENCE RATES	MALES RELATIVE RISKS	FEMALES RELATIVE RISKS	MALES ATTRIBUTABLE RISKS MN-SPECIFIC CALCULATIONS	FEMALES ATTRIBUTABLE RISKS MN-SPECIFIC CALCULATIONS	BOTH SEXES SMOKING- ATTRIBUTABLE DEATHS	MALES SMOKING- ATTRIBUTABLE DEATHS	FEMALES SMOKING- ATTRIBUTABLE DEATHS	BOTH SEXES SMOKING- ATTRIBUTABLE DEATHS <BY DX CAT>	BOTH SEXES SMOKING- ATTRIBUTABLE DEATHS 2 OF TOTAL <BY DX CAT>	MALES SMOKING- ATTRIBUTABLE DEATHS <BY DX CAT>	FEMALES SMOKING- ATTRIBUTABLE DEATHS <BY DX CAT>
T	CURRENT	CURRENT					4612	3362	1249	4609	14.0462	3362	18.7942
S:	SMOKERS:	SMOKERS:					[*****]	****	****	[*****]		****	****
29.502	31.702	28.002								3	1.0032	1	0.8132
	FORMER	FORMER	2.80	2.23	0.363	0.256	3	1	2				
S:	SMOKERS:	SMOKERS:								1722	24.3482	1280	33.9762
23.502	30.902	18.702	7.30	3.25	0.779	0.192	66	61	5				443
			4.05	4.89	0.819	0.417	82	72	10				
			1.45	1.81	0.125	0.185	40	21	19				
	NEVER	NEVER	2.01	1.95	0.425	0.308	148	87	61				
S:	SMOKERS:	SMOKERS:	9.50	4.89	0.914	0.559	55	50	5				
47.002	37.402	53.302	9.64	3.78	0.886	0.738	1229	938	291				
			0.00	2.36		0.276	14		14				
			2.11	2.32	0.249	0.111	28	23	6				
			1.81	1.50	0.324	0.452	62	28	33				
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
										1799	10.9332	1351	15.4862
			1.51	1.67	0.139	0.158	49	23	26				
			1.72	1.69	0.191	0.058	1252	1031	221				
			3.00	3.00	0.388	0.359	196	114	82				
			1.27	1.18	0.079	0.048	17	11	6				
			2.11	2.00	0.260	0.219	144	71	74				
			3.80	3.02	0.470	0.361	127	96	31				
			7.00	7.00	0.655	0.627	15	6	9				
										906	38.5352	615	45.3342
			1.89	1.76	0.220	0.175	221	118	104				292
			7.90	6.28	0.850	0.850	49	31	18				
			9.96	6.14	0.850	0.850	149	106	43				
			3.59	2.20	0.451	0.251	22	14	8				
			8.60	12.63	0.850	0.850	465	345	120				
										93	8.0272	61	9.8712
			3.07	1.80	0.396	0.183	37	25	12				32
			2.48	3.09	0.150	0.150	56	36	21				
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
											0.0002		0.0002
										38	12.5102	24	13.0012
UTABLE RISK CALCULATIONS			1.76	1.76	0.210	0.210	13	8	5				14
MALE CURRENT SMOKER			1.76	1.76	0.210	0.210	15	10	5				
ENCE RATE, AGES 20-35			1.76	1.76	0.210	0.210	10	5	4				
(2>													
			1.50	1.50	0.149	0.149	20	12	8	20	2.9792	12	3.0962
					0.012	0.015	30	20	10	30	1.3012	20	1.2162
											0.0002		0.0002
											0.0002		0.0002

***** CONVERSION OF 1980 NATIONAL DATA ON DIRECT COSTS INTO CELL PERCENTS BY DIAGNOSIS CATEGORY: BY SEX:

ES- ING- UTABLE THS TOTAL CAT>	FEMALES SMOKING- ATTRIBUTABLE DEATHS <BY DX CAT>	FEMALES SMOKING- ATTRIBUTABLE DEATHS <BY DX CAT>	ICD-9 CODE	BOTH SEXES DIRECT U.S. HEALTH CARE COSTS 1980	BOTH SEXES PERCENT OF DIRECT COSTS <BY DX CAT>	MALES DIRECT U.S. HEALTH CARE COSTS 1980	MALES PERCENT OF DIRECT COSTS <BY DX CAT>	FEMALES DIRECT U.S. HEALTH CARE COSTS 1980	FEMALES PERCENT OF DIRECT COSTS	MALES PERCENT OF DIAGNOSIS CATEGORY	FEMALES PERCENT OF DIAGNOSIS CATEGORY	MALES PERCENT OF TOTAL DIRECT COSTS <BY DX CAT>	FEMALES PERCENT OF TOTAL DIRECT COSTS
8.7942	1249	8.3712	000-999	\$219,400,000,000	100.002	\$87,618,000,000	100.002	\$123,525,000,000	100.002	41.502	58.502	41.502	41.262
0.8132	2	1.2012	001-139	\$219,242,000,000	100.002	\$87,617,000,000	100.002	\$123,527,000,000	100.002	40.472	59.532	0.832	
3.9762	443	13.3872	140-239	\$4,498,000,000	2.052	\$1,820,000,000	2.082	\$2,677,000,000	2.172	41.452	58.552	2.582	
			*140-149										
			* 150										
			* 151										
			* 157										
			* 161										
			* 162										
			* 180										
			* 186										
			* 189										
0.0002		0.0002	240-279	\$7,656,000,000	3.492	\$2,354,000,000	2.692	\$5,302,000,000	4.292	30.752	69.252	1.072	
0.0002		0.0002	280-289	\$1,205,000,000	0.552	\$427,000,000	0.492	\$775,000,000	0.632	35.522	64.482	0.202	
0.0002		0.0002	290-319	\$20,301,000,000	9.262	\$9,330,000,000	10.652	\$10,971,000,000	8.882	45.962	54.042	4.262	
0.0002		0.0002	320-389	\$17,499,000,000	7.982	\$7,558,000,000	8.632	\$9,941,000,000	8.052	43.192	56.812	3.452	
5.4862	446	5.7962	390-459	\$33,184,000,000	15.142	\$13,932,000,000	15.902	\$19,251,000,000	15.582	41.992	58.012	6.352	
			*401-405										
			*410-414										
			* 427.5										
			*430-438										
			* 440										
			* 441										
			* 443										
5.3342	292	29.2792	460-519	\$17,305,000,000	7.892	\$8,096,000,000	9.242	\$9,209,000,000	7.462	46.782	53.222	3.692	
			*480-487										
			*490-491										
			* 492										
			* 493										
			* 496										
9.8712	32	5.9422	520-579	\$31,755,000,000	14.482	\$13,428,000,000	15.332	\$18,327,000,000	14.842	42.292	57.712	6.122	
			*531-534										
			* 571										
0.0002		0.0002	580-629	\$13,162,000,000	6.002	\$3,509,000,000	4.002	\$9,652,000,000	7.812	26.662	73.342	1.602	
0.0002		0.0002	630-676	--	--	--	--	--	--				
0.0002		0.0002	680-709	\$6,179,000,000	2.822	\$2,573,000,000	2.942	\$3,607,000,000	2.922	41.632	58.372	1.172	
0.0002		0.0002	710-739	\$13,645,000,000	6.222	\$5,053,000,000	5.772	\$8,592,000,000	6.962	37.032	62.972	2.302	
0.0002		0.0002	740-759	\$1,409,000,000	0.642	\$626,000,000	0.712	\$783,000,000	0.632	44.432	55.572	0.292	
3.0012	14	11.7872	760-779	--	--	--	--	--	--				
			* 765										
			* 769										
			* 770										
3.0962	8	2.8222	780-799	\$3,968,000,000	1.812	\$1,654,000,000	1.892	\$2,314,000,000	1.872	41.682	58.322	0.752	
			* 798.0										
1.2162	10	1.5112	E800-E999	\$19,248,000,000	8.782	\$9,783,000,000	11.172	\$9,465,000,000	7.662	50.832	49.172	4.462	
0.0002		0.0002		\$2,246,000,000	1.022	\$331,000,000	0.382	\$1,915,000,000	1.552	14.742	85.262	0.152	
0.0002		0.0002		\$12,359,000,000	5.642	\$1,496,000,000	1.712	\$2,769,000,000	2.242	35.082	64.922	1.982	

***DISTRIBUTION OF STATE DIRECT COSTS AS NATIONAL 2'S					***SMOKING-ATTRIBUTABLE DIRECT COSTS BY SEX AND TOTAL		
MALES PERCENT OF TOTAL DIRECT COSTS (BY DX CAT)	FEMALES PERCENT OF TOTAL DIRECT COSTS	TOTAL MINNESOTA DIRECT HEALTH CARE COSTS: 1981	MALES DISTRIBUTION OF MINNESOTA DIRECT HEALTH CARE COSTS: 1981	FEMALES DISTRIBUTION OF MINNESOTA DIRECT HEALTH CARE COSTS: 1981	MALES SMOKING- ATTRIBUTABLE DIRECT COSTS MINNESOTA, 1981<1>	FEMALES SMOKING- ATTRIBUTABLE DIRECT COSTS MINNESOTA, 1981<1>	BOTH SEXES SMOKING- ATTRIBUTABLE DIRECT COSTS MINNESOTA, 1981<1>
<----->					<----->		
41.502	58.502	\$4,300,000,000			\$181,555,440	\$121,787,796	\$303,343,236
41.262	58.742				[*****]	[*****]	[*****]
0.832	1.222		\$35,703,653	\$52,515,758	\$290,399	\$630,617	\$921,016
2.582	3.642		\$110,746,653	\$156,441,659	\$37,627,323	\$20,943,041	\$58,570,364
1.072	2.422		\$46,169,073	\$103,988,287	\$0	\$0	\$0
0.202	0.352		\$8,395,666	\$15,238,036	\$0	\$0	\$0
4.262	5.002		\$182,989,573	\$215,174,556	\$0	\$0	\$0
3.452	4.532		\$148,235,283	\$194,973,135	\$0	\$0	\$0
6.352	8.782		\$273,256,973	\$377,581,826	\$42,317,527	\$21,886,074	\$64,203,601
3.692	4.202		\$158,787,094	\$180,616,396	\$71,985,016	\$52,882,570	\$124,867,586
6.122	8.362		\$263,363,772	\$359,448,007	\$25,997,927	\$21,359,786	\$47,357,714
1.602	4.402		\$68,827,353	\$189,319,353	\$0	\$0	\$0
1.172	1.642		\$50,456,161	\$70,732,753	\$0	\$0	\$0
2.302	3.922		\$99,104,642	\$168,515,157	\$0	\$0	\$0
0.292	0.362		\$12,277,757	\$15,357,003	\$0	\$0	\$0
0.752	1.062		\$32,439,952	\$45,384,552	\$1,004,440	\$1,280,729	\$2,285,168
4.462	4.322		\$191,874,276	\$185,637,332	\$2,332,807	\$2,804,980	\$5,137,788
0.152	0.872		\$6,491,913	\$37,558,953	\$0	\$0	\$0
1.982	3.662		\$85,023,816	\$157,373,627	\$0	\$0	\$0

APPENDIX D

Smoking-Attributable Indirect Costs

Due to Mortality from Smoking-Related Diseases:

Minnesota, 1981

Calculation 2: Current Smoker-Attributable Risks

(Method of Rice and Hodgson)

SMOKING-ATTRIBUTABLE INDIRECT COSTS DUE TO MORTALITY FROM SMOKING-RELATED DISEASES: MINNESOTA, 1981

CALCULATION 2: CURRENT SMOKER ATTRIBUTABLE RISKS
(Method of Rice and Hodgson)

CURRENT SMOKER ATTRIBUTABLE RISKS (Method of Rice and Hodgson)			MALES TOTAL DEATHS BY DIAGNOSIS CATEGORY	MALES TOTAL DEATHS SMOKING-REL DISEASES	MALES: DEATHS FROM SMOKING-RELATED DISEASES BY AGE OF DEATH														
ICD-9 CODE	DIAGNOSIS CATEGORY	SMOKING-RELATED DIAGNOSES			<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-		
000-999	ALL CONDITIONS		17891	11586	416	90	39	59	200	331	244	212	198	219	388	692	10		
001-139	INFECTIOUS DISEASES		134		3	6	1	2	1	0	4	1	0	4	2	6			
*010-012		Respiratory tuberculosis		3	0	0	0	0	0	0	0	0	0	0	0	0			
140-239	NEOPLASMS		3766		2	8	6	4	7	14	19	17	37	39	84	211	3		
*140-149		Lip, oral cavity, pharynx		78	0	0	0	0	0	0	0	0	0	0	3	7			
* 150		Esophagus		88	0	0	0	0	0	0	0	0	0	0	2	6			
* 151		Stomach		169	0	0	0	0	0	0	1	0	2	1	4	4			
* 157		Pancreas		204	0	0	0	0	0	0	0	0	0	3	2	14			
* 161		Larynx		55	0	0	0	0	0	0	0	0	0	0	1	6			
* 162		Trachea, lung, bronchus		1059	0	0	0	0	0	0	0	0	7	14	32	81	1		
* 180		Cervix uteri		0	0	0	0	0	0	0	0	0	0	0	0	0			
* 188		Urinary bladder		91	0	0	0	0	0	1	0	0	0	0	0	0			
* 189		Kidney, other urinary		87	0	1	1	1	0	0	0	0	1	1	4	2			
240-279	ENDOCRINE		275		3	4	0	1	1	2	4	3	5	1	12	10			
280-289	DISEASES OF BLOOD		56		1	0	0	0	0	2	1	0	0	0	0	1			
290-319	MENTAL DISORDERS		131		0	0	2	0	0	1	1	2	3	2	4	6			
320-389	NERVOUS SYSTEM		239		5	10	3	4	11	5	6	2	1	5	4	13			
390-459	CIRCULATORY SYSTEM		8723		7	4	2	2	4	12	6	35	43	79	163	285	5		
*401-405		Hypertension		164	0	0	0	0	0	0	0	1	0	0	1	6			
*410-414		Ischemic heart disease		5403	0	0	0	0	0	0	1	25	32	58	117	217	3		
* 427.5		Cardiac arrest		294	2	1	1	0	2	3	0	0	0	1	10	8			
*430-438		Cerebrovascular disease		136	*	*	*	0	*	*	*	5	1	7	9	14			
* 440		Arteriosclerosis		271	0	0	0	0	0	0	0	0	0	2	1	1			
* 441		Aortic aneurysm		204	0	0	0	0	0	1	0	0	0	0	3	3			
* 443		Peripheral vascular disease		9	0	0	0	0	0	0	0	0	0	0	0	0			
460-519	RESPIRATORY SYSTEM		1356		16	5	3	4	1	2	1	2	2	5	12	15			
*480-487		Pneumonia, influenza		534	7	3	3	0	0	2	1	0	1	1	5	4			
*490-491		Bronchitis, chronic/unspec		37	0	0	0	0	0	0	0	0	0	0	0	0			
* 492		Emphysema		125	0	0	0	0	0	0	0	0	0	1	0	2			
* 493		Asthma		32	0	0	0	2	0	0	0	1	0	1	1	2			
* 496		Chronic airway obstruction		406	0	0	0	0	0	0	0	0	0	0	3	3			
520-579	DIGESTIVE SYSTEM		617		3	1	0	0	0	2	1	5	11	16	23	51			
*531-534		Ulcers		64	0	1	0	0	0	1	0	0	0	0	0	3			
* 571		Cirrhosis		237	0	0	0	0	0	0	0	2	5	12	16	38			
580-629	GENITOURINARY SYSTEM		200		3	2	0	0	0	0	1	0	1	1	0	3			
630-676	COMPLICATIONS OF PREGNANCY		0		0	0	0	0	0	0	0	0	0	0	0	0			
680-709	DISEASES OF SKIN		9		0	0	0	0	0	0	0	0	0	0	0	0			
710-739	MUSCULOSKELETAL SYSTEM		36		0	0	0	0	0	0	0	0	0	0	2	2			
740-759	CONGENITAL ANOMALIES		143		106	11	2	4	2	3	2	1	1	1	3	2			
760-779	PERINATAL CONDITIONS		181		179	2	0	0	0	0	0	0	0	0	0	0			
* 765		Short gestation/low birth wt		39	39	0	0	0	0	0	0	0	0	0	0	0			
* 769		Respiratory distress syn		47	47	0	0	0	0	0	0	0	0	0	0	0			
* 770		Respiratory cond of newborn		26	26	0	0	0	0	0	0	0	0	0	0	0			
780-799	SIGNS, SYMPTOMS, ILL-DEFINED		380		80	4	0	0	1	3	5	1	2	5	2	4			
* 798.0		Sudden infant death syn		79	79	0	0	0	0	0	0	0	0	0	0	0			
E800-E999	INJURIES		1645	1645	8	33	20	38	172	285	193	143	92	61	77	83			

										FEMALES TOTAL DEATHS BY DIAGNOSIS CATEGORY	FEMALES TOTAL DEATHS SMOKING-REL DISEASES	FEMALES: DEATHS FROM SMOKING-RELATED DISEASES BY AGE OF DEATH																
44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+			<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69		
19	388	692	1066	1489	2024	2310	2490	2334	3085	14922	7932	283	37	27	28	98	73	86	90	116	134	198	334	550	760	1174		
4	2	6	7	9	14	16	18	15	25	128		10	3	1	0	1	1	1	1	3	1	1	2	2	10	7		
0	0	0	0	0	0	0	1	0	2		6	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0		
39	84	211	311	423	554	598	594	424	413	3308		2	8	8	4	11	6	11	28	37	55	85	162	276	334	435		
0	3	7	12	10	11	12	11	6	6		25	0	0	0	0	0	0	0	0	0	0	1	2	2	4			
0	2	6	4	17	13	22	10	4	10		23	0	0	0	0	0	0	0	0	0	0	1	2	1	5			
1	4	4	7	14	24	32	27	17	36		101	0	0	0	0	0	0	0	1	0	3	4	6	8	7			
3	2	14	22	20	32	27	40	23	21		198	0	0	0	0	0	1	0	0	2	2	2	7	15	19	22		
0	1	6	7	7	7	15	6	3	3		9	0	0	0	0	0	0	0	0	0	0	1	1	1	2			
14	32	81	118	153	195	195	146	76	42		395	0	0	0	0	0	0	0	1	3	8	14	27	43	56	71		
0	0	0	0	0	0	0	0	0	0		49	0	0	0	0	0	0	1	4	1	2	2	3	7	5	6		
0	0	0	3	4	13	17	20	17	15		50	0	0	0	0	0	0	0	0	0	0	1	2	3	7			
1	4	2	5	15	12	9	22	11	2		74	0	1	1	0	0	0	0	2	0	1	0	2	5	6	8		
1	12	10	13	10	21	35	41	41	68	384		1	1	0	0	1	3	4	4	3	3	8	7	14	15	49		
0	0	1	1	5	9	5	10	5	16	44		0	0	0	0	0	0	1	0	0	1	0	1	1	2	6		
2	4	6	6	10	16	9	13	21	35	156		1	0	0	0	0	0	0	0	0	2	1	0	2	0	8		
5	4	13	5	22	30	24	30	28	30	205		2	4	1	0	3	0	5	3	3	3	4	11	9	13	19		
79	163	285	541	770	1049	1202	1331	1360	1828	7731		2	3	3	3	0	6	9	12	28	27	53	87	162	266	472		
0	1	6	2	17	21	23	22	36	35		167	0	0	0	0	0	0	0	0	0	1	0	2	3	5	8		
58	117	217	399	568	725	790	783	769	919		3824	0	0	0	1	0	0	0	1	9	7	21	46	90	162	299		
1	10	8	20	13	39	41	42	44	67		228	2	1	1	1	0	0	0	0	2	1	1	5	8	6	18		
7	9	14	39	61	*	*	*	*	*		123	0	*	0	0	0	*	*	6	10	6	15	14	30	42	*		
2	1	1	8	2	19	18	32	59	129		336	0	0	0	0	0	0	0	0	0	0	0	0	3	4	5		
0	3	3	12	14	25	48	41	32	24		86	0	0	0	0	0	0	0	1	1	1	1	1	1	0	5		
0	0	0	0	0	1	1	1	1	5		14	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0		
5	12	15	48	70	131	196	231	244	368	996		9	0	3	0	4	5	2	2	4	5	4	11	25	39	69		
1	5	4	17	12	21	44	78	114	221		592	5	0	1	0	3	2	1	1	3	2	1	4	7	8	20		
0	0	0	2	1	7	4	6	5	12		21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4		
1	0	2	3	12	22	31	22	16	16		50	0	0	0	0	0	0	0	0	0	1	0	3	4	5	7		
1	1	2	2	4	3	3	4	3	6		30	0	0	0	0	0	1	0	0	0	1	1	0	2	2	3		
0	3	3	13	30	58	88	83	71	55		141	0	0	0	0	0	0	0	0	0	0	0	3	8	10	27		
16	23	51	50	62	87	86	70	52	97	546		2	0	0	1	1	1	2	3	11	7	12	23	19	37	50		
0	0	3	5	2	9	7	14	10	12		65	0	0	0	0	0	0	0	0	1	0	0	2	2	4	6		
12	16	38	33	40	38	25	17	5	6		137	0	0	0	0	0	0	2	1	5	3	8	17	15	17	20		
1	0	3	4	4	10	12	39	42	78	164		0	0	0	0	0	0	1	2	0	1	1	4	2	2	10		
0	0	0	0	0	0	0	0	0	0	2		0	0	0	0	0	1	0	0	0	1	0	0	0	0	0		
0	0	0	0	0	1	1	1	1	5	19		1	0	0	0	0	0	0	0	0	0	0	0	1	0	2		
0	2	2	2	7	4	5	5	4	5	80		1	0	0	0	0	0	0	1	0	0	1	3	2	6	9		
1	3	2	2	0	0	2	0	0	0	89		63	5	1	3	4	2	2	0	0	0	1	3	1	1	0		
0	0	0	0	0	0	0	0	0	0	123		123	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0		23	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0		26	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
0	0	0	0	0	0	0	0	0	0		20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
5	2	4	13	31	42	47	36	44	59	285		57	1	1	1	1	1	0	1	0	3	1	2	4	5	14		
0	0	0	0	0	0	0	0	0	0		54	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
61	77	83	63	66	56	72	71	53	58	662	662	9	12	9	16	72	47	48	33	27	25	26	18	30	30	24		

55-59	60-64	65-69	70-74	75-79	80-84	85+	MALES SMOKING PREVALENCE RATES	FEMALES SMOKING PREVALENCE RATES	MALES RELATIVE RISKS	FEMALES RELATIVE RISKS	MALES CURRENT SM ATTRIBUTABLE RISKS	FEMALES CURRENT SM ATTRIBUTABLE RISKS	MALES SMOKING- ATTRIBUTABLE DEATHS	FEMALES SMOKING- ATTRIBUTABLE DEATHS	AGE	MALES PRESENT VALUE OF FUTURE EARNINGS DISCOUNTED AT 4 PERCENT	MAL MORT FRO REL
550	760	1174	1468	2038	2541	4885	CURRENT SMOKERS:	CURRENT SMOKERS:					3042	1500	0-1	\$415,998	
2	10	7	15	15	16	38	31.70%	28.00%					[XXXXXXXXXX]	[XXXXXXXXXX]	1-4	\$438,242	
0	2	0	0	1	1	2			2.80	2.23	0.363	0.256	1	2	5-9	\$479,294	
276	334	435	447	487	426	486	FORMER SMOKERS:	FORMER SMOKERS:					52	10	10-14	\$529,007	
2	2	4	5	3	1	7	30.90%	18.70%	7.30	3.25	0.666	0.387	43	12	15-19	\$576,855	
2	1	5	3	2	4	5			4.05	4.89	0.492	0.521	21	19	20-24	\$604,379	
6	8	7	13	13	13	33			1.45	1.81	0.125	0.185	50	42	25-29	\$597,040	
15	19	22	32	30	34	30			2.01	1.95	0.243	0.210	40	5	30-34	\$557,084	
1	1	2	2	0	2	0			9.50	4.89	0.729	0.521	776	173	35-39	\$492,083	
43	56	71	57	53	32	30			9.64	3.78	0.733	0.438	14	14	40-44	\$412,732	
7	5	6	7	1	4	6			0.00	2.36		0.276	9	9	45-49	\$325,967	
2	3	7	10	6	5	13			2.11	2.32	0.260	0.270	24	14	50-54	\$235,464	
5	6	8	9	12	17	10			1.81	1.50	0.204	0.123	18	9	50-59	\$145,110	
14	15	49	40	72	55	104									60-64	\$67,446	
1	2	6	2	6	5	19									65-69	\$25,887	
2	0	8	9	11	31	91									70-74	\$12,666	
9	13	19	26	27	31	41									75-79	\$6,108	
162	266	472	720	1108	1572	3198									80-84	\$3,002	
3	5	8	11	29	33	74			1.51	1.67	0.139	0.158	23	26	85+	\$914	
90	162	299	413	598	790	1387			1.72	1.69	0.186	0.162	1005	619			
8	6	18	24	34	38	85			3.00	3.00	0.388	0.359	114	82			
30	42	*	*	*	*	*			1.27	1.18	0.079	0.048	11	6			
3	4	5	10	26	61	227			2.11	2.00	0.260	0.219	70	74			
1	0	5	13	11	25	26			3.80	3.02	0.470	0.361	96	31			
0	1	0	0	0	2	9			7.00	7.00	0.655	0.627	6	9			
25	39	69	69	129	170	446											
7	8	20	27	56	106	345			1.89	1.76	0.220	0.175	117	104			
0	0	4	1	2	6	8			7.90	6.28	0.686	0.597	25	13	0-1	\$330,065	
4	5	7	9	8	4	9			9.96	6.14	0.740	0.590	93	30	1-4	\$347,443	
2	2	3	2	4	7	7			3.59	2.20	0.451	0.251	14	8	5-9	\$379,771	
8	10	27	19	32	23	19			8.60	12.63	0.707	0.765	287	108	10-14	\$418,954	
19	37	50	42	78	76	181									15-19	\$448,842	
2	4	6	3	13	11	23			3.07	1.80	0.396	0.183	25	12	20-24	\$448,982	
15	17	20	15	13	10	11			2.48	3.09	0.319	0.369	76	51	25-29	\$418,703	
2	2	10	15	24	35	67									30-34	\$372,595	
0	0	0	0	0	0	0									35-39	\$322,318	
1	0	2	1	2	4	8									40-44	\$270,522	
2	6	9	16	10	15	16									45-49	\$216,805	
1	1	0	0	1	2	0									50-54	\$163,014	
0	0	0	0	0	0	0									50-59	\$111,643	
0	0	0	0	0	0	0	ATTRIBUTABLE RISK CALCS		1.76	1.76	0.210	0.210	8	5	60-64	\$67,282	
0	0	0	0	0	0	0	USE FEMALE CURRENT SMOKER		1.76	1.76	0.210	0.210	10	5	65-69	\$37,104	
0	0	0	0	0	0	0	PREVALENCE RATE, AGES 20-35		1.76	1.76	0.210	0.210	5	4	70-74	\$20,557	
4	5	14	24	28	51	89	<35.00%								75-79	\$10,952	
0	0	0	0	0	0	0			1.50	1.50	0.149	0.149	12	8	80-84	\$4,340	
30	30	24	42	40	52	101					0.012	0.015	20	10		\$1,197	

MALES PRESENT VALUE OF FUTURE EARNINGS DISCOUNTED AT 4 PERCENT	MALES: TOTAL INDIRECT MORTALITY COSTS FROM SMOKING- RELATED DISEASES	FEMALES: TOTAL INDIRECT MORTALITY COSTS FROM SMOKING- RELATED DISEASES	MALES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS	FEMALES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS	MALES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS <BY DX CATEGORY>	FEMALES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS <BY DX CATEGORY>	BOTH SEXES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS
\$415,998			\$172,507,743	\$50,185,915	\$172,507,743	\$50,185,915	\$222,693,658
\$438,242					*****	*****	*****
\$479,294					\$2,881	\$38,976	\$41,857
\$529,007	\$7,936	\$152,250	\$2,881	\$38,976			
\$576,855					\$68,423,604	\$15,170,850	\$83,594,454
\$604,379	\$5,569,362	\$817,640	\$3,709,195	\$316,427			
\$597,040	\$4,489,151	\$746,022	\$2,208,662	\$388,677			
\$557,084	\$6,878,090	\$3,598,169	\$859,761	\$665,661			
\$492,083	\$11,230,892	\$7,699,533	\$2,729,107	\$1,616,902			
\$412,732	\$3,646,238	\$465,941	\$2,658,108	\$242,755			
\$325,967	\$74,844,718	\$23,697,598	\$54,861,178	\$10,379,548			
\$235,464		\$3,305,942		\$912,440			
\$145,110	\$1,443,871	\$1,373,222	\$375,406	\$370,770			
\$67,446	\$5,010,715	\$2,257,476	\$1,022,186	\$277,670			
\$25,887							
\$12,666							
\$6,108							
\$3,002							
\$914					\$59,080,931	\$15,359,005	\$74,439,935
	\$4,284,936	\$2,340,254	\$595,606	\$369,760			
FEMALES	\$261,832,440	\$69,015,891	\$48,700,834	\$11,180,574			
PRESENT VALUE	\$11,313,873	\$5,044,142	\$4,389,783	\$1,810,847			
OF FUTURE	\$19,384,902	\$16,555,717	\$1,531,407	\$794,674			
EARNINGS	\$3,892,988	\$1,816,358	\$1,012,177	\$397,782			
DISCOUNTED	\$5,993,428	\$1,797,157	\$2,816,911	\$648,774			
AT 4 PERCENT	\$52,233	\$249,749	\$34,213	\$156,593			
	\$8,874,305	\$6,480,052	\$1,952,347	\$1,134,009	\$12,049,564	\$5,780,264	\$17,829,828
\$330,065	\$652,165	\$226,493	\$447,385	\$135,216			
\$347,443	\$3,287,534	\$2,103,036	\$2,432,775	\$1,240,791			
\$379,771	\$1,924,212	\$1,080,170	\$867,820	\$271,123			
\$418,954	\$8,980,533	\$3,920,424	\$6,349,237	\$2,999,124			
\$448,842					\$10,523,431	\$4,358,379	\$14,881,810
\$448,982	\$2,014,979	\$1,642,702	\$797,932	\$300,614			
\$418,703	\$30,487,459	\$10,996,651	\$9,725,499	\$4,057,764			
\$372,595							
\$322,318							
\$270,522							
\$216,805							
\$163,014							
\$111,643					\$9,784,273	\$4,782,642	\$14,566,915
\$67,282	\$16,223,922	\$7,591,495	\$3,407,024	\$1,594,214			
\$37,104	\$19,551,906	\$8,581,690	\$4,105,900	\$1,802,155			
\$20,557	\$10,815,948	\$6,601,300	\$2,271,349	\$1,386,273			
\$10,952					\$4,896,712	\$2,655,703	\$7,552,415
\$4,340	\$32,863,842	\$17,823,510	\$4,896,712	\$2,655,703			
\$1,197	\$645,528,958	\$135,016,376	\$7,746,347	\$2,040,097	\$7,746,347	\$2,040,097	\$9,786,445

APPENDIX E

Smoking-Attributable Indirect Costs

Due to Mortality from Smoking-Related Diseases:

Minnesota, 1981

Calculation 3: Minnesota-Specific Attributable Risks

(Method of Rice and Hodgson)

SMOKING-ATTRIBUTABLE INDIRECT COSTS DUE TO MORTALITY FROM SMOKING-RELATED DISEASES: MINNESOTA, 1981
 CALCULATION 3: MINNESOTA-SPECIFIC ATTRIBUTABLE RISKS
 (Method of Rice and Hodgson)

ICD-9 CODE	DIAGNOSIS CATEGORY	SMOKING-RELATED DIAGNOSES	BY DIAGNOSIS CATEGORY	SMOKING-REL DISEASES	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-
000-999	ALL CONDITIONS		17891	11586	416	90	39	59	200	331	244	212	198	219	388	692	10
001-139	INFECTIOUS DISEASES		134		3	6	1	2	1	0	4	1	0	4	2	6	
x010-012		Respiratory tuberculosis		3	0	0	0	0	0	0	0	0	0	0	0	0	
140-239	NEOPLASMS		3766		2	8	6	4	7	14	19	17	37	39	84	211	3
x140-149		Lip, oral cavity, pharynx		78	0	0	0	0	0	0	0	0	0	0	3	7	
x 150		Esophagus		88	0	0	0	0	0	0	0	0	0	0	2	6	
x 151		Stomach		169	0	0	0	0	0	0	1	0	2	1	4	4	
x 157		Pancreas		204	0	0	0	0	0	0	0	0	0	3	2	14	
x 161		Larynx		55	0	0	0	0	0	0	0	0	0	0	1	6	
x 162		Trachea, lung, bronchus		1059	0	0	0	0	0	0	0	0	7	14	32	81	1
x 180		Cervix uteri		0	0	0	0	0	0	0	0	0	0	0	0	0	
x 188		Urinary bladder		91	0	0	0	0	0	1	0	0	0	0	0	0	
x 189		Kidney, other urinary		87	0	1	1	1	0	0	0	0	1	1	4	2	
240-279	ENDOCRINE		275		3	4	0	1	1	2	4	3	5	1	12	10	
280-289	DISEASES OF BLOOD		56		1	0	0	0	0	2	1	0	0	0	0	1	
290-319	MENTAL DISORDERS		131		0	0	2	0	0	1	1	2	3	2	4	6	
320-389	NERVOUS SYSTEM		239		5	10	3	4	11	5	6	2	1	5	4	13	
390-459	CIRCULATORY SYSTEM		8723		7	4	2	2	4	12	6	35	43	79	163	285	5
x401-405		Hypertension		164	0	0	0	0	0	0	0	1	0	0	1	6	
x410-414		Ischemic heart disease		5403	0	0	0	0	0	0	1	25	32	58	117	217	3
x 427.5		Cardiac arrest		294	2	1	1	0	2	3	0	0	0	1	10	8	
x430-438		Cerebrovascular disease		136	x	x	x	0	x	x	x	5	1	7	9	14	
x 440		Arteriosclerosis		271	0	0	0	0	0	0	0	0	0	2	1	1	
x 441		Aortic aneurysm		204	0	0	0	0	0	1	0	0	0	0	3	3	
x 443		Peripheral vascular disease		9	0	0	0	0	0	0	0	0	0	0	0	0	
460-519	RESPIRATORY SYSTEM		1356		16	5	3	4	1	2	1	2	2	5	12	15	
x480-487		Pneumonia, influenza		534	7	3	3	0	0	2	1	0	1	1	5	4	
x490-491		Bronchitis, chronic/unspec		37	0	0	0	0	0	0	0	0	0	0	0	0	
x 492		Emphysema		125	0	0	0	0	0	0	0	0	0	1	0	2	
x 493		Asthma		32	0	0	0	2	0	0	0	1	0	1	1	2	
x 496		Chronic airway obstruction		406	0	0	0	0	0	0	0	0	0	0	3	3	
520-579	DIGESTIVE SYSTEM		617		3	1	0	0	0	2	1	5	11	16	23	51	
x531-534		Ulcers		64	0	1	0	0	0	1	0	0	0	0	0	3	
x 571		Cirrhosis		237	0	0	0	0	0	0	0	2	5	12	16	38	
580-629	GENITOURINARY SYSTEM		200		3	2	0	0	0	0	1	0	1	1	0	3	
630-676	COMPLICATIONS OF PREGNANCY		0		0	0	0	0	0	0	0	0	0	0	0	0	
680-709	DISEASES OF SKIN		9		0	0	0	0	0	0	0	0	0	0	0	0	
710-739	MUSCULOSKELETAL SYSTEM		36		0	0	0	0	0	0	0	0	0	0	2	2	
740-759	CONGENITAL ANOMALIES		143		106	11	2	4	2	3	2	1	1	1	3	2	
760-779	PERINATAL CONDITIONS		181		179	2	0	0	0	0	0	0	0	0	0	0	
x 765		Short gestation/low birth wt.		39	39	0	0	0	0	0	0	0	0	0	0	0	
x 769		Respiratory distress syn		47	47	0	0	0	0	0	0	0	0	0	0	0	
x 770		Respiratory cond of newborn		26	26	0	0	0	0	0	0	0	0	0	0	0	
780-799	SIGNS, SYMPTOMS, ILL-DEFINED		380		80	4	0	0	1	3	5	1	2	5	2	4	
x 798.0		Sudden infant death syn		79	79	0	0	0	0	0	0	0	0	0	0	0	
E800-E999	INJURIES		1645	1645	8	33	20	38	172	285	193	143	92	61	77	83	

										FEMALES TOTAL DEATHS BY DIAGNOSIS CATEGORY	FEMALES TOTAL DEATHS SMOKING-REL DISEASES	FEMALES: DEATHS FROM SMOKING-RELATED DISEASES BY AGE OF DEATH															
44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+			<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	
19	388	692	1066	1489	2024	2310	2490	2334	3085	14922	7932	283	37	27	28	98	73	86	90	116	134	198	334	550	760	1174	
4	2	6	7	9	14	16	18	15	25	128		10	3	1	0	1	1	1	1	3	1	1	2	2	10	7	
0	0	0	0	0	0	0	1	0	2		6	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	
39	84	211	311	423	554	598	594	424	413	3308		2	8	8	4	11	6	11	28	37	55	85	162	276	334	435	
0	3	7	12	10	11	12	11	6	6		25	0	0	0	0	0	0	0	0	0	0	0	1	2	2	4	
0	2	6	4	17	13	22	10	4	10		23	0	0	0	0	0	0	0	0	0	0	0	1	2	1	5	
1	4	4	7	14	24	32	27	17	36		101	0	0	0	0	0	0	0	0	1	0	3	4	6	8	7	
3	2	14	22	20	32	27	40	23	21		198	0	0	0	0	0	1	0	0	2	2	2	7	15	19	22	
0	1	6	7	7	7	15	6	3	3		9	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	
14	32	81	118	153	195	195	146	76	42		395	0	0	0	0	0	0	0	1	3	8	14	27	43	56	71	
0	0	0	0	0	0	0	0	0	0		49	0	0	0	0	0	0	1	4	1	2	2	3	7	5	6	
0	0	0	3	4	13	17	20	17	15		50	0	0	0	0	0	0	0	0	0	0	1	1	2	3	7	
1	4	2	5	15	12	9	22	11	2		74	0	1	1	0	0	0	0	2	0	1	0	2	5	6	8	
1	12	10	13	10	21	35	41	41	68	384		1	1	0	0	1	3	4	4	3	3	8	7	14	15	49	
0	0	1	1	5	9	5	10	5	16	44		0	0	0	0	0	0	1	0	0	1	0	1	1	2	6	
2	4	6	6	10	16	9	13	21	35	156		1	0	0	0	0	0	0	0	0	2	1	0	2	0	8	
5	4	13	5	22	30	24	30	28	30	205		2	4	1	0	3	0	5	3	3	3	4	11	9	13	19	
9	163	285	541	770	1049	1202	1331	1360	1828	7731		2	3	3	3	0	6	9	12	28	27	53	87	162	266	472	
0	1	6	2	17	21	23	22	36	35		167	0	0	0	0	0	0	0	0	0	1	0	2	3	5	8	
8	117	217	399	568	725	790	783	769	919		3824	0	0	0	1	0	0	0	1	9	7	21	46	90	162	299	
1	10	8	20	13	39	41	42	44	67		228	2	1	1	1	0	0	0	0	2	1	1	5	8	6	18	
7	9	14	39	61	*	*	*	*	*		123	0	*	0	0	0	*	*	6	10	6	15	14	30	42	*	
2	1	1	8	2	19	18	32	59	129		336	0	0	0	0	0	0	0	0	0	0	0	3	4	5		
0	3	3	12	14	25	48	41	32	24		86	0	0	0	0	0	0	0	1	1	1	1	1	0	5		
0	0	0	0	0	1	1	1	1	5		14	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	
5	12	15	48	70	131	196	231	244	368	996		9	0	3	0	4	5	2	2	4	5	4	11	25	39	69	
1	5	4	17	12	21	44	78	114	221		592	5	0	1	0	3	2	1	1	3	2	1	4	7	8	20	
0	0	0	2	1	7	4	6	5	12		21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
1	0	2	3	12	22	31	22	16	16		50	0	0	0	0	0	0	0	0	0	1	0	3	4	5	7	
1	1	2	2	4	3	3	4	3	6		30	0	0	0	0	0	1	0	0	0	1	1	0	2	2	3	
0	3	3	13	30	58	88	83	71	55		141	0	0	0	0	0	0	0	0	0	0	0	3	8	10	27	
6	23	51	50	62	87	86	70	52	97	546		2	0	0	1	1	1	2	3	11	7	12	23	19	37	50	
0	0	3	5	2	9	7	14	10	12		65	0	0	0	0	0	0	0	0	1	0	0	2	2	4	6	
2	16	38	33	40	38	25	17	5	6		137	0	0	0	0	0	0	2	1	5	3	8	17	15	17	20	
1	0	3	4	4	10	12	39	42	78	164		0	0	0	0	0	0	1	2	0	1	1	4	2	2	10	
0	0	0	0	0	0	0	0	0	0	2		0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	
0	0	0	0	0	1	1	1	1	5	19		1	0	0	0	0	0	0	0	0	0	0	0	1	0	2	
0	2	2	2	7	4	5	5	4	5	80		1	0	0	0	0	0	0	1	0	0	1	3	2	6	9	
1	3	2	2	0	0	2	0	0	0	89		63	5	1	3	4	2	2	0	0	0	1	3	1	1	0	
0	0	0	0	0	0	0	0	0	0	123		123	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0		23	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0		26	26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0		20	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
5	2	4	13	31	42	47	36	44	59	285		57	1	1	1	1	1	0	1	0	3	1	2	4	5	14	
0	0	0	0	0	0	0	0	0	0		54	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1	77	83	63	66	56	72	71	53	58	662		9	12	9	16	72	47	48	33	27	25	26	18	30	30	24	

55-59	60-64	65-69	70-74	75-79	80-84	85+	MALES SMOKING PREVALENCE RATES	FEMALES SMOKING PREVALENCE RATES	MALES RELATIVE RISKS	FEMALES RELATIVE RISKS	MALES ATTRIBUTABLE RISKS MN-SPECIFIC CALCULATIONS	FEMALES ATTRIBUTABLE RISKS MN-SPECIFIC CALCULATIONS	MALES SMOKING- ATTRIBUTABLE DEATHS	FEMALES SMOKING- ATTRIBUTABLE DEATHS	AGE	MALES PRESENT VALUE OF FUTURE EARNINGS DISCOUNTED AT 4 PERCENT	FEMALES PRESENT VALUE OF FUTURE EARNINGS DISCOUNTED AT 4 PERCENT
550	760	1174	1468	2038	2541	4885	CURRENT SMOKERS:	CURRENT SMOKERS:					3364	1250	0-1	\$415,998	
2	10	7	15	15	16	38	31.70%	28.00%					[XXXXXXXXXX][XXXXXXXXXX]		1-4	\$438,242	
0	2	0	0	1	1	2			2.80	2.23	0.363	0.256	1	2	5-9	\$479,294	
276	334	435	447	487	426	486	FORMER SMOKERS:	FORMER SMOKERS:	7.30	3.25	0.779	0.192	61	5	10-14	\$529,007	
2	2	4	5	3	1	7	30.90%	18.70%	4.05	4.89	0.819	0.417	72	10	15-19	\$576,855	
2	1	5	3	2	4	5			1.45	1.81	0.125	0.185	21	19	20-24	\$604,379	
6	8	7	13	13	13	33			2.01	1.95	0.425	0.308	87	61	25-29	\$597,040	
15	19	22	32	30	34	30			9.50	4.89	0.914	0.559	50	5	30-34	\$557,084	
1	1	2	2	0	2	0			9.64	3.78	0.886	0.738	938	292	35-39	\$492,083	
43	56	71	57	53	32	30			0.00	2.36		0.276		14	40-44	\$412,732	
7	5	6	7	1	4	6			2.11	2.32	0.249	0.111	23	6	45-49	\$325,967	
2	3	7	10	6	5	13			1.81	1.50	0.324	0.452	28	33	50-54	\$235,464	
5	6	8	9	12	17	10									50-59	\$145,110	
14	15	49	40	72	55	104									60-64	\$67,446	
1	2	6	2	6	5	19									65-69	\$25,887	
2	0	8	9	11	31	91									70-74	\$12,666	
9	13	19	26	27	31	41									75-79	\$6,108	
162	266	472	720	1108	1572	3198									80-84	\$3,002	
3	5	8	11	29	33	74			1.51	1.67	0.139	0.158	23	26	85+	\$914	
90	162	299	413	598	790	1387			1.72	1.69	0.191	0.058	1032	222			
8	6	18	24	34	38	85			3.00	3.00	0.388	0.359	114	82			
30	42	*	*	*	*	*			1.27	1.18	0.079	0.048	11	6			
3	4	5	10	26	61	227			2.11	2.00	0.260	0.219	70	74			
1	0	5	13	11	25	26			3.80	3.02	0.470	0.361	96	31			
0	1	0	0	0	2	9			7.00	7.00	0.655	0.627	6	9			
25	39	69	69	129	170	446											
7	8	20	27	56	106	345			1.89	1.76	0.220	0.175	117	104			
0	0	4	1	2	6	8			7.90	6.28	0.850	0.850	31	18	0-1	\$330,065	
4	5	7	9	8	4	9			9.96	6.14	0.850	0.850	106	43	1-4	\$347,443	
2	2	3	2	4	7	7			3.59	2.20	0.451	0.251	14	8	5-9	\$379,771	
8	10	27	19	32	23	19			8.60	12.63	0.850	0.850	345	120	10-14	\$418,954	
19	37	50	42	78	76	181									15-19	\$448,842	
2	4	6	3	13	11	23			3.07	1.80	0.396	0.183	25	12	20-24	\$448,982	
15	17	20	15	13	10	11			2.48	3.09	0.150	0.150	36	21	25-29	\$418,703	
2	2	10	15	24	35	67									30-34	\$372,595	
0	0	0	0	0	0	0									35-39	\$322,318	
1	0	2	1	2	4	8									40-44	\$270,522	
2	6	9	16	10	15	16									45-49	\$216,805	
1	1	0	0	1	2	0									50-54	\$163,014	
0	0	0	0	0	0	0									50-59	\$111,643	
0	0	0	0	0	0	0	ATTRIBUTABLE RISK CALCS		1.76	1.76	0.210	0.210	8	5	60-64	\$67,282	
0	0	0	0	0	0	0	USE FEMALE CURRENT SMOKER		1.76	1.76	0.210	0.210	10	5	65-69	\$37,104	
0	0	0	0	0	0	0	PREVALENCE RATE, AGES 20-35		1.76	1.76	0.210	0.210	5	4	70-74	\$20,557	
4	5	14	24	28	51	89	<35.00%								75-79	\$10,952	
0	0	0	0	0	0	0			1.50	1.50	0.149	0.149	12	8	80-84	\$4,340	
30	30	24	42	40	52	101					0.012	0.015	20	10		\$1,197	

MALES PRESENT VALUE OF FUTURE EARNINGS DISCOUNTED AT 4 PERCENT	MALES: TOTAL INDIRECT MORTALITY COSTS FROM SMOKING- RELATED DISEASES	FEMALES: TOTAL INDIRECT MORTALITY COSTS FROM SMOKING- RELATED DISEASES	MALES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS	FEMALES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS	MALES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS <BY DX CATEGORY>	FEMALES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS <BY DX CATEGORY>	BOTH SEXES SMOKING- ATTRIBUTABLE INDIRECT MORTALITY COSTS
\$415,998			\$187,269,836	\$49,706,205	\$187,269,836	\$49,706,205	\$236,976,041
\$438,242					*****	*****	*****
\$479,294					\$2,881	\$38,976	\$41,857
\$529,007	\$7,936	\$152,250	\$2,881	\$38,976			
\$576,855					\$85,276,115	\$23,339,731	\$108,615,846
\$604,379	\$5,569,362	\$817,640	\$4,338,533	\$156,987			
\$597,040	\$4,489,151	\$746,022	\$3,676,615	\$311,091			
\$557,084	\$6,878,090	\$3,598,169	\$859,761	\$665,661			
\$492,083	\$11,230,892	\$7,699,533	\$4,773,129	\$2,371,456			
\$412,732	\$3,646,238	\$465,941	\$3,332,662	\$260,461			
\$325,967	\$74,844,718	\$23,697,598	\$66,312,420	\$17,488,827			
\$235,464		\$3,305,942		\$912,440			
\$145,110	\$1,443,871	\$1,373,222	\$359,524	\$152,428			
\$67,446	\$5,010,715	\$2,257,476	\$1,623,472	\$1,020,379			
\$25,887							
\$12,666							
\$6,108							
\$3,002							
\$914					\$60,390,093	\$8,181,352	\$68,571,445
	\$4,284,936	\$2,340,254	\$595,606	\$369,760			
FEMALES	\$261,832,440	\$69,015,891	\$50,009,996	\$4,002,922			
PRESENT VALUE	\$11,313,873	\$5,044,142	\$4,389,783	\$1,810,847			
OF FUTURE	\$19,384,902	\$16,555,717	\$1,531,407	\$794,674			
EARNINGS	\$3,892,988	\$1,816,358	\$1,012,177	\$397,782			
DISCOUNTED	\$5,993,428	\$1,797,157	\$2,816,911	\$648,774			
AT 4 PERCENT	\$52,233	\$249,749	\$34,213	\$156,593			
	\$8,874,305	\$6,480,052	\$1,952,347	\$1,134,009	\$13,802,364	\$6,717,592	\$20,519,956
\$330,065	\$652,165	\$226,493	\$554,340	\$192,519			
\$347,443	\$3,287,534	\$2,103,036	\$2,794,404	\$1,787,581			
\$379,771	\$1,924,212	\$1,080,170	\$867,820	\$271,123			
\$418,954	\$8,980,533	\$3,920,424	\$7,633,453	\$3,332,360			
\$448,842					\$5,371,051	\$1,950,112	\$7,321,163
\$448,982	\$2,014,979	\$1,642,702	\$797,932	\$300,614			
\$418,703	\$30,487,459	\$10,996,651	\$4,573,119	\$1,649,498			
\$372,595							
\$322,318							
\$270,522							
\$216,805							
\$163,014							
\$111,643					\$9,784,273	\$4,782,642	\$14,566,915
\$67,282	\$16,223,922	\$7,591,495	\$3,407,024	\$1,594,214			
\$37,104	\$19,551,906	\$8,581,690	\$4,105,900	\$1,802,155			
\$20,557	\$10,815,948	\$6,601,300	\$2,271,349	\$1,386,273			
\$10,952					\$4,896,712	\$2,655,703	\$7,552,415
\$4,340	\$32,863,842	\$17,823,510	\$4,896,712	\$2,655,703			
\$1,197	\$645,528,958	\$135,016,376	\$7,746,347	\$2,040,097	\$7,746,347	\$2,040,097	\$9,786,445

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