



We take high pleasure in paying tribute to Larry Garfinkel for his lifelong contribution to the study of smoking and health. Few individuals have contributed as much to our present-day knowledge about the disease consequences of smoking. Since joining the American Cancer Society in 1947, he has played a critical role in this process of discovery, from organizing the earliest prospective studies in the 1950s, to the work that forms the basis of this monograph, and all the important steps in between. I would like to express my deep admiration and appreciation to Larry Garfinkel for his lifelong leadership in combating this Nation's most important health problem.

Richard D. Klausner, M.D.
Director
National Cancer Institute
December 1996

Foreword

This volume presents a detailed and comprehensive picture of the disease consequences that result directly from smoking cigarettes. Concern about the disease risks associated with the use of tobacco dates back two centuries. According to one medical historian, Dr. John Hill (1716?-1775) should be credited with the first report documenting an association between tobacco use and cancer for his work *Cautions Against the Immoderate Use of Snuff*. Others credit J.J. Holland for noting a relationship between cancer of the lip and tobacco use. Soemmering, in 1795, made a similar observation.

By the early part of this century, tobacco use was strongly suspected as a cause of cancer of the mouth because most cases were found among people who either smoked or chewed. However, at the beginning of the 20th century, the disease burden produced by tobacco use was largely unknown, and the staggering epidemic of disease that would be produced by cigarettes was yet to occur. The first successful national marketing of a modern blended cigarette, Camels, occurred in 1913. These new blended cigarettes quickly became the tobacco product of choice among consumers, and the deeper inhalation of tobacco smoke into the lungs that characterized the use of these products transformed the pattern of disease in the United States. Over a relatively short interval, the addictive nature of cigarettes and their widespread acceptance by society resulted in cigarette smoking becoming the largest preventable cause of death and disability in the United States and most of the developed world.

By 1930 a majority of males were already regular cigarette smokers, most having switched to cigarettes around the time of World War I; moreover, the popularity of smoking among females was increasing steadily as social taboos about females smoking gave way in a more "enlightened" era. Lung cancer deaths also began to increase, first among males and then, some 20 to 30 years later, among females. Before 1930 lung cancer was a rare disease not listed on the International Classification of Disease system in the United States. However, by the end of the 1930's a rapidly increasing lung cancer death rate among males had been noted by several scientists, including Dr. Harold Diehl and cancer surgeon Dr. Alton Ochsner of Tulane University. Dr. Ochsner recalled being aroused from his bed as a third-year medical student to witness a rare medical event that, according to his professors, he would probably not see again in his lifetime—an autopsy of a man who died of lung cancer. As a young cancer surgeon, he saw six lung cancer patients in a single year and concluded that an epidemic of lung cancer must be under way. All these patients were male, and all had a history of heavy cigarette smoking. This observation was among the first to link lung cancer and the new U.S. epidemic of lung cancer.

In 1950 four separate retrospective epidemiological studies demonstrated a clear link between cigarette smoking and lung cancer, and in 1951 two

major prospective mortality studies were initiated in an effort to resolve the remaining scientific questions. Sir Richard Doll and Sir Austin Bradford Hill, under the auspices of the Medical Research Council, enrolled 40,000 British physicians in a prospective study. This cohort now has been successfully followed for 40 years. In the United States, Drs. E. Cuyler Hammond and Daniel Horn, under the aegis of the American Cancer Society (ACS), enrolled 187,783 white males residing in 9 States at the beginning of 1952. In time, a total of 11 prospective mortality studies would form the cornerstone of our knowledge about the disease risks that accompany cigarette smoking. The most recent data from five of these studies are presented in this volume; they once again establish the overwhelming nature of proof that smoking is the largest preventable cause of cancer and other chronic diseases.

Thousands of scientists have contributed to the body of evidence that proves smoking causes disease, including the authors and scientific editors of this volume, but I would like to single out one for his singular dedication and seminal contributions to this field of research.

Assisting Hammond and Horn in their first prospective study was a young scientist named Lawrence Garfinkel. Larry began working for the American Cancer Society in 1947, where he was directly responsible for coordinating much of the field work, including training the thousands of ACS volunteers in data collection techniques. When ACS decided to undertake an even larger study in 1959 by enrolling 1 million people in its Cancer Prevention Study I (CPS-I), Larry's role changed from that of research support to co-principal investigator. He became increasingly involved in both data analysis and publication of results, and in 1961 he coauthored, with Cuyler Hammond, the article "Smoking Habits of Men and Women," which appeared in the August issue of the *Journal of the National Cancer Institute*. This article reported some of the first results from CPS-I.

During the 1960's Larry Garfinkel contributed to more than two dozen major papers on the relationship between smoking and health. (See pages xxvii - xxxiii for a complete chronological list of Mr. Garfinkel's publications.) Along with colleagues Cuyler Hammond and Oscar Auerbach, Larry coauthored the reported results of some of the first studies that combined epidemiology with pathology. These study results appeared in a series of articles in the *New England Journal of Medicine* and provided some of the earliest evidence of smoking's histological damage to the lung. During the 1970's and 1980's Larry wrote more than 70 papers advancing our knowledge of the effects of cigarette smoking on life expectancy, coronary heart disease, and stroke; benefits of quitting smoking; and risks of smoking cigarettes with different tar and nicotine yields.

When Cuyler Hammond retired from ACS in 1979, Larry became director of the ACS research program, and under his guidance, ACS initiated CPS-II, which included participants from all 50 States, the District of Columbia, and Puerto Rico. CPS-II remains the largest epidemiological study of its kind ever attempted in the history of medical science. In 1988 Larry Garfinkel and coauthor Steve Stellman published results on females from CPS-II that

shocked many in public health. Their analyses demonstrated that the lung cancer mortality rate among smoking females in CPS-II had increased nearly fivefold compared with females who smoked in CPS-I. The data for nonsmoking females showed no increase in lung cancer between the two studies—thus providing convincing evidence that lung cancer was almost exclusively a disease found among smokers. Larry Garfinkel is not only a contributor to this monograph; he is also one of its scientific editors.

In closing, I would like to take this opportunity to personally recognize Larry Garfinkel for his lifelong contribution to this important field of scientific inquiry. Few individuals have contributed as much to our knowledge about the disease consequences of smoking as Larry Garfinkel. He has played critical roles in this process of discovery, from organizing the earliest prospective studies to the work that forms the basis of the current volume and all the steps in between. I know I speak not only for the National Cancer Institute but also for the entire scientific community in recognizing Larry's leadership in combating this Nation's most important health problem.

Richard D. Klausner, M.D.
Director
National Cancer Institute

Preface

This, the eighth monograph in the Smoking and Tobacco Control series published by the National Cancer Institute (NCI), is in many respects also the most significant. Contained in this volume are new results from five of the world's largest prospective epidemiological studies defining the magnitude of disease risks caused by cigarette smoking.

Thirty years ago, in January 1966, NCI published a similar monograph titled *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*. The report of the Surgeon General's Advisory Committee on Smoking and Health had been released in 1964 and had relied extensively on data from prospective mortality studies to delineate the relationship between cigarette smoking and various chronic diseases. The 1966 NCI monograph provided a detailed examination of the outcomes of several of the large prospective mortality studies presented in the 1964 advisory committee report. At that time, the outcomes available from these studies were based on 3 to 6 years of followup; with the exception of the American Cancer Society's (ACS) Cancer Prevention Study I (CPS-I), studies in the 1966 NCI monograph did not include substantial numbers of females. This monograph includes three new prospective mortality studies (CPS-II [Chapter 5], the Nurses' Health Study [Chapter 8], and the Kaiser Permanente Prospective Mortality study [Chapter 6]), provides the outcomes of the CPS-I study after 12 years of followup (Chapter 3), and provides 26 years of followup of the study of U.S. veterans (Chapter 7). Data from these studies provide the most comprehensive description of the disease consequences produced by smoking available to date and are accompanied by a detailed description of the changes in smoking behaviors of the U.S. population over the past century. Prospective mortality studies continue to play a critical role in quantifying the relative mortality risks of smoking for the individual as well as in estimating the overall disease burden caused by cigarette smoking in our society. The goal of this monograph is to facilitate both these tasks by providing, in one volume, comprehensive descriptions of smoking behaviors and the disease risks that result from those behaviors.

BRIEF HISTORICAL PERSPECTIVE During the early part of this century, knowledge about the relationship between tobacco use and disease was based largely on clinical observations and a few small case-control studies of patients with lung cancer. A turning point in the understanding of smoking's relationship to disease occurred in 1950 with the publication of four retrospective studies of smoking habits among lung cancer patients and control subjects. Although many epidemiologists were satisfied that the relationship between smoking and lung cancer was established by these retrospective studies, others turned for confirmation to prospective studies that followed large numbers of "healthy" individuals to identify the causes of their subsequent mortality. Facts about an individual's lifestyle (including smoking), family history, medical and occupational data, place of residence,

and other personal information were recorded at the start of such a study and could be related to the frequency with which individuals with these characteristics died of specific diseases.

The first major prospective study was started in Great Britain in 1951 by Sir Richard Doll and Sir Austin Bradford Hill, who enrolled 40,000 British physicians. Doll and colleagues have recently published 40-year followup data on this unique cohort. The first U.S. prospective study was initiated in 1952 by two ACS investigators, E. Cuyler Hammond and Daniel Horn. They enrolled 188,000 white males residing in 9 States. Hammond and Horn released preliminary results from their study at the 103d annual meeting of the American Medical Association in June 1954. The results of these early studies astounded both the medical community and the public.

Significantly elevated death rates among smokers compared to never-smokers were found, not only for lung cancer but also for several other major causes of death. The elevation in risk was much greater for those who smoked cigarettes rather than pipes and cigars, and there was a gradient in risk that increased with the increasing amount smoked.

National Cancer Institute investigator Harold Dorn envisioned an even larger prospective study than that attempted by ACS. In January 1954 Dorn mailed questionnaires on smoking habits to veterans holding U.S. Government life insurance policies. Nearly 300,000 veterans replied; most were veterans of World War I, and almost all policyholders were white males. This cohort has been successfully traced for nearly three decades. The 26-year followup data are reported in this volume (Chapter 7).

Also in 1954 Weir and colleagues started to trace 68,000 California males in various occupations. During 1955 in Canada, Best and colleagues initiated a prospective study involving 92,000 Canadian pensioners. The Canadian Pensioners Study was the first to include significant numbers of females—nearly 14,000. Taken as a group, the prospective studies involved more than 600,000 individuals, but except for the Canadian study, they included few females. In the British Doctors study, only 6,000 enrollees were female, and in the Dorn study of U.S. veterans, less than 1 percent were female.

During 1959 ACS began its Cancer Prevention Study I and purposefully included large numbers of females in the study design. Between October 1959 and April 1960, ACS volunteers enrolled more than 1 million males and females from 25 States (562,671 females and 440,558 males). Participants completed confidential questionnaires about their family medical history, physical complaints, occupations, personal health behaviors, and other factors.

Substantial differences in the disease risks produced by smoking for males compared with those for females were evident in these early epidemiological investigations. For example, based on a 6-year followup from CPS-I, male smokers experienced a 70-percent greater overall mortality risk and a 1,000-percent higher risk from lung cancer than male never-smokers.

However, among females, overall mortality risks were much lower—only 20 to 30 percent higher than that of a never-smoker, and lung cancer mortality among females who smoked was only 200 percent greater than that of never-smoking females. Findings from other prospective and retrospective studies conducted in the United States and abroad during the 1950's and early 1960's confirmed these results.

These differences between males and females found in early epidemiological studies are largely explained by differences in smoking behaviors (Chapter 2). The epidemiological studies were started during the 1950's and 1960's, and the females most at risk for contracting smoking-related chronic diseases in these studies were older and had been born around or prior to the turn of the century. Among the oldest birth cohorts (those born before 1915 and most at risk during the 1950's), there were significant differences between males and females in their total lifetime smoking behaviors. Fifty percent or more of the males born between 1885 and 1915 became regular cigarette smokers at some time during their lives, with some cohorts attaining an ever-smoking rate of 80 percent. No female cohorts attained a smoking rate greater than 45 percent (see Chapter 2), and the very oldest cohorts of these females never exceeded a 20-percent ever-smoking prevalence. There were also important differences in the age at which these cohorts first began to regularly smoke cigarettes. Among males, the majority of ever-smokers had initiated regular smoking before age 21. However, among females born during these early years, smoking initiation frequently occurred as late as their thirties and forties.

This difference between males and females in the age at which they first began to smoke regularly resulted in substantial differences in duration of smoking between males and females in these early prospective studies. Because the magnitude of the risk produced by smoking is closely related to the duration of smoking, the difference in duration of smoking between males and females in the early epidemiological studies translated into differences in the size of the mortality ratios for smokers and never-smokers. Male smokers had longer average durations of smoking at any given age than female smokers, so they also had higher overall mortality ratios. Male smokers also smoked a greater number of cigarettes per day and were more likely to inhale compared with female smokers. These differences in smoking behaviors, rather than a difference in biological susceptibility, explained the apparent difference in the risks of smoking for males and females found in early epidemiological studies.

RESULTS FROM CONTEMPORARY STUDIES This volume presents results from three large, more contemporary prospective mortality studies and provides longer followup for two of the older studies dating from the 1950's. All these studies contain large numbers of subjects, and with the exception of the U.S. veterans study, all contain large numbers of females. When observations from the more contemporary studies are compared with those from the 1950's, one important but disturbing conclusion is apparent—mortality risks among continuing smokers, both males and females, have increased. In fact, relative

risks for smokers compared to never-smokers have increased for all major smoking-related diseases—coronary heart disease (CHD), lung cancer, other smoking-related cancers, stroke, and chronic obstructive pulmonary disease (COPD). This increase over time in the relative risks for smokers compared to never-smokers has occurred despite a dramatic decline in cardiovascular disease (CVD) death rates in the U.S. population, suggesting that the decline in CVD death rates has been proportionately greater among never-smokers than among continuing smokers.

Perhaps the best example of this can be seen when 6-year followup data from the two ACS studies are compared side by side (Chapter 4). Both CPS-I (initiated in 1959) and CPS-II (initiated in 1982) followed more than 1 million people each. Both used nearly identical study designs and methodologies, and they essentially represent two different groups of smokers born approximately a generation apart. After 6 years of followup, there had been 76,888 deaths among CPS-I participants and 79,802 deaths among CPS-II participants.

The increase in relative risk between the two studies is striking. Relative risks increased for overall mortality and for all the major smoking-related chronic diseases from CPS-I to CPS-II (see Table 1). Lung cancer risk among males who smoked doubled when the two studies were compared, increasing from 11.9 to 23.2. Among females, the lung cancer risk more than quadrupled, increasing from less than 3.0 in CPS-I to 12.8 in CPS-II. Risks for COPD also increased dramatically from 9.3 to 11.7 among males and from 6.7 to 12.8 among females.

The increase in relative risks between CPS-I and CPS-II translates into considerable increases in the percentage of deaths attributable to smoking among current cigarette smokers. Among active smokers, 57 percent of all male deaths and nearly half of all female deaths are attributed to smoking. More than 90 percent of the lung cancer that occurs among smokers is attributable to smoking for both males and females in CPS-II, and 71 percent (male) and 61 percent (female) of other smoking-related cancers are attributed to smoking (see Chapters 4 and 5).

The data for all-cause mortality among females from the Kaiser Permanente study (Chapter 6) and the Nurses' Health Study (Chapter 8) confirm the results found in CPS-II. The Kaiser Permanente study has followed more than 60,000 participants, including 36,035 females, since 1979, whereas the Nurses' Health Study enrolled 121,700 female nurses in 1976.

In both studies, all-cause mortality among females who smoked was 1.9-fold higher than among females who did not smoke. In the Kaiser Permanente study, cause-specific relative risks for female smokers were lung cancer, 15.1; CHD, 1.7; and COPD, 9.0. These findings are nearly identical to those reported for females in CPS-II.

Table 1
Changes in cigarette-related mortality risks between Cancer Prevention Study I (1959-1965) and Cancer Prevention Study II (1982-1988) and percentage of deaths attributable to active cigarette smoking

	CPS-I		CPS-II	
	Males			
	Relative Risk	Percent	Relative Risk	Percent
Overall Mortality	1.7	42.2	2.3	57.1
Lung Cancer	11.9	91.6	23.2	95.7
Coronary Heart Disease	1.7	41.5	1.9	46.2
Chronic Obstructive Pulmonary Disease	9.3	89.2	11.7	91.4
Stroke	1.3	21.9	1.9	46.8
Other Smoking-Related Cancers ^a	2.7	63.4	3.5	71.2
Females				
Overall Mortality	1.2	18.7	1.9	47.9
Lung Cancer	2.7	63.4	12.8	92.2
Coronary Heart Disease	1.4	27.0	1.8	45.1
Chronic Obstructive Pulmonary Disease	6.7	85.0	12.8	92.2
Stroke	1.2	15.2	1.8	45.7
Other Smoking-Related Cancers ^a	1.8	45.0	2.6	60.8

^aSites include larynx, oral cavity, esophagus, bladder, kidney, other urinary, and pancreas.

Based on the previously described differences between males and females in their durations of smoking, the increase in female relative risks was expected as females with longer durations of smoking reached the ages where they were at high risk for disease. However, the increase in relative risk between CPS-I and CPS-II for males was less expected. The increase among males is partly explained by the greater number of cigarettes smoked per day by males in CPS-II compared with CPS-I, and much of the difference between the two sets of relative risks disappears when duration and number of cigarettes smoked per day are held constant.

A difference still persists among smokers of long duration; part of this difference may be explained by the large proportion of males in CPS-I who did *not* start out smoking cigarettes but changed from other forms of tobacco to mass-produced cigarettes just before and during World War I. The modern

blended cigarette did not become popular until 1913 when Camel cigarettes were first introduced. Before their introduction, few people smoked mass-produced, machine-made cigarettes. For example, in 1910, of the 8.59 pounds of tobacco consumed per person in the United States, only 0.41 pound was consumed in the form of machine-made cigarettes (see Figure 1, Chapter 2). In contrast, nearly 4.5 pounds of tobacco were consumed in the form of cigars or as smoking tobacco used in pipes and roll-your-own cigarettes.

EFFECT OF QUITTING This monograph documents in detail the increased disease risks among more contemporary cohorts of cigarette smokers and also sheds considerable light on the positive benefits of quitting. The 26-year followup information from the U.S. veterans study (Chapter 7), as well as data from the other major prospective studies, clearly documents that quitting smoking results in substantial benefits for one's health, regardless of how long or how much one has smoked.

For all-cause mortality, the difference in risk between continuing smokers and those who quit increases with increasing duration of time since cessation. This difference is present when the data on risks are examined as relative risks or as differences in death rates. However, in the veterans study, male smokers had to have quit for 5 years or more before an appreciable reduction in overall mortality was evident. Similar findings are observed among females as well as males in the other epidemiological studies.

The residual risk produced by past smoking in former smokers is less among those who had smoked fewer cigarettes per day compared with those who had smoked two or more packs per day. However, because the death rates among smokers of two or more packs per day are so much higher than the rates for those who smoke one-half pack per day, the difference in death rates between continuing smokers and those who quit is greatest for those who have the greatest risk (heavy smokers). Expressed somewhat differently, the more one smokes, the greater one's risk of disease and, correspondingly, the more risk one can avoid by quitting.

The benefits of cessation are composed of avoidance of the additional risk that accumulates with a longer duration of smoking and the reversal of risk with increased years off cigarettes. Heavy smokers appear to retain some degree of elevated risk for lung cancer when compared to never-smokers, even after 20 years of cessation. In contrast, the risks for CHD for heavy smokers may eventually return to those of never-smokers after 20 years of cessation. Among veterans who reported smoking two or more packs of cigarettes daily and who had quit smoking for more than 30 years, overall mortality was still slightly elevated compared to never-smokers; a similar result was evident for smokers of more than two packs per day in the CPS-I study. For both studies, no excess overall mortality was demonstrated for light smokers who had quit for 20 years or more.

PUBLIC HEALTH IMPLICATIONS This volume presents the most detailed and comprehensive epidemiological description of the disease consequences of smoking ever assembled in one publication. It once again strongly reinforces what the public health community has been saying for more than 40 years: The best, and possibly the only, way to avoid the death and disability caused by cigarette smoking is to never begin, and the return on public health interventions that prevent smoking initiation, although a long time in arriving, is enormous.

For those who do start smoking, the less they smoke and the sooner they quit, the more risk they can avoid. Heavy smokers and smokers of longer duration are at greatest risk, but correspondingly, they also have the most to gain from cessation.

Preventing adolescent onset of regular smoking may have the greatest benefit for the individual and society in the long run, but it often takes decades before prevention has any measureable effect on national death rates. That option is not available to the nearly 50 million adult Americans who currently smoke cigarettes: The benefits of cessation will take 30 or more years before they affect U.S. death rates. The benefits of cessation are available to individuals who currently smoke, are greatest for those at greatest risk, and can affect death rates in as little as 5 years.

The clearest message that is drawn from the enormous quantity of data presented in this monograph is that smoking prevention and cessation efforts are complementary, not alternative, solutions to the current epidemic of diseases caused by smoking. We must accomplish both prevention and cessation if we are to successfully reduce the tragic burden of death and disability currently produced by cigarette smoking.

Peter G. Greenwald, M.D., Dr.P.H.
Director
Division of Cancer Prevention
and Control
National Cancer Institute

Acknowledgments

Changes in Cigarette-Related Disease Risks and Their Implication for Prevention and Control was developed under the general editorship of the Smoking and Tobacco Control Program (STCP), National Cancer Institute (NCI), **Donald R. Shopland**, Coordinator.

The scientific editors for this monograph were **David M. Burns**, M.D., Professor of Medicine and Medical Director of Respiratory Therapy, University of California, San Diego Medical Center, San Diego, California; **Lawrence Garfinkel**, M.A., Special Consultant, Epidemiology, American Cancer Society, New York, New York; and **Jonathan M. Samet**, M.D., Chairman, Department of Epidemiology, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Maryland.

The editors and STCP staff members gratefully acknowledge the many researchers and authors who made this monograph possible. Attributions for each chapter are as follows:

Chapter 1. Introduction, Summary, and Conclusions

David M. Burns, M.D.
Professor of Medicine
Medical Director of
Respiratory Therapy
University of California,
San Diego Medical Center
San Diego, CA

Lawrence Garfinkel, M.A.
Special Consultant,
Epidemiology
American Cancer Society
New York, NY

Jonathan M. Samet, M.D.,
M.S.
Professor and Chair
Department of Epidemiology
The Johns Hopkins
University School of
Hygiene and Public Health
Baltimore, MD

Chapter 2. Cigarette Smoking Behavior in the United States

David M. Burns, M.D.
Professor of Medicine
Medical Director of
Respiratory Therapy
University of California,
San Diego Medical Center
San Diego, CA

Lora Lee
Statistician
University of San Diego
San Diego, CA

Larry Z. Shen, Ph.D.
Statistician
Biometrics and Statistical
Sciences
Proctor & Gamble
Cincinnati, OH

Elizabeth Gilpin
Statistician
Cancer Center
University of California,
San Diego
La Jolla, CA

H. Dennis Tolley, Ph.D.
Consulting Statistician
Department of Statistics
Brigham Young University
Provo, UT

Jerry Vaughn
Programmer
Tobacco Control Policies
Project
University of California,
San Diego Medical Center
San Diego, CA

Thomas G. Shanks
Statistician
Baha'i World Centre
Haifa
ISRAEL

**Chapter 3. The American Cancer Society
Cancer Prevention Study I:
12-Year Followup of 1 Million
Men and Women**

David M. Burns, M.D.
Professor of Medicine
Medical Director of
Respiratory Therapy
University of California,
San Diego Medical Center
San Diego, CA

Thomas G. Shanks
Statistician
Baha'i World Centre
Haifa
ISRAEL

Won Choi, M.P.H.
Staff Research Associate
University of California,
San Diego
La Jolla, CA

Michael J. Thun, M.D., M.S.
Co-Director, Analytic
Epidemiology
Department of Epidemiology
and Surveillance
American Cancer Society
Atlanta, GA

Clark W. Heath, Jr., M.D.
Vice President
Epidemiology and
Surveillance Research
Department of Epidemiology
and Surveillance
American Cancer Society
Atlanta, GA

Lawrence Garfinkel, M.A.
Special Consultant,
Epidemiology
American Cancer Society
New York, NY

Michael J. Thun, M.D., M.S.
Co-Director, Analytic
Epidemiology
Department of Epidemiology
and Surveillance
American Cancer Society
Atlanta, GA

Cathy Day-Lally, M.S.P.H.
Research Analyst II
Department of Epidemiology
and Surveillance
American Cancer Society
Atlanta, GA

**Chapter 4. Trends in Tobacco Smoking
and Mortality From Cigarette
Use in Cancer Prevention
Studies I (1959 through 1965)
and II (1982 through 1988)**

Dena G. Myers
Research Analyst I
Department of Epidemiology
and Surveillance
American Cancer Society
Atlanta, GA

Eugenia E. Calle, Ph.D.
Co-Director, Analytic
Epidemiology
Department of Epidemiology
and Surveillance
American Cancer Society
Atlanta, GA

W. Dana Flanders, M.D., D.Sc.
Professor
Epidemiology Division
Emory University
School of Public Health
Atlanta, GA

Bao-Ping Zhu, Ph.D., M.B.B.S.,
M.S.
Research Scientist
Center for Public Health
Research and Evaluation
Battelle Memorial Institute
Atlanta, GA

Mohan M. Namboodiri,
M.P.H.
Statistical Programmer Analyst
Department of Epidemiology
and Surveillance
American Cancer Society
Atlanta, GA

Clark W. Heath, Jr., M.D.
Vice President
Epidemiology and
Surveillance Research
Department of Epidemiology
and Surveillance
American Cancer Society
Atlanta, GA

Chapter 5. Age and the Exposure-Response Relationships Between Cigarette Smoking and Premature Death in Cancer Prevention Study II

Michael J. Thun, M.D., M.S.
Co-Director, Analytic Epidemiology
Department of Epidemiology and Surveillance
American Cancer Society
Atlanta, GA

Dena G. Myers
Research Analyst I
Department of Epidemiology and Surveillance
American Cancer Society
Atlanta, GA

Cathy Day-Lally, M.S.P.H.
Research Analyst II
Department of Epidemiology and Surveillance
American Cancer Society
Atlanta, GA

Mohan M. Namboodiri,
M.P.H.
Statistical Programmer Analyst
Department of Epidemiology and Surveillance
American Cancer Society
Atlanta, GA

Eugenia E. Calle, Ph.D.
Co-Director, Analytic Epidemiology
Department of Epidemiology and Surveillance
American Cancer Society
Atlanta, GA

W. Dana Flanders, M.D., D.Sc.
Professor
Epidemiology Division
Emory University
School of Public Health
Atlanta, GA

Stacy L. Adams
Research Assistant
Emory University
Atlanta, GA

Clark W. Heath, Jr., M.D.
Vice President
Epidemiology and Surveillance
Research
Department of Epidemiology
and Surveillance
American Cancer Society
Atlanta, GA

**Chapter 6. Smoking and Mortality:
The Kaiser Permanente
Experience**

Gary D. Friedman, M.D., M.S.
Director
Division of Research
Kaiser Permanente Medical
Care Program
Oakland, CA

Irene Tekawa, M.A.
Biostatistician
Division of Research
Kaiser Permanente Medical
Care Program
Oakland, CA

Marianne Sadler, M.P.H.
Programmer/Analyst
Division of Research
Kaiser Permanente Medical
Care Program
Oakland, CA

Stephen Sidney, M.D., M.P.H.
Senior Epidemiologist
Division of Research
Kaiser Permanente Medical
Care Program
Oakland, CA

**Chapter 7. Former Cigarette Smoking
and Mortality Among U.S.
Veterans: A 26-Year Followup,
1954 to 1980**

Zdenek Hrubec, Sc.D.
Expert Consultant
National Cancer Institute
Parkville, MD

Joseph K. McLaughlin, Ph.D.
President
International Epidemiology
Institute, Ltd.
Rockville, MD

**Chapter 8. Smoking Cessation and
Decreased Risks of Total
Mortality, Stroke, and
Coronary Heart Disease
Incidence Among Women:
A Prospective Cohort Study**

Ichiro Kawachi, M.B., Ch.B.
Assistant Professor of Medicine
Channing Laboratory
Department of Medicine
Harvard Medical School
Brigham and Women's
Hospital
Department of Health and
Social Behavior
Harvard School of Public
Health
Boston, MA

Graham A. Colditz, Dr.P.H.,
M.B.B.S.
Associate Professor of Medicine
Channing Laboratory
Department of Medicine
Harvard Medical School
Brigham and Women's Hospital
Department of Epidemiology
Harvard School of Public
Health
Boston, MA

Meir J. Stampfer, M.D.
Professor of Epidemiology
and Nutrition
Departments of Epidemiology
and Nutrition
Harvard School of Public Health
Channing Laboratory
Department of Medicine
Harvard Medical School
Brigham and Women's Hospital
Boston, MA

Walter C. Willett, M.D.
Professor of Medicine
Channing Laboratory
Department of Medicine
Harvard Medical School
Brigham and Women's Hospital
Frederick Stare Professor of
Epidemiology and Nutrition
Departments of Epidemiology
and Nutrition
Harvard School of Public
Health
Boston, MA

JoAnn E. Manson, M.D.
Associate Professor of Medicine
Channing Laboratory
Division of Preventive
Medicine
Departments of Medicine
and Ambulatory Care
and Prevention
Harvard Medical School
Brigham and Women's
Hospital
Boston, MA

Bernard Rosner, Ph.D.
Professor of Medicine and
Biostatistics
Channing Laboratory
Department of Preventive
Medicine
Harvard Medical School
Department of Biostatistics
Harvard School of Public
Health
Boston, MA

David J. Hunter, M.B.B.S., Sc.D.
Associate Professor of
Epidemiology
Department of Epidemiology
Harvard School of Public
Health
Channing Laboratory
Department of Medicine
Harvard Medical School
Brigham and Women's
Hospital
Boston, MA

Charles H. Hennekens, M.D.,
Dr.P.H.
Professor of Ambulatory Care
and Prevention
John Snow Professor of
Medicine
Channing Laboratory
Division of Preventive
Medicine
Departments of Medicine
and Ambulatory Care
and Prevention
Department of Preventive
Medicine
Harvard Medical School
Brigham and Women's
Hospital
Professor of Epidemiology
Department of Epidemiology
Harvard School of Public
Health
Boston, MA

Frank E. Speizer, M.D.
Edward H. Kass Professor of
Medicine
Channing Laboratory
Department of Medicine
Harvard Medical School
Brigham and Women's
Hospital
Professor of Environmental
Science
Department of
Environmental Health
Harvard School of Public
Health
Boston, MA

**We gratefully acknowledge the following distinguished scientists,
researchers, and others, both in and outside Government, who
contributed critical reviews or assisted in other ways:**

Glen Bennett, M.P.H.
Coordinator
Advanced Technologies Applications and Health Education
Office of Prevention, Education, and Control
National Heart, Lung, and Blood Institute
National Institutes of Health
Bethesda, MD

Susan S. Devesa, Ph.D.
Chief
Descriptive Studies Section
Division of Cancer Etiology
National Cancer Institute
National Institutes of Health
Bethesda, MD

Richard Doll, F.R.S., F.R.C.P.
Emeritus Professor of Medicine
Radcliffe Infirmary
University of Oxford
Oxford
UNITED KINGDOM

Terry Dwyer, M.B.B.S., M.D., M.P.H.
Professor and Director
Health Research
Menzies Centre for Population
University of Tasmania
Hobart
AUSTRALIA

Luis G. Escobedo, M.D., M.P.H.
Medical Epidemiologist
Office on Smoking and Health
Centers for Disease Control and Prevention
Atlanta, GA

Dorothy L. Faulkner, Ph.D., M.P.H.
Epidemiologist
Epidemic Intelligence Service
Centers for Disease Control and Prevention
Atlanta, GA

Acknowledgments

Gary A. Giovino, Ph.D., M.S.
Chief
Epidemiology Branch
Office on Smoking and Health
Centers for Disease Control and Prevention
Atlanta, GA

Jay Lubin, Ph.D.
Mathematical Statistician
Biostatistics Branch
Division of Cancer Etiology
National Cancer Institute
National Institutes of Health
Bethesda, MD

Ann M. Malarcher, Ph.D.
Epidemiologist
Office on Smoking and Health
Centers for Disease Control and Prevention
Atlanta, GA

Robert K. Merritt, M.A.
Behavioral Scientist
Office on Smoking and Health
Centers for Disease Control and Prevention
Atlanta, GA

Donald J. Sharp, M.D.
Preventive Medicine Resident
Office on Smoking and Health
Centers for Disease Control and Prevention
Atlanta, GA

Jesse Steinfeld, M.D.
U.S. Surgeon General (retired)
San Diego, CA

Scott L. Tomar, D.M.D., Dr.P.H.
Epidemiologist
Office on Smoking and Health
Centers for Disease Control and Prevention
Atlanta, GA

Ernst L. Wynder, M.D.
President
American Health Foundation
New York, NY

Bao-Ping Zhu, Ph.D., M.B.B.S., M.S.
Research Scientist
Center for Public Health Research and Evaluation
Battelle Memorial Institute
Atlanta, GA

Finally, the editors and STCP staff members would also like to acknowledge the contributions of the following staff members of **MasiMax Resources, Inc.**, Rockville, Maryland, and **R.O.W. Sciences, Inc.**, Rockville, Maryland, who provided technical and editorial assistance in the preparation of this monograph. In particular, we would like to acknowledge the contribution of **Richard H. Amacher**, M.S., who served as Project Manager from September 1989 through August 1995 for the contract under which this publication was produced. We would also like to thank **Marilyn M. Massey**, M.P.H., MasiMax Resources, and **Jacqueline M. Tressler**, R.O.W. Sciences, who currently serve as Project Manager and Subcontract Manager, respectively, for the contract under which this publication was produced, for their valuable contribution during the final phases of monograph development. Special recognition is also due to **James R. Libbey**, M.P.I.A., who served as Managing Editor for this publication.

Douglas Bishop, M.B.A., Art Director
Rebecca A. Charton, M.S., Senior Librarian
Ruth E. Clark, Word Processing Supervisor
Daria T. Donaldson, Quality Control Proofreader
Catherine Godfrey, Word Processing Supervisor
Frances B. Nebesky, M.A., Senior Copyeditor
Esther M. Roberts, Word Processing Specialist
Donna Selig, Copyeditor/Proofreader
Barbara Shine, Proofreader
Keith W. Stanger, Graphics Services Coordinator
Donna Cay Tharpe, Quality Control Proofreader
Sonia Van Putten, Word Processing Specialist

Publications List

Lawrence Garfinkel

1. Auerbach, O., Gere, J.B., Pawlowski, J.M., Garfinkel, L. The rate of healing of pulmonary tuberculosis as affected by chemotherapy. *Am Rev Tuberc* 76: 988-1001, 1957.
2. Garfinkel, L., Ringel, A. The Arizona cancer registry. *Ariz Med* 15: 380-383, 1958.
3. Garfinkel, L., Craig, L., Seidman, H. An appraisal of left and right breast cancer. *J Natl Cancer Inst* 23: 617-631, 1959.
4. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Microscopic examination of bronchial epithelium in children. *Am Rev Resp Dis* 82: 640-648, 1960.
5. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Changes in the bronchial epithelium in relation to cigarette smoking and in relation to lung cancer. *N Engl J Med* 265: 253-267, 1961.
6. Hammond, E.C., Garfinkel, L. Smoking habits of men and women. *J Natl Cancer Inst* 27: 419-442, 1961.
7. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Bronchial epithelium in former smokers. *N Engl J Med* 267: 119-125, 1962.
8. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Changes in bronchial epithelium in relation to sex, age, residence, smoking, pneumonia. *N Engl J Med* 267: 111-118, 1962.
9. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Changes in the tracheobronchial tree in connection with cigarette smoking. In: *Tobacco and Health*, G. James and T. Rosenthal (Editors). Springfield, IL: Charles C. Thomas, 1962, pp. 136-143.
10. Seidman, H., Garfinkel, L., Craig, L. Death rates in New York City by socioeconomic class and religious group, and by country of birth, 1949-1951. *Jewish J Soc* 4: 254-272, 1962.
11. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Smoking habits and age in relation to pulmonary changes. Rupture of alveolar septums, fibrosis and thickening of walls of small arteries and arterioles. *N Engl J Med* 269: 1045-1054, 1963.
12. Garfinkel, L. Several studies show higher death rates for smokers than for non-smokers. *Public Health News NJ Dept Health* 44: 211-214, 1963.
13. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Changes in bronchial epithelium in relation to smoking habits. *Acta-Unio Internationalis Contra Cancrum* XX(3): 732-737, 1964.
14. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Interrelationships among various histologic changes in bronchial tubes and in lung parenchyma. *Am Rev Resp Dis* 90: 867-876, 1964.
15. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Rauchen und Lungkrebs. *Fortschr Med* 82 JG., Nr. 11: 405-408, 1964.
16. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. The role of smoking in the development of lung cancer. *Proc 5th Nat Cancer Conf* 497-501, 1964.
17. Hammond, E.C., Garfinkel, L. Changes in cigarette smoking. *J Natl Cancer Inst* 33: 49-64, 1964.
18. Auerbach, O., Hammond, E.C., Garfinkel, L. Smoking in relation to atherosclerosis of the coronary arteries. *N Engl J Med* 273: 775-779, 1965.
19. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Histologic changes in the esophagus in relation to smoking habits. *Arch Environ Health* 2: 4-15, 1965.
20. Gellin, G.A., Kopf, A.W., Garfinkel, L. Basal cell epithelioma. *Arch Dermatol* 91: 38-45, 1965.

21. Lightstone, A.C., Kopf, A.W., Garfinkel, L. Diagnostic accuracy—a new approach to its evaluation. *Arch Derm* 91: 497-502, 1965.
22. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Histologic evidence of emphysema and other pulmonary changes in relation to smoking. *Post Med* 40: 95-100, 1966.
23. Hammond, E.C., Garfinkel, L. The influence of health on smoking habits. *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, 1966, pp. 269-285.
24. Auerbach, O., Hammond, E.C., Kirman, D., Stout, A.P., Garfinkel, L. Histologic changes in bronchial tubes of cigarette smoking dogs. *CA Cancer J Clin* 20: 2055-2066, 1967.
25. Auerbach, O., Kirman, D., Hammond, E.C., Garfinkel, L. Production of emphysema in dogs by cigarette smoking. *JAMA* 199: 241-246, 1967.
26. Auerbach, O., Stout, A.P., Hammond, E.C., Garfinkel, L. Multiple primary bronchial carcinoma. *Cancer* 20: 699-705, 1967.
27. Garfinkel, L. Changes in cigarette smoking habits among physicians, 1959-1965. *CA Cancer J Clin* 17(4): 193-195, 1967.
28. Lieb, N.D., Silverman, S.I., Garfinkel, L. An analysis of soft tissue contours of the lip in relation to the maxillary cusps. *J Prosthet Dent* 18: 292-303, 1967.
29. Auerbach, O., Hammond, E.C., Garfinkel, L. Thickening of walls of arterioles and small arteries in relation to age and smoking habits. *N Engl J Med* 278: 980-984, 1968.
30. Garfinkel, L. The association between cigarette smoking and coronary heart disease and other cardiovascular diseases. *Bull N Y Acad Med* 44: 1495-1501, 1968.
31. Hammond, E.C., Garfinkel L. Changes in cigarette smoking, 1959-1965. *Am J Public Health* 58: 30-45, 1968.
32. Hammond, E.C., Garfinkel, L. Coronary heart disease, stroke, and aortic aneurysm. *Arch Environ Health* 19: 167-182, 1969.
33. Auerbach, O., Hammond, E.C., Garfinkel, L. Histologic changes in the larynx in relation to smoking habits. *Cancer* 25: 82-104, 1970.
34. Hammond, E.C., Auerbach, O., Kirman, D., Garfinkel, L. Effects of cigarette smoking on dogs. I. Design of experiment, mortality and findings in lung parenchyma. II. Pulmonary neoplasms. *Arch Environ Health* 21: 740-768, 1970.
35. Stolman, L.P., Kopf, A.W., Garfinkel, L. Are palmar keratoses a sign of internal malignancy? *Arch Dermatol* 101: 52-55, 1970.
36. Hammond, E.C., Auerbach, O., Kirman, D., Garfinkel, L. Effects of cigarette smoking on dogs. *CA Cancer J Clin* 21: 78-94, 1971.
37. Hammond, E.C., Auerbach, O., Kirman, D., Garfinkel, L. Thickness of walls of myocardial arterioles in relation to smoking and age. Findings in men and dogs. *Arch Environ Health* 22: 20-27, 1971.
38. Hammond, E.C., Garfinkel, L., Seidman, H. Longevity of parents and grandparents in relation to coronary heart disease and associated variables. *Circulation* 43: 31-44, 1971.
39. Litvak, H., Silverman, S.I., Garfinkel, L. Oral stereognosis in dentulous and edentulous subjects. *J Prosthet Dent* 25(3): 139-151, 1971.
40. Auerbach, O., Hammond, E.C., Garfinkel, L., Benante, C. Relation of smoking and age to emphysema. Whole-lung section study. *N Engl J Med* 286: 853-857, 1972.
41. Kantor, M.E., Silverman, S.I., Garfinkel, L. Centric relation recording techniques—a comparative investigation. *J Prosthet Dent* 28: 593-600, 1972.

42. Calagna, L.J., Silverman, S.I., Garfinkel, L. Influence of neuro-muscular conditioning on centric relation registrations. *J Prosthet Dent* 30: 598-604, 1973.
43. Hoffman, J., Silverman, S.I., Garfinkel, L. Comparison of condylar position in centric relation and in centric occlusion in dentulous subjects. *J Prosthet Dent* 30: 582-588, 1973.
44. Mashberg, A., Morrissey, B., Garfinkel, L. A study of the appearance of early asymptomatic oral squamous cell carcinoma. *Cancer* 32: 1436-1445, 1973.
45. Auerbach, O., Hammond, E.C., Garfinkel, L. Relation of smoking and age to findings in lung parenchyma: A microscopic study. *Chest* 65: 29-35, 1974.
46. Garfinkel, L., Hammond, E.C. Breast cancer and hypertension. *The Lancet* 2: 1381, 1974.
47. Percy, C., Garfinkel, L., Krueger, D.E., Dolman, A.B. Apparent changes in cancer mortality, 1968. A study of the effects of the introduction of the Eighth Revision, International Classification of Diseases. *Public Health Rep* 89: 418-428, 1974.
48. Auerbach, O., Garfinkel, L., Parks, V.R. Histologic type of lung cancer in relation to smoking habits, year of diagnosis and sites of metastasis. *Chest* 67: 382-387, 1975.
49. Garfinkel, L. Research methodology: What the clinician should know. *CA Cancer J Clin* 25: 58-61, 1975.
50. Hammond, E.C., Garfinkel, L. Aspirin and coronary heart disease: Findings in a prospective study. *Br Med J* 1: 269-271, 1975.
51. Auerbach, O., Carter, H.W., Garfinkel, L., Hammond, E.C. Cigarette smoking and coronary artery disease. A macroscopic and microscopic study. *Chest* 70: 697-705, 1976.
52. Ehrenreich, T., Porush, T.G., Churg, J., Garfinkel, L., Glabman, S., Goldstein, M.H., Grishman, E., Yunis, S.L. Treatment of idiopathic membranous nephropathy. *N Engl J Med* 295: 741-746, 1976.
53. Garfinkel, L. Cigarette smoking among physicians and other health professionals, 1959-1972. *CA Cancer J Clin* 26: 373-375, 1976.
54. Garfinkel, L. Methodology for determining beneficial effect of less harmful cigarettes on lung cancer risk. *Proceedings of 3rd World Conference on Smoking and Health. Vol. 1, Modifying the Risk for the Smoker*. DHEW Publication No. 76-1221. Rockville, MD: U.S. Department of Health, Education and Welfare, 1976, pp. 119-124.
55. Hammond, E.C., Garfinkel, L., Seidman, H., Lew, E.A. "Tar" and nicotine content of cigarette smoke in relation to death rates. *Environ Res* 12: 263-274, 1976.
56. Light, J., Silverman, S.I., Garfinkel, L. The use of an intraoral training aid in the speech rehabilitation of laryngectomy patients. *J Prosthet Dent* 35(4): 430-440, 1976.
57. Silverman, S., Silverman, S.I., Silverman, B., Garfinkel, L. Self-image and its relation to denture acceptance. *J Prosthet Dent* 35: 131-141, 1976.
58. Auerbach, O., Hammond, E.C., Selikoff, I.J., Parks, V.R., Kaslow, H.D., Garfinkel, L. Asbestos bodies in lung parenchyma in relation to ingestion and inhalation of mineral fibers. *Environ Res* 14: 286-304, 1977.
59. Auerbach, O., Saccomanno, G., Kuschner, M., Brown, R.D., Garfinkel, L. Histologic findings in the tracheobronchial tree of uranium miners and non-miners with lung cancer. *Cancer* 42: 483-489, 1978.
60. Garfinkel, L. Benefits of stopping smoking. *Prevention and Detection of Cancer. Part I—Prevention*, Vol. 1. New York: Marcel Dekker, 1978, pp. 777-779.
61. Hammond, E.C., Garfinkel, L., Lew, E.A. Longevity, selective mortality and competitive risks in relation to chemical carcinogenesis. *Environ Res* 16: 153-173, 1978.

62. Mashberg, A., Garfinkel, L. Early diagnosis of oral cancer: The erythroplastic lesion in high risk areas. *CA Cancer J Clin* 28: 297-303, 1978.
63. Auerbach, O., Garfinkel, L., Parks, V.R. Scar cancer of the lung: Increase over a 21-year period. *Cancer* 43: 636-642, 1979.
64. Auerbach, O., Hammond, E.C., Garfinkel, L. Changes in bronchial epithelium in relation to cigarette smoking, 1955-1960 vs. 1970-1977. *N Engl J Med* 300: 381-386, 1979.
65. Garfinkel, L. Cardiovascular mortality and cigarette smoking. *World Smoking and Health* 4: 42-45, 1979.
66. Garfinkel, L. Changes in cigarette consumption of smokers in relation to changes in tar/nicotine content of cigarettes smoked. *Am J Public Health* 69: 1274-1276, 1979.
67. Garfinkel, L. Classification of data in research. *CA Cancer J Clin* 29: 2-5, 1979.
68. Hammond, E.C., Garfinkel, L., Selikoff, I.J., Nicholson, W.J. Mortality experience of residents in the neighborhood of an asbestos factory. *Ann N Y Acad Sci* 330: 417-422, 1979.
69. Kripke, D.F., Simons, R.N., Garfinkel, L., Hammond, E.C. Short and long sleep and sleeping pills. Is increased mortality associated? *Arch Gen Psychiatry* 36: 103-116, 1979.
70. Lew, E.A., Garfinkel, L. Variations in mortality by weight among 750,000 men and women. *J Chron Dis* 32: 536-576, 1979.
71. Rickert, R., Auerbach, O., Garfinkel, L., Hammond, E.C., Frasca, J.M. Adenomatous lesions of the large bowel. *Cancer* 43: 1847-1856, 1979.
72. Silling, G., Rauch, M.A., Pentel, L., Halberstadt, G., Garfinkel, L. The significance of cephalometrics in treatment planning. *Angle Ortho* 49: 259-262, 1979.
73. Auerbach, O., Conston, A., Garfinkel, L., Parks, V.R., Kaslow, H.D., Hammond, E.C. Presence of asbestos bodies in organs other than the lung. *Chest* 77: 133-137, 1980.
74. Auerbach, O., Garfinkel, L. Atherosclerosis and aneurysm of aorta in relation to smoking habits and age. *Chest* 78: 805-809, 1980.
75. Auerbach, O., Hammond, E.C., Garfinkel, L. Changes in bronchial epithelium: Then and now. In: *Banbury Report 3: A Safe Cigarette?* Cold Spring Harbor, NY: Cold Spring Harbor Laboratory, 1980, pp. 19-28.
76. Garfinkel, L. Cancer mortality in nonsmokers: Prospective study by the American Cancer Society. *J Natl Cancer Inst* 65: 1169-1173, 1980.
77. Garfinkel, L. Changes in number of cigarettes smoked compared to changes in tar and nicotine content over a 13-year period. In: *Banbury Report 3: A Safe Cigarette?* Cold Spring Harbor, NY: Cold Spring Harbor Laboratory, 1980, pp. 141-154.
78. Garfinkel, L. The impact of low tar/nicotine cigarettes. *World Smoking Health* 5: 4-8, 1980.
79. Garfinkel, L., Poindexter, C.E., Silverberg, E. Cancer in black Americans. *CA Cancer J Clin* 30(1): 39-44, 1980.
80. Hammond, E.C., Garfinkel, L. General air pollution and cancer in the United States. *Prev Med* 9: 206-211, 1980.
81. Phillips, R.L., Garfinkel, L., Kuzma, J.W., Beeson, W.L., Lotz, J., Brin, B. Mortality among California Seventh-Day Adventists for selected cancer sites. *J Natl Cancer Inst* 65: 1109-1114, 1980.
82. Auerbach, O., Garfinkel, L. Myocardial mural arterial fibrosis and cigarette smoking: A comparative study, 1955-1960 versus 1970-1977. *Bull N Y Acad Med* 57: 759-775, 1981.
83. Garfinkel, L. Time trends in lung cancer mortality among nonsmokers and a note on passive smoking. *J Natl Cancer Inst* 66(6): 1061-1066, 1981.
84. Garfinkel, L. A tribute to Harold S. Diehl, MD (1891-1973); changing patterns of smoking and disease. *CA Cancer J Clin* 31: 114-119, 1981.

85. Lee, P.N., Garfinkel, L. Mortality and type of cigarette smoked. *J Epid Community Health* 35: 16-22, 1981.
86. Mashberg, A., Garfinkel, L., Harris, S. Alcohol as a primary factor in oral squamous carcinoma. *CA Cancer J Clin* 31: 146-155, 1981.
87. Garfinkel, L., Sarokhan, B. Trends in brain cancer tumor mortality in the United States. *Ann N Y Acad Sci* 381: 1-5, 1982.
88. Auerbach, O., Garfinkel, L., Parks, V.R., Conston, A.S., Galdi, V.A., Joubert, L. Histologic type of lung cancer and asbestos exposure. *Cancer* 54: 3017-3021, 1984.
89. Garfinkel, L. Cigarette smoking and coronary heart disease in blacks: Comparison to whites in a prospective study. *Am Heart J* 108: 802-807, 1984.
90. Garfinkel, L. Passive smoking and cancer—American experience. *Prev Med* 13: 691-697, 1984.
91. Kripke, D.F., Garfinkel, L. Excess nocturnal deaths related to sleeping pill and tranquilizer use. *The Lancet* 1: 99, 1984.
92. Stellman, S.D., Garfinkel, L. Cancer mortality among woodworkers. *Am J Ind Med* 5: 343-357, 1984.
93. Garfinkel, L. Overweight and cancer. *Ann Intern Med* 103: 1034-1036, 1985.
94. Garfinkel, L. Selection, follow-up, and analysis in the American Cancer Society prospective studies. *Natl Cancer Inst Monogr* 67: 49-52, 1985.
95. Garfinkel, L., Auerbach, O., Joubert, L. Involuntary smoking and lung cancer: A case control study. *J Natl Cancer Inst* 75: 463-469, 1985.
96. Lew, E.A., Garfinkel, L. Mortality at age 65 and over in a middleclass population. *Trans Soc Act* 36: 257-295, 1985.
97. Auerbach, O., Garfinkel, L. Histologic changes in pancreas in relation to smoking and coffee-drinking habits. *Digest Dis Sci* 31: 1014-1020, 1986.
98. Garfinkel, L. Cancer epidemiology. In: *Fundamentals of Surgical Oncology*. R.J. McKenna and G.P. Murphy (Editors). New York: MacMillan, 1986, pp. 28-39.
99. Garfinkel, L. Overweight and mortality. *Cancer* 58: 1826-1829, 1986.
100. Garfinkel, L., Stellman, S.D. Cigarette smoking among physicians, dentists, and nurses. *CA Cancer J Clin* 36: 2-8, 1986.
101. Kuller, L.H., Garfinkel, L., Correa, P., Haley, N., Hoffman, D., Preston-Martin, S., Sandler, D. Contribution of passive smoking to respiratory cancer. *Environ Health Perspect* 70: 57-69, 1986.
102. Stellman, S.D., Garfinkel, L. Artificial sweetener use and one-year weight change among women. *Prev Med* 15: 195-202, 1986.
103. Stellman, S.D., Garfinkel, L. Smoking habits and tar levels in a new American Cancer Society prospective study of 1.2 million men and women. *J Natl Cancer Inst* 76: 1057-1063, 1986.
104. Garfinkel, L. Cancer clusters. *CA Cancer J Clin* 37: 20-25, 1987.
105. Lew, E.A., Garfinkel, L. Differences in mortality and longevity by sex, smoking habits and health status. *Trans Soc Act* 39: 19-37, 1987.
106. Boffetta, P., Stellman, S.D., Garfinkel, L. Diesel exhaust exposure and mortality among males in the American Cancer Society prospective study. *Am J Ind Med* 14: 408-415, 1988.
107. Garfinkel, L., Boffetta, P., Stellman, S.D. Alcohol and breast cancer: A cohort study. *Prev Med* 17: 686-693, 1988.
108. Garfinkel, L., Stellman, S.D. Mortality by relative weight and exercise. *Cancer* 62: 1844-1850, 1988.
109. Garfinkel, L., Stellman, S.D. Smoking and lung cancer in women: Findings in a prospective study. *Cancer Res* 48: 6951-6955, 1988.

110. Stellman, S.D., Boffetta, P., Garfinkel, L. Smoking habits of 800,000 American men and women in relation to their occupations. *Am J Ind Med* 13: 43-58, 1988.
111. Auerbach, O., Garfinkel, L. Histologic change in the urinary bladder in relation to cigarette smoking and use of artificial sweeteners. *Cancer* 64: 983-987, 1989.
112. Boffetta, P., Stellman, S.D., Garfinkel, L. A case-control study of multiple myeloma nested in the American Cancer Society prospective study. *Int J Cancer* 43: 554-559, 1989.
113. Garfinkel, L., La Verda, N. Dietary patterns in nurses. *Proceedings of the 5th National Conference on Cancer Nursing*. New York: American Cancer Society, 1989.
114. Stellman, S.D., Garfinkel, L. Lung cancer risk is proportional to cigarette tar yield: Evidence from a prospective study. *Prev Med* 18: 515-525, 1989.
115. Stellman, S.D., Garfinkel, L. Proportion of cancer deaths attributable to cigarette smoking in women. *Women Health* 15: 19-28, 1989.
116. Boffetta, P., Garfinkel, L. Alcohol drinking and mortality among men enrolled in an American Cancer Society prospective study. *Epidemiology* 1: 242-248, 1990.
117. Garfinkel, L. The environment and cancer. Putting the risks into perspective. (Editorial.) *CA Cancer J Clin* 40: 261-263, 1990.
118. Garfinkel, L., Boffetta, P. Association between smoking and leukemia in two American Cancer Society prospective studies. *Cancer* 65: 2356-2360, 1990.
119. Garfinkel, L., Boffetta, P. Smoking and estrogen-related studies. Data from American Cancer Society studies. In: *Smoking and Hormone-Related Disorders*, N. Wald and J. Baron (Editors). London: Oxford University Press, 1990.
120. Garfinkel, L., Silverberg, E. Lung cancer and smoking trends in the United States over the past 25 years. *Ann N Y Acad Sci* 609: 146-158, 1990.
121. Lew, E.A., Garfinkel, L. Cancer. In: *Medical Risks—Trends in Mortality by Age and Time Elapsed: A Reference Volume*, E.A. Lew and J. Gajewski. (Editors.) New York: Praeger, 1990.
122. Lew, E.A., Garfinkel, L. Mortality at ages 75 and older in the Cancer Prevention Study (CPS I). *CA Cancer J Clin* 40: 210-224, 1990.
123. Auerbach, O., Garfinkel, L. The changing pattern of lung carcinoma. *Cancer* 68: 1973-1977, 1991.
124. Garfinkel, L. Cancer statistics and trends. (Chapter 1.) In: *American Cancer Society Textbook of Clinical Oncology*, A.I. Holleb, D.J. Fink, and G.P. Murphy. (Editors.) Atlanta, GA: American Cancer Society, 1991, pp. 1-6.
125. Garfinkel, L. The epidemiology of cancer in black Americans. *Stat* 72: 11-17, 1991.
126. Garfinkel, L. Nutrition and cancer: Current status. (Editorial.) *CA Cancer J Clin* 41: 325-327, 1991.
127. Garfinkel, L., Silverberg, E. Lung cancer and smoking trends in the United States over the past 25 years. *CA Cancer J Clin* 41: 137-145, 1991.
128. Menck, H.R., Garfinkel, L., Dodd, G.D. Preliminary report of the National Cancer Data Base. *CA Cancer J Clin* 41: 7-18, 1991.
129. Boffetta, P., Mashberg, A., Winkelmann, R., Garfinkel, L. Carcinogenic effect of tobacco smoking and alcohol drinking on anatomic sites of the oral cavity and oropharynx. *Int J Cancer* 52: 530-533, 1992.
130. Istvan, J.A., Cunningham, T.W., Garfinkel, L. Cigarette smoking and body weight in the Cancer Prevention Study I. *Int J Epidemiol* 21: 849-853, 1992.
131. Lee, P.Y., Silverman, M.K., Rigel, D.S., Vossaert, K.A., Kopf, A.W., Bart, R.S., Garfinkel, L., Levenstein, M.J. Level of education and the risk of malignant melanoma. *J Am Acad Dermatol* 26: 59-63, 1992.

132. Thun, M.J., Calle, E.E., Namboodiri, M.M., Flanders, W.P., Coates, R.J., Byers, T., Boffetta, P., Garfinkel, L., Heath, C.W. Risk factors for fatal colon cancer in a large prospective study. *J Natl Cancer Inst* 84: 1491-1500, 1992.
133. Garfinkel, L. Current trends in breast cancer. (Editorial). *CA Cancer J Clin* 43: 5-6, 1993.
134. Garfinkel, L. The National Cancer Data Base: A cancer treatment resource. (Editorial.) *CA Cancer J Clin* 43: 69-70, 1993.
135. Mashberg, A., Boffetta, P., Winkelman, R., Garfinkel, L. Tobacco smoking, alcohol drinking and cancer of the oral cavity and oropharynx among U.S. veterans. *Cancer* 72: 1369-1375, 1993.
136. Smart, C.R., Hartman, W.H., Beahrs, O.H., Garfinkel, L. Insights into breast cancer screening of younger women. Evidence from the 14-year followup of the Breast Cancer Detection Demonstration Project. *Cancer* 72(Suppl): 1449-1456, 1993.
137. Garfinkel, L. Evaluating cancer statistics. (Editorial.) *CA Cancer J Clin* 44: 5-6, 1994.
138. Garfinkel, L., Boring, C.C., Heath, C.W., Jr. Changing trends. An overview of breast cancer incidence and mortality. *Cancer* 74: 222-227, 1994.
139. Garfinkel, L., Mushinski, M. Cancer incidence, mortality and survival: Trends in four leading sites. *Stat* 75: 19-27, 1994.
140. Garfinkel, L. Cancer statistics and trends. In: *American Cancer Society Textbook of Clinical Oncology, Second Edition*, G.P. Murphy, W. Lawrence, Jr., and R.E. Lenhard. (Editors.) Atlanta, GA: American Cancer Society, 1995, pp. 1-9.
141. Garfinkel, L. Perspectives on cancer prevention. *CA Cancer J Clin* 45: 5-7, 1995.
142. Garfinkel, L. Probability of developing or dying of cancer. United States, 1991. *Stat* 76: 31-37, 1995.
143. Pion, I.A., Rigel, D.S., Garfinkel, L., Silverman, M.K., Kopf, A.W. Occupation and the risk of melanoma. *Cancer* 75(Suppl): 637-644, 1995.

Contents

	Page
Foreword	iii
Preface	vii
Acknowledgments	xv
Publications List	xxvii
Chapter 1: Introduction, Summary, and Conclusions	1
Trends in Smoking Prevalence	2
Trends in Smoking Cessation	6
Disease Consequences of Smoking.....	6
Changes in Disease Risk Over Time	8
Cessation	9
Public Health Implications.....	10
References	11
Chapter 2: Cigarette Smoking Behavior in the United States	13
Introduction	13
Timing of Events Linked to Smoking Behavior	15
Methods	18
Results	22
Prevalence of Ever-Smoking, by Birth Cohort	22
Prevalence of Current Smoking, by Birth Cohort	29
Smoking Cessation Rates, by Birth Cohort	35
Discussion	40
References	41
Appendix A: Five-Year, Birth-Cohort-Specific Ever-Smoking and Current Smoking Prevalence and Cessation Rates, by Age and Calendar Year	43
Chapter 3: The American Cancer Society Cancer Prevention Study I: 12-Year Followup of 1 Million Men and Women	113
Introduction	113
Methods	113

Analysis of CPS-I Data Set	114
Results	129
Appendices	148
References	149
Appendix A: Cause-Specific Risk Ratio of Mortality for White Males and Females for All Causes of Death	151
Appendix B: Excess Mortality and Relative Risk (Rate Ratio) of Death for Current Smokers, by Duration, Number of Cigarettes Per Day, and Attained Age	171
Appendix C: Summary of Person-Years of Observation and Deaths, by Subject Group	293
Appendix D: Tables of Observed and Fitted Death Rates for Never-Smokers, by Sex and Age Group	301
Chapter 4: Trends in Tobacco Smoking and Mortality From Cigarette Use in Cancer Prevention Studies I (1959 through 1965) and II (1982 through 1988)	305
Introduction	305
Subjects and Methods.....	306
Results	310
Discussion	325
Conclusions	330
References	331
Acknowledgments	333
Appendices 1 Through 30	335
Chapter 5: Age and the Exposure-Response Relationships Between Cigarette Smoking and Premature Death in Cancer Prevention Study II	383
Introduction	383
Background and Issues Considered	384
Subjects and Methods.....	385
Results	388
Discussion	396
Conclusions	405

References	411
Acknowledgments	413
Appendices 1 Through 59	415
Chapter 6: Smoking and Mortality: The Kaiser Permanente Experience	477
Introduction	477
Study Population and Methods	477
Results	479
Comment	493
References	496
Acknowledgments	497
Appendix A: Portions of the Smoking Habit Questionnaire Used in This Study	499
Chapter 7: Former Cigarette Smoking and Mortality Among U.S. Veterans: A 26-Year Followup, 1954 to 1980	501
Introduction	501
Methods	502
Results	504
Discussion	519
References	526
Appendix A: Cause-of-Death Groups (ICD-7 [World Health Organization, 1957]) Used in SMR, Rate, and RR Analyses and in Kahn (1966) and Rogot and Murray (1980)	529
Chapter 8: Smoking Cessation and Decreased Risks of Total Mortality, Stroke, and Coronary Heart Disease Incidence Among Women: A Prospective Cohort Study	531
Introduction	531
Methods	533
Results	537
Discussion	556
Conclusions	561
References	562
Acknowledgments	565

Introduction, Summary, and Conclusions

David M. Burns, Lawrence Garfinkel, and Jonathan M. Samet

Cigarette smoking is the largest preventable cause of death and disability in developed countries and is a rapidly growing health problem in developing countries. The magnitude and nature of the risks associated with smoking can be estimated using data from prospective epidemiological studies of smokers and nonsmokers and information on smoking in the population. In 1966 the National Cancer Institute (NCI) published the monograph *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases* (Haenszel, 1966), which included detailed presentations of the information available up to that time from several large prospective mortality studies examining relationships between smoking behavior and disease. Since then, several new large prospective mortality studies have been initiated, and additional years of followup are available for analysis for some of the studies whose results were presented in 1966. This new information can be used to more sharply characterize the risks of smoking.

The goal of this monograph is to provide detailed presentations of disease risks caused by smoking using data from these more recent studies and the more extensive followup data available from the American Cancer Society (ACS) Cancer Prevention Study I (CPS-I). This volume also contains descriptions of the quantitative relationships between various aspects of smoking behavior and disease occurrence as well as detailed tabular data contained in various chapter appendixes. Appendix data are presented in greater detail than would be required by most readers to facilitate use of this volume as a resource by investigators attempting to model or control for the effects of smoking in other epidemiological studies.

Five major prospective epidemiological studies are featured in this volume. CPS-I and CPS-II each followed more than 1 million individuals, with findings on followup of 6 years for CPS-II and 12 years for CPS-I reported in this volume. Because these two studies were initiated more than 20 years apart, they afford the opportunity to examine changes in mortality risks for smokers and nonsmokers incomparable populations over time; the mortality experiences during the first 6 years of followup for both studies are compared in Chapter 4 of this volume.

The Dorn study of U.S. veterans (Kahn, 1966) has the longest duration of followup of the prospective mortality studies, but it lacks repeat measures of smoking status during the followup period. It groups smokers who continued to smoke during followup and those who quit during the followup interval. Because of this limitation, analyses of this study are most informative for disease risks after prolonged periods of abstinence from smoking (Chapter 7). The mortality experience after 26 years of followup of veterans who were former smokers at the start of the study is used to describe the magnitude of disease risks in former smokers compared to lifelong never-smokers.

The Kaiser Permanente Prospective Mortality study (Chapter 6) followed 60,000 individuals enrolled in the Kaiser Permanente Health Plan and included a large proportion of Asian and African-American participants. The Nurses' Health Study (Chapter 8) enrolled 121,700 female registered nurses in 1976 and provides detailed risk estimates for these females, particularly those of younger and middle age.

Detailed estimates of the changes in smoking status with age and calendar year for white and black males and females by 5-year birth cohorts also are presented (Chapter 2).

Considerable effort was made to standardize the presentation of data among the studies, but significant differences exist in ascertainment of smoking status and in reporting of duration of smoking in the analyses. All the analyses accrued deaths and person-years of observation (PYO's) into age groups defined by age of the subject at death or in the year of followup (age was advanced during followup) and assumed that smoking status remained unchanged from the last followup measure of smoking status (CPS-I [Chapter 3] and the Nurses' Health Study) or from entry into the study (CPS-II [Chapter 5], Kaiser Permanente, and veterans studies). Analyses of the American Cancer Society CPS-I and the Kaiser Permanente study accrued deaths and PYO's into duration-of-smoking groups defined by duration of smoking at death or at the year of followup (duration was advanced during followup), but only CPS-I had questionnaire validation of smoking status during followup. Analyses of CPS-II accrued deaths and PYO's into duration-of-smoking groups defined by duration of smoking at entry into the study (duration was not advanced during followup). The study of U.S. veterans (Chapter 7) and the Nurses' Health Study do not present analyses by duration of smoking.

Understanding the impact of cigarette smoking on disease occurrence requires estimates of both the risks and prevalence rates of smoking. This volume provides descriptions of smoking behavior over time during the past century as well as disease-specific mortality estimates from several large prospective mortality studies. The goal is to provide, in one volume, as much information as possible on smoking and mortality to facilitate understanding of smoking-induced disease.

TRENDS IN SMOKING PREVALENCE Cigarette smoking as a form of tobacco use has largely been a 20th century phenomenon. Before 1910 almost all tobacco was consumed in pipes and cigars or as chewing tobacco and snuff. Beginning in 1913 mass marketing efforts of Camel and other cigarette brands were followed by a rapid rise in the number of cigarettes sold. Cigarette smoking was predominantly a male behavior at that time, and among males, it increased dramatically during and subsequent to World War I. Smoking was relatively uncommon behavior among females until the 1930's. The increase in smoking among females also coincided with a major national advertising campaign. Lucky Strike's "Reach for a Lucky Instead of a Sweet" campaign was one of the first tobacco advertising campaign to directly target females.

The prevalence of current smoking among sequential 5-year birth cohorts of white males and white females is presented in Figures 1 and 2, respectively. A birth cohort consists of all individuals born during specific calendar years, and birth cohort analyses present the experience of those individuals as they age. Birth cohort analyses are presented in Figures 1 and 2 for 5-year birth cohorts of white males and females born between 1885 and 1969.

Differences in smoking behavior over time explain many of the differences in U.S. lung cancer death rates among white and black males and females. Lung cancer had been a rare disease at the turn of the century, but lung cancer death rates rose rapidly among males beginning in the 1930's, about 20 to 25 years after the upsurge of cigarette smoking among males. Figure 3 presents race- and gender-specific, age-adjusted U.S. lung cancer death rates for the calendar years 1950 to 1993. Male lung cancer rates continued to rise into the 1980's, whereas female lung cancer death rates began to increase sharply only in the late 1960's. A major reason for the temporal differences between male and female lung cancer rates relates to the differences in smoking behavior presented in Figures 1 and 2. Females did not initiate smoking in large numbers until the 1930's, 20 to 25 years after the upswing in prevalence among males. As expected, female lung cancer death rates did not begin to increase steeply until the late 1960's, about 20 to 30 years after the beginning of rapid increases in male lung cancer death rates.

Peak rates of smoking prevalence were much higher among males earlier in this century, consistent with the higher lung cancer rates among males across the country. Prevalence rates of smoking in all birth cohorts among white males have been declining since the late 1950's (Figure 1), which is probably the major reason for the leveling off and subsequent decline in male lung cancer death rates evident during the late 1980's (Figure 3) (20 to 25 years after cessation).

Black males born before 1915 and black females born before 1920 had lower rates of smoking initiation than white males and females. Blacks born later in the century had rates of smoking that equaled or exceeded those of whites. Current smoking prevalence among black males is substantially higher than among white males, reflecting both higher rates of initiation and lower rates of cessation.

Comparison of smoking prevalence rates for birth cohorts of white and black males shows a similar relationship between differences in smoking behavior and differences in white and black lung cancer death rates. Before 1950 most cohorts of white males had higher lung cancer rates than the comparable cohorts of black males. By 1965 the pattern had inverted, with most cohorts of white males having lower lung cancer rates than the comparable cohorts of black males. The expected differences between white and black male lung cancer death rates are evident in Figure 3. Before 1960 white male lung cancer death rates exceeded those for black males, but by the mid-1960's lung cancer death rates among black males began to exceed those for white males, and they are currently dramatically higher among black males.

Figure 1

Prevalence of current cigarette smoking by 5-year birth cohorts of white males

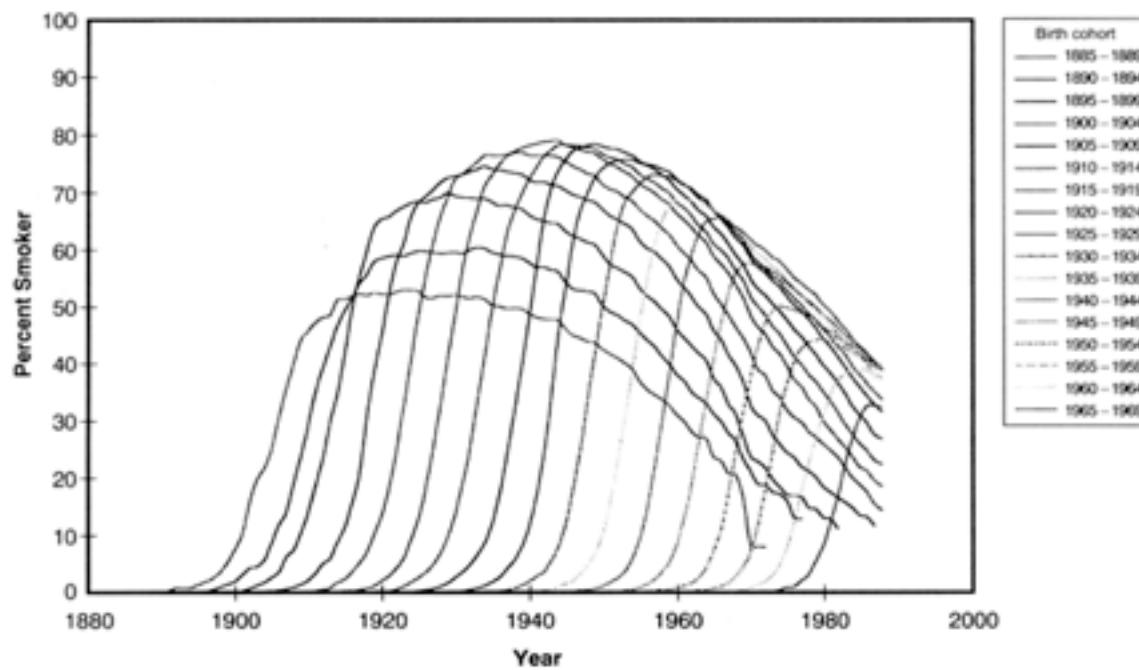


Figure 2

Prevalence of current cigarette smoking by 5-year birth cohorts of white females

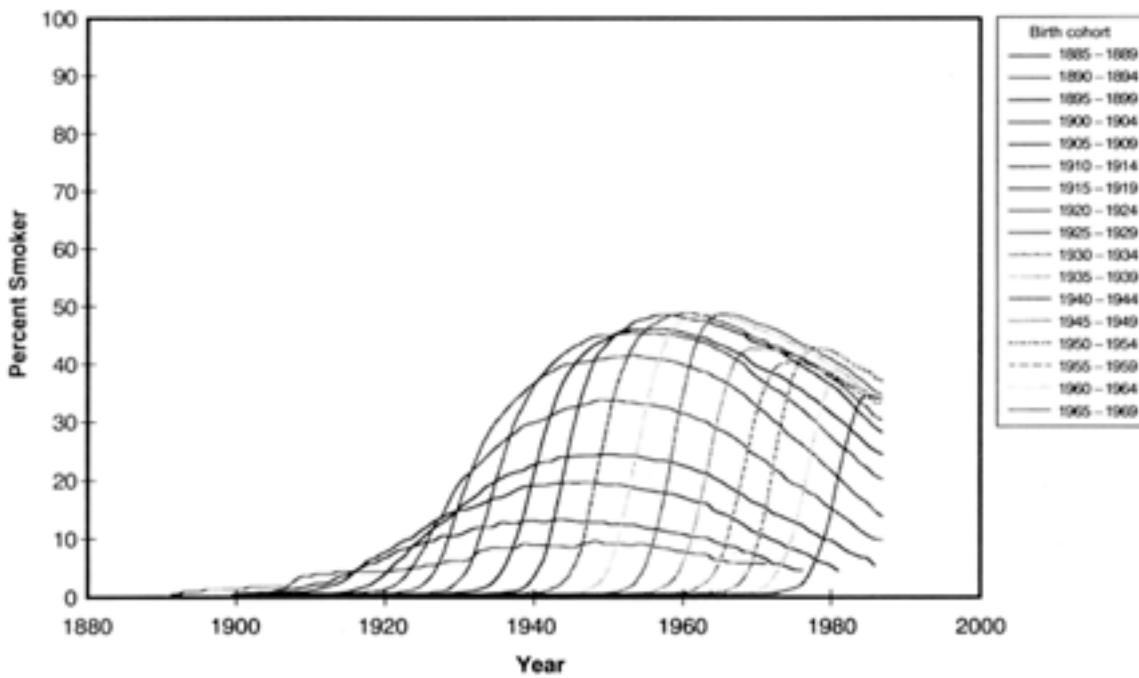
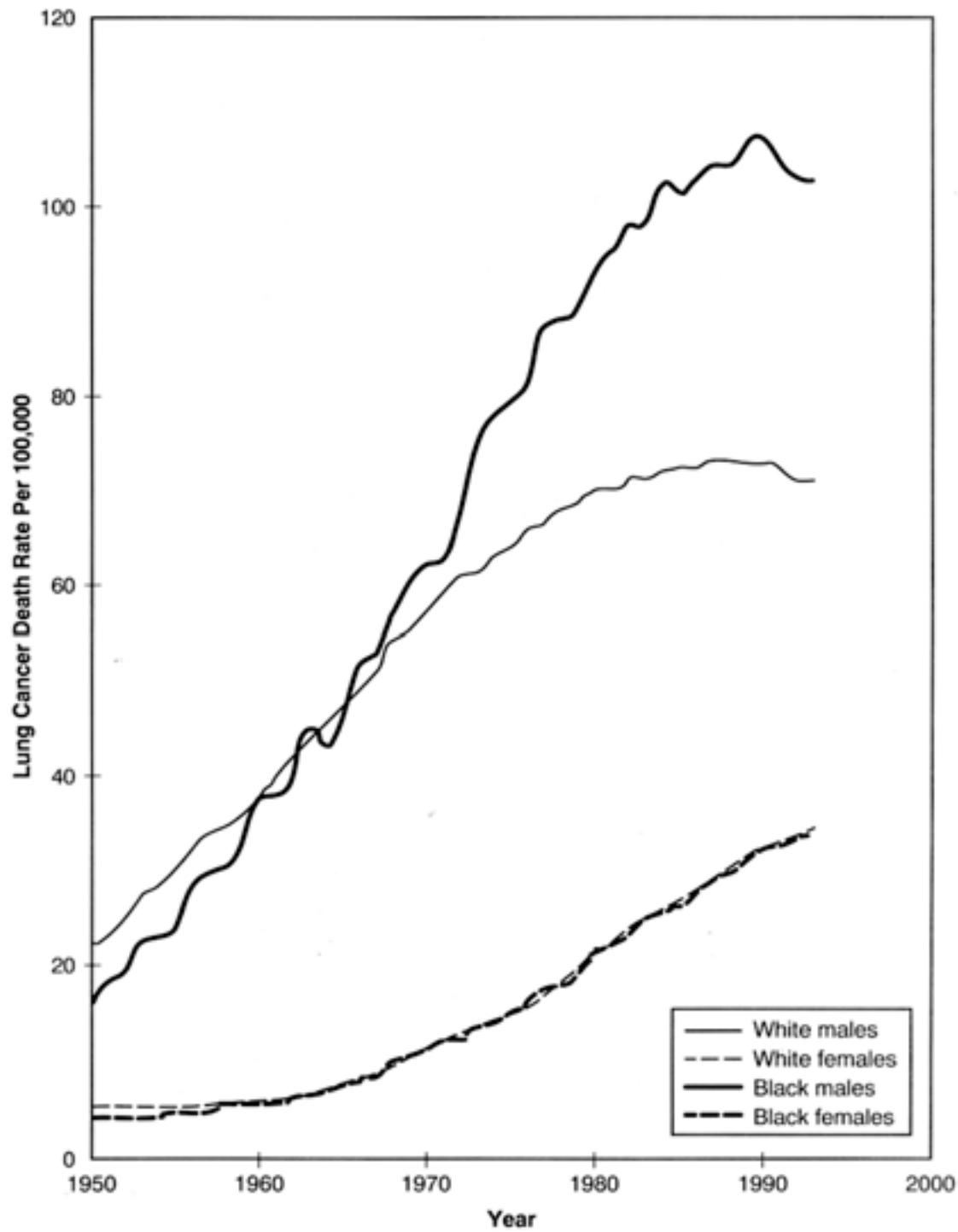


Figure 3
U.S. lung cancer death rates, 1950 to 1993

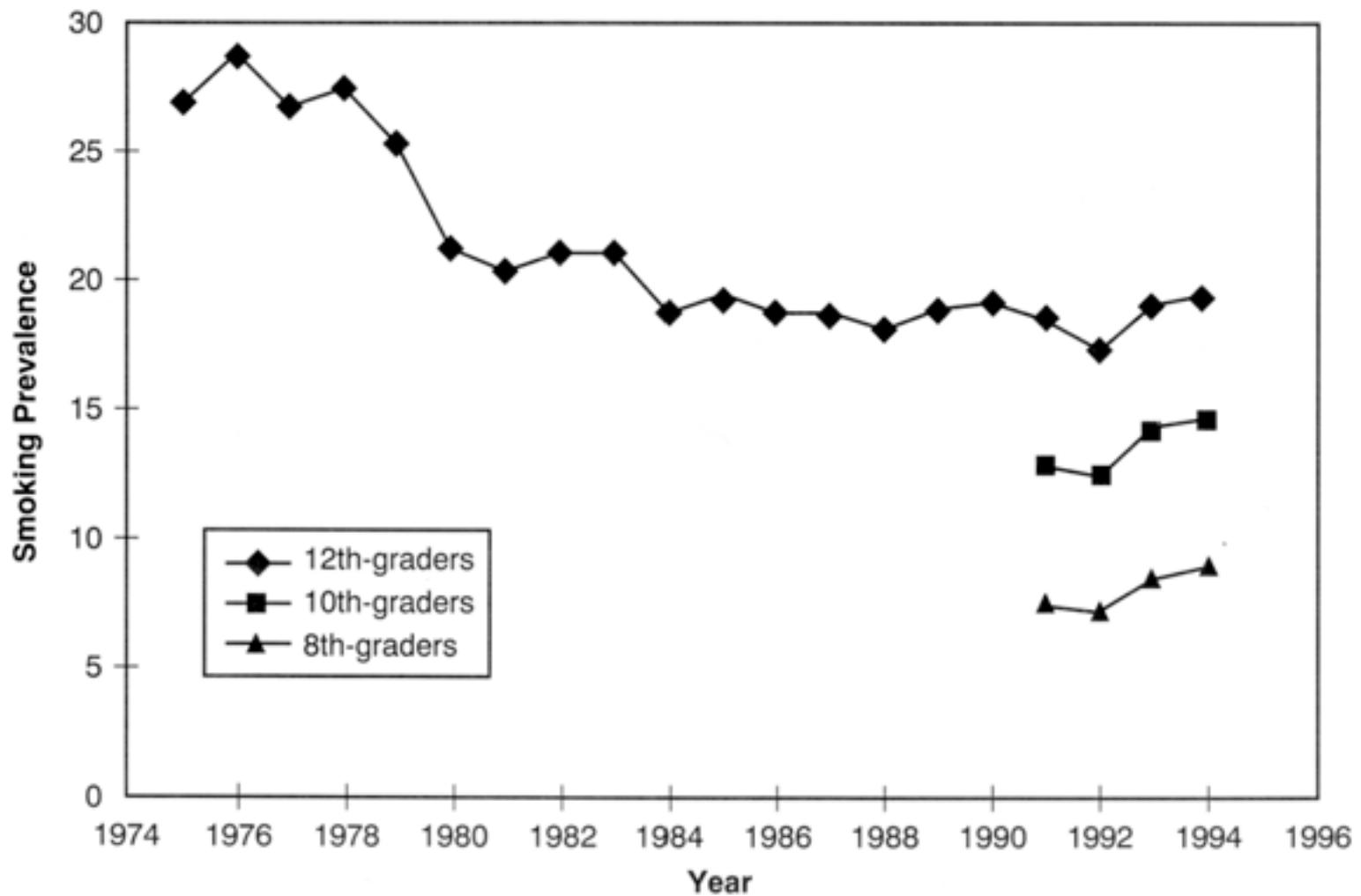


TRENDS IN SMOKING CESSATION Successful cessation of cigarette smoking was uncommon prior to 1950, probably due to the addictive nature of cigarette smoking and the lack of a widespread understanding that smoking caused disease. White males began to quit smoking during the mid 1950's, when the substantial disease risks associated with smoking were first widely publicized. A large increase in cessation occurred among males and females of both races during the years 1967 to 1970, which coincided with a substantial tobacco control effort by governmental and nongovernmental agencies concerned about public health as well as with a large counter-advertising campaign on television. Cessation rates declined slightly following 1970 and then increased in the late 1970's and early 1980's.

The 20th century has seen dramatic changes in both smoking initiation and smoking cessation, and these changes are responsible for the epidemic of disease among smokers documented in this volume. Changes in smoking behavior, and in male lung cancer incidence, suggest that we have reached the peak of the disease epidemic among males and may expect declining rates of smoking-induced disease in the future. There is some preliminary evidence that the lung cancer rate was decreased between 1990 and 1995 (Cole and Rodu, 1996). The pattern of smoking behavior and the increasing rates of lung cancer among females suggest that the peak rates of disease among females are yet to be reached; ultimately, however, mortality rates among females also should decline, as they have among females younger than age 45 (Ries et.al., 1994). The projected future decline in disease is not inevitable; it is dependent on continued success in achieving cessation and preventing initiation. Recent data on the prevalence of smoking among high school seniors, as well as among 8th- and 10th-graders, are presented in Figure 4; they suggest that rates of smoking initiation may once again be rising. Recent national adult prevalence data (Centers for Disease Control and Prevention, 1996) also suggest that the decline in adult smoking prevalence may have stopped and that smoking may be increasing even among adults. These trends are of enormous public health concern, and they could eliminate any future decreases in disease-specific death rates.

DISEASE CONSEQUENCES OF SMOKING The disease consequences of smoking are well documented in reports of the Surgeon General (U.S. Department of Health and Human Services, 1989 and 1990) and in a previous NCI monograph (Haenszel, 1966). This volume updates many of these findings and provides a more comprehensive understanding of the relationships among age, number of cigarettes smoked per day, duration of smoking, and duration of cessation in causation of disease. Estimates based on data from CPS-II demonstrate that 52 percent of deaths from all causes among male current smokers are attributable to cigarette smoking. Among female current smokers, 43 percent of deaths from all causes are attributable to smoking. If overall relative risks for all causes of death for current smokers, former smokers, and never-smokers from CPS-II are used to estimate the smoking-attributable fraction for the entire U.S. population older than age 35, the smoking prevalence rates in 1993 would generate smoking-attributable

Figure 4
Prevalence of daily cigarette smoking among 8th-, 10th-, and 12th-grade students, 1975 to 1994



percentages of 35.25 percent for all male deaths and 21.00 percent for all female deaths. This translates into approximately 569,000 excess deaths in 1993, 354,000 among males and 216,000 deaths among females.

These estimates are higher than those calculated using disease-specific relative risks and number of deaths for each cause of death. For example, the American Cancer Society estimates a total of 419,000 each year. They may overestimate the number of deaths because they include both causes of death for which smoking is synergistic with other factors in causing disease and diseases for which the association of smoking and disease is not causal (e.g., cirrhosis of the liver) and because they are based on the age distribution of the living population rather than the deaths. On the other hand, estimates derived from counts of specific causes of death ignore the contribution of smoking to overall poor health status. Poor general health may compromise survival for a broad range of diseases, including those not caused by cigarette smoking, and may limit the treatment options available for the patient. The excess deaths that result from poor health status would be excluded from estimates based only on those diseases caused by smoking. It is also possible that smoking makes small causal contributions to a variety of diseases other than those usually listed as caused by smoking. These small contributions might be difficult to identify in disease-specific epidemiologic analyses but would contribute to the all-cause mortality.

It is likely that the true contribution of smoking to overall mortality lies somewhere between the numbers generated by these two estimation techniques. Clearly, tobacco is a dominant causal factor for a wide variety of diseases and needs to be a principal focus for disease prevention efforts among cigarette smokers.

Excess rates of disease caused by cigarette smoking vary with a smoker's age, the number of cigarettes smoked per day, and the duration of smoking. Early age of initiation results in a longer duration of smoking at any given age. However, there is little evidence from the 12-year followup of CPS-I that early initiation results in an increase in lung cancer risk, independent of its contribution to duration of smoking. The excess risk of specific diseases among smokers also varies with age of the smoker. Among younger smokers, the largest excess disease risk results from coronary heart disease (CHD), with a rapid rise in excess lung cancer death rates developing after the smoker reaches age 55. Excess death rates from chronic obstructive pulmonary disease (COPD) rise even later, increasing dramatically after age 65.

CHANGES IN DISEASE RISK OVER TIME U.S. death rates for CHD, COPD, and lung cancer have changed dramatically over the past 40 years and vary substantially between males and females. As was discussed earlier, much of the difference between male and female lung cancer death rates can be explained by differences in smoking behaviors. A similar pattern of male and female death is also observed for COPD. Women began to smoke in large numbers later in the century than men; therefore, they have shorter average durations of smoking at any given age than men. In addition, they tend to smoke fewer cigarettes per day and are more likely to use filtered or

low-tar and -nicotine cigarettes. However, lung cancer rates among white females in CPS-I are lower than those of white males, even when stratified by number of cigarettes smoked per day and duration of smoking. This suggests that factors other than number of cigarettes per day and duration of smoking play a role in the differences between male and female lung cancer death rates. These factors may include differences in pattern of inhalation or type of cigarette smoked as well as other factors.

One of the major changes in cause of death over the past 40 years is the decline in deaths from CHD. Substantial changes in cigarette smoking, diet, and treatment of high blood pressure have occurred during this period, which are likely to be directly related to the decline in CHD deaths. Comparison of the CHD death rates in CPS-I and CPS-II (studies begun more than 20 years apart) reveals that CHD death rates declined between CPS-I and CPS-II among both current smokers and never-smokers. The temporal trend was so large that smokers in CPS-II had lower CHD death rates than lifelong never-smokers in CPS-I. However, the fall in CHD death rates between the two studies was slightly larger in proportionate terms among never-smokers than among current smokers.

Age-adjusted death rates for lung cancer increased dramatically between CPS-I and CPS-II among both male and female smokers. Rates for never-smokers changed little between the two studies. The dramatic changes in birth-cohort-specific smoking behavior among white females over time would be expected to result in these differences between the two studies among females. Careful examination of differences between the smoking behaviors of males in the two studies also suggests that much of the difference between male lung cancer death rates can be explained by differences between the smoking behaviors of males in the two studies. However, when age-, duration-of-smoking-, and cigarettes-per-day-specific strata are compared, lung cancer death rates for male smokers of 20 cigarettes per day who have smoked for more than 40 years are higher in CPS-II than in CPS-I.

These changes over time in the relative risks of death for smokers compared to never-smokers also have been reported for another large prospective mortality study, the British Doctors study. The results of 40 years of followup of these physicians (Doll et al., 1994) reveal that relative risks for all-cause mortality among smokers ages 45 to 64 years compared to never-smokers of the same ages increased threefold when the last 20 years of followup were compared with the first 20 years. A similar twofold increase was found for those ages 65 to 84.

CESSATION One of the principal goals of tobacco control efforts is mitigation of the disease consequences of cigarette smoking through promoting smoking cessation. New data on disease risks following cessation of smoking are presented in this volume, and those data reinforce our existing knowledge (U.S. Department of Health and Human Services, 1990) that smoking cessation dramatically reduces the risk of smoking-related illness in comparison with the risks for the continuing smoker.

Timing of this alteration in risk differs with different disease processes. The relative risk of death from CHD among former smokers in the CPS-I, Kaiser Permanente study, U.S. veterans study, and Nurses' Health Study populations approximates that of never-smokers once the smoker has been tobacco-free for 15 or more years. For shorter periods following cessation, the relative risk of CHD death is elevated but declines as the duration following cessation grows longer. In the U.S. veterans study, a small but statistically significant elevated relative risk (RR = 1.1) persisted among former smokers, even using the longest followup period (26 to 36 years).

The relative risk of death from lung cancer is essentially unchanged for the first 5 years following cessation, probably reflecting the long period between carcinogenic transformation of an individual cell and the death that results due to growth or metastatic spread of the lung cancer. Relative risk declines steadily over the period from 5 to 20 years following cessation. However, in contrast to CHD, the risk of death from lung cancer among former smokers remains elevated above that of never-smokers among the U.S. veterans, Kaiser Permanente, and CPS-I study populations, even 20 or more years following cessation.

Changes in relative risk of death from COPD following cessation mimic those for lung cancer. There is a slow decline in risk among former smokers compared to continuing smokers, but an increased risk persists among former smokers in comparison to never-smokers even 20 or more years following cessation.

PUBLIC HEALTH IMPLICATIONS Data in this monograph describe the enormous disease burden produced by cigarette smoking. The best way to entirely avoid the disease consequences of smoking is to never start smoking. Prevention of smoking initiation has been a major focus of tobacco control efforts, and these efforts have resulted in a substantial reduction in the proportion of adolescents and young adults who become cigarette smokers. As these younger individuals age, the disease burden produced by tobacco among their cohorts also will fall.

However, the vast majority of tobacco-related diseases occur among older individuals, and large numbers of these older individuals are either current or former smokers. Reduction in disease rates among current smokers is best achieved through cessation, and since the mid-1960's substantial increases in cessation rates among smokers have resulted in more than half of the ever-smokers in the United States becoming former smokers. Translation of this achievement in cessation into reductions in disease-specific death rates is slow but will accelerate as larger numbers of the older population become former smokers of long duration. Early evidence of this effect is reflected in the decline in CHD deaths over the past few decades and the more recent suggestion that white male lung cancer incidence and death rates have leveled off and begun to decline.

However, even if everyone who is currently smoking were to quit and no new smokers were to begin, the data presented in this volume suggest

that a substantial burden of smoking-caused disease would persist for the next several decades because of the residual lung cancer and COPD risks that exist for long-term former smokers. The difference between the current enormous number of deaths caused by smoking and this residual disease burden is a disease prevention goal potentially achievable through comprehensive tobacco control programs.

REFERENCES

- Centers for Disease Control and Prevention. Cigarette smoking among adults—United States, 1994. *MMWR. Morbidity and Mortality Weekly Report* 45(27): 588-590, 1996.
- Cole, P., Rodu, B. Declining cancer mortality in the United States. *Cancer*, 78(10).2045-2048, 1996
- Doll, R.; Peto, R.; Wheatley, K.; Gray, R.; Sutherland, I. Mortality in relation to smoking: 40 years' observations on male British doctors. *British Medical Journal* 309(6959): 901-911, 1994.
- Haenszel, W. (Editor). *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*. National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966.
- Kahn, H.A. The Dorn study of smoking and mortality among U.S. veterans: Report on eight and one-half years of observation. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 1-125.
- Ries, L.A., Miller, B.A., Hankey, B.F., Kosary, C.L. Harras, A., Edwards, B.K. (Editors). *SEER Cancer Statistics Review, 1973-1991: Tables and Graphs*. NIH Publication No. 94-2789. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute, 1994.
- U.S. Department of Health and Human Services. *Reducing the Health Consequences of Smoking: 25 years of Progress. A Report of the Surgeon General*, 1989. DHHS Publication No. (CDC) 89-8411. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1989.
- U.S. Department of Health and Human Services. *The Health Benefits of Smoking Cessation: A Report of the Surgeon General*, 1990. DHHS Publication No. (CDC) 90-8416. Rockville, MD: 1990. U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1990.

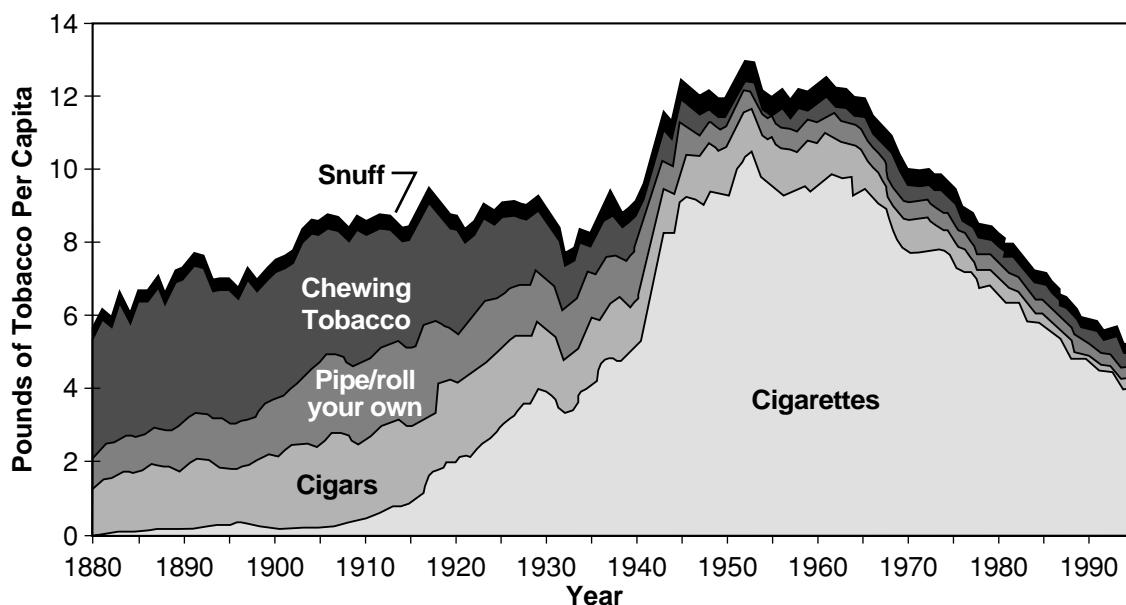
Cigarette Smoking Behavior in the United States

David M. Burns, Lora Lee, Larry Z. Shen, Elizabeth Gilpin, H. Dennis Tolley, Jerry Vaughn, and Thomas G. Shanks

INTRODUCTION Native Americans were using tobacco products in the Americas prior to the arrival of Columbus. Tobacco was commonly used in the American colonies and subsequently in the United States as chewing tobacco and snuff and in pipes and cigars during the 18th and 19th centuries. However, widespread use of tobacco in cigarettes is more recent, occurring largely during the 20th century. Figure 1 presents the per capita use of tobacco used in the United States as different product types during the past 115 years. Figure 2 shows total and per capita consumption of cigarettes from 1900 to 1995. There have been substantial changes in the use of tobacco products over time, with a shift toward cigarettes and away from other forms of tobacco. A dramatic rise and fall in the per capita and total number of cigarettes smoked also has occurred in the past century.

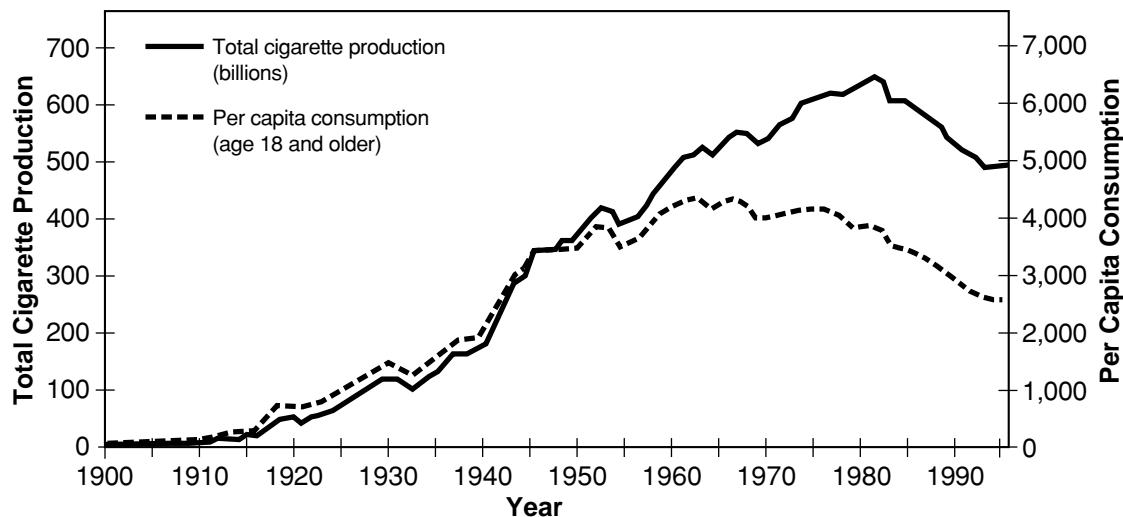
Cross-sectional surveys of the U.S. population reveal differences in smoking prevalence among various demographic categories (U.S. Department of Health and Human Services, 1989a). Males have a higher prevalence of

Figure 1
Per capita consumption of different forms of tobacco in the United States, 1880-1995



Source: U.S. Department of Agriculture, 1996.

Figure 2

Total and per capita cigarette consumption in the United States, 1900-1995

Source: U.S. Department of Agriculture, 1996.

smoking than females (U.S. Department of Health and Human Services, 1980; Centers for Disease Control and Prevention, 1994); there are differences in smoking prevalence among different age and racial groups; and smoking prevalence and cessation vary with educational attainment (Pierce et al., 1989). Differences in smoking prevalence among racial, gender, and age groups have also changed over time. Men began smoking in large numbers earlier in this century than women (U.S. Department of Health and Human Services, 1980; Harris, 1983), and differences among racial groups also have varied over time (Tolley et al. 1991; U.S. Department of Health and Human Services, 1986; Harris, 1983). Patterns of smoking prevalence, initiation, and cessation vary across racial, gender, and age categories and are different for individuals born in different years.

Differences in smoking behavior by year of birth make interpretation of age-specific estimates from multiple cross-sectional samples over time difficult and often confusing. A given age group in cross-sectional surveys done at different points in time will contain individuals who were born in different years. Changes in smoking behaviors within the specified age group over time may be produced by either temporal (calendar year) or cohort (year-of-birth) effects. Analyses in this chapter are presented by race- and gender-specific 5-year birth cohorts. A birth cohort comprises individuals born during specific calendar years (5-year groups in this presentation) and followed as they age. Birth cohort analyses presented in this chapter describe changes in smoking behavior among groups of individuals born during the same calendar years as they advance in age. This format presents a more accurate picture of the life history of smoking than can be derived from examination of differences in smoking behavior among different age groups in single or

multiple independent, cross-sectional samples of the population. Cross-sectional surveys describe smoking behaviors for specific age groups. Because changes in smoking behavior across age groups in a single study may be produced by either calendar year or year-of-birth effects, it is not valid to assume that differences in age-specific rates in a single study are attributable to age alone. Multiple cross-sectional studies define changes in age-specific rates at different points in time, but the difference in age-specific rates may be due to temporal (calendar year) effects or to age-specific rates in surveys done in different years that represent different birth cohorts. These different cohorts may have had different rates of smoking initiation and cessation and therefore wind up with different rates of smoking prevalence independent of changes relating to calendar year, which makes interpreting changes in age-specific smoking prevalences across multiple survey years difficult. Presentation of smoking behavior in multiple birth cohorts over time allows separation of calendar year trends from changes associated with aging.

Prevalence of smoking, duration of smoking, and number of cigarettes smoked per day are powerful predictors of the tobacco-related diseases described in other chapters of this monograph (U.S. Department of Health and Human Services, 1982, 1983, 1984, 1989a, and 1990). This chapter describes changes in smoking prevalence, initiation, and cessation for the U.S. population during approximately the past 115 years. The description is based on a pooling of data from the National Health Interview Surveys (NHIS) conducted between 1965 and 1991, which asked questions on smoking behavior.

**TIMING OF EVENTS
LINKED TO SMOKING
BEHAVIOR** Smoking behaviors for the birth cohorts presented in this chapter have been profoundly influenced by events and trends in the larger social environment within which smoking occurs (Burns, 1991) as well as by the addictive properties of cigarettes acting within the psychologic and physiologic structure of the individual (U.S. Department of Health and Human Services, 1988). Interpretation of the data on smoking behavior presented in this chapter requires an understanding of the social and political contexts within which smoking developed and which have led smokers to quit. Some of the events that influenced smoking behavior are listed in Table 1.

Cigarette smoking as a form of tobacco use was uncommon prior to 1900 (Figure 1). Per capita consumption of cigarettes in the United States was 54 in 1900 (U.S. Department of Health and Human Services, 1989a) compared with its peak of 4,345 in 1963 (Figure 2). Conversion of tobacco use from pipes, cigars, and chewing tobacco to cigarettes was enabled by the invention of machines that could mass produce cigarettes, eliminating the need for hand rolling, and by the development of safety matches that allowed a convenient, portable means of lighting cigarettes (Whelan, 1984). However, the real growth in cigarette sales occurred after advertising and mass marketing techniques were applied to cigarettes during the second decade of this century. The remarkable growth in sales of Camel cigarettes after a national promotional campaign in 1913 established the power of advertising

Table 1
Temporal events influencing cigarette use

Date	Event	Reference
1884	Invention of a machine to manufacture cigarettes	Whelan, 1984
1889	Invention of safety matches	Whelan, 1984
1913	Introduction and mass marketing of Camel brand cigarettes by R.J. Reynolds Tobacco Company	Burrough and Helyar, 1990
1914-18	World War I	
1928	Introduction of cigarette advertisements targeting women, including the "Reach for a Lucky Instead of a Sweet" campaign	Burns, 1994 Health Advocacy Center, 1986
1929	Beginning of the Great Depression in the United States	
1941-45	United States involvement in World War II	
1950	Publication of retrospective studies linking tobacco and disease	U.S. Department of Health and Human Services, 1989a
1954	Publication of prospective mortality studies linking cigarettes and lung cancer	U.S. Department of Health and Human Services, 1989a
1955	Marketing of filtered cigarettes	U.S. Department of Health and Human Services, 1981
1956	Founding of the Council for Tobacco Research	Freedman and Cohen, 1993
1964	Release of the U.S. Surgeon General's report on smoking and health	U.S. Department of Health, Education, and Welfare, 1964
1967-70	Counteradvertising on television	Warner, 1977
1968	Introduction of Virginia Slims and other brands targeted at women	Burns, 1994
1970	Cigarette advertisements banned from television; end of free time for counteradvertisements	U.S. Department of Health and Human Services, 1989a
1970	Nonsmokers' rights movement begins	Steinfeld, 1972
1983	Increase in the Federal excise tax on cigarettes by 8 cents	Burns, 1991
1986	Release of U.S. Surgeon General's report on involuntary smoking	U.S. Department of Health and Human Services, 1986
1992	Release of the U.S. Environmental Protection Agency report on environmental tobacco smoke	U.S. Environmental Protection Agency, 1992

in promoting sales (Burrough and Helyar, 1990). It set the stage for mass marketing of other brands of cigarettes and for a dramatic jump in cigarette use during the next several decades (Burrough and Helyar, 1990). Initially, cigarette marketing targeted males, but in the 1930's, advertising campaigns directed toward women began to appear (Health Advocacy Center, 1986). The most notorious of these campaigns was the "Reach for a Lucky Instead of a Sweet" series of advertisements that began a marketing theme linking cigarette smoking to weight control, a campaign that continues with other brands of cigarettes to this day (Health Advocacy Center, 1986; Burns, 1994).

Dramatic changes have occurred in per capita consumption of cigarettes during each of the World Wars, with mobilization of many men into the military during both wars and mobilization of women into the war industries during World War II. Gen. John J. Pershing is reported to have requested tobacco for his troops, and cigarettes were made part of the daily ration in 1918 (Whelan, 1984). Marketing and free distribution of cigarettes to military personnel during the Second World War is likely to have played a prominent role in generating the high prevalences (approximately 80 percent) of ever-smoking (smoking at least 100 cigarettes in a lifetime) among those cohorts of males who were of the correct ages to have served in the military during World War II (Burns, 1991).

Concern among members of the scientific community that cigarette smoking caused disease grew with the publication of retrospective epidemiologic studies of lung cancer in the late 1940's and early 1950's. The first major prospective mortality studies defining the disease risks of smoking cigarettes were published and widely disseminated through the lay press during the mid-1950's (U.S. Department of Health and Human Services, 1989a). Initial public health sector response to this knowledge included a public information campaign and development of smoking cessation interventions for individuals (Burns, 1991). The tobacco industry's response was creation of the Council for Tobacco Research (Freedman and Cohen, 1993), which legitimized the tobacco industry's media campaign to confuse the public about the strength of the scientific evidence linking cigarette smoking and disease (Whelan, 1984; Burns, 1994). At the same time, cigarette companies introduced and marketed filter cigarettes and low-tar-and-nicotine-yield cigarettes to counter growing health concerns among smokers (U.S. Department of Health and Human Services, 1981; Burns, 1994).

On June 2, 1967, the Federal Communications Commission required that significant amounts of free air time be made available for antismoking commercials to balance the cigarette advertisements on television and radio (U.S. Department of Health and Human Services, 1989a). As a result, from 1967 to 1970, many antismoking television spots were broadcast free by the major television networks. The time allotted for the spots was worth approximately \$75 million per year in 1970 dollars (Lydon, 1970). Substantial tobacco control efforts were also made by voluntary health agencies and other concerned groups during these years (U.S. Department

of Health and Human Services, 1989a; Burns, 1991). Cigarette advertising was banned from television and radio in 1970, and the number of antismoking spots broadcast declined by an estimated 80 percent (Lewit et al., 1981). The effectiveness of this antitobacco advertising is supported by decreases in U.S. per capita consumption between 1967 and 1970, the period of the most intense broadcast activity (Hamilton, 1972; Warner, 1977 and 1989; Doron, 1979; Fugii, 1980; Schneider et al., 1981; Warner, 1981; Baltagi and Levin, 1986) (Figure 2). Per capita consumption declined 6.9 percent between 1967 and 1970 in contrast to a 2-percent increase during the years immediately preceding the media campaign (1965-1967). When cigarette advertising was banned from broadcast media after 1970, antismoking spots also were removed, and a variety of other social changes that might have influenced smoking also occurred; per capita consumption increased 4.1 percent from 1971 to 1973 (Warner, 1977; U.S. Department of Agriculture, 1994). Evidence for an overall effect of all antitobacco activities over the past three decades also has been presented by Warner and Murt (1983) and Warner (1989), particularly in relation to the prevalence they projected would have been found if earlier birth cohort trends in smoking behavior had persisted.

Concerns about exposure to environmental tobacco smoke (ETS) and the social acceptability of smoking surfaced about 1970 (Steinfeld, 1972) and grew rapidly in the 1970's and early 1980's (U.S. Department of Health and Human Services, 1986). These concerns were reinforced with the demonstration of a causal link between ETS and lung cancer in the mid-1980's (U.S. Department of Health and Human Services, 1986; U.S. Environmental Protection Agency, 1992).

METHODS The National Center for Health Statistics, through the annual National Health Interview Survey, has collected health information since 1964 from a probability sample of the civilian, noninstitutionalized population of the United States. Since 1965, a section on tobacco use has been included in the survey. We have combined all the NHIS surveys that have questions about smoking behavior into a single data set for the analyses presented below. Individual surveys represent cross-sectional samples of the U.S. population at different times, have different sample sizes, and have different sets of questions on smoking behavior.

Background Material Concerning National Health Interview Surveys Smoking supplements to the NHIS were undertaken during 15 calendar years: 1965, 1966, 1970, 1974, 1976, 1977, 1978, 1979, 1980, 1983, 1985, 1987, 1988, 1990, and 1991. The sampling methods for these surveys change every decade, and details concerning the survey methodology are reported elsewhere (Fiore et al., 1989; U.S. Department of Health and Human Services, 1989b). Ever-smokers were defined as those who had smoked at least 100 cigarettes in their lifetime. Surveys before 1974 included smoking information on all adult members of a household, collected from a single adult from the same household; however, in 1974 and later, smoking information was collected from a randomly selected member of the household, with the survey

undertaken by telephone if the person was not present during the initial household interview. The 1965, 1966, and 1970 surveys included data from self-respondents and proxy respondents. Although there were differences in the demographic characteristics of both types of respondents, an analysis of the 1970 data showed that the smoking prevalence of self-respondents in 1970 was consistent with the prevalence obtained for the same demographic subgroup in the more representative self-respondent survey of 1974.

Accordingly, we limit our analysis to only the self-report data from the 1970 and earlier surveys. Since 1984, the sampling frame has included an oversampling for blacks so that more precise estimates can be made about this minority population (U.S. Department of Health and Human Services, 1989b). For our analysis we have included only adults age 20 and older so that the age range of the sample is uniform across all survey years. Sample sizes varied between 10,000 and 90,000 adults, and each survey included questions on smoking behavior. Birth year, a data element present for every respondent, was used to categorize each respondent into one of seventeen 5-year birth cohorts (1885-1889, 1890-1894, 1895-1899, 1900-1904, 1905-1909, 1910-1914, 1915-1919, 1920-1924, 1925-1929, 1930-1934, 1935-1939, 1940-1944, 1945-1949, 1950-1954, 1955-1959, 1960-1964, 1965-1969).

The total number of observations available for analysis is 460,254.

Comparability of the Distribution of Age of Initiation Across Survey Years We examined distribution of age of initiation for individual birth cohorts measured in different surveys conducted across a 20-calendar-year span and found no statistically significant differences in the distributions, allowing us to combine the distributions of age of initiation for individual birth cohorts across all the surveys that contained initiation data.

Smoking Initiation Six surveys (1970, 1978, 1979, 1980, 1987, and 1988) asked all ever-smokers the question, "How old were you when you began to smoke cigarettes fairly regularly?"; 94.7 percent of ever-smokers in those survey years gave an age of smoking initiation. Overall, data from 85,628 ever-smokers were available for analysis. A separate analysis was conducted for each birth-cohort/race/gender subgroup. Analyses of initiation were formulated as survival analyses in which the entire subgroup was considered to be present in the population at time of birth, and the age given by individuals for when they started smoking fairly regularly was taken as the age or time of an event (starting to smoke). All persons without event(s) were censored at the age attained in the survey in which they were interviewed. The result of this analysis is a curve, $I_t(a)$, which shows the percentage of the cohort remaining nonsmokers, by age. The survival analyses were performed through the procedure LIFETEST of the Statistical Analysis System (SAS) software package (The SAS Institute, 1988).

A second set of survival analyses was performed to estimate the percentage of the cohort remaining nonsmokers using calendar year rather than age as the measurement of time. From birth year and reported age of initiation, the calendar year when a person started smoking could be computed.

Differential Mortality The computed ever-smoking prevalence curves were adjusted to account for the fact that, compared to never-smokers, ever-smokers have less chance of being alive to be interviewed as they age; therefore, the prevalence of ever-smokers in a birth cohort declines at older ages. The impact of smoking on ever-smoking prevalence does not become prominent until the individual is older than 50 years (Kahn, 1966); however, we have conservatively analyzed our data to include effects beginning at age 30. For each birth cohort/race/gender subgroup, we computed the point prevalence of ever-smoking for each of the 15 surveys, using all individuals meeting the inclusion criteria. Point prevalence was computed as the sum of all recorded current and former smokers divided by the total number of individuals in the cohort. We adjusted upward the point prevalences from surveys taken prior to complete smoking initiation for a cohort by dividing the observed point prevalence at that age by the percentage of ever-smokers to initiate by that age.

The parameters b_1 and b_2 of the following exponential function were estimated (within each race/gender subgroup) by means of a weighted (weights were the total number of respondents meeting the standard inclusion criteria in each survey) nonlinear least-squares procedure (The SAS Institute, 1988) to obtain the best fit to the 15 adjusted point-prevalence estimates:

$$\text{prevalence} = b_1 - \exp(b_2(\text{age}-30)).$$

The fitted curve has a maximum value at age 30 and decreases exponentially as age increases beyond 30. The modeling was done separately for each birth cohort/race/gender subgroup to achieve the best fit to the point prevalence specific to the subgroup. Because of the small numbers of individuals in the cohorts for blacks, the results of modeling were unstable for the b_2 parameter, so the values of b_2 for corresponding white cohorts were used for both races. The curves were then standardized to 100 percent by dividing each of them by its maximum value to generate the age-specific differential mortality adjustment factors for each birth cohort.

For each birth cohort/race/gender subgroup, the modeled parameters were used to adjust the initiation curve. At age 30, the modeled peak prevalence is b_1-1 , which represents the peak ever-smoking prevalence for the birth cohort. The age-specific initiation curve was adjusted upward by the multiplication of each point on the curve by the ratio of the modeled peak prevalence (b_1-1) and the unadjusted peak prevalence for that birth cohort. For ages older than 30, the resulting curve then was multiplied by the differential mortality adjustment factor. Therefore, the initiation curves retained the same general shape of the distribution of age of initiation, but all the values on the curve were adjusted to reflect differential mortality of ever-smokers compared to never-smokers. The adjusted initiation curve will be referred to below as $I_t(a)$. A similar adjustment was made to the initiation curve expressed by calendar year. Because differential mortality is an age-related phenomenon, the ratios that were computed for the analysis by age

also were used for the analysis by calendar year. The translation was made by addition of the median birth year of the cohort to data expressed in terms of age.

Adjustment for differential mortality was applied only to the first 12 birth cohorts; later birth cohorts were assumed to be young enough when surveyed that there would be no bias due to differential mortality. The adjusted initiation curve is referred to below as $I^m_t'(a)$. A similar adjustment was made to initiation curves expressed by calendar year. Because differential mortality is an age-related phenomenon, the ratios that were computed for the analysis by age were also used for the analysis by calendar year. The translation was made by addition of the median birth year of the cohort to data expressed in terms of age.

Smoking Cessation Rates Twelve surveys (1965, 1966, 1970, 1978, 1979, 1980, 1983, 1985, 1987, 1988, 1990, and 1991) asked the question, "About how long has it been since you last smoked cigarettes fairly regularly?" Responses of former smokers were recorded as time in days, weeks, months, or years since cessation. With this information and age of the respondent at the time of the survey, the age or calendar year at which the respondent quit smoking could be calculated. Among those classified as former smokers, 91.5 percent provided information on when they quit. Data on 205,108 ever-smokers were available for analysis.

A survival analysis was performed using all ever-smokers in a given birth cohort/race/gender subgroup as the base population, with age of cessation as the time of the event. To reduce the effect of quit attempts that eventually fail on the birth cohort quit rates, all smokers were censored 2 years before the year of the survey in which they participated. Thus, only those who reported having successfully quit at least 2 years before a survey were counted as having events. The percentage of former smokers quitting in the 2 years prior to a survey was 25.1 percent overall and varied from 32.1 percent for black females to 21.6 percent for white males. The procedure LIFETEST of the SAS software package was used for the survival analyses (The SAS Institute, 1988). $C_e(a)$ is the computed survival curve for smoking cessation by age. A similar procedure was used for cessation rates by calendar year. Rates could be computed up to 1988, 3 years before the most recent survey, and rates are expressed as the percentage of current smokers at the start of a calendar year who successfully quit in that year.

Prevalence of Current Smoking Ever-smoker prevalence curves, after adjustment for differential mortality, were used to estimate current smoking prevalence. Within a particular birth cohort/race/gender subgroup, at any given age a person is either a never-smoker, former smoker, or current smoker. The prevalence of current smoking is thus given by the percentage of the population that has initiated by a given age ($I^m_t'(a)$) multiplied by the fraction of those ever-smokers that age who had quit ($C_e(a)$). The prevalence equation becomes:

$$\text{prevalence}_t(a) = I^m_t'(a) * C_e(a).$$

The subscript "t" indicates the computation is based on the total subgroup, and the subscript "e" indicates that computation is based only on ever-smokers.

As a check on validity of the adjustments for differential mortality and the methods used to calculate prevalence of current smoking, we tabulated the percentage agreement between the computed prevalence curves and the point-prevalence estimates of current smoking from each NHIS survey for each race/gender subgroup over all birth cohorts. If the computed curve at a given age passed through the 95-percent confidence limits of a point estimate for that age (median age of the cohort), it was considered to be in agreement. For white males the agreement was 86 percent, for black males 94 percent, for white females 85 percent, and for black females 89 percent. The higher percentage agreement for blacks is because of the wider confidence intervals for the point-prevalence estimates.

We also computed prevalence curves by calendar year, using cessation curves by year and initiation curves by year, adjusted for differential mortality.

RESULTS Analyses are presented as birth cohort-, race-, and gender-specific prevalences of ever-smoking and current smoking, and annual rates of long-term successful cessation. Rates for each cohort are presented in tabular form in Appendix A for both attained age and calendar year. Figures of ever-smoking prevalence are provided for attained age. Current smoking prevalence and quit rates are presented for calendar year. Two figures are presented for each race/gender group to allow examination of older and more recent cohorts separately. The 1925-1929 cohort is presented in both figures to facilitate comparison of cohorts across both sets of graphs.

PREVALENCE OF EVER-SMOKING, BY BIRTH COHORT Figures 3 through 12 present prevalence of ever-smoking for each birth cohort, by attained age. Ever-smoking prevalence is adjusted for differences in age-specific mortality rates between ever-smokers and never-smokers, which lowers the prevalence of ever-smoking as the cohort ages. The greater mortality rate in ever-smokers than in never-smokers results in fewer smokers surviving to the older ages, and therefore the prevalence of ever-smokers declines at older ages.

Initiation of regular smoking within each birth cohort is manifest as a rapid increase in prevalence during adolescence and early adulthood. Examination of Figures 3 through 12 reveals that initiation is largely confined to adolescence and early adulthood. With the exception of the older cohorts of women, most smokers become regular smokers before achieving adulthood. Two descriptors are of interest in relation to initiation: the percentage of the cohort that become cigarette smokers and the age distribution of initiation within the cohort. Both of these phenomena vary among the different gender and racial groups presented in Figures 3 through 12.

Figure 3

Ever-smoking prevalence, by age, for 5-year birth cohorts of white males born between 1885 and 1929

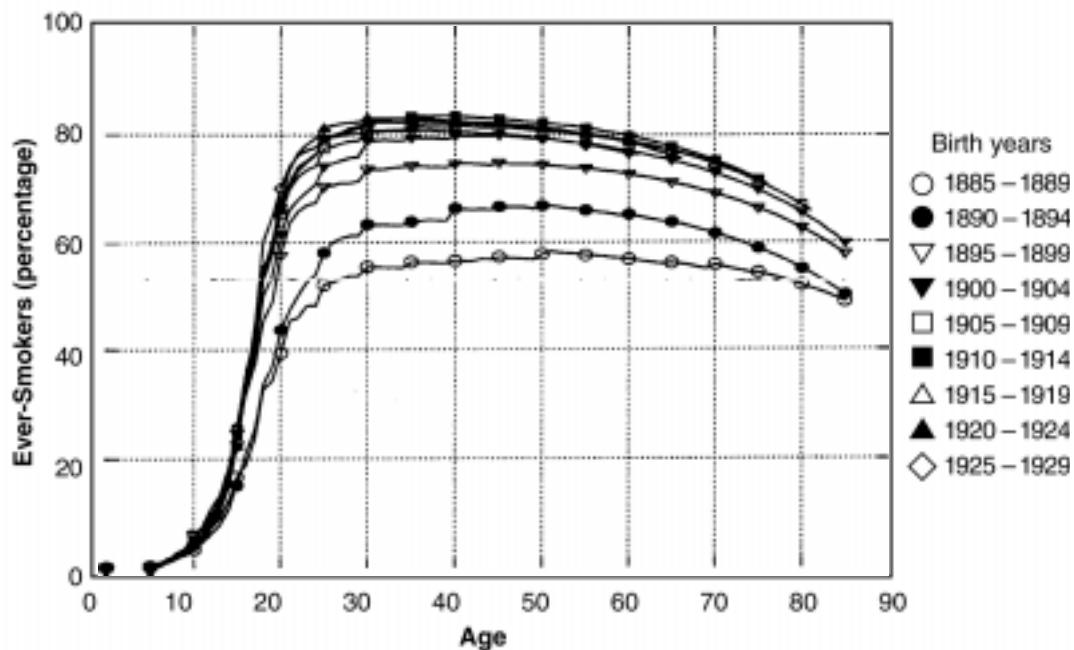


Figure 4

Ever-smoking prevalence, by age, for 5-year birth cohorts of white males born between 1925 and 1969

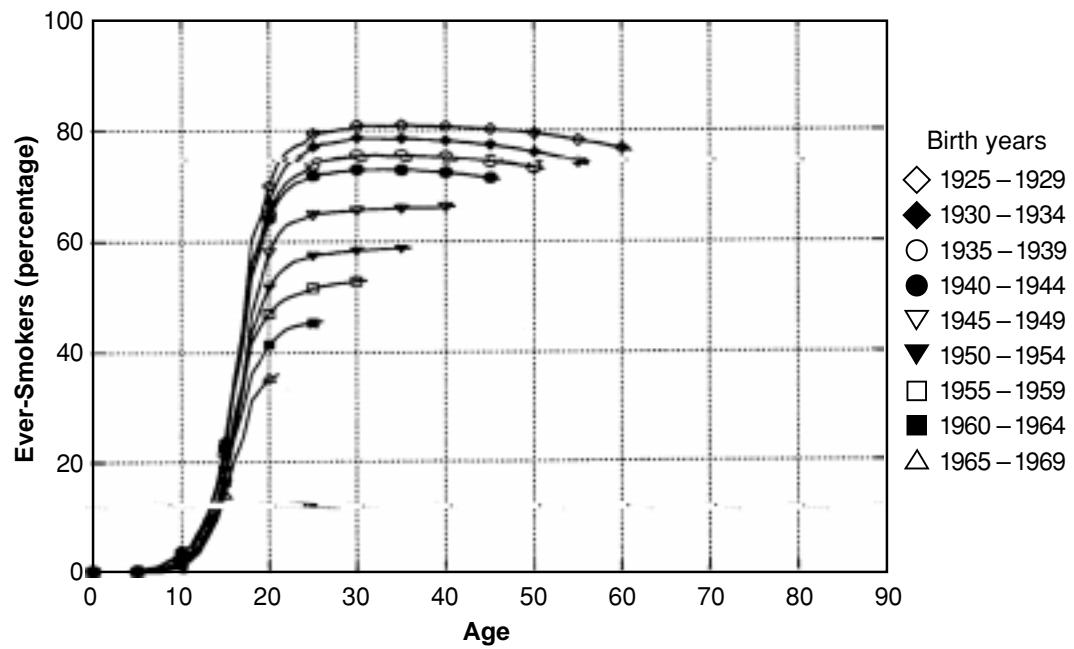


Figure 5

Ever-smoking prevalence, by age, for 5-year birth cohorts of white females born between 1885 and 1929

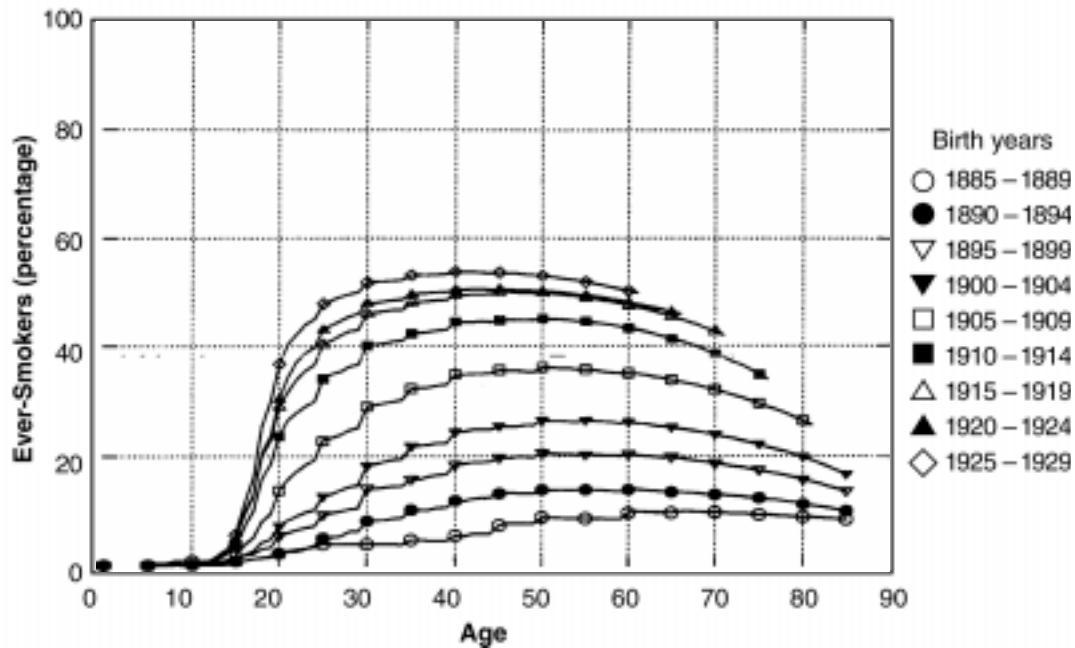


Figure 6

Ever-smoking prevalence, by age, for 5-year birth cohorts of white females born between 1925 and 1969

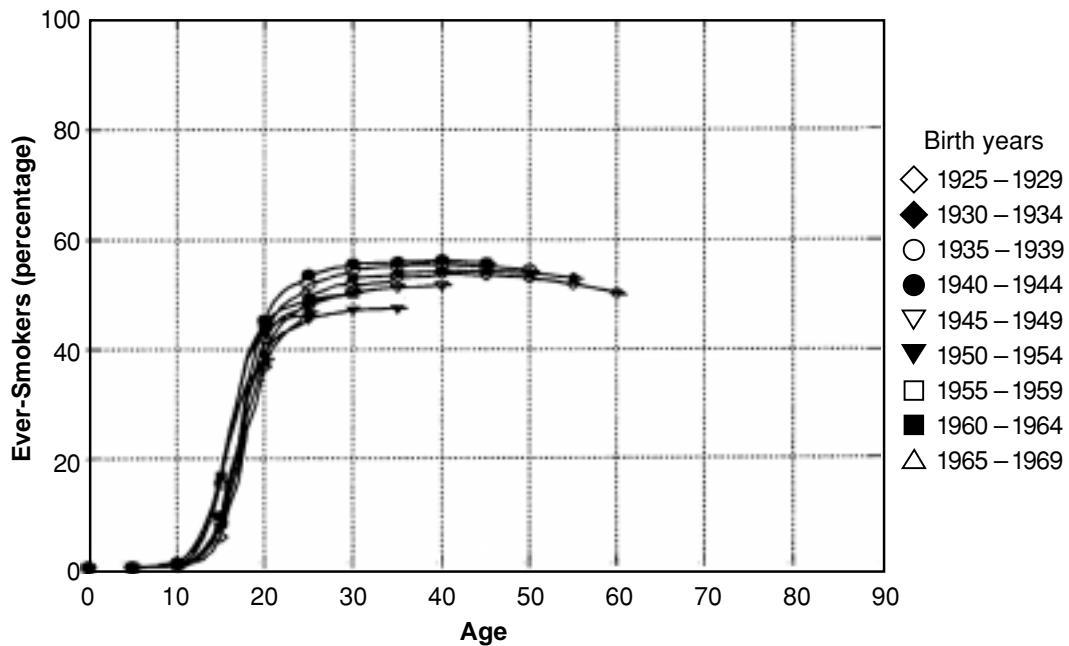


Figure 7

Ever-smoking prevalence among 5-year birth cohorts of white males, by age

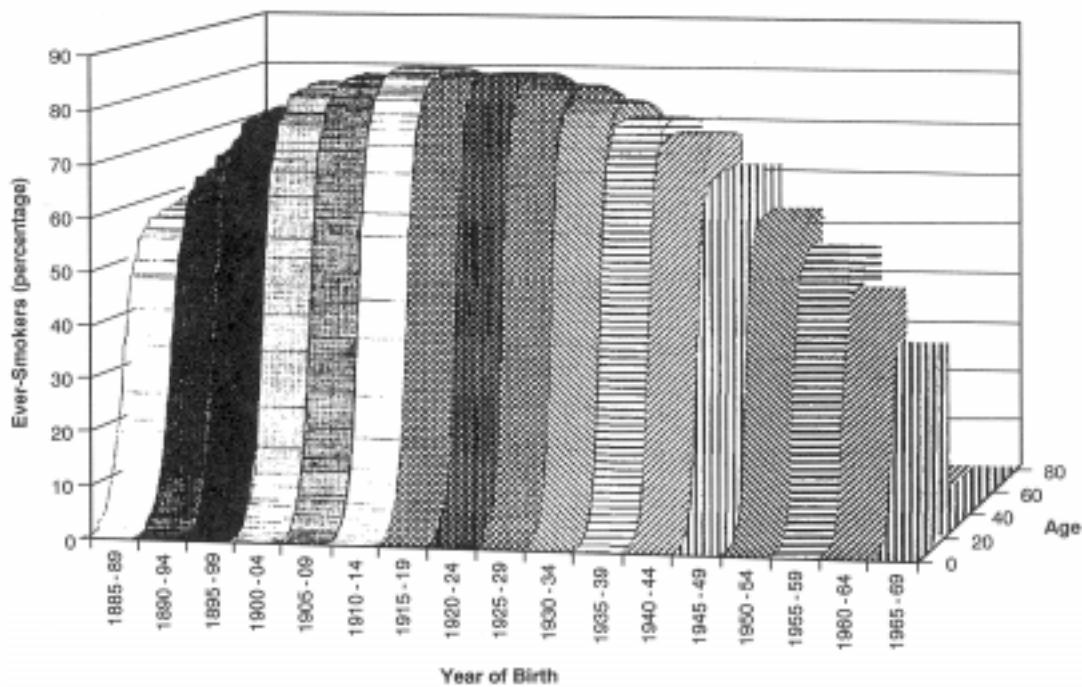


Figure 8

Ever-smoking prevalence among 5-year birth cohorts of white females, by age

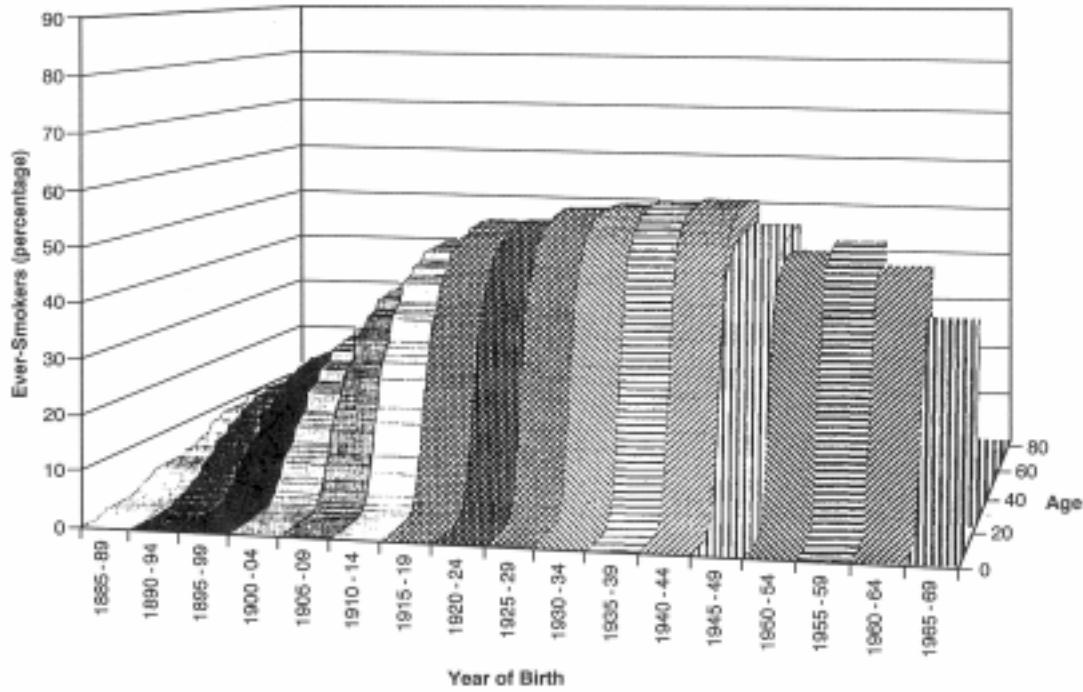


Figure 9

Ever-smoking prevalence, by age, for 5-year birth cohorts of black males born between 1900 and 1929

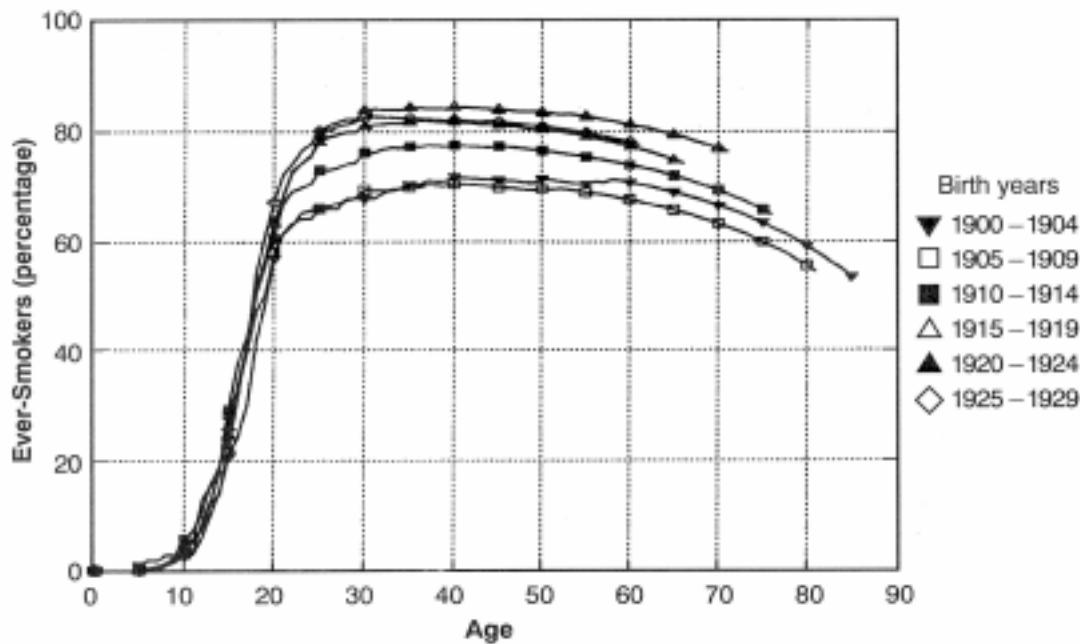


Figure 10

Ever-smoking prevalence, by age, for 5-year birth cohorts of black males born between 1925 and 1969

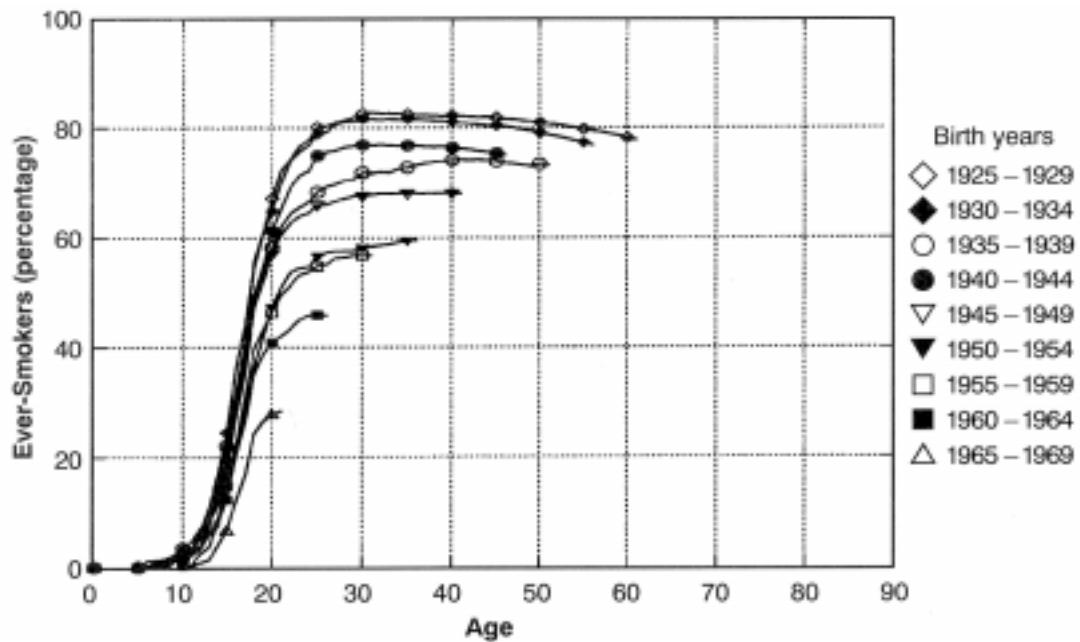


Figure 11

Ever-smoking prevalence, by age, for 5-year birth cohorts of black females born between 1900 and 1929

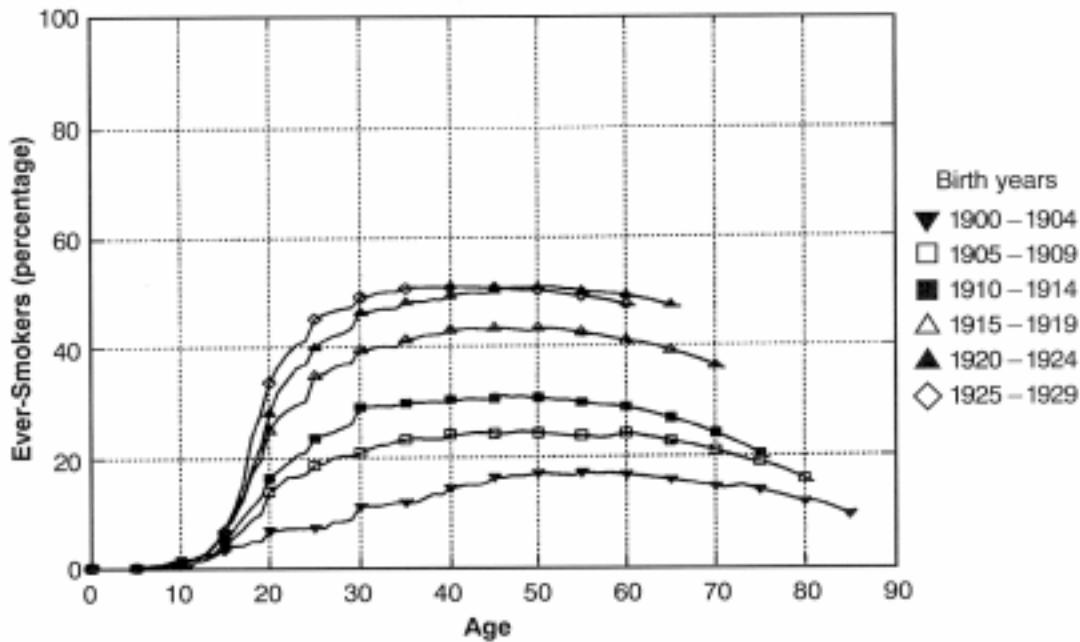
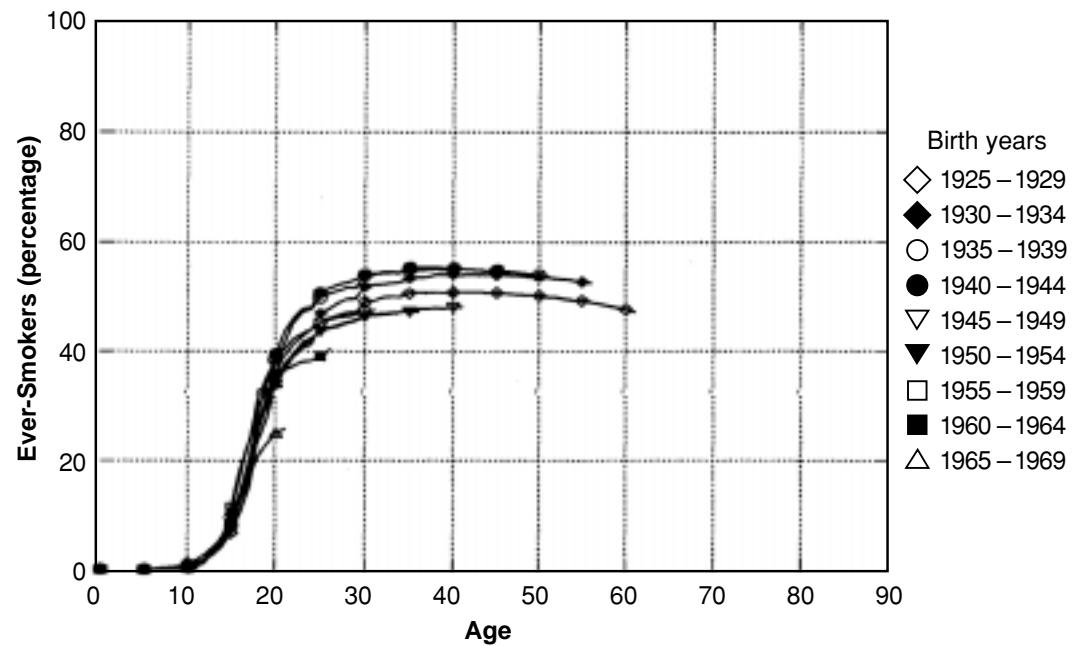


Figure 12

Ever-smoking prevalence, by age, for 5-year birth cohorts of black females born between 1925 and 1969



White Males Figure 3 presents prevalence of ever-smoking among white males, by 5-year birth cohorts born between 1885 and 1929. Prevalence of ever-smoking increases with each succeeding cohort until 1910. The next four cohorts have similar patterns of smoking uptake. A different pattern of smoking is evident among cohorts born after 1930 (Figure 4). The percentage of the population that ever smoked declines steadily with each succeeding cohort of white males. This decline in smoking prevalence almost certainly reflects the tobacco control activities that have focused on preventing adolescent smoking initiation over the past 40 years (Warner and Murt, 1983), and the result is more than a 50-percent reduction in smoking initiation between the white males born between 1925 and 1929 and the most recent cohort. However, the distribution of age of first regular smoking among those who do begin to smoke has changed only modestly among these cohorts.

White Females The pattern of initiation among white females is strikingly different from that among white males among those cohorts born before 1930 (Figure 5). Differences are evident in both prevalence of ever-smoking and distribution of age of initiation. The percentage of females who took up smoking increases with each sequential cohort from 1895 until 1944 (Figures 5 and 6), but the most dramatic differences between white males and white females are in the age distribution over which initiation occurs. In the most recent cohorts, initiation is confined to adolescence and early adulthood for both genders. However, in the earlier cohorts of white females, substantial initiation occurred during the third, fourth, and fifth decades of life. These gender differences in initiation are explained by differences in uptake of smoking by calendar year. Prior to 1930, cigarette smoking was largely a male behavior. However, during the 1930's and 1940's, initiation occurred across all birth cohorts of females. Therefore, initiation was spread across all age groups and not confined to adolescence and early adulthood. Ever-smoking prevalence increases with sequential cohorts, suggesting that those forces promoting initiation among females during the 1930's and 1940's were more effective among younger females in later cohorts and resulted in lower rates of initiation among mature females.

An additional and disturbing difference in rates of initiation between white males and white females is observed when recent cohorts are examined. Figures 7 and 8 show three-dimensional graphic depictions of all cohorts of white males and white females. Each succeeding cohort of white males born after 1925 shows a progressively lower prevalence of ever-smoking. A decline in initiation also occurs among succeeding cohorts of white females born from 1940 to 1954. However, the cohort born during the period 1955-1959 has an increased rate of initiation compared with the 1950-1954 cohort, and the 1960-1964 cohort has rates of initiation similar to the 1950-1954 cohort. This interruption or reversal of declining rates of initiation among a recent cohort of white females is in contrast to the continued decline in smoking initiation found among the same birth year cohorts of white males. Either more recent cohorts of white females were less responsive to tobacco control messages than their predecessors or, more likely, targeting of white females by

tobacco manufacturers has been successful in promoting initiation among those adolescent females exposed to messages linking smoking to women's liberation and a thin female figure. These advertising themes were prominent in the promotional campaigns for brands of cigarettes that would appeal to females, which were introduced in the late 1960's, (Burns, 1994) when the 1955-1959 cohort of white females was in adolescence.

Black Males Initiation of smoking among black males (Figures 9 and 10) is similar, but not identical, to that of white males. Older cohorts of black males were less likely to become smokers than white males, with cohorts born before 1915 having a lower peak prevalence of ever-smoking. In addition, the age distribution of initiation is shifted toward older adolescence and early adulthood among black males compared with white males.

Among cohorts born after 1915, black males were more likely to become cigarette smokers than white males. The pattern of a higher prevalence of ever-smoking among black males may be shifting with recent cohorts. Peak prevalence of ever-smoking among black and white males born between 1960 and 1964 is similar, and prevalence of ever-smoking is lower among black males than white males for those born between 1965 and 1969. It remains unclear whether this recent shift in pattern of initiation reflects a true change in smoking behavior among black males or the difficulty of obtaining representative samples of young black males in surveys such as the NHIS.

Black Females Initiation of regular smoking among black females (Figures 11 and 12) is more similar to that of white females than to that of black males. Prevalence of ever-smoking increases steadily among successive cohorts of black females until the cohort 1940-1944 is reached and then declines slightly among later cohorts. Black females have similar or lower rates of peak prevalence of ever-smoking than white females among all cohorts, in contrast to the higher prevalence rates of ever-smokers noted among black males in comparison with white males. This trend is particularly evident among the older cohorts and appears to have reemerged with more recent cohorts. As is noted for black males, the distribution of age of initiation is shifted toward later adolescence among black females compared with white females.

PREVALENCE OF CURRENT SMOKING, BY BIRTH COHORT Prevalence of current smoking, by birth cohort and by calendar year, is presented for black and white males and females in Figures 13 through 20. Tables in Appendix A present current smoking rates, by both age and calendar year. The differences between the ever-smoker curves and current smoker curves for a given cohort are produced by cessation of smoking within the cohort. Cessation rates, by birth cohort, are presented in the final section of this chapter. Current smoker prevalence is presented by calendar year, rather than age, to permit examination of changes in smoking behavior in relation to temporal events over the past century.

White Males The rapid increase in smoking prevalence that occurs during adolescence is evident in all the white male cohorts (Figures 13 and 14) and is manifest in these figures as a rapid increase in prevalence occurring 5 calendar years apart for each succeeding cohort. The percentage of the cohort who become smokers increases for the first several cohorts of white males. These increasing rates of initiation occurred between 1910 and 1920, coinciding with a rise in per capita consumption after 1910 (Figure 2). This change across the cohorts coincides with the introduction and mass marketing of machine-manufactured cigarettes around 1913 (Burrough and Helyar, 1990). The oldest cohorts were in early adulthood when tobacco manufacturers began to use mass marketing approaches to induce males to become cigarette smokers and, therefore, may have been less vulnerable to advertising approaches than younger cohorts. Those cohorts born after 1900 were subjected to tobacco advertising and promotion throughout adolescence, took up smoking in large numbers (more than 80 percent as shown in Figure 3), and began to smoke predominantly prior to age 25.

Cohorts born after 1900 and before 1934 have relatively similar patterns of uptake and rates of peak cohort smoking prevalence. The major difference in the pattern of current smoking among these cohorts, and between these cohorts and the more recent cohorts, is the width of the plateau that occurs around peak prevalence and the rate of decline in current smoking prevalence over time. Older cohorts have broad plateaus, indicating that little cessation occurred before 1950. More recent cohorts have a narrower plateau, with a rapid decline in prevalence occurring almost as soon as the peak prevalence is achieved. A rapid decline in smoking prevalence is evident across all the older cohorts after 1955, and the rate of decline accelerates in the late 1960's. The first major prospective mortality studies linking cigarettes to disease were published in the mid-1950's, and a concerted tobacco control effort, including a highly visible television antismoking campaign, occurred between 1967 and 1970. Data for white males suggest that the effects of these tobacco control influences were felt across all cohorts of adult smokers and resulted in substantial changes in smoking behavior among white males of all ages.

The pattern of current smoking prevalence observed among those cohorts born after 1930 (Figure 14) is one of declining peak prevalences with each succeeding cohort. This pattern results in the actual prevalence of smoking in any given calendar year being similar across all the recent cohorts, again suggesting that temporal events may have a more powerful influence on smoking prevalence than age has.

White Females Smoking initiation among older cohorts of white females shows a clear relationship with calendar year (Figure 15). Few females smoked before 1925, and a rapid rise in smoking prevalence is evident during the 1930's across several cohorts. This dramatic change in smoking behavior among females coincides with the tobacco industry's efforts to target females through advertising during the 1930's and 1940's (Health Advocacy Center, 1986).

Figure 13
Current smoking prevalence, by calendar year, for 5-year birth cohorts of white males born between 1885 and 1929

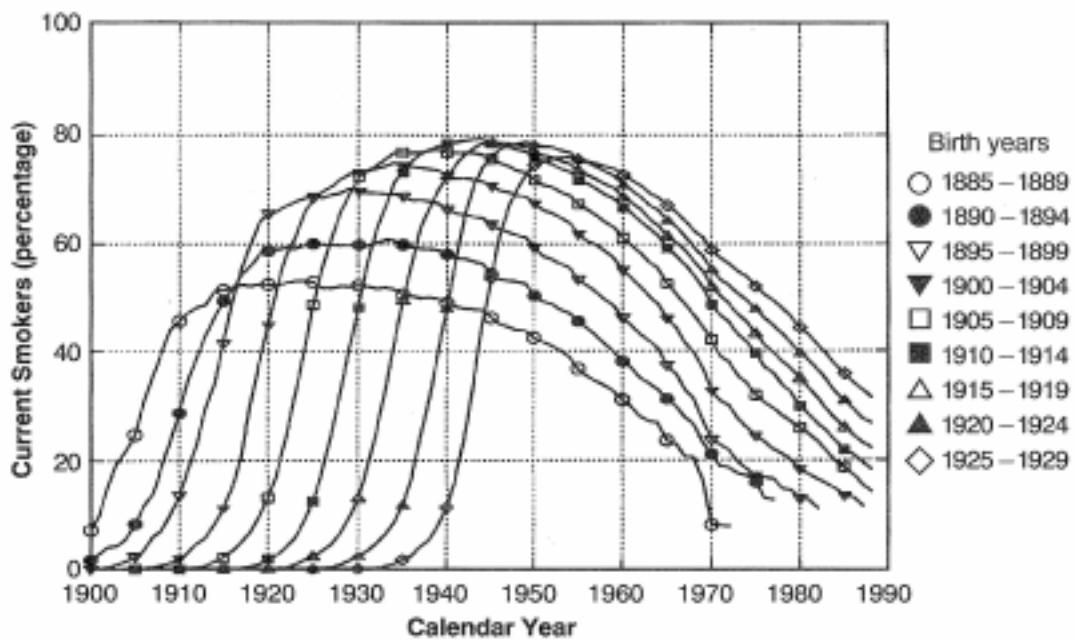


Figure 14
Current smoking prevalence, by calendar year, for 5-year birth cohorts of white males born between 1925 and 1969

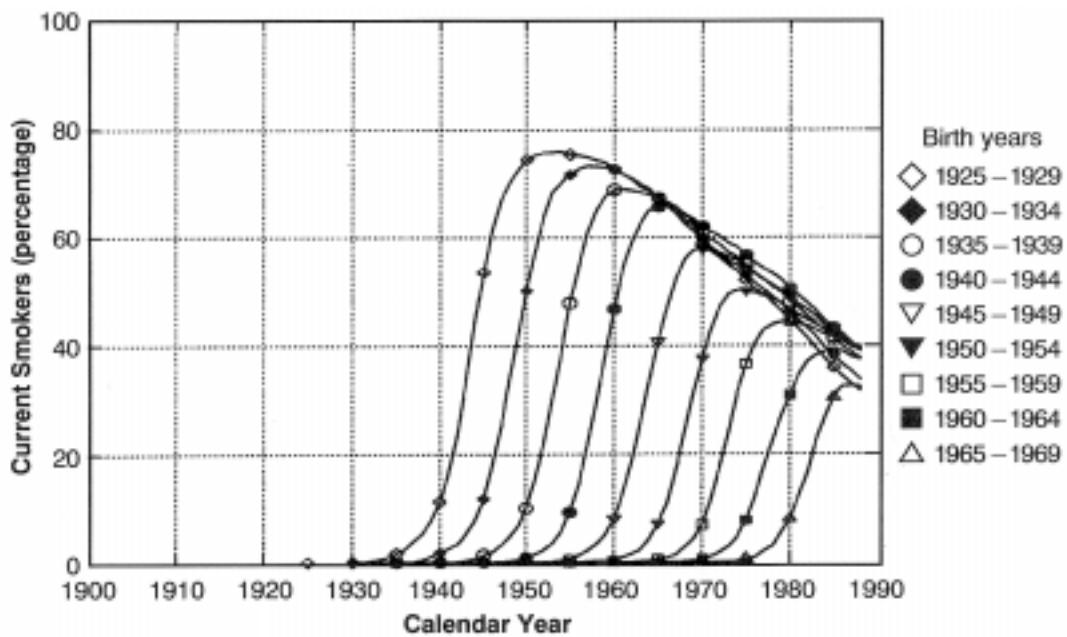


Figure 15

Current smoking prevalence, by calendar year, for 5-year birth cohorts of white females born between 1885 and 1929

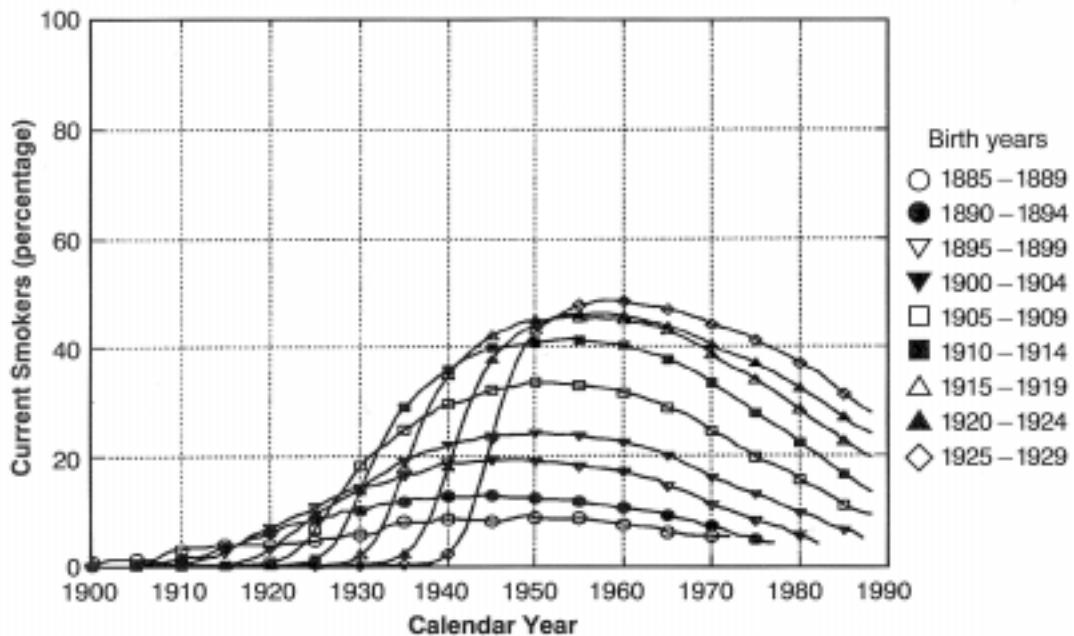


Figure 16

Current smoking prevalence, by calendar year, for 5-year birth cohorts of white females born between 1925 and 1969

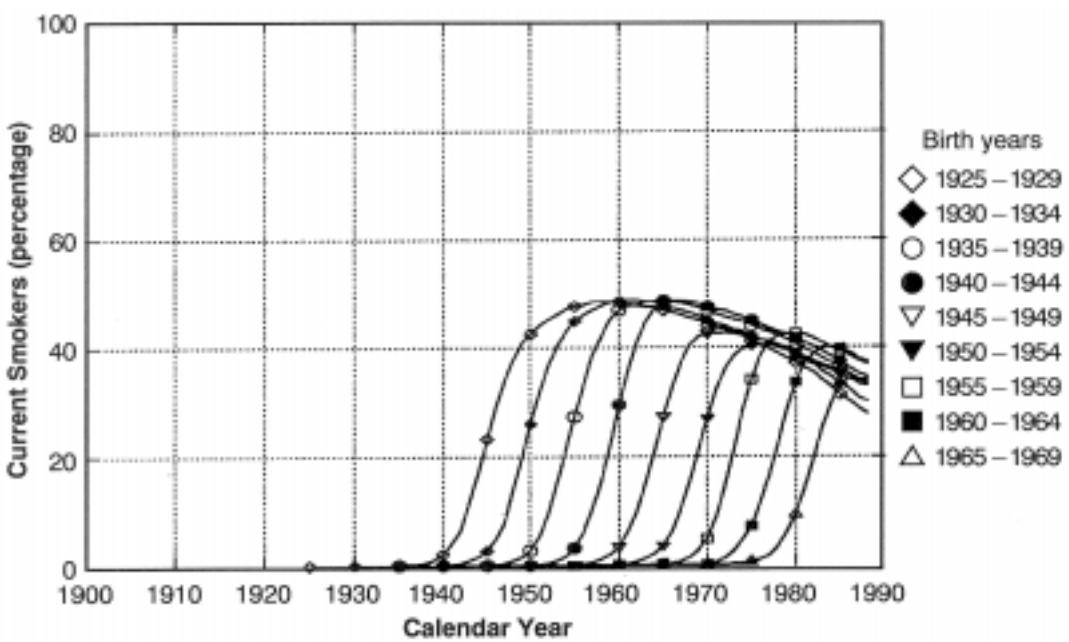


Figure 17

Current smoking prevalence, by calendar year, for 5-year birth cohorts of black males born between 1900 and 1929

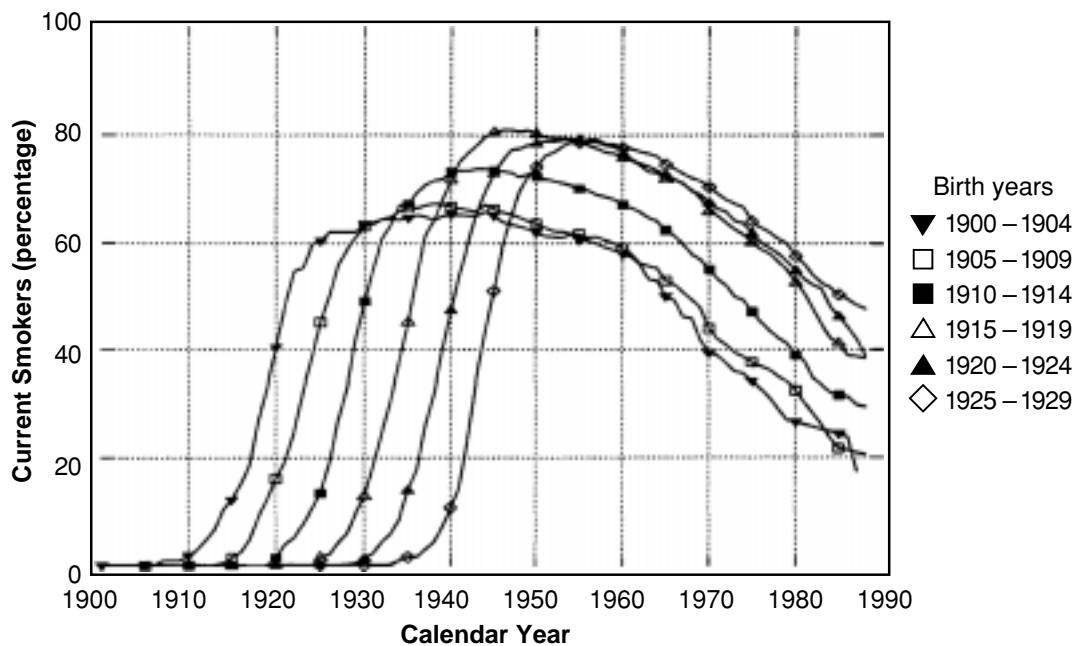


Figure 18

Current smoking prevalence, by calendar year, for 5-year birth cohorts of black males born between 1925 and 1969

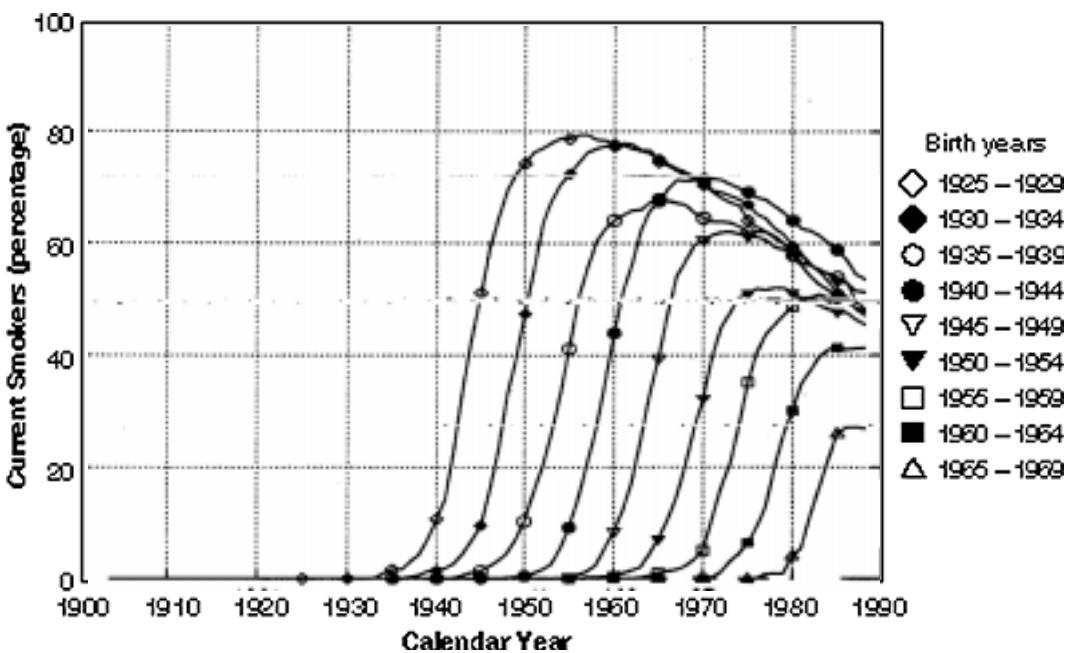


Figure 19

Current smoking prevalence, by calendar year, for 5-year birth cohorts of black females born between 1900 and 1929

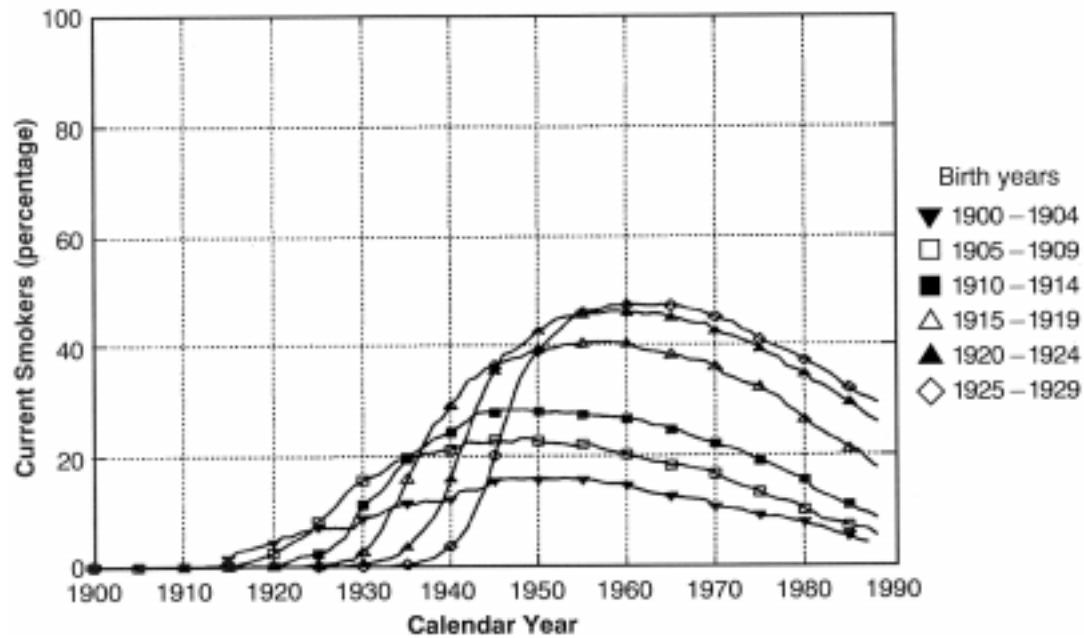
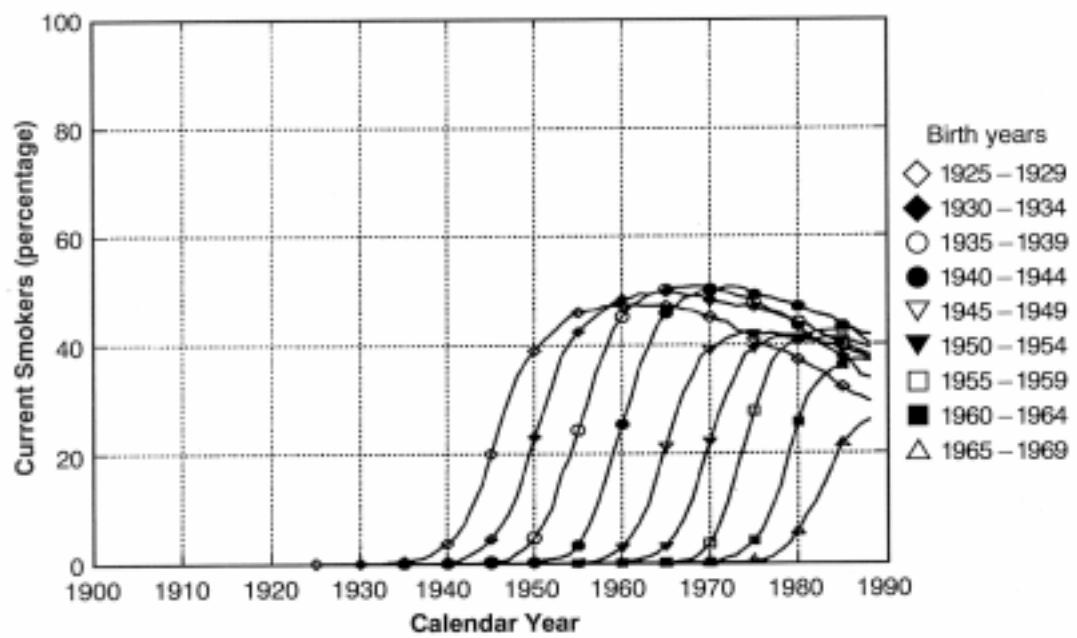


Figure 20

Current smoking prevalence, by calendar year, for 5-year birth cohorts of black females born between 1925 and 1969



Peak prevalence of smoking among white females is lower than that of comparable cohorts of white males for all but the two most recent cohorts. However, the decline in prevalence seen among successive cohorts of white males once peak prevalence has been reached is not as evident among white females (Figure 16). Even the more recent cohorts have a broad plateau of the prevalence curve with relatively low rates of decline in prevalence, indicating that there has been less cessation among white females than among the same cohorts of white males. It is unclear whether these observed differences in the magnitude and breadth of peak prevalences are because differences in the response of white males and white females to tobacco control influences or the competing influence of increased targeting of advertising and promotional activities toward females. Whatever the etiology of these differences among older cohorts, the most recent two cohorts of white males and white females have similar patterns of current smoking behavior. It remains to be determined whether differences in these cohorts will emerge as they age because of differences in cessation behavior or whether the differences in cessation behavior that were observed among earlier cohorts of white males and white females also will disappear.

Black Males Current smoking prevalence, by calendar year, is presented for cohorts of black males born after 1900 (Figures 17 and 18). The NHIS contains too few observations for earlier cohorts of black males to allow reliable estimation of smoking prevalence. Cohorts of black males born before 1915 had lower rates of peak smoking prevalence than comparable cohorts of white males, but those cohorts born after 1915 had similar or higher rates of peak smoking prevalence than their white male contemporaries. Most cohorts of black males have higher smoking prevalences than white males in the same cohorts, and this higher current prevalence is produced by both a higher peak prevalence among blacks in the cohort and a lower rate of decline in smoking prevalence after the peak.

Black Females With the exception of differences in age of initiation and lower rates of smoking prevalence among the older cohorts of black females, the prevalence of smoking among cohorts of black females is similar to that among white females of the same cohort (Figures 19 and 20).

SMOKING CESSATION RATES, BY BIRTH COHORT Cessation rates presented in this section are annual rates of long-term (2+ years) successful cessation as a percentage of current smokers. Those rates represent the percentage of current smokers in a given year who reported having quit in that year and who remained nonsmokers for at least the next 2 years. Individuals who had quit for less than 2 years at the time of the survey were censored from the cohort, thereby avoiding inclusion of individuals who had quit recently and were likely to relapse. The data were smoothed (Chambers and Hastie, 1991) to moderate a digit bias for 5-calendar-year increments in reporting remote cessation among the older cohorts.

Cessation rates are generally higher at older ages, but there is no pattern across the cohorts for the age at which cessation begins or for the absolute cessation rate at a given age. However, when the rates are plotted against

calendar year (Figures 21 through 26), a clearer picture of cessation behavior is evident. Among cohorts born before 1935, cessation rates appear to be influenced predominantly by calendar year, with a smaller influence of chronological age. In contrast, the more recent cohorts appear to have cessation rates that are determined by age.

White Males Annual quit rates for white males are presented in Figures 21 and 22, by the year in which the cessation occurred. In general, older cohorts have higher rates of cessation than more recent cohorts, suggesting an effect of age. However, all the cohorts show similar increases in cessation rates during the same calendar years. There were low rates of cessation before 1950 (Figure 21). Cessation rates began to increase in the mid-1950's and increased dramatically during the late 1960's among those cohorts that had reached adulthood. Many cohorts showed a downturn in cessation rates after 1970, with rates again increasing in the late 1970's and early 1980's. Changes during the 1950's coincided with the publication and widespread dissemination in the lay press of the first major prospective mortality studies defining the disease risks of smoking cigarettes. During the period 1967 to 1970, antismoking television spots were broadcast free by the networks, and in large numbers, to counter cigarette advertising; substantial tobacco control efforts also were made by voluntary health agencies and other concerned groups. When cigarette advertising was banned from television and radio in 1970, the antismoking spots were no longer broadcast in large numbers. Concerns about exposure to ETS and about the social unacceptability of smoking grew rapidly in the late 1970's. The interaction of these social and environmental changes and cessation rates is unclear, but the uniformity of the temporal changes across multiple cohorts (who are at different ages in the same year) makes a strong case for calendar-year events influencing smokers across all cohorts.

White Females Cessation rates are generally lower among white females than among white males for cohorts born before 1950 (Figures 23 and 24). Later cohorts have similar cessation rates among white males and white females. The increase in cessation rates noted among white males during the late 1950's is much less prominent among white females, but the rise of those rates for white females during the 1960's is almost as dramatic. The emphasis of early epidemiologic studies of risks attributable to smoking was on white males, who were then showing the greatest evidence of smoking-related disease. Uptake of smoking occurred much later in the century among females than among males. This difference resulted in lower relative risks for females in the early prospective mortality studies and led to a perception that females might be relatively protected from the disease consequences of smoking. It is unclear what role the emphasis on males in the studies or the underestimation of risks for females may have played in generating this pattern of lower rates of cessation among females.

Black Males and Black Females Small numbers of observations among black smokers did not allow estimation of cessation rates for cohorts born before 1900 and required use of 10 year birth cohorts to generate stable estimates for males and females (Figures 25 and 26).

Figure 21

Annual smoking cessation rates, by calendar year, for 5-year birth cohorts of white males born between 1890 and 1929

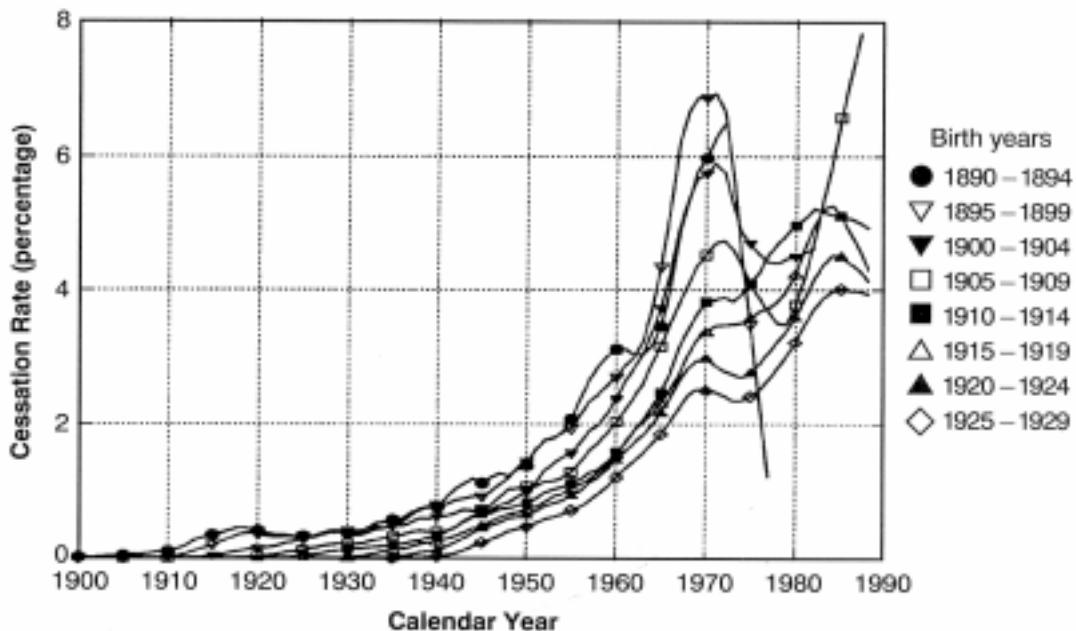


Figure 22

Annual smoking cessation rates, by calendar year, for 5-year birth cohorts of white males born between 1925 and 1969

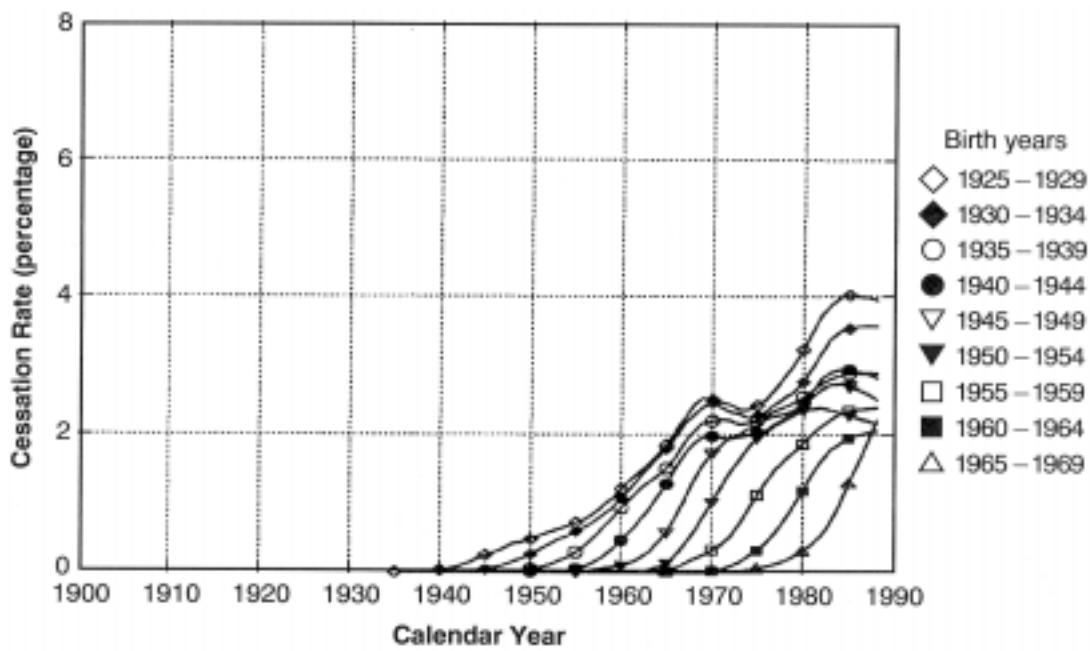


Figure 23

Annual smoking cessation rates, by calendar year, for 5-year birth cohorts of white females born between 1890 and 1929

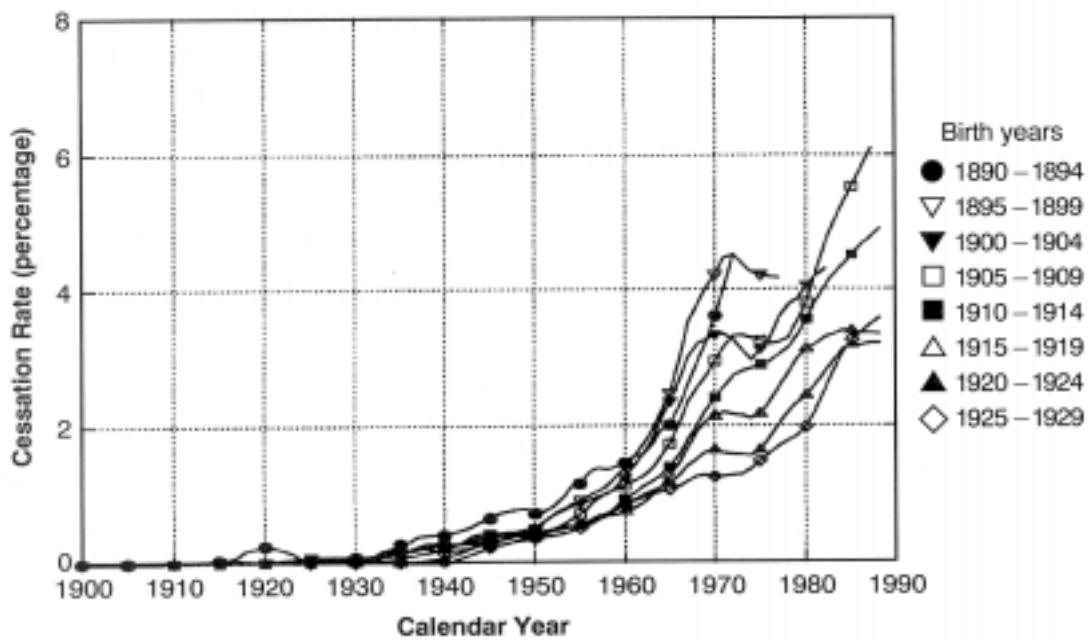


Figure 24

Annual smoking cessation rates, by calendar year, for 5-year birth cohorts of white females born between 1925 and 1969

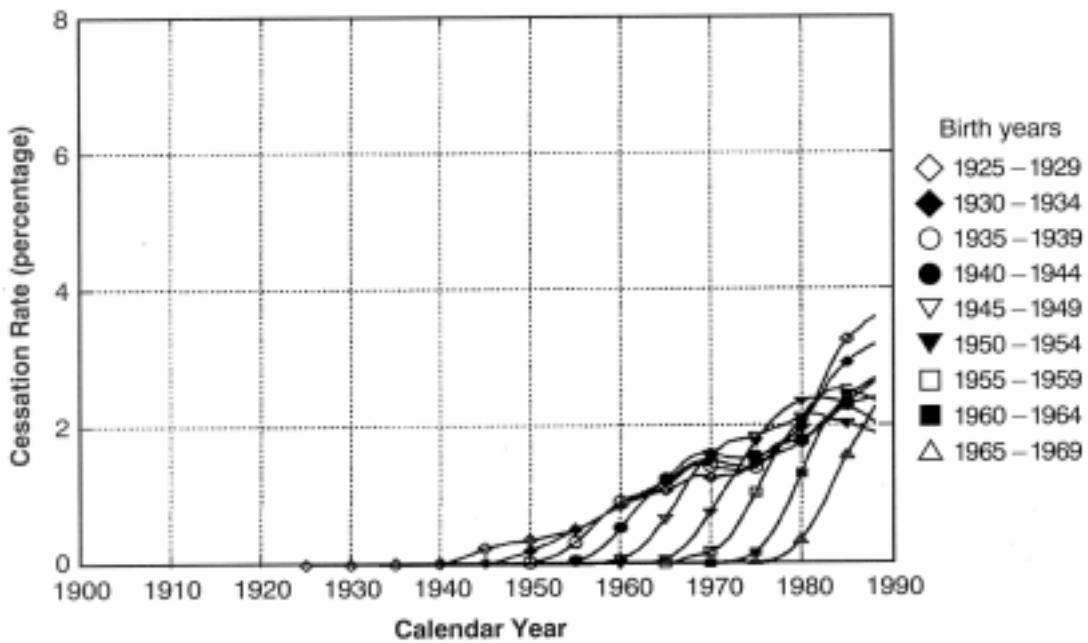


Figure 25

Annual smoking cessation rates, by calendar year, for 10-year birth cohorts of black males born between 1900 and 1969

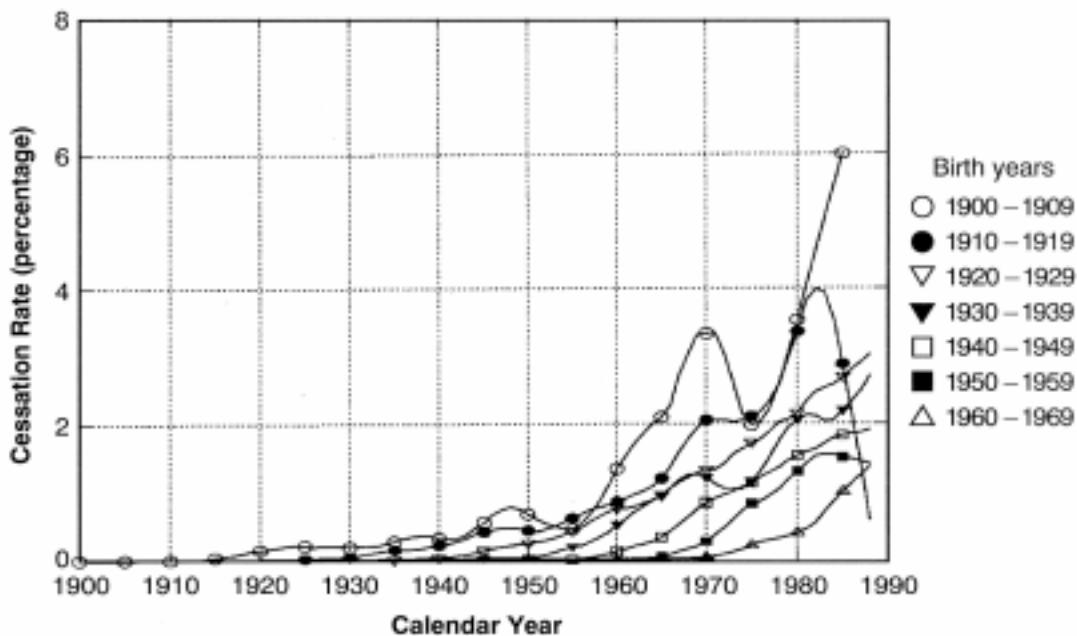
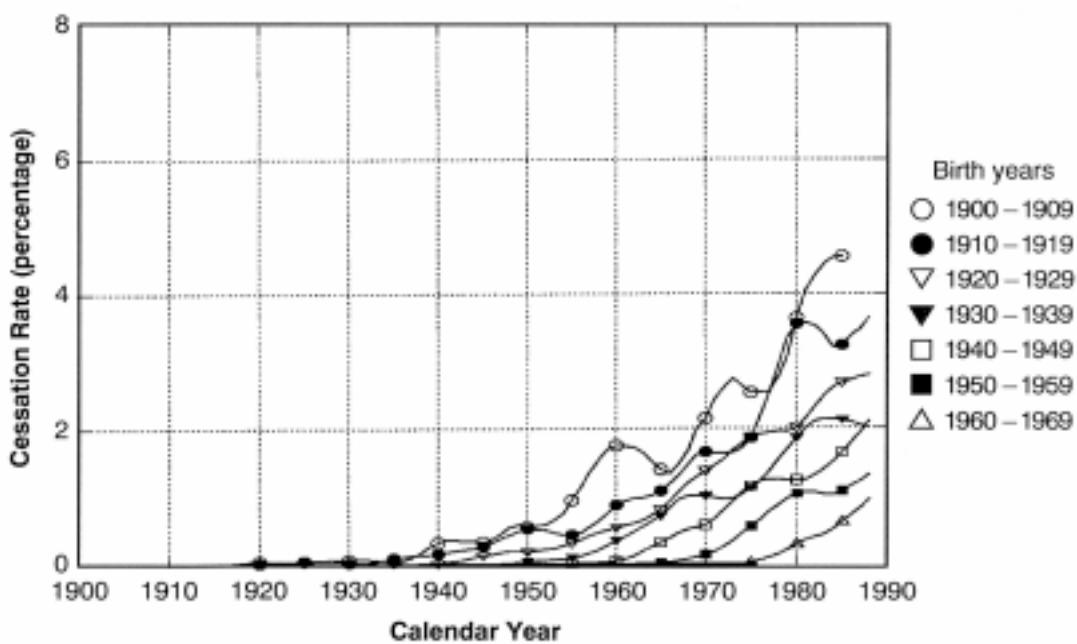


Figure 26

Annual smoking cessation rates, by calendar year, for 10-year birth cohorts of black females born between 1900 and 1969



Black males have markedly lower rates of cessation than white males across all cohorts where comparisons could be made. Cessation rates among black males were generally lower than rates for comparable cohorts of white females but were similar to those for black females. There is little evidence of an increase in cessation rates among blacks during the 1950's, and the cessation response during the late 1960's was also more modest than that seen among whites. However, cessation rates do appear to have risen during the late 1970's and 1980's among all cohorts of black males and black females.

DISCUSSION The analyses presented here represent the first birth cohort analyses of multiple NHIS's as a combined data set. Previous analyses (U.S. Department of Health and Human Services, 1980 and 1985; Harris, 1983; Tolley et al., 1991) have been based on a single NHIS or combinations of two or three surveys. The larger number of observations available in the current analyses allow presentation of the data as 5-year cohorts instead of 10-year cohorts as have been presented previously.

Use of tobacco has varied substantially across time and is different among racial and gender groups. Much of the difference in tobacco-related disease rates among males and females can be explained by differences in their smoking behavior by birth cohort. Females began smoking later in the century and therefore lagged behind males in rates of lung cancer and other diseases. Smoking prevalence among males peaked in the early 1950's and declined, resulting in lung cancer death rates that have now peaked among white males and are expected to decline. In contrast, the rates of smoking among females have declined only moderately, and lung cancer rates are continuing to rise among white females.

Differences in smoking prevalence among black males also may explain a part of the substantially higher rates of lung cancer among black males compared with white males. Black males have similar, but slightly higher, rates of ever-smoking prevalence and substantially lower rates of smoking cessation, leading to longer durations of smoking among ever-smokers. This longer duration of smoking would be expected to result in higher rates of lung cancer and may explain a part of the dramatic difference between black and white male lung cancer death rates.

Analyses of smoking initiation and cessation by calendar year suggest that cigarette smoking is a behavior substantially influenced by changes in the environment surrounding current smokers and those vulnerable to initiation or relapse of attempted cessation. Age appears to play a primary role in defining the window of vulnerability to smoking initiation and a minor role in increasing rates of cessation.

REFERENCES

- Baltagi, B.H., Levin, D. Estimating dynamic demand for cigarettes using panel data: The effects of bootlegging, taxation and advertising reconsidered. *Review of Economics and Statistics* 68: 148-155, 1986.
- Burns, D.M. The scientific rationale for comprehensive, community-based, smoking control strategies. In: *Strategies To Control Tobacco Use In the United States: A Blueprint for Public Health Action in the 1990's*. D.R. Shopland, D.M. Burns, J.M. Samet, and E.R. Gritz (Editors). Smoking and Tobacco Control Monographs—1. NIH Publication No. 92-3316. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute, 1991, pp. 1-32.
- Burns, D.M. Overview of office-based smoking cessation assistance. In: *Tobacco and the Clinician: Interventions for Medical and Dental Practice*. D.R. Shopland, D.M. Burns, S.J. Cohen, T.E. Kottke, and E.R. Gritz (Editors). Smoking and Tobacco Control Monograph No. 5. NIH Publication No. 94-3693. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute, 1994, pp. 3-11.
- Burrough, B., Helyar, J. *Barbarians at the Gate*. New York: Harper & Row, 1990.
- Centers for Disease Control and Prevention. Cigarette smoking among adults—United States, 1992, and changes in the designation of current cigarette smoking. *MMWR. Morbidity and Mortality Weekly Report* 43: 342-346, 1994.
- Chambers, J.M., Hastie, T.J. (Editors). *Statistical Models in S Language*. New York: Chapman and Hall, 1991.
- Doron, G. *The Smoking Paradox: Public Regulation in the Tobacco Industry*. Cambridge, MA: Abt Books, 1979.
- Fiore, M.F., Novotny, T.E., Pierce, J.P., Hatziaudre, E., Patel, K., Davis, R. Trends in cigarette smoking in the United States: The changing influence of gender and race. *Journal of the American Medical Association* 261: 49-55, 1989.
- Freedman, A.M., Cohen, L.P. Smoke and mirrors. *Wall Street Journal*, February 11, 1993. p. A1.
- Fugii, E.T. The demand for cigarettes: Further empirical evidence and its implication for public policy. *Applied Economics* 12: 479-489, 1980.
- Hamilton, J.L. The demand for cigarettes: Advertising, the health scare, and the cigarette advertising ban. *Review of Economics and Statistics* 54: 401-411, 1972.
- Harris, J. Cigarette smoking among successive birth cohorts of men and women in the United States during 1900-80. *Journal of the National Cancer Institute* 71: 473-479, 1983.
- Health Advocacy Center. *Sixty Years of Deception: An Analysis and Compilation of Cigarette Ads in Time Magazine*, 1925-1985. Vol. 1: 1925-1939. Palo Alto, CA: Health Advocacy Center, 1986.
- Kahn, H.A. The Dorn study of smoking and mortality among U.S. veterans: Report on eight and one-half years of observation. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 1-125.
- Lewit, E.M., Coate, D., Grossman, M. The effect of government regulation on teenage smoking. *Journal of Law and Economics* 24: 545-569, 1981.
- Lydon, C. Ban of TV cigarette ads could halt free spots against smoking. *New York Times*, August 16, 1970. p. 63.
- Pierce, J.P., Hatziaudre, E., Flyer, P., Hull, J., Maklan, D., Morganstein, D., Schreiber, G. *Tobacco Use in 1986—Methods and Basic Tabulations From Adult Use of Tobacco*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Office on Smoking and Health, 1989.
- Schneider, L., Klein, B., Murphy, K.M. Government regulation of cigarette health information. *Journal of Law and Economics* 24: 575-612, 1981.
- Steinfeld, J.L. The public's responsibility: A bill of rights for the non-smoker. *Rhode Island Medical Journal* 55: 124-126, 1972.
- The SAS Institute. *SAS Technical Report P-179*. Release 6.03. Cary, NC: The SAS Institute, 1988.
- Tolley, H.D., Crane, L., Shipley, N. Smoking prevalence and lung cancer death rates. In: *Strategies To Control Tobacco Use In the United States: A Blueprint for Public Health Action in the 1990's*. D.R. Shopland, D.M. Burns, J.M. Samet, and E.R. Gritz (Editors). Smoking and Tobacco Control Monographs—1. NIH Publication No. 92-3316. Bethesda, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute, 1991, pp. 73-144.
- U.S. Department of Agriculture. *Tobacco Situation and Outlook Report*. TS-228. Washington, DC: U.S. Department of Agriculture, Commodity Economics Division, Economic Research Service, 1994.
- U.S. Department of Agriculture. *Tobacco Situation and Outlook Report*. TBS-232. Washington, DC: U.S. Department of Agriculture, Commodity Economics Division, Economic Research Service, 1995.

- U.S. Department of Health and Human Services. *The Health Consequences of Smoking for Women: A Report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office of the Assistant Secretary for Health, Office on Smoking and Health, 1980.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: The Changing Cigarette. A Report of the Surgeon General*. DHHS Publication No. (PHS) 81-50156. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office of the Surgeon General, Office on Smoking and Health, 1981.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Cancer. A Report of the Surgeon General*. DHHS Publication No. (PHS) 82-50179. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health, 1982.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Cardiovascular Disease. A Report of the Surgeon General*. DHHS Publication No. (PHS) 84-50204. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health, 1983.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Chronic Obstructive Lung Disease*. DHHS Publication No. (PHS) 84-50205. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health, 1984.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Cancer and Chronic Lung Disease in the Workplace. A Report of the Surgeon General*. DHHS Publication No. (PHS) 85-50207. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health, 1985.
- U.S. Department of Health and Human Services. *The Health Consequences of Involuntary Smoking: A Report of the Surgeon General*. DHHS Publication No. (CDC) 87-8398. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Health Promotion and Education, Office on Smoking and Health, 1986.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Nicotine Addiction. A Report of the Surgeon General, 1988*. DHHS Publication No. (CDC) 88-8406. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Health Promotion and Education, Office on Smoking and Health, 1988.
- U.S. Department of Health and Human Services. *Reducing the Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General, 1989*. DHHS Publication No. (CDC) 89-8411. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1989a.
- U.S. Department of Health and Human Services. *Design and Estimation for the National Health Interview Survey, 1985-94*. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, National Center for Health Statistics, Public Health Service, 1989b.
- U.S. Department of Health and Human Services. *The Health Benefits of Smoking Cessation: A Report of the Surgeon General, 1990*. DHHS Publication No. (CDC) 90-8416. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1990.
- U.S. Department of Health, Education, and Welfare. *Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health Service*. PHS Publication No. 1103. Rockville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, 1964.
- U.S. Environmental Protection Agency. *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders*. EPA/600/6-90/006F. Washington, DC: Office of Research and Development, Office of Health and Environmental Assessment, 1992.
- Warner, K.E. The effect of the anti-smoking campaign on cigarette consumption. *American Journal of Public Health* 67: 645-650, 1977.
- Warner, K.E. Cigarette smoking in the 1970's: The impact of the antismoking campaign on consumption. *Science* 211: 729-731, 1981.
- Warner, K.E. Effects of the antismoking campaign: An update. *American Journal of Public Health* 79: 144-151, 1989.
- Warner, K.E., Murt, H.A. Premature deaths avoided by the antismoking campaign. *American Journal of Public Health* 73: 672-677, 1983.
- Whelan, E.W. *A Smoking Gun: How the Tobacco Industry Gets Away With Murder*. Philadelphia: George F. Stickley, 1984.

Appendix A

Five-Year, Birth-Cohort-Specific Ever-Smoking and Current Smoking Prevalence and Cessation Rates, by Age and Calendar Year

Table 1
Ever-smoking prevalence among 5-year birth cohorts of white males, by age

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0.03	0	0	0	0	0	0.02	0	0.02	0	0
3	0	0	0	0	0	0	0.03	0	0	0.03	0	0	0.02	0	0.02	0	0
4	0	0	0	0	0	0	0.06	0.03	0.03	0.05	0.03	0.04	0.02	0.02	0.02	0	0
5	0	0.24	0.27	0.07	0.21	0.07	0.24	0.16	0.15	0.14	0.13	0.08	0.03	0.03	0.05	0	0
6	0	0.48	0.82	0.44	0.62	0.48	0.71	0.81	0.51	0.49	0.4	0.27	0.16	0.13	0.14	0.14	0
7	1.66	0.95	1.23	1.16	0.93	1.18	1.48	1.62	0.84	0.88	0.77	0.46	0.36	0.31	0.3	0.23	0.06
8	1.66	2.62	2.6	2.1	2.48	2.07	2.16	2.22	1.48	1.43	1.24	0.83	0.74	0.51	0.43	0.48	0.26
9	2.22	2.86	3.56	2.68	3.3	2.84	3.01	3.05	2.37	2.22	1.98	1.38	1.21	0.84	0.87	1	0.65
10	3.32	4.05	5.88	4.79	6.04	4.47	5.02	4.62	3.8	3.68	2.88	2.4	1.97	1.45	1.51	1.54	1.1
11	4.99	4.52	7.53	5.58	6.71	5.28	5.99	5.4	4.64	4.56	3.52	3.15	2.76	1.89	2.23	2.39	1.95
12	7.2	6.19	10.95	7.91	10.9	8.87	9.74	8.27	7.59	7.55	6.67	6.05	4.86	3.9	3.88	4.55	3.44
13	8.86	7.62	12.45	10.01	13.12	11.42	12.17	10.67	9.96	10.65	9.71	9.1	7.98	6.37	6.52	7.6	6.1
14	12.19	10.71	17.24	14.58	18.44	16.85	17.84	15.14	15.67	15.75	14.68	14.9	12.51	10.42	10.67	10.93	9.29
15	16.62	15	24.77	22.12	25.46	24.57	25.69	22.31	23.13	23.74	21.43	22.47	18.62	16.05	17.65	16.2	13.9
16	18.83	20.95	32.02	32.49	35.32	35.4	36.11	32.85	34.8	35.05	33.15	33.76	28.12	25.33	27.02	24.4	20.19
17	23.82	25.47	37.35	39.38	41.72	42.6	43.2	40.74	44.84	43.94	41.03	41.77	35.25	33.03	34.09	29.89	24.48
18	32.68	33.8	45.56	50.19	53.09	54.53	55.45	54.65	60.18	55.8	53.7	53.64	46.73	43.37	41.74	35.98	31.17
19	34.34	36.9	48.85	53.75	57.58	58.78	58.64	60.07	64.51	60.55	58.81	58.86	52.72	47.98	44.71	38.71	33.44
20	39.33	43.8	57.47	61.36	65.38	66.17	66.26	67.46	70.04	67.13	64.97	64.2	58.19	51.84	47.01	41.45	35.26
21	45.42	47.37	63.62	66	69.92	71.16	70.75	73.49	74.19	71.2	68.6	67.33	61.19	54.21	48.76	42.94	36.04
22	45.98	49.99	65.68	67.96	72.19	74.12	73.26	76.62	76.15	73.75	70.63	69.33	62.98	55.51	49.8	44.22	-
23	48.19	52.61	66.91	69.41	73.48	75.34	74.94	78.24	77.2	75.04	71.93	70.48	63.75	56.47	50.38	44.77	-
24	48.19	54.04	67.32	70.86	74.26	76.55	76.3	79.41	77.76	75.89	72.64	71.08	64.23	56.91	50.88	45.09	-
25	52.07	58.08	70.33	74.2	77.56	79.14	78.99	81.29	79.44	77.12	73.99	71.88	64.89	57.49	51.6	45.36	-
26	52.62	59.99	70.6	74.78	77.92	79.77	79.96	81.76	79.67	77.59	74.68	72.17	65.03	57.73	51.87	45.5	-
27	53.18	60.7	71.01	75.36	78.44	80.29	80.61	82.12	79.87	77.73	74.87	72.36	65.26	57.91	52.15	-	-
28	53.73	61.18	71.01	75.72	78.85	80.8	81.32	82.36	80.15	78.06	75.13	72.68	65.4	58.16	52.43	-	-
29	53.73	61.18	71.42	75.94	78.96	81.21	81.65	82.44	80.23	78.25	75.26	72.71	65.46	58.2	52.64	-	-
30	55.39	63.32	73.61	78.91	80.61	82.47	82.35	83.19	80.94	78.66	75.45	72.96	65.64	58.36	52.87	-	-
31	55.35	63.27	73.69	79	80.55	82.67	82.33	83.13	80.91	78.61	75.48	72.9	65.72	58.41	52.94	-	-
32	55.3	63.21	73.64	79.09	80.85	82.94	82.44	83.14	80.89	78.56	75.52	72.92	65.79	58.57	-	-	-
33	55.26	63.16	73.99	79.02	80.99	83.09	82.43	83.07	80.85	78.47	75.44	72.96	65.85	58.6	-	-	-

Table 1 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
34	55.2	63.1	74.06	79.03	80.98	83.06	82.37	83.02	80.85	78.44	75.35	72.86	65.93	58.7	-	-	-
35	56.25	63.74	74.26	79.46	81.42	83.5	82.56	83.04	80.95	78.53	75.44	72.9	65.96	58.79	-	-	-
36	56.2	63.91	74.19	79.46	81.65	83.56	82.54	83	80.94	78.45	75.44	72.82	66.02	58.86	-	-	-
37	56.14	64.07	74.12	79.45	81.62	83.51	82.48	82.91	80.88	78.39	75.33	72.72	66.02	-	-	-	-
38	56.07	64	74.04	79.36	81.58	83.64	82.4	82.83	80.81	78.29	75.28	72.65	66.06	-	-	-	-
39	56.01	63.92	73.95	79.27	81.49	83.58	82.3	82.73	80.73	78.19	75.19	72.5	66.1	-	-	-	-
40	56.49	66.19	74.68	79.82	81.75	83.59	82.35	82.74	80.75	78.17	75.16	72.38	66.21	-	-	-	-
41	56.41	66.09	74.72	79.87	81.7	83.48	82.25	82.62	80.64	78.02	75.02	72.21	66.38	-	-	-	-
42	56.34	65.99	74.62	79.83	81.64	83.37	82.19	82.52	80.54	77.85	74.87	72.11	-	-	-	-	-
43	56.8	66.12	74.51	79.86	81.52	83.25	82.08	82.49	80.41	77.67	74.71	71.91	-	-	-	-	-
44	56.72	66.01	74.4	79.81	81.45	83.12	81.98	82.39	80.33	77.51	74.59	71.69	-	-	-	-	-
45	57.17	66.6	74.82	79.96	81.57	83.05	82	82.34	80.21	77.4	74.41	71.46	-	-	-	-	-
46	57.07	66.47	74.69	79.82	81.43	82.91	81.89	82.17	80.09	77.18	74.22	71.2	-	-	-	-	-
47	56.97	66.57	74.69	79.68	81.28	82.79	81.74	82.02	79.96	76.94	74.01	-	-	-	-	-	-
48	56.87	66.43	74.69	79.53	81.13	82.63	81.64	81.84	79.78	76.68	73.79	-	-	-	-	-	-
49	56.76	66.28	74.54	79.36	80.96	82.45	81.47	81.66	79.6	76.4	73.55	-	-	-	-	-	-
50	57.72	66.82	74.51	79.4	80.94	82.38	81.33	81.51	79.43	76.11	73.29	-	-	-	-	-	-
51	58.14	66.65	74.35	79.22	80.75	82.18	81.17	81.28	79.22	75.79	73.02	-	-	-	-	-	-
52	58.01	66.48	74.17	79.02	80.55	81.97	81	81.11	79	75.44	-	-	-	-	-	-	-
53	57.87	66.29	73.99	78.82	80.39	81.79	80.82	80.85	78.76	75.07	-	-	-	-	-	-	-
54	57.72	66.09	73.92	78.6	80.17	81.56	80.6	80.57	78.51	74.67	-	-	-	-	-	-	-
55	57.57	65.88	73.85	78.37	80.08	81.34	80.37	80.31	78.24	74.24	-	-	-	-	-	-	-
56	57.41	65.66	73.63	78.2	79.84	81.08	80.12	80.04	77.95	73.78	-	-	-	-	-	-	-
57	57.25	65.43	73.39	77.94	79.57	80.8	79.85	79.74	77.65	-	-	-	-	-	-	-	-
58	57.07	65.19	73.28	77.67	79.39	80.55	79.58	79.39	77.33	-	-	-	-	-	-	-	-
59	56.89	64.93	73.02	77.38	79.09	80.24	79.28	79.01	77.05	-	-	-	-	-	-	-	-
60	56.7	65.1	72.75	77.07	78.88	79.9	78.97	78.61	76.77	-	-	-	-	-	-	-	-
61	56.49	64.81	72.46	76.75	78.54	79.55	78.68	78.18	76.39	-	-	-	-	-	-	-	-
62	56.28	64.5	72.15	76.4	78.19	79.18	78.32	77.73	-	-	-	-	-	-	-	-	-
63	56.06	64.18	71.83	76.04	77.81	78.78	77.95	77.25	-	-	-	-	-	-	-	-	-
64	55.82	63.83	71.49	75.72	77.48	78.36	77.56	76.73	-	-	-	-	-	-	-	-	-
65	56.09	63.69	71.13	75.32	77.12	77.92	77.14	76.18	-	-	-	-	-	-	-	-	-
66	55.83	63.3	70.75	74.88	76.68	77.49	76.76	75.6	-	-	-	-	-	-	-	-	-
67	55.56	62.9	70.35	74.43	76.2	76.99	76.29	-	-	-	-	-	-	-	-	-	-

Table 1 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
68	55.28	62.47	69.93	73.94	75.7	76.46	75.8
69	54.98	62.01	69.48	73.43	75.17	75.9	75.27
70	55.66	61.54	69.01	72.89	74.61	75.3	74.72
71	55.33	61.03	68.51	72.32	74.02	74.67	74.13
72	54.97	60.5	67.98	71.71	73.39	73.99
73	54.6	59.93	67.42	71.07	72.72	73.28
74	54.21	59.33	66.84	70.39	72.02	72.52
75	54.29	58.7	66.22	69.66	71.27	71.72
76	53.86	58.04	65.56	68.9	70.47	70.87
77	53.41	57.34	64.87	68.09	69.63
78	52.93	56.59	64.14	67.24	68.75
79	52.43	55.81	63.36	66.33	67.8
80	51.91	54.98	62.55	65.38	66.8
81	51.36	54.1	61.69	64.36	65.75
82	50.78	53.18	60.78	63.29
83	50.17	52.2	59.82	62.15
84	49.54	51.17	58.8	60.95
85	48.87	50.08	57.73	59.67

Table 2
Ever-smoking prevalence among 5-year birth cohorts of white females, by age

Age	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
5	0.00	0.00	0.09	0.00	0.03	0.00	0.02	0.03	0.02	0.03	0.00	0.01	0.01	0.01	0.03	0.00	0.00
6	0.42	0.00	0.18	0.00	0.12	0.02	0.02	0.06	0.05	0.03	0.03	0.03	0.01	0.05	0.03	0.00	0.05
7	0.42	0.00	0.18	0.05	0.12	0.05	0.04	0.11	0.08	0.10	0.07	0.04	0.02	0.08	0.12	0.07	0.10
8	0.85	0.00	0.27	0.15	0.18	0.07	0.11	0.13	0.10	0.14	0.10	0.04	0.07	0.11	0.18	0.22	0.36
9	0.85	0.00	0.27	0.05	0.24	0.14	0.17	0.29	0.20	0.22	0.18	0.11	0.19	0.23	0.37	0.44	0.72
10	0.85	0.00	0.36	0.05	0.31	0.21	0.35	0.50	0.33	0.37	0.30	0.25	0.38	0.35	0.68	0.80	1.08
11	0.85	0.17	0.36	0.05	0.34	0.26	0.50	0.60	0.38	0.51	0.44	0.59	0.77	0.70	1.09	1.89	1.80
12	0.85	0.17	0.46	0.19	0.49	0.70	0.84	0.98	0.85	1.03	1.26	1.27	1.58	1.55	2.44	4.00	3.23
13	0.85	0.17	0.55	0.24	0.64	1.12	1.37	1.77	1.42	2.25	2.55	2.82	2.99	3.22	5.18	6.78	6.83
14	0.85	0.34	0.64	0.62	1.07	2.02	2.73	2.93	2.81	4.24	4.52	5.40	5.42	5.59	9.32	10.91	11.04
15	0.85	0.86	1.00	1.04	1.77	3.30	4.76	4.73	5.56	7.44	8.19	9.48	8.96	9.17	15.22	16.71	16.02
16	0.85	0.86	1.82	1.99	3.79	7.12	9.49	9.26	11.24	13.06	14.95	16.98	15.56	16.16	24.62	25.11	23.25
17	1.27	1.20	2.01	2.65	5.04	10.07	12.95	12.55	15.90	18.65	20.86	22.74	21.42	21.92	31.76	31.40	29.16
18	1.27	1.54	2.92	4.17	8.00	15.86	20.03	20.54	25.31	27.94	30.43	33.38	31.54	30.82	38.80	38.00	33.98
19	1.70	1.54	3.28	4.74	9.47	18.49	22.76	23.64	29.91	32.95	35.80	39.80	36.78	35.44	42.15	41.02	36.04
20	2.12	2.23	5.38	7.20	13.68	23.72	29.02	30.45	36.81	39.17	42.10	45.27	41.59	38.97	44.84	43.27	37.47
21	2.54	2.57	5.93	8.20	15.73	26.63	31.75	34.58	40.43	42.64	45.82	48.62	44.28	41.63	46.43	44.68	38.25
22	2.54	2.92	6.48	8.96	17.13	27.84	33.97	37.25	42.26	44.77	47.91	50.40	45.87	43.02	47.39	45.43	.
23	2.97	3.09	6.84	9.67	18.35	29.09	35.51	38.79	44.04	46.10	49.15	51.59	46.62	43.66	47.89	45.76	.
24	3.39	3.60	7.21	10.10	19.15	29.90	36.70	39.94	45.06	47.35	50.04	52.31	47.25	44.40	48.45	46.10	.
25	3.82	4.98	9.21	12.56	22.72	34.11	40.45	43.14	47.87	49.72	51.95	53.62	48.31	45.50	49.08	46.43	.
26	3.82	5.15	9.58	13.08	23.36	34.97	41.16	43.94	48.54	50.31	52.40	54.05	48.85	45.97	49.37	46.77	.
27	3.82	5.32	9.85	13.65	23.76	35.42	42.01	44.71	49.08	50.97	52.82	54.52	49.23	46.38	49.67	.	.
28	3.82	6.18	10.22	14.41	24.71	36.35	42.79	45.58	49.62	51.67	53.49	54.92	49.75	46.60	49.87	.	.
29	3.82	6.18	10.49	14.65	25.13	36.69	43.07	46.06	49.96	51.87	53.69	55.07	49.95	46.76	49.95	.	.
30	3.82	8.07	14.05	18.20	28.98	40.16	46.15	48.06	51.80	53.07	54.58	55.62	50.48	47.19	50.23	.	.

Table 2 (continued)

Table 2 (continued)

Age	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
62	9.79	13.75	20.03	25.75	34.74	42.72	46.83	47.46	-	-	-	-	-	-	-	-	-
63	9.73	13.63	19.86	25.53	34.45	42.30	46.41	47.11	-	-	-	-	-	-	-	-	-
64	9.67	13.51	19.67	25.33	34.14	41.86	45.97	46.73	-	-	-	-	-	-	-	-	-
65	9.61	13.38	19.71	25.15	33.85	41.43	45.51	46.34	-	-	-	-	-	-	-	-	-
66	9.91	13.38	19.51	24.89	33.51	40.93	45.01	45.92	-	-	-	-	-	-	-	-	-
67	9.85	13.24	19.30	24.65	33.15	40.44	44.48	-	-	-	-	-	-	-	-	-	-
68	9.78	13.10	19.08	24.41	32.81	39.88	43.92	-	-	-	-	-	-	-	-	-	-
69	9.71	12.94	18.85	24.16	32.45	39.28	43.33	-	-	-	-	-	-	-	-	-	-
70	9.64	12.92	18.61	23.83	32.03	38.65	42.75	-	-	-	-	-	-	-	-	-	-
71	9.57	12.75	18.36	23.49	31.58	37.98	42.08	-	-	-	-	-	-	-	-	-	-
72	9.49	12.71	18.10	23.21	31.11	37.27	-	-	-	-	-	-	-	-	-	-	-
73	9.41	12.53	17.92	22.83	30.62	36.51	-	-	-	-	-	-	-	-	-	-	-
74	9.33	12.35	17.64	22.44	30.09	35.71	-	-	-	-	-	-	-	-	-	-	-
75	9.25	12.28	17.34	22.02	29.54	34.86	-	-	-	-	-	-	-	-	-	-	-
76	9.17	12.07	17.02	21.59	28.96	33.96	-	-	-	-	-	-	-	-	-	-	-
77	9.08	11.86	16.70	21.13	28.35	-	-	-	-	-	-	-	-	-	-	-	-
78	9.00	11.64	16.36	20.74	27.71	-	-	-	-	-	-	-	-	-	-	-	-
79	8.91	11.41	16.00	20.23	27.03	-	-	-	-	-	-	-	-	-	-	-	-
80	8.81	11.17	15.63	19.70	26.31	-	-	-	-	-	-	-	-	-	-	-	-
81	8.72	10.93	15.24	19.15	25.55	-	-	-	-	-	-	-	-	-	-	-	-
82	8.62	10.67	14.84	18.57	-	-	-	-	-	-	-	-	-	-	-	-	-
83	8.52	10.41	14.41	17.95	-	-	-	-	-	-	-	-	-	-	-	-	-
84	8.42	10.13	13.97	17.31	-	-	-	-	-	-	-	-	-	-	-	-	-
85	8.31	9.84	13.51	16.64	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 3
Ever-smoking prevalence among 5-year birth cohorts of black males, by age

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.93	0.47	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	1.86	0.47	0.36	0.30	0.00	0.00	1.06	0.21	0.00	0.14	0.00	0.27	0.00	0.00
7	1.86	0.47	0.72	0.90	0.23	0.00	1.27	1.07	0.00	0.28	0.42	0.68	0.00	0.00
8	2.79	1.42	1.08	1.19	0.91	0.91	1.27	1.49	0.55	0.42	0.70	0.82	0.00	0.00
9	2.79	1.89	2.88	2.09	1.83	1.59	1.90	2.35	1.28	0.99	0.98	1.23	0.22	0.44
10	3.72	3.78	5.76	4.78	2.74	2.72	3.17	3.41	1.65	1.56	1.26	1.78	0.43	0.44
11	5.58	5.20	7.20	5.08	3.43	2.95	3.59	4.69	2.74	2.83	2.10	2.05	0.43	0.44
12	7.44	12.76	10.44	8.06	8.92	5.90	6.34	7.04	3.84	4.95	3.78	3.28	2.58	0.88
13	12.10	15.12	15.48	11.94	12.58	9.99	10.56	8.32	7.13	8.06	5.60	5.87	3.66	1.32
14	13.96	18.43	19.09	18.51	18.07	14.76	16.90	13.22	12.61	11.17	7.42	8.88	8.17	3.96
15	20.47	28.35	29.17	24.49	26.07	21.57	24.50	21.97	19.19	16.97	14.43	14.89	12.26	6.61
16	24.20	33.07	37.81	33.74	32.48	31.56	35.69	28.58	29.61	27.02	21.57	22.13	20.22	11.89
17	29.78	40.16	42.49	40.91	39.79	40.87	43.93	38.39	38.57	35.22	27.59	31.01	26.67	16.74
18	41.88	47.25	51.50	50.46	51.92	54.27	55.55	47.34	49.36	47.10	36.27	39.48	35.05	24.23
19	48.39	50.08	56.18	55.24	56.72	60.85	60.83	53.95	54.84	52.05	41.88	43.17	38.71	26.43
20	56.77	58.11	60.50	63.30	63.58	67.21	64.84	58.22	61.24	57.00	47.20	46.17	40.86	27.75
21	61.42	61.42	66.98	68.38	67.92	72.21	70.12	61.84	65.26	60.54	50.79	49.48	41.95	28.43
22	63.28	62.84	69.14	72.56	72.96	74.25	73.92	64.40	69.10	62.60	53.66	51.04	43.26	-
23	64.21	65.20	69.86	74.35	74.33	76.52	75.61	65.47	71.29	63.96	54.37	53.19	44.92	-
24	64.21	65.67	70.58	75.55	75.70	77.88	76.88	66.54	72.21	64.60	54.66	53.74	45.77	-
25	66.07	66.14	73.10	79.73	78.22	80.16	78.99	68.24	74.95	65.93	56.57	54.70	45.77	-
26	66.07	66.62	73.10	81.22	79.13	80.38	79.42	69.31	75.68	66.10	57.34	55.08	45.77	-
27	66.07	67.09	73.46	81.82	79.59	81.06	80.68	69.73	75.87	66.60	57.50	56.25	-	-
28	67.93	67.56	74.18	82.41	80.05	81.52	81.11	70.37	76.45	67.11	57.50	56.45	-	-
29	67.93	68.03	74.54	82.41	80.05	81.97	81.11	70.59	76.65	67.45	57.50	56.70	-	-
30	67.93	69.45	76.34	83.91	81.19	82.65	81.74	71.87	76.86	67.62	58.14	56.70	-	-

Table 3 (continued)

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
31	67.88	69.39	76.28	84.15	81.35	82.82	81.66	71.80	76.78	67.80	58.35	56.70	-	-
32	68.75	69.33	76.94	84.09	81.52	82.75	81.58	71.96	76.90	68.00	58.57	-	-	-
33	69.62	69.27	77.23	84.02	81.67	82.68	81.71	71.88	76.81	68.00	58.79	-	-	-
34	69.56	69.67	77.16	83.95	81.59	82.61	81.62	72.55	76.71	68.00	59.06	-	-	-
35	70.42	70.07	77.45	84.47	81.97	82.53	81.73	72.72	76.81	68.00	59.42	-	-	-
36	70.34	69.99	77.37	84.40	82.11	82.44	81.62	73.16	76.69	68.00	59.42	-	-	-
37	71.19	70.38	77.64	84.31	82.01	82.35	81.50	73.60	76.56	68.00	-	-	-	-
38	71.11	70.29	77.55	84.23	81.91	82.26	81.38	73.76	76.43	68.00	-	-	-	-
39	71.02	70.20	77.45	84.13	81.81	82.16	81.24	73.91	76.55	68.00	-	-	-	-
40	71.85	70.57	77.71	84.63	81.92	82.28	81.10	74.05	76.39	68.00	-	-	-	-
41	71.75	70.47	77.60	84.52	81.80	82.16	80.95	74.19	76.22	68.00	-	-	-	-
42	71.64	70.36	77.48	84.41	81.67	82.04	80.78	74.04	76.03	-	-	-	-	-
43	71.53	70.24	77.36	84.30	81.53	81.91	80.60	74.21	75.83	-	-	-	-	-
44	71.41	70.12	77.23	84.17	81.39	82.02	80.41	74.05	75.61	-	-	-	-	-
45	71.29	69.99	77.45	84.04	81.23	81.88	80.46	73.87	75.38	-	-	-	-	-
46	71.15	69.85	77.30	83.90	81.06	81.72	80.23	73.67	75.12	-	-	-	-	-
47	71.01	69.70	77.15	83.75	80.89	81.56	79.99	73.47	-	-	-	-	-	-
48	70.86	69.54	76.98	83.60	80.70	81.38	79.74	73.25	-	-	-	-	-	-
49	70.71	69.38	76.81	83.73	80.50	81.20	79.46	73.01	-	-	-	-	-	-
50	71.44	69.66	76.63	83.55	80.53	81.00	79.16	73.47	-	-	-	-	-	-
51	71.26	69.47	76.43	83.36	80.30	80.79	78.84	73.20	-	-	-	-	-	-
52	71.08	69.73	76.22	83.17	80.06	80.56	78.50	-	-	-	-	-	-	-
53	70.87	69.52	76.00	83.26	79.80	80.33	78.13	-	-	-	-	-	-	-
54	70.66	69.30	75.77	83.04	79.53	80.07	77.73	-	-	-	-	-	-	-
55	70.44	69.06	75.52	82.80	79.24	79.81	77.30	-	-	-	-	-	-	-
56	71.09	68.81	75.26	82.55	78.92	79.52	76.84	-	-	-	-	-	-	-
57	70.83	68.55	74.98	82.29	78.59	79.22	-	-	-	-	-	-	-	-
58	71.44	68.27	74.68	82.01	78.24	78.90	-	-	-	-	-	-	-	-
59	71.16	67.97	74.37	81.71	77.86	78.56	-	-	-	-	-	-	-	-
60	70.85	67.65	74.04	81.40	77.46	78.19	-	-	-	-	-	-	-	-
61	70.52	67.32	73.69	81.07	77.04	77.81	-	-	-	-	-	-	-	-

Table 3 (continued)

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
62	70.18	66.96	73.31	80.72	76.58	-	-	-	-	-	-	-	-	-
63	69.82	66.59	72.92	80.35	76.10	-	-	-	-	-	-	-	-	-
64	69.43	66.19	72.50	79.95	75.59	-	-	-	-	-	-	-	-	-
65	69.03	65.77	72.05	79.53	75.04	-	-	-	-	-	-	-	-	-
66	68.59	65.33	71.58	79.09	74.45	-	-	-	-	-	-	-	-	-
67	68.14	64.85	71.08	78.62	-	-	-	-	-	-	-	-	-	-
68	67.65	64.35	70.55	78.13	-	-	-	-	-	-	-	-	-	-
69	67.14	63.82	69.98	77.60	-	-	-	-	-	-	-	-	-	-
70	66.60	63.26	69.38	77.05	-	-	-	-	-	-	-	-	-	-
71	66.03	62.67	68.75	76.46	-	-	-	-	-	-	-	-	-	-
72	65.42	62.04	68.08	-	-	-	-	-	-	-	-	-	-	-
73	64.78	61.37	67.36	-	-	-	-	-	-	-	-	-	-	-
74	64.09	60.67	66.61	-	-	-	-	-	-	-	-	-	-	-
75	63.37	59.92	65.81	-	-	-	-	-	-	-	-	-	-	-
76	62.61	59.12	64.96	-	-	-	-	-	-	-	-	-	-	-
77	61.80	58.29	-	-	-	-	-	-	-	-	-	-	-	-
78	60.95	57.40	-	-	-	-	-	-	-	-	-	-	-	-
79	60.04	56.45	-	-	-	-	-	-	-	-	-	-	-	-
80	59.08	55.45	-	-	-	-	-	-	-	-	-	-	-	-
81	58.07	54.40	-	-	-	-	-	-	-	-	-	-	-	-
82	57.00	-	-	-	-	-	-	-	-	-	-	-	-	-
83	55.86	-	-	-	-	-	-	-	-	-	-	-	-	-
84	54.65	-	-	-	-	-	-	-	-	-	-	-	-	-
85	53.38	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 4
Ever-smoking prevalence among 5-year birth cohorts of black females, by age

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.20	0.00	0.29	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00
7	0.00	0.32	0.20	0.18	0.44	0.00	0.00	0.12	0.32	0.08	0.00	0.07	0.00	0.20
8	0.00	0.63	0.20	0.37	0.59	0.25	0.00	0.24	0.42	0.08	0.07	0.07	0.00	0.20
9	0.00	1.27	0.20	0.74	0.59	0.76	0.48	0.48	0.53	0.08	0.15	0.07	0.10	0.20
10	0.40	1.27	1.20	1.11	0.88	1.01	1.32	0.72	0.53	0.23	0.37	0.27	0.59	0.40
11	0.40	1.58	1.40	1.48	1.03	1.39	1.69	1.08	0.84	0.39	0.88	0.68	0.89	0.80
12	1.19	1.90	2.20	1.84	1.91	1.76	2.77	1.79	1.69	1.32	1.75	1.85	1.98	2.01
13	1.59	2.22	2.20	2.77	2.79	2.77	4.09	2.99	2.63	3.04	2.78	3.42	3.67	3.01
14	2.38	2.85	3.00	4.79	4.69	4.28	5.66	5.62	4.64	4.44	4.38	6.02	6.24	5.62
15	3.17	3.80	4.79	6.64	6.89	6.67	8.67	9.44	8.11	7.32	8.11	11.41	10.60	8.63
16	3.97	5.70	6.99	9.22	10.71	10.45	13.25	14.10	13.70	12.37	13.37	18.32	16.85	12.85
17	3.97	6.97	9.19	12.36	13.06	15.11	17.46	19.84	19.91	16.34	18.41	23.51	23.59	16.67
18	4.76	8.87	10.99	17.15	18.04	23.68	26.01	27.13	28.76	25.91	25.35	31.17	29.93	20.68
19	4.76	9.81	12.78	19.55	21.86	27.83	30.34	31.67	34.14	29.96	30.09	35.41	32.51	23.09
20	6.75	13.93	16.38	25.08	28.16	33.62	35.88	38.49	39.51	34.09	35.06	38.48	36.08	24.90
21	6.75	14.88	17.58	27.29	31.98	36.52	39.13	41.48	43.52	37.04	37.63	40.43	36.47	25.79
22	7.14	16.46	18.98	28.58	34.03	38.79	41.18	45.06	45.83	39.57	39.44	42.18	37.27	-
23	7.14	16.46	20.37	29.50	36.23	40.55	42.63	47.09	47.62	41.04	41.63	43.23	38.00	-
24	7.14	17.10	20.97	30.24	36.96	41.31	44.07	47.81	48.15	41.98	42.54	44.11	38.25	-
25	7.14	18.68	23.57	34.85	40.05	45.21	46.96	49.84	50.68	43.74	43.60	45.23	39.05	-
26	7.14	19.00	24.17	35.22	41.22	46.09	47.80	50.56	51.63	44.36	44.25	45.79	40.29	-
27	8.33	19.95	24.57	36.33	42.10	46.60	48.77	51.04	52.19	44.78	44.50	46.17	-	-
28	8.33	20.26	25.37	36.88	42.54	46.97	49.61	51.75	52.56	45.29	45.13	46.37	-	-
29	8.73	20.26	25.97	37.25	43.42	47.22	49.73	51.75	53.21	45.92	45.61	46.82	-	-
30	11.11	20.90	29.16	39.65	46.35	49.11	51.90	54.03	54.04	46.55	46.43	47.28	-	-

Table 4 (continued)

Table 4 (continued)

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
62	16.23	23.57	28.13	40.46	48.55	-	-	-	-	-	-	-	-	-
63	16.03	23.29	27.71	40.04	48.20	-	-	-	-	-	-	-	-	-
64	15.82	22.99	27.27	39.60	47.82	-	-	-	-	-	-	-	-	-
65	15.59	22.67	26.80	39.13	47.43	-	-	-	-	-	-	-	-	-
66	15.36	22.34	26.31	38.63	47.01	-	-	-	-	-	-	-	-	-
67	15.12	21.99	25.78	38.11	-	-	-	-	-	-	-	-	-	-
68	14.86	21.62	25.22	37.55	-	-	-	-	-	-	-	-	-	-
69	14.59	21.23	24.62	36.95	-	-	-	-	-	-	-	-	-	-
70	14.30	20.82	23.99	36.32	-	-	-	-	-	-	-	-	-	-
71	14.01	20.38	23.32	35.65	-	-	-	-	-	-	-	-	-	-
72	14.25	19.92	22.61	-	-	-	-	-	-	-	-	-	-	-
73	14.45	19.44	21.85	-	-	-	-	-	-	-	-	-	-	-
74	14.08	18.93	21.05	-	-	-	-	-	-	-	-	-	-	-
75	13.69	18.90	20.20	-	-	-	-	-	-	-	-	-	-	-
76	13.28	18.32	19.30	-	-	-	-	-	-	-	-	-	-	-
77	12.85	17.70	-	-	-	-	-	-	-	-	-	-	-	-
78	12.40	17.06	-	-	-	-	-	-	-	-	-	-	-	-
79	11.92	16.38	-	-	-	-	-	-	-	-	-	-	-	-
80	11.43	15.66	-	-	-	-	-	-	-	-	-	-	-	-
81	11.60	14.91	-	-	-	-	-	-	-	-	-	-	-	-
82	11.02	-	-	-	-	-	-	-	-	-	-	-	-	-
83	10.41	-	-	-	-	-	-	-	-	-	-	-	-	-
84	9.76	-	-	-	-	-	-	-	-	-	-	-	-	-
85	9.09	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 5
Ever-smoking prevalence among 5-year birth cohorts of white males, by year

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1885	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1886	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1887	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1888	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1889	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1890	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1891	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1892	0.55	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1893	0.55	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1894	0.55	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1895	1.11	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1896	1.66	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1897	2.22	J.24	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1898	3.32	0.71	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1899	4.99	1.19	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1900	7.20	1.67	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	9.97	2.86	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	15.51	4.05	0.41	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	19.39	4.28	0.96	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	21.60	5.47	1.51	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	24.93	8.31	2.33	0.07	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1906	31.02	11.66	3.42	0.15	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1907	36.01	13.81	6.02	0.36	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1908	40.44	18.57	7.11	0.65	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1909	44.87	23.57	10.13	1.16	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1910	46.53	28.80	13.55	1.89	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1911	48.19	34.99	18.20	3.12	0.10	0.00	-	-	-	-	-	-	-	-	-	-	-
1912	49.30	39.51	23.12	4.86	0.31	0.00	-	-	-	-	-	-	-	-	-	-	-
1913	49.85	43.32	29.55	5.73	0.57	0.00	-	-	-	-	-	-	-	-	-	-	-
1914	52.62	47.13	34.48	8.49	1.50	0.00	-	-	-	-	-	-	-	-	-	-	-
1915	53.18	50.23	41.73	11.17	2.17	0.07	0.00	-	-	-	-	-	-	-	-	-	-
1916	54.29	52.85	49.94	15.23	3.41	0.11	0.00	-	-	-	-	-	-	-	-	-	-
1917	54.84	55.70	55.96	20.31	4.90	0.18	0.00	-	-	-	-	-	-	-	-	-	-
1918	54.80	57.37	60.61	30.10	6.76	0.52	0.00	-	-	-	-	-	-	-	-	-	-
1919	55.30	59.99	65.13	38.22	9.76	0.92	0.00	-	-	-	-	-	-	-	-	-	-
1920	55.26	61.18	67.18	45.11	13.11	1.81	0.06	0.00	-	-	-	-	-	-	-	-	-
1921	55.20	61.89	68.00	52.59	17.76	2.62	0.09	0.00	-	-	-	-	-	-	-	-	-

Table 5 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1922	55.70	62.13	69.10	58.32	23.85	3.95	0.27	0.00	-	-	-	-	-	-	-	-	-
1923	56.20	62.08	69.92	61.94	32.11	5.76	0.80	0.00	-	-	-	-	-	-	-	-	-
1924	56.14	62.74	70.60	66.66	40.11	8.87	1.59	0.00	-	-	-	-	-	-	-	-	-
1925	56.07	63.39	71.42	69.56	48.79	12.52	2.33	0.05	0.00	-	-	-	-	-	-	-	-
1926	56.01	63.81	71.70	71.15	55.81	17.81	3.34	0.18	0.00	-	-	-	-	-	-	-	-
1927	55.94	63.74	72.38	72.46	61.54	24.38	4.58	0.42	0.00	-	-	-	-	-	-	-	-
1928	56.41	63.67	72.87	73.98	66.60	32.36	6.56	0.86	0.00	-	-	-	-	-	-	-	-
1929	56.34	63.84	73.77	74.93	70.06	40.71	9.42	1.46	0.03	-	-	-	-	-	-	-	-
1930	56.80	64.47	73.99	76.01	73.57	48.36	13.08	2.35	0.05	0.00	-	-	-	-	-	-	-
1931	56.72	64.62	74.06	76.74	74.86	57.01	18.60	3.37	0.05	0.00	-	-	-	-	-	-	-
1932	56.63	65.48	73.99	77.32	75.94	63.03	24.69	4.67	0.28	0.00	-	-	-	-	-	-	-
1933	57.07	66.09	74.06	78.06	77.18	67.54	32.75	6.31	0.56	0.00	-	-	-	-	-	-	-
1934	56.97	65.99	74.12	78.80	78.42	72.12	41.17	8.48	0.94	0.03	-	-	-	-	-	-	-
1935	56.87	66.12	74.17	79.10	79.04	74.37	49.55	11.69	1.68	0.05	0.00	-	-	-	-	-	-
1936	57.30	66.25	74.23	79.46	79.40	76.48	56.67	16.99	2.50	0.08	0.00	-	-	-	-	-	-
1937	57.18	66.13	74.54	79.39	79.71	78.03	63.34	23.72	3.93	0.22	0.00	-	-	-	-	-	-
1938	57.60	66.24	74.45	79.39	80.38	79.03	67.36	31.13	5.43	0.49	0.00	-	-	-	-	-	-
1939	57.47	66.34	74.62	79.38	80.68	79.80	70.61	39.51	7.83	1.02	0.00	-	-	-	-	-	-
1940	57.87	66.43	74.51	79.51	80.72	80.76	73.50	48.17	11.32	1.81	0.03	0.00	-	-	-	-	-
1941	57.72	66.51	74.40	79.49	81.06	81.39	75.87	56.76	16.37	2.55	0.08	0.00	-	-	-	-	-
1942	57.57	66.59	74.55	79.68	81.24	82.02	77.99	65.78	23.73	3.43	0.21	0.00	-	-	-	-	-
1943	57.41	66.42	74.56	79.87	81.47	82.52	79.41	71.32	33.45	5.27	0.42	0.00	-	-	-	-	-
1944	57.25	66.48	74.69	79.90	81.44	82.97	80.59	74.84	44.87	7.74	0.79	0.02	-	-	-	-	-
1945	57.07	66.29	74.69	80.07	81.61	83.16	81.33	77.58	53.89	11.80	1.38	0.04	0.00	-	-	-	-
1946	56.89	66.09	74.54	79.95	81.62	83.42	81.77	79.59	62.20	17.73	1.90	0.04	0.00	-	-	-	-
1947	56.70	65.88	74.38	79.82	81.63	83.46	82.04	80.66	68.04	25.03	3.20	0.19	0.00	-	-	-	-
1948	56.49	65.66	74.35	79.68	81.52	83.52	82.33	81.39	71.38	33.82	4.66	0.27	0.00	-	-	-	-
1949	56.28	65.43	74.17	79.68	81.57	83.58	82.45	81.94	74.29	42.05	6.67	0.48	0.00	-	-	-	-
1950	56.58	65.19	73.99	79.60	81.60	83.68	82.41	82.35	76.61	50.45	10.00	0.90	0.02	0.00	-	-	-
1951	56.34	65.15	73.79	79.43	81.58	83.62	82.40	82.69	77.91	58.05	15.42	1.57	0.06	0.00	-	-	-
1952	56.09	64.88	73.71	79.33	81.55	83.52	82.48	82.90	78.75	64.97	22.17	2.27	0.14	0.00	-	-	-
1953	55.83	64.59	73.63	79.15	81.41	83.44	82.49	83.07	79.41	69.83	30.21	3.55	0.24	0.00	-	-	-
1954	55.56	64.50	73.53	79.02	81.26	83.37	82.40	83.08	79.82	72.08	38.83	5.74	0.36	0.00	-	-	-
1955	55.28	64.18	73.28	78.82	81.11	83.24	82.46	83.09	80.15	74.14	48.20	9.29	0.66	0.02	0.00	-	-
1956	55.48	64.05	73.02	78.60	80.99	83.15	82.37	83.01	80.41	75.70	55.39	14.46	1.25	0.05	0.00	-	-
1957	55.16	63.69	72.75	78.37	80.87	83.05	82.30	83.01	80.66	76.63	61.87	21.43	2.11	0.13	0.00	-	-
1958	54.83	63.30	72.46	78.13	80.73	82.90	82.25	82.97	80.86	77.29	66.77	29.84	3.45	0.25	0.00	-	-

Table 5 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1959	54.97	62.90	72.15	77.87	80.58	82.79	82.14	82.88	80.94	77.65	69.65	38.46	5.14	0.33	0.00	-	
1960	54.60	62.47	71.83	77.67	80.37	82.62	82.08	82.80	80.97	77.92	71.74	47.29	8.06	0.53	0.02	0.00	-
1961	54.21	62.01	71.49	77.38	80.20	82.52	82.02	82.70	80.98	78.06	72.77	55.45	12.92	0.94	0.02	0.00	-
1962	53.81	61.54	71.13	77.07	80.01	82.34	81.92	82.61	80.95	78.31	73.41	60.71	18.50	1.50	0.05	0.00	-
1963	53.38	61.03	70.75	76.75	79.81	82.21	81.81	82.62	80.92	78.45	73.78	65.00	26.01	2.29	0.19	0.00	-
1964	53.41	60.50	70.35	76.40	79.55	82.01	81.74	82.54	80.90	78.51	74.31	67.99	33.56	4.23	0.30	0.00	-
1965	52.93	59.93	69.93	76.04	79.32	81.79	81.62	82.41	80.86	78.53	74.97	69.57	41.32	7.10	0.52	0.00	0.00
1966	52.43	59.33	69.48	75.66	79.02	81.55	81.45	82.34	80.78	78.44	75.15	70.74	48.35	10.93	0.90	0.00	0.00
1967	51.91	58.70	69.01	75.25	78.81	81.34	81.30	82.21	80.70	78.45	75.36	71.37	54.17	17.09	1.46	0.03	0.00
1968	51.36	58.04	68.51	74.88	78.52	81.08	81.12	82.14	80.64	78.45	75.43	71.93	58.57	24.47	2.71	0.11	0.00
1969	50.78	57.34	67.98	74.43	78.17	80.80	81.01	82.02	80.59	78.42	75.46	72.25	61.33	31.81	4.38	0.26	0.00
1970	50.17	56.59	67.42	73.94	77.79	80.51	80.83	81.86	80.49	78.35	75.46	72.52	63.03	38.70	7.01	0.65	0.00
1971	49.54	55.81	66.84	73.43	77.40	80.19	80.60	81.69	80.41	78.25	75.43	72.72	63.88	44.78	11.67	1.02	0.00
1972	48.87	54.98	66.22	72.89	77.12	79.91	80.37	81.54	80.29	78.14	75.40	72.83	64.50	49.90	17.82	1.82	0.06
1973	-	54.10	65.56	72.32	76.68	79.56	80.12	81.31	80.14	78.01	75.43	72.85	64.95	53.06	24.57	2.85	0.06
1974	-	53.18	64.87	71.71	76.20	79.18	79.86	81.10	80.00	77.85	75.39	72.97	65.28	54.87	31.94	4.64	0.19
1975	-	52.20	64.14	71.07	75.70	78.79	79.58	80.84	79.86	77.67	75.31	72.93	65.44	55.99	38.09	7.80	0.71
1976	-	51.17	63.36	70.39	75.17	78.41	79.28	80.60	79.67	77.51	75.22	72.85	65.60	56.79	42.68	12.01	0.84
1977	-	50.08	62.55	69.66	74.61	77.97	78.97	80.34	79.48	77.30	75.09	72.93	65.69	57.31	45.98	17.71	1.95
1978	-	-	61.69	68.90	74.02	77.49	78.68	80.03	79.27	77.14	74.98	72.89	65.75	57.82	47.83	22.94	2.99
1979	-	-	60.78	68.09	73.39	76.99	78.32	79.70	79.04	76.94	74.87	72.79	65.86	58.06	49.09	27.61	5.39
1980	-	-	59.82	67.24	72.72	76.46	77.95	79.39	78.81	76.68	74.71	72.65	65.97	58.32	50.24	32.08	8.12
1981	-	-	58.80	66.33	72.02	75.90	77.56	79.01	78.55	76.40	74.54	72.50	66.00	58.50	50.76	36.54	12.27
1982	-	-	57.73	65.38	71.27	75.30	77.14	78.61	78.29	76.11	74.36	72.38	66.03	58.63	51.38	39.91	16.75
1983	-	-	-	64.36	70.47	74.67	76.76	78.18	78.00	75.79	74.22	72.25	66.06	58.78	51.71	41.83	22.99
1984	-	-	-	63.29	69.63	73.99	76.29	77.73	77.70	75.44	74.01	72.07	66.06	58.89	51.96	43.41	27.73
1985	-	-	-	62.15	68.75	73.28	75.80	77.25	77.38	75.07	73.79	71.87	66.19	59.02	52.45	44.40	31.82
1986	-	-	-	60.95	67.80	72.52	75.27	76.73	77.09	74.67	73.55	71.65	66.22	59.07	52.83	45.12	34.55
1987	-	-	-	59.67	66.80	71.72	74.72	76.18	76.77	74.24	73.29	71.46	66.25	59.17	52.91	45.41	35.65
1988	-	-	-	-	65.75	70.87	74.13	75.60	76.39	73.78	73.02	71.20	66.31	59.17	52.91	45.53	36.11

Table 6
Ever-smoking prevalence among 5-year birth cohorts of white females, by year

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1885	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1886	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1887	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1888	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1889	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1890	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1891	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1892	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1893	0.42	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1894	0.42	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1895	0.42	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1896	0.85	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1897	0.85	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1898	0.85	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1899	0.85	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1900	0.85	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	0.85	0.17	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	1.27	0.17	0.18	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	1.27	0.17	0.18	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	1.27	0.17	0.27	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	1.27	0.34	0.27	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1906	1.27	0.69	0.27	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1907	1.27	0.86	0.27	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1908	2.12	0.86	0.37	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1909	2.97	1.03	0.37	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1910	2.97	1.37	0.46	0.05	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1911	3.39	1.72	0.73	0.05	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1912	3.39	1.72	1.00	0.09	0.03	0.00	-	-	-	-	-	-	-	-	-	-	-
1913	3.39	2.06	1.46	0.09	0.09	0.00	-	-	-	-	-	-	-	-	-	-	-
1914	3.82	2.92	1.83	0.19	0.18	0.00	-	-	-	-	-	-	-	-	-	-	-
1915	3.82	3.26	2.47	0.28	0.18	0.00	0.00	-	-	-	-	-	-	-	-	-	-

Table 6 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1916	3.82	3.78	3.56	0.52	0.18	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1917	3.82	4.46	4.57	0.95	0.21	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1918	3.81	5.15	5.66	1.37	0.40	0.02	0.00	-	-	-	-	-	-	-	-	-	-
1919	3.80	5.32	6.21	2.09	0.49	0.02	0.02	-	-	-	-	-	-	-	-	-	-
1920	3.79	6.18	7.03	3.08	0.64	0.12	0.02	0.00	-	-	-	-	-	-	-	-	-
1921	3.78	6.69	7.58	4.27	1.04	0.14	0.02	0.00	-	-	-	-	-	-	-	-	-
1922	4.19	7.55	8.49	5.55	1.74	0.23	0.02	0.00	-	-	-	-	-	-	-	-	-
1923	4.18	7.88	9.22	6.54	2.93	0.47	0.02	0.00	-	-	-	-	-	-	-	-	-
1924	4.58	8.20	9.68	8.15	4.46	0.72	0.06	0.00	-	-	-	-	-	-	-	-	-
1925	4.57	8.69	10.78	9.24	6.66	1.19	0.07	0.00	0.00	-	-	-	-	-	-	-	-
1926	4.97	9.18	11.60	10.38	8.70	2.23	0.11	0.02	0.00	-	-	-	-	-	-	-	-
1927	4.96	9.32	12.60	11.33	11.63	3.65	0.32	0.03	0.00	-	-	-	-	-	-	-	-
1928	5.35	10.14	13.22	12.32	13.41	6.30	0.46	0.06	0.00	-	-	-	-	-	-	-	-
1929	5.75	10.11	14.01	13.13	15.91	9.68	0.85	0.11	0.00	-	-	-	-	-	-	-	-
1930	5.73	10.25	14.44	14.27	18.26	13.73	1.84	0.24	0.00	0.00	-	-	-	-	-	-	-
1931	5.71	10.72	14.68	15.55	20.06	17.63	3.29	0.35	0.00	0.00	-	-	-	-	-	-	-
1932	6.10	11.35	15.00	16.40	21.13	20.98	5.42	0.45	0.00	0.00	-	-	-	-	-	-	-
1933	7.29	11.65	15.42	17.32	22.35	24.13	8.98	0.74	0.02	0.00	-	-	-	-	-	-	-
1934	7.67	11.77	16.01	18.57	23.67	27.01	12.99	1.21	0.07	0.00	-	-	-	-	-	-	-
1935	8.04	11.89	16.69	19.43	24.98	29.13	17.71	2.01	0.16	0.02	0.00	-	-	-	-	-	-
1936	8.01	12.67	16.91	20.28	26.11	30.89	22.01	3.57	0.20	0.02	0.00	-	-	-	-	-	-
1937	7.98	12.62	17.40	20.95	27.30	32.50	26.06	5.86	0.33	0.02	0.00	-	-	-	-	-	-
1938	7.95	12.57	18.14	21.37	28.15	33.94	29.84	9.04	0.51	0.05	0.00	-	-	-	-	-	-
1939	8.70	13.00	18.89	21.70	29.42	35.15	32.48	13.03	0.91	0.07	0.00	-	-	-	-	-	-
1940	8.67	13.26	19.18	22.58	30.10	36.50	35.04	17.90	2.04	0.14	0.00	0.00	-	-	-	-	-
1941	8.63	13.20	19.29	23.04	30.48	37.60	37.21	22.60	3.86	0.19	0.00	0.00	-	-	-	-	-
1942	8.59	13.13	19.30	23.44	31.03	38.80	38.77	27.68	6.42	0.44	0.02	0.00	-	-	-	-	-
1943	8.55	13.39	19.67	23.70	31.73	39.57	40.29	31.56	11.28	0.85	0.03	0.00	-	-	-	-	-
1944	8.51	13.63	19.76	24.37	32.45	40.37	41.57	35.23	16.81	1.54	0.03	0.00	-	-	-	-	-
1945	8.46	13.71	20.12	24.71	33.20	41.13	42.89	38.14	23.33	2.72	0.08	0.00	0.00	-	-	-	-
1946	8.42	13.63	20.20	24.95	33.55	41.43	43.99	40.34	29.34	4.75	0.22	0.00	0.00	-	-	-	-

Table 6 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1947	9.14	13.55	20.28	25.14	33.99	41.85	44.75	41.92	34.40	7.91	0.37	0.03	0.00	-	-	-	-
1948	9.46	13.61	20.35	25.19	34.35	42.15	45.60	43.37	38.24	13.88	0.82	0.04	0.00	-	-	-	-
1949	9.79	13.68	20.34	25.23	34.87	42.51	46.29	44.41	41.65	19.92	1.48	0.04	0.00	-	-	-	-
1950	9.73	13.73	20.23	25.77	35.22	43.02	46.86	45.39	43.56	26.01	2.72	0.10	0.00	0.00	-	-	-
1951	9.67	13.63	20.20	25.93	35.36	43.49	47.10	46.31	45.30	32.01	5.28	0.18	0.01	0.00	-	-	-
1952	9.61	13.68	20.33	25.91	35.49	43.80	47.51	47.18	46.64	36.98	9.33	0.38	0.02	0.00	-	-	-
1953	9.55	13.57	20.29	26.05	35.44	44.13	47.88	47.71	47.70	40.72	15.00	0.82	0.02	0.00	-	-	-
1954	9.48	13.60	20.16	26.19	35.44	44.55	48.26	48.32	48.87	43.68	21.30	1.60	0.06	0.00	-	-	-
1955	9.78	13.63	20.11	26.28	35.55	44.66	48.43	48.59	49.79	45.95	27.49	3.23	0.13	0.00	0.00	-	-
1956	9.71	13.51	20.05	26.23	35.74	44.64	48.70	48.97	50.36	47.54	33.60	6.13	0.28	0.03	0.00	-	-
1957	9.64	13.38	19.98	26.12	35.80	44.62	49.02	49.30	51.15	48.60	39.12	10.10	0.50	0.04	0.00	-	-
1958	9.57	13.24	19.98	26.31	35.94	44.73	49.12	49.69	51.67	49.84	43.24	15.61	1.11	0.05	0.01	-	-
1959	9.49	13.10	19.97	26.19	35.99	44.80	49.44	49.79	52.01	50.73	46.78	22.16	1.95	0.07	0.01	-	-
1960	9.41	13.10	19.96	26.23	35.99	45.04	49.68	50.07	52.28	51.58	48.81	29.67	3.34	0.15	0.03	0.00	-
1961	9.33	12.94	19.78	26.08	35.90	44.97	49.72	50.19	52.44	52.24	50.24	36.37	6.27	0.27	0.03	0.00	-
1962	9.25	12.92	19.58	26.06	35.74	44.97	49.78	50.29	52.62	52.76	51.06	42.26	9.80	0.58	0.06	0.00	-
1963	9.17	12.89	19.46	25.89	35.54	44.95	49.74	50.38	52.91	53.00	52.06	46.54	15.06	1.20	0.10	0.00	-
1964	9.08	12.71	19.33	25.76	35.39	44.84	49.76	50.46	53.21	53.26	52.69	49.38	20.94	2.09	0.14	0.00	-
1965	9.00	12.53	19.11	25.61	35.31	44.88	49.79	50.56	53.31	53.40	53.26	51.26	27.69	3.54	0.25	0.00	0.00
1966	8.91	12.35	18.88	25.41	35.19	44.69	49.74	50.58	53.44	53.53	53.74	52.47	33.55	6.37	0.35	0.00	0.00
1967	8.81	12.15	18.64	25.16	35.05	44.58	49.61	50.53	53.49	53.68	54.30	53.24	38.68	10.48	0.65	0.00	0.00
1968	8.72	11.95	18.39	24.89	34.93	44.42	49.55	50.44	53.56	53.89	54.61	53.86	42.41	15.56	1.40	0.00	0.00
1969	8.62	11.86	18.20	24.65	34.70	44.20	49.46	50.40	53.61	54.07	54.98	54.39	44.72	21.31	2.70	0.02	0.00
1970	8.52	11.64	17.92	24.44	34.44	44.00	49.28	50.37	53.58	54.19	55.13	54.70	46.07	27.41	4.81	0.18	0.00
1971	8.42	11.41	17.64	24.13	34.13	43.70	49.10	50.21	53.56	54.29	55.16	55.04	47.05	32.95	8.82	0.49	0.00
1972	8.31	11.17	17.34	23.81	33.81	43.42	48.87	50.14	53.54	54.28	55.20	55.35	47.83	37.19	14.53	1.18	0.05
1973	-	10.93	17.02	23.47	33.51	43.08	48.64	50.05	53.46	54.32	55.28	55.49	48.49	40.53	21.55	2.62	0.15
1974	-	10.67	16.70	23.18	33.19	42.72	48.43	49.91	53.32	54.35	55.40	55.60	49.02	42.46	28.65	4.58	0.31
1975	-	10.41	16.36	22.81	32.81	42.31	48.15	49.76	53.24	54.33	55.47	55.69	49.53	43.74	34.91	7.18	0.62
1976	-	10.13	16.00	22.41	32.41	41.90	47.85	49.54	53.08	54.29	55.54	55.75	49.97	44.80	39.89	11.16	0.92
1977	-	9.84	15.63	22.00	32.03	41.43	47.50	49.32	52.90	54.26	55.51	55.84	50.47	45.70	43.37	16.40	1.69

Table 6 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1978	-	-	15.24	21.56	31.58	40.96	47.14	49.10	52.71	54.21	55.54	55.94	50.72	46.23	45.49	22.69	3.39
1979	-	-	14.84	21.11	31.11	40.44	46.74	48.93	52.54	54.11	55.42	55.97	50.95	46.66	46.66	29.02	6.06
1980	-	-	14.41	20.63	30.62	39.88	46.33	48.69	52.30	54.05	55.33	56.07	51.09	46.91	47.76	34.69	9.39
1981	-	-	13.97	20.13	30.09	39.28	45.96	48.41	52.04	53.90	55.24	56.15	51.24	47.22	48.65	38.82	13.91
1982	-	-	13.51	19.70	29.54	38.65	45.50	48.11	51.85	53.88	55.10	56.11	51.37	47.37	49.01	41.67	20.07
1983	-	-	-	19.15	28.96	37.98	45.00	47.79	51.60	53.76	55.00	56.10	51.50	47.61	49.33	43.80	25.87
1984	-	-	-	18.57	28.35	37.27	44.47	47.46	51.29	53.58	54.88	56.16	51.57	47.74	49.59	45.19	30.80
1985	-	-	-	17.95	27.71	36.51	43.91	47.11	50.96	53.40	54.76	56.03	51.65	47.78	50.01	45.78	35.16
1986	-	-	-	17.31	27.03	35.71	43.32	46.73	50.61	53.20	54.58	55.88	51.73	47.83	50.20	46.19	36.81
1987	-	-	-	16.64	26.31	34.86	42.69	46.34	50.24	53.00	54.39	55.77	51.78	47.87	50.37	46.51	37.78
1988	-	-	-	-	25.55	33.96	42.08	45.92	49.93	52.78	54.19	55.60	51.83	48.04	50.41	46.60	38.23

Table 7
Ever-smoking prevalence among 5-year birth cohorts of black males, by year

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1900	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1906	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1907	0.93	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1908	0.93	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1909	0.93	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1910	1.86	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1911	2.79	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1912	4.65	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1913	6.51	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1914	10.24	0.47	0.00	-	-	-	-	-	-	-	-	-	-	-
1915	12.10	1.42	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1916	14.89	2.36	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1917	18.61	4.72	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1918	26.99	8.98	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1919	33.50	12.28	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1920	40.95	16.06	1.44	0.00	0.00	-	-	-	-	-	-	-	-	-
1921	49.32	19.37	3.96	0.30	0.00	-	-	-	-	-	-	-	-	-
1922	55.84	24.57	5.04	0.30	0.00	-	-	-	-	-	-	-	-	-
1923	56.77	32.13	7.56	0.30	0.00	-	-	-	-	-	-	-	-	-
1924	61.42	38.74	10.44	0.30	0.00	-	-	-	-	-	-	-	-	-
1925	62.35	45.36	13.32	1.49	0.00	0.00	-	-	-	-	-	-	-	-
1926	65.14	50.55	19.09	2.09	0.00	0.00	-	-	-	-	-	-	-	-
1927	65.14	56.22	27.01	4.18	0.00	0.00	-	-	-	-	-	-	-	-
1928	65.14	59.06	33.13	5.97	0.23	0.00	-	-	-	-	-	-	-	-
1929	65.14	61.42	42.13	9.56	0.46	0.00	-	-	-	-	-	-	-	-
1930	67.00	63.78	49.33	12.84	1.37	0.00	0.00	-	-	-	-	-	-	-

Table 7 (continued)

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1931	67.00	64.73	55.82	18.52	2.29	0.00	0.00	-	-	-	-	-	-	-
1932	67.93	65.67	61.22	24.49	4.35	0.00	0.00	-	-	-	-	-	-	-
1933	67.88	66.14	64.10	31.06	5.95	0.23	0.00	-	-	-	-	-	-	-
1934	67.83	67.09	67.70	37.63	8.46	0.91	0.00	-	-	-	-	-	-	-
1935	68.69	68.03	68.06	45.39	13.95	1.59	0.00	0.00	-	-	-	-	-	-
1936	69.56	68.03	70.58	54.65	17.84	1.59	0.00	0.00	-	-	-	-	-	-
1937	69.49	68.98	72.02	61.82	25.85	2.95	0.42	0.00	-	-	-	-	-	-
1938	69.42	69.39	72.74	64.80	31.80	4.32	0.63	0.00	-	-	-	-	-	-
1939	70.27	69.33	73.10	68.69	39.80	7.04	1.27	0.00	-	-	-	-	-	-
1940	71.11	69.27	74.90	72.57	47.58	10.68	1.48	0.00	0.00	-	-	-	-	-
1941	71.02	69.20	75.26	76.15	54.22	14.31	1.90	0.00	0.00	-	-	-	-	-
1942	70.93	69.13	75.62	77.95	60.16	23.62	2.75	0.21	0.00	-	-	-	-	-
1943	70.83	69.05	76.28	79.44	65.66	34.07	4.44	0.64	0.00	-	-	-	-	-
1944	71.64	70.38	76.22	81.23	69.77	43.16	6.76	1.07	0.00	-	-	-	-	-
1945	71.53	70.29	76.87	82.13	73.43	51.11	9.50	1.28	0.00	0.00	-	-	-	-
1946	71.41	70.20	77.16	83.32	76.18	59.28	15.63	2.14	0.00	0.00	-	-	-	-
1947	71.29	70.10	77.09	83.92	78.24	64.96	23.23	3.21	0.00	0.00	-	-	-	-
1948	71.15	70.47	77.01	83.86	78.92	69.96	32.95	4.49	0.18	0.00	-	-	-	-
1949	71.01	70.36	77.64	84.10	79.61	73.14	39.49	7.06	0.37	0.00	-	-	-	-
1950	70.86	70.24	77.55	84.03	80.07	75.18	47.52	10.27	0.37	0.00	0.00	-	-	-
1951	70.71	70.12	77.45	83.96	80.52	77.68	55.54	15.40	0.91	0.00	0.00	-	-	-
1952	70.54	69.99	77.35	83.89	80.75	78.59	63.99	20.11	1.64	0.00	0.00	-	-	-
1953	70.36	69.85	77.24	84.11	81.15	79.95	68.00	25.89	2.56	0.00	0.00	-	-	-
1954	71.08	69.70	77.13	84.33	81.08	81.09	71.17	33.16	5.48	0.14	0.00	-	-	-
1955	70.87	70.00	77.36	84.53	81.46	81.32	73.28	41.29	9.13	0.28	0.00	0.00	-	-
1956	70.66	69.84	77.23	84.44	81.84	82.23	75.82	50.49	14.43	0.71	0.00	0.00	-	-
1957	70.44	70.12	77.10	84.34	82.22	82.45	77.72	55.63	20.27	1.13	0.28	0.00	-	-
1958	70.20	69.93	76.95	84.24	82.13	82.39	78.56	60.76	26.85	2.40	0.28	0.00	-	-
1959	70.83	69.73	77.15	84.43	82.03	82.78	79.20	63.33	35.43	5.52	0.42	0.00	-	-
1960	70.56	69.52	76.98	84.31	82.16	82.71	79.83	65.04	44.02	8.35	0.56	0.00	0.00	-
1961	71.16	69.30	76.81	84.18	82.05	82.63	81.10	66.32	51.87	12.31	0.98	0.00	0.00	-

Table 7 (continued)

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1962	70.85	69.06	76.63	84.05	81.94	82.55	81.52	67.61	56.80	17.11	1.40	0.00	0.00	-
1963	70.52	68.81	76.43	83.91	81.82	82.47	81.45	68.46	63.19	24.89	1.96	0.14	0.00	-
1964	70.18	68.55	76.22	83.77	81.69	82.38	81.58	69.75	66.85	32.81	4.20	0.55	0.00	-
1965	69.82	68.27	76.00	83.61	81.55	82.29	81.49	70.82	68.85	39.75	7.00	1.09	0.00	0.00
1966	69.43	67.97	75.77	83.74	81.41	82.41	81.40	71.46	71.41	47.95	10.50	1.23	0.00	0.00
1967	69.03	67.65	75.52	83.56	81.25	82.30	81.51	71.89	73.60	54.60	14.43	1.50	0.00	0.00
1968	68.59	67.32	75.26	83.67	81.09	82.19	81.61	72.25	74.33	57.71	20.45	2.19	0.00	0.00
1969	68.14	66.96	74.98	83.47	80.91	82.29	81.49	72.18	75.25	60.96	27.03	3.28	0.00	0.00
1970	67.65	66.59	74.68	83.26	80.94	82.16	81.37	72.31	75.80	62.52	32.63	5.05	0.00	0.00
1971	67.14	66.19	74.37	83.04	80.74	82.02	81.24	72.50	76.63	64.21	40.05	10.38	0.22	0.00
1972	66.60	65.77	74.04	82.80	80.53	81.88	81.09	72.96	76.83	65.39	45.76	16.26	1.08	0.00
1973	66.03	65.33	73.69	82.55	80.30	81.72	80.94	73.40	76.75	66.23	49.19	20.63	3.01	0.00
1974	65.42	64.85	73.31	82.29	80.06	81.56	80.77	73.30	76.67	66.40	52.33	27.46	4.30	0.00
1975	64.78	64.35	72.92	82.01	79.80	81.38	80.59	73.46	76.78	66.91	53.76	35.79	6.45	0.00
1976	64.09	63.82	72.50	81.71	79.53	81.20	80.40	73.88	76.68	67.58	55.33	41.39	9.03	0.00
1977	63.37	63.26	72.05	81.40	79.24	81.00	80.19	74.56	76.78	67.75	55.75	45.22	12.90	0.88
1978	62.61	62.67	71.58	81.07	78.92	80.79	79.97	74.42	76.66	67.75	56.61	47.27	20.43	0.88
1979	61.80	62.04	71.08	80.72	78.59	80.56	79.99	74.28	76.54	67.93	56.93	49.15	26.45	0.88
1980	60.95	61.37	70.55	80.35	78.24	80.33	79.74	74.12	76.40	67.93	57.70	51.40	30.97	3.96
1981	60.04	60.67	69.98	79.95	77.86	80.07	79.46	73.95	76.25	68.17	58.13	53.31	35.98	5.29
1982	59.08	59.92	69.38	79.53	77.46	79.81	79.16	74.18	76.39	68.17	58.34	54.27	38.81	11.45
1983	58.07	59.12	68.75	79.09	77.04	79.52	78.84	73.99	76.22	68.17	58.56	55.42	41.64	16.30
1984	57.00	58.29	68.08	78.62	76.58	79.22	78.50	73.78	76.03	68.17	58.56	55.80	43.16	21.59
1985	55.86	57.40	67.36	78.13	76.10	78.90	78.13	73.56	75.83	68.17	58.77	56.95	44.25	26.43
1986	54.65	56.45	66.61	77.60	75.59	78.56	77.73	73.32	75.61	68.17	59.63	57.14	44.90	27.75
1987	53.38	55.45	65.81	77.05	75.04	78.19	77.30	73.47	75.38	68.17	59.63	57.14	45.56	28.19
1988	-	54.40	64.96	76.46	74.45	77.81	76.84	73.20	75.12	68.17	59.63	57.14	46.00	28.19

Table 8
Ever-smoking prevalence among 5-year birth cohorts of black females, by year

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1900	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1906	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1907	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1908	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1909	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1910	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1911	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1912	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1913	0.40	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1914	0.40	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1915	1.59	0.32	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1916	2.78	0.63	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1917	3.17	0.95	0.20	0.00	-	-	-	-	-	-	-	-	-	-
1918	3.57	1.26	0.20	0.00	-	-	-	-	-	-	-	-	-	-
1919	3.97	1.90	0.20	0.00	-	-	-	-	-	-	-	-	-	-
1920	4.37	2.53	0.20	0.00	0.00	-	-	-	-	-	-	-	-	-
1921	5.56	3.48	0.60	0.00	0.00	-	-	-	-	-	-	-	-	-
1922	5.56	4.43	1.20	0.00	0.00	-	-	-	-	-	-	-	-	-
1923	6.35	5.38	2.00	0.00	0.00	-	-	-	-	-	-	-	-	-
1924	6.75	6.32	2.20	0.37	0.00	-	-	-	-	-	-	-	-	-
1925	7.14	8.22	2.40	0.55	0.00	0.00	-	-	-	-	-	-	-	-
1926	7.14	9.80	3.00	0.55	0.00	0.00	-	-	-	-	-	-	-	-
1927	7.14	11.07	4.20	0.74	0.15	0.00	-	-	-	-	-	-	-	-
1928	7.14	13.28	5.40	1.11	0.15	0.00	-	-	-	-	-	-	-	-
1929	7.14	14.86	8.40	1.29	0.44	0.00	-	-	-	-	-	-	-	-
1930	8.73	15.81	11.40	2.58	0.73	0.00	0.00	-	-	-	-	-	-	-

Table 8 (continued)

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1931	9.13	16.44	12.60	4.24	0.88	0.00	0.00	.	-	-	-	-	-	-
1932	9.52	17.08	13.60	6.27	1.17	0.00	0.00	.	-	-	-	-	-	-
1933	10.69	18.66	15.80	9.96	1.47	0.13	0.00	.	-	-	-	-	-	-
1934	11.06	19.61	18.00	11.81	2.05	0.38	0.00	.	-	-	-	-	-	-
1935	11.43	19.92	19.80	15.87	3.52	0.38	0.00	0.00	.	-	-	-	-	-
1936	11.40	20.24	21.20	19.01	5.28	0.75	0.00	0.00	.	-	-	-	-	-
1937	11.76	20.87	22.20	22.70	6.90	1.01	0.00	0.00	.	-	-	-	-	-
1938	11.73	20.83	23.60	25.65	8.80	1.51	0.00	0.00	.	-	-	-	-	-
1939	11.69	21.42	24.20	26.94	11.45	2.64	0.00	0.00	.	-	-	-	-	-
1940	12.04	21.69	25.00	29.34	15.85	3.65	0.00	0.00	0.00	.	-	-	-	-
1941	13.55	22.58	26.00	31.19	20.54	5.03	0.36	0.00	0.00	.	-	-	-	-
1942	13.89	23.47	27.20	33.95	24.36	7.30	1.08	0.00	0.00	.	-	-	-	-
1943	13.84	23.41	28.75	34.69	28.91	10.82	1.81	0.00	0.00	.	-	-	-	-
1944	14.55	23.35	29.09	36.17	32.28	14.47	2.89	0.12	0.00	.	-	-	-	-
1945	15.64	23.90	29.23	36.91	35.51	20.13	4.46	0.24	0.00	0.00	.	-	-	-
1946	15.95	23.83	29.76	37.46	38.44	25.54	6.51	0.36	0.00	0.00	.	-	-	-
1947	16.25	23.76	29.69	38.20	39.18	30.32	9.04	0.72	0.00	0.00	.	-	-	-
1948	16.17	24.60	30.01	38.70	40.35	34.47	12.42	1.79	0.10	0.00	.	-	-	-
1949	16.47	24.52	29.94	39.75	41.67	37.24	17.60	2.86	0.10	0.00	.	-	-	-
1950	16.38	24.43	30.05	40.61	43.29	39.50	23.15	4.65	0.21	0.00	0.00	.	-	-
1951	16.66	24.33	30.15	40.91	44.46	41.26	27.61	7.16	0.63	0.08	0.00	.	-	-
1952	16.56	24.23	30.45	41.21	45.63	42.77	32.55	10.02	0.84	0.08	0.00	.	-	-
1953	16.82	24.13	30.35	41.86	46.17	44.53	37.73	15.99	1.05	0.08	0.00	.	-	-
1954	16.71	24.02	30.62	41.97	46.41	46.17	40.63	19.45	1.68	0.08	0.00	.	-	-
1955	16.95	24.20	30.51	42.43	46.79	47.05	42.67	24.46	3.15	0.16	0.00	0.00	.	-
1956	16.83	24.37	30.38	42.70	47.17	47.55	44.36	29.23	6.19	0.16	0.00	0.00	.	-
1957	16.69	24.24	30.25	42.96	47.40	48.05	45.69	34.96	9.97	0.39	0.00	0.00	.	-
1958	16.56	24.10	30.49	43.04	47.91	49.00	47.14	38.90	14.79	0.93	0.00	0.00	.	-
1959	16.76	23.95	30.72	43.10	48.13	49.32	48.58	43.31	20.77	1.79	0.00	0.00	.	-
1960	16.95	24.08	30.75	43.34	48.34	49.62	49.30	45.46	25.39	2.88	0.22	0.00	0.00	.
1961	16.78	23.91	30.76	43.21	48.55	49.93	50.03	47.49	30.32	4.82	0.44	0.00	0.00	.

Table 8 (continued)

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1962	16.61	23.74	30.57	43.08	48.60	49.98	51.23	48.80	36.19	7.39	0.73	0.00	0.00	.
1963	16.43	23.55	30.38	43.11	49.23	50.27	51.30	49.99	39.76	10.58	1.02	0.00	0.00	.
1964	16.23	23.64	30.54	42.96	49.28	50.56	51.97	50.71	43.96	16.11	1.68	0.07	0.00	.
1965	16.03	23.43	30.31	42.97	49.46	50.59	52.51	51.66	46.58	21.48	3.07	0.07	0.00	0.00
1966	15.82	23.76	30.07	42.79	49.63	50.61	52.81	52.74	47.94	27.08	5.19	0.14	0.00	0.00
1967	15.59	23.80	29.82	42.96	49.79	50.50	52.74	53.10	49.83	31.36	7.74	0.41	0.00	0.00
1968	15.36	23.82	29.55	43.28	50.24	50.76	53.27	53.87	50.67	34.79	11.69	0.68	0.00	0.00
1969	15.12	23.55	29.62	43.24	50.81	50.64	54.03	54.40	51.51	38.60	16.95	1.78	0.00	0.00
1970	14.86	23.26	29.32	43.02	50.80	50.64	54.07	54.34	52.14	40.47	22.43	3.55	0.10	0.00
1971	14.59	22.96	29.24	42.77	50.85	50.68	53.99	54.44	52.74	41.50	27.31	6.36	0.30	0.00
1972	14.30	22.65	28.89	42.52	50.68	50.71	53.90	54.54	53.65	42.74	31.51	10.80	0.99	0.00
1973	14.01	22.31	28.52	42.25	50.50	50.56	53.80	54.63	53.89	43.77	35.34	16.75	1.29	0.00
1974	13.69	21.96	28.13	41.96	50.52	50.39	54.08	54.88	53.97	44.70	39.02	21.80	2.48	0.00
1975	13.91	21.59	27.71	41.65	50.52	50.40	53.97	54.79	54.20	45.22	40.67	27.82	3.96	0.40
1976	13.55	21.20	27.27	41.33	50.31	50.39	54.04	54.87	54.42	45.63	42.03	32.13	5.75	0.40
1977	13.69	20.79	26.80	41.22	50.28	50.18	54.11	54.76	54.64	46.36	43.38	37.25	9.91	1.00
1978	13.28	20.36	26.31	40.85	50.04	49.97	53.98	54.82	54.86	46.46	44.28	39.51	13.88	2.01
1979	12.85	19.90	25.78	40.46	49.79	49.74	53.85	54.71	54.92	46.80	44.59	41.10	20.42	3.41
1980	12.40	19.42	25.22	40.04	49.53	49.50	53.71	54.81	55.21	46.80	45.25	42.63	25.97	5.62
1981	11.92	18.91	24.62	39.60	49.24	49.49	53.81	54.67	55.10	46.94	45.67	43.56	30.56	8.84
1982	11.43	18.37	23.99	39.13	49.20	49.22	53.65	54.53	55.20	47.23	45.98	45.07	33.15	11.04
1983	11.60	17.81	23.32	38.63	48.89	48.93	53.48	54.38	55.08	47.52	46.81	45.44	35.05	14.46
1984	11.02	17.70	22.61	38.11	48.55	48.62	53.31	54.23	54.95	47.81	47.32	46.01	36.54	18.27
1985	10.41	17.06	21.85	37.55	48.20	48.29	53.12	54.31	54.82	47.81	47.43	46.48	37.44	21.89
1986	9.76	16.38	21.05	36.95	47.82	47.94	52.93	54.13	54.67	47.95	47.53	47.13	38.54	23.69
1987	9.09	15.66	20.20	36.32	47.43	47.57	52.72	53.94	54.52	48.09	47.63	47.23	39.34	25.50
1988	-	14.91	19.30	35.65	47.01	47.17	52.50	53.73	54.35	48.09	47.63	47.42	39.53	26.61

Table 9
Current smoking prevalence among 5-year birth cohorts of white males, by age

Age	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.03	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.06	0.03	0.03	0.05	0.03	0.04	0.04	0.02	0.02	0.02	0.00	0.00
5	0.00	0.24	0.27	0.07	0.21	0.07	0.24	0.16	0.15	0.14	0.13	0.08	0.03	0.03	0.05	0.00	0.00
6	0.00	0.48	0.82	0.44	0.62	0.48	0.71	0.81	0.51	0.49	0.40	0.27	0.16	0.13	0.14	0.14	0.00
7	1.66	0.95	1.23	1.16	0.93	1.18	1.48	1.62	0.84	0.88	0.77	0.46	0.36	0.31	0.30	0.23	0.06
8	1.66	2.62	2.60	2.10	2.48	2.07	2.16	2.22	1.48	1.43	1.24	0.83	0.74	0.51	0.43	0.48	0.26
9	2.21	2.86	3.56	2.68	3.30	2.84	3.01	3.05	2.37	2.22	1.98	1.38	1.21	0.84	0.87	1.00	0.65
10	3.32	4.04	5.88	4.79	6.04	4.47	5.02	4.62	3.80	3.68	2.88	2.40	1.97	1.45	1.51	1.54	1.10
11	4.98	4.52	7.53	5.58	6.71	5.28	5.99	5.40	4.64	4.56	3.52	3.15	2.76	1.89	2.22	2.39	1.94
12	7.19	6.18	10.95	7.91	10.89	8.87	9.74	8.27	7.59	7.55	6.66	6.04	4.85	3.90	3.85	4.54	3.42
13	8.85	7.60	12.45	10.01	13.11	11.41	12.16	10.67	9.95	10.64	9.70	9.09	7.96	6.36	6.46	7.55	6.05
14	12.17	10.68	17.23	14.57	18.42	16.83	17.83	15.13	15.65	15.74	14.66	14.86	12.46	10.38	10.54	10.80	9.19
15	16.59	14.94	24.75	22.09	25.43	24.52	25.68	22.29	23.10	23.70	21.37	22.39	18.52	15.96	17.34	15.93	13.67
16	18.78	20.87	31.99	32.40	35.25	35.29	36.08	32.79	34.73	34.93	33.03	33.58	27.90	25.06	26.43	23.84	19.71
17	23.67	25.38	37.27	39.21	41.60	42.42	43.11	40.61	44.64	43.69	40.80	41.40	34.85	32.48	33.06	28.90	23.66
18	32.28	33.63	45.46	49.88	52.86	54.19	55.25	54.41	59.74	55.31	53.23	52.94	45.92	42.12	39.96	34.32	29.74
19	33.86	36.62	48.51	53.37	57.24	58.34	58.32	59.72	63.84	59.82	58.11	57.73	51.37	45.92	42.16	36.50	31.42
20	38.78	43.41	56.79	60.79	64.84	65.62	65.77	66.94	69.06	66.10	63.87	62.57	56.03	48.78	43.39	38.19	32.49
21	44.58	46.78	62.55	65.22	69.15	70.37	70.06	72.60	72.82	69.86	66.97	64.85	57.99	50.05	44.19	38.96	32.41
22	45.12	49.21	64.39	67.02	71.20	73.15	72.32	75.36	74.39	71.89	68.38	66.09	58.57	50.26	44.38	39.36	.
23	47.14	51.68	65.36	68.21	72.37	74.17	73.87	76.61	74.96	72.57	68.83	66.21	58.09	50.06	44.05	38.88	.
24	47.14	52.88	65.61	69.45	72.91	75.17	74.98	77.30	75.22	72.90	68.59	65.62	57.49	49.32	43.68	38.37	.
25	50.94	56.41	68.32	72.41	75.97	77.54	77.28	78.66	76.35	73.53	68.93	64.96	56.91	48.70	43.38	37.99	.
26	51.31	57.95	68.36	72.64	76.14	77.99	77.90	78.68	76.14	73.35	68.85	63.93	55.94	47.92	42.49	37.50	.
27	51.61	58.42	68.56	72.86	76.46	78.26	78.15	78.55	75.81	72.75	68.19	62.85	54.81	47.01	41.59	.	.
28	51.98	58.60	68.37	73.04	76.64	78.51	78.39	78.35	75.53	72.44	67.49	62.05	53.81	46.01	40.77	.	.
29	51.73	58.38	68.44	72.86	76.41	78.57	78.24	77.86	75.07	71.60	66.46	60.76	52.70	44.90	40.07	.	.
30	52.81	60.28	70.30	75.13	77.59	79.31	78.45	77.90	75.06	70.75	65.10	59.67	51.47	43.91	39.69	.	.

Table 9 (continued)

Age	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
31	52.51	60.19	69.98	75.03	77.19	79.11	77.87	77.18	74.14	69.98	63.73	58.42	50.34	42.93	38.72	-	-
32	52.38	59.95	69.63	74.94	77.25	78.89	77.48	76.50	73.31	68.77	62.25	57.54	49.19	42.25	-	-	-
33	52.33	59.80	69.82	74.62	77.08	78.45	76.91	75.69	72.29	67.45	60.86	56.35	48.15	41.25	-	-	-
34	52.20	59.46	69.72	74.19	76.80	77.69	76.29	74.81	71.55	66.20	59.30	55.12	46.99	40.32	-	-	-
35	53.10	59.79	69.48	73.99	76.89	77.57	75.65	73.92	70.63	64.61	58.05	53.69	45.78	39.50	-	-	-
36	53.05	59.67	69.24	73.55	76.70	77.19	75.06	73.05	69.24	62.91	56.99	52.29	44.66	38.92	-	-	-
37	52.91	59.63	68.90	73.05	75.94	76.54	74.28	71.98	68.09	61.42	55.70	51.07	43.33	-	-	-	-
38	52.50	59.18	68.32	72.49	75.43	76.09	73.42	70.83	66.76	59.73	54.30	49.85	42.12	-	-	-	-
39	52.17	59.01	67.94	71.92	74.69	75.39	72.55	69.58	65.43	58.21	52.90	48.54	41.24	-	-	-	-
40	52.27	60.91	68.10	71.85	74.12	74.43	71.66	68.20	63.68	56.59	51.72	46.98	40.46	-	-	-	-
41	51.94	60.48	67.77	71.58	73.36	73.50	70.61	66.95	61.92	55.40	50.42	45.57	39.46	-	-	-	-
42	51.78	60.05	67.00	70.98	72.67	72.57	69.67	65.67	60.30	54.21	49.16	44.23	-	-	-	-	-
43	52.21	59.88	66.43	70.47	71.68	71.80	68.55	64.40	58.81	52.89	47.60	42.68	-	-	-	-	-
44	51.95	59.44	65.69	69.89	70.66	70.86	67.23	62.61	57.36	51.34	46.44	41.53	-	-	-	-	-
45	52.01	59.47	65.45	69.51	69.73	70.01	65.83	60.74	55.76	49.96	45.09	40.14	-	-	-	-	-
46	51.57	59.01	64.83	68.77	68.93	69.05	64.47	58.86	54.41	48.65	43.45	38.90	-	-	-	-	-
47	50.95	58.76	64.29	68.11	68.00	68.02	62.80	56.93	53.16	47.60	42.13	-	-	-	-	-	-
48	50.41	58.00	63.57	67.28	67.11	66.85	61.28	55.24	51.80	46.19	41.27	-	-	-	-	-	-
49	49.70	57.48	63.03	66.28	66.21	65.40	59.77	53.72	50.54	44.55	39.74	-	-	-	-	-	-
50	50.27	57.15	62.27	65.36	64.95	63.71	57.66	51.98	48.90	42.82	38.51	-	-	-	-	-	-
51	50.45	56.22	61.22	64.27	63.54	62.25	56.13	50.64	47.47	40.70	37.26	-	-	-	-	-	-
52	49.80	55.44	60.23	63.30	62.19	60.63	54.16	49.06	45.81	39.05	-	-	-	-	-	-	-
53	49.23	54.60	59.18	62.14	60.83	59.24	52.27	47.54	44.09	37.50	-	-	-	-	-	-	-
54	48.75	54.14	58.22	60.81	59.27	57.74	50.14	46.10	42.57	35.98	-	-	-	-	-	-	-
55	47.99	53.10	57.05	59.29	57.76	55.96	48.15	44.35	40.72	35.06	-	-	-	-	-	-	-
56	47.59	52.24	55.78	58.03	56.25	52.92	46.49	42.75	38.87	33.60	-	-	-	-	-	-	-
57	46.47	51.23	54.47	56.80	54.57	51.07	44.49	41.26	37.19	-	-	-	-	-	-	-	-
58	45.98	50.42	53.36	55.18	53.15	49.20	42.82	39.65	35.51	-	-	-	-	-	-	-	-
59	45.39	49.16	51.94	53.60	50.97	47.06	41.05	37.72	33.89	-	-	-	-	-	-	-	-
60	44.70	48.43	50.66	51.72	48.48	44.92	39.12	35.94	32.47	-	-	-	-	-	-	-	-
61	43.84	47.30	49.30	49.75	46.19	43.11	37.89	34.04	31.81	-	-	-	-	-	-	-	-

Table 9 (continued)

Age	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
62	42.71	46.17	47.62	48.06	44.05	40.92	36.00	32.28	-	-	-	-	-	-	-	-	-
63	42.11	45.09	46.20	46.38	41.87	39.08	34.38	30.44	-	-	-	-	-	-	-	-	-
64	41.33	43.25	44.59	43.92	39.50	37.20	32.21	28.97	-	-	-	-	-	-	-	-	-
65	40.30	42.11	42.86	41.35	36.74	35.31	30.06	27.47	-	-	-	-	-	-	-	-	-
66	39.08	40.64	41.39	38.54	35.30	33.19	28.40	26.38	-	-	-	-	-	-	-	-	-
67	37.33	39.13	39.68	35.94	33.81	31.58	27.01	-	-	-	-	-	-	-	-	-	-
68	36.19	37.43	38.16	34.90	32.14	29.79	25.25	-	-	-	-	-	-	-	-	-	-
69	35.23	36.34	36.33	31.95	30.34	28.02	24.11	-	-	-	-	-	-	-	-	-	-
70	34.71	34.94	33.54	29.78	28.95	26.35	22.94	-	-	-	-	-	-	-	-	-	-
71	33.64	33.54	30.51	27.73	27.67	24.73	22.01	-	-	-	-	-	-	-	-	-	-
72	32.32	32.19	27.91	26.13	26.58	23.36	-	-	-	-	-	-	-	-	-	-	-
73	30.66	31.01	26.13	24.93	25.41	21.67	-	-	-	-	-	-	-	-	-	-	-
74	29.26	29.82	24.56	23.55	23.93	20.24	-	-	-	-	-	-	-	-	-	-	-
75	27.86	28.10	22.00	22.52	22.61	19.26	-	-	-	-	-	-	-	-	-	-	-
76	26.72	26.24	20.46	21.25	21.37	18.24	-	-	-	-	-	-	-	-	-	-	-
77	25.65	24.50	19.92	20.18	19.56	-	-	-	-	-	-	-	-	-	-	-	-
78	25.19	21.42	19.37	18.76	18.42	-	-	-	-	-	-	-	-	-	-	-	-
79	23.78	20.07	17.74	17.47	16.37	-	-	-	-	-	-	-	-	-	-	-	-
80	22.07	19.77	17.52	16.70	14.73	-	-	-	-	-	-	-	-	-	-	-	-
81	20.80	18.43	16.47	15.15	13.11	-	-	-	-	-	-	-	-	-	-	-	-
82	17.82	18.12	15.78	14.46	-	-	-	-	-	-	-	-	-	-	-	-	-
83	15.41	15.69	14.03	13.52	-	-	-	-	-	-	-	-	-	-	-	-	-
84	15.22	15.38	13.79	13.25	-	-	-	-	-	-	-	-	-	-	-	-	-
85	15.01	13.69	11.84	11.54	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 10
Current smoking prevalence among 5-year birth cohorts of white females, by age

Age	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
5	0.00	0.00	0.09	0.00	0.03	0.00	0.02	0.03	0.02	0.03	0.00	0.01	0.01	0.01	0.03	0.00	0.00
6	0.42	0.00	0.18	0.00	0.12	0.02	0.02	0.06	0.05	0.03	0.03	0.03	0.01	0.05	0.03	0.00	0.05
7	0.42	0.00	0.18	0.05	0.12	0.05	0.04	0.11	0.08	0.10	0.07	0.04	0.02	0.08	0.12	0.07	0.10
8	0.85	0.00	0.27	0.05	0.18	0.07	0.11	0.13	0.10	0.14	0.10	0.04	0.07	0.11	0.18	0.22	0.36
9	0.85	0.00	0.27	0.05	0.24	0.14	0.17	0.29	0.20	0.22	0.18	0.11	0.19	0.23	0.37	0.44	0.72
10	0.85	0.00	0.36	0.05	0.31	0.21	0.35	0.50	0.33	0.37	0.30	0.25	0.38	0.35	0.68	0.80	1.08
11	0.85	0.17	0.36	0.05	0.34	0.26	0.50	0.60	0.38	0.51	0.44	0.59	0.77	0.70	1.09	1.89	1.79
12	0.85	0.17	0.46	0.19	0.49	0.70	0.84	0.98	0.85	1.03	1.26	1.27	1.58	1.55	2.43	3.99	3.22
13	0.85	0.17	0.55	0.24	0.64	1.12	1.37	1.77	1.42	2.25	2.55	2.82	2.99	3.22	5.16	6.76	6.80
14	0.85	0.34	0.64	0.62	1.07	2.02	2.73	2.93	2.80	4.24	4.52	5.39	5.41	5.58	9.27	10.86	10.97
15	0.85	0.86	1.00	1.04	1.77	3.30	4.75	4.73	5.56	7.44	8.19	9.47	8.94	9.14	15.09	16.60	15.83
16	0.85	1.86	1.82	1.99	3.78	7.11	9.48	9.26	11.22	13.04	14.92	16.92	15.49	16.06	24.28	24.77	22.73
17	1.27	1.20	2.01	2.65	5.03	10.05	12.93	12.53	15.86	18.61	20.80	22.60	21.26	21.67	31.11	30.62	28.00
18	1.27	1.54	2.92	4.17	7.99	15.83	19.99	20.51	25.19	27.82	30.23	33.01	31.08	30.27	37.58	36.46	32.17
19	1.70	1.54	3.28	4.73	9.45	18.44	22.71	23.58	29.67	32.71	35.42	39.05	35.98	34.42	40.18	38.72	33.49
20	2.12	2.23	5.38	7.19	13.64	23.64	28.90	30.31	36.36	38.73	41.36	44.01	40.18	37.34	41.93	40.00	34.16
21	2.54	2.57	5.91	8.18	15.68	26.51	31.56	34.34	39.76	42.00	44.66	46.77	42.04	39.24	42.61	40.43	34.35
22	2.54	2.92	6.46	8.93	17.07	27.67	33.71	36.88	41.43	43.86	46.27	47.87	42.74	39.87	42.74	40.08	-
23	2.97	3.09	6.82	9.62	18.28	28.89	35.18	38.28	43.04	44.93	46.99	48.35	42.79	39.71	42.19	39.28	-
24	3.39	3.60	7.18	10.04	19.07	29.64	36.30	39.29	43.88	45.94	47.37	48.24	42.46	39.44	41.55	38.65	-
25	3.82	4.97	9.19	12.49	22.61	33.73	39.93	42.22	46.41	47.92	48.65	48.71	42.68	39.45	41.06	38.14	-
26	3.82	5.14	9.55	12.99	23.23	34.46	40.52	42.89	46.87	48.14	48.70	48.29	42.34	38.90	40.28	37.27	-
27	3.82	5.26	9.80	13.54	23.60	34.84	41.25	43.53	47.16	48.42	48.52	47.96	41.95	38.44	39.42	-	-
28	3.82	6.09	10.16	14.30	24.50	35.61	41.90	44.19	47.52	48.67	48.66	47.52	41.64	37.72	38.64	-	-
29	3.82	6.09	10.41	14.53	24.90	35.85	42.05	44.41	47.55	48.34	48.14	46.95	40.97	36.96	37.75	-	-
30	3.82	7.94	13.91	18.02	28.62	39.16	44.85	46.07	48.93	48.97	48.22	46.62	40.42	36.40	37.08	-	-

Table 10 (continued)

Age	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
31	3.81	8.09	13.87	18.30	28.81	39.26	44.75	45.88	48.60	48.52	47.60	46.15	39.85	35.59	36.55	-	-
32	3.80	8.06	14.11	18.71	29.10	39.42	44.80	45.89	48.41	48.10	47.21	45.33	39.32	34.63	-	-	-
33	3.79	8.37	14.34	18.97	29.31	39.50	44.80	45.82	48.10	47.64	46.64	44.71	38.49	34.02	-	-	-
34	3.78	8.52	14.30	19.10	29.41	39.49	44.65	45.64	47.74	47.08	46.01	44.00	37.70	33.44	-	-	-
35	4.61	9.99	15.51	21.27	31.40	40.63	45.63	46.24	48.08	46.93	45.65	43.32	36.99	32.98	-	-	-
36	4.59	9.94	15.54	21.37	31.45	40.62	45.51	46.09	47.68	46.25	45.04	42.64	36.27	32.53	-	-	-
37	4.58	9.92	16.03	21.52	31.48	40.62	45.34	45.85	47.17	45.61	44.49	41.84	35.67	-	-	-	-
38	4.57	10.38	16.23	21.75	31.78	40.67	45.36	45.51	46.88	45.01	43.87	41.13	35.02	-	-	-	-
39	4.53	10.32	16.29	21.74	31.76	40.55	45.15	45.11	46.42	44.41	43.22	40.49	34.50	-	-	-	-
40	5.34	11.60	18.08	23.48	33.46	41.66	45.74	45.11	46.11	43.88	42.50	39.69	33.96	-	-	-	-
41	5.32	11.56	18.16	23.58	33.39	41.54	45.32	44.62	45.50	43.29	41.68	38.99	33.55	-	-	-	-
42	5.71	11.81	18.38	23.69	33.34	41.38	45.09	44.16	44.80	42.71	40.94	37.89	-	-	-	-	-
43	5.69	12.09	18.36	23.67	33.27	41.16	44.80	43.62	44.26	41.88	40.24	36.93	-	-	-	-	-
44	5.68	11.99	18.45	23.63	33.21	40.85	44.44	43.00	43.54	41.21	39.45	36.03	-	-	-	-	-
45	7.27	12.66	18.99	24.01	33.56	40.76	44.39	42.39	43.11	40.56	38.63	35.16	-	-	-	-	-
46	7.65	12.70	18.92	23.92	33.24	40.52	43.93	41.73	42.43	39.92	37.90	34.29	-	-	-	-	-
47	7.58	12.59	19.06	23.87	32.92	40.26	43.45	40.96	41.72	39.22	36.99	-	-	-	-	-	-
48	7.55	12.50	19.01	23.96	32.66	39.96	42.87	40.27	41.05	38.42	35.82	-	-	-	-	-	-
49	7.52	12.39	18.77	23.75	32.29	39.51	42.11	39.46	40.12	37.40	34.76	-	-	-	-	-	-
50	8.67	13.00	19.44	24.37	32.74	39.41	41.33	38.80	39.54	36.46	33.86	-	-	-	-	-	-
51	8.64	12.84	19.26	24.08	32.36	38.67	40.49	38.24	38.59	35.46	33.16	-	-	-	-	-	-
52	8.60	12.80	19.14	23.85	31.85	38.17	39.54	37.54	37.71	34.12	-	-	-	-	-	-	-
53	8.57	12.67	19.02	23.62	31.52	37.44	38.47	36.84	36.86	33.03	-	-	-	-	-	-	-
54	8.33	12.71	18.78	23.38	31.00	36.71	37.43	36.04	35.78	31.99	-	-	-	-	-	-	-
55	8.29	12.57	18.74	23.26	30.55	35.95	36.53	35.27	34.52	31.09	-	-	-	-	-	-	-
56	8.20	12.43	18.44	22.88	29.97	34.99	35.72	34.26	33.54	30.13	-	-	-	-	-	-	-
57	8.11	12.16	18.24	22.62	29.34	34.18	34.70	33.26	32.21	-	-	-	-	-	-	-	-
58	8.02	12.05	18.05	22.21	28.74	33.08	33.78	32.27	31.02	-	-	-	-	-	-	-	-
59	7.88	11.84	17.80	21.73	28.01	31.99	32.81	31.21	29.88	-	-	-	-	-	-	-	-
60	8.86	12.12	17.76	21.58	27.30	30.78	31.58	30.12	28.68	-	-	-	-	-	-	-	-
61	9.05	12.06	17.49	21.09	26.53	29.67	30.42	28.88	27.98	-	-	-	-	-	-	-	-

Table 10 (continued)

Age	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
62	8.82	11.78	17.25	20.47	25.51	28.60	29.13	27.79	-	-	-	-	-	-	-	-	-
63	8.77	11.62	16.86	19.71	24.61	27.46	28.14	26.39	-	-	-	-	-	-	-	-	-
64	8.66	11.37	16.46	19.17	23.46	26.49	27.02	25.50	-	-	-	-	-	-	-	-	-
65	8.50	11.06	16.32	18.48	22.63	25.50	25.80	24.49	-	-	-	-	-	-	-	-	-
66	8.77	10.89	15.71	17.44	21.43	24.25	24.51	23.60	-	-	-	-	-	-	-	-	-
67	8.60	10.60	15.04	16.74	20.58	23.04	23.31	-	-	-	-	-	-	-	-	-	-
68	8.42	10.34	14.71	16.37	19.72	21.85	22.31	-	-	-	-	-	-	-	-	-	-
69	8.25	10.08	14.26	15.63	19.00	20.80	21.15	-	-	-	-	-	-	-	-	-	-
70	7.91	9.85	13.27	14.69	18.20	19.67	20.45	-	-	-	-	-	-	-	-	-	-
71	7.69	9.60	12.12	14.20	17.47	18.36	19.96	-	-	-	-	-	-	-	-	-	-
72	7.52	9.41	11.84	13.49	16.50	17.23	-	-	-	-	-	-	-	-	-	-	-
73	7.29	9.28	11.34	12.55	15.54	16.10	-	-	-	-	-	-	-	-	-	-	-
74	7.23	8.75	10.30	11.95	14.46	15.22	-	-	-	-	-	-	-	-	-	-	-
75	7.05	8.44	9.95	11.49	13.49	14.35	-	-	-	-	-	-	-	-	-	-	-
76	6.83	7.97	9.11	10.73	12.30	13.64	-	-	-	-	-	-	-	-	-	-	-
77	6.44	7.39	8.45	9.92	11.32	-	-	-	-	-	-	-	-	-	-	-	-
78	6.23	7.26	8.11	9.58	10.58	-	-	-	-	-	-	-	-	-	-	-	-
79	6.17	6.28	7.74	8.85	9.98	-	-	-	-	-	-	-	-	-	-	-	-
80	6.10	5.74	7.36	7.90	9.35	-	-	-	-	-	-	-	-	-	-	-	-
81	5.03	5.61	6.70	7.58	9.08	-	-	-	-	-	-	-	-	-	-	-	-
82	4.97	5.09	6.22	6.74	-	-	-	-	-	-	-	-	-	-	-	-	-
83	4.92	4.55	5.29	6.22	-	-	-	-	-	-	-	-	-	-	-	-	-
84	4.86	4.43	4.73	5.45	-	-	-	-	-	-	-	-	-	-	-	-	-
85	4.80	4.30	4.58	5.24	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 11
Current smoking prevalence among 5-year birth cohorts of black males, by age

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.93	0.47	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	1.86	0.47	0.36	0.30	0.00	0.00	1.06	0.21	0.00	0.14	0.00	0.27	0.00	0.00
7	1.86	0.47	0.72	0.90	0.23	0.00	1.27	1.07	0.00	0.28	0.42	0.68	0.00	0.00
8	2.79	1.42	1.08	1.19	0.91	0.91	1.27	1.49	0.55	0.42	0.70	0.82	0.00	0.00
9	2.79	1.89	2.88	2.09	1.83	1.59	1.90	2.35	1.28	0.99	0.98	1.23	0.22	0.44
10	3.72	3.78	5.76	4.78	2.74	2.72	3.17	3.41	1.65	1.56	1.26	1.78	0.43	0.44
11	5.58	5.20	7.20	5.08	3.43	2.95	3.59	4.69	2.74	2.83	2.10	2.05	0.43	0.44
12	7.44	12.76	10.44	8.06	8.92	5.90	6.34	7.04	3.84	4.95	3.78	3.27	2.57	0.88
13	12.10	15.08	15.48	11.94	12.58	9.99	10.56	8.32	7.13	8.06	5.60	5.86	3.63	1.32
14	13.96	18.38	19.09	18.51	18.07	14.76	16.90	13.22	12.61	11.17	7.41	8.86	8.07	3.96
15	20.47	28.27	29.12	24.49	26.07	21.57	24.44	21.97	19.19	16.94	14.38	14.78	12.09	6.61
16	24.20	32.99	37.68	33.69	32.44	31.56	35.53	28.58	29.58	26.93	21.45	21.91	19.89	11.68
17	29.55	40.05	42.35	40.73	39.75	40.87	43.73	38.34	38.41	35.11	27.35	30.63	26.08	16.44
18	41.06	47.12	51.32	50.17	51.86	54.21	55.29	47.23	49.10	46.76	35.79	38.85	33.93	23.79
19	47.26	49.95	55.88	54.85	56.59	60.51	60.55	53.83	54.33	51.62	41.13	41.98	37.39	25.58
20	55.22	57.96	60.08	62.85	63.37	66.76	64.40	57.95	60.41	56.28	45.78	44.60	39.20	26.86
21	59.50	61.26	66.28	67.89	67.55	71.72	69.64	61.27	64.17	59.29	48.86	47.40	39.67	27.11
22	61.06	62.67	68.30	71.83	72.55	73.33	73.42	63.58	67.86	60.67	51.20	48.60	40.58	-
23	61.70	64.69	69.01	73.50	73.67	75.40	74.66	64.32	69.85	61.54	51.33	50.11	41.59	-
24	61.45	64.82	69.60	74.47	74.94	76.57	75.74	65.06	70.47	61.31	51.22	50.05	42.21	-
25	62.98	65.12	71.96	78.47	77.26	78.53	77.37	66.32	72.25	62.11	52.54	50.41	41.55	-
26	62.98	65.41	71.71	79.83	77.90	78.48	77.33	66.83	72.33	61.56	52.41	50.09	41.21	-
27	62.98	65.87	71.93	80.30	78.17	78.68	78.38	66.77	71.56	61.08	51.60	50.70	-	-
28	64.75	66.16	72.51	80.53	78.62	79.03	78.14	67.08	72.00	60.82	50.29	50.08	-	-
29	64.75	66.45	72.86	80.29	78.44	78.92	77.49	66.87	71.18	60.71	49.33	49.46	-	-
30	64.48	67.66	74.09	81.27	79.29	79.11	77.33	67.16	71.03	60.10	48.85	48.74	-	-

Table 11 (continued)

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
31	64.17	67.24	73.90	80.90	79.45	78.89	76.17	65.94	70.17	59.29	48.39	48.74	-	-
32	64.73	66.83	74.41	80.24	78.98	78.55	75.68	65.01	69.72	58.81	47.96	-	-	-
33	65.54	66.76	74.16	80.06	78.67	77.92	75.14	64.10	68.62	57.77	47.43	-	-	-
34	65.48	66.97	73.55	79.75	78.15	77.29	74.48	64.32	67.95	56.59	46.54	-	-	-
35	66.02	67.17	73.15	80.01	78.05	76.74	73.24	63.10	67.20	55.96	46.64	-	-	-
36	64.85	66.56	72.94	79.81	77.81	76.17	72.89	62.60	65.73	55.17	45.59	-	-	-
37	65.35	66.20	72.80	79.01	77.00	75.68	71.76	62.85	64.60	53.51	-	-	-	-
38	65.27	65.93	72.44	78.57	76.17	75.15	70.59	62.47	64.09	52.60	-	-	-	-
39	65.19	65.67	72.22	77.76	75.53	74.12	69.80	61.54	62.96	51.83	-	-	-	-
40	65.95	65.10	71.92	77.86	74.79	72.72	68.86	60.83	62.26	51.56	-	-	-	-
41	65.58	64.82	71.55	77.40	73.99	71.98	68.19	60.10	60.46	50.79	-	-	-	-
42	64.93	63.81	70.30	77.18	73.35	71.08	67.24	58.35	59.45	-	-	-	-	-
43	64.54	63.52	69.99	75.87	72.54	69.33	66.28	57.41	57.68	-	-	-	-	-
44	64.16	62.69	69.07	74.79	71.69	69.14	64.75	56.46	56.27	-	-	-	-	-
45	63.77	62.21	69.13	73.93	70.28	68.59	63.79	55.64	54.76	-	-	-	-	-
46	63.37	61.90	68.33	73.68	69.48	67.60	61.70	54.39	53.50	-	-	-	-	-
47	63.25	61.59	67.66	72.58	68.40	66.18	60.45	53.81	-	-	-	-	-	-
48	62.56	61.46	67.11	71.86	67.55	65.04	58.86	53.14	-	-	-	-	-	-
49	61.87	60.77	66.43	71.15	66.67	63.28	57.54	52.07	-	-	-	-	-	-
50	61.95	59.94	65.04	69.96	64.98	61.77	54.99	51.56	-	-	-	-	-	-
51	61.52	59.42	64.73	68.73	64.23	60.54	53.69	50.13	-	-	-	-	-	-
52	61.36	59.46	63.91	67.09	63.33	59.42	51.95	-	-	-	-	-	-	-
53	60.91	58.56	62.26	66.00	61.85	57.29	50.70	-	-	-	-	-	-	-
54	60.17	57.30	60.38	65.22	60.05	55.60	50.14	-	-	-	-	-	-	-
55	59.43	55.97	59.26	63.45	58.80	54.37	48.59	-	-	-	-	-	-	-
56	59.98	54.95	58.35	62.86	57.21	52.87	47.60	-	-	-	-	-	-	-
57	59.21	54.52	56.67	61.87	56.02	51.14	-	-	-	-	-	-	-	-
58	58.61	53.29	55.43	60.08	55.28	49.68	-	-	-	-	-	-	-	-
59	56.98	52.22	52.82	58.65	53.48	49.46	-	-	-	-	-	-	-	-
60	56.45	50.20	51.01	56.74	50.99	48.82	-	-	-	-	-	-	-	-
61	53.56	48.68	49.98	55.65	49.11	47.88	-	-	-	-	-	-	-	-

Table 11 (continued)

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
62	52.57	46.74	48.69	54.73	47.43	-	-	-	-	-	-	-	-	-
63	50.12	44.65	47.10	51.87	45.88	-	-	-	-	-	-	-	-	-
64	49.27	42.72	45.49	48.77	43.98	-	-	-	-	-	-	-	-	-
65	45.16	42.04	43.58	45.17	41.93	-	-	-	-	-	-	-	-	-
66	41.42	40.93	42.16	44.00	39.94	-	-	-	-	-	-	-	-	-
67	41.15	39.83	40.37	42.33	-	-	-	-	-	-	-	-	-	-
68	40.85	38.30	39.11	40.13	-	-	-	-	-	-	-	-	-	-
69	40.55	37.98	37.44	39.23	-	-	-	-	-	-	-	-	-	-
70	39.00	37.22	35.36	38.03	-	-	-	-	-	-	-	-	-	-
71	38.66	36.43	33.09	37.74	-	-	-	-	-	-	-	-	-	-
72	35.91	33.66	32.31	-	-	-	-	-	-	-	-	-	-	-
73	35.56	32.27	31.45	-	-	-	-	-	-	-	-	-	-	-
74	32.48	29.24	30.43	-	-	-	-	-	-	-	-	-	-	-
75	29.06	27.60	30.06	-	-	-	-	-	-	-	-	-	-	-
76	28.71	25.14	29.67	-	-	-	-	-	-	-	-	-	-	-
77	28.34	23.89	-	-	-	-	-	-	-	-	-	-	-	-
78	27.94	22.29	-	-	-	-	-	-	-	-	-	-	-	-
79	27.53	21.92	-	-	-	-	-	-	-	-	-	-	-	-
80	27.09	17.95	-	-	-	-	-	-	-	-	-	-	-	-
81	26.62	17.61	-	-	-	-	-	-	-	-	-	-	-	-
82	26.13	-	-	-	-	-	-	-	-	-	-	-	-	-
83	25.61	-	-	-	-	-	-	-	-	-	-	-	-	-
84	25.06	-	-	-	-	-	-	-	-	-	-	-	-	-
85	24.47	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 12
Current smoking prevalence among 5-year birth cohorts of black females, by age

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.20	0.00	0.29	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00
7	0.00	0.32	0.20	0.18	0.44	0.00	0.00	0.12	0.32	0.08	0.00	0.07	0.00	0.20
8	0.00	0.63	0.20	0.37	0.59	0.25	0.00	0.24	0.42	0.08	0.07	0.07	0.00	0.20
9	0.00	1.27	0.20	0.74	0.59	0.76	0.48	0.48	0.53	0.08	0.15	0.07	0.10	0.20
10	0.40	1.27	1.20	1.11	0.88	1.01	1.32	0.72	0.53	0.23	0.37	0.27	0.59	0.40
11	0.40	1.58	1.39	1.48	1.03	1.39	1.69	1.08	0.84	0.39	0.88	0.68	0.89	0.80
12	1.19	1.90	2.19	1.84	1.91	1.76	2.77	1.79	1.69	1.32	1.75	1.85	1.98	2.01
13	1.59	2.22	2.18	2.77	2.79	2.77	4.09	2.99	2.63	3.04	2.77	3.42	3.67	3.01
14	2.38	2.85	2.97	4.79	4.69	4.27	5.66	5.62	4.64	4.44	4.38	6.01	6.24	5.60
15	3.17	3.78	4.75	6.64	6.89	6.66	8.67	9.43	8.10	7.32	8.10	11.40	10.60	8.61
16	3.97	5.68	6.93	9.22	10.71	10.43	13.25	14.09	13.68	12.35	13.33	18.29	16.83	12.81
17	3.97	6.94	9.10	12.36	13.06	15.06	17.44	19.81	19.87	16.29	18.31	23.45	23.47	16.56
18	4.76	8.83	10.86	17.15	18.04	23.59	25.96	27.09	28.66	25.78	25.13	30.98	29.56	20.49
19	4.76	9.78	12.63	19.49	21.86	27.69	30.24	31.60	34.01	29.68	29.74	35.09	31.90	22.79
20	6.75	13.82	16.19	25.01	28.16	33.39	35.76	38.36	39.30	33.54	34.45	37.90	35.13	24.57
21	6.75	14.76	17.33	27.17	31.98	36.17	38.93	41.30	43.14	36.27	36.73	39.37	35.43	25.28
22	7.14	16.27	18.71	28.46	33.96	38.38	40.93	44.87	45.32	38.59	38.12	40.74	36.06	-
23	7.14	16.27	20.09	29.33	36.05	40.09	42.33	46.78	47.00	39.73	39.93	41.36	36.64	-
24	7.14	16.89	20.63	30.07	36.70	40.80	43.77	47.22	47.17	40.41	40.49	41.85	36.45	-
25	7.14	18.38	23.18	34.50	39.64	44.50	46.47	49.14	49.08	41.79	40.91	42.43	36.74	-
26	7.14	18.69	23.71	34.81	40.72	45.21	47.31	49.57	49.81	41.91	41.05	42.63	37.91	-
27	8.33	19.63	24.05	35.91	41.42	45.58	47.88	49.89	50.17	41.97	40.81	42.61	-	-
28	8.33	19.94	24.71	36.40	41.85	45.82	48.45	50.15	50.19	41.73	41.05	42.14	-	-
29	8.73	19.94	25.23	36.71	42.68	45.78	48.31	49.67	50.53	41.85	40.87	42.42	-	-
30	11.11	20.56	28.27	38.84	45.37	47.44	50.09	51.38	50.83	42.11	40.88	42.38	-	-

Table 12 (continued)

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
31	11.09	21.14	28.08	38.56	45.37	47.37	49.78	51.01	50.34	41.69	40.49	42.30	-	-
32	11.06	21.63	28.15	38.98	45.56	47.69	49.57	50.96	49.64	41.12	40.42	-	-	-
33	11.43	21.72	27.96	38.81	45.60	47.65	49.33	50.41	49.20	40.88	40.07	-	-	-
34	11.79	22.09	27.95	38.57	45.59	47.32	49.28	49.68	48.69	40.69	40.20	-	-	-
35	11.76	22.25	28.24	39.74	46.42	47.68	49.60	49.72	48.80	40.54	39.70	-	-	-
36	11.73	22.40	28.28	39.78	46.58	47.69	49.45	49.31	48.07	39.99	38.91	-	-	-
37	12.47	22.34	28.14	40.10	46.27	47.29	49.03	48.54	47.32	39.41	-	-	-	-
38	13.21	22.09	28.03	40.13	46.37	47.02	48.79	47.59	46.78	38.94	-	-	-	-
39	13.16	22.03	27.67	40.09	45.90	46.85	48.11	46.54	46.24	38.28	-	-	-	-
40	14.19	22.84	27.76	40.67	46.02	46.36	47.91	45.93	45.19	38.31	-	-	-	-
41	14.51	22.57	27.45	40.38	45.97	46.26	47.48	45.19	44.45	37.04	-	-	-	-
42	14.74	22.78	27.63	40.37	45.78	45.68	47.21	44.71	44.00	-	-	-	-	-
43	14.68	22.79	27.53	40.00	45.27	45.20	46.60	44.11	43.04	-	-	-	-	-
44	14.90	22.31	27.34	39.51	44.94	44.39	46.30	42.94	42.75	-	-	-	-	-
45	15.94	22.22	27.28	39.55	44.07	43.71	45.45	42.25	41.70	-	-	-	-	-
46	15.87	22.12	27.30	38.98	43.54	42.81	44.93	41.14	41.57	-	-	-	-	-
47	15.94	22.00	26.95	38.45	43.14	41.90	43.30	40.59	-	-	-	-	-	-
48	15.65	21.87	26.75	38.04	42.29	40.80	42.36	39.80	-	-	-	-	-	-
49	15.70	21.66	26.31	37.48	41.80	39.92	41.38	39.10	-	-	-	-	-	-
50	15.96	20.85	25.71	37.64	41.55	39.28	39.60	38.96	-	-	-	-	-	-
51	15.43	20.54	25.30	37.00	40.46	38.57	39.11	37.64	-	-	-	-	-	-
52	15.32	20.12	24.67	36.12	40.11	37.92	38.16	-	-	-	-	-	-	-
53	15.01	19.42	24.34	35.31	38.75	36.56	37.18	-	-	-	-	-	-	-
54	14.89	19.19	23.72	34.59	37.88	35.86	35.71	-	-	-	-	-	-	-
55	15.31	19.08	23.40	33.74	37.08	34.67	34.34	-	-	-	-	-	-	-
56	15.08	18.62	22.95	33.02	35.82	34.01	34.20	-	-	-	-	-	-	-
57	14.52	18.24	22.34	32.29	34.77	33.16	-	-	-	-	-	-	-	-
58	14.36	18.04	22.00	31.80	33.75	32.01	-	-	-	-	-	-	-	-
59	13.79	17.99	20.89	31.29	32.96	30.95	-	-	-	-	-	-	-	-
60	13.54	18.06	20.66	30.22	32.22	29.60	-	-	-	-	-	-	-	-
61	12.89	17.50	20.25	28.33	31.30	28.88	-	-	-	-	-	-	-	-

Table 12 (continued)

Age	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
62	12.74	16.90	19.83	26.49	29.59	-	-	-	-	-	-	-	-	-
63	12.42	16.26	18.85	25.77	28.39	-	-	-	-	-	-	-	-	-
64	12.26	15.33	18.27	24.60	27.69	-	-	-	-	-	-	-	-	-
65	12.08	14.65	17.12	23.54	26.45	-	-	-	-	-	-	-	-	-
66	11.90	14.20	16.50	22.75	26.22	-	-	-	-	-	-	-	-	-
67	11.20	13.29	15.58	21.66	-	-	-	-	-	-	-	-	-	-
68	11.01	13.07	14.65	21.10	-	-	-	-	-	-	-	-	-	-
69	10.81	12.59	13.83	20.46	-	-	-	-	-	-	-	-	-	-
70	9.96	11.86	13.13	20.11	-	-	-	-	-	-	-	-	-	-
71	9.75	11.14	11.46	17.70	-	-	-	-	-	-	-	-	-	-
72	9.60	10.42	11.12	-	-	-	-	-	-	-	-	-	-	-
73	9.39	9.69	10.49	-	-	-	-	-	-	-	-	-	-	-
74	9.15	8.73	9.81	-	-	-	-	-	-	-	-	-	-	-
75	8.89	8.71	8.59	-	-	-	-	-	-	-	-	-	-	-
76	8.27	7.57	8.21	-	-	-	-	-	-	-	-	-	-	-
77	8.00	7.32	-	-	-	-	-	-	-	-	-	-	-	-
78	.37	7.05	-	-	-	-	-	-	-	-	-	-	-	-
79	6.38	6.09	-	-	-	-	-	-	-	-	-	-	-	-
80	5.75	5.83	-	-	-	-	-	-	-	-	-	-	-	-
81	5.84	5.55	-	-	-	-	-	-	-	-	-	-	-	-
82	5.55	-	-	-	-	-	-	-	-	-	-	-	-	-
83	4.58	-	-	-	-	-	-	-	-	-	-	-	-	-
84	4.30	-	-	-	-	-	-	-	-	-	-	-	-	-
85	4.00	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 13
Current smoking prevalence among 5-year birth cohorts of white males, by year

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1885	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1886	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1887	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1888	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1889	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1890	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1891	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1892	0.55	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1893	0.55	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1894	0.55	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1895	1.11	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1896	1.66	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1897	2.21	0.24	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1898	3.32	0.71	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1899	4.98	1.19	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1900	7.19	1.67	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	9.96	2.85	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	15.49	4.04	0.41	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	19.36	4.28	0.96	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	21.54	5.47	1.51	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	24.69	8.31	2.33	0.07	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1906	30.63	11.63	3.42	0.15	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1907	35.50	13.77	6.02	0.36	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1908	39.81	18.50	7.11	0.65	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1909	44.17	23.48	10.13	1.16	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1910	45.66	28.65	13.55	1.89	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1911	47.22	34.73	18.19	3.12	0.10	0.00	-	-	-	-	-	-	-	-	-	-	-
1912	48.15	39.16	23.10	4.86	0.31	0.00	-	-	-	-	-	-	-	-	-	-	-
1913	48.61	42.91	29.53	5.73	0.57	0.00	-	-	-	-	-	-	-	-	-	-	-
1914	51.23	46.58	34.40	8.49	1.50	0.00	-	-	-	-	-	-	-	-	-	-	-
1915	51.36	49.37	41.52	11.17	2.17	0.07	0.00	-	-	-	-	-	-	-	-	-	-

Table 13 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1916	51.84	51.48	49.51	15.21	3.41	0.11	0.00	-	-	-	-	-	-	-	-	-	-
1917	52.28	54.22	55.35	20.28	4.90	0.18	0.00	-	-	-	-	-	-	-	-	-	-
1918	52.07	55.72	59.79	30.01	6.76	0.52	0.00	-	-	-	-	-	-	-	-	-	-
1919	52.47	58.04	64.06	38.10	9.76	0.92	0.00	-	-	-	-	-	-	-	-	-	-
1920	52.33	58.65	65.56	44.81	13.11	1.81	0.06	0.00	-	-	-	-	-	-	-	-	-
1921	52.20	59.01	66.03	52.13	17.74	2.62	0.09	0.00	-	-	-	-	-	-	-	-	-
1922	52.67	59.24	66.99	57.75	23.81	3.95	0.27	0.00	-	-	-	-	-	-	-	-	-
1923	53.05	59.05	67.76	61.28	32.04	5.76	0.80	0.00	-	-	-	-	-	-	-	-	-
1924	52.99	59.59	68.36	65.86	40.01	8.87	1.59	0.00	-	-	-	-	-	-	-	-	-
1925	52.85	59.98	68.73	68.42	48.59	12.52	2.33	0.05	0.00	-	-	-	-	-	-	-	-
1926	51.74	59.90	68.51	69.55	55.44	17.78	3.34	0.18	0.00	-	-	-	-	-	-	-	-
1927	51.68	59.70	69.06	70.66	61.03	24.34	4.58	0.42	0.00	-	-	-	-	-	-	-	-
1928	52.03	59.59	69.33	71.98	65.94	32.28	6.55	0.86	0.00	-	-	-	-	-	-	-	-
1929	51.95	59.65	70.16	72.80	69.28	40.57	9.42	1.46	0.03	-	-	-	-	-	-	-	-
1930	52.12	59.76	69.69	73.08	72.44	48.05	13.08	2.35	0.05	0.00	-	-	-	-	-	-	-
1931	51.86	59.57	69.39	73.40	73.48	56.55	18.60	3.37	0.05	0.00	-	-	-	-	-	-	-
1932	51.61	60.16	69.29	73.86	74.42	62.49	24.68	4.67	0.28	0.00	-	-	-	-	-	-	-
1933	51.84	60.63	69.18	74.34	75.56	66.87	32.70	6.31	0.56	0.00	-	-	-	-	-	-	-
1934	51.48	60.49	69.17	74.86	76.72	71.28	41.08	8.48	0.94	0.03	-	-	-	-	-	-	-
1935	50.41	59.73	68.65	74.36	76.77	73.23	49.35	11.68	1.68	0.05	0.00	-	-	-	-	-	-
1936	50.17	59.35	67.92	74.24	76.72	75.15	56.36	16.97	2.50	0.08	0.00	-	-	-	-	-	-
1937	49.80	59.05	68.08	74.00	76.84	76.59	62.91	23.69	3.93	0.22	0.00	-	-	-	-	-	-
1938	49.89	59.00	67.65	73.71	77.23	77.35	66.71	31.06	5.43	0.49	0.00	-	-	-	-	-	-
1939	49.69	58.75	67.40	73.50	77.31	77.98	69.88	39.40	7.82	1.02	0.00	-	-	-	-	-	-
1940	48.87	57.95	66.36	72.59	76.81	78.49	72.46	47.91	11.31	1.81	0.03	0.00	-	-	-	-	-
1941	48.21	57.14	65.62	72.01	76.74	78.73	74.44	56.39	16.35	2.55	0.08	0.00	-	-	-	-	-
1942	47.90	57.15	65.31	72.06	76.78	79.08	76.42	65.26	23.69	3.43	0.21	0.00	-	-	-	-	-
1943	47.77	56.67	64.91	71.69	76.71	79.23	77.56	70.61	33.37	5.27	0.42	0.00	-	-	-	-	-
1944	47.63	56.32	64.73	71.41	76.43	79.37	78.50	73.91	44.73	7.74	0.79	0.02	-	-	-	-	-
1945	46.15	54.40	63.53	70.61	75.69	78.51	78.61	75.97	53.51	11.79	1.38	0.04	0.00	-	-	-	-
1946	45.03	53.26	62.66	69.88	74.89	78.19	78.52	77.50	61.50	17.71	1.90	0.04	0.00	-	-	-	-

Table 13 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1947	44.53	53.00	62.12	69.46	74.32	77.73	78.39	78.17	67.10	24.99	3.20	0.19	0.00	-	-	-	-
1948	43.93	52.77	61.52	68.93	73.57	77.36	78.14	78.46	70.12	33.72	4.65	0.27	0.00	-	-	-	-
1949	43.68	52.44	61.11	68.59	73.18	77.12	77.98	78.75	72.81	41.85	6.66	0.48	0.00	-	-	-	-
1950	42.50	50.27	59.28	67.32	71.68	76.12	76.95	78.32	74.47	50.06	9.99	0.90	0.02	0.00	-	-	-
1951	41.71	49.14	57.65	66.18	70.83	75.25	76.38	78.00	75.32	57.38	15.40	1.56	0.06	0.00	-	-	-
1952	41.00	48.65	57.02	65.59	70.40	74.74	76.01	77.86	75.83	64.03	22.11	2.27	0.14	0.00	-	-	-
1953	40.12	47.67	56.25	64.77	69.47	73.86	75.31	77.27	75.94	68.49	30.09	3.55	0.24	0.00	-	-	-
1954	38.97	46.94	55.40	63.83	68.79	73.15	74.74	76.76	75.97	70.29	38.65	5.73	0.36	0.00	-	-	-
1955	36.79	45.52	53.32	61.74	67.30	71.74	73.50	75.69	75.45	71.73	47.79	9.27	0.66	0.02	0.00	-	-
1956	35.38	44.15	52.04	60.48	66.23	71.01	72.65	74.97	75.23	72.86	54.70	14.43	1.25	0.05	0.00	-	-
1957	34.49	43.10	51.05	59.85	65.41	70.20	72.01	74.35	74.90	73.37	60.83	21.38	2.11	0.13	0.00	-	-
1958	33.68	41.30	49.57	58.53	64.02	69.07	70.96	73.33	74.32	73.23	65.27	29.71	3.45	0.25	0.00	-	-
1959	32.57	39.92	48.34	57.31	62.97	68.22	70.23	72.49	73.88	73.09	67.72	38.21	5.13	0.33	0.00	-	-
1960	31.00	38.08	46.14	55.05	61.05	66.64	68.58	70.90	72.73	72.36	68.86	46.69	8.03	0.53	0.02	0.00	-
1961	29.76	36.89	44.62	53.55	59.59	65.54	67.62	69.82	71.70	71.61	69.02	54.48	12.86	0.94	0.02	0.00	-
1962	28.03	35.06	43.23	51.93	58.30	64.24	66.32	68.68	70.79	71.01	68.76	59.11	18.39	1.50	0.05	0.00	-
1963	26.98	33.96	41.81	50.08	56.48	62.77	64.56	67.19	69.31	69.88	68.25	62.73	25.79	2.29	0.19	0.00	-
1964	26.83	32.96	40.57	48.79	55.32	61.53	63.45	66.22	68.60	69.07	67.95	65.15	33.21	4.23	0.30	0.00	-
1965	23.58	31.16	37.37	45.99	52.53	59.17	61.31	64.33	67.13	67.27	67.27	65.62	40.63	7.08	0.52	0.00	0.00
1966	22.87	29.79	35.78	44.24	50.55	57.72	60.19	63.06	65.82	66.21	66.47	65.89	47.21	10.90	0.90	0.00	0.00
1967	20.67	27.80	32.84	41.52	48.63	56.10	58.73	61.29	64.25	64.97	65.61	65.18	52.40	17.00	1.46	0.03	0.00
1968	20.45	26.46	31.16	39.66	46.51	54.06	56.60	59.33	62.44	63.28	64.25	64.27	55.97	24.22	2.71	0.11	0.00
1969	16.18	23.23	27.21	36.78	44.52	51.76	54.83	57.59	61.09	62.00	62.72	63.34	57.62	31.24	4.35	0.26	0.00
1970	7.99	21.02	23.61	32.65	42.04	48.55	51.86	55.08	58.79	59.62	60.91	62.03	57.81	37.51	6.93	0.65	0.00
1971	7.89	18.84	22.80	30.86	38.99	46.58	50.18	53.30	57.26	58.08	59.52	61.03	57.43	42.90	11.51	1.02	0.00
1972	7.78	18.56	21.68	29.91	37.87	45.25	48.61	52.11	56.17	56.94	58.65	60.15	57.10	47.15	17.55	1.82	0.06
1973	-	17.35	19.68	27.52	35.27	43.00	46.62	50.61	54.77	55.53	57.13	58.90	56.31	49.33	24.04	2.84	0.06
1974	-	17.06	18.29	25.86	34.05	41.73	45.39	49.39	53.69	54.72	56.34	58.22	55.66	50.15	31.04	4.62	0.19
1975	-	15.86	16.92	24.32	31.81	39.57	43.23	47.74	51.97	52.96	54.68	56.66	54.27	49.91	36.45	7.74	0.71
1976	-	12.96	16.72	23.39	30.45	37.16	41.21	46.04	50.43	51.54	53.25	55.28	53.13	49.57	40.21	11.87	0.84
1977	-	12.68	16.50	21.84	29.55	35.87	39.72	44.72	49.32	50.27	52.18	54.18	52.10	49.03	42.77	17.42	1.94

Table 13 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1978	.	.	14.60	20.98	28.00	33.69	38.00	43.06	47.83	48.83	50.72	53.21	51.01	48.48	43.73	22.43	2.97
1979	.	.	14.39	20.03	27.02	32.35	36.79	41.56	46.34	47.63	49.70	52.15	50.10	47.80	44.16	26.78	5.35
1980	.	.	12.87	18.23	25.78	29.79	34.91	39.59	44.33	46.13	47.95	50.41	48.70	46.45	44.30	30.70	8.03
1981	.	.	12.66	17.31	24.67	28.24	33.25	38.20	42.93	44.64	46.76	49.16	47.54	45.58	43.81	34.41	12.09
1982	.	.	10.99	16.43	23.47	26.74	31.40	36.54	41.20	42.99	45.31	47.63	46.48	44.55	43.51	36.99	16.43
1983	.	.	.	15.55	21.59	25.21	29.24	34.59	39.36	41.53	44.14	46.22	45.18	43.69	42.75	38.07	22.37
1984	.	.	.	14.60	19.91	23.54	27.53	32.39	37.47	39.54	42.52	44.44	43.57	42.81	41.89	38.66	26.76
1985	.	.	.	13.31	18.65	21.76	25.86	30.87	35.83	37.93	41.22	43.10	42.71	41.91	41.37	38.71	30.38
1986	.	.	.	13.05	17.30	21.02	24.62	29.43	34.21	36.42	39.86	41.92	41.62	40.98	40.58	38.84	32.45
1987	.	.	.	11.50	15.29	19.36	22.98	27.46	32.72	35.02	38.51	40.29	40.20	39.98	39.55	37.73	32.54
1988	14.18	18.35	22.21	26.71	31.51	33.69	37.47	39.25	39.59	39.31	38.84	37.38	32.36

Table 14
Current smoking prevalence among 5-year birth cohorts of white females, by year

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1885	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1886	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1887	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1888	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1889	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1890	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1891	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1892	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1893	0.42	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1894	0.42	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1895	0.42	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1896	0.85	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1897	0.85	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1898	0.85	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1899	0.85	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1900	0.85	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	0.85	0.17	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	1.27	0.17	0.18	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	1.27	0.17	0.18	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	1.27	0.17	0.27	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	1.27	0.34	0.27	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1906	1.27	0.69	0.27	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1907	1.27	0.86	0.27	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1908	2.12	0.86	0.37	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1909	2.97	1.03	0.37	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1910	2.97	1.37	0.46	0.05	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1911	3.39	1.72	0.73	0.05	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1912	3.39	1.72	1.00	0.09	0.03	0.00	-	-	-	-	-	-	-	-	-	-	-
1913	3.39	2.06	1.46	0.09	0.09	0.00	-	-	-	-	-	-	-	-	-	-	-
1914	3.82	2.92	1.83	0.19	0.18	0.00	-	-	-	-	-	-	-	-	-	-	-
1915	3.82	3.25	2.47	0.28	0.18	0.00	0.00	-	-	-	-	-	-	-	-	-	-

Table 14 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1916	3.82	3.77	3.55	0.52	0.18	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1917	3.82	4.45	4.56	0.95	0.21	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1918	3.81	5.14	5.65	1.37	0.40	0.02	0.00	-	-	-	-	-	-	-	-	-	-
1919	3.80	5.31	6.19	2.09	0.49	0.02	0.02	-	-	-	-	-	-	-	-	-	-
1920	3.79	6.10	7.01	3.08	0.64	0.12	0.02	0.00	-	-	-	-	-	-	-	-	-
1921	3.78	6.59	7.56	4.26	1.04	0.14	0.02	0.00	-	-	-	-	-	-	-	-	-
1922	4.19	7.44	8.47	5.54	1.74	0.23	0.02	0.00	-	-	-	-	-	-	-	-	-
1923	4.18	7.76	9.19	6.53	2.93	0.47	0.02	0.00	-	-	-	-	-	-	-	-	-
1924	4.58	8.08	9.63	8.14	4.45	0.72	0.06	0.00	-	-	-	-	-	-	-	-	-
1925	4.57	8.54	10.72	9.21	6.65	1.19	0.07	0.00	0.00	-	-	-	-	-	-	-	-
1926	4.97	9.02	11.52	10.32	8.68	2.23	0.11	0.02	0.00	-	-	-	-	-	-	-	-
1927	4.96	9.16	12.49	11.26	11.61	3.65	0.32	0.03	0.00	-	-	-	-	-	-	-	-
1928	5.32	9.97	13.10	12.25	13.37	6.30	0.46	0.06	0.00	-	-	-	-	-	-	-	-
1929	5.71	9.94	13.87	13.04	15.86	9.67	0.85	0.11	0.00	-	-	-	-	-	-	-	-
1930	5.69	10.03	14.26	14.15	18.20	13.70	1.84	0.24	0.00	0.00	-	-	-	-	-	-	-
1931	5.68	10.49	14.50	15.42	19.98	17.59	3.28	0.35	0.00	0.00	-	-	-	-	-	-	-
1932	6.06	11.11	14.83	16.27	21.04	20.92	5.42	0.45	0.00	0.00	-	-	-	-	-	-	-
1933	7.25	11.40	15.24	17.17	22.25	24.03	8.98	0.74	0.02	0.00	-	-	-	-	-	-	-
1934	7.62	11.52	15.82	18.39	23.55	26.89	12.98	1.21	0.07	0.00	-	-	-	-	-	-	-
1935	7.95	11.58	16.42	19.11	24.79	28.94	17.67	2.01	0.16	0.02	0.00	-	-	-	-	-	-
1936	7.92	12.23	16.61	19.91	25.84	30.62	21.94	3.57	0.20	0.02	0.00	-	-	-	-	-	-
1937	7.89	12.18	17.09	20.55	26.99	32.14	25.95	5.85	0.33	0.02	0.00	-	-	-	-	-	-
1938	7.85	12.10	17.77	20.95	27.75	33.52	29.68	9.04	0.51	0.05	0.00	-	-	-	-	-	-
1939	8.60	12.46	18.45	21.25	28.92	34.65	32.27	13.02	0.91	0.07	0.00	-	-	-	-	-	-
1940	8.42	12.63	18.66	22.02	29.45	35.82	34.69	17.87	2.04	0.14	0.00	0.00	-	-	-	-	-
1941	8.38	12.51	18.71	22.40	29.69	36.77	36.76	22.53	3.86	0.19	0.00	0.00	-	-	-	-	-
1942	8.34	12.42	18.69	22.77	30.19	37.87	38.27	27.56	6.42	0.44	0.02	0.00	-	-	-	-	-
1943	8.25	12.57	19.01	22.94	30.81	38.51	39.73	31.38	11.26	0.85	0.03	0.00	-	-	-	-	-
1944	8.21	12.80	19.08	23.55	31.49	39.26	40.92	34.99	16.77	1.54	0.03	0.00	-	-	-	-	-
1945	8.02	12.73	19.22	23.63	32.07	39.79	42.00	37.66	23.17	2.72	0.08	0.00	0.00	-	-	-	-
1946	7.98	12.54	19.20	23.72	32.28	39.92	42.89	39.64	29.04	4.75	0.22	0.00	0.00	-	-	-	-

Table 14 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1947	8.50	12.37	19.26	23.83	32.64	40.18	43.51	41.10	33.97	7.91	0.37	0.03	0.00	-	-	-	-
1948	8.81	12.34	19.29	23.86	32.91	40.33	44.23	42.37	37.65	13.86	0.82	0.04	0.00	-	-	-	-
1949	9.11	12.31	19.21	23.86	33.37	40.58	44.76	43.33	40.92	19.87	1.48	0.04	0.00	-	-	-	-
1950	8.66	12.30	18.93	24.08	33.50	40.72	44.90	43.98	42.57	25.88	2.72	0.10	0.00	0.00	-	-	-
1951	8.61	12.01	18.82	24.07	33.39	40.98	44.87	44.63	44.13	31.76	5.28	0.18	0.01	0.00	-	-	-
1952	8.50	12.02	18.88	23.93	33.42	41.15	45.16	45.36	45.23	36.59	9.31	0.38	0.02	0.00	-	-	-
1953	8.44	11.89	18.62	23.91	33.21	41.22	45.29	45.62	46.07	40.13	14.96	0.82	0.02	0.00	-	-	-
1954	8.39	11.89	18.36	23.91	33.12	41.50	45.50	46.06	47.07	42.95	21.23	1.60	0.06	0.00	-	-	-
1955	8.59	11.56	18.08	23.64	32.82	41.19	45.22	45.89	47.65	44.87	27.29	3.23	0.13	0.00	0.00	-	-
1956	8.36	11.25	17.84	23.30	32.75	40.96	45.23	45.97	47.94	46.17	33.22	6.12	0.28	0.03	0.00	-	-
1957	8.08	11.06	17.68	23.09	32.55	40.78	45.28	46.08	48.42	46.94	38.50	10.08	0.50	0.04	0.00	-	-
1958	7.91	10.86	17.47	23.05	32.29	40.65	45.10	46.08	48.51	47.78	42.25	15.55	1.11	0.05	0.01	-	-
1959	7.68	10.60	17.30	22.82	32.04	40.44	45.14	45.88	48.58	48.38	45.35	22.02	1.95	0.07	0.01	-	-
1960	7.35	10.40	16.97	22.41	31.53	40.10	44.84	45.60	48.31	48.63	46.84	29.34	3.33	0.15	0.03	0.00	-
1961	7.23	10.16	16.58	22.03	31.14	39.60	44.56	45.32	48.02	48.84	47.62	35.69	6.26	0.27	0.03	0.00	-
1962	6.95	9.87	16.05	21.64	30.69	39.23	44.34	44.95	47.71	48.79	47.91	41.12	9.76	0.58	0.06	0.00	-
1963	6.84	9.73	15.74	21.07	30.05	38.70	43.81	44.55	47.43	48.44	48.35	44.72	14.97	1.20	0.10	0.00	-
1964	6.69	9.60	15.49	20.76	29.74	38.35	43.59	44.32	47.41	48.33	48.60	47.06	20.77	2.09	0.14	0.00	-
1965	5.89	9.01	14.31	19.97	28.75	37.58	42.82	43.61	46.78	47.65	48.55	48.23	27.24	3.54	0.25	0.00	0.00
1966	5.83	8.53	13.82	19.29	28.16	36.97	42.21	43.18	46.49	47.25	48.39	48.70	32.77	6.36	0.35	0.00	0.00
1967	5.41	8.18	13.40	18.44	27.55	36.25	41.46	42.60	45.95	46.75	48.21	48.60	37.26	10.45	0.65	0.00	0.00
1968	5.35	8.04	12.68	17.74	26.74	35.39	40.58	41.88	45.46	46.29	47.75	48.48	40.45	15.47	1.40	0.00	0.00
1969	5.29	7.18	11.87	16.94	25.70	34.54	39.86	41.31	44.99	45.74	47.30	48.07	41.94	21.09	2.69	0.02	0.00
1970	5.23	7.05	10.86	15.95	24.44	33.28	38.40	40.15	44.00	44.76	46.66	47.43	42.49	26.91	4.78	0.18	0.00
1971	5.17	6.53	10.35	15.41	23.70	32.18	37.39	39.30	43.50	44.19	46.07	46.87	42.47	32.05	8.76	0.49	0.00
1972	5.10	6.02	9.85	14.82	22.91	31.23	36.44	38.79	43.19	43.85	45.59	46.62	42.61	35.79	14.41	1.18	0.05
1973	-	5.15	9.20	13.85	21.59	30.02	35.53	38.15	42.53	43.09	45.10	46.03	42.37	38.37	21.32	2.62	0.15
1974	-	5.03	8.71	13.42	20.91	29.11	34.96	37.74	42.09	42.83	44.68	45.57	42.17	39.63	28.19	4.57	0.31
1975	-	4.55	7.93	12.83	19.60	27.64	33.83	36.91	41.12	41.94	43.91	44.90	41.58	40.10	33.87	7.16	0.62
1976	-	4.09	7.60	12.35	18.84	26.67	32.83	35.97	40.26	41.33	43.34	44.06	41.24	40.24	38.14	11.11	0.92
1977	-	3.98	7.08	11.74	18.33	25.74	31.86	35.26	39.57	40.72	42.81	43.38	41.02	40.24	40.90	16.29	1.69

Table 14 (continued)

Year	1885-89	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1978	-	-	6.61	10.82	17.36	24.64	30.67	34.14	38.73	39.89	42.03	42.77	40.33	39.68	42.09	22.39	3.38
1979	-	-	5.75	10.16	16.80	23.65	29.62	33.39	37.97	39.32	41.38	42.41	39.71	39.24	42.44	28.42	6.04
1980	-	-	5.26	9.36	15.53	22.27	28.27	32.26	36.89	38.26	40.28	41.26	38.85	38.30	42.36	33.43	9.34
1981	-	-	4.78	9.14	14.65	21.16	27.06	31.26	36.12	37.42	39.60	40.70	38.13	37.82	42.26	36.85	13.78
1982	-	-	3.85	8.40	13.83	20.07	25.90	30.28	35.27	36.60	38.89	39.89	37.40	36.99	41.49	38.67	19.71
1983	-	-	-	7.41	12.96	18.81	24.85	29.30	33.94	35.48	37.99	39.21	36.62	36.22	40.75	39.86	25.14
1984	-	-	-	6.76	12.01	17.62	23.98	28.06	32.60	34.44	37.01	38.16	36.05	35.54	39.67	39.92	29.60
1985	-	-	-	6.24	10.80	16.44	22.48	26.93	31.18	33.06	36.03	37.18	35.38	34.64	39.05	39.64	33.20
1986	-	-	-	6.02	9.99	15.50	21.61	25.63	30.04	32.14	35.01	36.09	34.86	34.11	38.42	38.97	34.12
1987	-	-	-	4.70	9.38	14.17	20.33	24.68	28.73	30.68	33.97	35.03	33.77	33.10	37.42	37.88	33.93
1988	-	-	-	-	9.11	13.22	19.64	23.99	27.77	29.94	33.11	34.44	33.39	32.76	36.70	37.24	33.87

Table 15
Current smoking prevalence among 5-year birth cohorts of black males, by year

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1900	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1906	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1907	0.93	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1908	0.93	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1909	0.93	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1910	1.86	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1911	2.79	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1912	4.65	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1913	6.51	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1914	10.24	0.47	0.00	-	-	-	-	-	-	-	-	-	-	-
1915	12.10	1.42	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1916	14.89	2.36	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1917	18.54	4.72	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1918	26.78	8.98	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1919	33.24	12.28	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1920	40.47	16.06	1.44	0.00	0.00	-	-	-	-	-	-	-	-	-
1921	48.55	19.32	3.96	0.30	0.00	-	-	-	-	-	-	-	-	-
1922	54.75	24.50	5.04	0.30	0.00	-	-	-	-	-	-	-	-	-
1923	55.44	32.04	7.56	0.30	0.00	-	-	-	-	-	-	-	-	-
1924	59.74	38.64	10.44	0.30	0.00	-	-	-	-	-	-	-	-	-
1925	60.40	45.24	13.32	1.49	0.00	0.00	-	-	-	-	-	-	-	-
1926	62.09	50.42	19.05	2.09	0.00	0.00	-	-	-	-	-	-	-	-
1927	62.09	56.08	26.91	4.18	0.00	0.00	-	-	-	-	-	-	-	-
1928	62.09	58.90	33.01	5.97	0.23	0.00	-	-	-	-	-	-	-	-
1929	62.09	61.10	41.99	9.56	0.46	0.00	-	-	-	-	-	-	-	-
1930	63.60	63.12	49.08	12.84	1.37	0.00	0.00	-	-	-	-	-	-	-

Table 15 (continued)

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1931	63.60	63.89	55.53	18.52	2.29	0.00	0.00	-	-	-	-	-	-	-
1932	64.48	64.48	60.79	24.49	4.35	0.00	0.00	-	-	-	-	-	-	-
1933	64.43	64.95	63.54	31.01	5.95	0.23	0.00	-	-	-	-	-	-	-
1934	64.38	65.87	67.00	37.52	8.46	0.91	0.00	-	-	-	-	-	-	-
1935	64.67	66.63	67.23	45.20	13.95	1.59	0.00	0.00	-	-	-	-	-	-
1936	65.21	66.45	69.48	54.34	17.84	1.59	0.00	0.00	-	-	-	-	-	-
1937	64.88	67.02	70.90	61.38	25.85	2.95	0.42	0.00	-	-	-	-	-	-
1938	64.27	67.24	71.61	64.25	31.76	4.32	0.63	0.00	-	-	-	-	-	-
1939	65.05	67.18	71.83	68.10	39.76	7.04	1.27	0.00	-	-	-	-	-	-
1940	65.27	66.76	73.21	71.74	47.42	10.68	1.48	0.00	0.00	-	-	-	-	-
1941	65.19	66.34	73.44	75.07	54.04	14.31	1.90	0.00	0.00	-	-	-	-	-
1942	65.11	66.09	73.39	76.72	59.96	23.62	2.75	0.21	0.00	-	-	-	-	-
1943	65.02	65.84	73.77	78.08	65.36	34.07	4.44	0.64	0.00	-	-	-	-	-
1944	65.77	67.11	73.71	79.84	69.46	43.11	6.76	1.07	0.00	-	-	-	-	-
1945	65.10	66.30	73.41	80.60	72.94	50.99	9.49	1.28	0.00	0.00	-	-	-	-
1946	63.88	65.67	73.28	81.06	75.33	59.08	15.59	2.14	0.00	0.00	-	-	-	-
1947	63.49	65.39	73.08	81.04	77.28	64.67	23.15	3.21	0.00	0.00	-	-	-	-
1948	63.09	64.82	72.34	80.87	77.61	69.56	32.83	4.49	0.18	0.00	-	-	-	-
1949	62.69	64.18	72.80	80.97	78.19	72.56	39.36	7.06	0.37	0.00	-	-	-	-
1950	62.01	63.71	72.44	80.43	78.64	74.25	47.30	10.27	0.37	0.00	0.00	-	-	-
1951	61.32	62.87	71.95	79.77	79.00	76.37	55.23	15.40	0.91	0.00	0.00	-	-	-
1952	61.17	62.21	71.59	79.58	79.05	76.99	63.63	20.09	1.64	0.00	0.00	-	-	-
1953	61.02	62.09	71.22	79.54	79.25	77.97	67.62	25.86	2.56	0.00	0.00	-	-	-
1954	61.64	61.77	70.71	79.51	79.19	78.80	70.68	33.12	5.48	0.14	0.00	-	-	-
1955	60.63	61.68	70.12	79.22	78.93	78.66	72.36	41.10	9.13	0.28	0.00	0.00	-	-
1956	60.45	60.99	69.87	78.17	78.84	79.35	74.43	50.26	14.43	0.71	0.00	0.00	-	-
1957	59.98	61.24	69.08	77.72	78.74	79.38	76.21	55.30	20.27	1.13	0.28	0.00	-	-
1958	59.23	60.54	68.55	76.90	78.11	78.49	76.95	60.34	26.82	2.40	0.28	0.00	-	-
1959	58.66	60.00	68.19	76.71	77.93	78.39	77.30	62.74	35.40	5.52	0.42	0.00	-	-
1960	57.88	59.10	67.11	75.88	76.68	77.67	77.18	64.05	43.88	8.33	0.56	0.00	0.00	-
1961	57.26	57.84	66.43	75.28	75.57	77.41	77.85	65.01	51.50	12.28	0.98	0.00	0.00	-

Table 15 (continued)

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1962	55.90	56.21	65.74	74.45	74.74	76.96	77.70	65.87	56.22	17.08	1.40	0.00	0.00	-
1963	53.17	55.65	64.64	73.24	74.17	76.51	76.61	65.99	62.35	24.82	1.96	0.14	0.00	-
1964	52.91	55.22	64.14	72.98	73.53	76.12	76.52	67.22	65.72	32.64	4.20	0.55	0.00	-
1965	50.00	52.95	62.41	71.83	72.66	74.55	75.01	67.82	67.34	39.41	7.00	1.09	0.00	0.00
1966	49.07	52.14	61.34	71.77	71.91	73.79	74.10	67.55	69.75	47.54	10.48	1.23	0.00	0.00
1967	46.18	50.75	59.83	70.94	71.03	72.83	73.37	67.18	71.31	54.02	14.39	1.50	0.00	0.00
1968	45.90	49.35	57.87	69.85	69.64	72.12	72.63	66.73	71.05	56.85	20.31	2.18	0.00	0.00
1969	41.99	47.86	56.86	68.29	69.06	71.49	71.85	65.43	71.16	59.62	26.79	3.27	0.00	0.00
1970	39.31	43.93	55.06	65.93	67.52	70.38	70.25	64.44	71.45	60.55	32.20	5.03	0.00	0.00
1971	39.01	42.05	53.25	65.16	66.35	69.12	69.46	63.86	71.57	61.42	39.47	10.33	0.21	0.00
1972	37.53	40.98	51.97	63.78	65.75	67.99	69.06	63.76	71.31	61.85	44.84	16.18	1.07	0.00
1973	36.04	39.51	49.90	62.60	64.15	67.30	68.39	63.64	70.57	62.02	47.59	20.48	3.00	0.00
1974	35.71	38.83	49.39	61.62	63.67	66.73	67.85	63.05	69.82	61.62	50.28	27.09	4.28	0.00
1975	34.22	37.74	47.07	60.23	61.91	64.04	66.90	61.93	69.02	61.22	50.93	35.08	6.39	0.00
1976	32.73	37.04	45.26	58.84	60.15	62.90	65.26	62.03	68.15	61.11	51.86	40.16	8.92	0.00
1977	31.01	36.31	43.65	58.00	59.07	62.02	64.41	62.06	67.77	60.52	51.61	43.59	12.70	0.88
1978	28.94	35.06	42.17	56.42	57.90	60.76	62.60	61.22	66.54	59.25	51.90	45.43	19.98	0.88
1979	26.88	34.22	41.25	54.99	56.52	59.94	61.54	60.03	65.52	58.85	51.89	47.10	25.76	0.88
1980	26.51	32.42	39.08	52.62	54.81	57.50	59.50	58.38	63.99	58.38	51.01	48.73	30.04	3.96
1981	26.12	30.16	38.15	50.71	53.26	56.03	58.08	56.42	62.57	57.74	50.09	50.15	34.75	5.29
1982	25.70	28.14	34.81	47.66	52.11	53.96	56.22	55.93	62.13	55.94	49.70	50.28	37.22	11.39
1983	25.26	26.13	33.50	44.87	51.47	52.58	54.84	54.96	61.29	55.23	48.80	50.83	39.57	16.20
1984	24.79	23.49	31.96	42.21	48.03	51.53	53.04	54.60	59.97	54.38	48.10	50.10	40.91	21.32
1985	24.30	21.64	31.63	41.26	46.26	50.28	51.05	53.81	58.80	53.17	47.58	50.59	41.24	25.95
1986	23.77	21.28	31.27	39.03	44.30	49.50	50.53	53.06	57.07	52.84	47.59	50.13	40.95	27.03
1987	17.41	20.91	29.75	38.75	41.93	48.37	48.11	49.60	54.40	51.37	46.20	49.42	41.03	27.17
1988	-	20.51	29.37	38.45	39.07	47.68	46.97	48.08	53.51	51.13	45.40	49.42	41.17	26.88

Table 16
Current smoking prevalence among 5-year birth cohorts of black females, by year

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1900	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1906	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1907	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1908	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1909	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-	-
1910	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1911	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1912	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1913	0.40	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1914	0.40	0.00	0.00	-	-	-	-	-	-	-	-	-	-	-
1915	1.59	0.32	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1916	2.78	0.63	0.00	0.00	-	-	-	-	-	-	-	-	-	-
1917	3.17	0.95	0.20	0.00	-	-	-	-	-	-	-	-	-	-
1918	3.57	1.26	0.20	0.00	-	-	-	-	-	-	-	-	-	-
1919	3.97	1.90	0.20	0.00	-	-	-	-	-	-	-	-	-	-
1920	4.37	2.52	0.20	0.00	0.00	-	-	-	-	-	-	-	-	-
1921	5.56	3.46	0.60	0.00	0.00	-	-	-	-	-	-	-	-	-
1922	5.56	4.41	1.20	0.00	0.00	-	-	-	-	-	-	-	-	-
1923	6.35	5.35	2.00	0.00	0.00	-	-	-	-	-	-	-	-	-
1924	6.75	6.30	2.19	0.37	0.00	-	-	-	-	-	-	-	-	-
1925	7.14	8.19	2.39	0.55	0.00	0.00	-	-	-	-	-	-	-	-
1926	7.14	9.72	2.99	0.55	0.00	0.00	-	-	-	-	-	-	-	-
1927	7.14	10.98	4.16	0.74	0.15	0.00	-	-	-	-	-	-	-	-
1928	7.14	13.18	5.34	1.11	0.15	0.00	-	-	-	-	-	-	-	-
1929	7.14	14.74	8.30	1.29	0.44	0.00	-	-	-	-	-	-	-	-
1930	8.73	15.62	11.27	2.58	0.73	0.00	0.00	-	-	-	-	-	-	-

Table 16 (continued)

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1931	9.13	16.25	12.45	4.24	0.88	0.00	0.00	-	-	-	-	-	-	-
1932	9.52	16.87	13.44	6.27	1.17	0.00	0.00	-	-	-	-	-	-	-
1933	10.69	18.36	15.61	9.96	1.47	0.13	0.00	-	-	-	-	-	-	-
1934	11.06	19.29	17.79	11.81	2.05	0.38	0.00	-	-	-	-	-	-	-
1935	11.43	19.60	19.47	15.85	3.52	0.38	0.00	0.00	-	-	-	-	-	-
1936	11.40	19.91	20.45	18.95	5.28	0.75	0.00	0.00	-	-	-	-	-	-
1937	11.76	20.54	21.78	22.63	6.90	1.01	0.00	0.00	-	-	-	-	-	-
1938	11.73	20.50	23.10	25.54	8.80	1.51	0.00	0.00	-	-	-	-	-	-
1939	11.69	20.99	23.69	26.82	11.45	2.64	0.00	0.00	-	-	-	-	-	-
1940	12.04	21.08	24.35	29.13	15.85	3.64	0.00	0.00	0.00	-	-	-	-	-
1941	13.55	21.68	25.33	30.91	20.54	5.02	0.36	0.00	0.00	-	-	-	-	-
1942	13.80	22.53	26.50	33.61	24.36	7.28	1.08	0.00	0.00	-	-	-	-	-
1943	13.75	22.38	27.80	34.34	28.88	10.79	1.81	0.00	0.00	-	-	-	-	-
1944	14.37	22.32	28.06	35.75	32.25	14.43	2.89	0.12	0.00	-	-	-	-	-
1945	15.44	22.85	27.86	36.42	35.44	20.04	4.46	0.24	0.00	0.00	-	-	-	-
1946	15.74	22.49	28.36	36.97	38.21	25.36	6.51	0.36	0.00	0.00	-	-	-	-
1947	15.84	22.42	28.30	37.59	38.78	30.10	9.04	0.72	0.00	0.00	-	-	-	-
1948	15.76	23.22	28.39	37.80	39.90	34.20	12.42	1.79	0.10	0.00	-	-	-	-
1949	15.84	23.14	28.25	38.71	41.17	36.91	17.60	2.86	0.10	0.00	-	-	-	-
1950	15.54	22.66	28.07	39.25	42.59	38.98	23.09	4.65	0.21	0.00	0.00	-	-	-
1951	15.81	22.38	27.81	39.37	43.65	40.68	27.53	7.16	0.63	0.08	0.00	-	-	-
1952	15.71	22.19	27.94	39.59	44.72	42.13	32.44	10.01	0.84	0.08	0.00	-	-	-
1953	15.96	22.09	27.70	40.16	45.24	43.71	37.57	15.98	1.05	0.08	0.00	-	-	-
1954	15.75	21.80	27.81	40.14	45.38	45.20	40.41	19.42	1.68	0.08	0.00	-	-	-
1955	15.55	21.96	27.42	40.33	45.52	45.94	42.38	24.40	3.15	0.16	0.00	0.00	-	-
1956	15.43	21.83	27.24	40.53	45.75	46.35	44.02	29.16	6.19	0.16	0.00	0.00	-	-
1957	14.99	21.22	27.12	40.53	45.78	46.46	45.25	34.84	9.96	0.39	0.00	0.00	-	-
1958	14.66	20.71	27.05	40.54	46.18	47.12	46.48	38.70	14.76	0.93	0.00	0.00	-	-
1959	14.84	20.39	26.96	40.41	46.19	47.20	47.83	43.05	20.73	1.79	0.00	0.00	-	-
1960	14.47	20.12	26.55	40.20	45.91	47.20	48.32	45.12	25.33	2.88	0.22	0.00	0.00	-
1961	13.90	19.69	26.42	39.51	45.91	47.35	48.60	47.05	30.23	4.82	0.44	0.00	0.00	-

Table 16 (continued)

Year	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1962	13.44	19.16	25.97	39.08	45.52	47.23	49.42	48.03	36.00	7.39	0.73	0.00	0.00	-
1963	13.08	18.73	25.30	38.86	45.77	47.11	49.17	49.12	39.49	10.57	1.02	0.00	0.00	-
1964	12.78	18.68	25.34	38.56	45.62	47.27	49.65	49.68	43.46	16.08	1.68	0.07	0.00	-
1965	12.40	18.04	24.59	38.15	44.85	47.09	49.69	50.06	45.80	21.36	3.07	0.07	0.00	0.00
1966	12.24	18.13	24.17	37.89	44.62	46.98	49.56	50.59	46.94	26.84	5.18	0.14	0.00	0.00
1967	12.07	17.68	23.52	37.30	44.06	46.47	49.08	50.62	48.41	31.02	7.73	0.41	0.07	0.00
1968	11.88	17.37	22.87	37.05	43.74	46.22	48.95	50.84	49.00	34.28	11.67	0.68	0.00	0.00
1969	11.70	17.18	22.48	36.88	43.84	45.60	48.87	50.85	49.75	37.76	16.84	1.78	0.00	0.00
1970	10.51	16.49	21.96	35.91	42.44	44.99	48.13	50.12	49.81	39.11	22.26	3.55	0.10	0.00
1971	10.32	15.57	21.47	34.55	41.88	44.43	47.80	49.88	50.11	39.98	26.96	6.36	0.30	0.00
1972	10.12	14.89	21.07	33.96	41.54	44.12	47.46	49.56	50.68	41.13	31.08	10.79	0.99	0.00
1973	9.91	14.21	20.37	33.23	40.80	42.70	47.03	48.89	50.56	41.66	34.61	16.72	1.29	0.00
1974	9.38	13.76	19.68	32.75	40.31	42.13	47.19	48.62	50.21	42.17	38.02	21.76	2.48	0.00
1975	8.92	13.09	18.83	32.26	39.12	40.85	46.75	47.61	49.14	41.98	39.17	27.69	3.96	0.40
1976	8.69	12.42	18.26	31.26	38.27	39.99	46.21	47.09	48.85	41.79	39.90	31.71	5.75	0.40
1977	8.78	11.74	17.54	30.52	37.64	39.31	45.72	46.13	48.44	41.95	41.01	36.69	9.90	1.00
1978	8.17	11.49	16.78	28.67	35.91	38.77	45.22	45.52	47.90	41.61	41.31	38.74	13.85	2.01
1979	7.91	11.00	16.01	27.80	35.38	38.12	44.70	44.64	47.54	41.68	41.07	40.05	20.27	3.41
1980	7.63	10.03	15.37	26.34	34.61	37.08	43.05	44.03	46.85	41.06	41.06	40.97	25.70	5.62
1981	7.00	9.31	13.61	25.03	33.04	36.21	41.81	43.63	46.25	40.67	40.84	41.42	30.18	8.84
1982	6.71	8.10	12.80	24.13	32.63	35.39	40.57	42.43	45.53	40.36	40.76	42.34	32.45	11.01
1983	6.13	7.85	12.15	23.07	31.67	34.56	39.56	41.56	45.16	40.11	41.16	42.36	34.12	14.41
1984	5.44	7.50	11.21	22.19	30.22	32.97	38.45	40.63	44.60	39.79	41.16	42.49	35.34	18.22
1985	5.14	6.94	10.84	20.93	29.38	32.00	37.63	39.75	43.35	39.08	40.73	42.65	36.01	21.75
1986	4.28	6.66	9.64	20.60	28.12	30.75	36.56	39.26	42.75	38.52	40.50	42.94	37.00	23.36
1987	3.99	6.37	9.25	18.83	26.85	30.21	34.18	38.57	41.16	37.94	39.83	41.84	37.05	25.14
1988	-	5.31	8.39	17.56	25.93	29.35	33.72	37.88	40.06	37.41	39.32	41.62	36.82	25.93

Table 17
Annual quit rates among 5-year birth cohorts of white males, by age

Age	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
11	0.04	0.01	0.01	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.02	0.05	0.04	0.17	0.14	0.13
12	0.05	0.01	0.02	0.02	0.02	0.00	0.01	0.01	0.02	0.02	0.04	0.07	0.08	0.24	0.22	0.19
13	0.05	0.01	0.04	0.03	0.04	0.01	0.02	0.02	0.04	0.04	0.06	0.10	0.14	0.31	0.33	0.28
14	0.06	0.02	0.06	0.04	0.06	0.02	0.04	0.05	0.07	0.07	0.10	0.14	0.23	0.41	0.45	0.41
15	0.06	0.04	0.08	0.06	0.08	0.04	0.05	0.08	0.11	0.11	0.17	0.21	0.38	0.55	0.61	0.58
16	0.07	0.08	0.11	0.08	0.10	0.07	0.07	0.13	0.16	0.16	0.25	0.32	0.58	0.74	0.79	0.78
17	0.09	0.15	0.13	0.11	0.12	0.10	0.11	0.19	0.21	0.22	0.35	0.48	0.83	0.96	1.00	1.00
18	0.13	0.22	0.15	0.14	0.14	0.14	0.15	0.25	0.27	0.31	0.47	0.68	1.09	1.22	1.22	1.22
19	0.17	0.29	0.17	0.17	0.16	0.17	0.20	0.31	0.33	0.42	0.63	0.93	1.35	1.45	1.44	1.44
20	0.21	0.33	0.20	0.20	0.17	0.20	0.27	0.37	0.40	0.56	0.80	1.19	1.59	1.62	1.64	.
21	0.26	0.37	0.23	0.22	0.19	0.22	0.34	0.42	0.48	0.72	1.00	1.44	1.79	1.76	1.81	.
22	0.32	0.37	0.26	0.23	0.20	0.25	0.41	0.46	0.55	0.88	1.22	1.64	1.94	1.84	1.96	.
23	0.38	0.35	0.30	0.24	0.22	0.28	0.47	0.50	0.64	1.01	1.44	1.80	2.05	1.92	2.12	.
24	0.42	0.32	0.33	0.24	0.23	0.33	0.51	0.53	0.72	1.11	1.63	1.92	2.12	2.04	2.27	.
25	0.45	0.30	0.36	0.25	0.25	0.38	0.55	0.57	0.79	1.21	1.76	1.99	2.19	2.15	.	.
26	0.47	0.31	0.39	0.27	0.27	0.43	0.58	0.61	0.88	1.29	1.87	2.05	2.26	2.26	.	.
27	0.45	0.32	0.43	0.30	0.31	0.49	0.61	0.67	0.99	1.39	1.95	2.12	2.31	2.37	.	.
28	0.40	0.35	0.44	0.33	0.36	0.53	0.66	0.74	1.10	1.56	1.97	2.20	2.35	2.48	.	.
29	0.34	0.37	0.43	0.36	0.42	0.58	0.71	0.83	1.21	1.74	1.95	2.27	2.37	2.58	.	.
30	0.29	0.38	0.41	0.39	0.49	0.61	0.77	0.92	1.35	1.92	1.94	2.31	2.36	.	.	.
31	0.27	0.38	0.42	0.39	0.57	0.65	0.85	1.01	1.48	2.09	1.97	2.34	2.34	.	.	.
32	0.28	0.38	0.45	0.40	0.63	0.70	0.93	1.12	1.63	2.19	2.03	2.40	2.32	.	.	.
33	0.30	0.37	0.48	0.40	0.67	0.74	1.00	1.23	1.82	2.22	2.10	2.44	2.29	.	.	.
34	0.35	0.37	0.52	0.45	0.69	0.79	1.07	1.34	1.99	2.20	2.17	2.50	2.26	.	.	.
35	0.39	0.38	0.57	0.51	0.72	0.85	1.16	1.46	2.17	2.20	2.25	2.56
36	0.41	0.42	0.63	0.59	0.75	0.91	1.27	1.60	2.31	2.22	2.34	2.61
37	0.41	0.47	0.66	0.68	0.79	0.98	1.38	1.77	2.40	2.23	2.43	2.65
38	0.40	0.52	0.66	0.77	0.85	1.05	1.50	1.95	2.43	2.26	2.51	2.68
39	0.41	0.58	0.65	0.85	0.93	1.12	1.62	2.13	2.39	2.29	2.58	2.71
40	0.43	0.65	0.66	0.92	0.99	1.21	1.72	2.27	2.32	2.37	2.68
41	0.46	0.70	0.67	0.99	1.04	1.32	1.86	2.36	2.31	2.42	2.76
42	0.50	0.76	0.69	1.08	1.08	1.44	2.03	2.44	2.28	2.47	2.83
43	0.56	0.80	0.72	1.13	1.10	1.59	2.20	2.45	2.30	2.57	2.90
44	0.60	0.84	0.75	1.15	1.13	1.75	2.42	2.41	2.33	2.65	2.96
45	0.64	0.86	0.80	1.19	1.19	1.91	2.62	2.37	2.35	2.70

Table 17 (continued)

Age	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
46	0.70	0.87	0.86	1.20	1.31	2.08	2.74	2.34	2.45	2.72
47	0.79	0.89	0.96	1.24	1.49	2.24	2.81	2.36	2.61	2.75
48	0.89	0.95	1.06	1.31	1.68	2.41	2.81	2.43	2.83	2.79
49	0.98	1.03	1.17	1.44	1.86	2.58	2.77	2.54	3.09	2.81
50	1.06	1.14	1.27	1.60	2.02	2.75	2.74	2.70	3.38
51	1.12	1.26	1.40	1.76	2.15	2.95	2.74	2.90	3.55
52	1.14	1.38	1.53	1.93	2.30	3.15	2.79	3.11	3.74
53	1.18	1.53	1.64	2.07	2.55	3.30	2.86	3.32	3.90
54	1.19	1.64	1.76	2.20	2.82	3.41	2.97	3.54	4.03
55	1.24	1.75	1.87	2.34	3.07	3.52	3.12	3.72
56	1.34	1.86	2.04	2.50	3.32	3.59	3.29	3.88
57	1.47	1.96	2.22	2.79	3.58	3.64	3.50	4.05
58	1.59	2.06	2.41	3.10	3.77	3.67	3.76	4.20
59	1.69	2.16	2.63	3.47	3.86	3.71	4.00	4.35
60	1.80	2.30	2.84	3.85	3.91	3.84	4.27
61	1.96	2.45	3.15	4.20	4.02	4.05	4.47
62	2.17	2.62	3.51	4.56	4.16	4.31	4.63
63	2.34	2.79	3.97	4.67	4.31	4.67	4.80
64	2.55	2.95	4.37	4.65	4.45	4.96	4.95
65	2.75	3.09	4.78	4.66	4.58	5.13
66	2.89	3.33	5.19	4.57	4.71	5.17
67	2.95	3.64	5.44	4.44	4.86	5.12
68	2.97	4.27	5.61	4.19	4.98	5.07
69	2.99	4.97	5.53	4.00	5.05	4.98
70	3.00	5.85	5.41	3.97	5.16
71	3.02	6.50	5.35	3.92	5.30
72	3.10	6.93	5.07	3.92	5.44
73	3.35	6.97	4.69	4.02	5.57
74	3.83	6.45	4.38	4.31	5.70
75	4.54	5.62	4.29	4.82
76	5.10	5.03	4.35	5.42
77	5.67	4.42	4.49	6.08
78	5.97	3.63	4.56	6.75
79	6.38	2.83	4.66	7.45
80	6.68	2.01	4.76

Table 18
Annual quit rates among 5-year birth cohorts of white females, by age

Age	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.02	0.07	0.04	0.06
12	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.02	0.02	0.04	0.12	0.08	0.11
13	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.01	0.02	0.04	0.05	0.08	0.18	0.16	0.23
14	0.00	0.00	0.00	0.01	0.02	0.02	0.01	0.04	0.03	0.04	0.08	0.10	0.14	0.28	0.30	0.45
15	0.00	0.00	0.01	0.02	0.03	0.03	0.02	0.06	0.05	0.08	0.14	0.18	0.24	0.42	0.51	0.70
16	0.00	0.00	0.01	0.03	0.04	0.04	0.03	0.10	0.09	0.14	0.25	0.29	0.38	0.62	0.77	0.98
17	0.00	0.01	0.02	0.04	0.05	0.05	0.06	0.16	0.14	0.23	0.38	0.46	0.58	0.86	1.06	1.27
18	0.00	0.03	0.03	0.05	0.06	0.07	0.09	0.22	0.21	0.34	0.54	0.68	0.80	1.13	1.37	1.57
19	0.00	0.04	0.05	0.05	0.07	0.09	0.13	0.28	0.28	0.48	0.71	0.95	1.04	1.40	1.67	1.87
20	0.00	0.05	0.07	0.05	0.08	0.11	0.18	0.31	0.35	0.61	0.88	1.19	1.28	1.63	1.94	.
21	0.01	0.05	0.08	0.04	0.10	0.14	0.23	0.35	0.41	0.74	1.06	1.41	1.53	1.86	2.13	.
22	0.02	0.05	0.08	0.04	0.13	0.16	0.27	0.36	0.46	0.85	1.20	1.59	1.76	2.06	2.33	.
23	0.05	0.04	0.08	0.05	0.16	0.17	0.31	0.37	0.51	0.91	1.33	1.72	1.95	2.21	2.51	.
24	0.11	0.03	0.08	0.05	0.19	0.19	0.33	0.38	0.57	0.95	1.43	1.78	2.09	2.34	2.70	.
25	0.20	0.04	0.07	0.07	0.22	0.21	0.35	0.39	0.63	0.99	1.50	1.80	2.21	2.44	.	.
26	0.25	0.06	0.06	0.08	0.25	0.23	0.37	0.42	0.70	1.03	1.54	1.83	2.27	2.50	.	.
27	0.25	0.09	0.07	0.12	0.27	0.27	0.39	0.46	0.78	1.08	1.56	1.88	2.31	2.54	.	.
28	0.24	0.12	0.09	0.15	0.27	0.31	0.43	0.53	0.86	1.17	1.55	1.90	2.34	2.57	.	.
29	0.21	0.13	0.11	0.19	0.27	0.35	0.46	0.59	0.93	1.25	1.54	1.93	2.35	2.60	.	.
30	0.16	0.12	0.13	0.22	0.28	0.39	0.49	0.66	1.00	1.31	1.54	1.99	2.38	.	.	.
31	0.09	0.10	0.16	0.25	0.29	0.42	0.52	0.73	1.07	1.36	1.55	2.05	2.35	.	.	.
32	0.05	0.08	0.17	0.27	0.30	0.46	0.54	0.79	1.13	1.38	1.57	2.11	2.28	.	.	.
33	0.05	0.07	0.18	0.28	0.33	0.48	0.57	0.84	1.19	1.38	1.61	2.12	2.24	.	.	.
34	0.05	0.06	0.17	0.27	0.36	0.50	0.60	0.88	1.27	1.38	1.66	2.11	2.18	.	.	.
35	0.05	0.07	0.17	0.27	0.38	0.50	0.66	0.92	1.33	1.38	1.71	2.09
36	0.06	0.09	0.19	0.27	0.40	0.51	0.72	0.96	1.38	1.39	1.74	2.02
37	0.06	0.12	0.22	0.28	0.43	0.52	0.78	1.00	1.42	1.43	1.78	1.95
38	0.07	0.14	0.26	0.29	0.45	0.54	0.84	1.06	1.44	1.48	1.83	1.86
39	0.07	0.17	0.31	0.29	0.47	0.57	0.91	1.13	1.44	1.55	1.89	1.76
40	0.08	0.20	0.36	0.31	0.48	0.61	0.98	1.19	1.45	1.59	1.99
41	0.11	0.21	0.40	0.33	0.51	0.66	1.05	1.23	1.47	1.65	2.10
42	0.18	0.22	0.41	0.35	0.55	0.72	1.14	1.27	1.49	1.69	2.20
43	0.25	0.24	0.41	0.39	0.57	0.78	1.23	1.29	1.51	1.73	2.32
44	0.32	0.26	0.40	0.46	0.60	0.84	1.32	1.31	1.55	1.78	2.44
45	0.37	0.28	0.39	0.53	0.65	0.91	1.41	1.33	1.60	1.90

Table 18 (continued)

Age	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
46	0.42	0.32	0.41	0.60	0.72	1.02	1.50	1.38	1.68	2.09
47	0.45	0.37	0.48	0.68	0.80	1.16	1.54	1.45	1.81	2.27
48	0.48	0.39	0.57	0.76	0.89	1.34	1.56	1.51	1.98	2.47
49	0.51	0.40	0.64	0.85	0.99	1.52	1.57	1.60	2.22	2.68
50	0.55	0.39	0.70	0.92	1.12	1.71	1.56	1.69	2.47
51	0.61	0.41	0.77	0.98	1.26	1.89	1.56	1.81	2.65
52	0.66	0.45	0.83	1.06	1.41	2.01	1.59	1.98	2.84
53	0.73	0.51	0.89	1.14	1.56	2.07	1.67	2.17	3.02
54	0.76	0.61	0.94	1.23	1.70	2.08	1.82	2.38	3.20
55	0.79	0.72	1.01	1.34	1.86	2.10	1.99	2.59
56	0.82	0.83	1.12	1.47	2.06	2.12	2.17	2.77
57	0.80	0.92	1.21	1.66	2.28	2.18	2.37	2.95
58	0.77	0.99	1.29	1.85	2.47	2.31	2.57	3.12
59	0.74	1.01	1.41	2.09	2.62	2.51	2.77	3.28
60	0.76	1.04	1.60	2.33	2.75	2.69	2.98
61	0.82	1.10	1.82	2.59	2.84	2.83	3.15
62	0.94	1.17	2.07	2.82	2.86	3.01	3.29
63	1.10	1.30	2.42	3.02	2.91	3.16	3.45
64	1.25	1.50	2.68	3.18	3.01	3.26	3.59
65	1.35	1.76	2.85	3.26	3.16	3.38
66	1.46	2.03	2.99	3.24	3.31	3.49
67	1.52	2.32	3.08	3.18	3.49	3.60
68	1.56	2.88	3.17	3.12	3.73	3.71
69	1.53	3.22	3.18	3.10	3.94	3.82
70	1.49	3.55	3.31	3.19	4.09
71	1.58	3.99	3.50	3.47	4.15
72	1.74	4.31	3.60	3.87	4.23
73	2.07	4.43	3.63	4.38	4.32
74	2.49	4.32	3.72	4.93	4.39
75	3.10	4.35	3.80	5.21
76	3.86	4.25	4.00	5.29
77	4.68	3.90	4.35	5.30
78	5.45	3.54	4.87	5.30
79	6.19	3.12	5.36	5.23
80	6.94	2.63	5.92

Table 19
Annual quit rates among 10-year birth cohorts of black males, by age

Age	1890-99	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
8	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.04
9	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.06
10	0.06	0.01	0.00	0.00	0.00	0.00	0.01	0.08
11	0.08	0.02	0.00	0.00	0.00	0.00	0.03	0.11
12	0.11	0.02	0.01	0.00	0.01	0.01	0.05	0.15
13	0.18	0.04	0.02	0.00	0.02	0.02	0.10	0.19
14	0.22	0.06	0.05	0.01	0.04	0.05	0.14	0.26
15	0.26	0.10	0.07	0.02	0.05	0.08	0.20	0.34
16	0.26	0.15	0.09	0.04	0.06	0.13	0.29	0.43
17	0.26	0.17	0.11	0.07	0.08	0.18	0.40	0.50
18	0.21	0.21	0.12	0.09	0.10	0.25	0.52	0.58
19	0.14	0.22	0.13	0.13	0.12	0.33	0.63	0.66
20	0.07	0.23	0.14	0.16	0.17	0.41	0.72	-
21	0.06	0.26	0.15	0.19	0.23	0.49	0.81	-
22	0.08	0.27	0.16	0.21	0.30	0.59	0.88	-
23	0.10	0.29	0.17	0.23	0.38	0.69	0.94	-
24	0.13	0.28	0.18	0.26	0.44	0.81	1.04	-
25	0.15	0.26	0.19	0.27	0.51	0.90	1.20	-
26	0.17	0.23	0.21	0.28	0.57	0.96	1.39	-
27	0.22	0.20	0.24	0.30	0.65	1.00	1.58	-
28	0.29	0.20	0.30	0.33	0.77	1.03	1.78	-
29	0.37	0.23	0.35	0.35	0.87	1.05	1.98	-
30	0.41	0.27	0.39	0.39	0.97	1.08	-	-
31	0.47	0.27	0.44	0.45	1.04	1.15	-	-
32	0.49	0.30	0.46	0.50	1.12	1.23	-	-
33	0.45	0.34	0.47	0.55	1.16	1.33	-	-
34	0.36	0.43	0.47	0.60	1.13	1.44	-	-
35	0.28	0.46	0.47	0.64	1.12	1.51	-	-
36	0.22	0.48	0.48	0.70	1.12	1.56	-	-
37	0.20	0.52	0.50	0.79	1.15	1.61	-	-
38	0.18	0.55	0.51	0.87	1.15	1.66	-	-
39	0.19	0.57	0.52	0.95	1.20	1.71	-	-
40	0.20	0.56	0.58	1.03	1.29	-	-	-
41	0.22	0.58	0.68	1.08	1.39	-	-	-
42	0.22	0.62	0.75	1.11	1.49	-	-	-
43	0.24	0.63	0.79	1.12	1.60	-	-	-
44	0.30	0.57	0.85	1.15	1.70	-	-	-
45	0.36	0.52	0.87	1.21	1.76	-	-	-
46	0.43	0.50	0.88	1.30	1.78	-	-	-
47	0.49	0.55	0.88	1.41	1.82	-	-	-

Table 19 (continued)

Age	1890-99	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69
48	0.54	0.58	0.95	1.53	1.84	-	-	-
49	0.55	0.62	1.07	1.63	1.86	-	-	-
50	0.59	0.72	1.21	1.71	-	-	-	-
51	0.64	0.80	1.37	1.83	-	-	-	-
52	0.68	0.91	1.52	1.96	-	-	-	-
53	0.70	0.93	1.60	2.03	-	-	-	-
54	0.75	0.98	1.63	2.09	-	-	-	-
55	0.83	1.12	1.73	2.12	-	-	-	-
56	0.89	1.26	1.83	2.06	-	-	-	-
57	0.96	1.42	2.01	1.99	-	-	-	-
58	1.05	1.63	2.12	1.91	-	-	-	-
59	1.19	1.96	2.19	1.81	-	-	-	-
60	1.28	2.33	2.41	-	-	-	-	-
61	1.34	2.68	2.67	-	-	-	-	-
62	1.41	2.94	2.89	-	-	-	-	-
63	1.51	3.10	3.21	-	-	-	-	-
64	1.62	3.12	3.48	-	-	-	-	-
65	1.74	2.95	3.60	-	-	-	-	-
66	1.94	2.59	3.56	-	-	-	-	-
67	2.27	2.22	3.43	-	-	-	-	-
68	2.39	1.96	3.29	-	-	-	-	-
69	2.39	1.94	3.10	-	-	-	-	-
70	2.15	2.18	-	-	-	-	-	-
71	1.87	2.84	-	-	-	-	-	-
72	1.40	3.72	-	-	-	-	-	-
73	1.06	4.51	-	-	-	-	-	-
74	-0.83	4.99	-	-	-	-	-	-
75	0.87	4.85	-	-	-	-	-	-
76	1.25	4.27	-	-	-	-	-	-
77	1.70	3.61	-	-	-	-	-	-
78	1.69	2.88	-	-	-	-	-	-
79	1.60	2.01	-	-	-	-	-	-
80	1.34	-	-	-	-	-	-	-
81	1.12	-	-	-	-	-	-	-
82	0.74	-	-	-	-	-	-	-
83	-0.25	-	-	-	-	-	-	-
84	-0.22	-	-	-	-	-	-	-
85	-0.66	-	-	-	-	-	-	-

Table 20
Annual quit rates among 10-year birth cohorts of black females, by age

Age	1890-99	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.02	0.01	0.00	0.00	0.00	0.00
11	0.00	0.00	0.03	0.01	0.00	0.00	0.01	0.00
12	0.00	0.02	0.04	0.02	0.00	0.00	0.02	0.00
13	0.00	0.03	0.04	0.02	0.01	0.02	0.03	0.02
14	0.00	0.04	0.05	0.02	0.01	0.03	0.05	0.05
15	0.00	0.05	0.05	0.02	0.02	0.06	0.09	0.13
16	0.00	0.05	0.05	0.03	0.03	0.09	0.15	0.23
17	0.00	0.05	0.06	0.04	0.05	0.14	0.22	0.34
18	0.00	0.05	0.07	0.06	0.06	0.19	0.33	0.46
19	0.00	0.07	0.07	0.07	0.07	0.24	0.46	0.58
20	0.00	0.08	0.08	0.10	0.09	0.30	0.59	-
21	0.00	0.09	0.09	0.12	0.11	0.37	0.71	-
22	0.00	0.10	0.10	0.15	0.14	0.46	0.81	-
23	0.00	0.09	0.11	0.18	0.18	0.54	0.89	-
24	0.00	0.08	0.13	0.21	0.23	0.61	0.95	-
25	0.00	0.06	0.15	0.24	0.31	0.70	0.99	-
26	0.00	0.04	0.17	0.26	0.41	0.78	1.02	-
27	0.00	0.03	0.21	0.28	0.50	0.84	1.05	-
28	0.00	0.02	0.26	0.31	0.60	0.90	1.07	-
29	0.00	0.03	0.29	0.32	0.70	0.97	1.10	-
30	0.00	0.08	0.32	0.34	0.78	1.04	-	-
31	0.00	0.16	0.36	0.36	0.82	1.10	-	-
32	0.00	0.22	0.39	0.38	0.85	1.15	-	-
33	0.00	0.28	0.41	0.39	0.84	1.23	-	-
34	0.02	0.29	0.42	0.40	0.87	1.30	-	-
35	0.08	0.30	0.43	0.42	0.93	1.34	-	-
36	0.14	0.28	0.44	0.47	1.06	1.36	-	-
37	0.21	0.24	0.47	0.55	1.15	1.38	-	-
38	0.33	0.23	0.49	0.62	1.24	1.41	-	-
39	0.46	0.25	0.51	0.70	1.24	1.43	-	-
40	0.49	0.31	0.54	0.80	1.23	-	-	-
41	0.47	0.39	0.56	0.88	1.19	-	-	-
42	0.39	0.44	0.60	1.02	1.21	-	-	-
43	0.46	0.49	0.67	1.20	1.27	-	-	-
44	0.72	0.53	0.72	1.36	1.42	-	-	-
45	1.03	0.61	0.80	1.53	1.61	-	-	-
46	1.36	0.74	0.89	1.66	1.75	-	-	-
47	1.55	0.87	0.99	1.74	1.89	-	-	-

Table 20 (continued)

Age	1890-99	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69
48	1.61	1.05	1.10	1.74	2.01	-	-	-
49	1.49	1.22	1.20	1.71	2.13	-	-	-
50	1.20	1.33	1.32	1.71	-	-	-	-
51	0.96	1.36	1.44	1.75	-	-	-	-
52	0.93	1.31	1.51	1.84	-	-	-	-
53	1.15	1.26	1.53	1.96	-	-	-	-
54	1.37	1.24	1.51	2.09	-	-	-	-
55	1.47	1.27	1.48	2.20	-	-	-	-
56	1.55	1.40	1.48	2.30	-	-	-	-
57	1.56	1.52	1.57	2.38	-	-	-	-
58	1.61	1.70	1.78	2.45	-	-	-	-
59	1.52	1.81	2.13	2.52	-	-	-	-
60	1.49	1.85	2.43	-	-	-	-	-
61	1.38	1.85	2.68	-	-	-	-	-
62	1.34	1.84	2.92	-	-	-	-	-
63	1.11	1.88	3.01	-	-	-	-	-
64	0.87	1.95	2.99	-	-	-	-	-
65	0.77	1.96	2.94	-	-	-	-	-
66	0.78	1.94	2.88	-	-	-	-	-
67	1.13	2.05	2.82	-	-	-	-	-
68	1.45	2.25	2.77	-	-	-	-	-
69	2.00	2.55	2.71	-	-	-	-	-
70	2.43	2.80	-	-	-	-	-	-
71	2.53	3.12	-	-	-	-	-	-
72	2.12	3.37	-	-	-	-	-	-
73	1.51	3.49	-	-	-	-	-	-
74	0.95	3.47	-	-	-	-	-	-
75	0.53	3.56	-	-	-	-	-	-
76	0.21	3.79	-	-	-	-	-	-
77	0.24	4.24	-	-	-	-	-	-
78	1.12	4.65	-	-	-	-	-	-
79	1.85	5.16	-	-	-	-	-	-
80	2.61	-	-	-	-	-	-	-
81	2.78	-	-	-	-	-	-	-
82	2.46	-	-	-	-	-	-	-
83	2.16	-	-	-	-	-	-	-
84	1.65	-	-	-	-	-	-	-
85	0.91	-	-	-	-	-	-	-

Table 21
Annual quit rates among 5-year birth cohorts of white males, by year

Year	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1906	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1907	0.06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1908	0.08	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1909	0.09	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1910	0.11	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1911	0.14	0.03	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1912	0.19	0.06	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
1913	0.27	0.11	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-
1914	0.32	0.15	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-
1915	0.34	0.19	0.04	-	-	0.00	-	-	-	-	-	-	-	-	-	-
1916	0.38	0.25	0.06	0.00	-	0.00	-	-	-	-	-	-	-	-	-	-
1917	0.42	0.31	0.08	0.00	-	0.00	-	-	-	-	-	-	-	-	-	-
1918	0.46	0.36	0.11	0.01	-	0.00	-	-	-	-	-	-	-	-	-	-
1919	0.43	0.38	0.13	0.02	-	0.00	-	-	-	-	-	-	-	-	-	-
1920	0.42	0.36	0.14	0.03	-	0.00	0.00	-	-	-	-	-	-	-	-	-
1921	0.37	0.33	0.16	0.04	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-
1922	0.35	0.32	0.19	0.06	0.00	0.00	0.00	-	-	-	-	-	-	-	-	-
1923	0.35	0.33	0.23	0.08	0.01	0.00	0.00	-	-	-	-	-	-	-	-	-
1924	0.32	0.32	0.26	0.10	0.02	0.00	0.00	-	-	-	-	-	-	-	-	-
1925	0.33	0.33	0.28	0.13	0.04	0.00	0.00	0.00	-	-	-	-	-	-	-	-
1926	0.32	0.33	0.31	0.15	0.05	0.00	0.00	0.00	-	-	-	-	-	-	-	-
1927	0.35	0.37	0.36	0.18	0.08	0.00	0.00	0.00	-	-	-	-	-	-	-	-
1928	0.39	0.41	0.42	0.21	0.10	0.00	0.00	0.00	-	-	-	-	-	-	-	-
1929	0.39	0.39	0.42	0.22	0.12	0.00	0.00	0.00	-	-	-	-	-	-	-	-
1930	0.38	0.37	0.42	0.22	0.13	0.01	0.00	0.00	-	-	-	-	-	-	-	-
1931	0.37	0.35	0.41	0.22	0.14	0.03	0.00	0.00	-	-	-	-	-	-	-	-
1932	0.43	0.37	0.44	0.24	0.17	0.05	0.00	0.00	-	-	-	-	-	-	-	-
1933	0.52	0.43	0.48	0.28	0.17	0.07	0.01	0.00	-	-	-	-	-	-	-	-

Table 21 (continued)

104

Year	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1934	0.54	0.45	0.46	0.30	0.18	0.10	0.01	0.00	-	-	-	-	-	-	-	-
1935	0.58	0.50	0.48	0.33	0.20	0.12	0.02	0.00	-	-	-	-	-	-	-	-
1936	0.58	0.54	0.48	0.35	0.22	0.15	0.04	0.01	-	-	-	-	-	-	-	-
1937	0.69	0.64	0.53	0.39	0.25	0.18	0.06	0.01	-	-	-	-	-	-	-	-
1938	0.72	0.73	0.59	0.41	0.27	0.21	0.08	0.02	-	-	-	-	-	-	-	-
1939	0.77	0.76	0.59	0.40	0.31	0.24	0.10	0.02	-	-	-	-	-	-	-	-
1940	0.77	0.80	0.62	0.40	0.35	0.26	0.13	0.03	0.00	-	-	-	-	-	-	-
1941	0.89	0.80	0.64	0.40	0.39	0.29	0.17	0.04	0.00	-	-	-	-	-	-	-
1942	1.03	0.88	0.68	0.45	0.47	0.33	0.23	0.08	0.00	-	-	-	-	-	-	-
1943	1.10	0.89	0.73	0.55	0.54	0.38	0.30	0.12	0.01	-	-	-	-	-	-	-
1944	1.19	0.93	0.71	0.63	0.61	0.44	0.38	0.18	0.02	-	-	-	-	-	-	-
1945	1.13	0.92	0.73	0.72	0.66	0.48	0.45	0.24	0.04	-	-	-	-	-	-	-
1946	1.21	1.01	0.73	0.80	0.68	0.55	0.49	0.29	0.06	-	-	-	-	-	-	-
1947	1.27	1.11	0.80	0.92	0.74	0.61	0.54	0.35	0.10	0.01	0.00	-	-	-	-	-
1948	1.23	1.21	0.84	1.03	0.75	0.65	0.60	0.41	0.15	0.01	0.00	-	-	-	-	-
1949	1.34	1.37	0.93	1.05	0.79	0.69	0.62	0.44	0.20	0.03	0.00	-	-	-	-	-
1950	1.38	1.44	0.98	1.08	0.84	0.73	0.65	0.48	0.26	0.04	0.00	-	-	-	-	-
1951	.63	1.62	1.14	1.08	0.89	0.77	0.71	0.53	0.33	0.07	0.01	-	-	-	-	-
1952	1.77	1.75	1.32	1.15	0.99	0.84	0.78	0.59	0.41	0.10	0.01	-	-	-	-	-
1953	1.79	1.81	1.42	1.16	1.03	0.93	0.83	0.62	0.47	0.15	0.02	-	-	-	-	-
1954	1.90	1.88	1.52	1.21	1.07	0.97	0.88	0.67	0.53	0.22	0.03	0.00	-	-	-	-
1955	2.07	1.93	1.57	1.29	1.13	1.04	0.95	0.72	0.59	0.29	0.05	0.01	-	-	-	-
1956	2.38	2.14	1.73	1.44	1.19	1.10	1.02	0.78	0.66	0.39	0.08	0.02	-	-	-	-
1957	2.66	2.34	1.90	1.60	1.27	1.19	1.13	0.86	0.74	0.51	0.15	0.04	-	-	-	-
1958	2.87	2.45	1.99	1.74	1.34	1.30	1.22	0.97	0.84	0.66	0.23	0.06	-	-	-	-
1959	3.03	2.60	2.17	1.88	1.44	1.39	1.34	1.08	0.95	0.80	0.34	0.08	0.00	-	-	-
1960	3.11	2.71	2.38	2.04	1.58	1.56	1.48	1.21	1.08	0.94	0.47	0.10	0.00	-	-	-
1961	3.12	2.88	2.64	2.22	1.72	1.73	1.60	1.35	1.22	1.07	0.60	0.14	0.01	-	-	-
1962	3.04	3.00	2.83	2.40	1.90	1.90	1.72	1.46	1.37	1.20	0.75	0.20	0.02	-	-	-
1963	3.05	3.24	3.05	2.61	2.06	2.04	1.84	1.57	1.53	1.31	0.91	0.29	0.04	-	-	-
1964	3.16	3.70	3.36	2.89	2.24	2.14	1.98	1.70	1.66	1.40	1.09	0.42	0.07	0.00	-	-
1965	3.45	4.35	3.73	3.16	2.48	2.31	2.16	1.85	1.80	1.51	1.29	0.58	0.13	0.02	-	-
1966	4.01	5.22	4.27	3.49	2.75	2.51	2.38	2.03	1.96	1.67	1.51	0.80	0.24	0.06	-	-
1967	4.82	6.21	4.94	3.80	3.14	2.74	2.64	2.24	2.16	1.89	1.72	1.06	0.40	0.13	-	-

Table 21 (continued)

Year	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1968	5.35	6.68	5.37	4.08	3.41	3.04	2.83	2.43	2.29	2.05	1.88	1.34	0.59	0.19		
1969	5.78	6.87	5.66	4.36	3.63	3.25	2.94	2.52	2.40	2.16	1.95	1.55	0.80	0.24		
1970	5.97	6.86	5.75	4.53	3.83	3.36	2.98	2.50	2.46	2.19	1.98	1.73	1.02	0.32		
1971	6.27	6.93	5.89	4.70	3.85	3.46	2.88	2.47	2.39	2.22	1.96	1.84	1.23	0.40		
1972	6.48	6.67	5.77	4.74	3.90	3.47	2.79	2.42	2.33	2.20	1.95	1.96	1.45	0.51	0.09	
1973	-	5.71	5.27	4.61	3.83	3.49	2.74	2.35	2.29	2.15	1.97	2.01	1.64	0.70	0.15	
1974	-	4.56	4.87	4.38	3.93	3.50	2.69	2.35	2.24	2.16	1.99	2.08	1.81	0.90	0.22	
1975	-	3.48	4.69	4.09	4.10	3.57	2.76	2.41	2.27	2.20	2.03	2.13	1.95	1.12	0.32	
1976	-	2.39	4.54	3.89	4.26	3.68	2.88	2.50	2.33	2.27	2.07	2.22	2.03	1.31	0.43	
1977	-	1.23	4.42	3.68	4.53	3.73	3.06	2.66	2.44	2.34	2.15	2.27	2.14	1.49	0.58	
1978	-	-	4.40	3.50	4.70	3.83	3.23	2.84	2.53	2.40	2.25	2.30	2.20	1.64	0.77	0.17
1979	-	-	4.48	3.48	4.83	3.99	3.38	3.00	2.62	2.46	2.32	2.35	2.28	1.75	0.97	0.23
1980	-	-	4.50	3.78	4.97	4.24	3.59	3.22	2.76	2.54	2.45	2.42	2.34	1.87	1.19	0.31
1981	-	-	4.57	4.18	5.08	4.63	3.86	3.48	2.96	2.63	2.63	2.54	2.37	2.00	1.42	0.41
1982	-	-	4.63	4.74	5.21	4.96	4.17	3.71	3.17	2.72	2.79	2.65	2.38	2.12	1.63	0.54
1983	-	-	-	5.32	5.17	5.21	4.37	3.86	3.37	2.78	2.88	2.70	2.35	2.22	1.78	0.73
1984	-	-	-	5.90	5.13	5.27	4.52	3.99	3.47	2.84	2.92	2.71	2.32	2.31	1.88	0.99
1985	-	-	-	6.58	5.11	5.11	4.51	4.02	3.51	2.85	2.91	2.69	2.28	2.35	1.96	1.29
1986	-	-	-	7.20	5.07	4.85	4.39	3.99	3.54	2.87	2.88	2.64	2.23	2.36	2.00	1.59
1987	-	-	-	7.81	5.02	4.61	4.29	3.98	3.56	2.87	2.84	2.57	2.20	2.38	2.04	1.89
1988	-	-	-	-	4.93	4.31	4.14	3.94	3.55	2.87	2.80	2.49	2.16	2.39	2.07	2.21

Table 22
Annual quit rates among 5-year birth cohorts of white females, by year

Year	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1900	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1901	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1902	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1903	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1904	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1905	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1906	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1907	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1908	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1909	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1910	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1911	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-
1912	0.02	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-
1913	0.03	0.02	0	-	-	-	-	-	-	-	-	-	-	-	-	-
1914	0.04	0.03	0	-	-	-	-	-	-	-	-	-	-	-	-	-
1915	0.04	0.03	0	-	-	0	-	-	-	-	-	-	-	-	-	-
1916	0.06	0.04	0	0	-	0	-	-	-	-	-	-	-	-	-	-
1917	0.11	0.05	0	0	-	0	-	-	-	-	-	-	-	-	-	-
1918	0.19	0.04	0.01	0	-	0	-	-	-	-	-	-	-	-	-	-
1919	0.22	0.03	0.02	0	-	0	-	-	-	-	-	-	-	-	-	-
1920	0.25	0.03	0.03	0	-	0	0	-	-	-	-	-	-	-	-	-
1921	0.22	0.03	0.04	0.01	0	0	0	-	-	-	-	-	-	-	-	-
1922	0.2	0.04	0.05	0.02	0	0	0	-	-	-	-	-	-	-	-	-
1923	0.15	0.05	0.07	0.03	0	0	0	-	-	-	-	-	-	-	-	-
1924	0.07	0.08	0.08	0.04	0.01	0	0	-	-	-	-	-	-	-	-	-
1925	0.05	0.09	0.08	0.04	0.01	0	0	0	-	-	-	-	-	-	-	-
1926	0.04	0.1	0.08	0.04	0.01	0	0	0	-	-	-	-	-	-	-	-
1927	0.06	0.1	0.08	0.04	0.02	0	0	0	-	-	-	-	-	-	-	-
1928	0.08	0.1	0.08	0.04	0.03	0.01	0	0	-	-	-	-	-	-	-	-
1929	0.08	0.09	0.06	0.03	0.04	0.01	0	0	-	-	-	-	-	-	-	-
1930	0.08	0.07	0.05	0.03	0.05	0.01	0	0	0	-	-	-	-	-	-	-
1931	0.08	0.05	0.06	0.03	0.05	0.01	0	0	0	-	-	-	-	-	-	-
1932	0.11	0.06	0.09	0.05	0.07	0.02	0	0	0	-	-	-	-	-	-	-
1933	0.17	0.09	0.15	0.08	0.1	0.03	0	0	0	-	-	-	-	-	-	-

Table 22 (continued)

Year	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1934	0.21	0.1	0.17	0.11	0.13	0.05	0	0	0	-	-	-	-	-	-	-
1935	0.27	0.13	0.2	0.15	0.15	0.07	0	0	0	-	-	-	-	-	-	-
1936	0.31	0.16	0.2	0.19	0.17	0.09	0.01	0	0	-	-	-	-	-	-	-
1937	0.38	0.2	0.2	0.23	0.21	0.12	0.02	0	0	-	-	-	-	-	-	-
1938	0.39	0.23	0.21	0.28	0.23	0.15	0.04	0.01	0	-	-	-	-	-	-	-
1939	0.41	0.23	0.19	0.29	0.25	0.16	0.06	0.01	0	-	-	-	-	-	-	-
1940	0.4	0.25	0.21	0.3	0.26	0.17	0.08	0.01	0	0	-	-	-	-	-	-
1941	0.44	0.26	0.24	0.28	0.26	0.18	0.11	0.03	0	0	-	-	-	-	-	-
1942	0.48	0.3	0.3	0.27	0.28	0.2	0.16	0.07	0	0	-	-	-	-	-	-
1943	0.52	0.33	0.38	0.27	0.28	0.22	0.21	0.12	0.01	0	-	-	-	-	-	-
1944	0.6	0.36	0.41	0.26	0.31	0.26	0.26	0.18	0.01	0	-	-	-	-	-	-
1945	0.65	0.36	0.44	0.26	0.32	0.28	0.3	0.23	0.02	0	-	-	-	-	-	-
1946	0.72	0.4	0.42	0.25	0.34	0.33	0.32	0.26	0.03	0	-	-	-	-	-	-
1947	0.75	0.42	0.46	0.28	0.38	0.38	0.36	0.29	0.06	0	-	-	-	-	-	-
1948	0.77	0.41	0.45	0.33	0.41	0.41	0.39	0.32	0.1	0.01	0	-	-	-	-	-
1949	0.79	0.43	0.49	0.36	0.43	0.44	0.38	0.33	0.14	0.01	0	-	-	-	-	-
1950	0.72	0.48	0.51	0.39	0.45	0.47	0.39	0.35	0.19	0.02	0	-	-	-	-	-
1951	0.74	0.59	0.61	0.42	0.46	0.47	0.43	0.38	0.25	0.05	0	-	-	-	-	-
1952	0.83	0.71	0.7	0.5	0.49	0.5	0.47	0.4	0.3	0.09	0	-	-	-	-	-
1953	0.94	0.79	0.76	0.55	0.5	0.53	0.49	0.42	0.36	0.14	0.01	-	-	-	-	-
1954	1.1	0.85	0.82	0.63	0.52	0.53	0.52	0.46	0.42	0.22	0.02	-	-	-	-	-
1955	1.15	0.91	0.84	0.7	0.55	0.56	0.57	0.5	0.48	0.31	0.05	0	-	-	-	-
1956	1.31	0.97	0.91	0.82	0.57	0.59	0.61	0.55	0.54	0.43	0.09	0	-	-	-	-
1957	1.38	1.04	0.96	0.93	0.65	0.63	0.68	0.62	0.61	0.55	0.15	0.01	-	-	-	-
1958	1.35	1.12	1	1.01	0.71	0.68	0.72	0.7	0.7	0.69	0.24	0.02	0	-	-	-
1959	1.4	1.26	1.11	1.07	0.81	0.7	0.79	0.77	0.77	0.81	0.37	0.05	0	-	-	-
1960	1.44	1.39	1.23	1.12	0.92	0.75	0.86	0.84	0.85	0.9	0.52	0.08	0	-	-	-
1961	1.55	1.55	1.42	1.18	1.01	0.79	0.92	0.9	0.92	0.96	0.68	0.12	0.01	-	-	-
1962	1.58	1.72	1.58	1.26	1.1	0.87	0.98	0.95	1	1	0.84	0.2	0.01	-	-	-
1963	1.72	1.93	1.8	1.37	1.17	0.97	1.04	0.99	1.07	1.02	0.98	0.32	0.02	-	-	-
1964	1.93	2.19	2.07	1.53	1.27	1.09	1.1	1.02	1.12	1.05	1.12	0.48	0.03	-	-	-
1965	2.01	2.48	2.35	1.73	1.4	1.26	1.16	1.06	1.18	1.13	1.23	0.66	0.07	0	-	-
1966	2.28	2.96	2.66	2.02	1.56	1.45	1.27	1.1	1.27	1.22	1.34	0.86	0.13	0.03	-	-
1967	2.6	3.51	3	2.34	1.79	1.67	1.41	1.18	1.39	1.33	1.46	1.08	0.23	0.07	-	-

Table 22 (continued)

108

Year	1890-94	1895-99	1900-04	1905-09	1910-14	1915-19	1920-24	1925-29	1930-34	1935-39	1940-44	1945-49	1950-54	1955-59	1960-64	1965-69
1968	2.93	3.78	3.2	2.56	2	1.91	1.51	1.26	1.46	1.41	1.56	1.29	0.37	0.1		
1969	3.21	4.02	3.26	2.72	2.22	2.06	1.61	1.28	1.49	1.44	1.6	1.45	0.54	0.12		
1970	3.61	4.22	3.33	2.94	2.41	2.14	1.65	1.24	1.51	1.4	1.58	1.58	0.74	0.17		
1971	4.02	4.47	3.34	3.15	2.56	2.19	1.6	1.26	1.47	1.37	1.57	1.66	0.95	0.23		
1972	4.53	4.52	3.26	3.31	2.73	2.16	1.58	1.27	1.43	1.36	1.53	1.76	1.16	0.34	0.02	0.01
1973	-	4.38	3.09	3.32	2.8	2.14	1.57	1.28	1.41	1.33	1.52	1.79	1.37	0.54	0.04	0.01
1974	-	4.26	2.96	3.28	2.84	2.11	1.55	1.36	1.38	1.35	1.52	1.81	1.57	0.76	0.08	0.02
1975	-	4.21	3.11	3.24	2.89	2.17	1.64	1.48	1.44	1.39	1.55	1.83	1.76	1.03	0.15	0.01
1976	-	4.18	3.24	3.2	2.92	2.33	1.8	1.58	1.5	1.47	1.58	1.89	1.93	1.28	0.27	0.02
1977	-	4.17	3.57	3.22	3.04	2.55	2	1.69	1.61	1.56	1.66	1.95	2.09	1.54	0.45	0.04
1978	-	-	3.77	3.27	3.13	2.76	2.19	1.77	1.73	1.62	1.73	2	2.21	1.76	0.7	0.09
1979	-	-	3.85	3.52	3.3	2.97	2.32	1.84	1.84	1.67	1.76	2.06	2.29	1.93	0.99	0.19
1980	-	-	4.06	3.79	3.55	3.12	2.44	1.97	1.99	1.77	1.8	2.13	2.35	2.11	1.3	0.33
1981	-	-	4.2	4.24	3.81	3.18	2.6	2.21	2.19	1.86	1.88	2.17	2.39	2.28	1.62	0.52
1982	-	-	4.3	4.67	4.05	3.29	2.77	2.52	2.4	1.97	2.02	2.14	2.39	2.43	1.9	0.75
1983	-	-	-	4.99	4.21	3.33	2.93	2.79	2.62	2.06	2.12	2.09	2.38	2.5	2.12	1.02
1984	-	-	-	5.28	4.36	3.39	3.12	3.07	2.78	2.2	2.25	2.05	2.35	2.52	2.28	1.32
1985	-	-	-	5.52	4.51	3.38	3.18	3.25	2.91	2.31	2.29	2.03	2.29	2.5	2.41	1.56
1986	-	-	-	5.81	4.65	3.35	3.17	3.36	3.01	2.42	2.34	1.97	2.21	2.46	2.51	1.8
1987	-	-	-	6.09	4.78	3.35	3.2	3.48	3.09	2.53	2.37	1.93	2.13	2.41	2.59	2.02
1988	-	-	-	-	4.89	3.34	3.2	3.57	3.17	2.62	2.39	1.89	2.04	2.36	2.67	2.25

Table 23
Annual quit rates among 10-year birth cohorts of black males, by year

Year	1890-99	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69
1900	0.00	0.00	-	-	-	-	-	-
1901	0.00	0.00	-	-	-	-	-	-
1902	0.02	0.00	-	-	-	-	-	-
1903	0.07	0.00	-	-	-	-	-	-
1904	0.11	0.00	-	-	-	-	-	-
1905	0.17	0.00	-	-	-	-	-	-
1906	0.22	0.00	-	-	-	-	-	-
1907	0.26	0.00	-	-	-	-	-	-
1908	0.24	0.00	-	-	-	-	-	-
1909	0.21	0.00	-	-	-	-	-	-
1910	0.17	0.00	0.00	-	-	-	-	-
1911	0.14	0.00	0.00	-	-	-	-	-
1912	0.10	0.00	0.00	-	-	-	-	-
1913	0.08	0.00	0.00	-	-	-	-	-
1914	0.07	0.02	0.00	-	-	-	-	-
1915	0.09	0.04	0.00	-	-	-	-	-
1916	0.13	0.05	0.00	-	-	-	-	-
1917	0.17	0.08	0.00	-	-	-	-	-
1918	0.24	0.10	0.00	-	-	-	-	-
1919	0.29	0.13	0.00	-	-	-	-	-
1920	0.31	0.15	0.00	0.00	-	-	-	-
1921	0.31	0.16	0.00	0.00	-	-	-	-
1922	0.27	0.18	0.00	0.00	-	-	-	-
1923	0.24	0.21	0.00	0.00	-	-	-	-
1924	0.23	0.22	0.01	0.00	-	-	-	-
1925	0.21	0.21	0.02	0.00	-	-	-	-
1926	0.22	0.19	0.02	0.00	-	-	-	-
1927	0.23	0.21	0.03	0.00	-	-	-	-
1928	0.22	0.20	0.03	0.00	-	-	-	-
1929	0.21	0.21	0.04	0.00	-	-	-	-
1930	0.20	0.19	0.04	0.00	0.00	-	-	-
1931	0.21	0.20	0.06	0.00	0.00	-	-	-
1932	0.23	0.20	0.09	0.00	0.00	-	-	-
1933	0.25	0.21	0.11	0.00	0.00	-	-	-
1934	0.27	0.24	0.13	0.00	0.00	-	-	-
1935	0.28	0.27	0.14	0.00	0.00	-	-	-
1936	0.29	0.32	0.14	0.01	0.00	-	-	-
1937	0.30	0.34	0.15	0.02	0.00	-	-	-
1938	0.30	0.36	0.17	0.02	0.00	-	-	-
1939	0.29	0.35	0.19	0.03	0.00	-	-	-
1940	0.27	0.31	0.22	0.03	0.00	0.00	-	-
1941	0.28	0.30	0.23	0.04	0.00	0.00	-	-
1942	0.34	0.31	0.27	0.05	0.00	0.00	-	-
1943	0.49	0.36	0.31	0.07	0.01	0.00	-	-
1944	0.57	0.47	0.38	0.10	0.02	0.00	-	-
1945	0.61	0.55	0.42	0.14	0.03	0.00	-	-
1946	0.68	0.67	0.44	0.16	0.03	0.00	-	-
1947	0.78	0.74	0.47	0.19	0.03	0.00	-	-

Table 23 (continued)

Year	1890-99	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69
1948	0.89	0.78	0.47	0.21	0.03	0.00	-	-
1949	0.83	0.74	0.46	0.22	0.03	0.00	-	-
1950	0.81	0.67	0.43	0.24	0.03	0.00	0.00	-
1951	0.74	0.60	0.42	0.26	0.05	0.00	0.00	-
1952	0.83	0.53	0.45	0.29	0.08	0.00	0.00	-
1953	0.82	0.50	0.50	0.33	0.11	0.00	0.00	-
1954	0.93	0.45	0.56	0.37	0.15	0.00	0.00	-
1955	1.09	0.45	0.62	0.42	0.19	0.00	0.00	-
1956	1.25	0.54	0.67	0.48	0.21	0.01	0.00	-
1957	1.49	0.68	0.74	0.57	0.26	0.03	0.00	-
1958	1.54	0.86	0.78	0.64	0.34	0.06	0.00	-
1959	1.53	1.09	0.81	0.71	0.41	0.09	0.00	-
1960	1.52	1.34	0.86	0.75	0.51	0.12	0.00	0.00
1961	1.57	1.54	0.91	0.76	0.61	0.16	0.00	0.00
1962	1.60	1.71	0.96	0.78	0.71	0.20	0.00	0.00
1963	1.68	1.87	1.01	0.83	0.79	0.23	0.01	0.00
1964	1.88	1.99	1.08	0.87	0.87	0.26	0.02	0.00
1965	2.15	2.09	1.20	0.94	0.96	0.33	0.04	0.00
1966	2.48	2.27	1.37	1.05	1.06	0.43	0.08	0.00
1967	2.81	2.73	1.59	1.14	1.17	0.52	0.12	0.01
1968	3.01	3.04	1.78	1.21	1.25	0.63	0.16	0.01
1969	2.94	3.31	1.93	1.27	1.25	0.74	0.20	0.02
1970	2.71	3.33	2.05	1.31	1.20	0.84	0.26	0.03
1971	2.65	3.34	2.05	1.32	1.11	0.90	0.36	0.05
1972	2.56	3.02	2.05	1.41	1.05	0.96	0.47	0.08
1973	2.64	2.59	2.02	1.56	1.04	1.01	0.59	0.12
1974	2.64	2.15	2.05	1.62	1.03	1.07	0.72	0.15
1975	2.71	1.98	2.10	1.71	1.14	1.13	0.82	0.21
1976	-	2.02	2.16	1.76	1.29	1.21	0.86	0.25
1977	-	2.22	2.34	1.89	1.51	1.29	0.94	0.28
1978	-	2.60	2.57	2.02	1.75	1.36	1.03	0.30
1979	-	3.03	2.95	2.06	1.93	1.45	1.17	0.34
1980	-	3.53	3.36	2.14	2.05	1.53	1.29	0.39
1981	-	4.05	3.82	2.33	2.12	1.58	1.41	0.44
1982	-	4.57	3.98	2.47	2.11	1.63	1.52	0.54
1983	-	5.05	3.94	2.52	2.02	1.70	1.55	0.70
1984	-	5.53	3.54	2.57	2.05	1.79	1.53	0.86
1985	-	6.00	2.87	2.68	2.19	1.82	1.50	1.00
1986	-	-	2.12	2.80	2.32	1.85	1.47	1.12
1987	-	-	1.38	2.91	2.48	1.87	1.43	1.24
1988	-	-	0.58	3.02	2.69	1.90	1.40	1.36

Table 24
Annual quit rates among 10-year birth cohorts of black females, by year

Year	1890-99	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69
1900	0.00	0.00	-	-	-	-	-	-
1901	0.00	0.00	-	-	-	-	-	-
1902	0.00	0.00	-	-	-	-	-	-
1903	0.00	0.00	-	-	-	-	-	-
1904	0.00	0.00	-	-	-	-	-	-
1905	0.00	0.00	-	-	-	-	-	-
1906	0.00	0.00	-	-	-	-	-	-
1907	0.00	0.00	-	-	-	-	-	-
1908	0.00	0.00	-	-	-	-	-	-
1909	0.00	0.00	-	-	-	-	-	-
1910	0.00	0.00	0.00	-	-	-	-	-
1911	0.00	0.00	0.00	-	-	-	-	-
1912	0.00	0.00	0.00	-	-	-	-	-
1913	0.00	0.00	0.00	-	-	-	-	-
1914	0.00	0.00	0.00	-	-	-	-	-
1915	0.00	0.00	0.00	-	-	-	-	-
1916	0.00	0.00	0.00	-	-	-	-	-
1917	0.00	0.02	0.01	-	-	-	-	-
1918	0.00	0.03	0.01	-	-	-	-	-
1919	0.00	0.04	0.01	-	-	-	-	-
1920	0.00	0.05	0.01	0.00	-	-	-	-
1921	0.00	0.04	0.01	0.00	-	-	-	-
1922	0.00	0.04	0.01	0.00	-	-	-	-
1923	0.00	0.04	0.01	0.00	-	-	-	-
1924	0.00	0.04	0.03	0.00	-	-	-	-
1925	0.00	0.05	0.04	0.00	-	-	-	-
1926	0.03	0.05	0.06	0.00	-	-	-	-
1927	0.09	0.06	0.06	0.00	-	-	-	-
1928	0.14	0.07	0.06	0.00	-	-	-	-
1929	0.18	0.07	0.05	0.00	-	-	-	-
1930	0.18	0.07	0.03	0.00	0.00	-	-	-
1931	0.19	0.08	0.01	0.00	0.00	-	-	-
1932	0.15	0.08	0.02	0.00	0.00	-	-	-
1933	0.07	0.06	0.04	0.00	0.00	-	-	-
1934	0.03	0.05	0.07	0.00	0.00	-	-	-
1935	0.01	0.04	0.09	0.00	0.00	-	-	-
1936	0.11	0.05	0.11	0.00	0.00	-	-	-
1937	0.35	0.10	0.13	0.00	0.00	-	-	-
1938	0.60	0.17	0.14	0.01	0.00	-	-	-
1939	0.78	0.26	0.14	0.01	0.00	-	-	-
1940	0.84	0.32	0.16	0.02	0.00	0.00	-	-
1941	1.05	0.36	0.17	0.03	0.00	0.00	-	-
1942	1.22	0.35	0.20	0.05	0.00	0.00	-	-
1943	1.47	0.34	0.22	0.07	0.00	0.00	-	-
1944	1.55	0.34	0.23	0.11	0.00	0.00	-	-
1945	1.60	0.33	0.27	0.13	0.00	0.00	-	-
1946	1.76	0.37	0.32	0.15	0.00	0.00	-	-
1947	1.81	0.46	0.38	0.17	0.01	0.00	-	-

Table 24 (continued)

Year	1890-99	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69
1948	1.85	0.56	0.44	0.19	0.02	0.00	-	-
1949	1.59	0.58	0.49	0.19	0.03	0.00	-	-
1950	1.45	0.56	0.53	0.19	0.04	0.00	0.00	-
1951	1.18	0.57	0.51	0.20	0.05	0.00	0.00	-
1952	1.04	0.59	0.50	0.22	0.06	0.00	0.00	-
1953	0.72	0.66	0.46	0.23	0.07	0.00	0.00	-
1954	0.59	0.75	0.43	0.27	0.08	0.00	0.00	-
1955	0.72	0.95	0.43	0.32	0.10	0.01	0.00	-
1956	0.92	1.14	0.46	0.37	0.12	0.01	0.00	-
1957	1.29	1.36	0.55	0.43	0.16	0.02	0.00	-
1958	1.49	1.55	0.64	0.47	0.21	0.02	0.00	-
1959	1.65	1.71	0.76	0.51	0.28	0.03	0.00	-
1960	1.69	1.75	0.87	0.54	0.35	0.05	0.00	0.00
1961	1.68	1.74	0.93	0.57	0.40	0.08	0.00	0.00
1962	1.51	1.73	0.97	0.61	0.48	0.12	0.00	0.00
1963	1.24	1.65	0.98	0.65	0.56	0.19	0.00	0.00
1964	1.02	1.52	1.02	0.72	0.63	0.26	0.01	0.00
1965	0.96	1.39	1.08	0.81	0.72	0.32	0.01	0.00
1966	1.19	1.33	1.18	0.93	0.83	0.38	0.03	0.00
1967	1.52	1.48	1.31	1.07	0.95	0.46	0.05	0.00
1968	1.55	1.67	1.47	1.20	1.01	0.51	0.07	0.00
1969	1.48	1.98	1.61	1.28	1.01	0.54	0.10	0.00
1970	1.28	2.15	1.65	1.38	1.01	0.58	0.14	0.00
1971	1.10	2.42	1.64	1.45	0.99	0.67	0.18	-0.01
1972	0.74	2.60	1.64	1.55	0.95	0.80	0.26	-0.01
1973	0.30	2.73	1.65	1.69	0.97	0.92	0.35	0.00
1974	0.00	2.63	1.71	1.77	1.03	1.05	0.45	0.00
1975	0.00	2.52	1.86	1.88	1.13	1.15	0.56	0.02
1976	.	2.54	2.16	1.91	1.22	1.22	0.65	0.05
1977	.	2.54	2.51	1.93	1.37	1.25	0.78	0.10
1978	.	2.77	2.94	1.95	1.54	1.25	0.87	0.15
1979	.	3.06	3.34	1.95	1.69	1.23	0.97	0.21
1980	.	3.63	3.55	2.00	1.86	1.23	1.03	0.29
1981	.	4.04	3.57	2.14	2.00	1.24	1.05	0.35
1982	.	4.27	3.51	2.33	2.11	1.31	1.05	0.40
1983	.	4.43	3.39	2.48	2.14	1.39	1.02	0.44
1984	.	4.53	3.20	2.61	2.13	1.51	1.02	0.52
1985	.	4.54	3.22	2.67	2.12	1.65	1.07	0.62
1986	.	.	3.37	2.71	2.08	1.79	1.15	0.72
1987	.	.	3.47	2.75	2.04	1.94	1.23	0.83
1988	.	.	3.64	2.78	2.01	2.10	1.32	0.95

The American Cancer Society Cancer Prevention Study I: 12-Year Followup of 1 Million Men and Women

David M. Burns, Thomas G. Shanks, Won Choi, Michael J. Thun,
Clark W. Heath, Jr., and Lawrence Garfinkel

INTRODUCTION The American Cancer Society (ACS) Cancer Prevention Study I (CPS-I) is the largest prospective mortality study of diseases caused by tobacco use ever conducted in terms of person-years of observation (PYO's). The study, which began in 1959 and continued through September 1972, was designed and directed by Dr. E. Cuyler Hammond (Garfinkel, 1985). The publication in 1966 of the 3-year followup of this population (Hammond, 1966) played a critical role in establishing the causal linkage between smoking and several diseases, and it remains one of the most comprehensive presentations of the disease risks caused by smoking. The ACS used 68,116 volunteers to enroll the 1,078,894 men and women in the study. The 12-year followup of this cohort, the population used in the analyses presented in this report, includes more than 11 million person-years. Previous analyses of the 12-year followup of this study were more limited in the detail presented (Hammond et al., 1977; U.S. Department of Health and Human Services, 1989); the results in this chapter represent the most complete description of the 12-year followup of this cohort reported to date. The data are presented in as much detail as possible, recognizing that a unique contribution of this study is the large number of PYO's available for analysis. Because the data cover the spectrum of tobacco-related diseases, a comprehensive description of all the findings is not feasible within the limitations of this chapter. The major focus of the chapter is to present descriptive analyses of all-cause mortality and cause-specific mortality for lung cancer, coronary heart disease (CHD), cerebrovascular disease (CVD), and chronic obstructive pulmonary disease (COPD). A more extensive presentation of cause-specific mortality is included in Appendix A. A set of detailed tables presenting the major cause mortality experience of the cohort by number of cigarettes, attained age, and duration of smoking is contained in Appendix B.

METHODS

Description of the Study Population

Recruitment of the study population of 1,078,894 subjects was accomplished by 68,116 ACS volunteers. Each volunteer was asked to recruit about 10 households with at least one person older than 45 years of age. All household members older than 30 years were asked to complete a questionnaire. Volunteers were asked not to recruit strangers or casual acquaintances. Enrollment was completed in fall 1959. Approximately 3 percent of the questionnaires were discarded because they were incomplete or the respondents were not traced for administrative

reasons. Annual followup questionnaires were collected for the first 6 years and again in 1972 for the 12-year followup. The 12-year followup includes more than 11 million PYO's. Current cigarette smokers whose data are reported in this chapter include all who answered yes to the question "Do you smoke now?" excluding those who also reported current use of pipes or cigars.

Approximately 7 percent of the study population was nonwhite, and 95 percent of the subjects lived in the United States or Canada. The 25 States represented are Arizona, California, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Tennessee, Texas, and Virginia. Deaths were reported by the volunteers, and death certificates were obtained from the appropriate State health departments. Approximately 18 percent of the subjects traced died within the 12 years of followup, and death certificates were obtained in 95 percent of the reported deaths. Deaths were coded according to the *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death* (World Health Organization, 1957, pp. 78-98), in a version that used two digits. The overall standardized mortality at the 12-year followup reached 81 percent of that of the United States.

ANALYSIS OF CPS-I DATA SET Analyses have been performed separately for white males and white females. There were not sufficient numbers of deaths or PYO's to perform all analyses with these methods for blacks. Except where noted, data were not pooled across gender or race.

Followup Most subjects were enrolled for participation during October through December 1959, although some were enrolled in early 1960. For analysis, the period of followup began July 1, 1960, allowing a period for death caused by preexisting conditions at the beginning of the study; subjects dying before July 1, 1960, were excluded. Followup surveys were conducted according to the following schedule, with questionnaires completed at the dates marked with an asterisk:

September 30, 1960	September 30, 1964
September 30, 1961*	September 30, 1965*
September 30, 1962	September 30, 1971
September 30, 1963*	September 30, 1972*

When subjects were lost to followup, the last completed survey date prior to loss to followup was used as the censoring date.

Date of death was taken as the first day of the month of death. Person-months of observation (PMO's) accrued month by month until the date of loss to followup, date of death, or end of study on September 30, 1972, in which case subjects were censored alive. A maximum of 147 months of observation was accrued by participants who completed the whole period

of the study. Deaths were tallied according to age at death, and PMO's were accrued dynamically during the period of followup across several age groups.

The CPS-I data set includes information on 456,491 males, with known death dates for 117,199, and 594,551 females, with known death dates for 88,353.

Descriptive Tables for CPS-I Data Set Analyses were restricted to never-smokers and individuals who smoked cigarettes only. Current cigar and pipe smokers were excluded, as were users of smokeless tobacco. Never-smokers were individuals who indicated at the time of the initial survey that they never smoked cigarettes regularly. Current smokers were individuals who indicated current cigarette smoking at the time of the initial survey. Former smokers were individuals who indicated at the time of the initial survey that they were former cigarette smokers and did not indicate current smoking at any subsequent followup surveys or who indicated that they had quit for at least 2 years on the followup surveys. Followup time for former smokers began to accrue after they had quit for at least 2 years.

Age-specific PYO's and numbers of deaths for the white male and female groups separated into never-smoker, current smoker, and former smoker categories and black male and female groups separated into never-smoker and current smoker categories are presented in *Appendix C*. The appendix tables present deaths due to lung cancer, CHD, CVD, COPD, and all-cause mortality during the period of followup. Lung cancer deaths include lung cancer as primary, secondary (contributing cause), or tertiary (any mention on the death certificate) cause of death (code 62); the other diseases are for primary cause of death only (CHD = 00 or 01; CVD = 07, 08, 09; COPD = 3C, 34, 3D).

Mortality Rate Ratios Tables 1 through 14 present mortality rates, rate ratios, and rate differences for current smokers and former smokers in comparison with never-smokers. These ratios are calculated by dividing the rate for current smokers or former smokers by the rate for never-smokers of the same age group. The rate ratio for all levels of cigarette consumption combined for a particular age group is calculated by weighting the smoking-specific rates by the PMO's for each level of consumption. Rate ratio across age groups also is presented, calculated by standardization to the U.S. 1980 census population. All rates reported in this chapter are based on observed rates. Some tables for black smokers show a second set of risk estimates calculated using death rates for black smokers and white never-smokers of the same sex. Respondents whose levels of consumption were unknown are included in the calculation for combined levels of consumption.

Tables 1 and 2 present risk ratio of mortality by years of duration of smoking and level of cigarette consumption. Because each level of duration has contributions from several different levels of attained age, standardization was carried out by age within each cell. Within each cell of duration by consumption, age standardization was accomplished by weighting the contribution of the age-specific never-smoker comparison group using the PMO's of the same-age smoker group; that is, rates for never-smokers were

Table 1

Mortality rate ratios for white male current smokers, by level of duration of smoking—comparison never-smoker group weighted to match smoker person-years of observation for each (age x duration x cigarettes per day) cell^a

Cigarettes Per Day	Duration										
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
Lung Cancer											
1-9			1.26	4.42	0.47	3.45	4.06	4.29	3.69	4.31	5.42
10-19		2.30	2.83	2.37	5.69	6.93	8.55	9.64	9.00	15.04	8.05
20	4.86	9.16	3.24	6.18	11.03	9.85	14.07	14.17	16.10	17.00	14.98
21-39		3.51	8.18	4.77	14.00	16.91	17.43	20.77	25.20	25.10	25.64
40+			7.83	11.07	15.98	19.45	22.25	28.28	24.47	29.98	26.69
Combined	1.26	3.98	4.20	5.47	10.30	11.68	14.04	15.29	15.54	17.05	13.15
Coronary Heart Disease											
1-9	0.89	1.21	0.73	1.18	1.43	1.37	1.25	1.32	1.31	1.24	0.99
10-19	0.75	1.44	1.67	1.96	1.88	1.75	1.74	1.52	1.48	1.52	1.14
20	1.67	1.29	1.91	2.23	2.45	2.15	1.92	1.71	1.71	1.64	1.22
21-39	1.41	0.99	2.68	2.84	2.42	2.16	2.02	1.81	1.71	1.76	1.22
40+	5.54	0.74	3.08	3.23	3.13	2.66	2.34	1.97	1.97	1.87	1.33
Combined	1.47	1.21	1.82	2.24	2.30	2.08	1.90	1.68	1.63	1.59	1.16
Cerebrovascular Disease											
1-9		1.48	0.63	1.11	0.98	0.84	1.40	1.34	1.26	1.07	0.77
10-19		1.84	1.53	1.82	1.15	1.14	1.57	1.49	1.46	1.07	0.92
20		1.36	1.48	1.67	1.46	1.69	1.76	1.61	1.61	1.19	1.00
21-39		1.93	2.40	2.15	2.02	1.78	2.24	1.87	1.81	1.18	1.09
40+		1.71		2.64	2.26	2.64	2.28	2.41	1.57	1.74	1.26
Combined		1.57	1.28	1.74	1.51	1.62	1.85	1.68	1.56	1.18	0.96

Table 1 (continued)

Cigarettes Per Day	Duration										
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
Chronic Obstructive Pulmonary Disease											
1-9				3.36	2.17	3.09	9.27	8.97	12.18	11.57	8.00
10-19			3.06	5.73	4.47	5.32	7.51	8.07	11.44	13.60	10.51
20	29.95	10.76	6.86	3.60	2.69	7.45	12.92	15.23	13.80	15.47	14.96
21-39			5.69	9.28	4.07	7.22	11.94	18.73	21.34	20.75	18.40
40+				6.23	10.99	18.92	17.44	25.56	20.51	19.33	
Combined	7.50	3.30	3.59	4.59	3.67	7.03	12.15	14.01	15.42	15.47	12.98
All-Cause Mortality											
1-9	0.60	1.22	0.80	1.11	1.25	1.26	1.32	1.39	1.42	1.44	1.12
10-19	0.77	1.19	1.29	1.50	1.63	1.65	1.66	1.66	1.63	1.66	1.28
20	1.24	1.02	1.41	1.73	2.05	1.96	2.04	1.95	1.92	1.83	1.48
21-39	1.20	1.01	1.66	1.98	2.17	2.23	2.25	2.15	2.21	2.17	1.71
40+	2.37	0.73	2.04	2.44	2.78	2.71	2.63	2.56	2.38	2.21	1.81
Combined	1.01	1.07	1.37	1.72	2.00	2.00	2.03	1.94	1.89	1.81	1.40

^aWithin each cell of duration by consumption, age standardization was accomplished by weighting the contribution of the age-specific never-smoker comparison group using the person-months of observation (PMO's) of the same-age smoker group; that is, rates for never-smokers were standardized by age to observed smoker PMO's within each cell.

Table 2

Mortality rate ratios for white female current smokers, by level of duration of smoking—comparison never-smoker group weighted to match smoker person-years of observation for each (age x duration x cigarettes per day) cell^a

Cigarettes Per Day	Duration										
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
Lung Cancer											
1-9	0.52	1.04	1.22	0.17	1.97	1.71	1.40	0.40	1.01		
10-19	2.07		2.18	2.34	2.96	3.26	4.37	3.00	3.82	7.93	
20	1.55	2.01	5.87	4.41	7.09	7.05	6.75	9.23	6.41	15.55	
21-39	9.99		4.88	7.27	12.25	12.35	13.08	12.30	20.43	12.32	
40+	24.15		4.29	12.27	11.16	12.75	18.92	19.37		28.26	
Combined	1.63	0.89	3.00	2.91	5.00	5.21	5.72	5.63	4.81	7.73	
Coronary Heart Disease											
1-9	1.24	0.90	1.08	1.13	1.21	0.99	1.01	0.97	1.22	1.05	0.71
10-19	2.28	1.43	1.90	1.93	1.96	1.77	1.64	1.58	1.48	1.25	0.40
20	1.61	2.05	2.48	2.18	2.25	1.96	1.86	1.76	1.51	1.46	0.96
21-39	3.04	3.02	2.44	2.77	2.56	2.22	1.75	1.57	1.08	2.18	
40+	5.14	5.41	2.00	2.99	3.20	2.33	2.27	1.56	1.36	0.82	
Combined	1.58	1.40	1.73	1.75	1.88	1.67	1.60	1.46	1.40	1.21	0.72
Cerebrovascular Disease											
1-9	1.80	1.15	1.28	0.95	1.00	0.93	1.10	0.81	0.77	0.20	0.71
10-19	1.46	1.18	1.88	1.59	1.65	1.59	1.43	1.63	1.13	0.89	1.04
20	2.18	1.45	2.07	1.96	2.17	2.02	1.78	1.24	1.08	1.29	0.97
21-39	2.99	1.78	2.54	1.74	2.39	1.79	1.49	0.97	0.76	2.66	
40+	5.49	3.82	2.61	4.18	2.53	3.16	2.36	2.48	1.62	1.79	
Combined	1.77	1.33	1.69	1.55	1.60	1.61	1.49	1.27	1.00	0.74	0.92

Table 2 (continued)

Cigarettes Per Day	Duration										
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
Chronic Obstructive Pulmonary Disease											
1-9				1.36	2.11	4.33	3.61				
10-19	5.85	2.61		2.15	3.76	6.29	8.69	10.19	11.68	16.05	7.65
20		3.56	6.89	5.90	7.70	11.57	15.99	20.79	16.62	13.32	
21-39				8.15	4.26	9.10	17.37	25.45	35.19	29.08	
40+				11.33	12.19	15.00	32.25	11.02		70.37	160.70
Combined	1.52	1.48	1.66	3.42	4.69	7.87	10.94	11.30	10.41	11.27	4.45
All-Cause Mortality											
1-9	1.07	0.95	0.98	1.06	1.11	1.01	1.16	0.98	1.00	0.95	0.73
10-19	1.11	0.96	1.29	1.29	1.47	1.38	1.46	1.47	1.35	1.12	0.85
20	1.15	1.22	1.52	1.54	1.69	1.72	1.69	1.68	1.55	1.70	1.17
21-39	0.42	1.23	1.51	1.70	1.86	2.00	2.04	1.87	1.72	1.57	1.48
40+	1.76	1.55	1.95	2.31	2.16	2.26	2.22	2.37	2.12	2.22	0.72
Combined	1.08	1.04	1.26	1.34	1.49	1.47	1.53	1.45	1.34	1.25	0.88

^aWithin each cell of duration by consumption, age standardization was accomplished by weighting the contribution of the age-specific never-smoker comparison group using the person-months of observation (PMO's) of the same-age smoker group; that is, rates for never-smokers were standardized by age to observed smoker PMO's within each cell.

standardized by age to observed smoker PMO's within each cell. Respondents whose level of consumption was unknown are included in the calculation for combined levels of consumption. The rate ratios shown in these tables reflect the weighted sums across age levels within each category of duration and smoking level and, therefore, include the effect modification produced by both age and duration within any cell rather than being standardized by age to a defined population.

Tables 3 and 4 present rate ratio of mortality by years of duration of cessation for former smokers by level of former smoking. The comparison never-smoker rates are age standardized within each cell to the PMO's of former smokers using the same method as in Tables 1 and 2. There were not enough black former smokers in the survey to complete these tables for blacks.

Tables 5 through 10 present mortality rates and rate ratio of mortality by 15-year age groups, level of consumption, and sex and race, all standardized to U.S. 1980 population by 5-year age groups within cells. The "all-ages" value across age groups also is presented, calculated by standardization to U.S. 1980 standard population, age 30 and older. Respondents whose level of consumption was unknown are included in the calculation for combined levels of consumption.

**Duration-Specific
Mortality Rate Ratios
and Attributable Rates**

The tables in Appendix B present duration-specific mortality rate ratios and excess mortality rates by number of cigarettes smoked per day and attained age. These tables are calculated using modeled, rather than observed, death rates for never-smokers.

Modeling of never-smoker rates was used to stabilize estimates for death rates among younger groups of never-smokers. The low numbers of deaths in age groups younger than 50 years often resulted in rates of zero or rates that were considered unstable. Modeling allowed estimation of rates for the younger age groups of never-smokers that were above zero and increased smoothly with age. Followup data were tabulated for 92,307 white male never-smokers and 375,649 white female never-smokers. Deaths were tabulated in the age group for age at the time of death. Death certificates list primary causes of death, secondary contributing causes, and underlying conditions. Lung cancer deaths were tabulated for any mention of lung cancer on the death certificate; only the primary cause of death was used to calculate death rates from CHD, CVD, and COPD. Therefore, some deaths may have been included in both lung cancer and other-cause-of-death categories. PMO's were accrued on a month-by-month basis to the current age group. These results allowed calculation of the rate of deaths per 100,000 person-years of observation (PYO's) (PYO's/12 = PMO's) for each age group.

Never-smoker rates were modeled using both Poisson regression and linear regression of log(rate) techniques, all regressed to the median age of 5-year intervals between 40 and 85 years of age. A close fit of the data to an exponential curve was demonstrated, with close agreement between the models. Tables 1 through 5 in Appendix D show the observed death rates

Table 3
Mortality rate ratios for white male former smokers by duration of cessation and level of cigarette consumption—comparison never-smoker group weighted to match former smoker person-years of observation for each (age x duration x cigarettes per day) cell^a

Cigarettes Per Day	Duration of Cessation							
	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39
Lung Cancer								
1-9	2.83	1.68	1.22			0.58	1.38	1.89
10-19	7.96	3.50	2.91	2.04	0.96	2.16	1.68	
20	11.68	10.49	5.03	2.22	1.86	1.12	1.55	4.10
21-39	14.30	9.18	4.85	4.88	2.04		4.13	3.69
40+	27.88	12.36	7.77	3.74	3.99	0.89		
Combined	13.12	8.44	4.61	2.89	2.04	1.19	1.84	3.18
Coronary Heart Disease								
1-9	1.55	1.36	1.38	1.08	0.71	1.01	0.83	0.46
10-19	2.53	1.56	1.26	0.93	0.93	0.92	0.77	0.62
20	3.00	1.56	1.20	1.09	0.97	0.98	1.13	0.70
21-39	2.65	2.03	1.55	1.29	1.13	1.09	0.95	0.56
40+	2.96	1.68	1.72	1.15	1.02	0.98	1.25	0.39
Combined	2.66	1.64	1.37	1.13	0.99	0.96	0.93	0.55
Cerebrovascular Disease								
1-9	1.72	1.45	1.29	1.42	0.69	0.57	0.37	0.92
10-19	1.62	1.33	1.14	0.95	0.73	0.84	0.68	0.57
20	1.33	1.05	1.03	0.95	1.17	0.84	0.79	0.58
21-39	1.46	0.75	0.90	0.76	0.53	0.56	1.58	
40+	2.27	1.41	1.05	1.23	1.36	0.90	0.97	1.23
Combined	1.62	1.16	1.05	1.01	0.93	0.78	0.80	0.65
Chronic Obstructive Pulmonary Disease								
1-9		6.46	2.25	2.67	3.29			
10-19		21.03	12.35	9.02	2.07	0.95	0.85	1.01
20		41.10	15.27	11.85	7.05	3.75	1.13	2.89
21-39		31.00	28.14	11.39	5.57	1.40	1.98	
40+		57.03	34.25	10.33	9.37	4.00		4.99
Combined		36.14	18.89	10.33	5.64	2.80	1.42	2.28
All-Cause Mortality								
1-9	1.74	1.37	1.25	1.08	0.67	0.83	0.80	0.73
10-19	2.18	1.43	1.24	1.01	0.87	0.93	0.80	0.59
20	2.84	1.64	1.30	1.10	1.01	1.04	1.06	0.74
21-39	2.57	1.92	1.48	1.23	1.00	1.01	1.06	0.56
40+	3.18	2.13	1.74	1.30	1.16	1.08	1.23	0.79
Combined	2.58	1.69	1.39	1.15	0.98	0.96	0.91	0.66

^a Within each cell of duration by consumption, age standardization was accomplished by weighting the contribution of the age-specific never-smoker comparison group using the person-months of observation (PMO's) of the same-age smoker group; that is, rates for never-smokers were standardized by age to observed smoker PMO's within each cell.

Table 4

Mortality rate ratios for white female former smokers by duration of cessation and level of cigarette consumption—comparison never-smoker group weighted to match former smoker person-years of observation for each (age x duration x cigarettes per day) cell^a

Cigarettes Per Day	Duration of Cessation							
	2-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39
Lung Cancer								
1-9	2.13	1.89	0.45		2.38	1.81		
10-19		0.95	0.61	3.06	2.42		3.65	
20	4.31		0.76	0.98	1.66			
21-39				16.99	10.90			
40+								
Combined	2.85	1.51	0.58	3.19	2.52	2.61		
Coronary Heart Disease								
1-9	1.41	1.46	0.82	0.69	0.75	1.08	0.64	0.64
10-19	3.15	1.52	1.13	0.79	0.83	0.45	0.53	0.35
20	3.45	1.79	1.08	1.12	1.27	0.97	0.25	
21-39	1.99	0.88	0.51	0.63				
40+	5.52	1.49	0.86			1.48	1.99	
Combined	2.23	1.53	0.98	0.84	0.88	0.96	0.63	0.63
Cerebrovascular Disease								
1-9	1.78	0.90	1.10	0.80	0.69	0.42	0.63	0.83
10-19	0.99	0.88	1.47	0.93	0.62	1.01	0.42	
20	4.41	1.33	1.14	1.20	1.41	1.10	0.59	1.11
21-39	4.29	4.07	1.83	1.45	1.41			
40+	6.67	3.70	2.11			3.47		
Combined	2.28	1.18	1.25	1.01	1.11	0.84	0.57	0.92
Chronic Obstructive Pulmonary Disease								
1-9	16.08		5.97	4.13			8.64	
10-19		3.82	4.61	5.79	4.67			
20		9.52	2.91	7.35			33.48	
21-39		28.31						
40+		47.91						
Combined	16.08	9.46	5.15	5.45	4.67		13.74	
All-Cause Mortality								
1-9	1.97	1.16	1.10	0.82	0.94	0.93	0.79	0.65
10-19	1.92	1.34	1.22	0.88	0.79	0.84	0.75	0.56
20	2.84	1.53	1.18	1.16	1.22	1.33	1.17	0.52
21-39	2.87	1.27	0.95	1.08	1.36	0.60	0.87	0.95
40+	2.56	1.67	1.50	1.26	1.29	1.75	1.09	
Combined	2.17	1.31	1.15	0.94	0.98	1.02	0.88	0.63

^a Within each cell of duration by consumption, age standardization was accomplished by weighting the contribution of the age-specific never-smoker comparison group using the person-months of observation (PMO's) of the same-age smoker group; that is, rates for never-smokers were standardized by age to observed smoker PMO's within each cell.

Table 5

Mortality rates among white male current smokers, by level of cigarette consumption—standardized absolute mortality rates per 100,000^a

Cigarettes Per Day	Age			
	35-49	50-64	65-79	All Ages
Lung Cancer				
1-9	7.70	46.81	168.61	59.04
10-19	11.67	103.45	367.79	122.33
20	26.46	160.73	535.38	185.63
21-39	28.29	218.18	785.54	268.71
40+	39.71	274.33	888.75	315.26
Combined	25.16	170.95	503.51	175.87
Coronary Heart Disease				
1-9	101.78	544.37	1,852.05	770.47
10-19	142.38	682.76	2,087.90	893.66
20	167.73	764.25	2,184.38	968.59
21-39	170.50	758.91	2,209.83	962.02
40+	239.46	902.64	2,396.22	1,127.88
Combined	169.94	753.17	2,137.95	939.17
Cerebrovascular Disease				
1-9	13.76	77.24	563.07	248.03
10-19	22.63	75.41	572.95	268.30
20	18.98	93.15	563.70	250.89
21-39	24.71	105.89	581.79	255.82
40+	21.19	128.08	646.63	284.09
Combined	20.86	97.15	576.45	263.86
Chronic Obstructive Pulmonary Disease				
1-9		30.51	182.11	72.24
10-19	4.33	25.87	239.55	79.79
20	0.79	48.71	318.75	112.30
21-39	1.40	49.89	384.47	116.31
40+		66.29	466.72	149.06
Combined	1.32	45.90	295.70	100.71
All-Cause Mortality				
1-9	281.91	1,190.41	4,702.79	1,971.17
10-19	341.35	1,445.34	5,387.83	2,319.19
20	417.24	1,697.89	5,849.46	2,499.91
21-39	429.12	1,823.46	6,511.74	2,710.34
40+	586.29	2,195.01	6,910.57	2,966.77
Combined	422.43	1,715.30	5,756.71	2,465.47

^aRates adjusted within 15-year group by 5-year age-specific rates to 1980 U.S. standard population. All-ages rate adjusted by 5-year age-specific rates to 1980 U.S. standard population older than 30 years of age.

Table 6

**Mortality rates among white female current smokers, by level of cigarette consumption—
standardized absolute mortality rates per 100,000^a**

Cigarettes Per Day	Age			
	35-49	50-64	65-79	All Ages
Lung Cancer				
1-9	1.79	11.15	27.46	8.81
10-19	3.71	26.72	71.26	26.07
20	14.36	49.57	132.39	49.07
21-39	28.13	89.17	281.21	164.49
40+	20.86	119.01	208.39	79.37
Combined	9.90	37.92	84.76	33.61
Coronary Heart Disease				
1-9	15.36	106.14	741.69	331.19
10-19	22.58	174.20	1,075.58	457.27
20	24.26	206.90	1,060.19	450.07
21-39	42.26	220.24	1,301.99	561.03
40+	35.25	272.41	790.83	438.95
Combined	24.05	173.61	958.01	411.82
Cerebrovascular Disease				
1-9	9.67	44.21	320.71	153.70
10-19	15.48	76.58	362.93	185.36
20	18.74	76.30	430.75	191.77
21-39	19.44	70.22	542.96	200.22
40+	20.86	120.03	579.24	146.39
Combined	15.75	69.02	375.14	176.39
Chronic Obstructive Pulmonary Disease				
1-9	0.89	3.89	15.61	7.23
10-19	1.00	8.34	64.75	19.57
20	1.60	17.43	102.95	25.72
21-39	1.02	15.24	154.11	58.60
40+	3.04	31.54	189.02	44.30
Combined	1.24	11.21	62.17	18.85
All-Cause Mortality				
1-9	150.17	556.24	2,278.22	1,073.12
10-19	195.82	743.52	2,773.20	1,283.95
20	237.70	843.56	3,148.53	1,403.89
21-39	275.14	965.07	3,739.58	1,730.44
40+	324.06	1,219.96	3,196.19	1,586.20
Combined	211.60	759.29	2,749.85	1,271.06

^a Rates adjusted within 15-year group by 5-year age-specific rates to 1980 U.S. standard population. All-ages rate

Table 7

**Mortality rates among black male current smokers, by level of cigarette consumption—
standardized absolute mortality rates per 100,000^a**

Cigarettes Per Day	Age			
	35-49	50-64	65-79	All Ages
Lung Cancer				
1-9	42.17	174.87	324.78	123.70
10-19	14.63	140.36	317.61	103.30
20	37.82	230.00	612.15	190.25
21-39		90.81		26.79
40+		618.24		182.41
Combined	27.08	184.86	389.73	133.44
Coronary Heart Disease				
1-9	86.80	542.86	1,542.04	794.07
10-19	43.88	637.54	1,384.31	690.06
20	157.79	607.03	1,718.76	735.12
21-39	79.21	800.24	2,920.68	787.25
40+		372.28		109.84
Combined	91.36	601.71	1,515.39	740.87
Cerebrovascular Disease				
1-9	86.80	348.13	1,074.99	464.84
10-19		176.20	816.90	198.96
20	104.59	212.68	865.73	391.66
21-39		199.50		58.86
40+			1,616.46	290.82
Combined	53.49	236.85	918.86	353.53
Chronic Obstructive Pulmonary Disease				
1-9		39.40	41.02	65.91
10-19		29.34	317.61	65.80
20		72.36	345.87	83.57
21-39		140.10		41.33
40+		206.08		60.80
Combined		54.01	217.65	76.88
All-Cause Mortality				
1-9	606.06	2,363.62	5,366.52	2,672.09
10-19	490.44	1,908.51	6,418.90	2,566.44
20	876.34	2,100.09	6,476.93	2,486.80
21-39	1,031.23	2,273.09	4,315.21	1,781.42
40+		2,365.67	4,849.38	1,570.43
Combined	675.94	2,121.92	5,984.92	2,586.29

^aRates adjusted within 15-year group by 5-year age-specific rates to 1980 U.S. standard population. All-ages rate adjusted by 5-year age-specific rates to 1980 U.S. standard population older than 30 years.

Table 8

**Mortality rate ratios for black male current smokers, by level of cigarette consumption—
standardized rate ratios for black male current smokers compared with white male never-smokers^a**

Cigarettes Per Day	Age			
	35-49	50-64	65-79	All Ages
Lung Cancer				
1-9	15.72	14.86	8.78	7.83
10-19	5.45	11.93	8.59	6.54
20	14.10	19.54	16.55	12.05
21-39		7.72		1.70
40+		52.52		11.55
Combined	10.09	15.71	10.53	8.45
Coronary Heart Disease				
1-9	2.09	1.54	1.03	1.29
10-19	1.05	1.81	0.92	1.12
20+	3.79	1.72	1.14	1.20
21-39	1.90	2.27	1.94	1.28
40+		1.06		0.18
Combined	2.20	1.71	1.01	1.21
Cerebrovascular Disease				
1-9	15.49	7.55	2.42	2.18
10-19		3.82	1.84	0.93
20	18.66	4.61	1.95	1.84
21-39		4.33		0.28
40+			3.64	1.37
Combined	9.54	5.14	2.07	1.66
Chronic Obstructive Pulmonary Disease				
1-9		9.54	1.79	7.17
10-19		7.10	13.83	7.15
20		17.52	15.06	9.09
21-39		33.92		4.49
40+		49.89		6.61
Combined		13.08	9.48	8.36
All-Cause Mortality				
1-9	3.32	3.01	1.55	1.73
10-19	2.68	2.43	1.85	1.66
20	4.80	2.68	1.87	1.61
21-39	5.64	2.90	1.25	1.15
40+		3.02	1.40	1.02
Combined	3.70	2.70	1.73	1.67

^a Rates adjusted within 15-year group by 5-year age-specific rates to 1980 U.S. standard population. All-ages rate adjusted by 5-year age-specific rates to 1980 U.S. standard population older than 30 years of age.

Table 9

**Mortality rates among black female current smokers, by level of cigarette consumption—
standardized absolute mortality rates per 100,000^a**

Cigarettes Per Day	Age			
	35-49	50-64	65-79	All Ages
Lung Cancer				
1-9		15.19	39.16	11.53
10-19	12.89	92.65	86.36	47.05
20				
21-39				
40+		668.43		197.22
Combined	3.80	42.33	45.56	21.92
Coronary Heart Disease				
1-9	55.13	264.00	938.90	460.68
10-19	55.72	319.15	663.17	231.54
20	28.31	271.87	330.63	148.87
21-39		751.63		221.76
40+		1,336.87		394.43
Combined	49.51	301.68	781.49	391.50
Cerebrovascular Disease				
1-9	19.11	160.91	516.85	177.06
10-19	61.04	159.70	153.94	196.92
20	28.31		473.79	94.42
21-39	775.80			251.58
40+				
Combined	46.80	129.35	429.88	170.34
Chronic Obstructive Pulmonary Disease				
1-9		15.19		4.48
10-19				
20				
21-39				
40+				
Combined		8.22		2.43
All-Cause Mortality				
1-9	319.48	1,004.55	3,438.59	1,576.38
10-19	393.11	1,380.88	1,671.75	937.97
20	421.01	822.07	3,842.67	1,070.41
21-39	775.80	1,343.00		647.82
40+		2,005.30		591.65
Combined	364.45	1,098.49	3,076.47	1,419.34

^a Rates adjusted within 15-year group by 5-year age-specific rates to 1980 U.S. standard population. All-ages rate adjusted by 5-year age-specific rates to 1980 U.S. standard population older than 30 years of age.

Table 10

**Mortality rate ratios for black female current smokers, by level of cigarette consumption—
standardized rate ratios for black female current smokers compared with white female
never-smokers^a**

Cigarettes Per Day	Age			
	35-49	50-64	65-79	All Ages
Lung Cancer				
1-9		1.79	1.68	1.20
10-19	7.86	10.89	3.71	4.89
20				
21-39				
40+		78.55		20.48
Combined	2.32	4.97	1.96	2.28
Coronary Heart Disease				
1-9	7.15	3.20	1.37	1.49
10-19	7.22	3.87	0.96	0.75
20	3.67	3.30	0.48	0.48
21-39		9.12		0.72
40+		16.23		1.27
Combined	6.42	3.66	1.14	1.26
Cerebrovascular Disease				
1-9	3.15	5.14	1.73	1.07
10-19	10.07	5.10	0.52	1.19
20	4.67		1.59	0.57
21-39	127.92			1.52
40+				
Combined	7.72	4.13	1.44	1.03
Chronic Obstructive Pulmonary Disease				
1-9		10.50		1.17
10-19				
20				
21-39				
40+				
Combined		5.68		0.63
All-Cause Mortality				
1-9	2.12	2.08	1.64	1.50
10-19	2.61	2.86	0.80	0.89
20	2.79	1.70	1.84	1.02
21-39	5.15	2.78		0.62
40+		4.15		0.56
Combined	2.42	2.27	1.47	1.35

^aRates adjusted within 15-year group by 5-year age-specific rates to 1980 U.S. standard population. All-ages rate adjusted by 5-year age-specific rates to 1980 U.S. standard population older than 30 years of age.

for each age interval as well as the fitted values for each type of regression, all weighted to the square root of PMO's, for white males and females for lung cancer, CHD, CVD, COPD, and all-cause mortality.

Number of deaths and PMO's were tabulated for current smokers, with breakdowns along dimensions of age of initiation of smoking, duration of smoking, number of cigarettes smoked per day, and attained age. The difference between age of initiation and current monthly age was used to calculate duration of smoking for current smokers.

RESULTS

Changes in the Risk of Smoking With Age

All-cause mortality risk due to smoking changes with the age of the smoker. A long time lag exists between beginning smoking and onset of an increase in risk, and the biologic changes induced by smoking over time are cumulative in their effect on mortality. Smoking-related increased risk is commonly expressed as a ratio of the mortality rate in smokers compared with that of never-smokers (rate ratio), and a single summary rate ratio for smoking often is presented derived across all categories of smokers. However, the mortality rate in never-smokers changes with age, and the difference in mortality rates between smokers and never-smokers also changes with age. As a result, rate ratios for smoking are not constant across all age groups. The absolute magnitude of the excess mortality rate among smokers required to produce a rate ratio of two is much larger at age 80 than it is at age 40. Understanding changes in smoking risk with age requires an appreciation of both change in rate ratio with age and change in excess mortality rates with age.

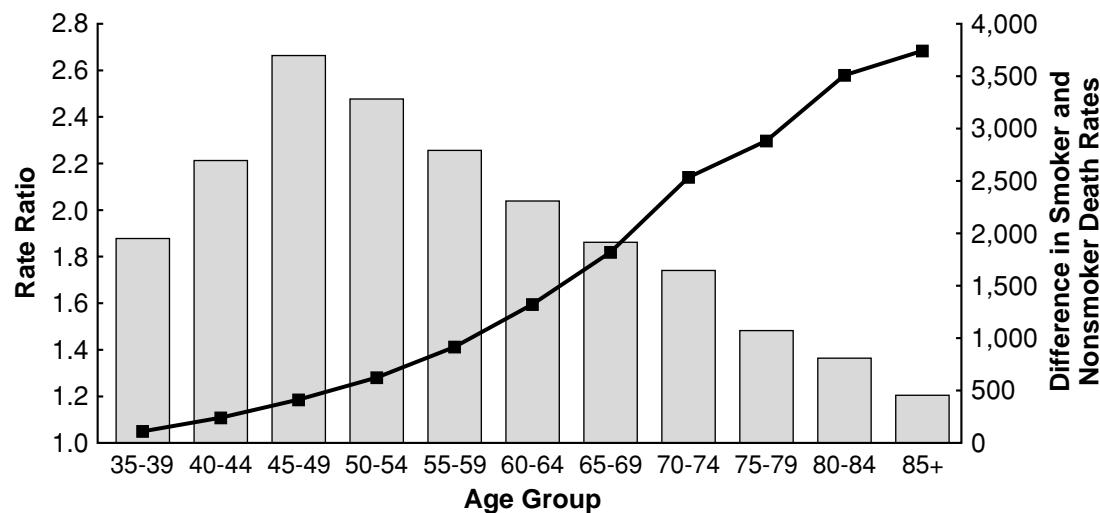
Figure 1 presents age-specific rate ratios for all-cause mortality for white male cigarette smokers in contrast to the absolute difference in mortality rates between smokers and never-smokers of the same ages. Rate ratios for all-cause mortality peak at 2.66 among the 45- to 49-year-old age group and then decline steadily with further increases in age. Differences between smoker and never-smoker mortality rates increase steadily with age and are greatest for that age group with the lowest rate ratio (age 85 and older). The inference that might be drawn from the rate ratio data alone that the impact of smoking on mortality declines at older ages would be incorrect, or at least incomplete. The impact of smoking on absolute, as opposed to relative, mortality continues to grow with age.

A similar effect is noted when rate ratios and excess mortality rates for white males are presented for four major causes of death linked to cigarette smoking (Figures 2 and 3). Rate ratios for lung cancer and COPD are much higher than those for CHD and CVD because of the multiplicity of other etiologic factors for vascular disease, in contrast to the relative specificity of cigarette smoking as a cause of lung cancer and COPD. There is a decline in rate ratio for all these causes of death among older age groups.

The age at which an increased rate ratio is first manifest is not the same for each cause of death. The rate ratio for CHD increases by the mid- to late-30-year-old age group, peaks with the 40- to 44-year-old age group, and then

Figure 1

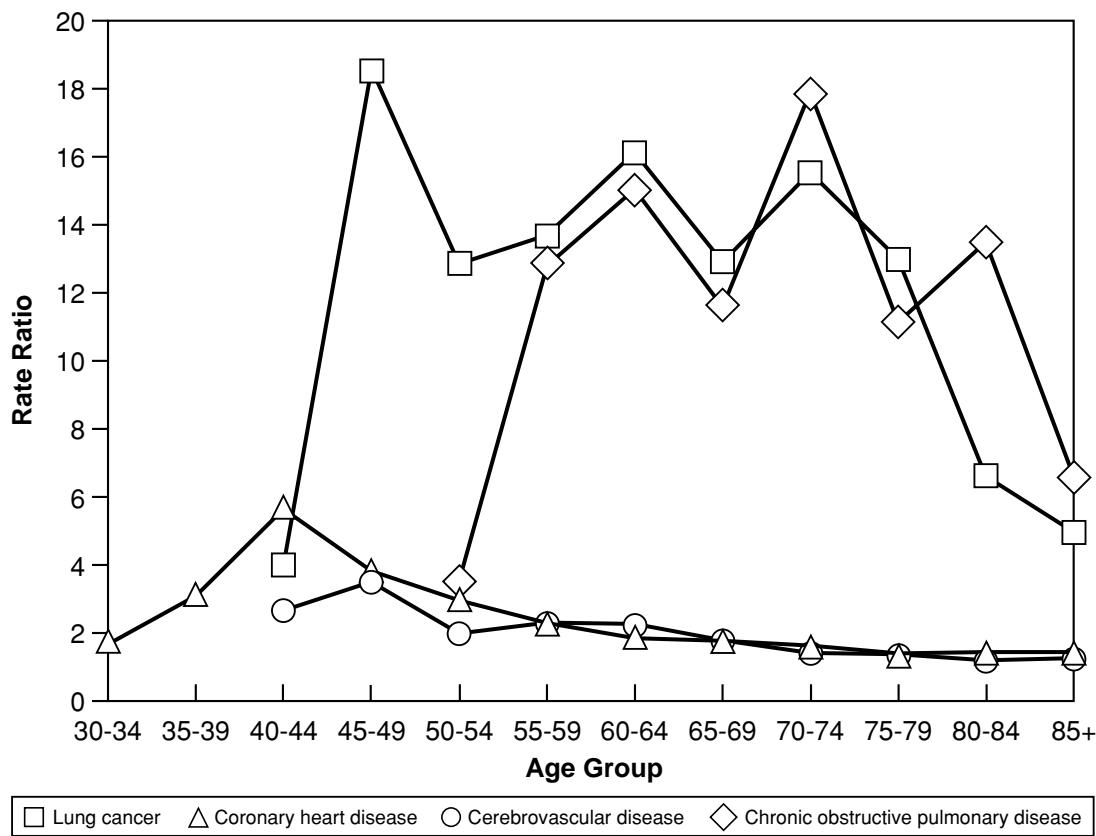
White male age-specific all-cause rate ratio and excess mortality between smokers and never-smokers



declines. An increased risk for lung cancer is first evident in the mid- to late-40-year-old age group, and an increased rate ratio for death from COPD is not evident until the late 50-year-old age group. This pattern is more evident when the differences between smoker and never-smoker mortality rates are examined (Figure 3). The impact of smoking on excess mortality prior to age 60 is largely manifest through its effect on deaths from CHD. Between ages 60 to 70 years, excess lung cancer mortality first increases rapidly, followed by a rapid increase in excess COPD mortality during the next decade of life. After age 80, each of these disease processes make an equivalent contribution to excess mortality. Thus, excess cause-specific mortality and all-cause mortality increase with age, but the fraction of excess all-cause mortality attributable to CHD is greater at younger ages.

Tables 11 through 14 present 5-year age-specific smoking risks by level of cigarette consumption per day for white males and females. Risks are presented as rate ratios (Tables 11 and 13) and as excess mortality rates, and the difference in mortality rates is presented between smokers and never-smokers (Tables 12 and 14). Risks are presented for each of four causes of death and for all-cause mortality. Never-smoker rates used in these tables are observed age-specific rates. Tables 5 to 7 and 9 present age- and cause-specific death rates for smokers of specified numbers of cigarettes per day. Fifteen-year age groups are presented for whites and blacks of both genders to allow comparison across race and gender of actual death rates for smokers in each stratum of age and number of cigarettes smoked per day. Rates were adjusted within 15-year age groups by 5-year age-specific rates to the U.S. 1980 standard population, but no attempt was made to adjust for differences in duration of smoking across strata or within strata for the different race and

Figure 2
White male cause-specific rate ratios for smoking by age

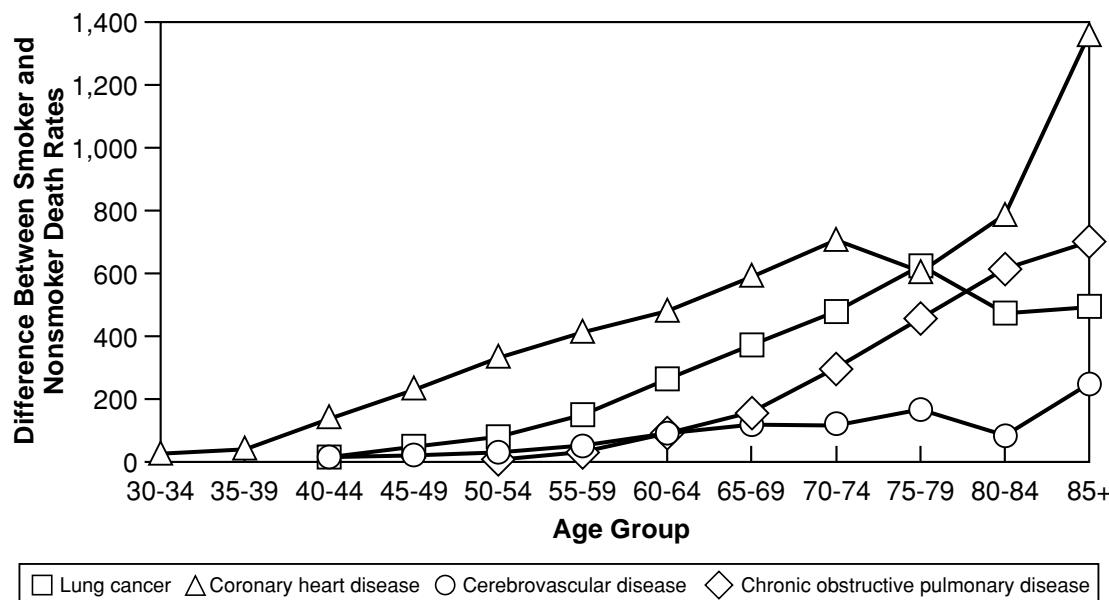


gender groups. Fifteen-year age groups were used because of the small number of deaths occurring among blacks for some of the causes of death.

In general, the small numbers of deaths among black never-smokers for many of the causes of death preclude generation of black-specific rate ratios. For example, there were only two lung cancer deaths among black male never-smokers. However, Tables 8 and 10 present rate ratios for black males and females by cause of death and all-cause mortality using the death rates among black smokers compared with the death rates among white never-smokers. These rate ratios allow rough comparison of the rate ratios for blacks by number of cigarettes smoked per day but should be interpreted with caution because of the small number of deaths among black smokers and the likely confounding of age and duration of smoking in these cross-race comparisons.

White Males—
Tables 5, 11, and 12 Rate ratios for all-cause mortality among white males increase with increasing number of cigarettes smoked per day and are higher at younger ages (45 to 54). Death rates for never-smokers are also

Figure 3
White male cause-specific excess mortality for smoking by age



lower at younger ages, particularly for those diseases for which smoking causes most of the disease occurrence (lung cancer and COPD). A low death rate among never-smokers can produce a large rate ratio for smokers even if the actual death rates among smokers are modest. This effect is manifest among white males by high rate ratios for lung cancer and COPD at younger ages despite low excess death rates for these diseases. In contrast, the largest contribution to excess mortality among smokers at younger ages results from CHD even though the rate ratios for CHD are much lower than those for lung cancer. This seeming discordance between rate ratios and excess mortality is the result of the relatively high death rates from CHD among never-smokers, and these higher CHD death rates in never-smokers occur because several factors other than smoking (e.g., hypertension, elevated cholesterol) make substantial causal contributions to CHD death rates.

Rate ratios for all-cause mortality and for disease-specific mortality decline among white males at older ages; however, the excess mortality rates among smokers for lung cancer, CHD, and COPD become similar in magnitude as age increases (Table 12).

Increased rate ratios for CVD are evident at younger ages, but there is an inconsistent dose-response relationship, possibly caused by low rates of death from this cause at these ages. Rate ratios approach 1 among the older age groups, and there is no clear dose-response relationship with the summary rate ratios standardized to the U.S. 1980 population. Excess mortality rates among smokers for CVD rise only modestly with age.

Table 11
Age-specific rate ratios for white male current smokers, by level of cigarette consumption

Cigarettes Per Day	Age											
	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	US80 ^a
Lung Cancer												
1-9			9.75	3.85	3.19	4.65	3.58	4.80	5.41	1.49	3.54	3.74
10-19		2.45	8.90	6.00	8.00	10.69	7.94	11.85	10.41	3.75	5.27	7.75
20		3.82	21.40	11.58	13.02	15.11	12.96	16.16	14.60	9.41	4.81	11.76
21-39		5.18	18.85	18.91	15.88	20.44	18.54	25.90	19.97	14.72	8.21	17.02
40+		7.10	23.82	16.88	23.18	26.35	21.41	23.22	27.62	16.76	9.44	19.97
Combined		4.15	18.43	12.77	13.60	16.05	12.82	15.41	12.84	6.47	4.79	11.14
Coronary Heart Disease												
1-9	2.07	3.20	2.27	1.68	1.70	1.41	1.35	1.16	1.21	1.01	1.16	1.25
10-19	3.09	3.43	3.51	2.40	2.16	1.65	1.57	1.45	1.21	1.25	1.11	1.45
20	3.20	5.63	3.67	3.07	2.27	1.82	1.64	1.52	1.27	1.29	1.36	1.58
21-39	2.46	5.92	3.88	3.12	2.17	1.83	1.65	1.62	1.21	1.31	1.15	1.57
40+	5.12	9.66	4.45	3.57	2.75	2.12	1.78	1.61	1.45	1.53	1.51	1.84
Combined	3.15	5.73	3.73	2.97	2.26	1.79	1.61	1.47	1.25	1.22	1.21	1.53
Cerebrovascular Disease												
1-9	2.13	2.78	1.56	1.62	1.75	1.35	1.03	1.40	0.93	1.07	1.16	
10-19	2.45	3.63	1.13	1.75	1.76	1.58	1.34	1.15	1.01	1.25	1.26	
20	2.54	3.41	1.68	2.19	2.06	1.73	1.26	1.11	1.12	0.90	1.18	
21-39	3.46	4.09	2.36	2.25	2.30	1.72	1.39	1.11	0.82	1.04	1.20	
40+	1.89	3.02	2.62	3.22	2.60	1.77	1.43	1.36	1.60	0.68	1.33	
Combined	2.64	3.51	1.92	2.24	2.10	1.66	1.28	1.18	1.05	1.07	1.24	

Table 11 (continued)

Cigarettes Per Day	Age												
	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	US80 ^a	
Chronic Obstructive Pulmonary Disease													
1-9					11.48	9.93	7.03	14.20	5.00	11.01	6.37	7.85	
10-19					2.61	5.41	8.87	9.16	11.85	10.39	14.01	3.76	8.67
20					3.79	13.69	15.74	10.58	19.33	12.80	15.39	8.02	12.21
21-39					3.23	10.30	18.25	16.47	22.94	13.49	8.50	8.21	12.64
40+					5.53	23.78	18.78	14.68	24.98	21.05	16.60	9.44	16.21
Combined					3.47	12.81	14.93	11.53	17.70	11.01	13.36	6.38	10.95
All-Cause Mortality													
1-9	0.65	1.73	1.93	1.50	1.61	1.46	1.35	1.36	1.36	1.20	1.07	1.27	
10-19	1.83	1.36	2.28	1.94	1.96	1.73	1.70	1.61	1.42	1.31	1.29	1.50	
20	1.82	2.17	2.65	2.43	2.21	2.03	1.84	1.79	1.51	1.48	1.22	1.62	
21-39	1.79	2.40	2.65	2.70	2.27	2.22	2.07	2.01	1.65	1.42	1.35	1.75	
40+	2.91	3.20	3.39	3.18	2.94	2.55	2.25	2.01	1.82	1.65	1.28	1.92	
Combined	1.87	2.21	2.66	2.47	2.25	2.03	1.85	1.73	1.48	1.36	1.20	1.59	

^a Standardized to U.S. 1980 population by 5-year strata greater than 30 years of age.

Table 12

Age-specific excess mortality (rate difference) for white male current smokers, by level of cigarette consumption

Cigarettes Per Day	Age											
	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	US80 ^a
Lung Cancer												
1-9			22.89	19.56	25.89	63.54	81.17	127.00	230.57	42.50	328.97	43.25
10-19		8.64	20.68	34.34	82.72	168.57	217.87	362.75	492.37	236.74	552.56	106.54
20		16.77	53.39	72.61	142.09	245.51	375.74	506.74	711.21	723.54	493.63	169.84
21-39		24.91	46.72	123.01	175.87	338.39	550.86	832.15	922.17	1,179.83	933.83	252.92
40+		36.34	59.71	109.02	262.19	441.22	641.10	742.55	1,392.55	1,355.08	1,093.71	299.47
Combined		18.74	45.62	80.84	148.98	261.88	371.41	481.62	619.34	470.08	490.76	160.08
Coronary Heart Disease												
1-9	20.36	65.55	104.60	114.39	227.41	242.52	333.75	248.57	525.22	27.22	1022.42	156.14
10-19	40.02	72.39	207.11	233.74	376.52	390.65	546.88	688.21	513.71	908.26	713.66	279.33
20	41.99	137.82	219.72	347.63	410.68	489.03	614.33	785.94	661.58	1,037.30	2,331.05	354.26
21-39	27.98	146.61	237.29	355.29	380.78	496.87	626.62	949.34	515.53	1,112.00	946.45	347.68
40+	78.81	257.81	284.62	430.87	566.40	671.50	749.11	928.92	1,112.27	1,923.57	3,288.87	513.55
Combined	41.03	140.85	225.05	329.64	408.95	475.19	590.15	714.66	609.62	790.90	1,359.97	324.84
Cerebrovascular Disease												
1-9		10.13	16.34	14.24	23.56	59.54	63.30	13.45	369.67	-128.81	258.63	34.98
10-19		12.96	24.12	3.26	28.76	60.26	106.43	149.35	139.92	13.05	889.52	55.25
20		13.79	22.10	17.22	45.25	83.80	132.40	113.89	103.32	213.03	-373.15	37.84
21-39		21.93	28.34	34.54	47.79	102.98	131.64	173.37	97.25	-322.44	128.94	42.77
40+		7.98	18.54	41.08	84.56	126.54	140.89	192.51	328.73	1,082.91	-1,146.30	71.04
Combined		14.64	23.00	23.29	47.44	87.47	119.78	123.71	166.72	82.28	247.09	50.81

Table 12 (continued)

Cigarettes Per Day	Age										
	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Chronic Obstructive Pulmonary Disease											
1-9				28.17	58.93	87.79	234.34	183.23	496.49	695.78	63.04
10-19				5.52	11.86	51.95	118.72	192.71	429.74	645.51	357.68
20				9.57	34.11	97.28	139.46	325.50	540.03	713.66	909.07
21-39				7.67	24.97	113.91	225.20	389.57	571.42	372.33	933.83
40+				15.56	61.19	117.35	199.19	425.66	917.47	773.86	1,093.71
Combined				8.46	31.74	91.99	153.29	296.42	457.97	613.11	697.52
All-Cause Mortality											
1-9	-42.08	136.52	237.92	214.68	442.25	585.96	749.00	1,243.74	2,138.83	1,933.24	1,207.60
10-19	100.69	67.82	327.25	400.96	702.45	914.51	1,488.61	2,111.39	2,464.95	3,029.94	5,342.23
20	98.95	218.62	422.08	611.99	885.56	1,295.23	1,792.11	2,710.24	3,021.68	4,616.55	3,980.88
21-39	95.58	262.19	419.81	728.21	924.43	1,531.48	2,289.19	3,485.47	3,826.43	4,081.91	6,315.92
40+	231.47	412.95	610.53	935.53	1,416.44	1,954.96	2,658.94	3,475.43	4,858.38	6,220.61	5,100.26
Combined	105.09	226.63	423.11	630.09	911.25	1,302.30	1,809.07	2,515.85	2,872.05	3,493.70	3,716.60

^a Standardized to U.S. 1980 population by 5-year strata greater than 30 years of age.

Table 13
Age-specific rate ratios for white female current smokers, by level of cigarette consumption

Cigarettes Per Day	Age										
	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Lung Cancer											
1-9		1.69	0.81	1.06	1.56	1.27	1.68	0.88	1.01		0.91
10-19		2.62	2.10	3.49	2.56	3.32	3.19	3.36	2.72	3.38	2.71
20		8.48	8.89	7.71	6.41	4.74	8.34	6.33	3.06	1.25	3.79
21-39		18.20	11.87	12.80	9.54	10.06	11.86	9.31	14.41		67.21
40+		10.78	13.64	15.07	24.17	7.89	5.48	15.37	6.75		8.24
Combined		6.28	5.39	5.53	4.80	3.83	4.80	3.80	2.59	1.27	2.05
Coronary Heart Disease											
1-9	9.20	0.68	1.89	1.59	1.41	1.17	1.06	1.07	1.09	1.18	0.91
10-19	7.37	2.36	2.72	2.63	2.43	1.85	1.77	1.55	1.47	1.33	1.22
20	3.63	3.24	3.81	2.96	2.02	1.86	1.78	1.21	1.19	1.20	1.45
21-39	19.48	5.82	3.59	4.16	2.91	2.25	1.79	1.91	1.93	1.54	1.57
40+	6.47	4.02	4.34	3.87	2.82	1.86	1.18	0.78	0.57	1.71	1.42
Combined	6.53	2.90	2.83	2.96	2.43	1.77	1.58	1.45	1.26	1.23	1.06
Cerebrovascular Disease											
1-9	2.30	1.69	1.26	1.49	1.45	1.36	0.98	1.30	0.98	0.89	0.69
10-19	5.53	1.31	2.33	2.58	2.41	2.42	1.63	1.09	1.15	1.05	0.87
20	3.42	2.73	3.23	2.91	2.44	2.25	1.86	1.40	1.32	1.03	0.77
21-39	4.87	0.91	4.26	3.14	2.11	1.97	1.29	1.19	2.39	0.73	0.62
40+		2.69	5.30	4.23	4.30	3.43	1.96	1.17	2.40		0.88
Combined	3.81	1.86	2.67	2.54	2.21	2.07	1.48	1.25	1.18	0.95	0.75
											1.06

Table 13 (continued)

Cigarettes Per Day	Age										
	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+ US80 ^a
Chronic Obstructive Pulmonary Disease											
1-9				2.54	4.65	1.68	2.79	1.30		3.62	1.89
10-19		6.29	3.40	6.65	6.74	6.16	4.58	11.34	2.01	3.70	5.11
20		6.02	4.05	10.95	18.38	14.12	11.44	12.35	1.49		6.72
21-39		6.39	4.57	7.42	16.97	5.45	23.55	22.17	25.11		15.31
40+		19.09		13.16	43.24	6.73	19.44	34.61			11.57
Combined		5.20	2.80	7.23	11.54	7.00	7.01	8.23	1.51	2.90	4.93
All-Cause Mortality											
1-9	0.79	1.01	1.11	1.13	1.20	1.13	1.04	1.10	1.11	1.07	0.86
10-19	1.47	1.03	1.40	1.40	1.64	1.54	1.41	1.29	1.30	1.16	0.96
20	1.17	1.73	1.71	1.75	1.84	1.67	1.74	1.63	1.27	1.25	0.96
21-39	1.67	1.85	1.90	1.93	1.96	2.06	1.56	1.74	1.96	1.25	1.48
40+	0.83	2.51	2.67	2.29	2.78	2.47	1.68	1.62	1.37	1.15	1.17
Combined	1.21	1.39	1.53	1.53	1.66	1.53	1.40	1.34	1.24	1.14	0.92
											1.21

^a Standardized to U.S. 1980 population by 5-year strata greater than 30 years of age.

Table 14
Age-specific excess mortality (rate difference) for white female current smokers, by level of cigarette consumption

Cigarettes Per Day	Age										
	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+
Lung Cancer											
1-9		1.14	-0.71	0.32	3.85	3.94	11.34	-2.48	0.52		-0.82
10-19		2.68	4.04	12.46	10.86	33.36	36.81	49.65	66.11	113.10	16.44
20		12.40	29.09	33.59	37.52	53.81	123.18	112.01	79.26	11.88	164.77
21-39		28.52	40.05	59.07	59.25	130.38	182.15	174.66	514.86		3,907.92
40+		16.22	46.58	70.43	160.76	99.14	75.20	302.05	220.68		69.74
Combined		8.75	16.18	22.66	26.39	40.72	63.81	58.90	60.92	12.80	61.94
Coronary Heart Disease											
1-9	11.80	-2.69	13.28	17.32	27.69	26.69	21.27	50.53	119.09	421.16	-435.41
10-19	9.17	11.25	25.85	48.25	96.27	137.26	265.62	378.22	625.83	762.21	1,130.82
20		21.84	33.62	83.11	131.50	164.55	299.76	534.54	276.20	444.43	998.12
21-39	26.61	39.99	38.82	93.28	128.16	200.77	274.82	622.77	1,224.47	1,226.77	2,889.48
40+		45.34	45.31	98.71	192.69	292.97	297.02	125.97	-284.21	-975.03	3,588.69
Combined	7.96	15.78	27.46	58.00	95.86	124.47	200.49	308.87	343.81	534.95	318.32
Cerebrovascular Disease											
1-9	3.74	4.56	2.43	8.77	11.34	19.54	-2.21	81.72	-15.71	-154.32	-1,001.90
10-19	13.03	2.05	12.61	28.18	35.66	76.21	79.24	23.83	96.61	66.24	-414.21
20	6.96	11.45	21.18	34.14	36.55	67.33	107.42	111.29	209.21	47.15	-731.29
21-39	11.15	-0.60	30.90	38.21	28.24	52.03	36.72	51.00	901.14	-374.91	-1,209.50
40+		11.24	40.79	57.58	83.66	130.72	120.36	47.94	906.45		-19.55
Combined	8.09	5.73	15.86	27.42	30.74	57.70	60.19	69.50	118.65	-63.65	-814.11
											10.45

Table 14 (continued)

Cigarettes Per Day	Age											
	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	US80 ^a
Chronic Obstructive Pulmonary Disease												
1-9					1.96	7.19	3.11	14.86	4.48		109.37	3.41
10-19			2.79	2.80	7.20	11.29	23.51	29.74	154.84	40.31	112.63	15.74
20			2.64	3.56	12.67	34.22	59.82	86.71	169.91	19.43		21.90
21-39			2.84	4.17	8.18	31.44	20.31	187.36	316.98	964.99		54.77
40+			9.53		15.50	83.18	26.10	153.22	503.16			40.47
Combined			2.21	2.10	7.94	20.75	27.36	49.96	108.16	20.35	79.21	15.02
All-Cause Mortality												
1-9	-21.35	1.34	23.91	41.64	87.38	92.58	44.13	214.02	404.33	490.61	-2,026.40	22.59
10-19	47.72	4.36	84.93	129.08	280.45	389.08	496.21	587.89	1,149.69	1,116.98	-517.04	233.43
20	17.30	109.32	151.47	244.61	369.14	484.22	890.65	1,295.42	1,018.92	1,725.55	-620.83	353.36
21-39	67.52	127.80	192.80	301.71	419.22	762.73	671.52	1,511.79	3,625.62	1,705.75	7,098.13	679.91
40+	-17.31	225.59	358.70	421.11	777.79	1,055.52	817.63	1,268.50	1,393.41	1,057.78	2,546.14	535.67
Combined	21.45	59.01	112.76	171.32	287.53	384.15	487.15	700.73	907.02	964.11	-1,172.10	220.54

^a Standardized to U.S. 1980 population by 5-year strata greater than 30 years of age.

White Females— All-cause and cause-specific mortality rate ratios are generally lower for white females than for white males. Excess mortality rates among smokers also are lower for each cause of death among white females compared to white males. The general pattern of dose-response relationships and change in risk with age is similar for white males and females once the difference in magnitude of risks is considered. Part of the difference between white males and white females in relative and excess mortality is attributable to differences in duration of smoking between males and females of the same age, particularly among the older age groups. Males began to smoke cigarettes in large numbers in the early part of this century, whereas females initiated smoking during the late 1930's and 1940's (see Chapter 2). Female smokers in CPS-I also smoked fewer cigarettes per day than male smokers, contributing to their lower age-specific rate ratios.

Black Males— Numbers of deaths and PMO's among black males were substantially smaller than those among whites of both genders. There were only two deaths from lung cancer and no deaths from COPD among black male never-smokers. Among black male smokers there were 62 deaths from lung cancer and 24 deaths from COPD. Mortality rates for black male smokers are presented for age groups where deaths occurred (Table 7). To allow some approximation of the risks occurring among black male smokers, white male age-specific never-smoker death rates are compared with rates among black male smokers to generate rate ratio estimates (Table 8).

The patterns seen in lung cancer and CHD rate ratios with number of cigarettes per day and age-specific changes in rate ratio are similar for black and white males. The absence of deaths from COPD among black male never-smokers precludes estimation of the rate ratios, but when white male never-smoker rates are used, an overall COPD rate ratio of 8.39 is calculated for black males compared with 10.96 among white males.

No smoking-related increased risk for CVD is evident among black male smokers, and the increased risk demonstrated when white male never-smoker rates are used probably reflects the higher rates of CVD among all black males.

Black Females— Numbers of deaths and PMO's among black females were larger than those available for black males but were still substantially smaller than those for white males or females. Only modest increases in risks for lung cancer and CHD are demonstrable among black female smokers, and there does not appear to be an increased risk for CVD or all-cause mortality. There were too few deaths from COPD among black female smokers and never-smokers for meaningful estimation.

Changes in the Risk of Smoking With Duration of Smoking Risks of smoking cigarettes have traditionally been expressed in relation to the age of the smoker, using age-specific rates for never-smokers as a comparison group. However, individuals begin smoking at different ages, and a given age group of smokers may contain individuals with markedly different durations of exposure. Therefore, categorizing disease risks by duration of smoking, rather than age, may be a more accurate method of examining this exposure. Tables 1 and 2

present rate ratio of cigarette smoking stratified by duration of smoking and number of cigarettes smoked per day. The comparison rate of never-smokers is a weighted average of never-smoker age-specific rates corresponding to those age groups of smokers each duration category. The age-specific rates of never-smokers are weighted by the PMO's in each age group of smokers within the duration category. Therefore, these rate ratios include any effect modification due to the differences in distribution by age of the population contained in the duration-specific strata.

Three variables define the temporal dimensions of smoking exposure: attained age, age of initiation, and duration of smoking. Once any two of these variables are specified for an individual smoker, the third is fixed, and attained age and duration of smoking become collinear variables. Because these variables are time based and because much smoking initiation occurs during a narrow period of adolescence and young adulthood, attained age for a population is an index of duration of exposure. Presentation of rate ratios in relation to the duration of cigarette use allows examination of risk with both principal determinants of smoking-related risk (duration and number of cigarettes smoked per day) stratified in the same table.

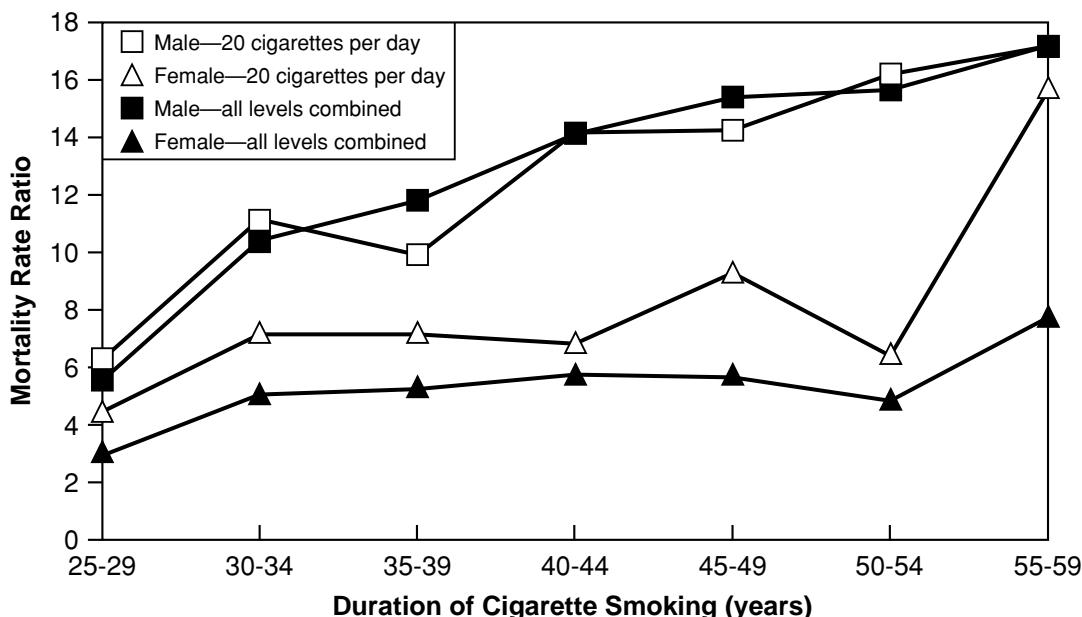
White Males—
Table 1 In contrast to age-specific rate ratios for lung cancer and COPD, which increase, peak, and then decline with age, duration-specific risks for these diseases increase steadily with increasing duration, excluding the 60+ years-of-duration category. The pattern for CHD is different, with rate ratios increasing to the 30- to 34-years-of-duration category and then declining. Cigarette smoking is the dominant etiologic factor for lung cancer and COPD in the population, and duration is a powerful determinant of that risk; however, CHD has a multifactorial etiology, and duration of exposure plays a less powerful role in determining risk. The pattern for CVD rate ratios is also an increase and then a decline, with the peak in rate ratios occurring at a somewhat longer duration than for CHD.

A second observation from these data is the lag time between initiation of smoking and the onset of an increased risk of the different diseases. Rate ratios for lung cancer and CHD are low, and there is no clear dose-response relationship with number of cigarettes smoked per day until the 20- to 24-years-of-duration category. The rate ratios for COPD begin to rise with the 35- to 39-years-of-duration category, and this is the first category with a consistent dose-response. A pattern for CVD is not clearly manifest but may be similar to that for CHD. The rate ratios for all-cause mortality first show a consistent dose-response with the 20- to 24-years-of-duration category.

White Females—
Table 2 Table 2 presents rate ratios for female smokers stratified by the major differences between males and females in smoking behavior: duration of smoking and number of cigarettes smoked per day. Rate ratios for lung cancer and all-cause mortality among females are generally well below the rate ratios for males in the same strata. Figure 4 presents duration-specific lung cancer rate ratios for males and females who smoke 20 cigarettes per day and for all levels of consumption combined.

Figure 4

Rate ratio by duration of cigarette smoking for white males and females who smoked 20 cigarettes per day and for all levels of consumption



The lung cancer risks for males are higher than those for females for all levels of consumption combined and for a specific dose (20 cigarettes per day).

The rate ratios for 20 cigarettes per day are similar to the all-levels-combined ratios for males, but the combined rate ratios are lower than the 20-cigarettes-per-day level for females. This suggests that there are additional reductions in female combined rate ratios produced by the relative distribution of female smokers into those strata with lower numbers of cigarettes smoked per day. Differences between male and female lung cancer risks are not entirely explained by differences in duration and current number of cigarettes smoked per day in this population. Differences in number of cigarettes smoked per day in the past, in tar yield of the cigarettes smoked, in depth of inhalation, or in other factors may explain these differences in lung cancer risks, as may differences between males and females in the age distributions of the individual strata.

When rate ratios for COPD are compared for males and females in the same dose and duration strata, rate ratios are similar or slightly higher for white females. Combined rate ratios are lower because of differences in distribution of dose and duration among females, but rate ratios for specified dose and duration categories are similar or elevated. There are a smaller number of deaths from COPD among women, making the rate ratios estimates somewhat unstable; there also may be a lower COPD death rate among female never-smokers compared with male never-smokers.

Changes in the Risk of Smoking With Duration of Cessation Rate ratios for all-cause and tobacco-related disease-specific mortality decline with cessation of cigarette smoking. Mortality risks within the first year of cessation are often reported to be higher than those for continuing smokers because many individuals quit following diagnosis of disease. For this reason, we have reported rate ratios beginning after the second year of cessation and have excluded those deaths and person-years of followup that occurred during the first 24 months of cessation.

White Males— A steady decline in all-cause rate ratios occurs with continuing cessation; by 20 to 24 years of cessation, all-cause rate ratios have returned to one. Rate ratios for lung cancer also decline but seem to plateau once 20 years of cessation has been reached. Rate ratios remain elevated at approximately 1.5 to 2 times that of never-smokers even for long durations of smoking. Rate ratios for CHD decline more rapidly than those for lung cancer, but an increased risk appears to remain for 20 years following cessation. A similar pattern of rate ratio decline occurs with cessation for CVD.

Rate ratios for COPD decline steadily with cessation, but the risks for the first 9 years of cessation are higher than those of continuing smokers. This may be attributable to the high rate of cessation that occurs following the development of clinically significant lung disease. A substantial amount of lung injury must occur to result in symptoms from COPD. This injury is not reversed with cessation, and a substantial period usually occurs between onset of symptoms and death from respiratory failure. In many patients, COPD will progress and eventually cause death, even if the patients stop smoking. It is likely that these clinically symptomatic individuals who quit smoking elevate the COPD death rate among former smokers for several years following cessation. As with lung cancer, the rate ratios for COPD do not return to 1 and appear to remain elevated even after prolonged cessation.

White Females— The number of former smokers among white females was much smaller than among males, particularly for former smokers of long duration. Clear declines in rate ratio were evident for CHD, CVD, and all-cause mortality, but the limited number of observations do not allow a clear conclusion to be drawn about rate ratios for lung cancer and COPD.

Changes in the Risk of Smoking With Age of Initiation Early age of initiation may increase the risk of smoking-related disease in two ways. One, early age of initiation increases the duration of smoking at any given age, and two, duration is a powerful determinant of smoking-related risk. However, it also has been postulated that the dose-to-produce-an-effect relationship for carcinogenic transformation may be lower at younger ages, making early age of initiation a factor in defining risk independent of its contribution to duration of smoking (Moolgavkar et al., 1989). The hypothesis that early age of initiation may increase risk has been incorporated into some models of tobacco carcinogenesis (Moolgavkar et al., 1989). Appendix B presents data on age-specific, duration-specific, and number-of-cigarettes-per-day-specific mortality. These data can be used to examine the effect of early age of

initiation, independent of its contribution to duration, by comparing rates for groups with different ages of initiation but the same durations of smoking.

Attained age, age of initiation, and duration of smoking are three time-based variables determining smoking risk. If a constant duration category is defined, only one of the other terms (age of initiation or attained age) can be varied, because fixing age of initiation and duration specifies the attained age of the smoker. Tables in Appendix B and figures 5 and 6 in this chapter are presented by attained age rather than age of initiation because attained age was recorded in single years, whereas age of initiation was recorded as a categorical variable. However, attained age is linked to age of initiation in these tables and figures, and can be converted to age of initiation by subtracting the duration from attained age.

Age of Initiation and Rate Ratio of Lung Cancer Figure 5 presents rate ratios for lung cancer for those cells in Appendix B of constant durations. Risks are plotted against attained age, and regression lines are presented for points representing specific numbers of cigarettes smoked per day. Each graph within the figure is for a single duration-of-exposure category.

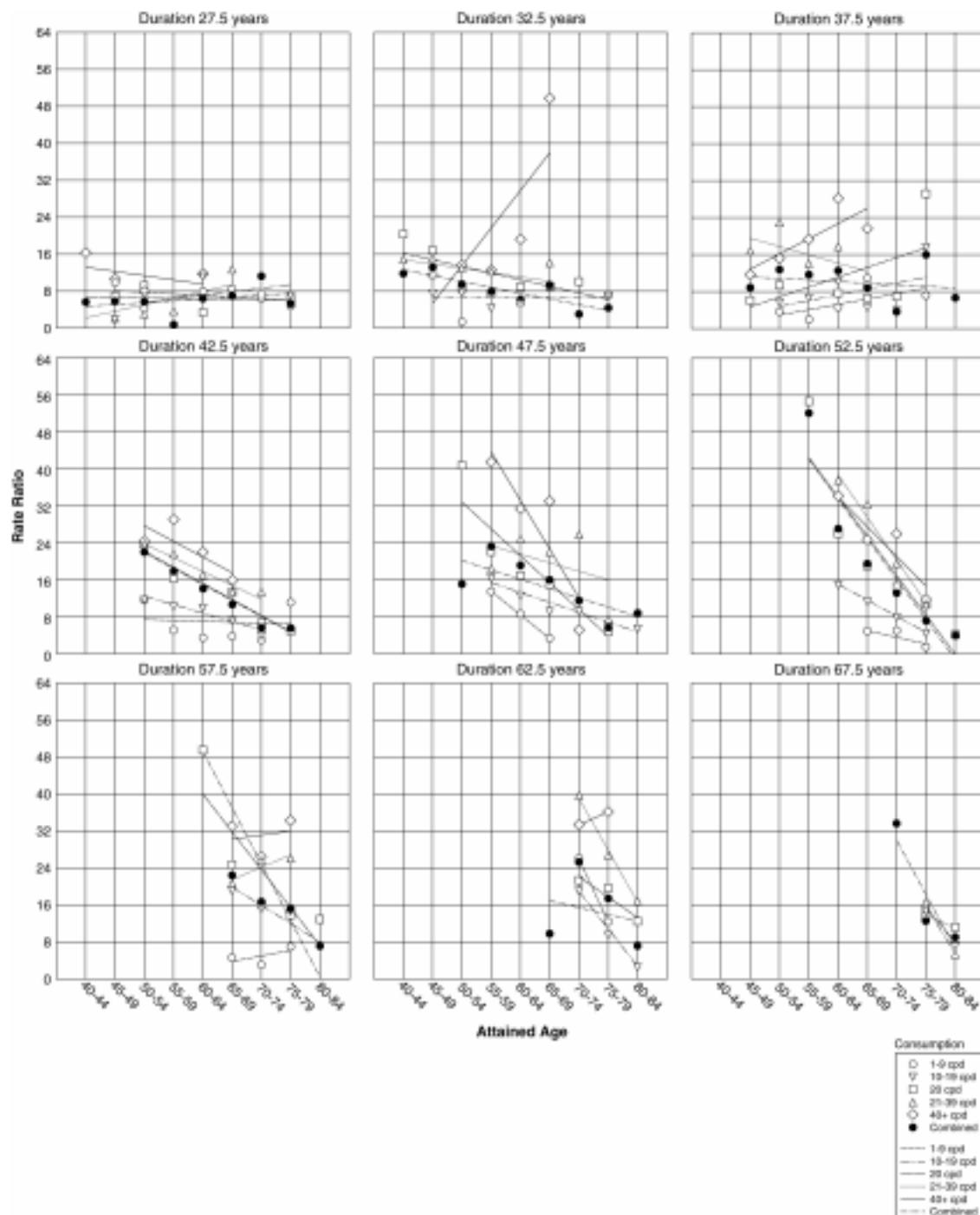
No clear pattern emerges in slopes of the regression lines of the rate ratios until the 40- to 44-years-of-duration category is reached, and then a clear negative slope with increasing attained age occurs for most of the regression lines. Interpretation of changes in rate ratios with attained age is complicated by the previously described decline in rate ratio with increasing age.

The authors postulated that an effect of age of initiation, independent of its effect on duration of exposure, also would be manifest as a decrease in excess mortality rates with increasing attained age among smokers with similar durations of smoking. Figure 6 presents the log of excess mortality rates for smokers of constant durations. Risks are plotted against attained age, and regression lines are presented for points representing specific numbers of cigarettes smoked per day. Each graph within the figure is for a single duration-of-exposure category. Slopes of the lines with increasing age within duration categories tend to be positive for the three shortest duration categories. However, the slopes of the lines for the five longest categories are not significantly greater than zero. An independent effect of age of initiation should result in higher excess mortality at the younger ages within constant duration categories. A constant duration line should then have a negative slope with increasing attained age because an older attained age for the same duration of smoking means that smoking must have been initiated later in life.

We conclude from these analyses that the major contribution of early age of initiation to increased risk of lung cancer is mediated through the longer duration of smoking at any given age that occurs with earlier age of initiation. An independent effect of age of initiation, if any exists, would be small.

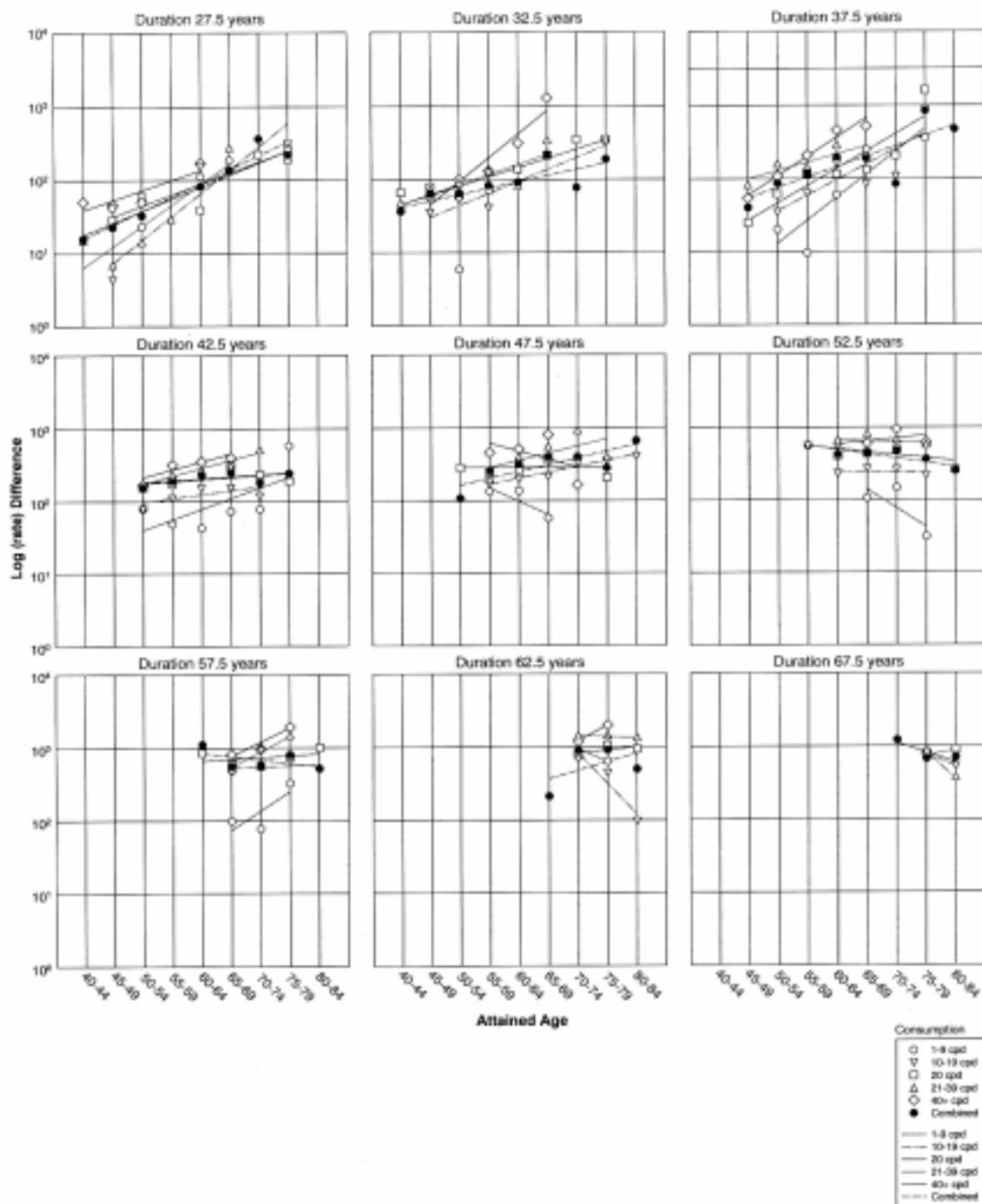
Figure 5

Rate ratios for lung cancer for white males for smoking by duration, level of consumption, and age



Key: cpd = cigarettes per day.

Figure 6
Excess mortality for white males for smoking by duration, level of consumption, and age



Key: cpd = cigarettes per day.

An increase in excess mortality rates for smokers with increasing attained age is observed for the three shortest duration-of-exposure categories. The age-specific rates for never-smokers already have been subtracted from the rate for smokers, so any independent additive effect of age should already have been removed from the values in the graphs. This positive slope with attained age might represent an interaction of age and smoking such that smoking at an older age carries with it an increased risk in comparison to the same intensity of smoking at a younger age. If this interaction is present, a positive slope could be expected among the longer duration-of-exposure categories, and there is none. It is possible that an interaction with age might be small or might have a maximum effect that is reached at shorter durations. The interaction then might be overwhelmed by the larger effect of duration of exposure at longer durations.

An additional likely possibility is that individuals with short durations of smoking and older attained ages (i.e., who began smoking later in life) may have begun smoking cigarettes after having smoked pipes or cigars for several years. This would result in these smokers, when reporting their duration of smoking cigarettes, underestimating their total duration of exposure to tobacco smoke and overestimating the risk of smoking for a given duration. Many males switched from smoking pipes and cigars to smoking cigarettes in the early part of this century (see Chapter 2), and the older age groups of smokers in the CPS-I population are likely to contain many individuals who switched to cigarettes earlier in life.

APPENDICES *Appendix A* is a set of risk ratio tables for age and number of cigarettes smoked per day for an expanded list of causes of death. This appendix allows examination of dose-response relationships for these causes of death as well as presenting summary risk ratios. Tables are presented for white males and white females separately.

Appendix B is a series of detailed tables of risk by duration of smoking. Risks are presented for age-specific and number-of-cigarettes-smoked-per-day-specific categories for each duration of exposure. Never-smoker rates used in these tables are based on a logistic regression of the never-smoker age-specific rates for each cause of mortality. Risk estimates for white males and white females are presented for lung cancer, CHD, CVD, COPD, and all-cause mortality. Tables 1a-1f through 10a-10f present observed number of deaths, PYO's, never-smoker rates, excess mortality rates, and rate ratios for smokers compared with never-smokers.

Appendix C lists the number of deaths and PYO's for lung cancer, CHD, CVD, COPD, and all-cause mortality by age group for black never-smokers and current smokers of both genders and white never-smokers, current smokers, and former smokers of both genders.

Appendix D gives the age-specific rates by disease, and for all-cause mortality, for never-smokers. The rates are presented as observed death rates and fitted death rates resulting from Poisson regression and linear regression of the log rates.

REFERENCES

- Garfinkel, L. Selection, follow-up, and analysis in the American Cancer Society prospective studies. *National Cancer Institute Monographs* 67: 49-52, 1985.
- Hammond, E.C. Smoking in relation to the death rates of one million men and women. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 127-204.
- Hammond, E.C., Garfinkel, L., Seidman, H., Lew, E.A. Some recent findings concerning cigarette smoking. In: *Origins of Human Cancer. Book A: Incidence of Cancer in Humans*, H.H. Hiatt, J.D. Watson, and J.A. Winsten (Editors). Cold Spring Harbor Conference on Cell Proliferation, Vol. 4. Cold Spring Harbor, NY: Cold Spring Harbor Laboratory, 1977, pp. 101-122.
- Moolgavkar, S.H., Dewanji, A., Luebeck, G. Cigarette smoking and lung cancer: Reanalysis of the British doctors' data. *Journal of the National Cancer Institute* 81(6): 415-420, 1989.
- U.S. Department of Health and Human Services. *Reducing the Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General*, 1989. DHHS Publication No. (CDC) 89-8411. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1989.
- World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death* (7th ed. rev. of the International Lists of Diseases and Causes of Death, adapted 1955). Vol. 1. Geneva: World Health Organization, 1957.

Appendix A

Cause-Specific Risk Ratio of Mortality for White Males and Females for All Causes of Death

The tables in this appendix depict mortality risk ratio by cause of death for current smokers compared to never-smokers by level of cigarette consumption for 15-year age groups.

Cigarette consumption groups:

- 1-19 cigarettes per day;
- 20 cigarettes per day;
- 21+ cigarettes per day; and
- combined levels.

Age groups:

- 35-49 years;
- 50-64 years;
- 65-79 years;
- 80+ years; and
- combined ages.

The minimum requirement for a cell to display a ratio is two deaths in the category for both current smokers and never-smokers. All ratios are standardized by 5-year age-specific rates to the 1980 U.S. population.

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE MALE / Coronary Artery Disease (Heart Disease) (Deaths: 15644/8192)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	3.0	1.8	1.4	1.1	1.4
20	4.0	2.2	1.5	1.2	1.6
21 +	4.7	2.3	1.5	1.2	1.6
combined	4.1	2.1	1.4	1.1	1.5

WHITE MALE / Rheumatic Heart Disease, Acute & Chronic (Deaths: 317/198)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.5	1.6	0.9	1.8	1.1
20	1.2	1.3	0.7		1.0
21 +	1.2	1.1	0.9		1.1
combined	1.0	1.3	0.8	1.6	1.1

WHITE MALE / Hypertensive Heart Disease (Deaths: 713/495)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.1	1.5	1.4	0.8	1.2
20	1.7	1.5	1.4	0.9	1.2
21 +	3.1	1.9	1.5	1.7	1.7
combined	2.1	1.6	1.4	0.9	1.3

WHITE MALE / Cerebrovascular Disease (Deaths: 2930/2550)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	3.5	1.7	1.3	1.0	1.2
20	3.2	2.0	1.3	1.0	1.2
21 +	4.2	2.5	1.4	0.9	1.2
combined	3.6	2.1	1.3	1.0	1.2

WHITE MALE / Aortic Aneurysm (Deaths: 804/149)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		3.1	4.4	3.0	3.6
20		4.2	6.1	3.9	5.0
21 +		5.3	8.2	4.5	6.3
combined		4.3	5.9	3.5	4.7

WHITE MALE / Hypertension (Deaths: 104/82)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.9	1.4	0.5	0.9
20		1.6	1.5	1.6	1.5
21 +	0.6	2.0	2.0		1.2
combined	0.2	1.8	1.6	0.9	1.2

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE MALE / Other Heart & Circulatory (Deaths: 1992/1478)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.3	1.9	1.4	1.2	1.4
20	1.0	2.0	1.6	1.2	1.4
21 +	1.4	2.5	1.7	0.9	1.3
combined	1.3	2.1	1.5	1.2	1.4

WHITE MALE / Peptic Ulcer (Deaths: 342/98)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	2.9	4.5	3.0	2.3	2.9
20	0.9	4.5	2.7	2.1	2.6
21 +	1.9	5.4	3.9	3.7	3.9
combined	1.7	4.8	3.0	2.4	2.9

WHITE MALE / Kidney Infection, Nephritis/Nephrosis (Deaths: 361/275)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	2.7	1.1	1.2	0.9	1.2
20	1.0	1.2	1.5	1.3	1.3
21 +	0.6	1.4	1.7	1.1	1.1
combined	1.2	1.2	1.4	1.0	1.2

WHITE MALE / Cirrhosis of Liver (Deaths: 536/123)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	5.8	2.0	1.5	2.0	
20	3.0	2.7	2.1	2.2	
21 +	6.3	4.5	2.7	3.4	
combined	4.9	3.2	2.0	2.5	

WHITE MALE / Diabetes (Deaths: 401/307)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.0	0.6	1.4	0.9
20	0.6	1.5	1.1	0.7	1.0
21 +	3.0	1.8	1.5		1.1
combined	1.4	1.5	1.0	1.0	1.1

WHITE MALE / Tuberculosis (Deaths: 54/25)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		4.4	2.9		1.8
20		2.3	2.2		1.8
21 +		2.1	1.9		1.1
combined		2.8	2.4		1.6

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE MALE / Pneumonia, Influenza (Deaths: 649/464)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.3	1.7	1.8	1.1	1.3
20	0.8	3.1	1.8	1.5	1.7
21 +	0.4	3.4	2.2	1.1	1.6
combined	0.6	2.8	1.9	1.2	1.5

WHITE MALE / C O P D (Deaths: 1374/119)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		6.5	9.6	8.3	8.8
20		11.4	13.6	10.7	12.2
21 +		13.2	18.5	9.0	14.1
combined		10.9	13.0	9.2	11.3

WHITE MALE / Asthma (Deaths: 90/34)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		2.4	2.2	2.7	2.4
20		2.8	2.1		2.3
21 +		2.0	1.7		1.3
combined		2.4	2.0	2.3	2.2

WHITE MALE / Other Respiratory (Deaths: 254/108)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		2.8	1.9	1.7	1.8
20	0.5	3.2	2.4	2.2	2.3
21 +		4.7	2.4		2.1
combined	0.4	3.6	2.2	1.8	2.1

WHITE MALE / Suicide (Deaths: 519/221)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	2.2	1.2	0.9		1.2
20	2.1	1.1	1.5		1.3
21 +	1.7	2.0	1.7		1.7
combined	1.9	1.4	1.3	0.5	1.4

WHITE MALE / Violence (Deaths: 1097/623)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.0	1.1	1.1	1.2	1.1
20	1.7	1.3	1.3	1.1	1.3
21 +	2.2	1.3	1.3	1.7	1.3
combined	1.8	1.3	1.2	1.2	1.3

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE MALE / Cancer, Buccal & Pharyngeal (Deaths: 230/29)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		5.5	3.8	3.6	3.9
20		8.8	3.8		4.1
21 +		11.5	8.6		6.3
combined		9.0	5.0	2.5	4.9

WHITE MALE / Cancer, Esophagus (Deaths: 160/30)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		2.6	2.7		2.4
20		4.5	5.1		3.9
21 +		6.0	5.5		5.4
combined		4.6	4.4	1.8	3.7

WHITE MALE / Cancer, Stomach (Deaths: 365/230)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.6	1.3	0.8	1.2
20		1.8	1.4	0.6	1.2
21 +		2.0	1.7		1.5
combined		1.8	1.4	0.8	1.3

WHITE MALE / Cancer, Colon, Large Intestine (Deaths: 591/483)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		0.9	1.0	1.2	1.0
20	0.5	0.9	1.1	1.5	1.1
21 +	1.3	1.0	1.4		1.1
combined	0.7	1.0	1.1	1.2	1.1

WHITE MALE / Cancer, Rectum (Deaths: 210/134)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.1	1.1	1.9	0.8	1.3
20	2.0	1.0	1.4	1.6	1.4
21 +	0.8	1.1	1.4	3.0	1.7
combined	1.4	1.0	1.6	1.3	1.4

WHITE MALE / Cancer, Liver & Biliary (comb) (Deaths: 174/86)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.5	1.1	1.2	1.2
20		3.1	1.6		1.3
21 +		3.0	1.7		1.9
combined		2.7	1.4	0.8	1.4

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE MALE / Cancer, Liver (Deaths: 115/45)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.3	1.3		1.3
20		3.4	2.3		1.8
21 +		2.4	3.1		2.9
combined		2.5	2.0	1.0	1.8

WHITE MALE / Cancer, Biliary passages (Deaths: 40/24)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.5	1.3		1.3
20		2.0	1.4		1.1
21 +		3.5			0.6
combined		2.5	1.1		1.2

WHITE MALE / Cancer, Gall Bladder (Deaths: 19/17)

cig\age	35-49	50-64	65-79	80+	comb age
1-19			0.7		1.0
20					0.3
21 +			0.9		0.9
combined			0.6		0.8

WHITE MALE / Cancer, Pancreas (Deaths: 549/198)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.4	1.8	1.8	1.1	1.6
20	1.2	2.4	2.3	1.3	2.0
21 +	1.5	2.5	2.6		2.2
combined	1.4	2.3	2.2	1.2	1.9

WHITE MALE / Cancer, Larynx (Deaths: 105/4)

cig\age	35-49	50-64	65-79	80+	comb age
1-19			8.0		8.8
20			30.2		26.0
21 +			26.9		21.1
combined			20.8		19.1

WHITE MALE / Cancer, Lung & Bronchus (Deaths: 3163/191)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	3.8	7.1	8.4	2.4	6.1
20	9.5	12.9	14.8	8.2	12.2
21 +	11.5	19.3	23.4	14.7	19.2
combined	9.1	13.8	14.3	5.6	11.4

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE MALE / Cancer, Prostate (Deaths: 563/572)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		0.9	1.5	1.1	1.2
20		1.3	1.2	0.9	1.0
21 +		1.3	1.0	0.7	0.9
combined		1.2	1.3	0.9	1.1

WHITE MALE / Cancer, Kidney (Deaths: 182/89)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.7	1.1	1.5	1.5
20		1.3	1.1		1.0
21 +		1.9	1.5		2.4
combined		1.6	1.2	1.4	1.5

WHITE MALE / Cancer, Urinary Bladder, Urinary System (Deaths: 318/102)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		3.0	2.0	3.1	2.2
20		5.0	3.0	3.8	3.1
21 +		5.8	3.7	4.7	3.9
combined		4.8	2.8	3.5	2.9

WHITE MALE / Cancer, Non-Hodgkin's Lymphoma (Deaths: 229/154)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.4	0.7	1.5	1.6	1.1
20	0.8	1.0	1.0		1.0
21 +	0.6	0.8	1.3		0.9
combined	0.7	0.9	1.3	1.4	1.1

WHITE MALE / Cancer, Multiple Myeloma (Deaths: 92/80)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.1	0.9		0.8
20		1.4	0.7		0.7
21 +		1.2	0.7		0.7
combined		1.3	0.8		0.8

WHITE MALE / Cancer, Leukemia (Deaths: 327/225)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.2	0.9	1.0	1.5	1.1
20	1.2	1.2	1.2	0.8	1.1
21 +	1.3	1.7	1.6	3.0	1.7
combined	1.3	1.3	1.1	1.4	1.2

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE MALE / Cancer, Hodgkin's Lymphoma (Deaths: 73/33)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.1	4.6	0.5	2.3	1.6
20	2.9	4.3	0.7		1.8
21 +	1.4	3.5	0.4		0.9
combined	1.9	4.1	0.6	1.7	1.6

WHITE MALE / Cancer, Melanoma of skin (Deaths: 58/54)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		0.6	0.7		0.4
20	0.8	0.5	1.2		0.9
21 +	0.6	1.2	0.5		0.6
combined	0.6	0.8	0.8		0.7

WHITE MALE / Cancer, Skin, non-melanoma (Deaths: 21/16)

cig\age	35-49	50-64	65-79	80+	comb age
1-19					
20			1.8		1.9
21 +					0.5
combined			0.8		0.9

WHITE MALE / Cancer, Brain (Deaths: 232/115)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.2	0.9		1.1
20	2.1	1.6	1.1		1.5
21 +	1.6	1.4	0.9		1.2
combined	1.6	1.4	1.0		1.3

WHITE MALE / Cancer, Bone (Deaths: 32/15)

cig\age	35-49	50-64	65-79	80+	comb age
1-19			1.5	4.0	2.2
20		2.3	1.0		1.1
21 +		1.9	1.5		1.3
combined		1.7	1.4	2.3	1.9

WHITE MALE / Cancer, Other (Deaths: 639/221)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.6	2.5	1.8	1.5	1.8
20	1.7	2.7	2.0	2.7	2.3
21 +	1.9	3.6	2.8		2.5
combined	1.5	3.0	2.1	1.8	2.2

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
Current smoker rate divided by never smoker rate.
Standardized by 5-year age-specific rates to 1980 US Population.
Minimum deaths for cell: 2/2

WHITE MALE / Other Diseases (Deaths: 1562/998)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.9	1.2	1.3	1.0	1.2
20	2.4	1.7	1.3	0.8	1.2
21 +	2.5	1.7	1.5	1.0	1.4
combined	2.3	1.6	1.4	1.0	1.3

WHITE MALE / All Causes Combined (Deaths: 38181/19637)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.7	1.7	1.5	1.2	1.4
20	2.3	2.2	1.7	1.3	1.6
21 +	2.6	2.5	1.9	1.3	1.8
combined	2.3	2.2	1.7	1.2	1.6

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE FEMALE / Coronary Artery Disease (Heart Disease) (Deaths: 3717/16458)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	2.7	1.8	1.3	1.1	1.2
20	3.2	2.5	1.5	1.1	1.4
21 +	5.3	2.9	1.7	1.3	1.6
combined	3.2	2.1	1.4	1.1	1.3

WHITE FEMALE / Rheumatic Heart Disease, Acute & Chronic (Deaths: 269/752)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.3	1.5	1.0	1.2	1.2
20	2.2	1.0	1.8		1.5
21 +	1.1	0.8	1.6		1.0
combined	1.5	1.3	1.3	1.1	1.3

WHITE FEMALE / Hypertensive Heart Disease (Deaths: 444/2130)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.2	1.4	1.2	0.9	1.1
20	1.1	2.5	1.5	1.3	1.5
21 +	1.5	2.3	1.6		1.6
combined	1.2	1.8	1.3	1.0	1.2

WHITE FEMALE / Cerebrovascular Disease (Deaths: 1483/8235)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.9	2.0	1.1	0.8	1.0
20	3.1	2.5	1.5	0.8	1.2
21 +	3.3	2.7	2.0	0.5	1.1
combined	2.5	2.2	1.3	0.8	1.0

WHITE FEMALE / Aortic Aneurysm (Deaths: 144/251)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	6.2	3.4	2.4	4.5	3.5
20	6.1	7.5	4.4	4.2	4.6
21 +		12.4	1.4		4.8
combined	5.3	5.7	2.9	4.5	3.9

WHITE FEMALE / Hypertension (Deaths: 46/245)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.9	1.3	1.1	0.8	0.9
20		2.1	1.2		1.6
21 +		1.0	2.9		1.1
combined	0.8	1.5	1.2	1.0	1.1

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE FEMALE / Other Heart & Circulatory (Deaths: 757/4919)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.9	1.1	1.3	0.8	0.9
20	1.5	2.0	1.5	0.9	1.1
21 +	1.4	1.4	1.5	1.0	1.2
combined	1.2	1.4	1.3	0.8	1.0

WHITE FEMALE / Peptic Ulcer (Deaths: 79/207)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.8	1.4	1.4	0.9	
20	1.9	4.6	3.5	2.6	
21 +	6.9	4.1		4.8	
combined	2.5	2.7	1.9	0.8	1.5

WHITE FEMALE / Kidney Infection, Nephritis/Nephrosis (Deaths: 148/736)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.0	0.8	1.0	0.6	0.8
20	1.6	1.1	1.4	1.9	1.6
21 +	1.3	1.3	0.7		0.5
combined	1.2	1.0	1.1	0.8	1.0

WHITE FEMALE / Cirrhosis of Liver (Deaths: 295/284)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	5.0	2.2	1.5		2.0
20	8.5	4.7	1.8		3.2
21 +	15.9	7.2	0.7		7.4
combined	7.7	3.6	1.5		2.9

WHITE FEMALE / Diabetes (Deaths: 184/1148)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.3	1.0	0.6	0.7	0.7
20	1.7	0.9	1.0		0.9
21 +	2.0	1.5	0.8		1.4
combined	1.0	1.0	0.7	0.7	0.8

WHITE FEMALE / Tuberculosis (Deaths: 11/56)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.4	1.5		0.7
20		1.1			0.5
21 +		1.1	1.4		0.6

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE FEMALE / Pneumonia, Influenza (Deaths: 240/1252)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.3	1.7	1.4	0.8	1.0
20	0.8	1.6	2.2	1.1	1.4
21 +	3.2	4.0	2.7		1.1
combined	1.4	1.9	1.7	0.9	1.2

WHITE FEMALE / C O P D (Deaths: 223/211)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	6.2	4.6	4.7	1.6	3.2
20	10.2	12.7	13.0		7.1
21 +	9.7	14.4	20.5		17.2
combined	7.9	8.1	7.9	2.0	5.0

WHITE FEMALE / Asthma (Deaths: 35/80)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.8	1.5	2.0		1.6
20		2.4	1.5		1.0
21 +		1.6			0.5
combined	0.5	1.8	1.8		1.4

WHITE FEMALE / Other Respiratory (Deaths: 81/252)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.7	1.0	1.0	1.1	1.1
20		1.6	1.8		1.9
21 +		2.6	7.9		6.4
combined	1.0	1.4	1.7	1.7	1.5

WHITE FEMALE / Suicide (Deaths: 220/244)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.1	2.1	1.4		1.5
20	2.3	1.8	1.4		2.3
21 +	3.5	4.9	1.2		3.4
combined	1.8	2.3	1.4		2.0

WHITE FEMALE / Violence (Deaths: 492/1531)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.5	1.1	1.4	1.1	1.3
20	1.0	1.3	1.2	1.9	1.5
21 +	2.2	1.8	2.2		1.1
combined	1.5	1.3	1.4	1.2	1.3

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE FEMALE / Cancer, Buccal & Pharyngeal (Deaths: 79/100)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		2.9	1.1		1.5
20	8.1	6.8	4.4		5.1
21 +		11.6	5.2		4.9
combined	3.3	5.1	2.3		2.8

WHITE FEMALE / Cancer, Esophagus (Deaths: 58/57)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		2.7	2.8		2.3
20		10.7			2.0
21 +		26.6	15.8		10.7
combined		7.9	3.0		3.1

WHITE FEMALE / Cancer, Stomach (Deaths: 104/558)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.2	0.9	0.9		0.6
20	0.5	0.8	1.2		1.2
21 +	0.8	0.9			0.3
combined	0.4	0.9	1.0		0.7

WHITE FEMALE / Cancer, Colon, Large Intestine (Deaths: 405/1988)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.7	1.0	1.0	0.6	0.8
20	0.4	0.8	0.9	0.7	0.8
21 +	0.9	0.7	0.5		0.9
combined	0.6	0.9	0.9	0.7	0.8

WHITE FEMALE / Cancer, Rectum (Deaths: 111/437)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.3	1.3	1.0	1.0	1.0
20	0.5	1.2	0.6		0.6
21 +	0.9	2.1			2.4
combined	0.5	1.3	0.8	1.0	1.0

WHITE FEMALE / Cancer, Liver & Biliary (comb) (Deaths: 108/431)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.2	1.3	0.9		0.9
20	3.5	1.5	1.2		0.9
21 +		1.7	0.6		0.6
combined	1.7	1.4	1.0		0.9

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE FEMALE / Cancer, Liver (Deaths: 60/197)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.3	1.4	0.9		0.7
20	4.3	1.5	0.9		0.9
21 +		2.8			0.8
combined	2.1	1.6	0.9		0.8

WHITE FEMALE / Cancer, Biliary passages (Deaths: 25/74)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.1	1.7		1.5
20		3.0	2.5		1.7
21 +			2.3		1.3
combined	1.7	2.0			1.6

WHITE FEMALE / Cancer, Gall Bladder (Deaths: 23/160)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.3	0.6		0.7
20		0.8	0.8		0.6
21 +					
combined	1.0	0.6			0.7

WHITE FEMALE / Cancer, Pancreas (Deaths: 230/665)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	2.4	1.5	1.4	1.3	1.4
20	4.7	1.4	1.1	2.5	1.6
21 +	2.5	2.2	2.2		1.7
combined	3.2	1.6	1.4	1.5	1.5

WHITE FEMALE / Cancer, Larynx (Deaths: 15/7)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		5.2			1.3
20		9.4			6.2
21 +		18.9	70.0		28.4
combined	8.0	9.0			5.4

WHITE FEMALE / Cancer, Lung & Bronchus (Deaths: 573/522)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.4	2.3	1.8	1.2	1.8
20	8.7	6.0	6.1		5.3
21 +	15.8	11.8	12.0		12.7
combined	5.8	4.6	3.7	1.8	3.6

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE FEMALE / Cancer, Liver (Deaths: 60/197)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.3	1.4	0.9		0.7
20	4.3	1.5	0.9		0.9
21 +		2.8			0.8
combined	2.1	1.6	0.9		0.8

WHITE FEMALE / Cancer, Biliary passages (Deaths: 25/74)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.1	1.7		1.5
20		3.0	2.5		1.7
21 +			2.3		1.3
combined		1.7	2.0		1.6

WHITE FEMALE / Cancer, Gall Bladder (Deaths: 23/160)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.3	0.6		0.7
20		0.8	0.8		0.6
21 +			2.3		1.3
combined		1.0	0.6		0.7

WHITE FEMALE / Cancer, Pancreas (Deaths: 230/665)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	2.4	1.5	1.4	1.3	1.4
20	4.7	1.4	1.1	2.5	1.6
21 +	2.5	2.2	2.2		1.7
combined	3.2	1.6	1.4	1.5	1.5

WHITE FEMALE / Cancer, Larynx (Deaths: 15/7)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		5.2			1.3
20		9.4			6.2
21 +		18.9	70.0		28.4
combined		8.0	9.0		5.4

WHITE FEMALE / Cancer, Lung & Bronchus (Deaths: 573/522)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.4	2.3	1.8	1.2	1.8
20	8.7	6.0	6.1		5.3
21 +	15.8	11.8	12.0		12.7
combined	5.8	4.6	3.7	1.8	3.6

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE FEMALE / Cancer, Urinary Bladder, Urinary System (Deaths: 66/205)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		2.1	2.2	1.1	1.7
20		3.8	2.3		1.4
21 +		5.0			0.5
combined		3.0	2.1	0.8	1.6

WHITE FEMALE / Cancer, Non-Hodgkin's Lymphoma (Deaths: 127/469)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.3	1.1	0.9	1.6	1.0
20	0.7	1.0	1.2		0.9
21 +		1.6	0.6		0.7
combined	0.4	1.1	1.0	1.2	1.0

WHITE FEMALE / Cancer, Multiple Myeloma (Deaths: 51/202)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.6	0.9		1.0
20		0.2	0.6		0.4
21 +		1.6			0.5
combined	1.2	1.2	0.7		0.8

WHITE FEMALE / Cancer, Leukemia (Deaths: 127/536)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.7	1.2	0.8		0.8
20	0.6	1.4	0.6		0.6
21 +		1.3	1.3		0.9
combined	0.6	1.3	0.8		0.8

WHITE FEMALE / Cancer, Hodgkin's Lymphoma (Deaths: 46/107)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.3	1.1	11.3	1.6
20	0.6	1.3			2.0
21 +		1.6			0.9
combined	0.3	1.3	1.1	11.6	1.7

WHITE FEMALE / Cancer, Melanoma of skin (Deaths: 40/115)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	0.4	1.3	0.8		1.0
20	1.0	1.4	1.3		1.1
21 +					
combined	0.5	1.2	0.9		0.9

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
 Current smoker rate divided by never smoker rate.
 Standardized by 5-year age-specific rates to 1980 US Population.
 Minimum deaths for cell: 2/2

WHITE FEMALE / Cancer, Skin, non-melanoma (Deaths: 7/32)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.3			0.6
20		2.6			0.5
21 +					
combined		1.6			0.5

WHITE FEMALE / Cancer, Brain (Deaths: 125/297)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.1	1.0	0.6		0.9
20	1.4	1.2	1.6		2.3
21 +	0.9	0.9			0.6
combined	1.2	1.1	0.8		1.2

WHITE FEMALE / Cancer, Thyroid (Deaths: 13/68)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		0.7			0.2
20	13.9	1.5	1.6		1.6
21 +					0.4
combined	5.8	1.0	0.4		0.6

WHITE FEMALE / Cancer, Bone (Deaths: 11/43)

cig\age	35-49	50-64	65-79	80+	comb age
1-19		1.1			1.5
20		0.8			0.5
21 +		2.9			0.8
combined		1.2			1.3

WHITE FEMALE / Cancer, Other (Deaths: 312/992)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.4	1.5	1.0	0.9	1.1
20	2.9	1.5	1.1		1.2
21 +	2.3	2.3	1.3		1.2
combined	2.0	1.6	1.1	0.9	1.2

WHITE FEMALE / Other Diseases (Deaths: 813/2866)

cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.3	1.3	1.1	1.1	1.2
20	1.5	1.6	1.4	0.8	1.2
21 +	1.8	1.3	1.5		1.5
combined	1.4	1.4	1.2	1.1	1.2

MORTALITY RISK RATIO by LEVEL of CIGARETTE CONSUMPTION
Current smoker rate divided by never smoker rate.
Standardized by 5-year age-specific rates to 1980 US Population.
Minimum deaths for cell: 2/2

WHITE FEMALE / All Causes Combined					(Deaths: 14047/55063)
cig\age	35-49	50-64	65-79	80+	comb age
1-19	1.2	1.4	1.2	0.9	1.1
20	1.6	1.8	1.5	1.0	1.3
21 +	1.9	2.2	1.7	1.2	1.5
combined	1.4	1.6	1.3	1.0	1.2

Appendix B

Excess Mortality and Relative Risk (Rate Ratio) of Death for Current Smokers, by Duration, Number of Cigarettes Per Day, and Attained Age

For each category of 5-year duration of smoking, 5-year attained age, and number of cigarettes per day, a complete breakdown is given of the following:

- Observed deaths.
- Total person-years of observation (PYO's).
- Never-smoker rate for specific attained age; the modeled rate is provided by Poisson regression of never-smoker rates by age and weighted to the square root of PYO's. For combined ages, the rate is adjusted to match the distribution of PYO's by age for the comparable current smoker group.
- Excess mortality—current smoker rate minus never-smoker rate.
- Relative risk—current smoker rate divided by never-smoker rate.

Duration is given for 5-year groups from 0 to 80 years duration of smoking. Attained age is given for 5-year groups from 40 to 85 years of age. Reported cigarettes per day is given in categories of 1-9, 10-19, 20, 21-39, and 40+, and current smokers of any number of cigarettes. Combined rates are reported across both duration and age, with reported rates weighted to observed PYO's within the category.

Table Subject Group

- 1 White male lung cancer (1°, 2°, and 3° cause of death)
- 2 White male coronary heart disease
- 3 White male cerebrovascular disease
- 4 White male chronic obstructive pulmonary disease (COPD)
- 5 White male all-cause mortality
- 6 White female lung cancer (1°, 2°, and 3° cause of death)
- 7 White female coronary heart disease
- 8 White female cerebrovascular disease
- 9 White female COPD
- 10 White female all-cause mortality

Table Number of Cigarettes Per Day
Subgroup

- | | |
|---|---|
| A | 1-9 cigarettes per day |
| B | 10-19 cigarettes per day |
| C | 20 cigarettes per day |
| D | 21-39 cigarettes per day |
| E | 40+ cigarettes per day |
| F | Current smokers of any number of cigarettes |

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	3.4	5.1	7.6	11.3	16.9	25.2	37.6	56.2	84.0

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	3
50-54	0	0	0	0	0	1	1	2	1	0	0	0	0	0	0	0	5
55-59	0	0	0	0	0	0	0	2	5	2	0	0	0	0	0	0	9
60-64	0	0	0	0	0	0	1	0	3	5	10	0	0	0	0	0	19
65-69	0	0	0	0	0	1	0	3	3	5	6	1	0	0	0	0	19
70-74	0	0	0	0	0	0	0	0	1	0	7	3	6	0	0	0	17
75-79	0	0	0	0	0	1	0	1	2	0	1	7	9	0	0	0	21
80-84	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	3
CMA	0	0	0	0	1	6	1	11	17	19	14	11	15	0	1	0	96

Total PYO

40-44	22.9	104.8	235.9	666.3	1756.3	5862.2	297.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4958.2
45-49	62.5	194.8	302.3	511.4	1479.9	3831.6	4080.2	664.5	24.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11151.9
50-54	92.6	316.8	417.8	569.2	1095.8	3187.9	7477.6	7217.6	1134.8	35.9	0.0	0.0	0.0	0.0	0.0	0.0	21546.0
55-59	73.5	340.9	456.0	525.0	768.3	1568.3	4386.6	9656.8	8400.1	1353.1	38.9	0.0	0.0	0.0	0.0	0.0	27567.4
60-64	0.0	172.0	508.3	415.8	510.1	752.2	1481.3	3987.1	8517.9	6756.0	1170.6	34.8	0.0	0.0	0.0	0.0	24305.9
65-69	0.0	0.0	233.8	446.4	323.3	470.6	625.3	1113.8	3171.3	6200.9	4637.8	830.9	28.5	0.0	0.0	0.0	18082.6
70-74	0.0	0.0	0.0	247.1	463.3	269.9	379.6	448.4	889.7	2109.5	3814.8	2645.6	611.5	26.1	0.0	0.0	11905.3
75-79	0.0	0.0	0.0	0.0	260.3	384.0	188.6	249.8	324.6	532.8	1160.3	1838.6	1298.9	357.9	13.3	0.0	6619.0
80-84	0.0	0.0	0.0	0.0	0.0	194.3	226.8	105.3	113.7	132.3	207.3	405.5	716.1	468.0	159.8	4.0	2733.2
CMA	151.5	1129.4	2154.0	3080.1	6657.2	12531.0	19143.8	23453.2	22576.8	17120.6	11029.5	5755.3	2655.0	852.0	173.2	4.0	128869.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

7.7	9.3	11.7	12.6	11.9	11.2	11.1	12.9	17.2	23.7	32.9	44.9	58.1	70.9	81.8	84.0	19.1
-----	-----	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

Age	Excess Mortality (Rate Differences)																	CMD
	0-4	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	70-74	75-79		
40-44																		21.84
45-49						62.51	47.13											15.64
50-54							23.80	5.81	20.15	80.55								21.35
55-59									9.41	48.22	136.51							61.30
60-64									116.07	58.37	41.82	131.14						79.87
65-69										187.30	244.14	69.40	55.43	104.17	95.15			105.15
70-74											74.76		145.85	75.75	943.55			261.04
75-79											344.18	559.95		29.96	324.50	636.66		25.79
80-84																		55.36
CMA							3.12	36.65	-5.88	34.02	58.09	87.24	93.99	146.20	505.87			
Relative Risk (Rate Ratios)																		
40-44																		5.31
45-49																		3.07
50-54																		2.89
55-59																		4.63
60-64																		4.17
65-69																		3.79
70-74																		5.64
75-79																		1.31
80-84																		3.90
CMA							1.26	4.26	0.47	3.64	4.38	4.68	3.85	4.25	9.56			

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
10-19 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age									Duration								
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	3.4	5.1	7.6	11.3	16.9	25.2	37.6	56.2	84.0

Observed deaths for smokers based on age groups \ durations (years)

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
45-49	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	6
50-54	0	0	0	0	0	0	0	12	9	3	0	0	0	0	0	0	24
55-59	0	1	0	0	0	0	0	5	19	28	7	2	0	0	0	0	62
60-64	0	0	0	0	0	0	2	0	15	37	39	8	0	0	0	0	101
65-69	0	0	0	0	0	1	0	2	11	34	35	12	0	0	0	0	95
70-74	0	0	0	1	1	0	0	1	2	13	25	37	11	1	0	0	92
75-79	0	0	0	0	0	1	1	3	0	3	5	28	14	6	0	0	61
80-84	0	0	0	0	0	0	0	0	0	1	0	3	2	5	2	0	13
CMA	0	1	0	1	3	5	23	49	81	97	75	80	27	12	2	0	456

Total PYO

40-44	17.3	66.8	244.1	1357.0	4857.6	5880.6	936.0	38.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13397.7
45-49	49.9	148.3	230.9	741.6	3160.6	10349.7	12504.3	2023.0	69.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29277.4
50-54	78.2	226.0	380.3	676.0	1807.8	6879.5	19801.0	20870.2	3341.1	100.7	0.0	0.0	0.0	0.0	0.0	0.0	54160.7
55-59	37.3	109.1	339.3	576.8	1064.3	2511.5	9343.5	25001.0	23516.3	3846.9	105.9	0.0	0.0	0.0	0.0	0.0	66542.0
60-64	0.0	84.4	311.7	383.8	644.1	1101.5	2362.0	8420.8	21191.9	18412.1	3158.2	106.9	0.0	0.0	0.0	0.0	56177.3
65-69	0.0	0.0	131.6	317.4	397.8	584.7	879.0	1800.5	6172.5	14388.7	11954.3	2418.4	84.8	0.0	0.0	0.0	39129.6
70-74	0.0	0.0	0.0	159.4	367.0	336.3	495.4	699.0	1313.8	3682.9	8133.3	6526.3	1520.6	56.4	0.0	0.0	23290.5
75-79	0.0	0.0	0.0	0.0	153.0	262.9	253.4	308.6	433.9	786.8	1827.3	3481.2	2766.5	713.8	18.5	0.0	11005.6
80-84	0.0	0.0	0.0	0.0	0.0	114.6	173.8	126.8	131.3	208.0	325.8	533.3	1033.7	819.5	264.5	1.7	3792.6
CMA	1.2.7	724.5	1637.9	4212.0	12452.2	28021.3	46748.4	58288.3	56170.0	41426.0	25604.8	13066.0	5465.5	1568.7	283.0	1.7	296373.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

7.3	8.8	10.6	9.6	8.2	8.0	9.2	11.7	15.8	22.2	31.1	42.0	56.1	69.9	82.2	84.0	17.2
-----	-----	------	-----	-----	-----	-----	------	------	------	------	------	------	------	------	------	------

		Excess Mortality (Rate Differences)																	
Age	0-4	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	60-64	65-69	70-74	75-79	CMD
40-44						37.78													11.54
45-49							4.60	34.92											15.43
50-54								53.04	35.56	82.23									36.75
55-59								42.21	64.70	107.77	170.67								81.86
60-64									164.70	161.25	157.72	194.94	236.44						162.91
65-69									145.83	65.88	153.01	211.09	267.58	470.99					217.58
70-74									234.84	105.42	114.58	315.34	269.73	529.30	685.76				357.27
75-79										324.12	308.38	915.96	325.09	217.40	748.10	449.83	784.41		498.03
80-84											396.79		478.61	98.90	526.15	672.17			256.78
CMA	129.25		14.13	15.94	9.88	39.97	70.97	128.37	211.99	263.01	570.26	437.68	685.00	624.55					136.46
Relative Risk (Rate Ratios)																			
40-44							12.14												4.40
45-49								1.91	7.90										4.05
50-54									8.01	5.70	11.87								5.86
55-59									4.74	6.73	10.54	16.11							8.25
60-64									10.76	10.56	10.36	12.55	15.01						10.65
65-69										6.79	4.41	7.07	9.38	11.62	19.69				9.63
70-74										7.24	3.80	4.04	9.38	8.17	15.06	19.22			10.49
75-79											6.76	7.02	17.29	6.78	4.87	14.31	9.00	14.95	9.86
80-84												5.73		6.70	2.18	7.27	9.00		4.08
CMA	15.72		2.47	2.96	2.24	5.33	7.08	9.11	10.57	9.47	14.57	8.80	10.80	8.60					8.94

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
20 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	3.4	5.1	7.6	11.3	16.9	25.2	37.6	56.2	84.0

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	1	1	3	2	0	0	0	0	0	0	0	0	0	7
45-49	0	0	0	0	1	9	29	2	0	0	0	0	0	0	0	0	41
50-54	0	1	0	1	0	10	32	39	19	1	0	0	0	0	0	0	103
55-59	0	1	0	1	1	0	16	77	110	29	2	0	0	0	0	0	237
60-64	0	0	1	1	2	1	6	21	114	120	37	2	0	0	0	0	305
65-69	0	0	0	1	0	0	3	4	34	102	111	32	0	0	0	0	287
70-74	0	0	0	1	1	1	2	2	4	23	72	63	22	1	0	0	192
75-79	0	0	0	0	0	1	1	5	1	2	14	37	42	9	0	0	112
80-84	0	0	0	0	0	0	0	0	0	1	1	6	13	9	3	0	30
CMA	0	2	1	6	6	25	91	150	282	278	237	140	77	19	3	0	1317

Total PYO

40-44	15.9	83.6	329.9	2641.8	11988.3	15971.4	2856.6	85.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34173.0
45-49	54.6	153.2	373.2	1280.2	6503.3	25247.0	34125.2	6451.8	204.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74395.6
50-54	76.3	262.0	481.1	1169.9	3063.6	14515.9	48267.8	55330.5	10600.3	326.3	0.0	0.0	0.0	0.0	0.0	0.0	134093.8
55-59	21.4	196.0	423.4	847.6	1768.8	4184.3	19276.4	59059.8	60180.5	11710.8	323.8	0.0	0.0	0.0	0.0	0.0	157992.7
60-64	0.0	69.2	297.2	499.3	992.2	1749.8	3921.8	16326.5	46302.3	42031.2	8527.7	239.4	0.0	0.0	0.0	0.0	120656.3
65-69	0.0	0.0	132.3	384.0	487.8	799.9	1294.9	2628.4	10320.5	27101.6	23305.1	5127.1	167.3	0.0	0.0	0.0	71749.0
70-74	0.0	0.0	0.0	191.7	397.5	378.6	522.8	804.4	1578.4	5393.2	13110.8	10574.4	2739.4	88.5	0.0	0.0	35779.6
75-79	0.0	0.0	0.0	0.0	169.2	310.3	242.3	306.0	419.4	795.8	2299.2	4814.0	3818.4	1132.4	40.5	0.0	14347.4
80-84	0.0	0.0	0.0	0.0	0.0	116.3	146.9	96.5	126.3	150.2	283.1	582.3	1280.1	951.9	338.6	16.5	4038.5
CMA	168.3	763.9	2037.1	7217.4	25370.6	63273.4	110654.5	141089.5	129731.8	87509.0	47849.5	21307.2	7985.3	2172.8	379.1	16.5	647525.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

6.8	8.4	9.7	8.3	6.7	6.8	8.2	19.7	14.6	20.4	28.9	39.8	53.6	67.6	81.0	84.0	14.9
-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	------	------	------

Age	Excess Mortality (Rate Differences)															CMD		
	0-4	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	70-74	75-79		
40-44				31.80	4.95	15.39	66.82										17.09	
45-49					10.31	30.58	79.92	25.93									50.05	
50-54	374.11			77.91	61.33	58.73	62.92	171.68	298.87								69.25	
55-59				106.68	45.24		71.70	119.08	171.49	236.34	606.46						138.71	
60-64		319.64		183.39	184.70	40.28	136.12	111.75	229.33	268.63	417.01	818.49					235.28	
65-69				235.21			206.47	126.98	304.24	351.16	451.09	598.93					374.80	
70-74					213.93	226.50	344.95	210.98	215.77	368.82	511.52	558.13	765.45				498.97	
75-79						266.01	356.57	1577.76	182.20	195.11	552.69	712.37	1043.71	738.54			724.40	
80-84											269.28	1002.49	947.70	861.49	802.07		733.16	
CMA	253.40	39.38	74.84	16.94	32.71	74.02	95.57	202.75	297.26	466.43	617.24	910.70	806.81	710.37		588.51		
Relative Risk (Rate Ratios)																		
40-44				10.38	2.46	5.54	20.65										6.04	
45-49					3.04	7.04	16.78	6.12									10.86	
50-54	50.46			11.30		9.11	8.76	9.32	23.69	40.51							19.15	
55-59				10.44	5.00		7.35	11.54	16.18	21.92	54.68						13.28	
60-64		19.94		11.87	11.95	3.39	9.07	7.62	14.59	16.92	25.71	49.50					14.94	
65-69				10.33			9.19	6.04	13.07	14.93	16.90	24.76					15.87	
70-74					6.68	7.02	10.16	6.60	6.73	11.33	14.59	15.83	21.33				14.26	
75-79						5.73	7.34	29.06	4.24	4.47	10.83	13.67	19.56	14.14			13.86	
80-84												4.21	12.94	12.29	11.26	10.55		9.73
CMA	31.14	5.06	10.02	3.52	5.81	10.00	9.89	14.87	15.55	17.15	16.50	18.00	12.93	9.77			13.67	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	3.4	5.1	7.6	11.3	16.9	25.2	31.6	56.2	84.0

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74
40-44	0	0	0	0	4	2	1	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	2	18	4	0	0	0	0	0	0	0
50-54	0	0	0	0	2	2	30	63	13	0	0	0	0	0	0
55-59	0	0	0	1	0	1	17	58	90	16	0	0	0	0	0
60-64	0	0	0	0	0	0	2	28	76	96	33	3	0	0	0
65-69	0	0	0	0	1	1	2	3	17	72	89	14	1	0	0
70-74	0	0	0	0	1	3	0	0	3	20	36	37	16	1	0
75-79	0	0	0	0	0	0	0	0	1	1	4	20	16	3	1
80-84	0	0	0	0	0	0	0	1	0	0	1	1	4	1	3
CMA	0	0	0	1	8	11	70	157	200	207	163	75	37	5	4

Total PYO

40-44	3.1	26.2	160.2	1720.0	7693.8	10580.9	2000.3	64.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45-49	20.6	46.6	151.4	725.8	4094.9	16627.3	23137.9	4715.6	146.1	0.0	0.0	0.0	0.0	0.0	0.0
50-54	21.8	92.3	204.5	581.7	1792.3	9184.8	31882.9	36894.5	7345.4	234.4	0.0	0.0	0.0	0.0	0.0
55-59	4.6	62.8	171.2	370.3	852.9	2408.5	12048.3	37327.9	37787.0	7906.3	206.3	0.0	0.0	0.0	0.0
60-64	0.0	22.0	91.0	183.4	424.9	767.7	2031.0	9457.1	26549.2	23365.3	5263.6	145.2	0.0	0.0	0.0
65-69	0.0	0.0	33.5	105.4	194.3	322.6	556.9	1240.0	5098.3	13010.6	10937.7	2664.8	77.8	0.0	0.0
70-74	0.0	0.0	0.0	42.8	100.6	134.4	218.6	326.2	567.9	2081.1	4997.5	3830.8	1070.8	30.2	0.0
75-79	0.0	0.0	0.0	0.0	37.5	68.4	71.2	81.3	123.6	236.8	680.3	1373.9	1070.8	316.1	7.6
80-84	0.0	0.0	0.0	0.0	0.0	12.5	22.8	17.3	19.9	38.4	66.7	138.5	287.1	233.4	63.9
CMA	50.0	249.8	811.8	3729.5	15191.2	40107.0	71969.9	90124.6	77637.3	46872.8	22154.0	8153.2	2506.5	579.7	71.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

6.6	8.4	8.8	6.8	5.8	6.2	7.8	10.4	14.0	19.4	27.0	37.1	50.5	66.4	81.0
-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	------

Age	Excess Mortality (Rate Differences)															CMD		
	0-4	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	70-74	75-79		
40-44					48.60	15.51	46.60										28.07	
45-49						6.96	72.73	79.76									43.26	
50-54							104.03	14.21	86.53	163.19	169.42						117.10	
55-59								30.22	129.80	144.06	226.88	191.07					173.27	
60-64									81.60	279.20	269.39	402.55	610.07				304.51	
65-69										284.79	333.92	216.73	308.24	528.19	788.50	500.17	558.88	
70-74											490.60	923.39	682.72	928.20	1456.64		835.44	
75-79												366.16	531.72	1399.47	1437.94	892.89	1074.69	
80-84													1309.35	344.44			1134.86	
CMA					19.99	46.87	21.25	89.43	163.84	243.57	422.24	708.73	882.76	1425.66	796.13		233.71	
Relative Risk (Rate Ratios)																		
40-44					15.33	5.57	14.74										9.26	
45-49						2.37	15.36	16.75									9.54	
50-54							14.75	2.88	12.44	22.57	23.40						16.46	
55-59								23.90	3.67	12.49	13.75	21.66	17.91				16.34	
60-64									5.84	17.55	16.96	24.86	37.15				20.82	
65-69										12.30	14.25	9.60	13.23	21.96	32.26	20.85		23.17
70-74											14.03	25.53	19.14	25.66	39.69			23.19
75-79												7.51	10.46	25.89	26.57	16.86		20.11
80-84													16.59	5.10			14.51	
CMA					3.93	9.09	4.44	12.42	16.81	18.35	22.79	27.22	24.78	29.23	12.96		18.99	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	3.4	5.1	7.6	11.3	16.9	25.2	37.6	56.2	84.0

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0	0	5
45-49	0	0	0	0	2	5	8	2	0	0	0	0	0	0	0	0	17
50-54	0	0	0	0	0	3	19	25	10	0	0	0	0	0	0	0	57
55-59	0	0	0	0	0	0	10	46	72	26	1	0	0	0	0	0	155
60-64	0	0	0	0	0	1	4	25	54	71	20	2	0	0	0	0	177
65-69	0	0	0	0	0	1	4	4	11	57	36	14	0	0	0	0	127
70-74	0	0	0	0	0	1	0	0	0	2	24	20	9	0	0	0	56
75-79	0	0	0	0	0	0	0	0	0	2	12	11	2	0	0	0	29
80-84	0	0	0	0	0	0	0	1	0	0	1	0	0	5	0	0	7
CMA	0	0	0	0	4	14	45	103	147	158	84	48	20	7	0	0	630

Total PYO

40-44	11.5	20.8	123.6	878.3	3739.6	5384.8	1323.4	49.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11531.8
45-49	13.8	62.2	84.8	422.8	2256.2	8956.0	12920.9	3039.8	122.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28178.6
50-54	14.8	64.6	173.0	365.9	1007.7	5046.6	17670.1	21472.3	5376.2	187.3	0.0	0.0	0.0	0.0	0.0	0.0	51378.3
55-59	10.4	60.0	112.3	252.4	525.8	1455.3	6804.4	21049.2	21980.8	5528.8	163.3	0.0	0.0	0.0	0.0	0.0	57942.7
60-64	0.0	24.0	85.7	123.0	259.2	507.4	1233.5	5236.8	14626.3	13360.3	3459.3	111.2	0.0	0.0	0.0	0.0	36228.3
65-69	0.0	0.0	27.4	58.3	100.9	194.5	317.7	732.0	2775.1	6904.7	5780.3	1696.1	59.8	0.0	0.0	0.0	18646.7
70-74	0.0	0.0	0.0	16.9	41.1	72.8	98.2	176.4	349.3	1028.9	2461.4	2001.6	715.9	29.8	0.0	0.0	6992.3
75-79	0.0	0.0	0.0	0.0	14.0	23.4	37.5	51.3	78.3	112.9	293.5	619.0	538.8	230.4	5.8	0.0	2004.9
80-84	0.0	0.0	0.0	0.0	0.0	6.1	11.3	16.2	21.3	16.8	22.5	62.4	140.0	116.1	43.5	2.3	458.3
CMA	50.5	231.6	606.7	2117.7	7944.3	21646.8	40416.9	52125.7	45529.4	27139.7	12180.3	4490.3	1454.5	376.3	49.3	2.3	216361.9

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

6.7	8.5	9.2	7.0	5.9	6.3	7.8	10.3	13.6	16.8	26.0	35.6	48.5	63.3	80.7	84.0	12.8
-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	------	------	------

Age	Excess Mortality (Rate Differences)															CMD		
	0-4	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	70-74	75-79		
40-44						50.09	52.32										39.97	
45-49						63.58	50.76	56.85	54.82								55.26	
50-54							51.88	99.96	108.86	178.44							103.38	
55-59								135.67	207.24	316.26	458.96						256.21	
60-64								180.20	307.41	460.35	347.34	514.55	561.29				434.33	
65-69									1233.98	521.24	371.18	800.32	507.61	800.23				655.88
70-74											156.74	937.40	961.56	1219.49				765.24
75-79												625.21	1882.39	1965.22	811.77			1390.22
80-84																	1443.30	
CMA							44.44	58.38	103.52	187.33	309.05	563.39	663.62	1033.35	1326.57	1797.15	278.37	
Relative Risk (Rate Ratios)																		
40-44						15.77	16.43										12.79	
45-49						17.50	11.02	12.22	11.82								11.91	
50-54							7.86	14.21	15.39	24.59							14.67	
55-59								13.01	19.34	28.99	41.62						23.66	
60-64								11.66	19.22	28.28	21.58	31.49	34.26				26.74	
65-69									49.96	21.68	15.73	32.75	24.71	32.75				27.02
70-74											5.16	25.90	26.54	33.40				21.28
75-79												12.12	34.48	36.31	15.44			25.73
80-84																	18.59	
CMA							8.52	10.27	14.24	19.25	23.37	30.99	26.50	30.00	28.37	29.38	22.73	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**

Current smokers of any number of cigarettes

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	3.4	5.1	7.6	11.3	16.9	25.2	37.6	56.2

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	Age																
	0-4	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	70-74	75-79	CMD
40-44	0	0	0	1	9	8	3	0	0	0	0	0	0	0	0	0	21
45-49	0	0	0	0	4	19	60	8	0	0	0	0	0	0	0	0	91
50-54	0	1	0	1	2	16	94	138	46	1	0	0	0	0	0	0	299
55-59	0	2	0	2	1	1	48	202	307	80	5	0	0	0	0	0	648
60-64	0	0	1	1	2	5	12	92	288	339	99	7	0	0	0	0	846
65-69	0	0	0	1	1	4	9	16	76	271	279	74	1	0	0	0	732
70-74	0	0	0	2	3	5	2	3	10	61	164	161	64	3	0	0	478
75-79	0	0	0	0	0	3	2	9	4	8	26	504	93	20	1	0	270
80-84	0	0	0	0	0	0	0	2	0	4	3	10	21	20	9	0	69
CMA	0	3	1	8	22	61	230	470	731	764	576	356	179	43	10	0	3454

Total PYO

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	3.4	5.1	7.6	11.3	16.9	25.2	37.6	56.2
40-44	70.7	306.3	1109.5	7511.5	30155.5	39819.0	7427.3	249.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	86649.2
45-49	204.6	608.3	1152.2	3709.5	17582.3	65235.1	87054.7	17245.7	567.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	193059.5
50-54	283.6	972.4	1686.7	3377.8	6813.7	38957.3	125546.2	142326.2	27912.5	869.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	350745.8
55-59	147.3	860.8	1517.3	2590.4	4998.8	12185.2	52086.3	152730.6	152535.9	30473.9	847.4	0.0	0.0	0.0	0.0	0.0	0.0	410973.7
60-64	0.0	373.6	1308.4	1628.2	2850.3	4907.7	11067.3	43648.0	118020.7	104549.8	21687.3	641.4	0.0	0.0	0.0	0.0	0.0	310712.5
65-69	0.0	0.0	565.7	1328.6	1518.3	2390.4	3710.8	7567.8	27687.5	68038.6	57018.8	12818.9	421.2	0.0	0.0	0.0	0.0	183066.3
70-74	0.0	0.0	0.0	674.8	1404.1	1199.9	1732.8	2484.8	4751.0	14410.2	32827.4	25806.5	6714.3	235.6	0.0	0.0	0.0	92241.3
75-79	0.0	0.0	0.0	0.0	649.4	1076.7	795.9	1004.8	1402.7	2490.8	6325.8	12247.8	9584.8	2800.8	89.1	0.0	0.0	38466.3
80-84	0.0	0.0	0.0	0.0	0.0	452.0	590.3	365.1	414.3	552.5	916.5	1751.0	3531.6	2617.2	884.3	27.4	0.0	12962.2
CMA	706.1	3121.3	7319.7	20820.7	67972.2	166223.2	290031.3	367622.3	333291.9	221405.4	1196033.2	53225.6	20251.8	5653.5	973.3	27.4	0.0	1678278.6

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

7.2	8.8	10.3	8.9	7.2	7.1	8.4	10.9	14.8	20.6	29.1	40.2	54.3	68.3	81.4	84.0	14.9
-----	-----	------	-----	-----	-----	-----	------	------	------	------	------	------	------	------	------	------

Age	Excess Mortality (Rate Differences)																	CMD
	0-4	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	70-74	75-79		
40-44				9.92	26.45	16.70	37.00											20.84
45-49					17.69	24.06	63.86	41.32										42.00
50-54	95.27			22.04	15.13	33.51	67.31	89.40	157.24	104.84								77.68
55-59	221.06			65.91	8.71	-3.09	80.86	120.96	189.97	251.22	578.73							146.38
60-64			59.55	44.54	53.29	85.01	91.36	193.90	227.15	307.37	439.40	1074.46						255.40
65-69				50.06	40.66	142.13	217.33	186.22	249.29	373.10	464.11	552.07	212.23					374.65
70-74					258.76	176.02	379.05	77.78	83.09	172.84	385.67	461.94	586.23	915.54	1235.79			480.56
75-79							222.41	195.06	839.52	228.95	264.96	354.79	792.91	914.07	657.87			645.65
80-84								463.84		640.01	243.36	500.48	510.66	680.21	933.84			488.06
CMA	87.30	3.32	29.52	25.15	29.57	70.87	116.97	204.57	324.48	452.37	628.69	829.61	692.29	945.96				190.87
Relative Risk (Rate Ratios)																		
40-44				3.93	8.80	5.92	11.91											7.15
45-49					4.49	5.75	13.61	9.16										9.29
50-54	13.58			3.91	3.00	5.43	9.90	12.82	21.79	14.86								11.27
55-59	20.57			6.83	1.77	0.73	8.16	11.71	17.81	23.24	52.22							13.96
60-64		4.53		3.64	4.16	6.04	6.41	12.49	14.46	19.21	27.04	64.67						16.14
65-69				2.99	2.61	6.64	9.62	8.39	10.89	15.80	19.41	22.90	9.42					15.86
70-74				7.87	5.68	11.07	3.07	3.21	5.59	11.25	13.27	16.57	25.32	33.83				13.77
75-79						4.96	4.47	15.93	5.07	5.71	7.31	15.10	17.26	12.70				12.48
80-84								6.52		8.62	3.90	6.96	7.08	9.10	12.12			6.81
CMA	10.91	1.32	4.31	4.49	5.15	9.41	11.75	14.86	16.76	16.55	16.65	16.29	11.54	12.62				13.77

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	73.3	120.6	198.5	326.6	537.6	884.8	1456.3	2396.9	3944.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	1	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	4
45-49	0	0	2	2	1	5	7	2	0	0	0	0	0	0	0	0	19
50-54	0	1	0	0	0	8	25	22	4	0	0	0	0	0	0	0	60
55-59	0	0	0	2	2	4	27	56	51	7	0	0	0	0	0	0	151
60-64	0	0	4	4	3	6	11	27	66	64	10	1	0	0	0	0	196
65-69	0	0	1	6	0	7	6	13	28	74	77	23	0	0	0	0	235
70-74	0	0	0	3	8	4	4	9	13	36	76	50	11	0	0	0	214
75-79	0	0	0	0	4	16	6	2	10	22	23	53	63	12	0	0	211
80-84	0	0	0	0	0	2	10	6	3	4	10	13	26	20	2	0	96
CMA	1	1	7	17	19	52	98	139	175	207	196	140	100	32	2	0	1186

Total PYO

40-44	22.9	104.8	235.9	668.3	1756.3	1862.2	297.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4958.2
45-49	62.5	194.8	302.3	511.4	1479.9	3631.6	4080.2	664.5	24.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11151.9
50-54	92.6	316.8	417.8	569.2	1095.8	3187.9	7477.6	7217.6	1134.8	35.9	0.0	0.0	0.0	0.0	0.0	0.0	21546.0
55-59	73.5	340.9	456.0	525.0	768.3	1568.3	4386.6	9656.8	8400.1	1353.1	38.9	0.0	0.0	0.0	0.0	0.0	27567.4
60-64	0.0	172.0	508.3	415.8	510.1	752.2	1481.3	3987.1	8517.9	6756.0	1170.6	34.8	0.0	0.0	0.0	0.0	24305.9
65-69	0.0	0.0	233.8	446.4	323.3	470.6	625.3	1113.8	3171.3	6200.9	4637.8	830.9	28.5	0.0	0.0	0.0	18062.6
70-74	0.0	0.0	0.0	247.1	463.3	269.9	379.6	448.4	889.7	2109.5	3614.8	2645.6	611.5	26.1	0.0	0.0	11905.3
75-79	0.0	0.0	0.0	0.0	260.3	394.0	188.6	249.8	324.6	532.8	1160.3	1838.6	1298.9	357.9	13.3	0.0	6619.0
80-84	0.0	0.0	0.0	0.0	0.0	194.3	226.8	105.3	113.7	132.3	207.3	405.5	716.1	468.0	159.8	4.0	2733.2
CMA	251.5	1129.4	2154.0	3383.1	6657.2	12531.0	19143.8	23453.2	22576.8	17120.6	11029.5	5755.3	2655.0	852.0	173.2	4.0	128869.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

205.2	263.7	368.5	406.0	395.7	372.5	348.9	403.5	570.5	643.4	1260.2	1644.1	2581.5	3218.4	3625.7	3944.9	683.2
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	-------

		Excess Mortality (Rate Differences)																	
Age		0-4	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	70-74	75-79	CMD	
40-44						-16.32		598.06										7.41	
45-49						541.12	270.49	-53.01	9.91	50.98	180.39							49.79	
50-54								52.48	135.87	106.35	154.01							80.01	
55-59									54.31	-66.31	-71.60	288.87	273.97	280.49	190.69			221.11	
60-64										243.41	424.51	50.53	260.09	204.97	139.58	237.23	409.70	316.67	268.78
65-69										-457.18	459.21		602.69	74.79	282.31	-1.90	308.54	775.46	1883.20
70-74										-242.14		270.62	25.63	-402.52	550.75	4.91	250.26	535.96	433.63
75-79												-659.90	1664.03	784.74	-1596.0	683.99	1731.99	-414.55	485.77
80-84												-2915.7	463.59				880.16	-739.02	314.07
CMA		192.45	-175.21	-30.52	96.53	-110.30	42.43	162.98	189.15	204.66	365.69	516.83		588.46	1184.93	537.44	-2670.7		237.13
Relative Risk (Rate Ratios)																			
40-44								0.78		9.16									1.10
45-49								5.49	3.24	0.56	1.08	1.42	2.50						1.41
50-54									1.58		1.26	1.68	1.54	1.78					1.40
55-59										1.17	0.80	0.78	1.88	1.84	1.86	1.58			1.68
60-64										1.45	1.79	1.09	1.48	1.38	1.26	1.44	1.76	1.59	1.50
65-69										0.48	1.52		1.68	1.08	1.32	1.00	1.35	1.88	3.13
70-74											0.83	1.19	1.02	0.72	1.38	1.00	1.17	1.37	1.30
75-79												0.64	1.69	1.33	0.33	1.29	1.72	0.83	1.20
80-84													0.26	1.12			1.22	0.81	0.92
CMA		1.94	0.34	0.91	1.24	0.72	1.11	1.47	1.47	1.36	1.43	1.41	1.32	1.46	1.17	0.30		1.35	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Never-smokers for White Males Aged Between 40 and 84**

10-19 cigarettes per day for smokers

Never-smoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	73.3	120.6	198.5	326.6	537.6	884.8	1456.3	2396.9	3944.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	1	1	2	8	3	0	0	0	0	0	0	0	0	0	15
45-49	0	0	0	1	7	34	34	4	0	0	0	0	0	0	0	0	80
50-54	0	2	2	2	7	28	68	90	13	0	0	0	0	0	0	0	212
55-59	1	2	0	6	5	14	59	151	186	38	0	0	0	0	0	0	462
60-64	0	0	1	1	3	12	24	77	186	209	34	2	0	0	0	0	549
65-69	0	0	0	3	5	11	12	32	93	189	210	38	4	0	0	0	597
70-74	0	0	0	4	9	4	8	4	32	60	178	174	38	2	0	0	513
75-79	0	0	0	0	9	2	9	13	16	21	37	110	80	30	2	0	329
80-84	0	0	0	0	0	1	8	3	7	11	11	29	58	45	4	0	177
CMA	1	4	4	18	47	114	225	374	533	528	470	353	180	77	6	0	2934

Total PYO

40-44	17.3	66.8	244.1	1357.0	4857.6	5880.6	936.0	36.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13397.7
45-49	49.9	168.3	230.9	741.6	3160.6	10349.7	12504.3	2023.0	69.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29277.4
50-54	78.2	226.0	380.3	676.0	1807.8	6879.5	19801.0	20870.2	3341.1	100.7	0.0	0.0	0.0	0.0	0.0	0.0	54160.7
55-59	37.3	199.1	339.3	576.8	1064.3	2511.5	9043.5	25001.0	23516.3	3646.9	95.9	0.0	0.0	0.0	0.0	0.0	66542.0
60-64	0.0	84.4	311.7	383.8	644.1	1101.5	2362.0	8420.8	21191.9	18412.1	3158.2	106.9	0.0	0.0	0.0	0.0	56177.3
65-69	0.0	0.0	131.6	317.4	397.8	584.7	879.0	1800.5	6172.5	14388.7	11954.3	2418.4	84.8	0.0	0.0	0.0	39129.6
70-74	0.0	0.0	0.0	159.4	367.0	336.3	495.4	699.0	1313.8	3682.9	8133.3	6526.3	1520.6	56.4	0.0	0.0	23290.5
75-79	0.0	0.0	0.0	0.0	153.0	262.9	253.4	308.6	433.9	786.8	1827.3	3481.2	2766.5	713.8	18.5	0.0	11005.8
80-84	0.0	0.0	0.0	0.0	0.0	114.6	173.8	126.8	131.3	208.0	325.8	533.3	1093.7	819.5	264.5	1.7	3792.8
CMA	182.7	724.5	1637.9	4212.0	12452.2	28021.3	46748.4	59288.3	96170.0	41426.0	25504.8	13066.0	5465.5	1589.7	283.0	1.7	296773.8

Never-smoker death rates per 100,000 standardized to current smoker age \ duration distribution

191.6	245.7	315.1	292.2	244.4	233.6	270.0	363.1	510.6	771.9	1169.2	1695.2	2421.5	3161.5	3643.7	3944.9	596.7
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	-------

Excess Mortality (Rate Differences)																		
Age	0-4	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	70-74	75-79	CMD	
40-44		336.43	0.43	-32.09	62.78	247.25											38.70	
45-49			14.26	100.89	207.93	151.32	77.14										152.66	
50-54	686.49	327.39	97.39	588.76	208.54	144.95	232.77	190.63									192.96	
55-59	677.96		713.52	143.13	230.79	304.81	277.33	464.30	661.16								367.66	
60-64		-216.75	-277.02	-71.83	551.81	478.48	376.79	340.08	597.52	538.96							439.65	
65-69			69.30	371.98	996.58	480.36	892.45	621.85	428.70	671.87	686.45						640.87	
70-74				1052.84	996.01	-267.01	158.49	-684.06	979.31	172.84	732.22	1209.85	1042.73				746.31	
75-79					3485.47	-1636.1	1154.58	1815.92	1290.46	272.33	-372.07	762.98	494.86	1806.27			592.44	
80-84							659.38			1343.53	-568.11	14.0.42	1358.33	1546.22	-2432.6		721.86	
CMA	306.37	-70.84	135.15	133.08	173.22	211.34	277.74	438.33	502.67	673.62	1006.49	871.86	1682.23	-1723.5		391.95		

Relative Risk (Rate Ratios)																		
40-44		5.59	1.01	0.56	1.86	4.37											1.53	
45-49			1.12	1.84	2.72	2.25	1.64										2.27	
50-54	4.46	2.65	1.49	1.95	2.05	1.73	2.17	1.96									1.97	
55-59	3.08		3.18	1.44	1.71	1.93	1.85	2.42	3.02								2.13	
60-64		0.60	0.48	0.87	2.03	1.89	1.70	1.63	2.11	2.06							1.82	
65-69			1.07	1.42	2.13	1.54	2.01	1.70	1.48	1.99	1.78						1.72	
70-74				1.72	1.68	0.82	1.11	0.39	1.67	1.12	1.50	1.83	1.72				1.51	
75-79					2.45	0.32	1.48	1.76	1.54	1.11	0.84	1.32	1.21	1.75			1.25	
80-84							1.17			1.34	0.86	1.38	1.34	1.39	0.38		1.18	
CMA	2.25	0.78	1.46	1.54	1.74	1.78	1.79	1.86	1.65	1.58	1.59	1.36	1.53	0.55			1.66	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**

20 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	73.3	120.6	198.5	326.8	537.6	884.8	1456.3	2396.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	1	15	31	8	1	0	0	0	0	0	0	0	0	56
45-49	0	1	1	0	11	66	120	17	3	0	0	0	0	0	0	0	219
50-54	0	1	2	4	12	66	216	324	54	5	0	0	0	0	0	0	684
55-59	0	1	5	2	12	25	142	384	472	116	2	0	0	0	0	0	1161
60-64	0	1	0	5	12	11	39	157	491	468	123	5	0	0	0	0	1312
65-69	0	0	2	4	11	7	15	39	133	397	433	103	5	0	0	0	1149
70-74	0	0	0	7	5	8	12	15	31	102	314	272	68	3	0	0	837
75-79	0	0	0	0	3	6	8	6	16	28	50	166	125	40	2	0	450
80-84	0	0	0	0	0	2	7	4	9	10	12	32	57	51	15	1	200
CMA	0	4	10	23	81	222	567	947	1209	1126	904	578	255	94	17	1	6068

Total PYO

40-44	15.9	83.6	329.9	2841.8	11986.3	15971.4	2856.6	85.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34173.0
45-49	54.6	153.2	373.2	1283.2	6503.3	25247.0	34125.2	6451.8	204.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74395.6
50-54	76.3	262.0	481.1	1169.9	3063.6	14515.9	48267.8	55330.5	10800.3	3263	0.0	0.0	0.0	0.0	0.0	0.0	134093.8
55-59	21.4	196.0	423.4	847.6	1768.8	4184.3	19276.4	59059.8	60180.5	11710.8	323.8	0.0	0.0	0.0	0.0	0.0	157992.7
60-64	0.0	69.2	297.2	499.3	992.2	1749.8	3921.8	16326.5	46302.3	42031.2	8527.7	238.4	0.0	0.0	0.0	0.0	125956.3
65-69	0.0	0.0	132.3	384.0	487.8	799.9	1294.9	2628.4	10320.5	27101.6	23305.1	5127.1	167.3	0.0	0.0	0.0	71749.0
70-74	0.0	0.0	0.0	191.7	397.5	378.6	522.8	804.4	1578.4	5293.2	13110.8	10574.4	2739.4	88.5	0.0	0.0	35779.6
75-79	0.0	0.0	0.0	0.0	169.2	310.3	242.3	306.0	419.4	795.8	2299.2	4614.0	3818.4	1132.4	40.5	0.0	14347.4
80-84	0.0	0.0	0.0	0.0	0.0	196.3	146.9	96.5	126.3	150.2	283.1	552.3	1260.1	951.9	338.6	16.5	4038.5
CMA	168.3	763.9	2037.1	7217.4	25370.6	63273.4	110654.5	141089.5	129731.8	87509.0	47849.5	21307.2	7985.3	2172.8	379.1	16.5	647525.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

177.7	232.7	294.6	243.8	189.1	187.5	229.3	315.0	459.5	695.0	1096.5	1585.5	2286.8	3036.8	3779.5	3944.9	495.2
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	-------

		Excess Mortality (Rate Differences)																	
Age		0-4	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	70-74	75-79	CMD	
40-44		-38.07	51.86	120.83	206.79													90.61	
45-49		547.39		48.56	140.83	231.06	142.91	1348.80										173.79	
50-54	183.22	217.27	143.44	193.23	256.21	249.04	387.11	310.95	1333.71									311.63	
55-59		854.23	-90.68	351.80	270.84	410.01	323.55	457.66	663.89	291.12								408.20	
60-64			463.73	671.87	91.05	456.84	424.02	522.81	575.85	904.75	1550.80							547.08	
65-69			156.84	1370.04	-9.74	273.55	598.95	403.87	580.03	973.13	1124.11	2103.22						716.59	
70-74				2195.87	-198.45	656.83	839.24	408.40	507.89	434.97	938.87	1115.94	1025.97					883.01	
75-79					-623.48	-463.48	905.49	-436.10	1417.94	1121.81	-222.18	1051.39	876.73	1135.39				739.57	
80-84											2714.33	294.10	1849.54	578.58	1412.68	485.29		1007.40	
CMA		290.87	206.27	74.91	130.16	163.35	283.08	356.19	472.42	591.70	885.44	1127.22	906.58	1289.38	704.96		441.94		
Relative Risk (Rate Ratios)																			
40-44			0.48	1.71	2.65	3.82												2.24	
45-49			2.22	1.40	2.17	2.92	2.19	12.19										2.44	
50-54	1.92	2.09	1.72	1.97	2.29	2.25	2.95	2.57	7.72									2.57	
55-59		3.62	0.72	2.08	1.83	2.26	1.99	2.40	3.03	1.89								2.25	
60-64			1.86	2.25	1.17	1.85	1.79	1.97	2.07	2.68	3.88							2.02	
65-69			1.18	2.55	0.99	1.31	1.68	1.46	1.66	2.10	2.27	3.38						1.81	
70-74			2.51	0.86	1.45	1.58	1.28	1.35	1.30	1.64	1.77	1.70						1.61	
75-79				0.74	0.81	1.38	0.82	1.59	1.47	0.91	1.44	1.37	1.47					1.31	
80-84										1.69	1.07	1.47	1.15	1.36	1.12			1.26	
CMA		2.25	1.72	1.31	1.69	1.87	2.23	2.13	2.03	1.85	1.83	1.71	1.40	1.42	1.19			1.89	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**

21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										Duration	CVD
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate		
	73.3	120.6	198.5	326.6	537.6	884.8	1456.3	2396.9	3944.9	73.3		

Observed deaths for smokers based on age groups \ durations (years)

Age	0-4	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	70-74	75-79	CVD
40-44	0	0	0	0	17	58	4	0	0	0	0	0	0	0	0	0	39
45-49	0	0	1	1	52	62	66	17	0	0	0	0	0	0	0	0	159
50-54	0	0	0	2	9	42	134	218	46	1	0	0	0	0	0	0	452
55-59	1	0	2	2	6	14	87	221	289	81	2	0	0	0	0	0	705
60-64	0	0	0	1	5	3	24	87	283	263	70	4	0	0	0	0	740
65-69	0	0	0	1	1	4	6	12	78	197	199	82	1	0	0	0	551
70-74	0	0	0	0	1	2	5	9	17	44	105	108	36	1	0	0	328
75-79	0	0	0	0	1	2	1	3	5	10	22	46	26	12	0	0	128
80-84	0	0	0	0	0	1	2	1	1	2	2	9	11	10	2	0	41
CVA	1	0	3	7	52	148	329	568	719	598	400	219	74	23	2	0	3143

Total PYO

40-44	3.1	26.2	160.2	1720.0	7693.8	10580.9	2000.3	64.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22249.1
45-49	10.6	46.6	151.4	725.8	4094.9	16627.3	23137.9	4715.6	146.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49666.2
50-54	21.8	92.3	204.5	581.7	1792.3	9184.8	31682.9	36894.5	7345.4	234.4	0.0	0.0	0.0	0.0	0.0	0.0	88234.5
55-59	4.6	62.8	171.2	370.3	852.9	2408.5	12048.3	37327.9	37787.0	7906.3	208.3	0.0	0.0	0.0	0.0	0.0	99148.1
60-64	0.0	22.0	91.0	183.4	424.9	767.7	2031.0	9457.1	26549.2	23065.3	5263.6	145.2	0.0	0.0	0.0	0.0	68300.3
65-69	0.0	0.0	33.5	105.4	194.3	322.6	556.9	1240.0	5098.3	13010.6	10937.7	2664.8	77.8	0.0	0.0	0.0	34241.8
70-74	0.0	0.0	42.8	100.6	134.4	218.6	326.2	567.9	2081.1	4997.5	3630.8	1070.8	30.2	0.0	0.0	0.0	13400.8
75-79	0.0	0.0	0.0	0.0	37.5	68.4	71.2	81.3	123.6	236.8	660.3	1373.9	1070.8	316.1	7.6	0.0	4067.5
80-84	0.0	0.0	0.0	0.0	0.0	12.5	22.8	17.3	19.9	36.4	66.7	138.5	287.1	233.4	63.9	2.0	902.5
CVA	50.0	249.8	811.8	3729.5	15191.2	40107.0	71969.9	90124.6	77637.3	46872.8	22154.0	8153.2	2506.5	579.7	71.5	2.0	360210.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

170.4	232.9	252.6	188.8	153.3	162.0	213.5	299.7	435.4	649.7	981.6	1453.9	2125.4	2971.3	3780.7	3944.9	413.9
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)																	
	0-4	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	70-74	75-79	CMD	
40-44					147.69	96.85	126.70										102.02	
45-49				17.19	172.46	252.30	164.66	239.92									199.55	
50-54				145.38	303.70	258.82	221.82	392.41	427.78	228.13							313.81	
55-59			841.81	213.41	376.83	254.63	395.45	265.41	438.17	697.85	633.74						384.41	
60-64					639.09	-146.81	644.07	362.34	528.34	587.99	792.28						545.84	
65-69						355.16	192.53	62.91	645.11	629.32	934.57	1066.57					724.31	
70-74							831.15	1303.02	1537.09	657.98	644.74	1362.92	1905.82				991.30	
75-79										1826.98	836.83	951.21	31.13	1399.59			750.02	
80-84													-113.29	339.25			598.00	
CMA							116.97	-1.13	189.02	207.02	243.67	330.56	490.89	626.11	823.90	1232.13	826.89	996.50
Relative Risk (Rate Ratios)																		
40-44						3.02	2.32	2.73									2.39	
45-49						1.14	2.43	3.09	2.37	2.99							2.65	
50-54						1.73	2.53	2.30	2.12	2.98	3.16	2.15					2.58	
55-59				3.58	1.65	2.15	1.78	2.21	1.81	2.34	3.14	2.94					2.18	
60-64						2.19	0.73	2.20	1.71	1.98	2.09	2.47					2.02	
65-69						1.40	1.22	1.09	1.73	1.71	2.06	2.21					1.82	
70-74							1.57	1.89	2.06	1.45	1.44	1.94	2.31				1.68	
75-79										1.76	1.35	1.40	1.01	1.58			1.31	
80-84													0.97	1.09			1.15	
CMA						1.46	0.99	2.23	2.28	2.14	2.10	2.13	1.96	1.84	1.85	1.39	1.34	2.90

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	73.3	120.6	198.5	326.6	537.6	884.8	1456.3	2396.9	3944.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	1	0	8	15	6	1	0	0	0	0	0	0	0	0	31
45-49	0	0	2	0	7	29	51	15	0	0	0	0	0	0	0	0	104
50-54	0	2	0	1	8	28	109	115	36	0	0	0	0	0	0	0	301
55-59	0	1	2	1	3	8	46	190	208	56	2	0	0	0	0	0	517
60-64	0	0	3	1	5	6	13	62	185	180	47	2	0	0	0	0	504
65-69	0	0	1	0	1	3	10	12	30	100	125	34	0	0	0	0	316
70-74	0	0	0	0	0	2	2	2	13	21	56	60	18	0	0	0	174
75-79	0	0	0	0	0	3	1	2	4	6	9	20	14	11	0	0	70
80-84	0	0	0	0	0	0	1	0	0	1	2	6	6	8	4	0	28
CMA	0	3	9	3	32	94	239	399	478	364	241	122	38	19	4	0	2045

Total PYO

40-44	11.5	20.8	123.6	878.3	3739.6	5384.8	1323.4	49.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11531.8
45-49	13.8	62.2	84.8	422.8	2256.2	8996.0	12920.9	3339.8	122.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28178.6
50-54	14.8	64.6	173.0	365.9	1007.7	5046.6	17670.1	21472.3	5376.2	187.3	0.0	0.0	0.0	0.0	0.0	0.0	51378.3
55-59	10.4	60.0	112.3	252.4	525.8	1455.3	6804.4	21049.2	21980.8	5528.8	163.3	0.0	0.0	0.0	0.0	0.0	57942.7
60-64	0.0	24.0	85.7	123.0	259.2	507.4	1233.5	5236.6	14826.3	13060.3	3459.3	111.2	0.0	0.0	0.0	0.0	39228.3
65-69	0.0	0.0	27.4	58.3	100.9	194.5	317.7	732.0	2775.1	6904.7	5780.3	1696.1	59.8	0.0	0.0	0.0	18646.7
70-74	0.0	0.0	0.0	16.9	41.1	72.8	98.2	176.4	349.3	1028.9	2461.4	2001.6	715.9	29.8	0.0	0.0	6992.3
75-79	0.0	0.0	0.0	0.0	14.0	23.4	37.5	51.3	78.3	112.9	293.5	619.0	538.8	230.4	5.8	0.0	2004.9
80-84	0.0	0.0	0.0	0.0	0.0	6.1	11.3	16.2	21.3	16.8	22.5	62.4	140.0	116.1	43.5	2.3	458.3
CMA	50.5	231.6	606.7	2117.7	7944.3	21646.8	40416.9	52125.7	45529.4	27139.7	12190.3	4490.3	1454.5	376.3	49.3	2.3	216361.9

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

175.1	234.7	264.7	194.9	156.1	165.5	212.9	296.4	427.6	625.3	936.3	1362.0	2020.8	2800.1	3764.2	3944.9	405.6
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)																	CMD	
	0-4	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	70-74	75-79			
40-44					140.66	205.30	380.11											195.56	
45-49					189.68	203.22	274.13	328.54										248.49	
50-54				74.82	595.45	356.37	418.40	307.11	508.36									367.39	
55-59				69.53	243.97	223.09	349.39	576.01	619.64	606.23	897.85							565.62	
60-64					1391.65	644.85	516.30	645.92	710.17	809.67	821.07							747.18	
65-69						657.59	2263.12	754.51	198.22	563.47	1277.71	1119.79						809.84	
70-74								-322.63	2265.07	584.67	818.80	1541.32	1057.95					1032.16	
75-79											669.56	834.14	201.33	2377.06					1094.54
80-84																		2164.16	
CMA	1060.78	1218.81	-53.25	246.75	268.76	378.41	469.04	622.28	715.90	1042.31	1305.04	591.77	2249.71					539.60	
Relative Risk (Rate Ratios)																			
40-44					2.92	3.80	6.19											3.67	
45-49					2.57	2.69	3.27	3.72										3.06	
50-54				1.38	4.00	2.80	3.11	2.70	3.56									2.95	
55-59				1.21	1.75	1.68	2.07	2.76	2.90	3.10	3.75							2.73	
60-64					3.59	2.20	1.96	2.20	2.32	2.51	2.53							2.39	
65-69						1.74	3.56	1.85	1.22	1.64	2.44	2.27						1.92	
70-74								0.78	2.56	1.40	1.56	2.06	1.73					1.71	
75-79											1.28	1.35	1.06	1.99					1.46
80-84																		1.55	
CMA	5.52	5.60	0.73	2.58	2.62	2.78	2.56	2.46	2.14	2.11	1.97	1.29	1.80					2.33	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Never-smokers for White Males Aged Between 40 and 84**

Current smokers of any number of cigarettes

Never-smoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	73.3	120.6	198.5	326.6	537.6	884.8	1456.3	2396.9	3944.9

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CMD
40-44	1	0	2	2	43	72	23	2	0	0	0	0	0	0	0	0	145
45-49	0	1	6	4	38	197	279	55	3	0	0	0	0	0	0	0	563
50-54	0	6	4	9	36	174	553	773	156	6	0	0	0	0	0	0	1717
55-59	2	4	9	13	28	66	363	5011	1213	298	6	0	0	0	0	0	3013
60-64	0	1	9	12	28	38	111	411	1221	1190	286	14	0	0	0	0	3321
65-69	0	0	4	14	18	33	50	108	364	963	1054	255	10	0	0	0	2873
70-74	0	0	0	14	24	20	31	39	107	264	731	670	172	6	0	0	2078
75-79	0	0	0	0	17	31	25	27	52	87	143	399	309	106	4	0	1200
80-84	0	0	0	0	0	6	28	14	20	29	37	89	160	136	28	1	548
CMA	3	12	34	68	232	637	1463	2440	3136	2837	2257	1427	651	248	32	1	15478

Total PYO

40-44	70.7	306.3	1109.5	7511.5	30155.5	39819.0	7427.3	249.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	86649.2
45-49	204.6	608.3	1152.2	3709.5	17582.3	65235.1	87054.7	17245.7	567.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	193359.5
50-54	283.6	972.4	1666.7	3377.8	8813.7	36957.3	125546.2	142326.2	27912.5	869.7	0.0	0.0	0.0	0.0	0.0	0.0	350745.8
55-59	147.3	860.8	1517.3	2590.4	4998.8	12185.2	52086.3	152730.6	152535.9	30473.9	647.4	0.0	0.0	0.0	0.0	0.0	410973.7
60-64	0.0	373.6	1308.4	1628.2	2850.3	4907.7	11087.3	43648.0	118020.7	104549.8	21697.3	641.4	0.0	0.0	0.0	0.0	310712.5
65-69	0.0	0.0	565.7	1328.6	1518.3	2390.4	3710.8	7567.8	27687.5	68038.6	57018.8	12818.9	421.2	0.0	0.0	0.0	183066.3
70-74	0.0	0.0	0.0	674.8	1404.1	1199.9	1732.8	2484.8	4751.0	14410.2	32827.4	25806.5	6714.3	235.6	0.0	0.0	92241.3
75-79	0.0	0.0	0.0	0.0	649.4	1076.7	795.9	1004.8	1402.7	2490.8	6325.8	12247.8	9584.8	2800.8	89.1	0.0	36466.3
80-84	0.0	0.0	0.0	0.0	0.0	452.0	590.3	365.1	414.3	552.5	916.5	1711.0	3531.6	2617.2	864.3	27.4	12062.2
CMA	706.1	3121.3	7319.7	20820.7	67972.2	166223.2	290031.3	367622.3	333291.9	221405.4	119633.2	53225.6	20251.8	5653.5	973.3	27.4	1678278.8

Never-smoker death rates per 100,000 standardized to current smoker age \ duration distribution

190.1	246.9	307.5	266.4	208.7	290.7	237.8	320.6	465.9	703.1	1078.1	1604.0	2323.6	3074.3	3603.3	3944.9	498.5
-------	-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	-------

Excess Mortality (Rate Differences)																		
Age	0-4	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	70-74	75-79	CMD	
40-44			107.00	-46.64	69.33	107.55	236.41	728.61									94.06	
45-49	43.82	400.17	-12.75	95.54	181.40	199.91	198.34	408.21									160.93	
50-54	418.56	41.54	67.99	209.99	248.18	242.01	344.66	360.43	475.95								291.06	
55-59	138.07	266.54	175.21	233.50	215.00	370.28	335.31	468.58	651.24	381.39							406.49	
60-64	-269.93	150.25	199.42	444.76	236.69	463.54	404.01	496.96	600.60	780.53	1645.06						531.22	
65-69		-177.70	168.92	300.75	495.68	462.61	542.28	429.84	530.54	963.68	1104.42	1489.53					684.55	
70-74			618.53	252.99	210.47	332.76	113.21	795.85	375.73	770.49	1129.94	1105.38	1090.56				796.48	
75-79				220.85	462.38	744.15	290.35	1310.34	1096.04	-136.31	860.86	826.99	1387.82				722.57	
80-84					-2617.5	798.15	-110.19	882.10	1303.93	92.16	1256.70	585.81	1251.53	-778.41			598.20	
CMA	234.78	137.51	157.04	60.15	132.58	162.53	266.61	343.12	474.97	578.24	808.49	1077.00	890.97	1312.34	-515.58	423.73		

Relative Risk (Rate Ratios)																		
Age	0-4	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	70-74	75-79	CMD	
40-44			2.46	0.36	1.95	2.47	4.23	10.94									2.28	
45-49	1.36	4.32	0.89	1.79	2.50	2.66	2.64	4.39									2.50	
50-54	3.11	1.21	1.34	2.06	2.25	2.22	2.74	2.82	3.40								2.47	
55-59	1.42	1.82	1.54	1.71	1.66	2.13	2.03	2.43	2.99	2.17							2.24	
60-64	0.50	1.28	1.37	1.83	1.44	1.86	1.75	1.92	2.12	2.45	4.06						1.99	
65-69		0.80	1.19	1.34	1.56	1.52	1.61	1.49	1.60	2.09	2.25	2.68					1.77	
70-74			1.42	1.17	1.14	1.23	1.08	1.55	1.26	1.53	1.76	1.76	1.75				1.55	
75-79				1.09	1.20	1.31	1.12	1.55	1.46	0.94	1.36	1.25	1.58				1.30	
80-84					0.34	1.20	0.97	1.22	1.33	1.02	1.32	1.15	1.32	0.80			1.15	
CMA	2.24	1.56	1.51	1.23	1.64	1.91	2.12	2.07	2.02	1.82	1.75	1.67	1.38	1.43	0.86		1.85	

CMA=Combined ages.

CME =Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	4.5	9.6	20.4	43.3	91.8	194.9	413.7	878.2

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
50-54	0	0	0	0	0	2	3	4	0	0	0	0	0	0	0	0	9
55-59	0	0	0	1	0	0	4	3	5	2	0	0	0	0	0	0	15
60-64	0	0	0	0	2	2	0	6	11	11	1	0	0	0	0	0	33
65-69	0	0	0	1	0	0	0	2	6	19	16	0	0	0	0	0	44
70-74	0	0	0	2	1	3	1	2	5	9	19	8	3	0	0	0	53
75-79	0	0	0	0	1	3	1	0	8	4	14	31	19	3	0	0	84
80-84	0	0	0	0	0	2	5	0	3	2	4	4	10	8	5	0	43
CMA	0	0	0	4	4	13	16	17	36	47	54	43	32	11	5	0	264

Total PYO

40-44	22.9	104.8	235.9	668.3	1756.3	1862.2	297.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4958.2
45-49	62.5	194.8	302.3	511.4	1479.9	3631.6	4080.2	664.5	24.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11151.9
50-54	92.6	316.8	417.8	569.2	1095.8	3187.9	7477.6	7217.6	1134.8	35.9	0.0	0.0	0.0	0.0	0.0	0.0	21546.0
55-59	73.5	340.9	456.0	525.0	768.3	1566.3	4386.6	9656.8	8400.1	1353.1	38.9	0.0	0.0	0.0	0.0	0.0	27567.4
60-64	0.0	172.0	508.3	415.8	510.1	752.2	1481.3	3987.1	8517.9	6756.0	1170.6	34.8	0.0	0.0	0.0	0.0	24305.9
65-69	0.0	0.0	233.8	446.4	323.3	470.6	625.3	1113.8	3171.3	6200.9	4637.8	830.9	28.5	0.0	0.0	0.0	18082.6
70-74	0.0	0.0	0.0	247.1	463.3	269.9	379.6	448.4	889.7	2109.5	3814.8	2645.6	611.5	26.1	0.0	0.0	11905.3
75-79	0.0	0.0	0.0	0.0	260.3	394.0	188.6	249.8	324.6	532.8	1160.3	1638.8	1298.9	357.9	13.3	0.0	6619.0
80-84	0.0	0.0	0.0	0.0	0.0	194.3	226.8	105.3	113.7	132.3	207.3	405.5	716.1	468.0	159.8	4.0	2733.2
CMA	251.5	1129.4	2154.0	3383.1	6657.2	12531.0	19143.8	23453.2	22576.8	17120.6	11029.5	5755.3	2655.0	852.0	173.2	4.0	128869.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

22.9	34.8	57.8	79.7	91.3	92.5	72.4	74.9	117.5	203.0	362.4	630.8	1029.8	1405.6	1788.3	1864.2	181.2
------	------	------	------	------	------	------	------	-------	-------	-------	-------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)																	CMD					
	0-4	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	70-74	75-79							
40-44						49.18												15.65					
45-49							39.42											8.33					
50-54							42.36	19.74	35.04									21.39					
55-59							47.93	-12.19	16.27	104.55								11.16					
60-64								58.67	37.32	71.00	-6.39							43.95					
65-69								-15.35	-5.71	111.50	150.09							48.42					
70-74									148.28	12.92	84.34	-111.33	76.87					31.45					
75-79										1586.49	-127.51	328.43	807.87	584.55	-40.03				390.86				
80-84											340.09	65.87	-877.73	-467.69	-154.77	1264.09	-290.90						
CMA							38.53	-31.21	11.27	11.18	-2.37	50.85	71.52	127.24	116.37	175.45	-114.49	1099.14	39.18				
Relative Risk (Rate Ratios)																							
40-44							11.87											4.46					
45-49								5.11										1.87					
50-54								3.08	1.97	2.72								2.05					
55-59								4.40	2.11	0.72	1.38	3.42						1.26					
60-64									4.27	2.90	1.64	1.41	1.77	0.93				1.48					
65-69										1.15	0.92	0.97	1.57	1.77				1.25					
70-74										0.52	2.69	0.64	1.08	1.03	1.20	0.73	1.19		1.08				
75-79											0.44	0.87	2.81	0.85	1.37	1.92	1.67	0.95		1.45			
80-84											0.55	1.18			1.04	0.53	0.75	0.92	1.68	0.84			
CMA												1.48	0.66	1.12	1.15	0.97	1.43	1.35	1.18	1.17	0.92	1.61	1.22

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
10-19 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age									Duration								
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	4.5	9.6	20.4	43.3	91.8	194.9	413.7	878.2	1864.2

Observed deaths for smokers based on age groups \ durations (years)

Age	Duration															CMD	
	0-4	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	70-74	75-79	
40-44	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	3
45-49	0	1	0	0	0	4	3	1	0	0	0	0	0	0	0	0	9
50-54	0	0	0	0	0	2	9	5	0	0	0	0	0	0	0	0	16
55-59	0	0	0	0	1	2	5	16	16	4	0	0	0	0	0	0	44
60-64	0	0	0	1	1	2	2	7	31	31	5	0	0	0	0	0	80
65-69	0	0	0	2	1	3	1	5	16	35	43	5	0	0	0	0	111
70-74	0	0	0	1	1	2	1	4	6	23	52	38	14	0	0	0	142
75-79	0	0	0	0	3	4	4	3	4	10	17	34	31	7	1	0	118
80-84	0	0	0	0	0	2	1	0	8	3	7	6	13	19	8	1	68
CMA	0	1	0	4	9	22	26	41	81	106	124	83	58	26	9	1	591

Total PYO

40-44	17.3	66.8	244.1	1357.0	4657.6	5880.6	936.0	38.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13397.7
45-49	49.9	148.3	230.9	741.6	3160.6	10349.7	12554.3	2023.0	69.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29277.4
50-54	78.2	226.0	380.3	676.0	1807.8	6679.5	19801.0	20870.2	3341.1	100.7	0.0	0.0	0.0	0.0	0.0	0.0	54160.7
55-59	37.3	199.1	339.3	576.8	1064.3	2511.5	9343.5	25001.0	23516.3	3846.9	105.9	0.0	0.0	0.0	0.0	0.0	66542.0
60-64	0.0	84.4	311.7	383.8	644.1	1101.5	2362.0	8420.8	21191.9	18412.1	3158.2	106.9	0.0	0.0	0.0	0.0	56177.3
65-69	0.0	0.0	131.6	317.4	397.8	584.7	879.0	1800.5	6172.5	14368.7	11954.3	2418.4	84.8	0.0	0.0	0.0	39129.6
70-74	0.0	0.0	0.0	159.4	367.0	336.3	495.4	699.0	1313.8	3682.9	8133.3	6575.3	1520.6	56.4	0.0	0.0	23290.5
75-79	0.0	0.0	0.0	0.0	153.0	262.9	253.4	308.6	433.9	786.8	1827.3	341.2	2766.5	713.8	18.5	0.0	11005.8
80-84	0.0	0.0	0.0	0.0	0.0	114.6	173.8	126.8	131.3	208.0	325.8	533.3	1093.7	819.5	264.5	1.7	3792.8
CMA	182.7	724.5	1637.9	4212.0	12452.2	28021.3	46748.4	59288.3	56170.0	41426.0	25504.8	13066.0	5465.5	1589.7	283.0	1.7	296773.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

20.6	31.3	48.9	51.1	44.8	41.9	44.3	58.1	96.2	175.4	321.6	553.5	905.7	1370.0	1799.7	1864.2	148.5
------	------	------	------	------	------	------	------	------	-------	-------	-------	-------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)															CMD			
	0-4	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	70-74	75-79			
40-44					36.65	12.48											17.87		
45-49						29.05	14.39	39.83									21.14		
50-54							8.69	25.07	3.58								9.16		
55-59							50.70	36.38	10.26	20.74	24.78	60.72					22.87		
60-64								63.44	89.75	-7.15	-6.69	54.46	76.55	66.50			50.59		
65-69									435.18	56.46	318.21	-61.14	82.79	64.31	48.34	564.80	11.84	88.77	
70-74										-141.25	180.92	-211.87	158.52	42.95	210.78	225.62	168.54	506.97	
75-79											1062.57	643.18	700.22	93.97	43.63	392.84	52.11	98.47	242.34
80-84													-421.86	284.72	-739.00	-675.51	454.32	1160.40	
CMA	106.70		43.91	27.46	36.63	11.30	11.01	47.99	80.48	164.62	81.70	125.52	265.56	1380.49			52.63		
Relative Risk (Rate Ratios)																			
40-44					9.10	3.76											4.95		
45-49						4.03	2.50	5.15									3.20		
50-54						1.43	2.23	1.18									1.45		
55-59						2.17	1.84	1.24	1.48	1.57	2.40						1.53		
60-64						2.84	1.69	1.98	0.92	0.91	1.59	1.83	1.72				1.55		
65-69							3.23	1.29	2.63	0.58	1.42	1.33	1.25	1.85	1.06		1.46		
70-74								0.66	1.44	0.49	1.38	1.10	1.51	1.55	1.41	2.23		1.47	
75-79									2.23	1.73	1.80	1.11	1.05	1.45	1.06	1.11	1.28	1.12	1.22
80-84													0.77	1.15	0.60	0.64	1.24	1.62	0.96
CMA		4.41		1.86	1.61	1.87	1.26	1.19	1.50	1.46	1.51	1.15	1.13	1.19	1.77		1.36		

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
20 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										Duration
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	
	4.5	9.6	20.4	43.3	91.8	194.9	413.7	878.2	1864.2		

Observed deaths for smokers based on age groups \ durations (years)

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	3	2	0	0	0	0	0	0	0	0	0	6
45-49	0	0	0	0	2	12	7	3	0	0	0	0	0	0	0	0	24
50-54	0	0	0	0	1	3	20	28	3	0	0	0	0	0	0	0	55
55-59	0	1	0	0	0	4	12	43	59	11	0	0	0	0	0	0	130
60-64	0	0	0	0	2	2	4	25	72	77	14	0	0	0	0	0	196
65-69	0	0	0	3	1	2	2	5	22	74	88	22	1	0	0	0	220
70-74	0	0	0	1	4	2	2	2	7	27	86	57	12	1	0	0	261
75-79	0	0	0	0	1	3	3	4	3	7	25	41	49	6	1	0	143
80-84	0	0	0	0	0	0	3	1	2	1	5	14	24	23	10	0	83
CMA	0	1	0	4	12	31	55	111	168	197	218	134	86	30	11	0	1058

Total PYO

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Total PYO							
40-44	15.9	83.6	329.9	2641.8	11988.3	15971.4	2856.6	85.6	0.0	34173.0							
45-49	54.6	153.2	373.2	1283.2	6503.3	25247.0	34125.2	6451.8	204.2	74395.6							
50-54	76.3	262.0	481.1	1169.9	3063.6	14515.9	46267.8	55330.5	10600.3	134063.8							
55-59	21.4	196.0	423.4	847.6	1768.8	4184.3	19276.4	59059.8	60180.5	11710.8	157992.7						
60-64	0.0	69.2	297.2	499.3	992.2	1749.8	3921.8	16326.5	46302.3	42031.2	8527.7	120956.3					
65-69	0.0	0.0	132.3	364.0	487.8	799.9	1294.9	2628.4	10320.5	27101.6	23305.1	5127.1	167.3	0.0	71749.0		
70-74	0.0	0.0	0.0	191.7	397.5	378.6	522.8	604.4	1578.4	5393.2	13110.8	10574.4	2739.4	88.5	0.0	36779.6	
75-79	0.0	0.0	0.0	0.0	169.2	310.3	242.3	306.0	419.4	795.8	2299.2	4814.0	3818.4	1132.4	40.5	0.0	14347.4
80-84	0.0	0.0	0.0	0.0	0.0	116.3	148.9	96.5	126.3	150.2	283.1	552.3	1260.1	951.9	338.6	16.5	4038.5
CMA	168.3	763.9	2037.1	7217.4	25370.6	63273.4	110654.5	141089.5	129731.8	87509.0	47849.5	21307.2	7985.3	2172.8	379.1	16.5	647525.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

18.3	28.8	42.4	39.6	29.8	27.7	31.4	46.3	79.7	147.0	278.2	500.0	860.1	1291.2	1758.8	1864.2	108.8
------	------	------	------	------	------	------	------	------	-------	-------	-------	-------	--------	--------	--------	-------

		Excess Mortality (Rate Differences)																		
Age		0-4	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	70-74	75-79	CMD		
40-44						3.82	14.26	65.49											13.04	
45-49						21.15	37.93	10.91	36.90										22.66	
50-54						12.26	0.29	21.06	30.23	7.92									20.64	
55-59						52.34	19.00	29.55	54.78	50.67									39.03	
60-64						109.76	22.48	10.18	61.31	63.68	91.36	72.35							79.22	
65-69						586.34	10.08	55.12	-45.46	-4.68	18.26	78.14	182.69	234.19					111.72	
70-74						592.56	114.56	-31.13	-165.10	29.76	86.91	242.23	125.31	24.32					148.05	
75-79							88.49	360.18	428.98	-162.93	1.46	209.14	-26.53	405.04	-348.37			118.48		
80-84											-67.91	670.91	40.46	552.01	1089.31				191.05	
CMA		102.06		15.84	17.55	21.28	18.32	32.34	49.79	78.11	177.42	128.91	216.65	89.45	1142.90				54.56	
Relative Risk (Rate Ratios)																				
40-44						1.84	4.15	15.48											3.88	
45-49						3.20	4.95	2.14	4.84										3.36	
50-54						1.60	1.01	2.03	2.48	1.39									2.01	
55-59						2.21	1.44	1.68	2.27	2.17									1.90	
60-64						2.20	1.24	1.11	1.67	1.69	2.00	1.79							1.76	
65-69		4.01		1.05	1.28	0.79	0.98	1.09	1.40	1.94	2.20								1.57	
70-74				2.43	1.28	0.92	0.65	1.07	1.21	1.59	1.30	1.06							1.36	
75-79					1.10	1.41	1.49	0.81	1.00	1.24	0.97	1.46	0.60						1.13	
80-84											0.95	1.36	1.02	1.30	1.56				1.10	
CMA		4.54		1.40	1.59	1.77	1.58	1.70	1.62	1.53	1.64	1.26	1.25	1.07	1.65				1.50	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**

21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										Duration
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	
	4.5	9.6	20.4	43.3	91.8	194.9	413.7	878.2	1864.2		

Observed deaths for smokers based on age groups \ durations (years)

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	1	2	3	1	0	0	0	0	0	0	0	0	0	7
45-49	0	0	0	0	3	4	10	1	0	0	0	0	0	0	0	0	18
50-54	0	0	0	0	1	5	17	22	8	0	0	0	0	0	0	0	53
55-59	0	0	0	0	1	2	8	27	37	8	1	0	0	0	0	0	84
60-64	0	1	0	0	0	0	2	11	54	50	8	0	0	0	0	0	126
65-69	0	0	0	0	0	1	0	3	12	33	49	8	0	0	0	0	96
70-74	0	0	0	1	1	1	0	0	1	15	33	26	7	0	0	0	85
75-79	0	0	0	0	0	2	2	0	2	2	5	7	16	6	0	0	42
80-84	0	0	0	0	0	0	0	1	0	0	2	3	4	3	0	0	13
CMA	0	1	0	2	8	18	40	65	114	108	98	44	27	9	0	0	534

Total PYO

40-44	3.1	26.2	160.2	1720.0	7693.8	10580.9	2000.3	64.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49666.2
45-49	20.6	46.6	151.4	725.8	4094.9	16627.3	23137.9	4715.6	146.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	86234.5
50-54	21.8	92.3	201.5	531.7	1792.3	9184.8	31882.9	36894.5	7345.4	234.4	0.0	0.0	0.0	0.0	0.0	0.0	99148.1
55-59	4.6	62.8	171.2	370.3	852.9	2408.5	12048.3	37327.9	37787.0	7906.3	208.3	0.0	0.0	0.0	0.0	0.0	66300.3
60-64	0.0	22.0	91.0	183.4	424.9	767.7	2031.0	9457.1	26549.2	23085.3	5263.6	145.2	0.0	0.0	0.0	0.0	34241.8
65-69	0.0	0.0	33.5	105.4	194.3	322.6	556.9	1240.0	5096.3	13010.6	10937.7	2664.8	77.8	0.0	0.0	0.0	13400.8
70-74	0.0	0.0	0.0	42.8	100.6	134.4	218.6	326.2	567.9	2081.1	4997.5	3630.8	1070.8	302	0.0	0.0	4087.5
75-79	0.0	0.0	0.0	0.0	37.5	68.4	71.2	81.3	123.6	236.8	680.3	1373.9	1070.8	316.1	7.6	0.0	902.5
80-84	0.0	0.0	0.0	0.0	0.0	12.5	22.8	17.3	19.9	38.4	66.7	138.5	287.1	233.4	63.9	2.0	902.5
CMA	50.0	249.8	811.8	3729.5	15191.2	40107.0	71969.9	90124.6	77637.3	46872.8	22154.0	8153.2	2506.5	579.7	71.5	2.0	380210.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

17.1	28.7	35.3	26.2	19.7	19.2	26.3	41.7	72.1	131.6	244.4	439.4	771.5	1251.1	1759.8	1864.2	80.0
------	------	------	------	------	------	------	------	------	-------	-------	-------	-------	--------	--------	--------	------

Age	Excess Mortality (Rate Differences)															CMD		
	0-4	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	70-74	75-79		
40-44				53.62	21.47	23.83	45.47										26.94	
45-49					63.66	14.46	33.62	11.61									26.64	
50-54						35.42	34.06	32.94	39.25	88.53							39.69	
55-59							73.99	39.78	23.14	29.08	54.66	57.93	406.94				41.47	
60-64								6.65	24.49	111.58	122.17	60.17					92.66	
65-69									115.09	47.03	40.47	58.73	253.09	105.31			114.66	
70-74										-237.64	307.05	246.61	264.98	240.02			220.56	
75-79											-33.44	-143.28	-368.72	615.95	1020.02			154.36
80-84												-470.85	-578.92				-423.73	
CMA	371.52		27.42	32.98	25.65	29.28	30.39	74.74	98.81	198.00	100.28	305.70	301.56				60.47	
Relative Risk (Rate Ratios)																		
40-44				12.86	5.75	6.27	11.05										6.96	
45-49					7.63	2.51	4.50	2.21									3.78	
50-54						2.74	2.67	2.62	2.93	5.34							2.95	
55-59							2.71	1.92	1.54	1.67	2.26	2.34	11.10				1.96	
60-64								1.07	1.27	2.22	2.33	1.66					2.01	
65-69									1.59	1.24	1.21	1.30	2.30	1.54			1.59	
70-74										0.43	1.74	1.60	1.64	1.58			1.53	
75-79											0.96	0.84	0.58	1.70	2.16			1.18
80-84												0.75	0.69				0.77	
CMA	13.92		2.05	2.68	2.33	2.11	1.73	2.04	1.75	1.81	1.23	1.40	1.24				1.76	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age									Duration							
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	4.5	9.6	20.4	43.3	91.8	194.9	413.7	878.2

Observed deaths for smokers based on age groups \ durations (years)

Age	Duration													CVD			
	0-4	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	70-74	75-79	
40-44	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
45-49	0	0	0	0	0	3	4	1	0	0	0	0	0	0	0	0	8
50-54	0	1	0	0	0	3	10	16	3	0	0	0	0	0	0	0	33
55-59	0	0	0	0	0	2	8	24	30	5	1	0	0	0	0	0	70
60-64	0	0	0	0	0	0	0	7	25	42	5	0	0	0	0	0	79
65-69	0	0	0	1	0	1	1	4	5	22	21	7	0	0	0	0	62
70-74	0	0	0	0	0	0	0	2	4	6	12	16	5	0	0	0	45
75-79	0	0	0	0	0	1	0	1	0	0	3	9	8	2	0	0	24
80-84	0	0	0	0	0	1	1	0	0	1	1	1	7	1	0	0	13
CVA	0	1	0	1	0	12	25	55	67	76	43	33	20	3	0	0	336

Total PYO

40-44	11.5	20.8	123.6	878.3	3739.6	5384.8	1323.4	49.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11531.8
45-49	13.8	62.2	84.8	422.8	2256.2	8956.0	12920.0	3339.8	122.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28178.6
50-54	14.8	64.6	173.0	365.9	1007.7	5046.6	17670.1	21472.3	5376.2	187.3	0.0	0.0	0.0	0.0	0.0	0.0	51378.3
55-59	10.4	60.0	112.3	252.4	525.8	1455.3	6804.4	21049.2	21980.8	5528.8	163.3	0.0	0.0	0.0	0.0	0.0	57942.7
60-64	0.0	24.0	85.7	123.0	259.2	507.4	1233.5	5236.6	14826.3	13360.3	3459.3	111.2	0.0	0.0	0.0	0.0	39228.3
65-69	0.0	0.0	27.4	58.3	100.9	194.5	317.7	732.0	2775.1	6904.7	5780.3	1696.1	59.8	0.0	0.0	0.0	18644.7
70-74	0.0	0.0	0.0	16.9	41.1	72.8	98.2	176.4	349.3	1028.9	2461.4	2001.6	715.9	29.8	0.0	0.0	6992.3
75-79	0.0	0.0	0.0	0.0	14.0	23.4	37.5	51.3	78.3	112.9	293.5	619.0	538.8	230.4	5.8	0.0	2004.9
80-84	0.0	0.0	0.0	0.0	0.0	6.1	11.3	16.2	21.3	16.8	22.5	62.4	140.0	116.1	43.5	2.3	458.3
CVA	50.5	231.6	606.7	2117.7	7944.3	21646.8	40416.9	52125.7	45529.4	27139.7	12180.3	4490.3	1454.5	376.3	49.3	2.3	216361.9

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

18.5	29.4	37.9	26.5	19.5	19.5	26.1	41.3	70.6	124.2	227.4	407.3	716.4	1145.7	1749.1	1864.2	76.8
------	------	------	------	------	------	------	------	------	-------	-------	-------	-------	--------	--------	--------	------

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44						14.05	71.04										12.82
45-49						23.90	21.36	20.34									18.79
50-54						39.07	36.21	54.14	35.42								43.85
55-59						94.18	74.31	70.76	93.23	47.18							77.55
60-64							41.80	76.80	222.55	52.72							109.56
65-69							119.89	351.54	-14.73	123.72	168.40	217.81					137.59
70-74								719.95	731.31	169.41	73.80	365.64	284.68				229.84
75-79											143.94	575.75	606.48	-10.22			318.85
80-84																	972.19
CMA	402.42		20.75			35.91	35.77	64.22	76.51	155.80	125.67	327.63	658.62	-348.34			78.48
Relative Risk (Rate Ratios)																	
40-44						4.11	16.71										3.83
45-49						3.49	3.22	3.12									2.96
50-54						2.92	2.78	3.66	2.74								3.15
55-59						3.18	2.72	2.64	3.16	2.09							2.79
60-64							1.46	1.84	3.42	1.57							2.19
65-69							1.62	2.80	0.92	1.63	1.86	2.12					1.71
70-74								2.74	2.77	1.41	1.18	1.93	1.69				1.56
75-79											1.16	1.66	1.69	0.99			1.36
80-84																	1.52
CMA	14.89		1.78			2.84	2.37	2.56	2.08	2.25	1.55	1.80	1.92	0.70			2.02

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**

Current smokers of any number of cigarettes

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

	Age	Age										CVD
		40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84		
	Rate	4.5	9.6	20.4	43.3	91.8	194.9	413.7	878.2	1864.2		

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CVD
40-44	0	0	0	1	5	9	4	0	0	0	0	0	0	0	0	0	19
45-49	0	1	0	0	5	23	6	0	0	0	0	0	0	0	0	0	61
50-54	0	1	0	0	2	15	59	76	15	0	0	0	0	0	0	0	168
55-59	0	1	0	1	2	10	37	114	148	31	2	0	0	0	0	0	346
60-64	0	1	0	1	5	6	8	56	194	214	30	0	0	0	0	0	518
65-69	0	0	0	7	2	7	4	19	64	163	217	43	1	0	0	0	547
70-74	0	0	0	5	7	9	4	10	23	80	203	147	41	2	0	0	531
75-79	0	0	0	0	5	13	10	8	17	23	67	122	123	24	3	0	415
80-84	0	0	0	0	0	5	11	2	13	7	20	28	59	55	23	1	224
CVA	0	4	0	15	33	97	163	291	474	538	542	340	224	81	26	1	2829

Total PYO

40-44	70.7	306.3	1109.5	7511.5	30155.5	39819.0	7427.3	249.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	86649.2
45-49	204.6	608.3	1152.2	3709.5	17582.3	65235.1	87554.7	17245.7	567.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	193359.5
50-54	283.6	972.4	1666.7	3377.8	8813.7	38957.3	125546.2	142326.2	27912.5	869.7	0.0	0.0	0.0	0.0	0.0	0.0	350745.8
55-59	147.3	860.8	1517.3	2590.4	4998.8	12185.2	52086.3	152730.6	152535.9	30473.9	847.4	0.0	0.0	0.0	0.0	0.0	410973.7
60-64	0.0	373.8	1308.4	1628.2	2850.3	4907.7	11087.3	43648.0	118020.7	104549.8	21697.3	641.4	0.0	0.0	0.0	0.0	310712.5
65-69	0.0	0.0	565.7	1328.6	1518.3	2390.4	3710.8	7567.8	27687.5	68036.6	57018.8	12818.9	421.2	0.0	0.0	0.0	183066.3
70-74	0.0	0.0	0.0	674.8	1404.1	1199.9	1732.8	2484.8	4751.0	14410.2	32827.4	25776.5	6714.3	235.6	0.0	0.0	922413.3
75-79	0.0	0.0	0.0	0.0	649.4	1076.7	795.9	1004.8	1402.7	2490.8	6325.8	12147.8	9584.8	2800.8	89.1	0.0	38466.3
80-84	0.0	0.0	0.0	0.0	0.0	452.0	590.3	365.1	414.3	552.5	916.5	1711.0	3531.6	2617.2	864.3	27.4	12062.2
CVA	706.1	3121.3	7319.7	20620.7	67972.2	166223.2	290031.3	367622.3	333291.9	221405.4	119633.2	53225.6	20251.8	5653.5	973.3	27.4	1678278.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

20.4	31.6	47.3	45.1	35.5	32.1	34.3	48.3	82.1	150.7	284.1	510.7	881.9	1315.3	1773.9	1864.2	110.7
------	------	------	------	------	------	------	------	------	-------	-------	-------	-------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)															CMD		
	0-4	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	70-74	75-79		
40-44				8.79	12.06	16.00	49.33										17.40	
45-49	154.81				18.84	25.66	20.27	25.19									21.95	
50-54	82.46				2.31	16.13	26.62	33.02	33.36								27.52	
55-59	72.92			-4.65	-3.25	36.81	27.78	31.38	53.77	58.47	192.76						40.93	
60-64	175.86			-30.40	63.60	30.44	-19.67	36.48	72.56	112.87	60.27						74.89	
65-69				331.97	-63.18	97.93	-47.11	56.16	36.25	74.06	185.67	140.54	42.53				103.89	
70-74				327.29	84.82	306.33	-182.66	-11.28	70.38	141.44	204.66	155.90	196.91	435.23			161.94	
75-79					-108.29	329.22	378.20	-61.99	333.77	45.21	180.94	117.89	405.08	-21.30			200.60	
80-84						-757.98	-0.82	-1316.3	1273.40	-597.20	318.04	-227.70	-193.53	237.34	736.90			-7.12
CMA	96.57			26.99	13.10	26.30	21.93	30.88	60.08	92.25	168.95	128.14	224.13	117.46	897.30			57.85
Relative Risk (Rate Ratios)																		
40-44				2.94	3.67	5.00	11.91										4.85	
45-49	17.13				2.96	3.67	3.11	3.62									3.29	
50-54	5.05				1.11	1.89	2.31	2.62	2.64								2.35	
55-59	2.69			0.89	0.92	1.90	1.64	1.73	2.24	2.35	5.46						1.95	
60-64	2.92			0.67	1.91	1.33	0.79	1.40	1.79	2.23	1.66						1.82	
65-69				2.70	0.68	1.50	0.55	1.29	1.19	1.38	1.95	1.72	1.22				1.53	
70-74					1.79	1.21	1.81	0.56	0.97	1.17	1.34	1.49	1.36	1.48	2.05		1.39	
75-79						0.88	1.37	1.43	0.91	1.36	1.05	1.21	1.13	1.46	0.98		1.23	
80-84						0.59	1.00	0.29	1.68	0.68	1.17	0.86	0.90	1.13	1.40		1.00	
CMA	4.06			1.60	1.37	1.82	1.64	1.64	1.73	1.61	1.59	1.25	1.25	1.09	1.51		1.52	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	0.7	1.3	2.2	3.9	6.7	11.7	20.4	35.5	61.8

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55-59	0	0	0	0	0	1	1	5	1	0	0	0	0	0	0	0	9
60-64	0	0	0	0	0	0	0	2	4	6	3	0	0	0	0	0	15
65-69	0	0	0	0	0	0	0	0	2	6	8	4	0	0	0	0	20
70-74	0	0	0	0	0	0	1	0	1	5	15	8	2	0	0	0	32
75-79	0	0	0	0	0	1	0	0	0	1	0	6	2	4	0	0	14
80-84	0	0	0	0	0	0	0	1	4	0	0	2	7	2	1	0	17
CMA	0	0	0	0	0	2	2	4	16	19	26	20	11	6	1	0	107

Total PYO

40-44	22.9	104.8	235.9	668.3	1756.3	1862.2	297.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4958.2
45-49	62.5	194.8	302.3	511.4	1479.9	3631.6	4080.2	664.5	24.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11151.9
50-54	92.6	316.8	417.8	569.2	1095.8	3187.9	7477.6	7217.6	1134.8	35.9	0.0	0.0	0.0	0.0	0.0	0.0	21546.0
55-59	73.5	340.9	456.0	525.0	768.3	1568.3	4386.6	9656.8	8400.1	1353.1	38.9	0.0	0.0	0.0	0.0	0.0	27567.4
60-64	0.0	172.0	508.3	415.8	510.1	752.2	1481.3	3987.1	8517.9	6756.0	1170.6	34.8	0.0	0.0	0.0	0.0	24305.9
65-69	0.0	0.0	233.8	446.4	323.3	470.6	625.3	1113.8	3171.3	6200.9	4637.6	830.9	28.5	0.0	0.0	0.0	18062.6
70-74	0.0	0.0	0.0	247.1	463.3	269.9	379.6	448.4	889.7	2109.5	3814.8	2645.6	611.5	26.1	0.0	0.0	11905.3
75-79	0.0	0.0	0.0	0.0	260.3	394.0	188.6	249.8	324.6	532.8	1160.3	1638.6	1298.9	357.9	13.3	0.0	6619.0
80-84	0.0	0.0	0.0	0.0	0.0	194.3	226.8	105.3	113.7	132.3	207.3	405.5	716.1	468.0	159.8	4.0	2733.2
CMA	251.5	1129.4	2154.0	3383.1	6657.2	12531.0	19143.8	23453.2	22576.8	17120.6	11029.5	5755.3	2655.0	852.0	173.2	4.0	128869.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

2.3	3.1	4.4	5.2	5.2	4.9	4.4	5.1	7.4	11.3	17.6	26.8	36.8	49.5	59.8	61.8	9.3
-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	-----

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44																	26.78
45-49																	54.98
50-54																	96.89
55-59							59.90	18.93	6.49	55.66	70.04						248.40
60-64								43.43		40.23	82.08	249.55					176.02
65-69										51.35	85.05	160.78	409.68				560.21
70-74									243.06		92.01	216.63	372.82	282.00	306.68		73.76
75-79											152.19		290.85	118.48	1082.09		
80-84												431.44	915.76	365.57			
CMA							11.06	6.02	12.00	63.51	99.68	218.13	320.71	375.47	654.76		
Relative Risk (Rate Ratios)																	
40-44																	8.45
45-49																	9.17
50-54																	9.44
55-59							16.49	5.90	2.68	15.40	19.12						13.18
60-64									7.45	6.98	13.20	36.09					5.96
65-69										5.38	8.26	14.73	41.10				10.07
70-74										12.92	5.51	11.63	19.29	14.83	16.04		
75-79											5.29		9.20	4.34	31.49		
80-84												7.98	15.82	6.92			
CMA							3.25	2.36	3.37	9.63	9.82	13.39	12.97	10.67	14.24		

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
10-19 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	0.7	1.3	2.2	3.9	6.7	11.7	20.4	35.5	61.8

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	2
50-54	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	4
55-59	0	0	0	0	0	0	0	4	5	0	0	0	0	0	0	0	9
60-64	0	0	0	0	0	0	2	2	12	15	3	0	0	0	0	0	34
65-69	0	0	0	0	0	0	2	2	6	14	20	8	0	0	0	0	52
70-74	0	0	0	0	1	0	0	1	1	5	19	16	8	0	0	0	51
75-79	0	0	0	0	0	0	1	1	1	3	1	8	20	54	3	0	52
80-84	0	0	0	0	0	1	0	1	0	2	1	3	7	7	1	0	23
CMA	0	0	0	0	1	4	7	14	27	37	51	47	29	10	1	0	228

Total PYO

40-44	17.3	66.8	244.1	1357.0	4857.6	5880.6	936.0	36.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13397.7
45-49	49.9	148.3	230.9	741.6	3160.6	10349.7	12504.3	2023.0	69.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29277.4
50-54	78.2	226.0	380.3	676.0	1807.8	6879.5	19801.0	20870.2	3341.1	100.7	0.0	0.0	0.0	0.0	0.0	0.0	54160.7
55-59	37.3	199.1	339.3	576.8	1064.3	2511.5	9343.5	25001.0	23516.3	3646.9	105.9	0.0	0.0	0.0	0.0	0.0	66542.0
60-64	0.0	84.4	311.7	383.8	644.1	1101.5	2362.0	8420.8	21191.9	18412.1	3158.2	106.9	0.0	0.0	0.0	0.0	56177.3
65-69	0.0	0.0	121.6	317.4	397.8	584.7	879.0	1800.5	6172.5	14388.7	11954.3	2418.4	84.8	0.0	0.0	0.0	39129.6
70-74	0.0	0.0	0.0	159.4	367.0	336.3	495.4	699.0	1313.8	3682.9	8133.3	652.3	1520.6	56.4	0.0	0.0	23290.5
75-79	0.0	0.0	0.0	0.0	153.0	262.9	253.4	308.6	433.9	786.8	1627.3	348.2	2798.5	713.8	18.5	0.0	11005.8
80-84	0.0	0.0	0.0	0.0	0.0	114.6	173.8	126.8	131.3	208.0	325.8	533.3	1093.7	819.5	264.5	1.7	3792.8
CMA	182.7	724.5	1637.9	4212.0	12452.2	28021.3	46748.4	59298.3	56170.0	41426.0	25504.8	13066.0	5465.5	1589.7	283.0	1.7	29677.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

2.2	2.9	3.8	3.6	3.0	2.9	3.3	4.3	6.5	10.2	16.2	24.4	36.2	48.5	60.1	61.8	8.0
-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	-----

Age	Excess Mortality (Rate Differences)															CMD			
	0-4	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	70-74	75-79			
40-44						16.27											6.73		
45-49						6.39	6.72										5.56		
50-54							2.83	12.15									5.16		
55-59								12.13	17.40								9.66		
60-64								77.95	17.02	49.90	74.74	68.26					53.79		
65-69									215.82	99.37	85.49	85.59	155.59	319.08			121.18		
70-74						252.09				122.67	55.72	115.37	213.22	224.77	505.73			198.58	
75-79							344.86	359.12	268.57	655.89	91.61	402.31	539.03	470.56	364.82			436.99	
80-84										899.76	245.21	500.81	578.27	792.40	316.29			544.64	
CMA						5.01	11.42	11.71	19.29	41.59	79.10	183.79	335.33	494.42	580.56	293.30		66.87	
Relative Risk (Rate Ratios)																			
40-44						23.20											10.18		
45-49						7.57	6.27										5.35		
50-54							2.27	6.47									3.33		
55-59								4.14	5.50								3.50		
60-64								12.58	3.53	8.42	12.11	14.12					8.99		
65-69									19.43	9.48	8.30	8.31	14.28	28.24			11.25		
70-74						13.36				7.02	3.73	6.66	11.46	12.02	25.80			10.74	
75-79									10.72	11.12	9.13	19.48	3.58	12.34	16.19	14.26	11.84		13.31
80-84												15.56	4.97	9.11	10.36	13.83	6.12		9.82
CMA						2.66	5.00	4.58	5.46	7.43	8.74	12.36	14.75	14.67	12.97	5.88		9.66	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
20 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	0.7	1.3	2.2	3.9	6.7	11.7	20.4	35.5

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	2
50-54	0	0	0	0	0	5	5	7	2	0	0	0	0	0	0	0	15
55-59	0	0	1	1	0	0	0	18	28	7	1	0	0	0	0	0	56
60-64	0	0	1	1	0	1	1	10	37	55	15	3	0	0	0	0	124
65-69	0	0	0	0	0	0	1	3	19	43	30	7	3	0	0	0	106
70-74	0	0	0	0	3	0	0	1	2	20	44	39	8	2	0	0	119
75-79	0	0	0	0	0	0	1	1	3	3	14	27	24	10	1	0	84
80-84	0	0	0	0	0	0	0	0	1	1	0	4	18	5	2	0	31
CMA	0	0	2	2	3	4	8	40	92	129	104	80	53	17	3	0	537

Total PYO

40-44	15.9	83.6	329.9	2641.8	11968.3	15871.4	2856.6	85.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34173.0
45-49	54.6	153.2	373.2	1283.2	6503.3	25247.0	34125.2	6451.8	204.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74395.6
50-54	76.3	262.0	481.1	1169.9	3063.6	14515.9	48257.8	55330.5	10600.3	326.3	0.0	0.0	0.0	0.0	0.0	0.0	134093.8
55-59	21.4	196.0	423.4	847.6	1768.8	4184.3	19276.4	59059.8	60180.5	11719.8	323.8	0.0	0.0	0.0	0.0	0.0	157992.7
60-64	0.0	69.2	297.2	499.3	992.2	1749.8	3921.8	16326.5	46302.3	42001.2	8527.7	239.4	0.0	0.0	0.0	0.0	120956.3
65-69	0.0	0.0	132.3	364.0	487.8	799.9	1294.9	2628.4	10320.5	27191.6	23005.1	5127.1	167.3	0.0	0.0	0.0	71749.0
70-74	0.0	0.0	0.0	191.7	397.5	378.6	522.8	804.4	1578.4	5393.2	13110.8	10574.4	2739.4	86.5	0.0	0.0	36779.6
75-79	0.0	0.0	0.0	0.0	169.2	310.3	242.3	306.0	419.4	795.8	2293.2	4814.0	3616.4	1132.4	40.5	0.0	14347.4
80-84	0.0	0.0	0.0	0.0	0.0	116.3	146.9	98.5	126.3	150.2	283.1	552.3	1260.1	951.9	308.6	16.5	4038.5
CMA	168.3	763.9	2037.1	7217.4	25370.6	63273.4	110654.5	141089.5	129731.8	87509.0	47649.5	21307.2	7985.3	2172.8	379.1	16.5	647525.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

2.0	2.7	3.4	3.0	2.3	2.2	2.7	3.8	5.7	9.1	14.8	22.6	34.0	46.4	59.0	61.8	6.4
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	-----

Age	Excess Mortality (Rate Differences)																	CMD		
	0-4	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	70-74	75-79				
40-44							6.65											1.41		
45-49							4.87	8.14	10.43	16.65								8.97		
50-54								26.61	42.66	55.91	305.01							31.58		
55-59			232.31	114.12				54.52	73.18	124.13	169.17	1246.32						95.79		
60-64			329.78	193.54			50.42	18.77			65.51	102.42	172.39	146.95	117.01	124.82	1781.12		136.02	
65-69																				
70-74								734.33			103.92	106.32	350.45	315.21	348.43	271.64		312.20		
75-79											377.31	291.31	679.79	341.51	573.43	525.37	593.04	847.58		549.98
80-84															662.53	1366.70	463.48	528.92		705.83
CMA							94.76	24.75	9.57	4.12	4.54	24.57	65.18	138.34	202.76	352.83	629.76	738.00	732.41	76.49
Relative Risk (Rate Ratios)																				
40-44							6.21													
45-49							3.10	4.66	5.70	8.50								2.11		
50-54								7.88	12.04	15.46	79.90							5.04		
55-59			61.09	30.52				9.10	11.88	19.45	26.14	186.22						9.17		
60-64			50.01	29.76			8.49	3.79										15.24		
65-69								6.59	9.74	15.72	13.55	10.99	11.66	153.06				12.61		
70-74									6.10	6.21	58.19	56.46	18.09	14.32					16.31	
75-79									11.63	9.21	20.15	19.62	17.16	15.80	17.71	24.88			16.50	
80-84															11.72	23.12	8.50	9.56		12.43
CMA							28.68	9.36	5.24	2.87	2.69	7.50	12.37	16.25	14.90	16.59	19.54	16.86	13.42	12.87

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	0.7	1.3	2.2	3.9	6.7	11.7	20.4	35.5	61.8

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50-54	0	0	0	0	0	2	4	3	1	0	0	0	0	0	0	0	10
55-59	0	0	0	0	0	2	1	9	12	4	0	0	0	0	0	0	28
60-64	0	0	0	0	0	0	2	9	24	34	11	0	0	0	0	0	80
65-69	0	0	0	0	0	0	1	0	10	31	31	10	1	0	0	0	85
70-74	0	0	0	0	0	0	0	1	0	9	18	19	8	0	0	0	55
75-79	0	0	0	0	0	0	0	0	0	0	8	8	3	0	0	0	27
80-84	0	0	0	0	0	0	0	0	0	0	0	0	1	2	1	0	4
CMA	0	0	0	0	1	5	7	23	47	78	68	37	58	5	1	0	290

Total PYO

40-44	3.1	26.2	160.2	1720.0	7693.8	10580.9	2000.3	64.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22249.1
45-49	20.6	46.6	151.4	725.8	4094.9	16627.3	23137.9	4715.6	146.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49666.2
50-54	21.8	92.3	204.5	581.7	1792.3	9184.8	31882.9	36894.5	7345.4	234.4	0.0	0.0	0.0	0.0	0.0	0.0	86234.5
55-59	4.6	62.8	171.2	370.3	852.9	2408.5	12048.3	37327.9	37787.0	7906.3	208.3	0.0	0.0	0.0	0.0	0.0	99548.1
60-64	0.0	22.0	91.0	163.4	424.9	767.7	2031.0	9457.1	26549.2	23365.3	5263.6	145.2	0.0	0.0	0.0	0.0	66300.3
65-69	0.0	0.0	33.5	105.4	194.3	322.6	556.9	1240.0	5098.3	13010.6	10937.7	2664.8	77.8	0.0	0.0	0.0	34241.8
70-74	0.0	0.0	0.0	42.8	100.6	134.4	218.6	326.2	567.9	2081.1	4997.5	3630.8	1070.8	302.2	0.0	0.0	13400.8
75-79	0.0	0.0	0.0	0.0	37.5	68.4	71.2	81.3	123.6	236.8	680.3	1373.9	1070.8	316.1	7.6	0.0	4067.5
80-84	0.0	0.0	0.0	0.0	0.0	12.5	22.8	17.3	19.9	38.4	66.7	138.5	287.1	233.4	63.9	2.0	902.5
CMA	50.0	249.8	811.8	3729.5	15191.2	40107.0	71969.9	90124.6	77637.3	46672.8	22154.0	8153.2	2506.5	579.7	71.5	2.0	360210.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

1.9	2.7	3.0	2.2	1.8	1.6	2.5	3.6	5.4	8.4	13.3	20.6	31.3	45.3	59.0	61.8	5.2
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	-----

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Ratio	0.7	1.3	2.2	3.9	6.7	11.7	20.4	35.5	61.8

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
55-59	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	28
60-64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80
65-69	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85
70-74	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	55
75-79	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
80-84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
CMA	0	0	0	0	1	6	7	23	47	78	68	37	58	5	1	0	290

Total PYO

40-44	3.1	26.2	160.2	1720.0	7693.8	10580.9	2000.3	64.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22249.1
45-49	20.6	46.6	151.4	725.8	4094.9	16627.3	23137.9	4715.6	146.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49666.2
50-54	21.8	92.3	204.5	561.7	1792.3	9184.8	31882.9	36894.5	7345.4	234.4	0.0	0.0	0.0	0.0	0.0	0.0	88234.5
55-59	4.6	62.8	171.2	370.3	852.9	2468.5	12048.3	37327.9	37787.0	7906.3	208.3	0.0	0.0	0.0	0.0	0.0	99548.1
60-64	0.0	22.0	91.0	163.4	424.9	767.7	2031.0	9457.1	26549.2	23365.3	5263.6	145.2	0.0	0.0	0.0	0.0	66300.3
65-69	0.0	0.0	33.5	105.4	194.3	322.6	556.9	1240.0	5096.3	13010.6	10937.7	2664.8	77.8	0.0	0.0	0.0	34241.8
70-74	0.0	0.0	0.0	42.8	100.6	134.4	218.6	326.2	567.9	2081.1	4997.5	3830.8	1070.8	30.2	0.0	0.0	13400.8
75-79	0.0	0.0	0.0	0.0	37.5	68.4	71.2	81.3	123.6	236.8	680.3	1373.9	1070.8	316.1	7.6	0.0	4067.5
80-84	0.0	0.0	0.0	0.0	0.0	12.5	22.8	17.3	19.9	38.4	66.7	138.5	287.1	233.4	63.9	2.0	902.5
CMA	50.0	249.8	811.8	3729.5	15191.2	40107.0	71969.9	90124.6	77607.3	46672.8	22154.0	8153.2	2596.5	579.7	71.5	2.0	360210.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

1.9	2.7	3.0	2.2	1.8	1.6	2.5	3.6	5.4	8.4	13.3	20.6	31.3	45.3	59.0	61.8	5.2
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	-----

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	0.7	1.3	2.2	3.9	6.7	11.7	20.4	35.5

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50-54	0	0	0	0	0	0	5	1	2	0	0	0	0	0	0	0	8
55-59	0	0	0	0	0	0	0	14	17	6	1	0	0	0	0	0	36
60-64	0	0	0	0	0	0	1	4	17	17	7	0	0	0	0	0	46
65-69	0	0	0	0	0	0	0	0	5	14	17	2	1	0	0	0	39
70-74	0	0	0	0	0	0	0	0	0	3	15	9	5	0	0	0	32
75-79	0	0	0	0	0	0	0	1	1	0	4	7	5	2	0	0	20
80-84	0	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	3
CMA	0	0	0	0	0	0	6	26	43	40	44	19	11	3	0	0	186

Total PYO

40-44	11.5	20.8	123.6	878.3	3739.6	5384.8	1323.4	49.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29178.6
45-49	13.8	62.2	84.8	422.8	2256.2	8956.0	12920.9	3039.8	122.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	51378.3
50-54	14.8	64.6	173.0	365.9	1007.7	5046.6	17670.1	21472.3	5376.2	187.3	0.0	0.0	0.0	0.0	0.0	0.0	57942.7
55-59	10.4	60.0	112.3	252.4	525.8	1455.3	6604.4	21049.2	21980.8	5528.8	163.3	0.0	0.0	0.0	0.0	0.0	39228.3
60-64	0.0	24.0	85.7	123.0	259.2	507.4	1233.5	5238.6	14826.3	13360.3	3459.3	111.2	0.0	0.0	0.0	0.0	0.0
65-69	0.0	0.0	27.4	58.3	100.9	194.5	317.7	732.0	2775.1	6904.7	5780.3	1696.1	59.8	0.0	0.0	0.0	18645.7
70-74	0.0	0.0	0.0	16.9	41.1	72.8	98.2	176.4	349.3	1029.9	2481.4	2001.6	715.9	29.8	0.0	0.0	6992.3
75-79	0.0	0.0	0.0	0.0	14.0	23.4	37.5	51.3	78.3	112.9	293.5	619.0	538.8	230.4	5.8	0.0	2604.9
80-84	0.0	0.0	0.0	0.0	0.0	6.1	11.3	16.2	21.3	16.8	22.5	62.4	140.0	116.1	43.5	2.3	458.3
CMA	50.5	231.6	606.7	2117.7	7944.3	21646.8	40416.9	52125.7	45529.4	27139.7	12180.3	4490.3	1454.5	376.3	49.3	2.3	216361.9

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

2.0	2.7	3.2	2.3	1.8	1.9	2.5	3.5	5.3	8.1	12.6	19.4	29.6	42.4	58.7	61.8	5.1
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	-----

Age	Excess Mortality (Rate Differences)														CMD			
	0-4	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	70-74	75-79		
40-44																	13.35	
45-49																	61.72	
50-54							26.06	2.44	34.98								110.53	
55-59							62.65	73.47	104.66								197.44	
60-64							74.34	69.63	107.93	120.51	195.63						437.26	
65-69									168.46	191.05	282.39	106.21					962.06	
70-74									271.18	589.02	429.26	678.02					592.77	
75-79										1327.37	1095.37	892.44	802.50				80.85	
80-84																		
CMA							12.39	34.85	89.16	139.33	348.63	403.71	726.66	754.94				
Relative Risk (Rate Ratios)																		
40-44																	7.01	
45-49																	16.97	
50-54							12.74	2.10	16.75								17.43	
55-59								17.21	20.01	28.07							17.86	
60-64							12.05	11.35	17.04	18.91	30.07						22.45	
65-69									15.36	17.31	25.11	10.07					28.11	
70-74									14.30	29.89	22.05	34.25					10.60	
75-79										38.40	31.86	26.15	24.46					16.80
80-84																		
CMA							6.06	10.89	17.68	18.30	28.65	21.78	25.54	18.80				

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**

Current smokers of any number of cigarettes

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										CMD
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84		
Rate	0.7	1.3	2.2	3.9	6.7	11.7	20.4	35.5	61.8		

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
45-49	0	0	0	0	0	3	1	0	0	0	0	0	0	0	0	0	4
50-54	0	0	0	0	0	3	15	14	5	0	0	0	0	0	0	0	37
55-59	0	0	1	1	0	3	2	46	67	19	2	0	0	0	0	0	141
60-64	0	0	1	1	0	1	6	27	94	127	39	3	0	0	0	0	299
65-69	0	0	0	0	0	1	3	6	44	109	107	31	5	0	0	0	306
70-74	0	0	0	0	4	0	1	3	5	42	112	92	31	2	0	0	292
75-79	0	0	0	0	0	2	2	3	7	5	34	68	53	22	1	0	197
80-84	0	0	0	0	0	1	0	2	6	3	1	10	33	18	5	0	79
CMA	0	0	2	2	5	15	30	101	226	305	295	204	122	42	6	0	1357

Total PYO

40-44	70.7	306.3	1109.5	7511.5	30155.5	39819.0	7427.3	249.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	193359.5
45-49	204.6	608.3	1152.2	3709.5	17582.3	65235.1	87054.7	17245.7	567.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	350745.8
50-54	263.6	972.4	1666.7	3377.8	6813.7	38957.3	125546.2	142326.2	27912.5	889.7	0.0	0.0	0.0	0.0	0.0	0.0	410973.7
55-59	147.3	600.8	1517.3	2590.4	4098.8	12185.2	52096.3	152730.6	152535.9	30473.9	847.4	0.0	0.0	0.0	0.0	0.0	316752.5
60-64	0.0	373.6	1308.4	1628.2	2850.3	4907.7	11087.3	43648.0	118020.7	104549.8	21697.3	641.4	0.0	0.0	0.0	0.0	183066.3
65-69	0.0	0.0	565.7	1328.6	1518.3	2390.4	3710.8	7567.8	27667.5	68036.6	57018.8	12818.9	421.2	0.0	0.0	0.0	92241.3
70-74	0.0	0.0	0.0	674.8	1404.1	1199.9	1732.8	2484.8	4751.0	14410.2	32827.4	25806.5	6714.3	236.6	0.0	0.0	36468.3
75-79	0.0	0.0	0.0	0.0	649.4	1076.7	795.9	1004.8	1402.7	2490.8	6325.8	122.7.8	9584.8	2800.8	89.1	0.0	12062.2
80-84	0.0	0.0	0.0	0.0	0.0	452.0	590.3	365.1	414.3	552.5	916.5	1711.0	3521.6	2617.2	884.3	27.4	167827.8
CMA	706.1	3121.3	7319.7	20820.7	67972.2	166223.2	290031.3	367622.3	330291.9	221405.4	119633.2	53225.6	20251.8	5653.5	973.3	27.4	

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

	2.1	2.9	3.7	3.3	2.5	2.4	2.8	3.9	5.8	9.2	14.8	22.9	34.6	47.0	59.4	61.8	6.5
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	-----

Age	Excess Mortality (Rate Differences)															CMD			
	0-4	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	70-74	75-79			
40-44					2.58	1.78											1.58		
45-49						3.32	-0.13										0.79		
50-54						5.48	9.73	7.62	15.69								8.33		
55-59			62.04	34.74		20.75	-0.03	26.25	40.06	58.48	232.15						30.44		
60-64			69.70	54.69		13.65	47.39	55.13	72.92	114.74	173.02	460.99					89.50		
65-69						30.12	69.13	67.57	147.20	148.49	175.94	230.12	1175.47				155.44		
70-74							264.49	37.32	100.34	84.85	271.07	320.79	306.11	441.31	828.57		296.17		
75-79								150.27	215.79	263.09	463.56	165.25	501.99	519.71	517.47	750.01		476.62	
80-84									159.46	488.04	1386.33	481.21	47.33	522.67	872.65	625.99	503.67		593.16
CMA			23.60	6.34	4.82	6.63	7.53	23.61	62.56	128.56	231.81	360.33	567.84	695.87	557.07		74.36		
Relative Risk (Rate Ratios)																			
40-44					4.52	3.43											3.15		
45-49						3.60	0.90										1.62		
50-54						3.47	5.38	4.43	8.07								4.75		
55-59			17.05	9.99		6.37	0.99	7.79	11.26	16.13	61.05						8.88		
60-64			11.36	9.13		3.03	8.04	9.19	11.84	18.05	26.71	69.51					14.30		
65-69						3.57	6.90	6.77	13.57	13.68	16.02	20.65	101.36				14.27		
70-74							13.97	2.83	5.92	5.16	14.30	16.73	17.49	22.64	41.64		15.53		
75-79								5.23	7.06	8.41	14.06	5.66	15.14	15.64	15.58	22.13		14.43	
80-84									3.58	8.87	23.44	8.79	1.77	9.46	15.13	11.13	9.15		10.60
CMA			7.33	2.94	2.91	3.77	3.68	7.11	11.73	14.98	16.69	16.71	17.42	15.80	10.36		12.44		

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	161.3	269.3	449.5	750.3	1252.4	2090.5	3489.5	5824.7	9722.7

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	1	0	0	4	3	6	2	0	0	0	0	0	0	0	0	0	16
45-49	0	1	3	3	6	15	18	5	0	0	0	0	0	0	0	0	51
50-54	0	2	1	2	4	15	48	53	32	0	0	0	0	0	0	0	137
55-59	0	3	0	5	4	10	52	108	110	25	1	0	0	0	0	0	318
60-64	0	1	6	7	7	14	19	57	146	153	26	1	0	0	0	0	437
65-69	0	0	1	10	2	12	11	30	61	161	185	44	1	0	0	0	518
70-74	0	0	0	10	15	11	13	19	34	88	187	142	43	1	0	0	563
75-79	0	0	0	0	10	32	15	12	31	45	64	167	136	37	0	0	549
80-84	0	0	0	0	0	6	29	11	17	26	36	89	65	20	0	0	316
CMA	1	7	11	41	51	121	207	295	411	489	489	390	269	103	20	0	2905

Total PYO

40-44	22.9	104.8	235.9	668.3	1756.3	1862.2	297.9	9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4958.2
45-49	62.5	194.8	302.3	511.4	1479.9	3631.6	4080.2	664.5	24.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11151.9
50-54	92.6	316.8	417.8	569.2	1095.8	3167.9	7477.6	7217.6	1134.8	35.9	0.0	0.0	0.0	0.0	0.0	0.0	21546.0
55-59	73.5	340.9	456.0	525.0	766.3	1568.3	4386.6	9656.8	8400.1	1353.1	38.9	0.0	0.0	0.0	0.0	0.0	27567.4
60-64	0.0	172.0	508.3	415.8	510.1	752.2	1481.3	3987.1	8517.9	6756.0	1170.6	34.8	0.0	0.0	0.0	0.0	24305.9
65-69	0.0	0.0	233.8	446.4	323.3	470.6	625.3	1113.8	3171.3	6200.9	4637.8	800.9	28.5	0.0	0.0	0.0	18082.6
70-74	0.0	0.0	0.0	247.1	463.3	269.9	379.8	448.4	889.7	2109.5	3614.8	2645.6	611.5	26.1	0.0	0.0	11905.3
75-79	0.0	0.0	0.0	0.0	260.3	394.0	188.6	249.8	324.6	532.8	1160.3	1838.6	1298.9	357.9	13.3	0.0	6619.0
80-84	0.0	0.0	0.0	0.0	0.0	194.3	226.8	105.3	113.7	132.3	267.3	405.5	716.1	468.0	159.8	4.0	2733.2
CMA	251.5	1129.4	2154.0	3363.1	6657.2	12531.0	19143.8	23453.2	22576.8	17120.6	11029.5	5755.3	2655.0	852.0	173.2	4.0	128869.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

466.4	604.7	823.9	949.3	931.0	877.3	814.4	928.6	1338.4	1998.0	3017.0	4459.2	6298.1	7894.4	9422.6	9722.7	1622.5
-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44				437.25	9.49	160.88	510.00										161.37
45-49				723.27	317.32	136.14	122.20	171.87	463.16								188.03
50-54	181.75	-210.12	-98.10	-64.48	21.03	192.42	294.82	607.93									186.35
55-59	129.68		202.06	-229.64	-112.68	435.13	368.09	559.21	1097.33								403.23
60-64		-71.89	431.30	119.92	608.88	30.22	177.21	461.63	1012.25	968.71							545.51
65-69		-1662.8	149.53	-1471.9	459.50	-331.23	602.87	-167.00	505.86	1898.47	3204.83						774.11
70-74			567.69	-251.53	585.81	-64.72	747.60	332.13	602.08	1412.50	1877.91	3542.36					1239.45
75-79				-1982.2	2297.08	2129.30	-1019.9	3725.96	2620.67	-308.69	3256.34	4545.52	4512.86				2469.56
80-84					46635.2	3062.01				2822.53	-844.78	2706.02	4198.18	2790.33			1838.87
CMA	68.75	15.05	-313.25	262.66	-164.94	88.27	266.93	318.26	482.04	858.19	1416.61	2317.11	3633.69	4194.81	2126.99		631.75
Relative Risk (Rate Ratios)																	
40-44				3.71	1.06	2.00	4.16										2.00
45-49				3.69	2.18	1.51	1.45	1.64	2.79								1.70
50-54	1.40	0.53		0.78	0.81	1.05	1.43	1.63	2.35								1.41
55-59	1.17			1.27	0.89	0.85	1.58	1.49	1.75	2.46							1.54
60-64		0.94		1.34	1.10	1.49	1.02	1.14	1.37	1.81	1.77						1.44
65-69		0.20		1.07	0.30	1.22	0.84	1.29	0.92	1.24	1.91	2.53					1.37
70-74				1.16	0.93	1.17	0.98	1.21	1.10	1.20	1.40	1.54	2.02				1.36
75-79					0.86	1.39	1.37	0.82	1.64	1.45	0.95	1.56	1.80	1.77			1.42
80-84						0.32	1.31				1.29	0.91	1.28	1.43	1.29		1.19
CMA	0.85	1.02	0.62	1.28	0.82	1.10	1.33	1.34	1.36	1.43	1.47	1.52	1.61	1.53	1.23		1.39

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
10-19 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	161.3	269.3	449.5	750.3	1252.4	2090.5	3489.5	5824.7	9722.7

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	1	2	10	15	6	0	0	0	0	0	0	0	0	0	34
45-49	0	2	0	1	11	60	78	12	0	0	0	0	0	0	0	0	154
50-54	0	3	2	2	11	48	150	189	36	1	0	0	0	0	0	0	444
55-59	1	3	1	10	12	26	119	324	361	81	3	1	0	0	0	0	941
60-64	0	0	5	5	10	24	42	158	415	462	82	1	0	0	0	0	1206
65-69	0	0	1	9	12	22	27	66	187	473	499	105	5	0	0	0	1406
70-74	0	0	0	10	15	10	22	20	64	177	443	423	106	6	0	0	1296
75-79	0	0	0	0	16	15	22	32	38	58	119	303	248	74	5	0	930
80-84	0	0	0	0	0	6	12	9	21	23	35	72	149	127	35	1	490
CMA	1	8	90	39	97	226	478	810	1124	1275	1181	906	508	207	40	1	6911

Total PYO

40-44	17.3	66.8	244.1	1357.0	4857.6	5880.6	936.0	38.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13397.7
45-49	49.9	148.3	230.9	741.6	3160.6	10349.7	12504.3	2033.0	69.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29277.4
50-54	78.2	226.0	360.3	676.0	1807.8	6879.5	19801.0	20670.2	3341.1	100.7	0.0	0.0	0.0	0.0	0.0	0.0	54160.7
55-59	37.3	199.1	339.3	576.8	1064.3	2511.5	9343.5	25001.0	23516.3	3846.9	105.9	0.0	0.0	0.0	0.0	0.0	66542.0
60-64	0.0	84.4	311.7	363.8	644.1	1101.5	2362.0	8420.8	21191.9	18412.1	3158.2	106.9	0.0	0.0	0.0	0.0	56177.3
65-69	0.0	0.0	131.6	317.4	397.8	584.7	879.0	1800.5	6172.5	14388.7	11954.3	2418.4	84.8	0.0	0.0	0.0	39129.6
70-74	0.0	0.0	0.0	159.4	367.0	336.3	495.4	699.0	1313.8	3682.9	8133.3	6526.3	1520.6	56.4	0.0	0.0	23290.5
75-79	0.0	0.0	0.0	0.0	153.0	262.9	253.4	308.6	433.9	786.8	1827.3	3481.2	2786.5	713.8	18.5	0.0	11005.8
80-84	0.0	0.0	0.0	0.0	0.0	114.6	173.8	126.8	131.3	208.0	325.8	533.1	1093.7	819.5	264.5	1.7	3792.8
CMA	182.7	724.5	1637.9	4212.0	12452.2	28621.3	46748.4	59288.3	56170.0	41426.0	25504.8	13066.1	5465.5	1589.7	283.0	1.7	29673.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

434.5	562.3	728.1	678.0	566.7	540.1	622.9	817.5	1192.8	1623.2	2792.3	4098.8	5897.1	7751.3	9467.9	9722.7	1410.9
-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Age	Excess Mortality (Rate Differences)																
	0-4	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	70-74	75-79	CMD
40-44		248.37	-13.94	44.54	93.75	479.70											92.45
45-49			-134.44	78.75	310.44	354.50	323.89										290.87
50-54	877.94	76.36	-153.64	159.00	248.23	308.04	456.10	687.86									370.29
55-59	756.61	455.61	983.30	377.17	284.94	523.31	545.65	784.81	1355.28								663.84
60-64		351.87	50.52	300.19	926.44	525.75	623.89	705.89	1256.81	1344.04							894.37
65-69			744.86	925.81	1672.30	981.14	1575.12	939.04	1196.78	2063.72	2251.15						1502.66
70-74				2783.34	597.67	-516.29	951.18	-428.30	1381.72	1316.45	1957.20	2991.99	3481.48				2074.97
75-79					4632.77	-119.51	2856.61	4545.23	2932.70	1547.36	687.48	2879.23	3139.65	4543.03			2625.32
80-84						-2816.2		1334.99	1021.73	3779.40	3901.19	5774.55		3509.81			3196.68
CMA	541.93	-117.55	247.92	212.33	266.47	399.81	548.68	808.29	1254.59	1838.17	2845.19	3397.52	5270.26	4696.38			917.77
Relative Risk (Rate Ratios)																	
40-44		2.54	0.91	1.28	1.58	3.97											1.57
45-49			0.50	1.29	2.15	2.32	2.20										2.06
50-54	2.95	1.17	0.66	1.35	1.55	1.69	2.01	2.53									1.82
55-59	2.61	0.39	2.31	1.50	1.38	1.70	1.73	2.05	2.81								1.88
60-64		1.28	1.04	1.24	1.74	1.42	1.50	1.56	2.00	2.07							1.71
65-69			1.36	1.44	1.80	1.47	1.75	1.45	1.57	2.00	2.06						1.72
70-74				1.80	1.17	0.85	1.27	0.82	1.40	1.38	1.56	1.86	2.00				1.59
75-79					1.80	0.98	1.49	1.78	1.50	1.27	1.12	1.49	1.54	1.78			1.45
80-84							0.71		1.14	1.11	1.39	1.40	1.59	1.36			1.33
CMA	1.96	0.84	1.37	1.37	1.49	1.64	1.67	1.68	1.69	1.66	1.70	1.58	1.68	1.49			1.65

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
20 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	161.3	269.3	449.5	750.3	1252.4	2090.5	3489.5	5824.7	9722.7

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	6	35	71	21	1	0	0	0	0	0	0	0	0	134
45-49	0	1	1	2	24	145	270	43	5	0	0	0	0	0	0	0	492
50-54	0	2	3	8	21	120	445	649	121	6	0	0	0	0	0	0	1375
55-59	0	4	6	5	22	46	251	819	1070	281	7	0	0	0	0	0	2513
60-64	0	1	4	9	25	20	77	328	1140	1172	290	11	0	0	0	0	3077
65-69	0	0	3	11	16	18	39	76	353	994	1034	254	13	0	0	0	2811
70-74	0	0	0	11	22	20	31	35	74	294	819	713	200	9	0	0	2218
75-79	0	0	0	0	7	20	17	26	43	56	180	432	385	111	6	0	1283
80-84	0	0	0	0	0	7	23	7	23	20	32	92	177	167	46	2	596
CMA	0	8	19	52	172	468	1174	1984	2829	2813	2362	1502	775	287	52	2	14499

Total PYO

40-44	15.9	83.6	329.9	2841.8	11988.3	15971.4	2856.6	85.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34173.0
45-49	54.6	153.2	373.2	1283.2	6503.3	25247.0	34125.2	6451.8	204.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	74395.6
50-54	78.3	262.0	481.1	1169.9	3063.6	14515.9	48267.8	55330.5	10600.3	326.3	0.0	0.0	0.0	0.0	0.0	0.0	134093.8
55-59	21.4	196.0	423.4	847.6	1768.8	4184.3	19276.4	59059.8	60180.5	11710.8	323.8	0.0	0.0	0.0	0.0	0.0	157992.7
60-64	0.0	69.2	297.2	499.3	992.2	1749.8	3921.8	16326.5	46302.3	42031.2	8527.7	239.4	0.0	0.0	0.0	0.0	120956.3
65-69	0.0	0.0	132.3	364.0	487.8	799.9	1294.9	2628.4	10320.5	27101.6	23305.1	5127.1	167.3	0.0	0.0	0.0	71749.0
70-74	0.0	0.0	191.7	397.5	378.6	522.8	804.4	1578.4	5393.2	13110.8	10574.4	2739.4	88.5	0.0	0.0	0.0	35779.6
75-79	0.0	0.0	0.0	0.0	569.2	310.3	242.3	306.0	419.4	795.8	2299.2	4814.0	3818.4	1132.4	40.5	0.0	14347.4
80-84	0.0	0.0	0.0	0.0	0.0	116.3	146.9	96.5	126.3	150.2	283.1	552.3	1260.1	951.9	338.6	96.5	4036.5
CMA	168.3	763.9	2037.1	7217.4	25370.6	63273.4	110654.5	141069.5	129731.8	87509.0	47849.5	21307.2	79865.3	2172.8	379.1	16.5	647525.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

40-44	531.7	656.1	562.9	434.5	429.3	525.0	725.8	1069.3	1635.8	2540.0	3616.9	5660.5	7437.3	9306.3	9722.7	1163.7
-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Age	Excess Mortality (Rate Differences)																		CMD
	0-4	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	70-74	75-79			
40-44				49.81	130.63	283.22	573.82											230.80	
45-49				-1.31	-113.42	99.75	309.00	521.92	397.19	2179.69								392.04	
50-54	313.86	174.10	234.31	235.96	377.18	472.45	723.46	691.98	1389.12									575.91	
55-59	1290.52	1139.09	-160.39	493.52	349.06	551.81	636.43	1027.68	5649.19	1411.86								840.26	
60-64		93.64	550.00	1267.30	-109.39	711.00	756.60	1209.68	1536.00	2148.29	3342.09							1291.49	
65-69			774.05	1189.28	159.71	921.25	800.95	1329.85	1577.15	2346.27	2863.55	-678.40						1827.30	
70-74				2249.60	2045.07	1793.33	2440.65	861.45	1198.72	1776.40	2757.26	3253.16	3611.30					2709.54	
75-79					-1686.8	619.94	1192.80	2671.99	4427.59	1212.64	2004.18	3149.08	4257.97	3977.30				3117.63	
80-84										3595.83	1581.39	6936.42	4323.98	7620.85	3863.31				5635.25
CMA	515.53	276.64	157.57	243.42	310.36	535.98	680.39	1111.40	1578.75	2396.31	3232.36	4144.92	5771.24	4411.04				1075.43	
Relative Risk (Rate Ratios)																			
40-44					1.31	1.81	2.76	4.56										2.43	
45-49					1.00	0.58	1.37	2.15	2.94	2.47	9.09							2.46	
50-54		1.70	1.39	1.52	1.52	1.84	2.05	2.61	2.54	4.09								2.28	
55-59		2.72	2.52	0.79	1.66	1.47	1.74	1.85	2.37	3.20	2.88							2.12	
60-64			1.07	1.44	2.01	0.91	1.57	1.60	1.97	2.23	2.72	3.67						2.03	
65-69				1.37	1.57	1.98	1.44	1.38	1.64	1.75	2.12	2.37	3.72					1.87	
70-74					1.64	1.59	1.51	1.70	1.25	1.34	1.51	1.79	1.93	2.09				1.78	
75-79						0.71	1.11	1.20	1.46	1.76	1.21	1.34	1.54	1.73	1.68			1.54	
80-84											1.37	1.16	1.71	1.44	1.80	1.40		1.52	
CMA		1.87	1.42	1.28	1.56	1.72	2.02	1.94	2.04	1.97	1.94	1.85	1.75	1.78	1.47			1.92	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	161.3	269.3	449.5	750.3	1252.4	2090.5	3489.5	5824.7	9722.7

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	6	33	47	15	0	0	0	0	0	0	0	0	0	101
45-49	0	0	1	1	21	104	166	39	1	0	0	0	0	0	0	0	333
50-54	0	0	1	2	20	77	302	487	105	3	0	0	0	0	0	0	997
55-59	1	0	3	4	9	30	171	538	699	175	5	0	0	0	0	0	1635
60-64	0	1	2	4	8	5	50	217	705	700	195	10	0	0	0	0	1887
65-69	0	0	0	4	4	11	15	34	206	529	556	145	6	0	0	0	1510
70-74	0	0	0	2	5	10	10	25	31	122	322	309	97	3	0	0	936
75-79	0	0	0	0	1	5	5	9	12	19	66	132	120	42	2	0	415
80-84	0	0	0	0	0	2	2	5	1	2	7	25	37	28	11	0	120
CMA	1	1	7	23	101	291	736	1354	1760	1550	1153	621	260	73	13	0	7944

Total PYO

40-44	3.1	26.2	160.2	1720.0	7693.8	10580.9	2000.3	64.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	22249.1	
45-49	20.6	46.6	151.4	725.8	4094.9	16627.3	23137.9	4715.6	146.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49666.2	
50-54	21.8	92.3	204.5	581.7	1792.3	9184.8	31882.9	36894.5	7345.4	234.4	0.0	0.0	0.0	0.0	0.0	0.0	88234.5	
55-59	4.6	62.8	171.2	370.3	852.9	2406.5	12048.3	37327.9	37767.0	7906.3	208.3	0.0	0.0	0.0	0.0	0.0	99148.1	
60-64	0.0	22.0	91.0	183.4	424.9	767.7	2031.0	9457.1	26549.2	23365.3	5263.6	145.2	0.0	0.0	0.0	0.0	66300.3	
65-69	0.0	0.0	33.5	105.4	194.3	322.6	556.9	1240.0	5098.3	13010.6	10937.7	2664.8	77.8	0.0	0.0	0.0	34241.8	
70-74	0.0	0.0	42.8	100.6	134.4	218.6	326.2	567.9	2081.1	4997.5	3630.8	1070.8	30.2	0.0	0.0	0.0	13400.8	
75-79	0.0	0.0	0.0	37.5	68.4	71.2	81.3	123.6	238.8	680.3	1373.9	1070.8	316.1	7.6	0.0	4067.5		
80-84	0.0	0.0	0.0	0.0	12.5	22.8	17.3	19.9	38.4	66.7	138.5	287.1	233.4	63.9	2.0	902.5		
CMA	9.0	249.8	811.8	3729.5	15191.2	40107.0	71969.9	90124.6	77637.3	46872.8	22154.0	8153.2	2506.5	579.7	71.5	2.0	360210.8	

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

365.1	532.0	580.2	432.2	348.7	367.6	486.7	688.9	1011.1	1525.7	2332.0	3491.9	5157.7	7272.8	9309.3	9722.7	966.2
-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	-------

Excess Mortality (Rate Differences)																					
Age	0-4	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	70-74	75-79	CMD				
40-44				187.51	267.59	282.87	568.55										292.63				
45-49				-131.51	243.54	356.19	448.15	557.76									401.19				
50-54				39.50	-105.66	666.42	368.85	497.72	870.48	979.97	630.28						680.45				
55-59				1002.38	329.81	304.90	495.29	666.98	690.98	1099.54	1463.11	1650.66						898.75			
60-64					928.42	630.31	-601.06	1209.43	1042.17	1403.04	1743.49	2452.29						1525.03			
65-69						-32.21	1319.44	602.87	651.41	1950.07	1975.39	2992.82	3350.88						2319.28		
70-74								1065.39	4175.27	1969.02	2372.81	2953.70	4576.60	5569.54						3495.11	
75-79											2200.60	4170.36	3782.83	5381.48	7462.89						4378.08
80-84														3165.54	2273.01						3573.69
CMA				-131.70	262.15	184.53	316.15	357.92	535.91	813.45	1255.89	1781.12	2872.45	4124.82	5215.37	5320.62				1123.14	
Relative Risk (Rate Ratios)																					
40-44					2.16	2.66	2.75	4.65										2.81			
45-49					0.51	1.90	2.32	2.66	3.07									2.49			
50-54				1.09	0.76	2.48	1.87	2.11	2.94	3.18	2.85							2.51			
55-59				2.34	1.44	1.41	1.66	1.89	1.92	2.47	2.95	3.20						2.20			
60-64					1.74	1.50	0.52	1.97	1.83	2.12	2.39	2.96						2.22			
65-69						0.98	1.63	1.29	1.31	1.93	1.94	2.43	2.60						2.11		
70-74								1.31	2.20	1.56	1.68	1.85	2.31	2.60						2.00	
75-79										1.38	1.72	1.65	1.92	2.26						1.75	
80-84											1.33	1.23								1.37	
CMA				0.75	1.49	1.43	1.91	1.97	2.10	2.18	2.24	2.17	2.23	2.18	2.01	1.73				2.16	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	161.3	269.3	449.5	750.3	1252.4	2090.5	3489.5	5824.7	9722.7

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	1	2	18	34	11	1	0	0	0	0	0	0	0	0	67
45-49	0	0	2	1	15	62	129	30	1	0	0	0	0	0	0	0	240
50-54	0	2	0	3	13	57	226	291	92	2	0	0	0	0	0	0	667
55-59	0	2	2	1	8	18	108	429	511	142	9	0	0	0	0	0	1230
60-64	0	0	4	1	7	12	27	147	438	487	131	7	0	0	0	0	1261
65-69	0	0	1	1	3	7	23	29	103	323	307	87	7	0	0	0	891
70-74	0	0	0	0	1	3	3	8	28	60	566	152	66	2	0	0	489
75-79	0	0	0	0	0	4	1	4	10	11	30	74	57	25	0	0	216
80-84	0	0	0	0	0	1	2	1	1	4	5	11	17	20	10	1	73
CMA	0	5	10	9	65	198	530	940	1184	1029	648	331	147	47	10	1	5154

Total PYO

40-44	11.5	20.8	123.6	878.3	3739.6	5384.8	1323.4	49.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11531.8
45-49	13.8	62.2	84.8	422.8	2256.2	8956.0	12920.9	3339.8	122.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26178.6
50-54	14.8	64.6	173.0	365.9	1007.7	5046.6	17670.1	21472.3	5376.2	187.3	0.0	0.0	0.0	0.0	0.0	0.0	51378.3
55-59	10.4	60.0	112.3	252.4	525.8	1455.3	6804.4	21049.2	21980.8	5528.8	163.3	0.0	0.0	0.0	0.0	0.0	57942.7
60-64	0.0	24.0	85.7	123.0	259.2	507.4	1233.5	5238.6	14826.3	13366.3	3459.3	111.2	0.0	0.0	0.0	0.0	39228.3
65-69	0.0	0.0	27.4	58.3	100.9	194.5	317.7	732.0	2775.1	6904.7	5780.3	1696.1	59.8	0.0	0.0	0.0	18646.7
70-74	0.0	0.0	0.0	16.9	41.1	72.8	98.2	176.4	349.3	1028.9	2481.4	2001.6	715.9	29.8	0.0	0.0	6992.3
75-79	0.0	0.0	0.0	0.0	54.0	23.4	37.5	51.3	78.3	112.9	293.5	619.0	538.8	230.4	5.8	0.0	2004.9
80-84	0.0	0.0	0.0	0.0	0.0	6.1	11.3	16.2	21.3	16.8	22.5	62.4	140.0	116.1	43.5	2.3	458.3
CMA	50.5	231.6	606.7	2117.7	7944.3	21646.8	40416.9	52125.7	45529.4	27139.7	12180.3	4490.3	1454.5	378.3	49.3	2.3	216361.9

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

396.6	536.3	608.8	446.0	354.8	375.7	485.4	681.3	992.6	1466.9	2221.3	3014.3	4897.1	6842.7	9267.6	9722.7	945.9
-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)																CMD
	0-4	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	70-74	75-79	
40-44				66.38	320.01	470.09	669.86										419.67
45-49				-32.74	395.56	422.99	729.09	628.96									582.42
50-54				370.36	840.61	679.98	829.50	905.74	1261.76	618.60							887.64
55-59				-354.13	771.33	486.60	836.90	1287.78	1574.45	1818.05	4759.90						1372.49
60-64					1448.56	1112.51	936.49	1553.69	1701.80	2392.73	2534.54						1962.11
65-69						1506.44	5149.76	1871.22	1621.07	2587.47	3220.66	3036.94					2687.80
70-74								1045.19	4525.74	2341.85	3254.56	4194.46	5729.42				3503.93
75-79											4396.72	6130.02	4753.67	5025.17			4948.77
80-84																	6204.57
CMA	1622.71	1039.54	-20.98	463.38	539.01	625.89	1122.00	1607.90	2324.60	3098.77	4057.26	5209.44	5648.97				1436.19
Relative Risk (Rate Ratios)																	
40-44				1.41	2.98	3.91	5.15										3.60
45-49				0.88	2.47	2.57	3.71	3.34									3.16
50-54				1.82	2.87	2.51	2.85	3.02	3.81	2.36							2.97
55-59				0.53	2.03	1.65	2.12	2.72	3.10	3.42	7.34						2.83
60-64					2.16	1.89	1.75	2.24	2.36	2.91	3.02						2.57
65-69						1.72	3.46	1.90	1.78	2.24	2.54	2.45					2.29
70-74								1.30	2.30	1.67	1.93	2.18	2.64				2.00
75-79											1.75	2.05	1.82	1.86			1.85
80-84																	1.64
CMA	4.03	2.71	0.95	2.31	2.43	2.70	2.65	2.62	2.58	2.40	2.22	2.06	1.83				2.52

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Males Aged Between 40 and 84**
Current smokers of any number of cigarettes

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	161.3	269.3	449.5	750.3	1252.4	2090.5	3489.5	5824.7	9722.7

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CMD
40-44	1	0	2	20	99	174	55	2	0	0	0	0	0	0	0	0	353
45-49	0	4	7	8	77	369	663	129	7	0	0	0	0	0	0	0	1254
50-54	0	10	7	17	69	319	1172	1676	371	12	0	0	0	0	0	0	3653
55-59	2	12	14	25	55	131	704	2232	2765	707	25	1	0	0	0	0	6672
60-64	0	3	22	27	58	75	215	908	2964	2991	728	35	0	0	0	0	7923
65-69	0	0	6	35	37	72	116	235	920	2497	2600	643	32	0	0	0	7193
70-74	0	0	0	33	61	55	80	107	233	737	1948	1755	514	22	0	0	5545
75-79	0	0	0	0	34	78	60	84	136	189	467	1117	955	291	14	0	3425
80-84	0	0	0	0	0	22	69	33	63	67	107	236	476	413	125	4	1615
CMA	3	29	56	165	490	1315	3134	5406	7359	7200	5675	3783	1977	726	139	4	37663

Total PYO

40-44	70.7	306.3	1109.5	7511.5	30155.5	39819.0	7427.3	249.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	86649.2
45-49	204.6	608.3	1152.2	3709.5	17582.3	65235.1	87054.7	17245.7	567.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	193359.5
50-54	283.6	972.4	5666.7	3377.8	8813.7	36957.3	125546.2	142326.2	27912.5	869.7	0.0	0.0	0.0	0.0	0.0	0.0	350745.8
55-59	147.3	860.8	1517.3	2590.4	4998.8	12185.2	52086.3	152730.6	152535.9	30473.9	847.4	0.0	0.0	0.0	0.0	0.0	410973.7
60-64	0.0	373.6	1308.4	1628.2	2850.3	4907.7	11087.3	43648.0	118020.7	104549.8	21697.3	641.4	0.0	0.0	0.0	0.0	310712.5
65-69	0.0	0.0	565.7	1328.6	1518.3	2390.4	3710.8	7567.8	27687.5	68038.6	57018.8	12818.9	421.2	0.0	0.0	0.0	183066.3
70-74	0.0	0.0	0.0	674.8	1404.1	1199.9	1732.8	2484.8	4751.0	14410.2	32827.4	25806.5	6714.3	235.6	0.0	0.0	92241.3
75-79	0.0	0.0	0.0	0.0	649.4	1076.7	795.9	1004.8	1452.7	2490.8	6325.8	12247.8	9584.8	2800.8	89.1	0.0	38468.3
80-84	0.0	0.0	0.0	0.0	0.0	452.0	590.3	365.1	414.3	552.5	916.5	1711.0	3531.6	2617.2	884.3	27.4	12062.2
CMA	706.1	3121.3	7319.7	20820.7	67972.2	166223.2	290031.3	367622.3	303291.9	221405.4	119633.2	53225.1	20251.8	5653.5	973.3	27.4	1678278.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

431.2	565.1	710.1	616.9	481.6	461.1	545.5	739.4	1085.0	1655.8	2566.8	3863.4	5652.6	7531.9	9065.9	9722.7	1172.1
-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	--------

Age	Excess Mortality (Rate Differences)																	CMD
	0-4	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	70-74	75-79		
40-44		18.94	104.93	166.97	275.65	579.19	640.55											246.06
45-49	368.34	338.26	-53.62	168.66	327.02	492.30	478.73	964.56										394.76
50-54	578.87	-29.50	53.80	333.38	369.35	484.03	728.08	879.66	899.32									502.00
55-59	643.83	172.42	214.79	349.97	324.78	601.30	711.10	1062.39	1569.72	2199.84								873.16
60-64	-449.37	429.01	405.90	782.50	275.81	686.76	827.87	1174.29	1608.43	2102.86	3736.55							1297.54
65-69		-1029.8	543.86	346.49	921.50	1035.52	1014.75	1232.27	1579.45	2469.37	2925.50	5507.41						1838.65
70-74			1401.17	854.95	1094.13	1127.41	816.60	1414.70	1624.92	2444.54	3311.09	4165.74	5849.00					2521.88
75-79				-589.28	1419.84	1713.73	2538.54	3671.07	1763.33	1557.68	3295.30	4139.00	4565.30					3678.68
80-84					-4855.4	1965.81	-683.87	5482.44	2403.99	1952.14	4070.40	3755.67	6057.72	4413.57				3666.27
CMA	-6.29	363.94	82.24	175.61	239.25	330.03	535.05	731.15	1122.99	1596.15	2342.01	3244.12	4109.48	5309.89	4914.87			1072.03
Relative Risk (Rate Ratios)																		
40-44		1.12	1.65	2.03	2.71	4.59	4.97											2.53
45-49	2.44	2.26	0.80	1.63	2.21	2.83	2.78	4.58										2.47
50-54	2.29	0.93	1.12	1.74	1.82	2.06	2.62	2.96	3.00									2.32
55-59	1.86	1.23	1.29	1.47	1.43	1.80	1.95	2.42	3.09	3.93								2.16
60-64	0.64	1.34	1.32	1.62	1.22	1.55	1.66	1.94	2.28	2.66	3.96							2.04
65-69	0.51	1.26	1.17	1.44	1.50	1.49	1.59	1.76	2.18	2.40	3.63							1.88
70-74		1.40	1.25	1.31	1.32	1.23	1.41	1.47	1.70	1.95	2.19	2.66						1.72
75-79			0.90	1.24	1.29	1.44	1.66	1.30	1.27	1.57	1.71	1.78						1.53
80-84				0.50	1.20	0.93	1.56	1.25	1.20	1.42	1.39	1.62	1.45					1.38
CMA	0.99	1.64	1.12	1.28	1.50	1.72	1.98	1.99	2.04	1.96	1.91	1.84	1.73	1.70	1.52			1.91

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
	Rate	2.4	3.5	5.2	7.6	11.1	16.3	23.9	35.1

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	2
50-54	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	5
55-59	0	0	0	1	1	0	6	2	0	0	0	0	0	0	0	0	10
60-64	0	0	0	0	0	1	0	2	5	1	1	0	0	0	0	0	10
65-69	0	0	1	1	2	1	1	2	3	0	0	0	0	0	0	0	11
70-74	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	3
75-79	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	3
80-84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CMA	0	0	1	3	5	1	14	12	7	1	1	0	0	0	0	0	45

Total PYO

40-44	709.3	2091.8	3221.0	6111.7	11643.1	10203.1	667.3	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34653.1
45-49	1060.5	3437.5	4635.5	6281.3	11346.4	20786.1	16442.0	945.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64960.7
50-54	1046.6	3987.8	6165.6	7067.4	9590.8	17192.7	27229.5	17452.5	904.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	90645.0
55-59	487.5	3251.3	5824.0	6617.8	8002.3	11305.3	16212.4	23225.2	11331.1	575.8	13.9	0.0	0.0	0.0	0.0	0.0	89046.7
60-64	0.0	1334.5	4669.5	4904.3	5913.2	7083.5	9539.7	12597.9	11678.7	4341.5	282.3	9.9	0.0	0.0	0.0	0.0	62354.9
65-69	0.0	0.0	1921.2	4077.8	3524.4	4485.3	5289.4	6171.6	5796.7	4025.3	1345.9	158.8	7.2	0.0	0.0	0.0	36803.3
70-74	0.0	0.0	0.0	1620.6	2878.8	2302.8	2951.9	3145.5	3035.7	2082.8	1348.6	595.2	82.2	3.3	0.0	0.0	20044.9
75-79	0.0	0.0	0.0	0.0	1077.9	1689.2	1265.3	1472.6	1402.3	1128.5	607.2	507.3	239.6	36.2	1.0	0.0	9427.1
80-84	0.0	0.0	0.0	0.0	0.0	572.8	754.3	490.6	504.0	414.5	304.0	187.3	165.3	67.4	8.0	1.0	3469.0
CMA	3323.8	14102.8	26436.8	36680.8	53974.8	75620.3	82351.8	65507.0	34688.7	12578.6	3901.8	1458.4	494.2	106.8	9.0	1.0	411404.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

4.4	5.5	7.0	7.7	7.6	7.5	8.3	9.1	10.4	11.2	12.4	13.4	15.2	18.2	24.2	30.4	38.4	45.1	49.6	51.4	9.1
-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	------	------	------	------	------	-----

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44					6.18												0.47
45-49							6.63										-0.46
50-54							2.16	6.27	105.43								0.33
55-59				7.07	4.89		25.34	1.01									3.63
60-64					5.77		9.82	28.55	-2.58	11.89							4.89
65-69					35.72	8.19	40.41	5.96	2.57	16.07	35.42						13.55
70-74						37.76				7.85	9.00						-6.98
75-79								43.93		36.21							-3.26
80-84												129.60					
CMA							-3.17	0.39	1.69	-6.21	8.67	8.18	6.82	-10.28	1.42		1.83
Relative Risk (Rate Ratios)																	
40-44						3.56											1.20
45-49							3.44										0.87
50-54							1.42	2.21	21.33								1.06
55-59						1.93	1.64	4.33	1.13								1.48
60-64							1.52	1.88	3.56	0.77	2.07						1.44
65-69						3.19	1.50	3.47	1.36	1.16	1.98	3.17					1.83
70-74							2.58				1.33	1.38					0.63
75-79								2.25		2.03			4.69				0.91
80-84																	
CMA							0.54	1.05	1.22	0.18	2.04	1.81	1.51	0.44	1.06		1.20

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
10-19 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	2.4	3.5	5.2	7.6	11.1	16.3	23.9	35.1

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
45-49	0	0	0	0	0	2	4	0	0	0	0	0	0	0	0	0	6
50-54	0	0	0	0	2	3	10	6	2	0	0	0	0	0	0	0	23
55-59	0	0	1	0	1	3	1	8	7	0	0	0	0	0	0	0	21
60-64	0	0	1	0	2	1	6	11	11	2	0	0	0	0	0	0	34
65-69	0	0	0	0	2	4	1	1	4	5	1	0	0	0	0	0	18
70-74	0	0	0	0	0	1	2	2	3	1	2	2	0	0	0	0	13
75-79	0	0	0	0	0	0	1	1	2	1	1	1	0	0	0	0	7
80-84	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	4
CMA	0	0	2	0	8	15	27	31	29	9	4	3	0	0	0	0	126

Total PYO

40-44	239.5	1039.5	2406.6	6950.7	16906.8	16826.9	965.8	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45294.8
45-49	332.4	1554.7	3095.0	5997.3	14740.5	32996.0	28767.3	1785.4	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89279.5
50-54	329.1	1667.4	3649.4	6198.0	10600.4	24183.5	44607.8	31016.3	1724.5	13.0	0.0	0.0	0.0	0.0	0.0	0.0	124009.4
55-59	197.6	12868.8	3013.9	5189.8	8175.5	13661.1	26372.8	37425.8	19522.1	941.7	13.1	0.0	0.0	0.0	0.0	0.0	115800.0
60-64	0.0	523.1	2570.4	3297.8	5237.7	7969.3	11981.5	17800.8	17595.7	6772.3	319.3	6.0	0.0	0.0	0.0	0.0	73561.8
65-69	0.0	0.0	719.3	1989.8	2687.2	4235.6	6039.8	7589.8	7569.0	5282.9	1789.5	103.8	3.2	0.0	0.0	0.0	38009.8
70-74	0.0	0.0	0.0	688.7	1583.6	1843.7	2745.0	3237.1	3235.8	2333.7	1445.7	563.0	51.5	4.0	0.0	0.0	17731.7
75-79	0.0	0.0	0.0	0.0	534.4	996.2	1066.3	1276.8	1232.1	1024.4	628.3	367.8	176.0	29.4	2.0	0.0	7333.8
80-84	0.0	0.0	0.0	0.0	0.0	281.8	446.8	405.7	385.1	289.3	246.0	140.1	101.5	56.9	19.0	1.0	2373.1
CMA	1096.6	6091.4	14954.6	30312.1	60496.1	102994.0	123014.0	190553.7	51275.3	16657.3	4441.8	1180.7	302.2	90.3	21.0	1.0	513513.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

4.5	5.3	6.2	6.4	6.1	6.2	7.3	9.1	12.0	16.6	23.0	29.9	39.2	44.9	49.9	51.4	52.2
-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	------	------

		Excess Mortality (Rate Differences)																
Age		0-4	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	70-74	75-79	CMD
40-44						3.49	3.53											1.99
45-49							2.52	10.37										3.18
50-54						13.68	7.22	17.23	14.16	110.79								13.36
55-59				25.58		4.63	14.36	-3.81	13.77	28.26								10.53
60-64				37.16		27.04	5.41	36.93	50.62	51.37	18.39							36.06
65-69						58.09	78.10	0.22	-3.16	36.51	78.31	39.55						31.02
70-74							30.30	48.92	37.84	68.77	18.91	114.40	331.30					49.37
75-79								58.68	43.22	127.23	62.52	124.07	236.76					60.35
80-84								396.23	441.57									117.11
CMA			7.13		7.12	8.37	14.68	21.71	44.51	37.48	67.04	224.15						16.76
		Relative Risk (Rate Ratios)																
40-44						2.45	2.46											1.83
45-49							1.71	3.93										1.90
50-54						3.64	2.39	4.32	3.73	22.36								3.58
55-59			4.36			1.61	2.89	0.50	2.81	4.72								2.39
60-64			4.33			3.43	1.13	4.49	5.54	5.61	2.65							4.15
65-69						4.56	5.78	1.01	0.81	3.24	5.79	3.42						2.90
70-74							2.27	3.04	2.58	3.87	1.79	5.78	14.84					3.06
75-79								2.67	2.23	4.62	2.78	4.54	7.75					2.72
80-84								8.70	9.58									3.28
CMA			2.14		2.17	2.35	3.02	3.38	4.70	3.26	3.91	8.48						3.05

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
20 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age								
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	2.4	3.5	5.2	7.6	11.1	16.3	23.9	35.1	51.4

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	Duration												CMO				
	0-4	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	70-74	75-79	
40-44	0	0	0	0	5	1	1	0	0	0	0	0	0	0	0	0	7
45-49	0	0	1	0	4	11	13	2	0	0	0	0	0	0	0	0	31
50-54	0	0	0	0	3	8	19	14	1	0	0	0	0	0	0	0	45
55-59	0	0	0	1	1	3	10	27	8	2	0	0	0	0	0	0	52
60-64	0	0	0	0	1	3	1	8	12	15	6	1	0	0	0	0	47
65-69	0	0	0	1	0	2	8	5	17	13	5	0	0	0	0	0	51
70-74	0	0	0	0	1	0	3	4	3	5	0	4	0	0	0	0	20
75-79	0	0	0	0	1	0	1	2	1	1	0	1	0	0	0	0	7
80-84	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
CMA	0	0	1	3	18	26	63	67	45	27	6	5	0	0	0	0	261

Total PYO

40-44	122.0	731.3	5864.4	6356.6	18026.6	20503.2	1633.8	85	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49246.3
45-49	180.5	1002.0	2402.1	5194.9	13784.6	34778.5	30528.6	2516.8	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93401.0
50-54	149.6	992.5	2591.9	5031.6	9413.9	22961.8	46292.8	35321.8	2430.8	14.3	0.0	0.0	0.0	0.0	0.0	0.0	125200.8
55-59	89.3	741.5	2096.8	3998.7	6975.3	12751.7	25212.9	36148.0	21649.3	1271.8	9.7	0.0	0.0	0.0	0.0	0.0	0.0
60-64	0.0	286.8	1260.2	2475.9	4345.8	7306.3	11839.8	17317.4	17882.0	7367.3	386.0	7.5	0.0	0.0	0.0	0.0	0.0
65-69	0.0	0.0	419.0	1322.0	2099.4	3577.0	5635.6	7411.9	7257.7	5077.6	1778.6	135.8	7.0	0.0	0.0	0.0	34721.5
70-74	0.0	0.0	0.0	422.2	967.3	1303.6	2327.3	3066.0	3013.1	2110.2	1347.2	503.3	62.9	2.2	0.0	0.0	15155.0
75-79	0.0	0.0	0.0	0.0	315.8	582.2	715.3	1126.5	1081.8	860.8	509.1	324.4	142.6	23.9	0.0	0.0	5682.2
80-84	0.0	0.0	0.0	0.0	0.0	167.9	235.6	277.5	317.5	230.6	170.5	91.5	68.9	30.3	2.8	0.0	1593.0
CMA	541.4	3754.2	10634.3	24801.8	55828.6	103962.2	127421.4	105194.4	53645.0	16932.4	4201.0	1062.4	281.4	56.3	2.8	0.0	508419.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

4.4	5.1	5.9	6.0	5.6	5.7	6.8	8.8	11.6	15.6	22.0	28.7	36.1	43.4	51.4	0.0	7.8
-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	-----	-----

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44					25.32	2.46	58.80										11.80
45-49		36.09			25.48	28.09	35.24	75.93									29.65
50-54					26.68	29.65	35.86	34.45	35.95								30.76
55-59			17.41	6.73	15.92	32.06	63.18	29.35	149.66								36.44
60-64			29.25	57.89	2.54	56.43	58.15	72.74	70.30	247.92							55.55
65-69			59.31		39.58	125.62	51.12	217.90	239.69	264.79							130.55
70-74					79.44		104.96	106.52	75.62	213.00			770.89				108.03
75-79						261.61	104.71	142.44	57.34	81.06			273.15				86.09
80-84								308.91									11.32
CMA		3.45	6.07	26.62	19.34	42.61	54.91	72.30	143.67	120.85	441.97						43.56
Relative Risk (Rate Ratios)																	
40-44					11.49	2.02	25.36										5.89
45-49		11.77			8.20	8.94	10.96	22.46									9.38
50-54					6.15	6.72	7.91	7.64	7.93								6.93
55-59				3.29	1.89	3.09	5.22	9.31	4.86	20.69							6.06
60-64				3.62	6.20	1.23	6.06	6.22	7.53	7.31	23.25						5.99
65-69			4.63		3.42	8.69	4.13	14.34	15.67	17.21							8.99
70-74					4.32		5.38	5.45	4.16	9.90			33.20				5.51
75-79						9.02	3.98	5.06	2.63	3.31			8.78				3.51
80-84								7.00									1.22
CMA		1.58	2.01	5.79	4.41	7.23	7.26	7.24	10.10	6.50	16.42						6.60

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										CMO
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84		
Rate	2.4	3.5	5.2	7.6	11.1	16.3	23.9	35.1	51.4		

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMO
40-44	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	0	5
45-49	0	0	1	0	0	2	7	3	0	0	0	0	0	0	0	0	13
50-54	0	0	0	0	0	2	9	11	0	0	0	0	0	0	0	0	22
55-59	0	0	0	0	0	2	1	3	7	8	1	0	0	0	0	0	22
60-64	0	0	0	0	0	0	6	5	9	4	1	0	0	0	0	0	25
65-69	0	0	0	0	0	0	1	1	6	5	2	1	0	0	0	0	16
70-74	0	0	0	0	0	0	0	1	0	0	3	3	0	0	0	0	7
75-79	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	5
80-84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CMA	0	0	1	0	3	10	28	32	25	10	5	1	0	0	0	0	115

Total PYO

40-44	16.6	129.8	474.0	1710.3	5853.9	7467.3	755.2	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16411.1
45-49	21.5	123.9	430.4	1192.3	3567.5	10748.8	12025.3	1259.3	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29374.1
50-54	27.4	156.8	380.5	919.2	2057.6	5728.7	14152.9	12369.2	1179.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	36994.3
55-59	10.4	95.3	313.1	666.4	1314.5	2727.0	6276.9	11760.9	7626.5	537.3	1.3	0.0	0.0	0.0	0.0	0.0	31331.6
60-64	0.0	38.9	186.7	371.1	728.2	1419.3	2523.5	4388.3	5435.9	2466.3	161.2	5.0	0.0	0.0	0.0	0.0	17724.2
65-69	0.0	0.0	52.3	180.1	314.4	611.0	1101.3	1631.7	1838.5	1535.8	558.8	50.4	4.0	0.0	0.0	0.0	7878.3
70-74	0.0	0.0	0.0	49.3	109.1	189.3	394.8	591.7	658.1	481.6	357.8	143.2	20.8	2.0	0.0	0.0	2997.6
75-79	0.0	0.0	0.0	0.0	28.7	70.2	102.8	164.6	188.5	117.4	93.0	86.3	27.7	4.5	0.0	0.0	883.3
80-84	0.0	0.0	0.0	0.0	0.0	12.9	24.3	28.8	38.4	27.1	16.5	14.9	15.2	7.1	3.0	0.0	188.3
CMA	75.9	544.8	1837.0	5088.6	13973.8	28974.5	37356.8	32218.4	18971.9	5568.4	1166.5	299.8	67.7	13.6	3.0	0.0	143782.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

4.4	5.0	5.4	5.2	4.8	4.8	6.0	7.9	10.6	14.3	19.9	27.0	34.2	42.0	51.4	0.0	7.0
-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	-----	-----

Age	Excess Mortality (Rate Differences)														CMD		
	0-4	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	70-74	75-79	
40-44					14.67	51.15											28.05
45-49					228.80	15.07	54.67	234.68									40.72
50-54						29.73	58.41	83.60									54.28
55-59						29.07	40.19	51.92	97.27	178.53							62.62
60-64							226.62	102.80	154.42	151.05							129.91
65-69						147.33	74.47	351.39	255.63	113.89	162.61						186.75
70-74							223.33			599.00	814.63						209.58
75-79								1556.41									530.94
80-84																	
CMA					49.02	16.87	29.68	68.91	91.40	136.75	179.22	400.83	306.58				72.94
Relative Risk (Rate Ratios)																	
40-44					7.08	22.20											12.62
45-49					65.68	5.26	16.45	67.34									12.51
50-54						6.73	12.26	17.12									11.47
55-59						20.02	4.82	6.29	7.83	13.80	24.49						9.24
60-64							21.34	10.23	14.86	14.56							12.66
65-69							10.02	5.56	22.51	16.65	7.97	10.96					12.43
70-74								10.58			26.02	36.02					9.75
75-79									45.34								16.13
80-84																	
CMA					10.05	4.67	7.15	12.40	12.54	13.96	13.57	21.18	12.34				11.36

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	2.4	3.5	5.2	7.6	11.1	16.3	23.9	35.1	51.4

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	3	2	0	0	0	0	0	0	0	0	0	5
50-54	0	0	0	0	1	0	4	3	2	0	0	0	0	0	0	0	10
55-59	0	0	1	0	0	0	0	1	7	9	2	0	0	0	0	0	20
60-64	0	0	0	0	0	0	0	2	0	3	3	0	0	0	0	0	8
65-69	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	3
70-74	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	3
75-79	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
80-84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CMA	0	0	1	0	1	6	9	12	14	7	0	1	0	0	0	0	51

Total PYO

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	CMD
40-44	17.0	50.8	147.1	569.4	1945.5	2472.4	298.8	2.3	5503.2
45-49	15.0	75.3	160.3	392.6	1147.0	3499.3	3081.3	499.7	9772.4
50-54	10.3	64.6	183.3	342.3	732.5	1971.5	4861.1	4300.6	13034.8
55-59	4.4	47.9	135.9	276.6	517.3	1023.0	2296.0	4217.5	11766.0
60-64	0.0	14.0	68.8	172.5	322.8	571.7	935.1	1624.3	6941.8
65-69	0.0	0.0	27.2	77.8	123.5	236.8	455.4	616.2	3199.0
70-74	0.0	0.0	0.0	23.0	52.8	63.4	129.8	229.2	1204.8
75-79	0.0	0.0	0.0	0.0	20.8	30.9	28.5	54.1	366.2
80-84	0.0	0.0	0.0	0.0	4.5	7.4	13.0	19.1	68.6
CMA	46.7	252.6	722.6	1854.3	4862.2	9673.5	12980.3	11586.8	51856.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

3.9	4.9	5.7	5.6	5.0	5.0	6.1	8.0	10.5	14.4	18.8	25.9	32.9	38.8	35.1	0.0	7.3
-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	-----	-----

Age	Excess Mortality (Rate Differences)														CMD		
	0-4	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	70-74	75-79	
40-44						38.03											15.76
45-49						82.20	46.70										47.83
50-54							77.10	64.09	366.85								71.53
55-59							36.14	158.37	297.67	639.30							162.38
60-64							202.74		131.75	277.94							104.10
65-69						405.90		145.96		137.91							77.45
70-74								412.42		431.98							225.07
75-79																	238.00
80-84																	
CMA						132.70		15.61	55.76	63.18	95.56	200.77	290.00				91.03
Relative Risk (Rate Ratios)																	
40-44						16.76											7.53
45-49						24.23	14.20										14.46
50-54							15.87	13.36	71.74								14.79
55-59							5.75	21.83	40.16	85.10							22.36
60-64							19.19		12.82	25.94							10.34
65-69						25.85		9.94		9.44							5.74
70-74								18.22		19.04							10.40
75-79																	7.78
80-84																	
CMA						24.30		4.15	12.14	11.29	12.97	20.16	21.19				13.43

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Lung Cancer Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
Current smokers of any number of cigarettes

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	2.4	3.5	5.2	7.6	11.1	16.3	23.9	35.1

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	80-84	CMD
40-44	0	0	0	0	8	7	1	0	0	0	0	0	0	0	0	0	0	16
45-49	0	0	2	0	4	18	28	5	0	0	0	0	0	0	0	0	0	57
50-54	0	0	0	0	6	13	44	36	6	0	0	0	0	0	0	0	0	105
55-59	0	0	2	2	5	7	21	51	32	5	0	0	0	0	0	0	0	125
60-64	0	0	1	1	6	2	24	33	39	16	2	0	0	0	0	0	0	124
65-69	0	0	1	2	4	9	11	15	29	21	7	0	0	0	0	0	0	99
70-74	0	0	0	1	1	2	6	8	7	90	5	6	0	0	0	0	0	46
75-79	0	0	0	0	1	0	4	3	7	2	4	0	0	0	0	0	0	23
80-84	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0	0	5
CMA	0	0	6	6	35	58	141	154	120	54	16	10	0	0	0	0	0	600

Total PYO

40-44	1104.3	4043.2	8113.1	21698.6	54405.9	57472.9	4341.8	26.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	151208.5
45-49	1629.9	6193.4	10723.3	19058.3	44586.0	102808.7	94744.3	7006.4	37.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	286787.7
50-54	1562.9	6689.1	12970.8	19558.5	32395.2	72038.2	137144.0	100510.3	6755.8	39.5	0.0	0.0	0.0	0.0	0.0	0.0	369864.3
55-59	789.3	5422.8	11383.7	16949.3	24985.0	41468.0	78361.0	114777.3	63079.1	3635.7	37.9	0.0	0.0	0.0	0.0	0.0	360869.1
60-64	0.0	2197.3	8255.5	11221.7	16547.5	24350.0	36819.5	53736.7	54691.7	21985.2	1244.3	28.4	0.0	0.0	0.0	0.0	231077.7
65-69	0.0	0.0	3138.9	7647.5	8748.9	13145.7	18521.5	23421.2	23162.7	16569.9	5764.2	469.3	22.3	0.0	0.0	0.0	120612.0
70-74	0.0	0.0	0.0	2803.7	5589.4	5732.6	8548.8	10269.4	10189.3	7227.5	4545.9	5884.3	229.6	12.4	0.0	0.0	57133.9
75-79	0.0	0.0	0.0	0.0	1977.6	3068.6	3178.0	4094.6	3903.8	3196.3	5870.7	5320.2	601.5	96.0	3.3	0.0	23692.5
80-84	0.0	0.0	0.0	0.0	0.0	1039.9	1468.3	1215.6	1256.6	980.5	741.3	435.2	355.8	161.9	32.8	2.0	7691.9
CMA	5086.4	24745.8	54585.3	98937.8	189235.5	321424.5	383127.3	315060.3	163178.2	53634.6	14305.3	4137.3	1209.3	272.3	36.0	2.0	1628977.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

4.4	5.4	6.5	6.7	6.2	6.2	7.2	9.1	12.0	16.4	22.6	29.4	37.4	44.3	50.0	51.4	8.2
-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	------	------	------	-----

Age	Excess Mortality (Rate Differences)														CMD									
	0-4	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	70-74	75-79								
40-44																6.17								
45-49																16.34								
50-54																21.75								
55-59																27.04								
60-64																42.52								
65-69																65.75								
70-74																56.57								
75-79																61.98								
80-84																13.55								
CMA																28.68								
Relative Risk (Rate Ratios)																								
40-44						6.09	5.05	9.54								4.38								
45-49						5.27	2.54	4.95	8.35	20.17						5.62								
50-54							3.57	3.48	6.19	6.91	17.08					5.19								
55-59							2.31	1.55	2.63	2.22	3.53	5.85	6.67	18.09		4.56								
60-64								1.09	0.80	3.25	0.74	5.85	5.51	6.40	6.53	14.43	4.82							
65-69									1.95	1.60	2.80	4.19	3.64	3.92	7.67	7.75	7.43	5.03						
70-74										1.49	0.75	1.46	2.93	3.25	2.87	5.78	4.49	13.30	3.36					
75-79											1.44		3.59	2.09	5.01	1.78	3.05	8.63	2.77					
80-84													2.65	4.80				1.26						
CMA														1.69	0.90	2.97	2.92	5.11	5.40	6.15	6.14	4.95	8.21	4.52

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	10.6	21.0	41.5	81.9	161.8	319.6	631.2	1246.6	2461.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
45-49	0	0	2	2	5	6	4	0	0	0	0	0	0	0	0	0	19
50-54	0	2	5	2	6	6	15	7	1	0	0	0	0	0	0	0	44
55-59	0	2	4	5	5	10	21	27	9	1	0	0	0	0	0	0	84
60-64	0	1	9	9	6	12	16	26	23	10	3	0	0	0	0	0	115
65-69	0	0	5	10	11	22	27	20	23	11	6	1	0	0	0	0	136
70-74	0	0	0	9	25	12	19	18	17	12	9	0	0	0	0	0	133
75-79	0	0	0	0	14	29	19	24	19	14	15	4	2	1	0	0	141
80-84	0	0	0	0	0	10	26	8	16	17	6	6	4	4	1	0	96
CMA	0	5	26	37	72	107	148	130	106	65	42	20	6	5	1	0	772

Total PYO

40-44	709.3	2091.8	3221.0	6111.7	11643.1	10203.1	667.3	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34653.1
45-49	1080.5	3437.5	4635.5	6281.3	11346.4	20786.1	16442.0	945.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64960.7
50-54	1046.6	3987.8	6165.6	7067.4	9590.8	17192.7	27229.5	17452.5	904.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	90645.0
55-59	487.5	3251.3	5824.0	6817.8	8002.3	11305.3	18212.4	23225.2	11331.1	575.8	13.9	0.0	0.0	0.0	0.0	0.0	89046.7
60-64	0.0	1334.5	4669.5	4904.3	5913.2	7083.5	9539.7	12597.9	11678.7	4341.5	282.3	9.9	0.0	0.0	0.0	0.0	62354.9
65-69	0.0	0.0	1921.2	4077.8	3524.4	4485.3	5289.4	6171.6	5796.7	4025.3	1345.9	158.8	7.2	0.0	0.0	0.0	36803.3
70-74	0.0	0.0	0.0	1620.6	2676.8	2302.6	2951.9	3145.5	3035.7	2082.8	1348.6	595.2	82.2	3.3	0.0	0.0	20044.9
75-79	0.0	0.0	0.0	0.0	1077.9	1689.2	1265.3	1472.6	1402.3	1128.5	607.2	507.3	239.6	36.2	1.0	0.0	9427.1
80-84	0.0	0.0	0.0	0.0	0.0	572.8	754.3	490.6	504.0	414.5	304.0	187.3	165.3	67.4	8.0	1.0	3469.0
CMA	3323.8	14192.8	26436.8	36880.8	53974.8	75620.3	82351.8	65507.0	34658.7	12576.6	3901.8	1458.4	494.2	106.8	9.0	1.0	411404.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

34.2	52.6	84.5	113.0	123.4	128.7	139.7	178.4	277.4	459.5	726.2	1043.2	1537.2	1994.8	2326.9	2461.9	164.3
------	------	------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)															CMD -4.87	
	0-4	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	70-74	75-79	
40-44		20.41					139.23										8.24
45-49		22.14	10.83	23.06		7.86	3.32										7.05
50-54	8.66	39.60	-13.19	21.07		-6.59	13.59	-1.36	69.13								12.39
55-59	-20.43	-13.26	-8.61	-19.46		6.51	33.96	34.31	-2.52	91.72							22.59
60-64	-66.90	30.90	21.68	-60.37		7.57	5.89	44.55	35.10	68.50	901.05						49.92
65-69		-69.35	-74.36	-7.50	170.88	190.84	4.45	77.17	-46.34	126.18							32.30
70-74			-75.85	237.83	-110.06	12.44	-58.96	-71.20	-55.05	258.81	860.97						249.10
75-79					52.21	470.23	254.99	363.29	108.29	-6.01	1223.90	-456.15	-411.81				363.10
80-84						-715.96	965.21	-431.21	712.68	1639.41	-488.24	742.35	-41.35				
CMA	-17.18	13.83	-12.71	10.02		12.77	39.99	20.04	34.22	57.36	350.21	328.13	-323.07				23.36
Relative Risk (Rate Ratios)																	
40-44		2.92					14.09										0.54
45-49		2.05	1.52	2.50	1.37	1.16											1.39
50-54	1.21	1.95	0.68	1.51	0.84	1.33	0.97	2.67									1.17
55-59	0.75	0.84	0.89	0.76	1.06	1.41	1.42	0.97	2.12								1.15
60-64	0.46	1.19	1.13	0.63	1.05	1.04	1.28	1.22	1.42	6.57							1.14
65-69	0.81	0.77	0.98	1.53	1.60	1.01	1.24	0.86	1.39								1.16
70-74		0.86	1.36	0.83	1.02	0.91	0.89	0.91	1.41	2.40							1.05
75-79			1.04	1.38	1.20	1.31	1.09	1.00	1.98	0.63	0.67						1.20
80-84					0.71	1.40	0.66	1.29	1.67	0.80	1.30	0.96					1.15
CMA	0.67	1.16	0.89	1.06	1.10	1.29	1.11	1.12	1.12	1.48	1.31	0.79					1.14

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
10-19 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	10.6	21.0	41.5	81.9	161.8	319.6	631.2	1246.6	2461.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	2	4	1	1	0	0	0	0	0	0	0	0	0	8
45-49	0	0	1	1	4	16	15	0	0	0	0	0	0	0	0	0	37
50-54	0	0	7	1	9	20	30	25	1	0	0	0	0	0	0	0	93
55-59	0	1	5	6	16	23	49	50	37	3	0	0	0	0	0	0	190
60-64	0	1	6	6	15	28	42	55	43	25	3	0	0	0	0	0	224
65-69	0	0	3	11	14	33	36	45	46	30	10	1	0	0	0	0	229
70-74	0	0	0	7	17	14	28	36	27	19	5	0	0	0	0	0	191
75-79	0	0	0	0	12	18	24	25	26	19	10	7	2	0	0	0	143
80-84	0	0	0	0	0	6	17	19	9	7	8	6	1	0	0	0	74
CMA	0	2	22	34	91	159	242	257	198	111	50	19	3	0	0	0	1189

Total PYO

40-44	239.5	1039.5	2406.6	6950.7	16936.8	16826.9	986.8	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45394.8	
45-49	332.4	1554.7	3095.0	5997.3	14740.5	32996.0	28767.3	1785.4	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89279.5	
50-54	329.1	1687.4	3649.4	6198.0	15600.4	24183.5	44607.8	39016.3	1724.5	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	124000.4
55-59	197.6	1286.8	3013.9	5189.8	8175.5	13661.1	26372.8	37425.8	19522.1	941.7	13.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	115800.0
60-64	0.0	523.1	2070.4	3297.8	5237.7	7969.3	11981.5	17808.8	17595.7	6772.3	319.3	6.0	0.0	0.0	0.0	0.0	0.0	0.0	73581.8
65-69	0.0	0.0	719.3	1889.8	2687.2	4235.6	6039.8	7589.8	7569.0	5282.9	1789.5	103.8	3.2	0.0	0.0	0.0	0.0	0.0	36000.8
70-74	0.0	0.0	0.0	668.7	1583.6	1843.7	2745.0	3237.1	3235.8	2333.7	1445.7	563.0	51.5	4.0	0.0	0.0	0.0	0.0	17731.7
75-79	0.0	0.0	0.0	0.0	534.4	996.2	1066.3	1276.8	1232.1	1024.4	626.3	367.8	176.0	29.4	2.0	0.0	0.0	0.0	7333.8
80-84	0.0	0.0	0.0	0.0	0.0	281.8	446.8	405.7	385.1	289.3	246.0	140.1	101.5	56.9	19.0	1.0	0.0	2373.1	
CMA	1098.6	6091.4	14954.6	30312.1	60496.1	102994.0	123014.0	100553.7	51275.3	16657.3	4441.8	1180.7	332.2	90.3	21.0	1.0	0.0	513513.8	

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

35.8	49.9	70.5	82.0	82.2	84.8	102.9	142.5	223.6	379.7	656.8	1010.4	1513.7	1985.1	2346.2	2461.9	130.9
------	------	------	------	------	------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44				18.14	12.96	-4.70	90.70										6.96
45-49			11.30	-4.34	6.13	27.48	31.13										20.43
50-54			150.32	-25.36	43.41	41.21	25.76	39.11	16.49								33.50
55-59		-4.23	63.95	33.67	113.76	86.42	103.85	51.65	107.58	236.64							82.13
60-64		29.34	127.96	20.10	124.55	189.51	188.70	147.00	82.54	207.31	777.87						142.59
65-69			97.49	233.20	201.38	459.50	276.43	273.29	288.13	248.26	239.20						282.86
70-74				385.25	442.30	128.15	388.83	542.69	481.33	525.77	663.06	256.89					445.96
75-79					998.85	560.34	1004.11	711.38	863.66	608.12	345.13	656.44	-110.23				703.30
80-84						-333.00	1343.34	2221.73	-124.76	-41.87	790.11						656.39
CMA		-17.05	76.63	30.13	68.24	69.54	93.83	113.04	162.56	296.70	466.93	598.89	-610.55				100.63
Relative Risk (Rate Ratios)																	
40-44				2.70	2.22	0.56	9.53										1.66
45-49			1.54	0.79	1.29	2.31	2.48										1.97
50-54			4.62	0.39	2.05	1.99	1.62	1.94	1.40								1.81
55-59		0.95	2.02	1.41	2.39	2.05	2.27	1.63	2.31	3.89							2.00
60-64		1.18	1.79	1.12	1.77	2.17	2.17	1.91	1.51	2.28	5.81						1.88
65-69			1.31	1.73	1.63	2.44	1.86	1.86	1.90	1.78	1.75						1.89
70-74				1.61	1.70	1.20	1.62	1.66	1.76	1.63	2.08	1.41					1.71
75-79					1.80	1.45	1.81	1.57	1.69	1.49	1.28	1.53	0.91				1.56
80-84						0.86	1.55	1.90	0.95	0.98	1.32						1.27
CMA		0.66	2.09	1.37	1.83	1.82	1.91	1.79	1.73	1.76	1.71	1.59	0.60				1.77

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
20 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	10.6	21.0	41.5	81.9	161.8	319.6	631.2	1246.6	2461.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	80-84	CMD
40-44	0	0	0	1	4	8	1	0	0	0	0	0	0	0	0	0	0	14
45-49	0	0	0	4	10	11	17	3	0	0	0	0	0	0	0	0	0	45
50-54	0	1	1	4	15	23	45	44	4	0	0	0	0	0	0	0	0	137
55-59	0	2	3	4	12	17	53	62	63	4	0	0	0	0	0	0	0	220
60-64	0	0	5	9	12	25	40	53	61	24	3	0	0	0	0	0	0	232
65-69	0	0	1	6	18	32	43	40	36	37	13	2	0	0	0	0	0	228
70-74	0	0	0	7	14	18	27	40	28	26	12	10	0	0	0	0	0	182
75-79	0	0	0	0	5	10	7	18	17	17	6	5	2	0	0	0	0	87
80-84	0	0	0	0	0	2	10	7	7	6	9	1	3	1	1	1	0	47
CMA	0	3	10	35	90	146	243	267	216	114	43	18	5	1	1	0	0	1192

Total PYO

40-44	122.0	731.3	1864.4	6396.6	18026.6	20503.2	1633.8	85	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49246.3
45-49	180.5	1002.0	2402.1	5194.9	13784.6	34778.5	33528.6	2516.8	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93401.0
50-54	149.6	992.5	2591.9	5031.8	9413.9	22961.8	46292.8	35321.8	2430.8	14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	125200.8
55-59	89.3	741.5	2096.8	3998.7	6975.3	12751.7	25212.9	38148.0	21649.3	1271.8	9.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60-64	0.0	286.8	1260.2	2475.9	4345.8	7306.3	11839.8	17317.4	17882.0	7367.3	386.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0
65-69	0.0	0.0	419.0	1322.0	2099.4	3577.0	5635.6	7411.9	7257.7	5077.6	1778.6	135.1	7.0	0.0	0.0	0.0	0.0	0.0
70-74	0.0	0.0	0.0	422.2	967.3	1333.6	2327.3	3066.0	3013.1	2110.2	1347.2	503.3	62.9	2.2	0.0	0.0	0.0	0.0
75-79	0.0	0.0	0.0	0.0	315.8	582.2	715.3	1126.5	1081.8	860.8	509.1	324.4	142.6	23.9	0.0	0.0	0.0	0.0
80-84	0.0	0.0	0.0	0.0	0.0	167.9	235.8	277.5	317.5	230.6	170.5	91.5	66.9	30.3	2.8	0.0	0.0	0.0
CMA	541.4	3754.2	10634.3	24801.8	55928.6	103962.2	127421.4	105194.4	53645.0	16932.4	4201.0	1062.4	261.4	56.3	2.8	0.0	0.0	508419.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

34.4	47.2	64.7	72.7	68.3	69.8	89.2	131.6	207.3	348.0	603.8	933.7	1383.6	1875.5	2461.9	0.0	118.0
------	------	------	------	------	------	------	-------	-------	-------	-------	-------	--------	--------	--------	-----	-------

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44				5.09	11.55	28.38	50.57										17.79
45-49				55.99	51.53	10.62	29.69	98.19									27.17
50-54	59.26	-2.91	36.00	117.85	58.67	55.71	83.98	123.07									67.93
55-59	187.78	61.13	18.09	90.09	51.37	128.26	80.58	209.06	232.58								112.84
60-64		234.94	201.67	114.30	180.33	176.01	144.21	179.29	163.93	615.37							167.36
65-69		-60.95	134.25	537.77	574.99	443.40	220.96	176.41	409.08	411.31							337.04
70-74			1026.90	816.19	718.54	528.98	673.42	298.07	600.92	259.55	1355.87						569.71
75-79				336.94	471.13	267.91	351.28	324.94	728.43	-68.00	294.64						284.52
80-84					-1270.8	1782.86	60.80	-257.20	140.18	2816.87							488.49
CMA	32.71	29.38	68.43	92.58	70.67	101.50	122.26	195.34	325.26	419.80	760.59	393.15					116.42
Relative Risk (Rate Ratios)																	
40-44				1.48	2.09	3.67	5.75										2.67
45-49				3.66	3.45	1.51	2.41	5.67									2.29
50-54	2.43	0.93	1.92	3.84	2.41	2.34	3.00	3.97									2.64
55-59	3.29	1.75	1.22	2.10	1.63	2.57	1.98	3.55	3.84								2.38
60-64		2.45	2.25	1.71	2.11	2.09	1.89	2.11	2.01	4.80							2.03
65-69		0.75	1.42	2.68	2.80	2.39	1.69	1.55	2.28	2.29							2.05
70-74			2.63	2.29	2.14	1.84	2.07	1.47	1.95	1.41	3.15						1.90
75-79				1.27	1.38	0.79	1.28	1.26	1.58	0.95	1.24						1.23
80-84					0.48	1.72	1.02	0.90	1.06	2.14							1.20
CMA	1.89	1.45	1.94	2.35	2.01	2.14	1.90	1.94	1.93	1.70	1.81	1.28					1.99

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	10.6	21.0	41.5	81.9	161.8	319.6	631.2	1246.6	2461.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	1	3	3	1	0	0	0	0	0	0	0	0	0	8
45-49	0	0	0	0	1	7	5	1	0	0	0	0	0	0	0	0	14
50-54	0	0	0	1	2	6	17	18	3	0	0	0	0	0	0	0	47
55-59	0	0	0	2	3	5	9	23	15	2	0	0	0	0	0	0	59
60-64	0	0	0	2	3	3	13	18	20	8	0	0	0	0	0	0	67
65-69	0	0	0	2	5	6	6	8	10	5	4	1	0	0	0	0	47
70-74	0	0	0	0	1	1	8	9	9	6	4	1	0	0	0	0	39
75-79	0	0	0	0	0	0	5	4	6	4	2	1	0	0	0	0	22
80-84	0	0	0	0	0	0	0	0	1	2	1	0	3	0	0	0	7
CMA	0	0	0	8	18	31	64	81	64	27	11	3	3	0	0	0	310

Total PYO

40-44	16.6	129.8	474.0	1710.3	5853.9	7467.3	755.2	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16411.1
45-49	21.5	123.9	430.4	1192.3	3567.5	19748.8	12625.3	1259.3	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29374.1
50-54	27.4	156.8	360.5	919.2	2657.6	5728.7	14152.9	12389.2	1179.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	36994.3
55-59	10.4	95.3	313.1	666.4	1314.5	2727.0	6276.9	11760.9	7628.5	537.3	1.3	0.0	0.0	0.0	0.0	0.0	31331.6
60-64	0.0	38.9	186.7	371.1	728.2	1419.3	2523.5	4388.3	5435.9	2466.3	1612.2	5.0	0.0	0.0	0.0	0.0	17724.2
65-69	0.0	0.0	52.3	180.1	314.4	611.0	1101.3	1631.7	1806.5	1535.8	558.8	50.4	4.0	0.0	0.0	0.0	7878.3
70-74	0.0	0.0	49.3	109.1	189.3	394.8	591.7	658.1	481.6	357.8	143.2	20.8	2.0	0.0	0.0	0.0	2997.6
75-79	0.0	0.0	0.0	0.0	28.7	70.2	102.6	164.6	186.5	117.4	93.0	86.3	27.7	4.5	0.0	0.0	883.3
80-84	0.0	0.0	0.0	0.0	0.0	12.9	24.3	28.8	36.4	27.1	16.5	14.9	15.2	7.1	3.0	0.0	188.3
CMA	75.9	544.6	1837.0	5086.6	13973.8	26974.5	37356.8	32216.4	16971.9	5168.4	1168.5	299.8	67.7	13.6	3.0	0.0	143782.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

34.5	45.2	55.8	55.9	46.7	49.4	60.5	105.1	170.1	280.8	494.0	839.1	1274.7	1789.7	2461.9	0.0	95.5
------	------	------	------	------	------	------	-------	-------	-------	-------	-------	--------	--------	--------	-----	------

Age	Excess Mortality (Rate Differences)															CMD			
	0-4	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	70-74	75-79			
40-44				47.83	40.61	29.54	121.78										36.11		
45-49					7.02	44.11	20.57	58.40									26.65		
50-54						67.30	55.71	63.24	78.62	103.80	212.96						65.55		
55-59							218.17	146.28	101.41	61.44	113.62	114.69	290.32				106.36		
60-64								377.13	250.16	49.54	253.32	248.35	206.09	162.54				216.18	
65-69									790.98	1270.63	662.38	225.22	170.68	224.31	5.94	396.16		276.96	
70-74										1394.96	889.92	736.40	614.68	486.89				669.84	
75-79											1183.79	1936.43						1243.96	
80-84																		1250.54	
CMA																		120.06	
Relative Risk (Rate Ratios)																			
40-44					5.50	4.82	3.78	12.45									4.56		
45-49						1.33	3.10	1.98	3.78								2.27		
50-54							2.62	2.34	2.52	2.89	3.50	6.13					3.06		
55-59								3.66	2.79	2.24	1.75	2.39	2.40	4.54			2.30		
60-64									3.33	2.55	1.31	3.18	2.53	2.27	2.00			2.34	
65-69										3.47	4.98	3.07	1.70	1.53	1.70	1.02	2.24		1.87
70-74												3.21	2.41	2.17	1.97	1.77		2.06	
75-79													1.95	2.55				2.00	
80-84																		1.51	
CMA																		2.26	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
	Rate	10.6	21.0	41.5	81.9	161.8	319.6	631.2	1246.6

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	3
45-49	0	0	0	1	0	1	3	0	0	0	0	0	0	0	0	0	5
50-54	0	0	0	1	0	0	9	6	1	0	0	0	0	0	0	0	17
55-59	0	0	1	0	0	3	4	9	11	1	0	0	0	0	0	0	29
60-64	0	0	1	1	4	4	5	6	6	5	0	0	0	0	0	0	32
65-69	0	0	0	2	0	2	4	2	5	3	2	0	0	0	0	0	20
70-74	0	0	0	0	0	1	1	3	1	1	2	1	0	0	0	0	10
75-79	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	0	4
80-84	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
CMA	0	0	2	6	5	14	26	27	25	11	4	1	0	0	0	0	121

Total PYO

40-44	17.0	50.8	147.1	569.4	1945.5	2472.4	298.8	23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5503.2
45-49	15.0	75.3	160.3	392.6	1147.0	3499.3	3681.3	499.7	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9772.4
50-54	10.3	64.6	180.3	342.3	732.5	1971.5	4661.1	4300.6	537.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	13034.8
55-59	4.4	47.9	135.9	276.6	517.3	1023.0	2296.0	4217.5	2948.2	309.2	0.0	0.0	0.0	0.0	0.0	0.0	11786.0
60-64	0.0	14.0	68.8	172.5	322.8	571.7	935.1	1624.3	2099.4	1037.8	95.6	0.0	0.0	0.0	0.0	0.0	6941.8
65-69	0.0	0.0	27.2	77.8	123.5	236.8	455.4	616.2	700.8	648.3	291.3	20.6	1.0	0.0	0.0	0.0	3199.0
70-74	0.0	0.0	0.0	23.0	52.8	63.4	129.8	229.2	246.6	219.3	147.8	79.8	12.2	1.0	0.0	0.0	1204.8
75-79	0.0	0.0	0.0	0.0	20.8	30.9	28.5	54.1	79.2	65.3	33.2	34.3	15.7	4.0	0.3	0.0	366.2
80-84	0.0	0.0	0.0	0.0	0.0	4.5	7.4	13.0	13.6	19.1	4.3	1.4	5.0	0.3	0.0	0.0	68.6
CMA	46.7	252.6	722.6	1854.3	4862.2	9873.5	12963.3	11586.6	6627.3	2299.9	572.2	136.1	33.8	5.3	0.3	0.0	51856.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

27.5	43.5	60.2	63.9	55.2	53.0	70.0	107.0	168.3	290.1	443.7	758.4	1177.5	1187.2	1246.6	0.0	102.2
------	------	------	------	------	------	------	-------	-------	-------	-------	-------	--------	--------	--------	-----	-------

Excess Mortality (Rate Differences)																	
Age	0-4	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	70-74	75-79	CMD
40-44				164.98	40.76	29.81											43.88
45-49				233.71		7.57	54.34										30.15
50-54				250.62			143.65	97.06	144.52								88.93
55-59							211.31	93.03	131.45	291.17	241.50						164.53
60-64							1077.51	537.87	372.88	207.55	123.96	319.98					299.14
65-69							524.86	558.70	4.97	393.82	143.11		366.89				305.58
70-74								677.88	-225.87	-175.28							198.84
75-79																	-154.19
80-84																	
CMA				216.60	259.68	47.60	88.79	130.28	126.03	206.91	188.14	255.42					131.12
Relative Risk (Rate Ratios)																	
40-44				16.51	4.83	3.80											5.12
45-49				12.12		1.36	3.59										2.44
50-54				7.04			4.46	3.34	4.48								3.14
55-59							3.58	2.14	2.60	4.55	3.95						3.01
60-64							7.66	4.32	3.30	2.28	1.77	2.98					2.85
65-69							2.64	2.75	1.02	2.23	1.45		2.15				1.96
70-74									2.07	0.64	0.72						1.32
75-79																	0.66
80-84																	
CMA				4.60	5.06	1.86	2.68	2.66	2.18	2.24	1.65	1.58					2.26

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Coronary Heart Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**

Current smokers of any number of cigarettes

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	10.6	21.0	41.5	81.9	161.8	319.6	631.2	1246.6	2461.9

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	1	5	12	13	4	0	0	0	0	0	0	0	0	0	35
45-49	0	0	3	8	20	41	44	4	0	0	0	0	0	0	0	0	120
50-54	0	3	13	9	32	55	116	100	90	0	0	0	0	0	0	0	338
55-59	0	5	13	17	36	58	136	171	135	11	0	0	0	0	0	0	562
60-64	0	2	21	27	40	72	116	158	153	72	9	0	0	0	0	0	670
65-69	0	0	9	31	48	95	116	115	120	86	35	5	0	0	0	0	660
70-74	0	0	0	23	57	46	83	108	91	72	49	26	0	0	0	0	555
75-79	0	0	0	0	31	59	55	72	69	54	33	17	6	1	0	0	397
80-84	0	0	0	0	0	18	53	34	30	33	24	13	11	5	3	0	227
CMA	0	10	60	120	276	457	723	762	611	328	150	61	17	6	3	0	3584

Total PYO

40-44	1104.3	4043.2	8113.1	21698.6	54405.9	57472.9	4341.8	28.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	151208.5
45-49	5629.9	6193.4	10723.3	19358.3	44586.0	502808.7	94744.3	7006.4	37.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	286787.7
50-54	5562.9	6689.1	12970.8	19558.5	32395.2	72038.2	137144.0	900510.3	6775.8	39.5	0.0	0.0	0.0	0.0	0.0	0.0	369684.3
55-59	789.3	5422.8	11380.7	16949.3	24985.0	41468.0	76361.0	114777.3	63079.1	3635.7	37.9	0.0	0.0	0.0	0.0	0.0	366869.1
60-64	0.0	2197.3	8255.5	11221.7	16547.5	24350.0	36619.5	53736.7	54691.7	21985.2	1244.3	28.4	0.0	0.0	0.0	0.0	231077.7
65-69	0.0	0.0	3138.9	7647.5	8748.9	13145.7	18521.5	23421.2	23162.7	16569.9	5764.2	469.3	22.3	0.0	0.0	0.0	120612.0
70-74	0.0	0.0	0.0	2803.7	5589.4	5732.6	8548.8	10269.4	10189.3	7227.5	4646.9	1864.3	229.6	12.4	0.0	0.0	57133.9
75-79	0.0	0.0	0.0	0.0	1977.6	3368.6	3178.0	4094.6	3983.8	3196.3	1870.7	1320.2	601.5	98.0	3.3	0.0	23662.5
80-84	0.0	0.0	0.0	0.0	0.0	1039.9	1466.3	1215.6	1258.6	960.5	741.3	435.2	355.8	161.9	32.8	2.0	7691.9
CMA	5086.4	24745.8	54585.3	98937.6	589235.5	321424.5	363127.3	315060.3	163178.2	53634.6	14305.3	4137.3	1209.3	272.3	36.0	2.0	1628977.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

34.5	50.9	75.5	89.6	86.5	86.1	101.8	141.2	221.9	375.0	638.7	961.6	1470.3	1941.1	2352.2	2461.9	131.3
------	------	------	------	------	------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44		1.69	12.40	11.42	11.98	81.49											12.51
45-49		6.97	20.97	23.85	18.87	25.43	36.08										20.83
50-54	2.05	58.73	4.52	57.29	34.86	43.09	58.00	106.09									45.20
55-59	10.26	32.25	18.35	62.14	57.92	91.61	67.04	132.07	220.61								79.32
60-64	-70.82	92.54	78.77	79.89	133.85	153.21	132.19	117.91	165.66	561.49							128.11
65-69		-32.89	85.75	229.03	403.06	306.69	171.40	198.46	199.40	287.59	745.92						227.60
70-74			169.14	368.57	171.22	339.68	420.46	261.89	364.98	423.25	748.59						340.19
75-79				320.98	504.89	484.06	511.83	485.41	442.84	517.49	41.13	-249.08					429.04
80-84					-731.01	1147.61	335.09	160.08	903.71	775.49	525.44	629.41	626.09				489.23
CMA	-10.47	34.41	31.72	59.32	56.07	86.92	100.66	152.59	236.53	409.85	492.82	-64.43	262.07				86.73
Relative Risk (Rate Ratios)																	
40-44		1.16	2.17	2.07	2.13	8.66											2.18
45-49		1.33	2.00	2.14	1.90	2.21	2.72										1.99
50-54	1.05	2.42	1.11	2.38	1.84	2.04	2.40	3.56									2.09
55-59	1.13	1.39	1.22	1.76	1.71	2.12	1.82	2.61	3.69								1.97
60-64	0.56	1.57	1.49	1.49	1.83	1.95	1.82	1.73	2.02	4.47							1.79
65-69	0.90	1.27	1.72	2.26	1.96	1.54	1.62	1.62	1.90	3.33							1.71
70-74		1.30	1.62	1.27	1.54	1.67	1.41	1.58	1.67	2.19							1.54
75-79				1.26	1.41	1.39	1.41	1.39	1.36	1.42	1.03	0.80					1.34
80-84					0.70	1.47	1.14	1.07	1.37	1.21	1.21	1.26	1.25				1.20
CMA	0.79	1.46	1.35	1.69	1.65	1.85	1.71	1.69	1.63	1.64	1.50	0.96	1.14				1.68

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Duration										CMD
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84		
Rate	2.7	5.9	12.8	27.8	60.7	132.3	288.4	628.6	1370.2		

Observed deaths for smokers based on age groups \ durations (years)

Age	Duration										CMD					
	0-4	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	70-74	75-79
40-44	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	2	4	2	0	0	0	0	0	0	0	0	0
50-54	0	0	2	1	5	2	8	5	0	0	0	0	0	0	0	0
55-59	1	1	6	5	2	2	4	5	7	0	0	0	0	0	0	0
60-64	0	0	5	3	3	4	7	7	8	6	0	0	0	0	0	0
65-69	0	0	2	5	6	4	7	9	9	2	1	0	0	0	0	0
70-74	0	0	0	4	10	8	11	14	52	7	3	2	0	0	0	0
75-79	0	0	0	0	8	11	8	10	7	7	5	0	1	2	0	0
80-84	0	0	0	0	0	5	10	5	8	3	4	0	1	3	0	0
CMA	1	2	15	19	36	41	57	55	51	25	13	2	2	5	0	0

Total PYO

40-44	709.3	2091.8	3221.0	6111.7	11643.1	16263.1	667.3	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34653.1
45-49	1080.5	3437.5	4635.5	6281.3	11346.4	20796.1	16442.0	945.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	64960.7
50-54	1046.6	3987.8	6165.6	7067.4	9590.8	17192.7	27229.5	17452.5	904.0	8.3	0.0	0.0	0.0	0.0	0.0	90645.0
55-59	487.5	3251.3	5824.0	6817.8	8002.3	11305.3	18212.4	23225.2	11331.1	575.8	13.9	0.0	0.0	0.0	0.0	89046.7
60-64	0.0	1334.5	4669.5	4904.3	5913.2	7083.5	9539.7	12587.9	11678.7	4341.5	282.3	9.9	0.0	0.0	0.0	62354.9
65-69	0.0	0.0	1921.2	4077.8	3524.4	4485.3	5289.4	6171.6	5796.7	4025.3	1345.9	158.8	7.2	0.0	0.0	36803.3
70-74	0.0	0.0	0.0	1620.6	2876.8	2302.6	2951.9	3145.5	3035.7	2082.8	1348.6	595.2	82.2	3.3	0.0	20044.9
75-79	0.0	0.0	0.0	0.0	1077.9	1689.2	1265.3	1472.6	1402.3	1128.5	607.2	507.3	239.8	36.2	1.0	0.0
80-84	0.0	0.0	0.0	0.0	0.0	572.8	754.3	490.6	504.0	414.5	304.0	187.3	165.3	67.4	8.0	1.0
CMA	3323.8	14102.8	26436.8	36880.8	53074.8	75620.3	82361.8	65507.0	34658.7	12576.6	3901.8	1458.4	494.2	106.8	9.0	1.0

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

10.6	17.6	30.8	44.4	51.4	56.8	59.6	75.7	122.6	213.9	354.4	527.1	812.8	1086.2	1287.8	1370.2	71.0
------	------	------	------	------	------	------	------	-------	-------	-------	-------	-------	--------	--------	--------	------

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44		45.12		13.67		7.11											5.97
45-49					11.77	13.38	6.30										6.45
50-54				19.66	1.38	39.26	-1.14	16.61	15.88								12.60
55-59	177.28	2.91		75.18	45.49	-2.85	-10.15	-5.88	-6.32	33.93							9.22
60-64				45.36	0.48	-9.96	-4.22	12.68	-5.13	7.81	77.51						8.27
65-69				-28.20	-9.68	37.94	-43.12	0.04	13.53	22.96	-62.61	-58.00					-10.03
70-74					-41.56	59.23	59.05	84.26	156.70	106.92	47.71	-65.93	47.66				65.82
75-79						113.57	22.60	3.64	50.47	-129.44	-6.31	194.89		-211.21			-2.75
80-84							-497.23	-44.39	-351.02	217.09	-446.45	-54.42					-245.97
CMA	19.50	-3.42		25.94	7.11	15.28	-1.56	9.57	8.22	24.52	-15.12	-21.19	-389.96	-406.11			7.72
Relative Risk (Rate Ratios)																	
40-44		17.78		6.09		3.65											3.22
45-49					3.01	3.28	2.08										2.10
50-54				2.54	1.11	4.08	0.91	2.30	2.24								1.99
55-59	7.37	1.10		3.70	2.63	0.90	0.64	0.79	0.77	2.22							1.33
60-64				1.76	1.01	0.84	0.93	1.21	0.92	1.13	2.28						1.14
65-69				0.79	0.93	1.29	0.67	1.00	1.10	1.17	0.98	0.56					0.92
70-74					0.86	1.21	1.20	1.29	1.54	1.37	1.17	0.77	1.17				1.23
75-79						1.18	1.04	1.01	1.08	0.79	0.99	1.31		0.66			1.00
80-84							0.64	0.97	0.74	1.16	0.53	0.96					0.82
CMA	2.84	0.81		1.84	1.16	1.30	0.97	1.16	1.11	1.20	0.93	0.94	0.26	0.50			1.11

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**

10-19 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

	Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
	Rate	2.7	5.9	12.8	27.8	60.7	132.3	288.4	628.6	1370.2

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	2	1	3	0	0	0	0	0	0	0	0	0	0	6
45-49	0	0	0	0	5	4	8	2	0	0	0	0	0	0	0	0	19
50-54	0	1	2	0	4	13	21	13	0	0	0	0	0	0	0	0	54
55-59	0	1	1	5	7	4	11	27	14	0	0	0	0	0	0	0	70
60-64	0	0	1	2	8	16	15	17	22	15	0	0	0	0	0	0	86
65-69	0	0	2	3	6	5	12	12	19	13	3	0	1	0	0	0	76
70-74	0	0	0	0	2	5	8	9	8	11	5	4	0	0	0	0	52
75-79	0	0	0	0	6	5	10	10	7	5	7	5	1	0	0	0	52
80-84	0	0	0	0	0	4	6	8	1	5	3	2	2	2	0	0	33
CMA	0	2	6	12	39	59	91	96	71	49	18	7	4	2	0	0	458

Total PYO

40-44	239.5	1039.5	2406.6	6950.7	16936.8	16826.9	966.8	8.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45394.8
45-49	332.4	1554.7	3095.0	5997.3	14740.5	32996.0	28767.3	1785.4	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89279.5
50-54	329.1	1687.4	3649.4	6198.0	10600.4	24183.5	44607.8	31016.3	1724.5	13.0	0.0	0.0	0.0	0.0	0.0	0.0	124009.4
55-59	197.6	1286.8	3013.9	5189.8	8175.5	13661.1	26372.8	37425.8	19522.1	941.7	13.1	0.0	0.0	0.0	0.0	0.0	115800.0
60-64	0.0	523.1	2070.4	3297.8	5237.7	7969.3	11981.5	17808.8	17595.7	6772.3	319.3	6.0	0.0	0.0	0.0	0.0	73561.8
65-69	0.0	0.0	719.3	1989.8	2687.2	4235.6	6039.8	7588.8	7569.0	5262.9	1789.5	103.8	3.2	0.0	0.0	0.0	36009.8
70-74	0.0	0.0	0.0	688.7	1583.6	1843.7	2745.0	3237.1	3235.8	2333.7	1445.7	563.0	51.5	4.0	0.0	0.0	17731.7
75-79	0.0	0.0	0.0	0.0	534.4	996.2	1066.3	1276.8	1232.1	1024.4	628.3	367.8	176.0	29.4	2.0	0.0	7333.8
80-84	0.0	0.0	0.0	0.0	0.0	281.8	446.8	405.7	365.1	269.3	246.0	140.1	101.5	56.9	19.0	1.0	2373.1
CMA	1098.6	6091.4	14954.6	30312.1	60496.1	102994.0	123014.0	100553.7	51275.3	16657.3	4441.8	1180.7	332.2	90.3	21.0	1.0	513613.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

11.2	16.6	25.1	31.0	32.4	34.1	41.3	57.9	95.0	171.1	316.4	507.9	797.7	1080.8	1299.8	1370.2	54.4
------	------	------	------	------	------	------	------	------	-------	-------	-------	-------	--------	--------	--------	------

		Excess Mortality (Rate Differences)																
Age		0-4	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	70-74	75-79	CMD
40-44					26.09	3.22	15.14											10.53
45-49						28.06	6.26	21.95	106.16									15.42
50-54	46.49		42.03			24.96	40.98	34.30	29.14									30.77
55-59	49.87	5.34	68.50	57.78	1.44	13.87	44.30	43.87										32.60
60-64			-12.39	-0.05	92.05	140.08	64.50	34.76	64.34	160.80								69.77
65-69			145.77	18.47	90.98	-14.25	66.38	25.81	118.73	113.78	35.35							67.65
70-74						-162.09	-17.18	3.06	-10.35	-41.15	182.98	57.48	422.10					4.88
75-79							494.12	-126.68	309.19	154.58	-60.46	-140.52	485.60	-356.74				80.45
80-84								49.07	-27.18	601.85	-1110.5	358.40	-150.70					20.38
CMA		16.25	14.98	8.59	32.05	23.15	32.71	39.52	43.49	123.09	86.84	85.02	406.48					34.81
		Relative Risk (Rate Ratios)																
40-44					10.70	2.20	6.63											4.92
45-49						5.79	2.07	4.75	19.12									3.63
50-54	4.64		4.29			2.95	4.21	3.69	3.28									3.41
55-59	2.79	1.19	3.46			3.08	1.05	1.50	2.59	2.58								2.17
60-64			0.80	1.00	2.52	3.31	2.06	1.57	2.06	3.65								2.15
65-69			2.10	1.14	1.69	0.69	1.50	1.20	1.90	1.86	1.27							1.51
70-74						0.44	0.94	1.01	0.96	0.86	1.63	1.20	2.46					1.02
75-79							1.79	0.80	1.49	1.25	0.90	0.78	1.77	0.43				1.13
80-84								1.04	0.98	1.44	0.19	1.26	0.89					1.01
CMA		1.96	1.60	1.28	1.99	1.68	1.79	1.68	1.46	1.72	1.26	1.17	1.51					1.64

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
20 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										Duration
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	
	2.7	5.9	12.8	27.8	60.7	132.3	288.4	628.6	1370.2		

Observed deaths for smokers based on age groups \ durations (years)

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	1	1	5	1	0	0	0	0	0	0	0	0	0	0	8
45-49	0	0	0	0	3	5	17	4	0	0	0	0	0	0	0	0	29
50-54	0	0	2	1	3	15	24	21	1	0	0	0	0	0	0	0	67
55-59	0	0	2	2	3	9	15	24	13	2	0	0	0	0	0	0	70
60-64	0	0	0	5	7	8	12	20	25	6	1	0	0	0	0	0	84
65-69	0	0	1	2	6	9	17	16	19	11	2	0	0	0	0	0	83
70-74	0	0	0	0	4	4	9	12	12	10	5	4	0	0	0	0	60
75-79	0	0	0	0	2	7	4	12	11	4	3	1	4	0	0	0	48
80-84	0	0	0	0	0	1	5	6	3	1	3	3	0	0	0	0	22
CMA	0	0	6	11	33	59	103	115	84	34	14	8	4	0	0	0	471

Total PYO

40-44	122.0	731.3	1864.4	6356.6	18026.6	20503.2	1633.8	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49246.3
45-49	180.5	1002.0	2402.1	5194.9	13784.6	34778.5	30528.6	2516.8	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93401.0
50-54	149.6	992.5	2591.9	5031.6	9413.9	22961.8	46292.8	35321.8	2430.8	14.3	0.0	0.0	0.0	0.0	0.0	0.0	125200.8
55-59	89.3	741.5	2096.8	3998.7	6975.3	12751.7	25212.9	36148.0	21649.3	1271.8	9.7	-1.0	0.0	0.0	0.0	0.0	112944.8
60-64	0.0	286.8	1260.2	2475.9	4345.8	7306.3	11839.8	17317.4	17882.0	7267.3	386.0	7.5	0.0	0.0	0.0	0.0	70475.0
65-69	0.0	0.0	419.0	1322.0	2099.4	3677.0	5635.6	7411.9	7257.7	5077.6	1778.6	135.8	7.0	0.0	0.0	0.0	34721.5
70-74	0.0	0.0	0.0	422.2	967.3	1333.6	2327.3	3066.0	3013.1	2110.2	1347.2	503.3	62.9	2.2	0.0	0.0	15155.0
75-79	0.0	0.0	0.0	0.0	315.8	582.2	715.3	1126.5	1081.8	860.8	509.1	324.4	142.6	23.9	0.0	0.0	5662.2
80-84	0.0	0.0	0.0	0.0	0.0	167.9	235.6	277.5	317.5	230.6	170.5	91.5	68.9	30.3	2.8	0.0	1593.0
CMA	541.4	3754.2	10634.3	24801.8	55828.6	103962.2	127421.4	106194.4	53645.0	16932.4	4201.0	1062.4	281.4	56.3	2.8	0.0	508419.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

10.7	15.6	22.8	27.0	26.2	27.0	34.5	52.6	86.9	154.7	285.9	463.9	721.8	1013.7	1370.2	0.0	48.0
------	------	------	------	------	------	------	------	------	-------	-------	-------	-------	--------	--------	-----	------

Age	Excess Mortality (Rate Differences)															CMD		
	0-4	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	70-74	75-79		
40-44			50.95	13.04	25.05	2.19											13.56	
45-49					15.90	8.62	44.84	153.07									25.19	
50-54			64.39	7.10	19.09	52.55	39.07	46.66	28.37								40.74	
55-59			67.54	22.17	15.16	42.73	31.65	35.07	32.20	129.42							34.13	
60-64					141.25	100.38	48.80	40.66	54.80	79.11	20.75	198.37					58.90	
65-69			106.36	18.99	153.49	119.31	169.36	83.57	129.49	84.34	-19.85						106.75	
70-74						125.16	11.56	98.34	103.01	109.88	185.52	82.77	506.45				107.53	
75-79							4.81	573.80	49.36	436.64	388.27	-163.89	-39.31	-320.36				216.14
80-84								752.18	791.95	-425.33	-936.53	369.32						10.83
CMA			33.62	17.33	32.85	29.77	46.29	56.73	69.65	46.06	47.34	289.11	699.57					44.61
Relative Risk (Rate Ratios)																		
40-44		19.95	5.85	10.32	1.81												6.04	
45-49					3.71	2.45	8.65	27.12									5.30	
50-54		6.04	1.56	2.49	5.11	4.06	4.65	3.22									4.19	
55-59			3.43	1.80	1.54	2.53	2.14	2.26	2.16	5.65							2.23	
60-64					3.33	2.65	1.80	1.67	1.90	2.30	1.34	4.27					1.96	
65-69			1.80	1.14	2.16	1.90	2.26	1.63	1.98	1.64	0.85						1.81	
70-74						1.43	1.04	1.34	1.36	1.38	1.64	1.29	2.76				1.37	
75-79							1.01	1.91	0.89	1.69	1.62	0.74	0.94	0.49			1.34	
80-84									1.55	1.58	0.69	0.32	1.28				1.01	
CMA			2.47	1.64	2.26	2.10	2.34	2.08	1.80	1.30	1.17	1.62	1.97				1.83	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	2.7	5.9	12.8	27.8	60.7	132.3	288.4	628.6

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	6	3	2	0	0	0	0	0	0	0	0	11
50-54	0	0	0	2	1	4	7	7	0	0	0	0	0	0	0	0	21
55-59	0	0	0	0	1	3	2	7	4	0	0	0	0	0	0	0	17
60-64	0	0	0	0	1	0	2	4	6	5	1	0	0	0	0	0	19
65-69	0	0	0	2	0	0	1	7	1	1	0	0	0	0	0	0	12
70-74	0	0	0	0	0	0	1	2	5	0	1	1	0	0	0	0	10
75-79	0	0	0	0	2	1	2	4	2	1	0	1	0	0	0	0	5
80-84	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	2
CMA	0	0	0	4	5	15	18	31	20	9	3	1	2	0	0	0	106

Total PYO

40-44	16.6	129.8	474.0	5710.3	5853.9	7457.3	755.2	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16411.1
45-49	21.5	123.9	430.4	5192.3	5367.5	60748.8	12025.3	1258.3	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29374.1
50-54	27.4	156.8	380.5	919.2	2057.6	5728.7	14152.9	12389.2	1179.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	36994.3
55-59	10.4	95.3	313.1	666.4	1314.5	2727.0	6276.9	11760.9	7628.5	537.3	1.3	0.0	0.0	0.0	0.0	0.0	31331.6
60-64	0.0	36.9	186.7	371.1	728.2	1419.3	2523.5	4366.3	5435.9	2466.3	161.2	5.0	0.0	0.0	0.0	0.0	17724.2
65-69	0.0	0.0	52.3	180.1	314.4	611.0	1101.3	1631.7	1838.5	1535.8	558.8	50.4	4.0	0.0	0.0	0.0	7878.3
70-74	0.0	0.0	49.3	109.1	189.3	394.8	591.7	658.1	461.6	357.8	143.2	20.8	2.0	0.0	0.0	0.0	2997.6
75-79	0.0	0.0	0.0	0.0	28.7	70.2	102.6	164.6	168.5	117.4	93.0	86.3	27.7	4.5	0.0	0.0	883.3
80-84	0.0	0.0	0.0	0.0	0.0	12.9	24.3	28.8	36.4	27.1	16.5	14.9	15.2	7.1	3.0	0.0	186.3
CMA	75.9	544.8	1637.0	5088.6	13973.8	28974.5	37356.8	32218.4	16971.9	5168.4	1188.5	299.8	67.7	13.6	3.0	0.0	143762.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

19.7	14.9	19.4	20.1	16.8	17.8	25.1	40.0	68.4	119.5	225.5	410.1	660.7	965.2	1370.2	0.0	37.3
------	------	------	------	------	------	------	------	------	-------	-------	-------	-------	-------	--------	-----	------

Excess Mortality (Rate Differences)																	
Age	0-4	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	70-74	75-79	CMD
40-44						10.70											3.40
45-49						49.96	19.09	152.95									31.59
50-54				204.81	35.83	57.05	36.69	43.73									43.99
55-59						48.23	62.17	4.02	31.67	24.59							26.41
60-64						76.64		18.56	30.46	49.68	142.04						46.50
65-69						978.30		-41.49	296.71	-77.91	47.19						20.02
70-74							-35.11	49.65	471.40								45.22
75-79								586.59	1493.41								1069.51
80-84																	-307.80
CMA						58.48	18.98	33.96	23.06	56.21	49.40	54.63	26.94	-76.45			37.86
Relative Risk (Rate Ratios)																	
40-44						4.98											2.27
45-49						9.53	4.26	27.10									6.39
50-54					17.03	3.80	5.47	3.87	4.42								4.44
55-59						2.73	3.95	1.14	2.14	1.66							1.95
60-64						2.26		1.31	1.50	1.82	3.34						1.77
65-69						6.39		0.69	3.24	0.41	0.49						1.15
70-74								0.88	1.17	2.63							1.16
75-79									1.93	3.38							2.70
80-84																	0.76
CMA						3.91	2.13	2.91	1.92	2.41	1.72	1.46	1.12	0.81			2.02

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	2.7	5.9	12.8	27.8	60.7	132.3	286.4	628.6	1370.2

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	2	2	1	0	0	0	0	0	0	0	0	5
50-54	0	0	0	1	0	2	3	4	0	0	0	0	0	0	0	0	10
55-59	0	0	1	1	0	2	0	5	3	0	0	0	0	0	0	0	12
60-64	0	0	0	0	1	1	2	3	3	3	0	0	0	0	0	0	13
65-69	0	0	0	0	0	2	1	1	2	2	0	0	0	0	0	0	8
70-74	0	0	0	0	1	0	1	0	1	0	1	0	0	0	0	0	4
75-79	0	0	0	0	0	0	0	1	1	2	1	1	0	0	0	0	6
80-84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CMA	0	0	1	2	3	9	9	15	10	7	2	1	0	0	0	0	59

Total PYO

40-44	17.0	50.8	147.1	569.4	1945.5	2472.4	298.8	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5503.2	
45-49	15.0	75.3	190.3	392.6	1147.0	3499.3	3981.3	499.7	2.0	0.0	0.0	0.0	0.0	0.0	0.0	9772.4	
50-54	10.3	64.6	183.3	342.3	732.5	1971.5	4861.1	4330.6	537.6	1.0	0.0	0.0	0.0	0.0	0.0	13034.8	
55-59	4.4	47.9	135.9	276.6	517.3	1023.0	2286.0	4217.5	2948.2	309.2	0.0	0.0	0.0	0.0	0.0	11766.0	
60-64	0.0	14.0	66.8	172.5	322.8	571.7	935.1	924.3	2099.4	1037.6	95.6	0.0	0.0	0.0	0.0	6941.8	
65-69	0.0	0.0	27.2	77.8	123.5	236.8	455.4	616.2	700.8	648.3	291.3	20.6	1.0	0.0	0.0	3199.0	
70-74	0.0	0.0	0.0	23.0	52.8	63.4	129.8	229.2	246.6	219.3	147.8	79.8	12.2	1.0	0.0	1204.8	
75-79	0.0	0.0	0.0	20.8	30.9	38.5	54.1	79.2	65.3	33.2	34.3	15.7	4.0	0.3	0.0	366.2	
80-84	0.0	0.0	0.0	0.0	4.5	7.4	13.0	13.6	19.1	4.3	1.4	5.0	0.3	0.0	0.0	68.6	
CMA	46.7	252.6	722.6	1854.3	4862.2	9673.5	12983.3	11586.8	6627.3	2299.9	572.2	136.1	33.8	5.3	0.3	0.0	51856.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

8.3	14.2	21.1	23.4	20.6	19.3	25.6	40.9	67.7	125.1	198.8	361.9	601.2	599.1	628.6	0.0	40.2
-----	------	------	------	------	------	------	------	------	-------	-------	-------	-------	-------	-------	-----	------

Age	Excess Mortality (Rate Differences)														CMD	
	0-4	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	70-74	
40-44					48.71		51.29	44.36	194.27							15.48
45-49							88.67	48.94	79.59							45.30
50-54				279.34		167.66		90.71	73.91							63.94
55-59					303.71		114.23	153.19	124.00	82.20	228.39					74.14
60-64						249.14		712.18	87.26	29.99	153.08	176.18				126.58
65-69										117.16						117.78
70-74																43.64
75-79																1009.99
80-84																73.62
CMA						117.32	84.51	41.14	71.83	43.72	88.58	83.20	179.23	150.76		
Relative Risk (Rate Ratios)																
40-44						19.12		9.75	8.57	34.15						6.76
45-49							22.87	7.94	4.83	7.23						8.73
50-54								12.98		7.02	4.26	3.85				6.01
55-59									5.50	2.88	3.52	3.94	2.35	4.76		3.66
60-64										6.38	1.66	1.23	2.16	2.33		3.09
65-69												1.41				1.89
70-74																1.15
75-79																2.61
80-84																2.83
CMA						6.57	4.62	3.00	4.72	2.71	3.17	2.23	2.43	1.76		

CMA=Combined ages.

CMD=Combined durations.

**Comparison of Cerebrovascular Disease Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
Current smokers of any number of cigarettes

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

	Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
		Rate	2.7	5.9	12.8	27.8	60.7	132.3	288.4	1370.2

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	1	1	4	7	6	0	0	0	0	0	0	0	0	0	0	19
45-49	0	0	0	0	10	21	32	9	0	0	0	0	0	0	0	0	72
50-54	0	1	6	5	13	36	63	50	1	0	0	0	0	0	0	0	175
55-59	1	2	10	13	13	20	32	66	41	2	0	0	0	0	0	0	202
60-64	0	0	6	10	20	29	38	51	64	35	2	0	0	0	0	0	255
65-69	0	0	5	12	18	20	38	45	50	29	6	0	1	0	0	0	224
70-74	0	0	0	4	17	17	30	37	38	28	15	11	0	0	0	0	197
75-79	0	0	0	0	18	24	24	35	30	20	17	3	7	2	0	0	160
80-84	0	0	0	0	0	10	21	19	12	10	10	5	4	5	0	0	96
CMA	1	4	28	48	116	183	278	314	236	124	50	19	12	7	0	0	1420

Total PYO

40-44	1104.3	4043.2	8113.1	21698.6	54405.9	57472.9	4341.8	28.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	151208.5
45-49	1629.9	6193.4	10723.3	19058.3	44586.0	102898.7	94744.3	7006.4	37.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	286787.7
50-54	1562.9	6889.1	12970.8	19558.5	32395.2	72038.2	137144.0	100510.3	6775.8	39.5	0.0	0.0	0.0	0.0	0.0	0.0	369604.3
55-59	789.3	5422.8	11363.7	16949.3	24985.0	41468.0	78361.0	114777.3	63079.1	3635.7	37.9	0.0	0.0	0.0	0.0	0.0	360689.1
60-64	0.0	2197.3	8255.5	11221.7	16547.5	24350.0	36819.5	53736.7	54691.7	21985.2	1244.3	28.4	0.0	0.0	4.0	0.0	231077.7
65-69	0.0	0.0	3138.9	7647.5	8748.9	13145.7	18521.5	23421.2	23162.7	16569.9	5764.2	469.3	22.3	0.0	0.0	0.0	120612.0
70-74	0.0	0.0	0.0	2803.7	5589.4	5732.6	8548.8	10269.4	10189.3	7227.5	4646.9	1884.3	229.6	12.4	0.0	0.0	57133.9
75-79	0.0	0.0	0.0	0.0	1977.6	3366.6	3178.0	4094.6	3983.8	3196.3	1870.7	1320.2	601.5	98.0	3.3	0.0	23692.5
80-84	0.0	0.0	0.0	0.0	0.0	1039.9	1466.3	1215.6	1258.6	980.5	741.3	435.2	355.8	161.9	32.8	2.0	7691.9
CMA	5086.4	24745.8	54585.3	98937.6	189235.5	321424.5	363127.3	315060.3	163178.2	53634.6	14305.3	4137.3	1209.3	272.3	36.0	2.0	1628977.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

10.7	17.0	27.2	34.3	34.5	35.0	40.9	57.4	94.3	169.0	305.5	491.5	773.1	1054.0	1303.3	1370.2	54.6
------	------	------	------	------	------	------	------	------	-------	-------	-------	-------	--------	--------	--------	------

Age	Excess Mortality (Rate Differences)															CMD		
	0-4	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	70-74	75-79		
40-44		22.04	9.64	15.75	10.18	7.75											9.88	
45-49					16.57	14.57	27.91	122.59									19.25	
50-54		1.74	33.48	12.79	27.36	37.20	33.16	36.97	1.96								30.11	
55-59	98.86	9.04	60.00	48.85	24.19	20.39	12.99	31.40	37.15	27.17							28.13	
60-64			11.98	28.42	60.17	58.40	42.51	34.21	56.30	96.50	100.05						49.66	
65-69				26.99	24.62	73.44	19.84	72.87	59.83	83.57	42.72	-28.21					53.42	
70-74					-145.71	15.77	8.17	62.54	71.91	84.56	99.03	34.41	295.38				56.42	
75-79						291.60	83.86	126.59	226.16	124.44	-2.89	280.16	-401.36	535.15			131.13	
80-84							-406.60	59.98	192.82	-416.76	-350.32	-21.29	-221.23	-246.09	1717.80			-122.15
CMA	8.95	-0.79	24.12	14.22	26.77	21.95	31.68	42.27	50.29	62.17	43.97	-32.23	219.28	1516.36			32.53	
Relative Risk (Rate Ratios)																		
40-44		9.20	4.58	6.86	4.79	3.88											4.67	
45-49					3.83	3.49	5.76	21.92									4.28	
50-54		1.14	3.62	2.00	3.14	3.91	3.60	3.89	1.16								3.51	
55-59	4.55	1.32	3.15	2.75	1.87	1.73	1.47	2.13	2.33	1.98							2.01	
60-64			1.20	1.47	1.99	1.96	1.70	1.56	1.93	2.62	2.65						1.82	
65-69			1.20	1.19	1.56	1.15	1.55	1.45	1.63	1.22	0.79						1.40	
70-74				0.49	1.05	1.03	1.22	1.25	1.29	1.34	1.12	2.02					1.20	
75-79					1.45	1.13	1.20	1.36	1.20	1.00	1.45	0.36	1.85				1.21	
80-84						0.70	1.04	1.14	0.70	0.74	0.98	0.84	0.82	2.25			0.91	
CMA	1.84	0.95	1.89	1.41	1.78	1.63	1.78	1.74	1.53	1.37	1.14	0.93	1.28	2.44			1.60	

CMA = Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										Duration	CVD					
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate							
	0.1	0.3	0.6	1.2	2.3	4.6	9.0	17.9	35.5								
Observed deaths for smokers based on age groups \ durations (years)																	
Age	0-4	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	70-74	75-79	CVD
40-44	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55-59	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	3
60-64	0	1	0	0	0	0	1	3	1	0	0	0	0	0	0	0	6
65-69	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	3
70-74	0	0	0	0	0	1	1	2	1	0	0	0	0	0	0	0	5
75-79	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	2
80-84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CVA	0	1	0	0	0	2	4	8	5	0	0	0	0	0	0	0	20

	Total PYO													0.0	0.0	0.0	0.0	0.0	0.0	0.0
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	0.0	0.0	0.0							
40-44	709.3	2091.8	3221.0	6111.7	11643.1	10203.1	667.3	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34653.1	0.0	
45-49	1080.5	3437.5	4635.5	6281.3	11346.4	20796.1	16442.0	945.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64980.7	0.0	
50-54	1046.6	3987.8	6165.6	7067.4	9590.8	17192.7	27229.5	17452.5	904.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	90645.0	0.0	
55-59	487.5	3251.3	5824.0	6817.8	8002.3	11305.3	16212.4	23225.2	11331.1	575.8	13.9	0.0	0.0	0.0	0.0	0.0	0.0	89046.7	0.0	
60-64	0.0	1334.5	4669.5	4904.3	5913.2	7083.5	9539.7	12597.9	11678.7	4341.5	282.3	9.9	0.0	0.0	0.0	0.0	0.0	62354.9	0.0	
65-69	0.0	0.0	1921.2	4077.8	3524.4	4485.3	5289.4	6171.6	5796.7	4025.3	1345.9	158.8	7.2	0.0	0.0	0.0	0.0	36803.3	0.0	
70-74	0.0	0.0	0.0	1620.6	2876.8	2302.6	2951.9	3145.5	3035.7	2062.8	1348.6	595.2	82.2	3.3	0.0	0.0	0.0	20044.9	0.0	
75-79	0.0	0.0	0.0	0.0	1977.9	1689.2	1265.3	1472.6	1402.3	1128.5	607.2	507.3	239.6	36.2	1.0	0.0	0.0	9427.1	0.0	
80-84	0.0	0.0	0.0	0.0	0.0	572.8	754.3	490.6	504.0	414.5	304.0	187.3	165.3	67.4	8.0	1.0	0.0	3469.0	0.0	
CVA	3323.8	14102.8	26436.8	36680.8	53974.8	75620.3	82361.8	65507.0	34658.7	12578.6	3901.8	1458.4	494.2	106.8	9.0	1.0	1.0	41140.7	0.0	

	Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution													0.0	0.0	0.0	0.0	0.0
	0.5	0.7	1.2	1.6	1.8	1.8	2.0	2.5	4.0	6.6	10.4	15.0	22.1	28.8	33.6	35.5	2.3	

Age	Excess Mortality (Rate Differences)														CMD 2.74		
	0-4	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	70-74	75-79	
40-44						9.65											2.21
45-49																	7.32
50-54																	3.59
55-59							9.82	3.15									15.91
60-64		72.64					8.18	21.52	6.26								3.29
65-69								27.85	12.69								2.52
70-74							34.39	24.84	54.54	23.90							19.42
75-79										124.70							2.91
80-84																	4.19
CMA		6.35					0.81	2.85	9.67	10.46							1.79
Relative Risk (Rate Ratios)																	2.76
40-44								65.96									1.18
45-49																	2.07
50-54																	
55-59								9.47	3.71								
60-64		32.60						4.56	10.36	3.73							
65-69									7.11	3.79							
70-74								4.81	3.75	7.03	3.64						
75-79										7.96							
80-84																	
CMA		9.53						1.44	2.44	4.80	3.64						

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
10-19 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										Duration							
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	0.1	0.3	0.6	1.2	2.3	4.6	9.0	17.9

Observed deaths for smokers based on age groups \ durations (years)

Age	Age										Duration								
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	CMD	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
50-54	0	0	1	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	5
55-59	0	0	0	1	0	0	1	2	5	0	0	0	0	0	0	0	0	0	9
60-64	0	0	0	0	0	0	0	3	5	2	0	0	0	0	0	0	0	0	10
65-69	0	0	0	0	0	0	0	4	3	2	1	0	0	0	0	0	0	0	10
70-74	0	0	0	0	0	1	1	0	0	2	2	1	0	0	0	0	0	0	7
75-79	0	0	0	0	0	1	1	3	0	3	2	2	1	0	0	0	0	0	13
80-84	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
CMA	0	0	1	1	0	3	8	14	14	9	5	3	1	0	0	0	0	0	59

Total PYO

Age	Age										Duration							
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	CMD	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49
40-44	239.5	1039.5	2406.6	6950.7	16906.8	16826.9	986.8	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45394.8
45-49	302.4	1554.7	3095.0	5997.3	14745.5	32996.0	28767.3	1785.4	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89279.5
50-54	329.1	1687.4	3649.4	6198.0	10600.4	24183.5	44807.8	31016.3	1724.5	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	124009.4
55-59	197.6	1286.8	3013.9	5189.8	8175.5	13661.1	26372.8	37425.8	19522.1	941.7	13.1	0.0	0.0	0.0	0.0	0.0	0.0	115800.0
60-64	0.0	523.1	2070.4	3297.8	5237.7	7969.3	11981.5	17808.8	17595.7	6772.3	319.3	6.0	0.0	0.0	0.0	0.0	0.0	73581.8
65-69	0.0	0.0	719.3	1989.8	2687.2	4235.6	6039.8	7589.8	7569.0	5282.9	1789.5	103.8	3.2	0.0	0.0	0.0	0.0	36009.8
70-74	0.0	0.0	0.0	688.7	1583.6	1843.7	2745.0	3237.1	3235.8	2333.7	1445.7	563.0	51.5	4.0	0.0	0.0	0.0	17731.7
75-79	0.0	0.0	0.0	0.0	534.4	996.2	1066.3	1276.8	1232.1	1024.4	628.3	367.8	176.0	29.4	2.0	0.0	0.0	7333.8
80-84	0.0	0.0	0.0	0.0	0.0	281.8	446.8	405.7	385.1	289.3	246.0	140.1	101.5	56.9	19.0	1.0	0.0	2373.1
CMA	1098.6	6091.4	14954.6	30312.1	60496.1	102994.0	123014.0	100553.7	51275.3	16657.3	4441.8	1180.7	332.2	90.3	21.0	1.0	0.0	513513.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

0.5	0.7	1.0	1.2	1.2	1.2	1.5	2.0	3.2	5.4	9.5	14.5	21.8	26.6	30.9	35.5	1.9
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	-----

Age	Excess Mortality (Rate Differences)															CMD		
	0-4	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	70-74	75-79		
40-44																	3.07	
45-49																	3.45	
50-54			26.82			3.55	1.66	2.64	57.40								6.61	
55-59				18.11			2.63	4.18	24.45								11.29	
60-64								14.55	26.12	27.23							21.75	
65-69								48.14	35.06	33.30	51.32						30.44	
70-74						45.20	27.39		76.66	129.31	168.58						159.34	
75-79						82.46	75.86	217.03		274.93	300.42	525.60						48.74
80-84							168.30	210.97									9.62	
CMA		5.69	2.13			1.71	5.04	11.89	24.11	48.60	103.12	239.57	279.25					
Relative Risk (Rate Ratios)																		
40-44							35.39										11.40	
45-49							3.84	5.52	99.21								6.90	
50-54			46.88			7.07	3.27	4.81	22.10								6.71	
55-59				16.63				7.33	12.36	12.85							5.91	
60-64								11.56	8.70	8.31	12.26						5.77	
65-69									9.48	15.31	19.65						4.37	
70-74						6.00	4.03										9.89	
75-79						5.60	5.23	13.11		16.34	17.76	30.34					2.37	
80-84							6.30	6.94									6.16	
CMA		6.70	2.83			2.41	4.44	6.86	8.56	9.95	11.91	17.50	13.81					

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
20 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	0.1	0.3	0.6	1.2	2.3	4.6	9.0	17.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1
45-49	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	3
50-54	0	0	0	0	0	1	3	2	0	0	0	0	0	0	0	0	6
55-59	0	0	0	0	0	1	1	6	6	0	0	0	0	0	0	0	16
60-64	0	0	0	0	0	2	4	7	7	5	1	0	0	0	0	0	26
65-69	0	0	0	0	2	1	3	5	6	5	1	0	0	0	0	0	23
70-74	0	0	0	1	1	0	1	2	2	4	2	2	0	0	0	0	15
75-79	0	0	0	0	0	0	1	1	4	3	2	0	0	0	0	0	11
80-84	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
CMA	0	0	0	1	4	7	15	25	25	17	6	2	0	0	0	0	102

Total PYO

40-44	122.0	7313.3	1864.4	6356.6	18026.6	20503.2	1633.8	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49246.3
45-49	180.5	1002.0	2432.1	5194.3	13784.6	34778.5	33528.6	2516.8	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93401.0
50-54	149.6	992.5	2591.9	5031.6	9413.9	22961.8	46292.8	35321.8	2430.8	14.3	0.0	0.0	0.0	0.0	0.0	0.0	125200.8
55-59	89.3	741.5	2096.8	3998.7	6975.3	12751.7	25212.9	38148.0	21649.3	1271.8	9.7	0.0	0.0	0.0	0.0	0.0	112944.8
60-64	0.0	286.8	1260.2	2475.9	4345.8	7306.3	11839.8	17317.4	17882.0	7387.3	386.0	7.5	0.0	0.0	0.0	0.0	70475.0
65-69	0.0	0.0	419.0	1322.0	2699.4	3577.0	5635.6	7411.9	7257.7	5077.6	1778.6	135.8	7.0	0.0	0.0	0.0	34721.5
70-74	0.0	0.0	0.0	422.2	967.3	1333.6	2327.3	3066.0	3013.1	2110.2	1347.2	503.3	62.9	2.2	0.0	0.0	15155.0
75-79	0.0	0.0	0.0	0.0	315.8	582.2	715.3	1126.5	1081.8	860.8	509.1	324.4	142.6	23.9	0.0	0.0	5662.2
80-84	0.0	0.0	0.0	0.0	0.0	167.9	235.6	277.5	317.5	230.6	170.5	91.5	68.9	30.3	2.8	0.0	1593.0
CMA	541.4	3754.2	10634.3	24801.8	55928.6	103962.2	127421.4	105194.4	53645.0	16932.4	4201.0	1062.4	281.4	56.3	2.8	0.0	508419.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

0.5	0.7	0.9	1.0	1.0	1.0	1.3	1.8	3.0	5.0	8.7	13.4	19.9	27.0	35.5	0.0	1.7
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	-----	-----

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44					5.40		5.45	2.69									1.88
45-49							3.77	5.90	5.08								2.92
50-54							6.68	2.81	19.81	26.56							4.21
55-59							25.08	31.49	38.12	36.85	65.57	256.77					13.01
60-64							90.71	23.40	48.68	62.90	78.11	93.91	51.67				34.59
65-69							227.83	94.35	33.93	56.19	57.34	180.52	139.42	368.38			61.66
70-74									121.89	70.85	351.85	330.81	374.94				89.94
75-79																	175.66
80-84																	27.23
CMA							3.00	6.18	5.74	10.50	21.89	43.85	95.42	134.17	174.84		18.38
Relative Risk (Rate Ratios)																	
40-44						37.33											13.66
45-49							19.51	10.12									10.90
50-54							7.45	11.09	9.69								8.20
55-59							6.77	3.42	18.09	23.91							12.22
60-64							11.91	14.70	17.59	17.03	29.53	112.72					16.05
65-69							20.90	6.13	11.68	14.80	18.14	21.61	12.34				14.53
70-74							26.21	11.44	4.75	7.22	7.34	20.97	16.43	43.97			10.95
75-79									7.80	4.95	20.63	19.45	21.92				10.80
80-84										11.94							1.77
CMA							3.91	7.37	6.79	9.29	12.69	15.76	20.18	16.50	14.03		11.94

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	0.1	0.3	0.6	1.2	2.3	4.6	9.0	17.9

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	Duration															CVD	
	0-4	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	70-74	75-79	
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
50-54	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1
55-59	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	3
60-64	0	0	0	0	0	0	1	0	1	2	0	0	0	0	0	0	6
65-69	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
70-74	0	0	0	0	0	0	0	1	0	2	1	0	0	0	0	0	6
75-79	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	3
80-84	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	2
CVA	0	0	0	0	0	0	2	2	5	7	6	3	1	0	0	0	25

Total PYO

40-44	16.6	129.8	474.0	1710.3	5853.9	7467.3	755.2	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16411.1
45-49	21.5	123.9	430.4	1192.3	3567.5	10748.8	12025.3	1259.3	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	29374.1
50-54	27.4	156.8	380.5	919.2	2057.6	5728.7	14152.9	12389.2	1179.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	36994.3
55-59	10.4	95.3	313.1	666.4	1314.5	2727.0	6276.9	11760.9	7628.5	537.3	1.3	0.0	0.0	0.0	0.0	0.0	31331.6
60-64	0.0	38.9	186.7	371.1	728.2	1419.3	2523.5	4388.3	5435.9	2466.3	1612.2	5.0	0.0	0.0	0.0	0.0	17724.2
65-69	0.0	0.0	52.3	180.1	314.4	611.0	1101.3	1631.7	1838.5	1535.8	558.8	50.4	4.0	0.0	0.0	0.0	7878.3
70-74	0.0	0.0	0.0	49.3	109.1	189.3	394.8	591.7	658.1	481.6	357.8	143.2	20.8	2.0	0.0	0.0	2997.6
75-79	0.0	0.0	0.0	0.0	28.7	70.2	102.6	164.6	188.5	117.4	93.0	86.3	27.7	4.5	0.0	0.0	883.3
80-84	0.0	0.0	0.0	0.0	0.0	12.9	24.3	28.8	38.4	27.1	16.5	14.9	15.2	7.1	3.0	0.0	188.3
CVA	75.9	544.8	1837.0	5088.6	13973.8	28974.5	37356.8	32218.4	16971.9	5168.4	1188.5	299.8	67.7	13.6	3.0	0.0	143782.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

0.5	0.6	0.8	0.8	0.7	0.7	1.0	1.5	2.4	4.0	7.1	12.0	18.3	25.8	35.5	0.0	1.4
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	-----	-----

Age	Excess Mortality (Rate Differences)														CMD		
	0-4	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	70-74	75-79	
40-44						9.01											3.11
45-49							6.48	7.49									4.82
50-54								7.34	25.06								8.42
55-59									20.49	34.49	78.80						31.55
60-64									56.73	60.55							20.83
65-69																	191.12
70-74							244.23		294.87	198.61	550.01						321.70
75-79																	1026.87
80-84																	16.03
CMA						6.20	4.38	14.03	38.82	92.73	245.35	321.56					
Relative Risk (Rate Ratios)																	
40-44																	11.55
45-49							31.57										9.25
50-54								12.09	13.81								8.26
55-59									7.34	22.62							14.73
60-64									9.91	16.01	35.28						5.57
65-69									13.45		14.29						22.15
70-74								28.02		30.63	22.97	61.85					18.95
75-79																	29.89
80-84																	12.80
CMA						9.87	5.51	10.40	17.03	24.14	35.69	27.69					

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age								
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	0.1	0.3	0.6	1.2	2.3	4.6	9.0	17.9	35.5

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	Duration															CWD	
	0-4	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	70-74	75-79	
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
50-54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
55-59	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	2
60-64	0	0	0	0	0	0	1	1	2	2	0	0	0	0	0	0	6
65-69	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
70-74	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	2
75-79	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	2
80-84	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CWA	0	0	0	0	0	1	2	3	5	1	0	1	1	0	0	0	14

Total PYO

40-44	17.0	50.8	147.1	569.4	1945.5	2472.4	298.8	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5503.2
45-49	15.0	75.3	160.3	392.6	1147.0	3499.3	3681.3	499.7	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9772.4
50-54	10.3	64.6	183.3	342.3	732.5	1971.5	4861.1	4300.6	537.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	13034.8
55-59	4.4	47.9	135.9	276.6	517.3	1023.0	2286.0	4217.5	2948.2	309.2	0.0	0.0	0.0	0.0	0.0	0.0	11786.0
60-64	0.0	14.0	68.8	172.5	322.8	571.7	935.1	1624.3	2099.4	1037.8	95.6	0.0	0.0	0.0	0.0	0.0	6941.8
65-69	0.0	0.0	27.2	77.8	123.5	236.8	455.4	616.2	700.8	648.3	291.3	20.6	1.0	0.0	0.0	0.0	3199.0
70-74	0.0	0.0	0.0	23.0	52.8	63.4	129.8	229.2	246.6	219.3	147.8	79.8	12.2	1.0	0.0	0.0	1204.8
75-79	0.0	0.0	0.0	0.0	20.8	30.9	28.5	54.1	79.2	65.3	33.2	34.3	15.7	4.0	0.3	0.0	366.2
80-84	0.0	0.0	0.0	0.0	0.0	4.5	7.4	13.0	13.6	19.1	4.3	1.4	5.0	0.3	0.0	0.0	68.8
CWA	46.7	252.6	722.6	1854.3	4862.2	9873.5	12983.3	11586.8	6627.3	2299.9	572.2	136.1	33.8	5.3	0.3	0.0	51856.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

0.4	0.6	0.9	0.9	0.8	0.8	1.0	1.5	2.4	4.1	6.3	10.9	16.9	17.1	17.9	0.0	1.5
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	-----	-----

Age	Excess Mortality (Rate Differences)														CMD		
	0-4	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	70-74	75-79	
40-44																	9.94
45-49								24.82									
50-54																	
55-59										66.68							15.84
60-64						172.63	104.64	120.83	92.97								64.13
65-69										149.68							26.70
70-74								427.33	396.50								156.97
75-79																	528.26
80-84																	
CMA							9.38	14.41	24.37	73.05	39.34						25.54
Relative Risk (Rate Ratios)																	
40-44																	34.72
45-49								85.23									
50-54																	
55-59									58.53								14.67
60-64						76.11	46.53	53.57	41.45								37.61
65-69										33.84							6.86
70-74								48.28	44.87								18.37
75-79																	30.47
80-84																	
CMA							13.48	15.53	17.03	31.46	10.49						18.57

CMA=Combined ages.

CMD=Combined durations.

**Comparison of COPD Death Rates of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
Current smokers of any number of cigarettes

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
	Rate	0.1	0.3	0.6	1.2	2.3	4.6	9.0	17.9

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
45-49	0	0	0	0	0	3	5	0	0	0	0	0	0	0	0	0	8
50-54	0	0	1	0	0	2	5	4	1	0	0	0	0	0	0	0	13
55-59	0	0	0	1	0	1	4	12	15	0	0	0	0	0	0	0	33
60-64	0	1	0	0	0	4	6	16	17	9	1	0	0	0	0	0	54
65-69	0	0	0	0	2	1	3	12	10	9	2	0	0	0	0	0	39
70-74	0	0	0	1	1	2	4	5	6	7	6	3	0	0	0	0	35
75-79	0	0	0	0	0	1	2	4	7	7	4	4	2	0	0	0	31
80-84	0	0	0	0	0	0	2	2	0	0	1	0	0	0	0	0	5
CMA	0	1	1	2	4	15	31	55	56	32	14	7	2	0	0	0	220

Total PYO

40-44	1104.3	4043.2	8113.1	21698.6	54405.9	57472.9	4341.8	28.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	151208.5
45-49	1629.9	6193.4	10723.3	19058.3	44586.0	102808.7	94744.3	7006.4	37.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	286787.7
50-54	1562.9	6689.1	12970.8	19558.5	32395.2	72038.1	137144.0	100510.3	6775.8	39.5	0.0	0.0	0.0	0.0	0.0	0.0	369684.3
55-59	789.3	5422.8	11380.7	16949.3	24985.0	41468.0	78361.0	114777.3	63079.1	3635.7	37.9	0.0	0.0	0.0	0.0	0.0	360689.1
60-64	0.0	2197.3	8255.5	11221.7	16547.5	24350.0	36819.5	53736.7	54691.7	21965.2	1244.3	28.4	0.0	0.0	0.0	0.0	231077.7
65-69	0.0	0.0	3138.9	7647.5	8748.9	13145.7	18521.5	23421.2	23162.7	16569.9	5764.2	469.3	22.3	0.0	0.0	0.0	120612.0
70-74	0.0	0.0	0.0	2803.7	5589.4	5732.6	8548.8	10269.4	10189.3	7227.5	4646.9	1884.3	229.6	12.4	0.0	0.0	57133.9
75-79	0.0	0.0	0.0	0.0	1977.6	3368.6	3178.0	4094.6	3963.8	3196.3	1870.7	1320.2	601.5	96.0	3.3	0.0	23692.5
80-84	0.0	0.0	0.0	0.0	1039.9	14683.3	1215.6	1258.6	980.5	741.3	435.2	355.8	161.9	32.8	2.0	0.0	7691.9
CMA	5086.4	24745.8	54585.3	98937.6	189235.5	321424.5	363127.3	315060.3	163178.2	53634.6	14305.3	4137.3	1209.3	272.3	56.0	2.0	1628977.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

0.5	0.7	1.1	1.3	1.2	1.2	1.4	2.0	3.2	5.4	9.2	14.1	21.2	28.0	34.0	35.5	1.9
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	------	------	------	------	------	-----

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44					1.69	1.59											1.17
45-49						2.62	4.98										2.49
50-54				7.13		2.19	3.06	3.40	14.17								2.75
55-59					4.74	1.25	3.95	9.30	22.62								7.99
60-64			43.21			14.13	14.00	27.48	29.78	38.64	78.07						21.07
65-69						18.30	3.05	11.64	46.68	38.82	49.76	30.14					27.78
70-74					26.63	8.85	25.85	37.75	39.65	49.85	87.81	120.08	150.17				52.22
75-79						11.76	45.01	79.77	157.79	201.08	195.90	285.07	314.58				112.92
80-84							100.67	128.99				99.35					29.46
CMA	3.32	0.76	0.75	0.68	3.44	6.64	15.45	31.15	54.30	66.79	155.08	144.22					11.63
Relative Risk (Rate Ratios)																	
40-44					12.37	11.71											8.90
45-49						9.90	17.91										9.47
50-54				13.19		4.75	6.24	6.81	25.25								5.70
55-59					5.09	2.08	4.40	9.02	20.52								7.89
60-64			19.80			7.15	7.09	12.95	13.52	17.81	34.97						10.17
65-69						5.02	1.67	3.55	11.24	9.47	11.82	7.61					7.09
70-74					3.95	1.98	3.86	5.18	5.39	6.52	10.72	14.29	17.61				6.78
75-79							1.66	3.51	5.45	9.80	12.22	11.93	16.91	18.55			7.30
80-84								3.83	4.63				3.80				1.80
CMA	5.62	1.71	1.59	1.72	3.81	5.59	8.68	10.84	11.12	10.68	11.99	7.81					7.22

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
1-9 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
	Rate	94.7	160.4	271.6	459.9	778.7	1318.6	2232.8	3780.7

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	2	3	9	17	17	2	0	0	0	0	0	0	0	0	0	50
45-49	1	7	13	8	31	50	42	2	1	0	0	0	0	0	0	0	155
50-54	1	5	24	29	30	57	112	62	5	0	0	0	0	0	0	0	325
55-59	2	9	30	39	32	64	95	127	67	3	0	0	0	0	0	0	468
60-64	0	11	38	35	38	51	86	102	105	36	6	0	0	0	0	0	510
65-69	0	0	21	36	42	59	63	78	82	52	16	4	0	0	0	0	453
70-74	0	0	0	33	59	46	62	69	80	45	27	16	1	0	0	0	438
75-79	0	0	0	0	43	68	59	58	64	43	33	16	11	5	0	0	400
80-84	0	0	0	0	0	33	68	33	40	31	23	17	8	9	2	0	254
CMA	4	34	129	169	292	445	589	531	444	212	105	53	20	14	2	0	3063

Total PYO

40-44	709.3	2091.8	3221.0	6111.7	11643.1	10203.1	667.3	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	34653.1
45-49	1080.5	3407.5	4635.5	6291.3	11346.4	20796.1	16442.0	945.2	6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	64960.7
50-54	1046.6	3987.8	6165.6	7067.4	9590.8	17192.7	27229.5	17452.5	904.0	8.3	0.0	0.0	0.0	0.0	0.0	0.0	90645.0
55-59	487.5	3251.3	5824.0	6617.8	8002.3	11305.3	16212.4	23225.2	11301.1	575.8	13.9	0.0	0.0	0.0	0.0	0.0	89046.7
60-64	0.0	1334.5	4669.5	4904.3	5913.2	7083.5	9539.7	12597.9	19678.7	4341.5	262.3	9.9	0.0	0.0	0.0	0.0	62354.9
65-69	0.0	0.0	1921.2	4077.8	3524.4	4485.3	5289.4	6171.6	5796.7	4025.3	1345.9	158.8	7.2	0.0	0.0	0.0	36803.3
70-74	0.0	0.0	0.0	1620.6	2876.8	2302.6	2951.9	3145.5	3035.7	2082.8	1348.6	595.2	82.2	3.3	0.0	0.0	20044.9
75-79	0.0	0.0	0.0	0.0	1077.9	1689.2	1265.3	1472.6	1492.3	1128.5	807.2	507.3	239.6	36.2	1.0	0.0	9427.1
80-84	0.0	0.0	0.0	0.0	0.0	572.8	754.3	490.6	504.0	414.5	304.0	187.3	165.3	67.4	8.0	1.0	3469.0
CMA	3323.8	14102.8	26436.8	36880.8	53974.8	75620.3	82351.8	65507.0	34658.7	12576.6	3901.8	1458.4	494.2	106.8	9.0	1.0	415404.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

225.3	309.7	437.7	527.5	536.5	539.5	596.0	751.9	1082.0	1632.1	2371.6	3197.1	4364.1	5387.7	6119.6	6401.8	678.1
-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)																CMD
	0-4	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	70-74	75-79	
40-44	0.89	-1.59	52.53	51.28	71.89	205.01											49.56
45-49	-67.85	43.24	120.05	-33.03	112.82	80.15	95.05	51.21									78.21
50-54	-176.05	-146.21	117.66	138.74	41.20	59.94	139.72	83.65	281.50								86.94
55-59	-49.64	-183.08	55.22	112.14	-60.01	106.22	61.73	86.93	131.40	61.09							65.68
60-64		45.55	35.06	-65.07	-136.09	-58.74	122.77	30.93	120.35	96.55	1347.05						39.17
65-69			-225.52	-435.77	-126.92	-3.18	-127.55	-54.75	96.00	-26.76	-129.83	1201.06					-87.74
70-74				-196.47	-581.85	-235.02	-132.44	-39.16	402.56	-72.17	-230.67	455.55					-47.68
75-79					208.46	244.94	882.09	157.94	783.11	29.65	1654.37	426.97	810.59				462.38
80-84						-640.14	2613.76	324.87	1534.69	1077.07	1163.97	2676.95	-1560.6				1258.44
CMA	-104.96	-68.57	50.27	-15.07	4.48	49.01	119.26	58.73	199.03	53.59	319.42	436.95	-316.91				66.44
Relative Risk (Rate Ratios)																	
40-44		1.01	0.98	1.55	1.54	1.76	3.16										1.52
45-49	0.58	1.27	1.75	0.79	1.79	1.50	1.59	1.32									1.49
50-54	0.35	0.46	1.43	1.51	1.15	1.22	1.51	1.31	2.04								1.32
55-59	0.89	0.60	1.12	1.24	0.87	1.23	1.13	1.19	1.29	1.13							1.14
60-64		1.06	1.05	0.92	0.83	0.92	1.16	1.04	1.15	1.12	2.73						1.05
65-69			0.83	0.67	0.90	1.00	0.90	0.96	1.07	0.98	0.90	1.91					0.93
70-74				0.91	0.92	0.89	0.94	0.98	1.18	0.97	0.90	1.20					0.98
75-79					1.06	1.06	1.23	1.04	1.21	1.01	1.44	0.83	1.21				1.12
80-84						0.90	1.41	1.05	1.24	1.17	1.18	1.42	0.76				1.19
CMA	0.53	0.78	1.11	0.97	1.01	1.09	1.20	1.08	1.18	1.03	1.13	1.14	0.93				1.10

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
10-19 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										CMI
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84		
Rate	94.7	160.4	271.6	459.9	778.7	1318.6	2232.8	3780.7	6401.8		

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMI
40-44	0	0	2	13	27	25	2	0	0	0	0	0	0	0	0	0	69
45-49	0	8	4	12	49	94	106	3	0	0	0	0	0	0	0	0	267
50-54	1	4	19	20	47	104	194	145	15	0	0	0	0	0	0	0	549
55-59	0	7	11	30	59	91	202	249	178	7	0	0	0	0	0	0	834
60-64	0	5	21	20	59	84	149	192	175	104	7	0	0	0	0	0	816
65-69	0	0	12	24	42	73	107	110	130	104	26	5	1	0	0	0	634
70-74	0	0	0	13	34	35	67	89	98	63	53	14	1	0	0	0	467
75-79	0	0	0	0	25	43	51	71	57	47	34	21	8	2	0	0	359
80-84	0	0	0	0	0	16	42	40	25	20	10	8	4	1	0	0	186
CMA	1	24	69	132	333	565	920	899	678	345	140	50	18	6	1	0	4181

Total PYO

40-44	239.5	1039.5	2406.6	6950.7	16936.8	16826.9	966.8	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45394.8
45-49	332.4	1554.7	3095.0	5997.3	14740.5	32996.0	28767.3	1785.4	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	89279.5
50-54	329.1	1687.4	3649.4	6198.0	10600.4	24183.5	44607.8	31093.3	1724.5	13.0	0.0	0.0	0.0	0.0	0.0	0.0	124009.4
55-59	197.6	1286.8	3013.9	5189.8	8175.5	13661.1	26372.8	39425.8	19522.1	941.7	13.1	0.0	0.0	0.0	0.0	0.0	115800.0
60-64	0.0	523.1	2070.4	3297.8	5237.7	7969.3	11981.5	17808.8	17595.7	6772.3	319.3	6.0	0.0	0.0	0.0	0.0	73581.8
65-69	0.0	0.0	719.3	1989.8	2687.2	4235.6	6039.8	7588.8	7569.0	5282.9	1789.5	103.8	3.2	0.0	0.0	0.0	36009.8
70-74	0.0	0.0	0.0	688.7	1583.6	1843.7	2745.0	3237.1	3235.8	2333.7	1445.7	563.0	51.5	4.0	0.0	0.0	17731.7
75-79	0.0	0.0	0.0	0.0	534.4	995.2	1066.3	1276.8	1232.1	1024.4	628.3	367.8	176.0	29.4	2.0	0.0	7333.8
80-84	0.0	0.0	0.0	0.0	0.0	281.8	446.8	405.7	365.1	289.3	246.0	140.1	101.5	56.9	19.0	1.0	2373.1
CMA	1098.6	6091.4	14954.6	30312.1	60496.1	102994.0	123014.0	100553.7	51275.3	16657.3	4441.8	1180.7	302.2	90.3	21.0	1.0	513513.8

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

233.3	296.4	378.6	409.7	383.2	400.2	481.8	641.0	926.0	1417.5	2204.6	3122.0	4318.2	5363.7	6152.2	6401.8	575.4
-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)																
	0-4	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	70-74	75-79	CMD
40-44		-11.62	92.31	64.69	53.85	107.94											57.27
45-49	354.18	-31.16	39.69	110.96	124.49	208.08	7.63										138.66
50-54	32.28	-34.55	249.03	51.09	171.78	158.45	163.30	195.90	598.22								171.11
55-59		84.11	-94.92	118.16	261.78	206.23	306.05	205.43	451.90	283.47							260.32
60-64		177.14	235.56	-172.27	347.73	275.32	464.86	299.39	215.84	756.93	1413.91						330.24
65-69			349.80	-112.47	244.38	404.89	452.97	130.70	398.93	650.00	134.31						349.38
70-74				-345.07	-85.74	-334.38	208.03	516.62	795.81	466.84	1433.36	253.91					400.93
75-79						897.26	535.83	1002.03	1779.92	845.60	807.26	1631.14	1928.39	764.74			1114.46
80-84							-724.70	2999.41	3458.49	90.28	512.61	1728.26					1436.09
CMA	-142.23	97.64	82.76	25.73	157.27	148.41	266.09	253.09	396.31	653.66	947.33	1112.94	1100.79				238.77
Relative Risk (Rate Ratios)																	
40-44			0.88	1.97	1.68	1.57	2.14										1.60
45-49		3.21	0.81	1.25	1.69	1.78	2.30	1.05									1.86
50-54	1.12	0.87	1.92	1.19	1.63	1.58	1.60	1.72	3.20								1.63
55-59		1.16	0.79	1.26	1.57	1.45	1.67	1.45	1.98	1.62							1.57
60-64		1.23	1.30	0.78	1.45	1.35	1.60	1.38	1.28	1.97	2.82						1.42
65-69			1.27	0.91	1.19	1.31	1.34	1.10	1.30	1.49	1.10						1.26
70-74				0.85	0.96	0.85	1.09	1.23	1.36	1.21	1.64	1.11					1.18
75-79					1.24	1.14	1.27	1.47	1.22	1.21	1.43	1.51	1.20				1.29
80-84						0.89	1.47	1.54	1.01	1.08	1.27						1.22
CMA	0.39	1.33	1.22	1.06	1.40	1.37	1.55	1.39	1.43	1.46	1.43	1.36	1.25				1.41

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Never-smokers for White Females Aged Between 40 and 84**
20 cigarettes per day for smokers

Never-smoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age																	
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	94.7	160.4	271.6	459.9	778.7	1318.6	2232.8	3780.7

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	2	15	55	50	6	0	0	0	0	0	0	0	0	0	128
45-49	1	0	5	14	47	101	143	26	0	0	0	0	0	0	0	0	337
50-54	0	5	8	21	43	127	246	233	18	0	0	0	0	0	0	0	701
55-59	0	7	11	24	48	84	195	314	202	16	0	0	0	0	0	0	901
60-64	0	2	14	25	43	71	161	209	242	82	10	1	0	0	0	0	860
65-69	0	0	9	21	45	84	127	138	136	129	44	5	0	0	0	0	738
70-74	0	0	0	11	35	47	70	100	87	83	40	32	2	1	0	0	508
75-79	0	0	0	0	11	24	23	55	61	48	20	16	9	0	0	0	267
80-84	0	0	0	0	0	19	20	22	23	13	23	8	8	3	2	0	141
CMA	1	14	49	131	327	607	991	1597	769	371	137	62	19	4	2	0	4581

Total PYO

40-44	122.0	731.3	1864.4	6356.6	18026.6	20503.2	1633.8	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49246.3
45-49	180.5	1002.0	2402.1	5194.9	13784.6	34778.5	33528.6	2516.8	13.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	93401.0
50-54	149.6	992.5	2591.9	5031.6	9413.9	22961.8	46292.8	35321.8	2430.8	14.3	0.0	0.0	0.0	0.0	0.0	0.0	125200.8
55-59	89.3	741.5	2096.8	3998.7	6975.3	12751.7	25212.9	36148.0	21649.3	1271.8	9.7	0.0	0.0	0.0	0.0	0.0	112944.8
60-64	0.0	286.8	1260.2	2475.9	4345.8	7306.3	11839.8	17317.4	17882.0	7367.3	366.0	7.5	0.0	0.0	0.0	0.0	70475.0
65-69	0.0	0.0	419.0	1322.0	2099.4	3577.0	5635.6	7411.9	7257.7	5077.6	1778.6	135.8	7.0	0.0	0.0	0.0	34721.5
70-74	0.0	0.0	0.0	422.2	967.3	1333.8	2327.3	3066.0	3013.1	2110.2	1347.2	503.3	62.9	2.2	0.0	0.0	15155.0
75-79	0.0	0.0	0.0	0.0	315.8	582.2	715.3	1126.5	1081.8	860.8	509.1	324.4	142.6	23.9	0.0	0.0	5682.2
80-84	0.0	0.0	0.0	0.0	0.0	167.9	235.6	277.5	317.5	230.6	170.5	91.5	68.9	30.3	2.8	0.0	1593.0
CMA	541.4	3754.2	10634.3	24801.8	55928.6	103962.2	127421.4	105194.4	53645.0	16802.4	4201.0	1062.4	281.4	56.3	2.8	0.0	508419.7

Never-smoker death rates per 100,000 standardized to current smoker age \ duration distribution

225.7	283.4	363.9	373.1	343.1	349.0	437.6	605.4	875.5	1326.6	2064.8	2977.4	4015.3	5128.7	6401.8	0.0	504.6
-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	-----	-------

Age	Excess Mortality (Rate Differences)															CMD	
	0-4	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	70-74	75-79	
40-44				12.55	141.25	210.38	149.14	272.53									165.19
45-49				47.76	109.10	180.56	130.01	266.10	872.65								200.41
50-54				232.18	37.05	145.77	185.17	281.49	259.80	368.05	468.91						288.30
55-59				484.14	64.73	140.31	238.25	198.85	313.52	363.22	473.17	798.22					337.84
60-64				-61.46	302.24	231.00	210.75	193.03	581.10	429.15	574.59	334.29	1811.95				441.56
65-69					829.37	269.90	824.85	1029.73	934.93	543.26	555.27	1221.97	1155.27				806.88
70-74						372.83	1385.73	1291.57	775.07	1028.81	654.64	1700.57	736.42	4125.90			1119.26
75-79							-295.95	341.82	-595.06	1101.66	1858.30	1795.82	147.91	1151.21			918.20
80-84								4913.32	2087.75	1526.11	842.28	-763.94	7087.92				2449.41
CMA	-41.04	89.52	106.83	155.04	241.57	234.88	340.13	437.46	558.04	864.43	1196.28	2898.32	2736.27				366.48
Relative Risk (Rate Ratios)																	
40-44				1.13	2.49	3.22	2.57	3.88									2.74
45-49				1.30	1.68	2.13	1.81	2.66	6.44								2.25
50-54				1.85	1.14	1.54	1.68	2.04	1.96	2.43	2.73						2.06
55-59				2.05	1.14	1.31	1.50	1.43	1.68	1.79	2.03	2.74					1.73
60-64				0.90	1.43	1.30	1.27	1.25	1.75	1.55	1.74	1.43	3.33				1.57
65-69				1.63		1.20	1.63	1.78	1.71	1.41	1.42	1.93	1.88				1.61
70-74						1.17	1.62	1.58	1.35	1.46	1.29	1.76	1.33	2.85			1.50
75-79							0.92	1.09	0.85	1.29	1.49	1.47	1.04	1.30			1.24
80-84								1.77	1.33	1.24	1.13	0.88	2.11				1.36
CMA	0.82	1.32	1.30	1.42	1.70	1.67	1.78	1.72	1.64	1.65	1.58	1.99	1.68				1.69

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
21-39 cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										Duration
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	Rate	
40-44	0	1	0	3	14	25	4	0	0	94.7	
45-49	0	0	1	1	9	40	60	7	0	160.4	
50-54	0	0	1	5	10	33	83	11	0	271.6	
55-59	0	1	1	7	10	22	46	98	77	459.9	
60-64	0	0	0	4	9	14	36	72	82	778.7	
65-69	0	0	0	4	10	10	19	35	32	1318.6	
70-74	0	0	0	1	3	6	14	20	25	2232.8	
75-79	0	0	0	0	3	2	9	10	9	3780.7	
80-84	0	0	0	0	0	1	0	2	3	6491.8	
CMA	0	2	3	25	68	153	273	333	250	104	38

Total PYO

40-44	16.6	129.8	474.0	1710.3	5853.9	7467.3	755.2	4.0	0.0	0.0	0.0	0.0	0.0	0.0	16411.1
45-49	21.5	123.9	430.4	1192.3	3567.5	19748.8	12025.3	1259.3	5.0	0.0	0.0	0.0	0.0	0.0	29374.1
50-54	27.4	156.8	380.5	919.2	2057.6	5728.7	14152.9	12389.2	1179.0	3.0	0.0	0.0	0.0	0.0	36994.3
55-59	10.4	95.3	313.1	666.4	1314.5	2727.0	6276.9	11760.9	7628.5	537.3	1.3	0.0	0.0	0.0	31331.6
60-64	0.0	38.9	186.7	371.1	728.2	1419.3	2523.5	4388.3	5435.9	2466.3	161.2	5.0	0.0	0.0	17724.2
65-69	0.0	0.0	52.3	180.1	314.4	611.0	1101.3	1631.7	1638.5	1535.8	558.8	50.4	4.0	0.0	7878.3
70-74	0.0	0.0	0.0	49.3	109.1	189.3	394.8	591.7	658.1	481.6	367.8	143.2	20.8	2.0	0.0
75-79	0.0	0.0	0.0	0.0	28.7	70.2	102.6	164.6	188.5	117.4	93.0	86.3	27.7	4.5	0.0
80-84	0.0	0.0	0.0	0.0	0.0	12.9	24.3	38.8	38.4	27.1	16.5	14.9	15.2	7.1	3.0
CMA	75.9	544.8	1837.0	5088.6	13973.8	28974.5	37356.8	32218.4	16971.9	5168.4	1188.5	299.8	67.7	13.6	3.0

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

227.3	273.3	313.4	303.8	259.3	273.4	363.3	517.5	760.9	1138.9	1782.9	2707.6	3746.1	4919.6	6401.8	0.0	460.1
-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	-----	-------

Excess Mortality (Rate Differences)																	
Age	0-4	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	70-74	75-79	CMD
40-44				80.69	144.43	240.07	434.96										191.67
45-49				71.94	-76.53	91.88	211.74	338.55	395.45								241.32
50-54				-6.79	272.37	214.41	304.45	314.85	446.77	661.40							355.53
55-59				-140.49	590.50	300.85	346.86	272.95	373.38	549.48	1029.17						401.86
60-64					299.20	457.25	207.71	727.12	862.02	729.76	883.72	1062.70					705.12
65-69						902.59	1861.89	318.06	406.71	826.44	421.94	113.84	1067.67				547.27
70-74							936.24	1313.03	1147.51	1566.14	2127.84	2239.62					1423.49
75-79								2295.23	6829.36								3690.96
80-84																	2097.52
CMA																	421.81
Relative Risk (Rate Ratios)																	
40-44						1.89	2.52	3.53	5.59								3.02
45-49						1.45	0.52	1.57	2.32	3.11	3.47						2.50
50-54						0.97	2.00	1.79	2.12	2.16	2.64	3.44					2.31
55-59						0.69	2.28	1.65	1.75	1.59	1.81	2.19	3.24				1.87
60-64							1.38	1.59	1.27	1.93	2.11	1.94	2.13	2.39			1.91
65-69							1.68	2.41	1.24	1.31	1.63	1.32	1.09	1.76			1.42
70-74								1.42	1.59	1.51	1.70	1.95	2.00				1.63
75-79									1.61	2.61							1.98
80-84																	1.33
CMA																	1.92

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
40+ cigarettes per day for smokers

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	Age										CMD
	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84		
Rate	94.7	160.4	271.6	459.9	778.7	1318.6	2232.6	3780.7	6401.8		

Observed deaths for smokers based on age groups \ durations (years)
Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	0	0	2	8	9	1	0	0	0	0	0	0	0	0	0	20
45-49	0	0	1	2	3	20	28	2	0	0	0	0	0	0	0	0	56
50-54	0	0	0	3	9	14	28	38	6	0	0	0	0	0	0	0	98
55-59	0	1	3	1	2	11	21	47	47	8	0	0	0	0	0	0	141
60-64	0	0	1	1	6	8	19	26	35	23	4	0	0	0	0	0	123
65-69	0	0	0	3	2	6	10	12	10	14	9	0	0	0	0	0	66
70-74	0	0	0	0	2	4	2	9	5	9	5	3	0	0	0	0	39
75-79	0	0	0	0	1	2	1	2	2	4	1	1	0	0	0	0	18
80-84	0	0	0	0	0	0	1	1	0	2	1	1	0	0	0	0	6
CMA	0	1	5	12	33	74	111	137	105	60	20	8	1	0	0	0	567

Total PYO

40-44	17.0	50.8	147.1	569.4	1945.5	2472.4	298.8	23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5503.2
45-49	15.0	75.3	160.3	392.6	1147.9	3499.3	3981.3	499.7	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	972.4
50-54	10.3	64.6	183.3	342.3	732.5	1971.5	4861.1	4300.6	537.6	1.0	0.0	0.0	0.0	0.0	0.0	0.0	13034.8
55-59	4.4	47.9	135.9	276.6	517.3	1023.0	2296.0	4217.5	2948.2	309.2	0.0	0.0	0.0	0.0	0.0	0.0	11766.0
60-64	0.0	14.0	68.8	172.5	322.8	571.7	935.1	1624.3	2099.4	1037.8	95.6	0.0	0.0	0.0	0.0	0.0	6941.8
65-69	0.0	0.0	27.2	77.8	123.5	236.8	455.4	616.2	700.8	648.3	291.3	20.6	1.0	0.0	0.0	0.0	3199.0
70-74	0.0	0.0	0.0	23.0	52.8	63.4	129.8	229.2	246.6	219.3	147.8	79.8	12.2	1.0	0.0	0.0	1204.8
75-79	0.0	0.0	0.0	0.0	20.8	30.9	28.5	54.1	79.2	65.3	33.2	34.3	15.7	4.0	0.2	0.0	366.2
80-84	0.0	0.0	0.0	0.0	0.0	4.5	7.4	13.0	13.6	19.1	4.3	1.4	5.0	0.3	0.0	3.0	66.6
CMA	46.7	252.6	722.6	1854.3	4862.2	9673.5	12963.3	11586.8	6627.3	2299.9	572.2	136.1	33.8	5.3	0.3	0.0	51856.7

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

189.2	266.7	334.0	307.3	291.2	268.3	370.6	524.1	754.1	1158.3	1645.7	2528.4	3598.6	3610.7	3780.7	0.0	485.5
-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	-----	-------

Excess Mortality (Rate Differences)																		
Age	0-4	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	70-74	75-79	CMD	
40-44				256.51	316.48	269.29	246.00										268.70	
45-49				349.05	101.15	411.15	542.90	239.87									412.84	
50-54				604.74	957.07	438.52	304.41	605.88	844.51								480.24	
55-59				-68.34	-73.29	615.38	458.74	654.51	1134.32	2127.71							738.48	
60-64					1080.30	620.69	1253.18	821.93	668.40	1437.61							993.14	
65-69						1214.82	877.19	628.92	108.27	840.78	1770.64						744.54	
70-74								1694.50	-205.06	1870.57							1004.41	
75-79																	1135.06	
80-84																		
CMA	129.19	358.01	309.88	387.51	461.22	484.29	658.26	830.20	1450.46	1849.79							607.88	
Relative Risk (Rate Ratios)																		
40-44				3.71	4.34	3.84	3.53										3.84	
45-49				3.18	1.63	3.56	4.38	2.50									3.57	
50-54				3.23	4.52	2.61	2.12	3.23	4.11								2.77	
55-59				0.79	0.84	2.34	2.00	2.42	3.47	5.63							2.61	
60-64					2.39	1.80	2.61	2.06	2.14	2.85							2.28	
65-69						1.92	1.67	1.48	1.08	1.64	2.34						1.56	
70-74								1.76	0.91	1.84							1.45	
75-79																	1.30	
80-84																		
CMA	1.48	2.07	1.92	2.33	2.60	2.31	2.26	2.10	2.25	2.12							2.25	

CMA=Combined ages.

CMD=Combined durations.

**Comparison of All-Cause Mortality of Current Smokers
and Neversmokers for White Females Aged Between 40 and 84**
Current smokers of any number of cigarettes

Neversmoker death rates per 100,000 by age groups using the logistic regression model are

Age	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84
Rate	94.7	160.4	271.6	459.9	778.7	1318.6	2232.8	3780.7	6401.8

Observed deaths for smokers based on age groups \ durations (years)

Duration

Age	0-4	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	70-74	75-79	CMD
40-44	0	3	7	42	121	126	15	0	0	0	0	0	0	0	0	0	314
45-49	2	15	24	37	130	305	379	40	1	0	0	0	0	0	0	0	933
50-54	2	54	52	78	139	335	663	567	55	0	0	0	0	0	0	0	1905
55-59	2	25	56	101	151	272	559	835	571	42	0	0	0	0	0	0	2614
60-64	0	18	74	85	155	228	453	601	639	288	30	1	0	0	0	0	2572
65-69	0	0	42	88	141	232	326	373	390	321	108	16	1	0	0	0	2038
70-74	0	0	0	58	133	138	215	287	295	221	141	67	5	1	0	0	1561
75-79	0	0	0	0	83	139	143	196	204	151	92	65	30	7	0	0	1110
80-84	0	0	0	0	0	69	131	98	91	69	37	28	16	5	0	0	613
CMA	6	75	255	489	1053	1844	2684	2997	2246	1092	440	186	64	24	5	0	13600

Total PYO

40-44	1104.3	4043.2	8113.1	21698.6	54405.9	57472.9	4341.8	28.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	151208.5
45-49	1629.9	6193.4	10723.3	19058.3	44586.0	102808.7	94744.3	7006.4	37.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	286787.7
50-54	1562.9	6689.1	12979.8	19558.5	32395.2	72038.2	137144.0	100510.3	6775.8	39.5	0.0	0.0	0.0	0.0	0.0	0.0	369884.3
55-59	789.3	5422.8	11383.7	16949.3	24985.0	41468.0	78361.0	114777.3	63079.1	3635.7	37.9	0.0	0.0	0.0	0.0	0.0	360889.1
60-64	0.0	2197.3	8255.5	11221.7	16547.5	24390.0	36819.5	53736.7	54691.7	21985.2	1244.3	28.4	0.0	0.0	0.0	0.0	231077.7
65-69	0.0	0.0	3138.9	7647.5	8748.9	13145.7	18521.5	23421.2	23162.7	16569.9	5764.2	469.3	22.3	0.0	0.0	0.0	120612.0
70-74	0.0	0.0	0.0	2803.7	5589.4	5732.6	8548.8	10269.4	10189.3	7227.5	4646.9	1884.3	229.8	12.4	0.0	0.0	57133.9
75-79	0.0	0.0	0.0	0.0	1977.6	3368.6	3178.0	4046.6	3983.8	3196.3	1870.7	1320.2	601.5	98.0	3.3	0.0	23692.5
80-84	0.0	0.0	0.0	0.0	0.0	1039.9	1468.3	1215.6	1258.6	980.5	741.3	435.2	355.8	161.9	32.8	2.0	7691.9
CMA	5086.4	24745.8	54585.3	98937.6	189235.5	321424.5	363127.3	315060.3	163178.2	53634.6	14305.3	4137.3	1209.3	272.3	36.0	2.0	1628977.5

Neversmoker death rates per 100,000 standardized to current smoker age \ duration distribution

226.8	301.2	399.6	437.7	406.8	401.5	476.3	625.2	915.4	1401.2	2151.7	3051.5	4212.6	5266.5	6165.2	6401.8	575.5
-------	-------	-------	-------	-------	-------	-------	-------	-------	--------	--------	--------	--------	--------	--------	--------	-------

Age	Excess Mortality (Rate Differences)																
	0-4	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	70-74	75-79	CMD
40-44	-20.53	-6.45	98.84	127.68	124.51	250.76											112.93
45-49	-37.69	81.80	63.41	33.74	131.17	136.27	239.63	410.51									164.93
50-54	-143.63	46.38	129.30	127.21	157.48	193.43	211.84	292.52	540.11								217.01
55-59	-206.49	1.12	32.04	136.00	144.47	196.04	253.47	267.60	445.32	695.33							264.43
60-64		40.45	117.64	-21.26	157.97	157.62	451.60	339.69	369.64	531.25	1632.36						334.32
65-69			19.44	-167.90	293.02	446.23	441.51	273.97	365.14	618.64	555.04	2091.09					371.11
70-74				-164.05	146.72	174.52	262.19	561.93	662.44	824.99	801.50	1332.86	-54.91				499.41
75-79					416.33	345.65	718.97	1006.10	1339.98	943.45	1137.32	1142.91	1206.82				904.31
80-84						233.33	2519.86	1660.15	828.53	635.41	2905.73	2100.67	1467.03	3479.81			1567.59
CMA	-108.62	1.92	67.52	56.58	149.69	172.17	276.43	316.03	458.04	634.83	924.07	1444.12	1079.90	3544.20			263.01
Relative Risk (Rate Ratios)																	
40-44		0.78	0.91	2.04	2.35	2.31	3.65										2.19
45-49	0.77	1.51	1.40	1.21	1.82	1.85	2.49	3.56									2.03
50-54	0.47	0.75	1.48	1.47	1.58	1.71	1.78	2.08	2.99								1.80
55-59	0.55	1.00	1.07	1.30	1.31	1.43	1.55	1.58	1.97	2.51							1.57
60-64		1.05	1.15	0.97	1.20	1.20	1.58	1.44	1.50	1.68	3.10						1.43
65-69			1.01	0.87	1.22	1.34	1.33	1.21	1.28	1.47	1.42	2.59					1.28
70-74				0.93	1.07	1.08	1.13	1.25	1.30	1.37	1.26	1.59	0.98				1.22
75-79					1.11	1.09	1.19	1.27	1.35	1.25	1.30	1.30	1.32				1.24
80-84						1.04	1.39	1.26	1.13	1.10	1.45	1.33	1.23	1.54			1.24
CMA	0.52	1.01	1.17	1.13	1.37	1.43	1.58	1.50	1.50	1.45	1.43	1.47	1.26	1.67			1.46

CMA=Combined ages.

CMD=Combined durations.

Appendix C

Summary of Person-Years of Observation and Deaths, by Subject Group

Each table provides person-years of observation (PYO's) and number of deaths due to lung cancer (1°, 2°, and 3° cause of death), coronary heart disease, cerebrovascular disease, chronic obstructive pulmonary disease, and all-cause mortality by 5-year age groups. Total PYO's and deaths for each category and total number of subjects (N) are given.

Table Subject Group

- 1 White male never-smoker
- 2 White male current smoker
- 3 White male former smoker
- 4 White female never-smoker
- 5 White female current smoker
- 6 White female former smoker
- 7 Black male never-smoker
- 8 Black male current smoker
- 9 Black female never-smoker
- 10 Black female current smoker

White Male Neversmoker

TABLE 1

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
25-29	0.4	0	0	0	0	0
30-34	3793.9	0	1	0	0	6
35-39	15698.5	0	3	0	0	19
40-44	33582.9	2	10	3	0	63
45-49	76421.2	2	63	7	0	195
50-54	145637.8	10	244	37	5	624
55-59	186108.7	22	604	71	5	1359
60-64	166616.6	29	996	132	11	2100
65-69	130530.3	41	1261	238	19	2783
70-74	95753.3	32	1459	426	17	3293
75-79	61181.8	32	1500	565	28	3628
80-84	30235.2	26	1099	544	15	2912
85-89	11439.0	17	663	349	12	1800
90-94	2720.6	1	238	140	6	687
95-99	440.3	1	45	30	1	149
100-04	65.5	0	7	7	0	20
105-09	2.8	0	0	1	0	5
TOTAL	960228.8	215	8193	2550	119	19643
N=	92307					

=====

White Male Current Smoker

TABLE 2

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
30-34	8749.4	0	4	0	0	8
35-39	41571.3	3	25	4	0	94
40-44	89081.4	22	152	21	2	369
45-49	199033.0	96	612	64	4	1350
50-54	361439.0	317	1797	176	43	3826
55-59	424133.3	682	3111	363	146	6962
60-64	321538.3	898	3450	536	317	8240
65-69	190655.4	768	2967	576	320	7514
70-74	97079.8	500	2173	552	305	5781
75-79	41093.3	276	1258	448	207	3617
80-84	13127.8	73	581	247	87	1723
85-89	2877.3	18	221	107	26	616
90-94	456.7	2	38	19	2	108
95-99	51.3	1	6	4	0	15
100-04	0.3	0	1	0	0	1
TOTAL	1790887.6	3656	16396	3117	1459	40224
N=	174997					

White Male Former Smoker

TABLE 3

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
30-34	752.0	0	0	0	0	2
35-39	4554.1	0	0	1	0	6
40-44	11096.3	1	5	1	0	26
45-49	30773.6	2	48	6	2	106
50-54	68236.4	13	190	12	9	408
55-59	94644.1	30	465	46	18	1019
60-64	87344.8	74	669	95	59	1538
65-69	64653.1	71	797	142	79	1764
70-74	40367.8	77	772	201	70	1880
75-79	19525.1	36	502	154	64	1272
80-84	6826.2	23	290	110	22	771
85-89	1612.2	4	114	40	8	284
90-94	323.6	0	29	14	0	77
95-99	31.8	0	5	3	0	14
100-04	0.9	0	0	1	0	1
TOTAL	430742.0	331	3886	826	331	9168
N=	42225					

=====

White Female Never-smoker

TABLE 4

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
30-34	14176.3	0	0	2	0	13
35-39	69449.8	0	1	2	0	70
40-44	180915.8	3	15	12	0	271
45-49	379841.3	14	57	36	2	814
50-54	599269.3	30	177	107	7	1952
55-59	706330.2	49	475	179	9	3094
60-64	660231.2	95	1064	355	13	4743
65-69	548399.4	92	1902	685	25	6613
70-74	409282.6	86	2790	1126	34	8361
75-79	260511.1	100	3440	1688	39	9868
80-84	132398.0	63	3033	1827	53	9052
85-89	52196.2	35	2224	1423	19	6431
90-94	14571.8	6	1010	626	9	2968
95-99	2464.0	0	239	150	0	723
100-04	220.2	0	29	19	0	95
105-09	11.0	0	2	0	1	8
TOTAL	4030268.0	573	16458	8237	211	55076
N=	375649					

White Female Current Smoker

TABLE 5

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
25-29	3.0	0	0	0	0	0
30-34	13757.8	0	1	2	0	12
35-39	63805.8	1	6	7	0	78
40-44	153735.8	16	37	19	2	321
45-49	291998.5	58	124	74	8	955
50-54	397548.8	110	348	180	13	1976
55-59	369088.8	123	602	207	34	2678
60-64	237725.0	131	679	265	54	2621
65-69	125337.8	101	686	232	40	2122
70-74	60067.8	48	595	207	35	1648
75-79	25175.9	25	419	193	31	1182
80-84	8280.9	5	234	109	5	646
85-89	2115.7	2	101	41	1	245
90-94	316.6	1	27	16	2	76
95-99	45.4	0	4	2	0	13
100-04	2.4	0	1	0	0	2
TOTAL	1749005.9	621	3864	1554	225	14575
N=	158727					

=====

White Female Former Smoker

TABLE 6

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
30-34	1082.9	0	0	0	0	3
35-39	6360.8	0	0	0	0	8
40-44	17366.3	0	0	0	1	30
45-49	36990.3	0	4	7	0	100
50-54	53849.9	7	21	7	2	222
55-59	53312.2	6	39	16	3	273
60-64	36882.9	5	60	30	8	322
65-69	21866.7	6	76	36	1	267
70-74	12210.8	2	107	35	5	323
75-79	5917.1	3	84	43	3	254
80-84	2225.4	0	62	44	3	189
85-89	626.4	0	32	24	0	93
90-94	119.4	0	12	9	0	27
95-99	12.1	0	0	0	0	4
100-04	3.5	0	1	0	0	2
TOTAL	248826.6	29	498	251	26	2117
N=	22810					

Black Male Never-smoker

TABLE 7

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
30-34	170.2	0	0	0	0	0
35-39	715.1	0	0	0	0	1
40-44	1375.0	0	0	1	0	5
45-49	2075.9	1	1	2	0	12
50-54	3018.1	0	5	3	0	26
55-59	3555.1	0	7	10	0	41
60-64	3155.9	1	17	6	0	56
65-69	2449.8	0	15	14	0	66
70-74	1891.1	0	22	21	0	94
75-79	1240.9	0	26	13	0	90
80-84	667.3	0	19	10	0	62
85-89	256.3	0	8	8	0	38
90-94	62.8	0	4	4	0	15
95-99	13.8	0	2	1	0	4
100-04	2.5	0	1	0	0	2
TOTAL	20649.7	2	127	93	0	512
N=	2157					

Black Male Current Smoker

TABLE 8

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
30-34	576.5	0	0	0	0	1
35-39	2335.1	0	0	1	0	15
40-44	4230.7	1	5	3	0	21
45-49	6173.1	4	11	3	0	56
50-54	8012.8	6	31	9	1	100
55-59	8011.7	13	38	17	4	144
60-64	5612.4	19	56	23	6	197
65-69	3215.6	4	40	17	3	126
70-74	1778.8	7	29	15	4	98
75-79	919.1	8	17	16	4	96
80-84	363.9	0	14	8	1	38
85-89	116.2	0	9	1	1	20
90-94	16.9	0	2	2	0	4
95-99	1.8	0	0	0	0	1
TOTAL	41364.4	62	252	115	24	917
N=	4218					

Black Female Neversmoker

TABLE 9

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
30-34	881.8	0	0	0	0	1
35-39	3751.3	0	0	0	0	9
40-44	7548.4	0	1	3	1	21
45-49	11581.5	1	6	3	0	49
50-54	15455.3	3	16	7	1	82
55-59	16839.9	1	24	25	1	143
60-64	14729.4	3	47	23	0	199
65-69	11467.8	1	56	39	1	242
70-74	8234.3	3	58	34	0	238
75-79	5435.3	0	59	55	1	235
80-84	2748.7	0	43	46	0	196
85-89	1079.7	1	31	38	1	141
90-94	282.1	1	9	13	0	50
95-99	73.5	0	3	3	0	15
100-04	33.0	0	1	1	0	3
105-09	10.5	0	0	1	0	1
110-14	5.3	0	1	0	0	1
TOTAL	100157.6	14	355	291	6	1626
N=	9881					

=====

Black Female Current Smoker

TABLE 10

AGE GROUP	TOTAL PYO	DEATHS DUE TO				
		LUNG.C	CORONARY	CERBRO-V	COPD	ALL.CAUSE
30-34	934.0	0	0	1	0	1
35-39	3674.4	0	2	2	0	12
40-44	6488.3	0	2	3	0	18
45-49	7941.0	1	5	3	0	40
50-54	7940.3	4	13	6	0	58
55-59	6139.4	0	17	8	0	66
60-64	3670.9	3	18	7	1	57
65-69	1892.3	2	11	5	0	38
70-74	879.0	0	9	5	0	25
75-79	372.9	0	3	2	0	20
80-84	112.4	0	2	1	0	9
85-89	17.1	0	1	0	0	1
90-94	2.8	0	0	0	0	1
TOTAL	40064.8	10	83	43	1	346
N=	3835					

Appendix D

Tables of Observed and Fitted Death Rates for Never-Smokers, by Sex and Age Group

For 5-year age groups between 40 and 85 years, the observed death rates and the fitted death rates for white never-smokers are given by sex. The modeled rates include Poisson regression and linear regression of log (rate). Modeled rates are weighted to the square root of the total person-years of observation for the cells.

Table Cause of Death

- 1 Lung cancer (1° , 2° , and 3° cause of death)
- 2 Coronary heart disease (1° cause of death)
- 3 Cerebrovascular disease (1° cause of death)
- 4 Chronic obstructive pulmonary disease (COPD) (1° cause of death)
- 5 All-cause mortality

Tables of Observed and Fitted Death Rates for Never Smokers by Age Group
 Fitted Rates by Poisson regression and linear regression of log rates.

Table 1: Lung Cancer, as 1°, 2°, or 3° cause of death

Age GrpMALE.....		FEMALE.....		
	obsrvd	pois.rg	lin.reg	obsrvd	pois.rg	lin.rg
40-44	5.96	3.39	3.19	1.66	2.41	2.22
45-49	2.62	5.06	4.81	3.69	3.54	3.31
50-54	6.87	7.56	7.27	5.01	5.19	4.94
55-59	11.82	11.30	10.97	6.94	7.60	7.38
60-64	17.41	16.87	16.56	14.39	11.14	11.03
65-69	31.41	25.20	25.01	16.78	16.33	16.47
70-74	33.42	37.64	37.76	21.01	23.94	24.60
75-79	52.30	56.22	57.01	38.39	35.10	36.74
80-84	85.99	83.98	86.08	47.58	51.45	54.86

Table 2: Coronary Artery Disease, as 1° cause of death

Age GrpMALE.....		FEMALE.....		
	obsrvd	pois.rg	lin.reg	obsrvd	pois.rg	lin.rg
40-44	29.78	73.26	46.22	8.29	10.64	6.50
45-49	82.44	120.58	83.36	15.01	21.01	14.05
50-54	167.54	198.46	150.34	29.54	41.49	30.39
55-59	324.54	326.64	271.13	67.25	81.95	65.72
60-64	597.78	537.61	488.98	161.16	161.84	142.15
65-69	966.06	884.83	881.84	346.83	319.61	307.47
70-74	1523.71	1456.31	1590.36	681.68	631.21	665.05
75-79	2451.71	2396.88	2868.12	1320.48	1246.59	1438.45
80-84	3634.84	3944.93	5172.51	2290.82	2461.92	3111.29

Table 3: Cerebro-Vascular Disease, as 1° cause of death

Age GrpMALE.....		FEMALE.....		
	obsrvd	pois.rg	lin.reg	obsrvd	pois.rg	lin.rg
40-44	8.93	4.52	5.41	6.63	2.69	4.56
45-49	9.16	9.60	11.05	9.48	5.86	8.97
50-54	25.41	20.38	22.58	17.86	12.77	17.64
55-59	38.15	43.26	46.14	25.34	27.84	34.69
60-64	79.22	91.82	94.28	53.77	60.69	68.22
65-69	182.33	194.91	192.66	124.91	132.30	134.15
70-74	444.89	413.73	393.70	275.12	288.38	263.83
75-79	923.48	878.21	804.53	647.96	628.60	518.86
80-84	1799.23	1864.17	1644.06	1379.93	1370.21	1020.40

Table 4: C O P D, as 1° cause of death

Age Grp	MALE.....			FEMALE.....		
	obsrvd	pois.rg	lin.reg	obsrvd	pois.rg	lin.reg
40-44	0.00	0.73	0.83	0.00	0.15	0.27
45-49	0.00	1.28	1.42	0.53	0.29	0.48
50-54	3.43	2.22	2.42	1.17	0.58	0.85
55-59	2.69	3.87	4.11	1.27	1.16	1.51
60-64	6.60	6.73	6.99	1.97	2.30	2.69
65-69	14.56	11.71	11.90	4.56	4.56	4.77
70-74	17.75	20.39	20.26	8.31	9.04	8.48
75-79	45.77	35.49	34.47	14.97	17.92	15.06
80-84	49.61	61.78	58.66	40.03	35.54	26.76

Table 5: All Cause Mortality

Age Grp	MALE.....			FEMALE.....		
	obsrvd	pois.rg	lin.reg	obsrvd	pois.rg	lin.reg
40-44	187.60	161.33	167.70	149.79	94.73	128.45
45-49	255.16	269.29	277.47	214.30	160.40	204.30
50-54	428.46	449.50	459.11	325.73	271.60	324.94
55-59	730.22	750.30	759.65	438.04	459.89	516.82
60-64	1260.38	1252.41	1256.93	718.38	778.73	822.01
65-69	2132.07	2090.53	2079.73	1205.87	1318.61	1307.42
70-74	3439.05	3489.53	3441.15	2042.84	2232.77	2079.46
75-79	5929.87	5824.74	5693.79	3787.94	3780.72	3307.41
80-84	9631.16	9722.71	9421.03	6836.96	6401.82	5260.46

Trends in Tobacco Smoking and Mortality From Cigarette Use in Cancer Prevention Studies I (1959 Through 1965) and II (1982 Through 1988)

Michael J. Thun, Cathy Day-Lally, Dena G. Myers, Eugenia E. Calle, W. Dana Flanders, Bao-Ping Zhu, Mohan M. Namboodiri, and Clark W. Heath, Jr.

INTRODUCTION Despite the vast literature on the adverse effects of tobacco smoking and on trends in the diseases caused by smoking in the general population, there are almost no descriptive data on how death rates in smokers and never-smokers have changed over time. The 1989 U.S. Surgeon General's report (U.S. Department of Health and Human Services, 1989) noted that in the 20-year period from the mid-1960's through the early 1980's, the relative risk of fatal lung cancer approximately doubled in male cigarette smokers and increased nearly fivefold in female cigarette smokers; smaller increases were observed for coronary heart disease (CHD) and stroke. The Surgeon General based these observations on preliminary comparisons of Cancer Prevention Studies I and II (CPS-I and CPS-II) of the American Cancer Society (ACS) that cover the years 1959 through 1965 and 1982 through 1986, respectively.

Because CPS-I and CPS-II provide smoking information and mortality data on populations studied with comparable techniques in the 1960's and 1980's, these data can be used to gain a longitudinal perspective on changes in smoking-specific mortality over time (Shopland et al., 1991). This chapter extends the analyses in the 1989 Surgeon General's report (U.S. Department of Health and Human Services, 1989) by (1) comparing patterns of cigarette smoking (i.e., prevalence, amount, age of initiation, and duration) in CPS-I, CPS-II, and two nationally representative surveys from the same periods; (2) extending followup of CPS-II for 2 additional years through 1988; (3) presenting death rates, rate ratios (RR's) (death rate in smokers divided by that in never-smokers), and rate differences (RD's) (death rate in smokers minus the rate in never-smokers) for lung cancer, CHD, chronic obstructive pulmonary disease (COPD), stroke, other smoking-related cancers, and all causes combined among current cigarette smokers and lifelong never-smokers in CPS-I and CPS-II; and (4) examining the extent to which the rise in lung cancer death rates from CPS-I to CPS-II can be explained by cigarette consumption.

SUBJECTS AND METHODS**Study Population**

Subjects in the analyses were drawn from CPS-I (Garfinkel, 1985; Hammond, 1964 and 1966) and CPS-II (Garfinkel, 1985; Garfinkel and Stellman, 1988; Peto et al., 1992; Stellman and Garfinkel, 1986); selected characteristics are shown in Table 1.

Subjects were recruited in fall 1959 for CPS-I and in fall 1982 for CPS-II from among the friends, neighbors, and acquaintances of ACS volunteers. Enrollment was based on those who were part of a household, excluding persons in institutions or military service and itinerants who would be difficult to trace (Garfinkel, 1985). Volunteers sought to enroll all household members 30 years of age or older if at least one family member was 45 years or older. CPS-I included subjects from 25 States; CPS-II included subjects from 50 States, the District of Columbia, Puerto Rico, and Guam. Participants in both studies were older, more educated, and more frequently married and part of the middle class than the general U.S. population (Garfinkel, 1985; Stellman and Garfinkel, 1986). Whites made up 97 percent of CPS-I and 93 percent of CPS-II.

Because the age distributions of subjects in CPS-I and CPS-II were similar at the time of enrollment, the two studies represent birth cohorts separated by approximately 20 years (Figure 1). CPS-I includes predominantly cohorts born between 1880 and 1919, whereas CPS-II participants were mostly from cohorts born from 1900 to 1939 and who became adults during the peak years of cigarette smoking in America (U.S. Department of Health and Human

Table 1
Selected characteristics of CPS-I and CPS-II

Full Cohorts	CPS-I	CPS-II
Followup Period ^a	1959-1965	1982-1988
Study Participants	1,051,038	1,185,106
Vital Status, Number (percent) ^b		
Alive:	959,121 (91.3)	1,083,600 (91.4)
Dead:	76,888 (7.3)	79,802 (6.7)
Lost:	15,029 (1.4)	21,704 (1.8)
Exclusions		
Former smokers	70,108	262,790
Ever pipe/cigar	149,828	101,600
Smoking data incomplete or unclassifiable ^c	44,715	109,353
Total exclusions	264,651	473,743
Analytic Cohorts		
Current cigarette smoker	298,687	228,682
Lifelong never-smoker	487,700	482,681
Total analytic cohort	786,387	711,363

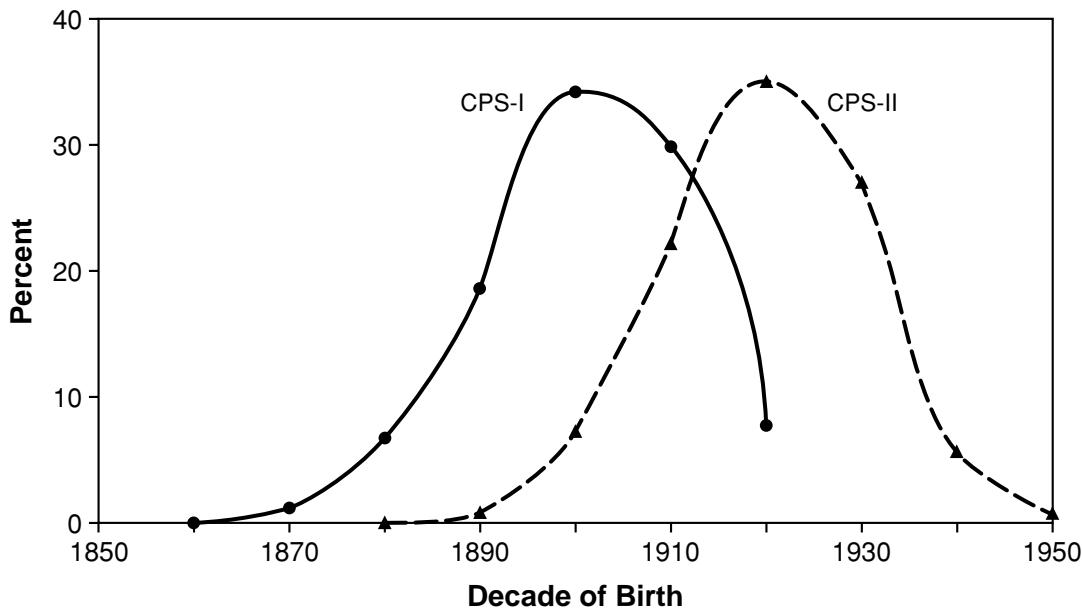
^a Analyses restricted to first 6 years of followup to enhance comparability.

^b Vital status as of September 30, 1965, for CPS-I and August 31, 1988, for CPS-II. Followup terminated before September 30, 1965, for 1,005 CPS-I participants because of administrative reasons (see text).

^c Excludes subjects with incomplete or unclassifiable data on status, pipe or cigar smoking, cigarettes per day, or duration of smoking.

Key: CPS = Cancer Prevention Study.

Figure 1
Distribution of CPS-I and CPS-II participants by 10-year birth cohort



Services, 1989). The number of subjects in each birth cohort and the relationship between year of birth and age at enrollment are shown in Appendix 1.

Table 1 shows the composition of the included and excluded subjects analyzed in this chapter. Death rate analyses were based on more than 220,000 current smokers (defined below) and more than 480,000 lifelong never-smokers in each study, excluding former smokers, persons who ever smoked pipes or cigars, and those whose information on smoking was incomplete or unclassifiable. Analyses of smoking prevalence were based on the full cohorts. Certain analyses of lung cancer were restricted to current cigarette smokers, ages ≥ 50 years, who reported smoking 20 or 40 cigarettes per day for at least 30 years at baseline.

Followup

The participants' vital status was determined through personal inquiry by the volunteers for 12 years in CPS-I and 6 years in CPS-II. For comparability, the analyses were restricted to the first 6 years in each study: for CPS-I from enrollment through September 30, 1965, and for CPS-II from enrollment through August 31, 1988. Persons lost to followup were considered alive until the date last observed, which in CPS-II was considered to be the end of followup. Included in the group "lost to followup" in CPS-I were 1,005 participants for whom followup was terminated early because of the inability of some local field units to continue the study (Table 1) (Hammond, 1966). Death certificates were obtained for deceased subjects. The underlying cause of death was coded according to abbreviated versions

of the *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-7)* (World Health Organization, 1957) for CPS-I and the *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-9)* (World Health Organization, 1977) for CPS-II.

Smoking Information At enrollment in the two studies, participants completed a four-page questionnaire that had similar questions on smoking. Participants in CPS-I were asked, "Do you now smoke?," and if the answer was yes, "How many cigarettes do you usually smoke a day?"; parallel questions were asked about pipe and cigar smoking (men only) and former smoking. Participants in CPS-II were asked, "Do you now or have you ever smoked cigarettes at least one a day for 1 year's time?" For men this question also mentioned cigars and pipes. Current and former smokers were asked to complete separate sections on the age of starting, average number of cigarettes smoked per day, duration of smoking, and depth of inhalation. In the prevalence analyses, current smokers were defined as any current cigarette smokers regardless of their use of pipes or cigars. In the rate analyses, current smoker status was restricted to persons who smoked cigarettes only and to those with complete data on amount and duration. Never-smokers were defined as persons who never smoked any tobacco product.

Smoking Prevalence We compared baseline data on the prevalence of cigarette smoking (with or without pipes or cigars) among subjects in CPS-I and CPS-II. Also assessed was how data from these cohorts represent national smoking patterns by comparing age-, race-, and sex-specific data as well as age-adjusted prevalence in CPS-I and CPS-II to corresponding data for persons ages ≥ 30 in the National Health Interview Surveys (NHIS) conducted in 1965 (NHIS-65), 1983 (NHIS-83), and 1987 (NHIS-87) (National Center for Health Statistics, 1975; Kovar and Poe, 1985; Massey et al., 1989). These probability samples of the civilian, noninstitutionalized population of the United States provided weighted, nationally representative estimates of smoking in the Nation near the baseline interviews of CPS-I (1959) and CPS-II (1982). NHIS-83 did not include questions on pipe or cigar smoking. The percentage of men in NHIS-83 who smoked only pipes or cigars was therefore estimated from NHIS-87. The age-specific percentage of men in NHIS-83 who smoked only cigarettes was estimated from the age-specific percentage in NHIS-83 who never smoked cigarettes minus the percentage in NHIS-87 who smoked only pipes or cigars. The definition of current smoking differed slightly between NHIS and CPS-I and CPS-II. In NHIS, current smoking was defined as smoking at least 100 cigarettes (in addition to at least some smoking cigars and/or pipes) in a lifetime plus smoking during the past 30 days. Smoking prevalence was adjusted for age using direct standardization with weighting by the combined baseline age distribution for CPS-I and CPS-II (Appendix 2).

Cigarettes Smoked Per Day The data on daily cigarette consumption reflected current (at time of enrollment), but not past, usage in both studies. The CPS-I data were precategorized (1-9, 10-19, 20, 21-39, 40, ≥ 41 cigarettes per day). Using these categories, we compared the percentage distribution of smokers in CPS-I, CPS-II, NHIS-65, and NHIS-83 within 5-year age groups. We also

estimated the mean daily consumption of cigarettes within age groups, based on published midpoints for the CPS-I categories (4.8, 12, 20, 29.2, 40, 58.6 cigarettes) (Hammond et al., 1977) and the continuous data in CPS-II. The mean number of cigarettes currently smoked per day in CPS-I and CPS-II were compared with the corresponding values in NHIS-65 and NHIS-83.

Age of Smoking Initiation In CPS-I, the age when subjects began smoking also was precategorized (<10, 10-14, 15-19, 20-24, . . . ≥50 years). Using these categories, we compared the cumulative percentage of cigarette smokers in each of the four studies who had begun smoking by various ages (<15, <20, <25, <30) within 10-year birth cohorts. We also converted the age of initiation categories to their estimated midpoints (9, 12, 17, . . . 50) and compared the mean age of smoking initiation within 10-year birth cohorts in the four studies.

Duration of Smoking The number of years that current smokers had smoked cigarettes prior to enrollment was calculated in CPS-I by subtracting the estimated age of initiation from age at enrollment. In CPS-II, the duration value reported by the respondents was used, or if that value was missing, it was calculated as in CPS-I. Because there was no information on changes in smoking status in CPS-II, the duration was considered to be fixed throughout the followup in both studies.

Endpoints Analyses were restricted to the major causes of smoking-related mortality: lung cancer, CHD, COPD, stroke, other smoking-related cancers (oropharynx, larynx, esophagus, pancreas, bladder, and kidney), and all causes of death combined. *ICD-7* (World Health Organization, 1957) and *ICD-9* (World Health Organization, 1977) codes corresponding to each disease category are listed in footnotes in the relevant tables. As in many other prospective studies of smoking (Doll and Hill, 1966; Doll and Peto, 1976; Hammond, 1964 and 1966; Kahn, 1966; U.S. Department of Health and Human Services, 1989), our analyses included persons with prevalent cancers reported at the time of enrollment, unless otherwise indicated.

Rate Analyses Age-specific and age-adjusted death rates (per 100,000 person-years) were computed based on the number of person-years at risk by attained age through September 30, 1965, for CPS-I and through August 31, 1988, for CPS-II. Age-adjusted death rates were directly standardized to the combined person-year distribution of CPS-I and CPS-II (Appendix 2). These rates were used to compute RR's and RD's. Ninety-five-percent confidence intervals for the RR and RD were calculated using approximate variance formulas (Flanders, 1984; Rothman, 1986).

Death rates were compared among all current cigarette smokers and lifelong never-smokers for each endpoint. For lung cancer, death rates also were compared in CPS-I and CPS-II according to specified numbers of cigarettes smoked daily at enrollment and duration of smoking. Because of sample size considerations, these comparisons were possible only among persons ages ≥50 years who had smoked for at least 30 years. The most precise and potentially least confounded comparison was based on persons

who reported smoking 20 or 40 cigarettes daily at baseline, the two categories for which daily cigarette consumption in CPS-I had not been grouped into broad intervals. First, lung cancer death rates were compared at equivalent levels of current consumption and duration for all races and baseline cancer status (Appendices 3 and 4). Further analyses were restricted to whites to eliminate potential confounding by race and also excluded persons with prevalent cancer other than nonmelanoma skin cancer (Appendices 5 and 6). The exclusion of prevalent cancers minimized the possibility that cigarette smokers with cancer might differentially participate in CPS-II. These comparisons are presented only as stratified analyses because of the constraints on standardization discussed elsewhere (Chapter 5).

Attributable Risk in Smokers In CPS-I and CPS-II, the percentage of deaths attributable to smoking among current cigarette smokers was estimated by using standard formulas for attributable proportion for an exposed population (Rothman, 1986). Also estimated were the proportionate contributions of lung cancer, CHD, and other conditions to the overall increase in death rates by dividing the cause-specific RD by the all-cause RD, expressed as a percentage.

RESULTS

The following is the order of presentation: Baseline smoking practices are compared in CPS-I (1959), CPS-II (1982),

Order of Presentation NHIS-65 (1965), and NHIS-83 (1983); specific causes of death are discussed in order of their contribution to smoking-related mortality in CPS-II (lung cancer, CHD, COPD, stroke, and other smoking-related cancers); and all causes of death combined are presented by smoking status and study.

For each cause, death rates in current cigarette smokers are compared with those in lifelong never-smokers. Lung cancer rates are measured in relation to daily cigarette use and duration of smoking in CPS-I and CPS-II. The percentage of deaths attributable to smoking among current cigarette smokers is examined for each endpoint in the two studies.

Baseline Smoking Practices Table 2 shows the percentage of black and white men and women who currently smoke, formerly smoked, and never smoked cigarettes at the time of enrollment in CPS-I and CPS-II. Age-adjusted prevalence decreased from 44.8 to 24.3 percent in white men. Smaller decreases occurred in black men and white women, whereas the prevalence in black women increased slightly. The percentage who were former smokers more than doubled among white men, more than quadrupled among white women, more than tripled among black men, and almost quadrupled among black women. The percentage of never-smokers remained essentially unchanged in black men, rose slightly in white men, and decreased in women of both races.

Trends in smoking prevalence from CPS-I to CPS-II resembled those in the general U.S. population, as reflected by NHIS-65 and NHIS-83 (Table 2). The prevalence in CPS-I was somewhat lower than in NHIS-65 and was lower in CPS-II than in NHIS-83, consistent with the higher educational background of CPS participants. However, temporal trends in prevalence

Table 2

Age-adjusted prevalence^a of current, former, and never cigarette^b smoking at baseline by race, sex, and study

Race/Sex	Smoking Status	Percent			
		CPS-I	CPS-II	NHIS-65	NHIS-83
White Men					
White Men	Current	44.8	24.3	47.4	33.3
	Former	16.7	39.3	25.5	40.8
	Never	21.5	25.6	15.2	18.8
Black Men					
Black Men	Current	47.7	34.3	55.0	43.5
	Former	8.1	26.9	16.1	29.5
	Never	23.2	24.4	13.8	21.1
White Women					
White Women	Current	24.2	20.4		28.3
	Former	5.1	21.3	8.1	19.2
	Never	68.8	52.1	62.1	52.4
Black Women					
Black Women	Current	20.0	24.8	23.9	31.5
	Former	3.5	13.8	6.3	13.4
	Never	71.6	48.2	69.4	55.0

^aPrevalence in the full cohorts (Table 1), age-adjusted to the baseline age distribution of CPS-I and CPS-II (Appendix 2).

^bCigarette smoking with or without pipes or cigars.

Key: CPS = Cancer Prevention Study; NHIS = National Health Interview Survey.

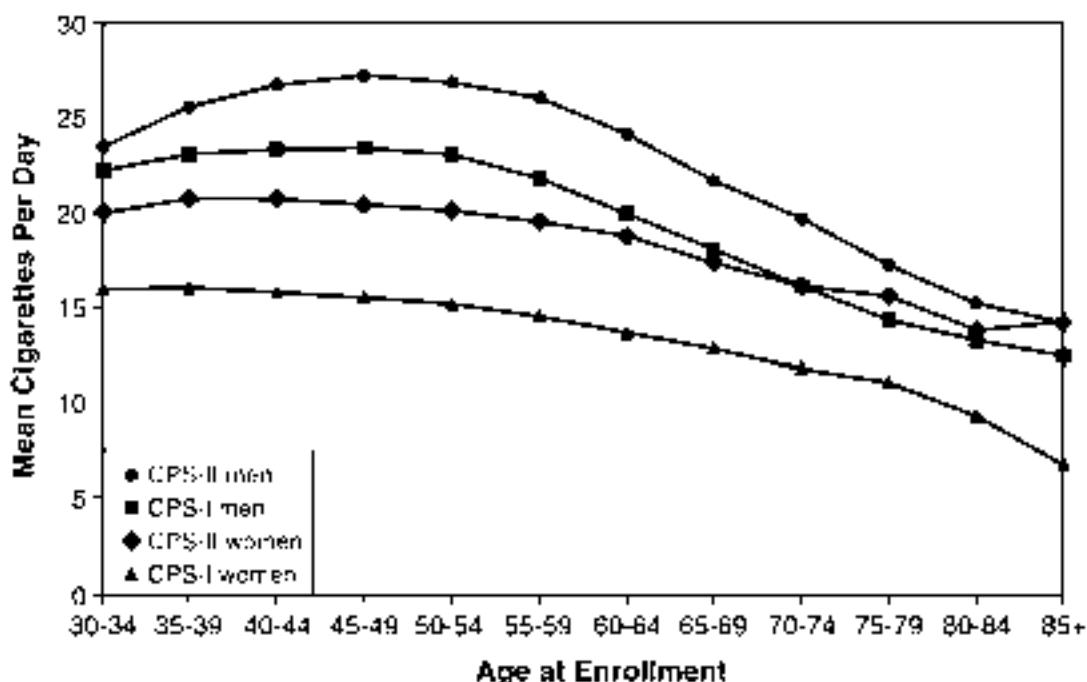
from the 1960's to the 1980's were similar, comparing CPS-I with CPS-II and NHIS-65 with NHIS-83 within race and sex subgroups.

Appendices 7 through 10 show that the age-specific prevalence of current cigarette smoking decreased markedly with age in all studies, although patterns of smoking differed among older participants in the two studies. In the 1960's (CPS-I and NHIS-65), older subjects included a larger proportion of never-smokers, reflecting the lower prevalence of beginning to smoke among persons born prior to 1900. In the 1980's (CPS-II and NHIS-83), older subjects included a larger proportion of former smokers as well as never-smokers, showing the increased contribution of smoking cessation. The combined influences of smoking cessation, lower uptake in earlier birth cohorts, and higher mortality in older smokers caused smokers to constitute a smaller fraction of the population with increasing age.

Cigarettes Smoked Per Day Figure 2 illustrates that the mean number of cigarettes smoked per day was higher at every age in CPS-II than in CPS-I and was greater in men than in women (except in CPS-II men age 85 and older). The mean difference in daily consumption between CPS-I and CPS-II at baseline did not exceed six cigarettes per day at any age except for women age 85 and older (mean values shown in Appendix 11). Men in CPS-I and CPS-II averaged 22.4 and 25.4 cigarettes per day, respectively, with age-specific differences

Figure 2

Mean number of cigarettes smoked daily at baseline by current smokers according to age at enrollment



in mean number of cigarettes smoked per day from 5 to 23 percent higher in CPS-II. The mean number of cigarettes smoked per day among women increased from 15.3 to 19.6, with the age-specific mean number of cigarettes per day from 27 to 107 percent higher in CPS-II. The average number of cigarettes smoked per day by all current smokers decreased in all groups after approximately 50 years of age. This age-related decline possibly reflected a combination of reduced consumption by individuals, higher mortality among heavier smokers, and lower cigarette consumption among earlier birth cohorts (Burns, 1994). More detailed categorical data on age-specific consumption patterns are shown in Appendixes 12 through 15 and reveal a consistent increase in the fraction of smokers in CPS-II who smoked 40 and 40+ cigarettes per day in every age group, although the NHIS data are imprecise because of the small number of subjects older than age 75. This trend also is observed in the NHIS data.

Age of Initiating Smoking Persons in more recent birth cohorts began smoking at progressively younger ages, particularly women born after 1910 and men born after 1890 (Table 3). Temporal trends were similar in CPS-I and CPS-II. The mean age of initiation was nearly identical in the two studies where the birth cohorts overlapped. Age of initiation in CPS-I and CPS-II closely paralleled published data from NHIS-87 and NHIS-88 (Centers for Disease Control,

Table 3
Average age of initiation among cigarette smokers^a by sex and birth cohort, CPS-I and CPS-II

Sex 1950	Study	Birth Cohort							
		1870	1880	1890	1900	1910	1920	1930	1940
Men									
	CPS-I	23.8	21.8	19.8	18.9	18.4	17.7	—	—
	CPS-II	—	—	19.2	18.8	18.2	17.8	17.6	17.2
	NHIS 87-88	—	—	—	—	17.5	17.2	17.1	17.0
Women									
	CPS-I	42.4	39.3	34.2	27.1	21.8	19.8	—	—
	CPS-II	—	—	33.7	27.1	22.4	20.9	19.6	18.4
	NHIS 87-88	—	—	—	—	22.9	21.0	19.4	17.5

^aBased on age of initiation among current cigarette smokers in the analytic cohorts of CPS-I and CPS-II (Table 1) and published data from the National Health Interview Surveys of 1987 and 1988, whites (Burns, 1994).

Key: CPS = Cancer Prevention Study; NHIS = National Health Interview Survey.

1991). Birth cohort data in Appendix 16 show the cumulative percentage of persons who began smoking before various ages. This percentage increased with later birth cohorts except among men who began smoking before 15 years of age. In this group the pattern was reversed, and the cumulative percentage decreased with later birth cohorts for unclear reasons. The fraction of smokers who initiated smoking before 15 years of age was substantially higher for CPS-II than for CPS-I among males for those cohorts where the two studies overlap.

Duration of Smoking Figure 3 shows the mean duration of smoking at baseline according to age at enrollment. Male current smokers of comparable age had smoked for a similar number of years in CPS-I and CPS-II at ages younger than 60, but the mean number of years of smoking was higher in CPS-II among older age groups of males (although for those men age 85 and older the difference was slight). Women had smoked longer in CPS-II than in CPS-I. The largest divergence between CPS-I and CPS-II occurred among women ages 65 to 69 and 70 to 74 at enrollment. For these groups, the duration was approximately 11 years longer in CPS-II than in CPS-I (Appendix 17). This difference in smoking duration reflected primarily the younger age at which women began smoking in CPS-II. For males older than age 60, the mean difference in duration for 5-year age groups varied from 0.4 to 2.2 years.

Depth of Inhalation A larger percentage of women reported inhaling cigarette smoke moderately or deeply in CPS-II than in CPS-I (Table 4). The distribution among male smokers did not change significantly according to self-report.

Tar Content of Cigarettes The measured tar content of cigarettes, as determined by machine smoking, decreased markedly from CPS-I (Garfinkel, 1979) to CPS-II (Federal Trade Commission, 1983). Figure 4 shows that most cigarette brands smoked by men at enrollment in CPS-I exceeded 17.0 mg, whereas most brands currently smoked in CPS-II had lower tar ratings. A similar shift in distribution was seen

Figure 3

Mean number of years of smoking cigarettes at baseline by current smokers according to age at enrollment

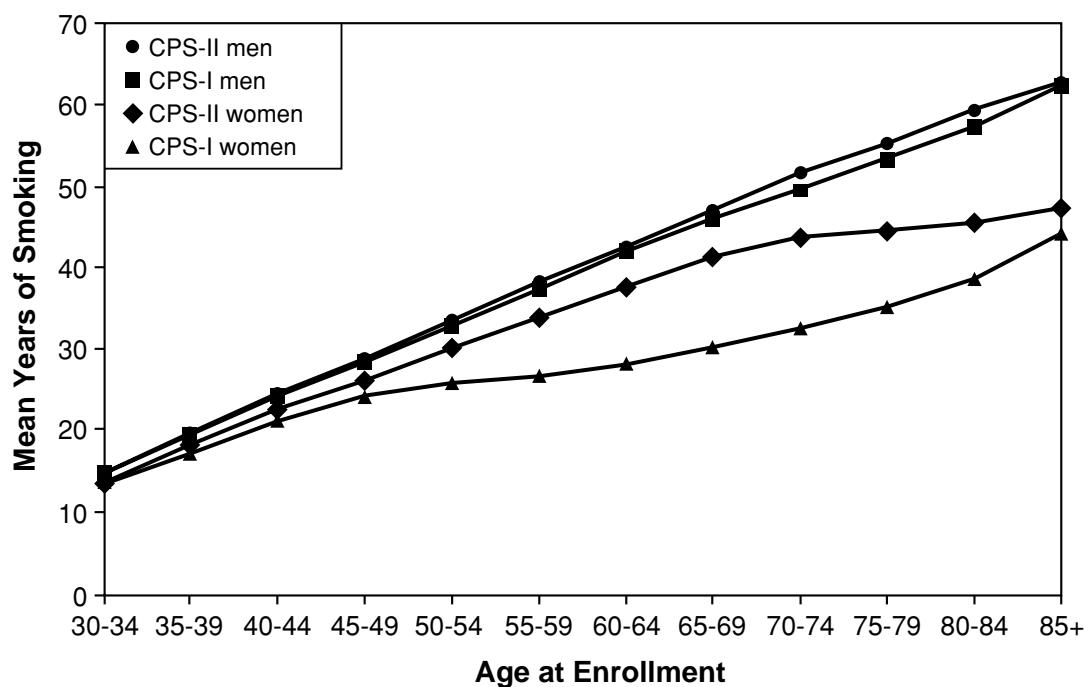


Table 4

Self-reported depth of inhalation among current cigarette smokers by sex and stu\$y

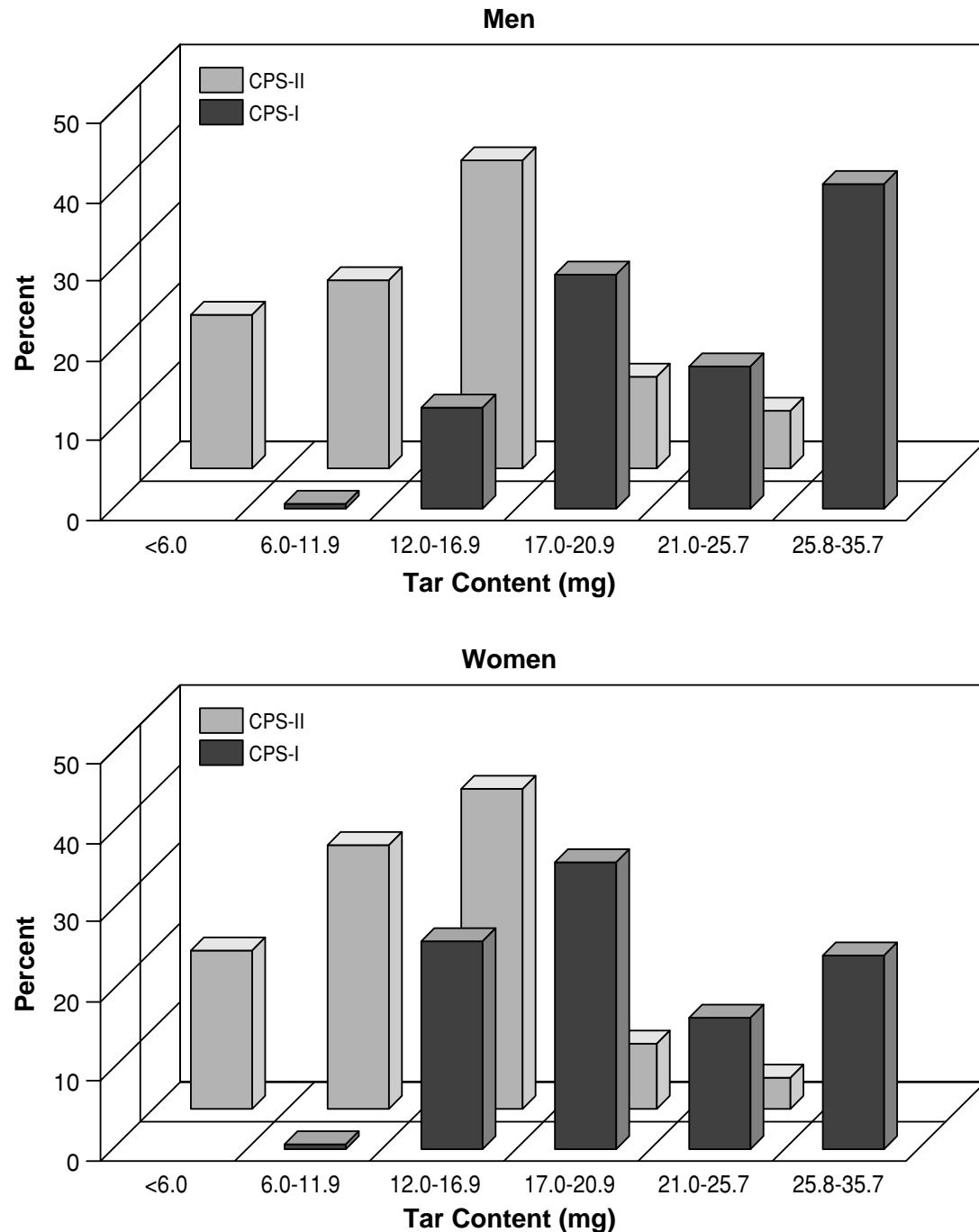
Depth of Inhalation	Men (%)		Women (%)	
	CPS-I (N = 146,459)	CPS-II (N = 101,888)	CPS-I (N = 152,228)	CPS-II (N = 126,794)
Do Not Inhale	5.8	5.5	13.0	6.8
Inhale Slightly	13.3	12.6	23.1	16.5
Inhale Moderately	55.6	53.2	51.4	60.4
Inhale Deeply	24.9	26.8	12.1	14.1
Unknown	0.5	1.8	0.4	2.3

Key: CPS = Cancer Prevention Study.

among women, although the tar content was lower in women's than in men's cigarettes (Appendix 18). These data reflect the brand smoked at the time of enrollment, and they may underestimate the tar content of cigarettes smoked earlier in life because the official ratings have decreased since the early 1950's (U.S. Department of Health and Human Services, 1993).

Figure 4

Percentage distribution of tar content, as measured by machine smoking, of the cigarette brand smoked at enrollment



Summary of Changes in Smoking From CPS-I to CPS-II Substantive changes in smoking practices occurred between CPS-I and CPS-II, but the direction of these changes was mixed and varied by sex: Prevalence decreased markedly in men but not in women; average daily cigarette consumption and duration of smoking increased in women more than in men but increased in CPS-II in both sexes; and machine-measured tar content decreased for both sexes. The increase in measured tobacco consumption from CPS-I to CPS-II was much larger in women than in men. The potential for unmeasured differences in cigarette smoking behavior between the two studies is discussed below.

Specific Causes of Death Age-specific death rates from lung cancer among current cigarette smokers and lifelong never-smokers are shown in Figure 5 and Appendixes 19 and 20. Lung cancer death rates were much higher in smokers than in never-smokers, except among women in CPS-I. Rates among both male and female smokers were substantially higher in CPS-II than in CPS-I for all ages older than 50. The absolute increase in death rates from CPS-I to CPS-II was similar among male and female smokers.

Among lifelong never-smokers, the lung cancer death rates changed relatively little from CPS-I to CPS-II (Appendices 19 and 20). The age-specific death rates were slightly higher in CPS-II than CPS-I among nonsmoking men older than 70 and nonsmoking women 50 and older although differences among CPS-II and CPS-I women did not become substantial until age 70 and older.

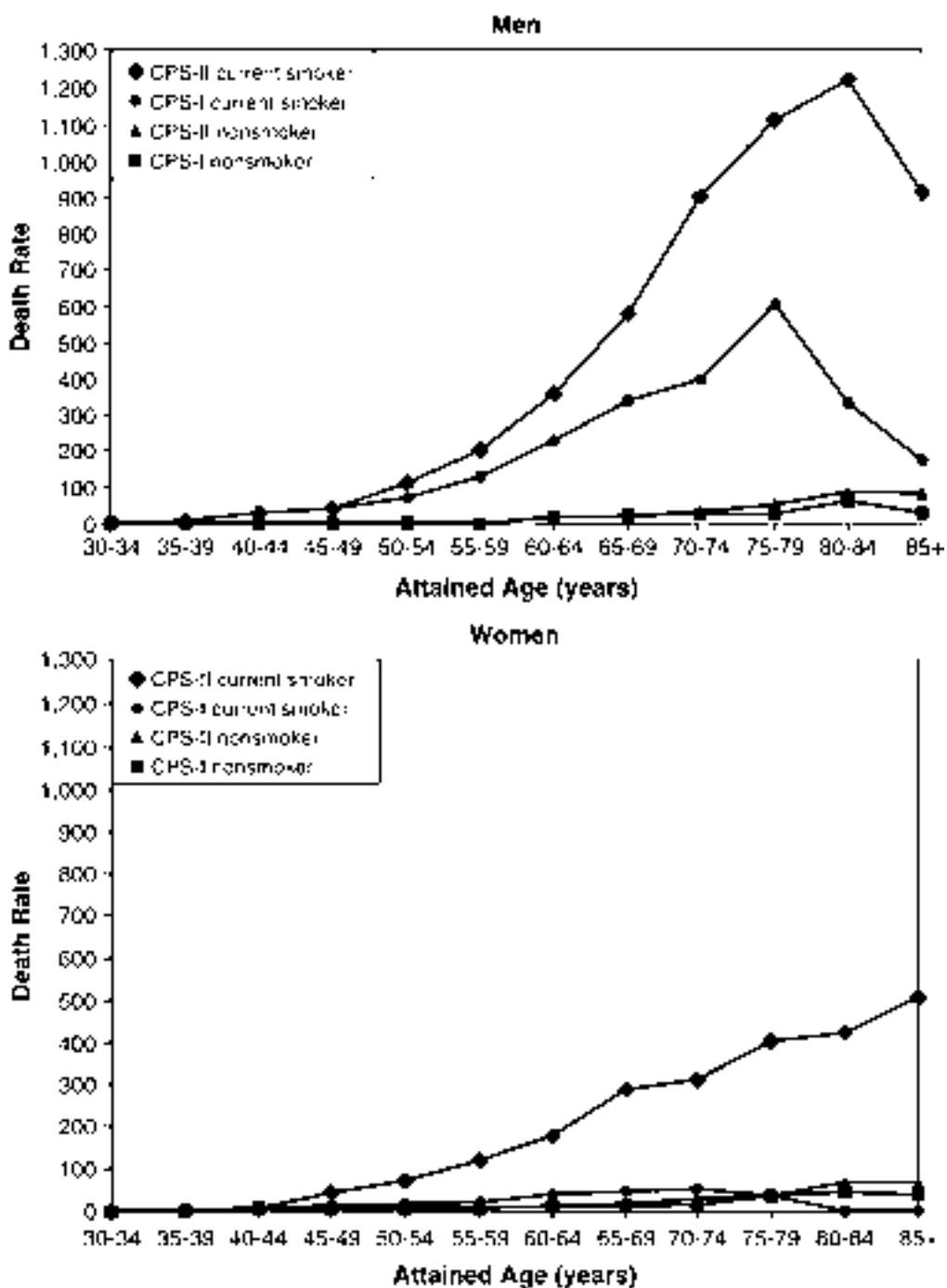
Age-adjusted death rates from lung cancer per 100,000 person-years (Table 5) increased from CPS-I to CPS-II among current cigarette smokers from 187.1 to 341.3 in men and from 26.1 to 154.6 in women. Among never-smokers the age-adjusted death rate did not change substantially between studies in either sex.

Taken together, the trends in lung cancer death rates among all current smokers (Figure 5 and Table 5) show that the epidemic in women smokers followed that in men by approximately 20 years. In CPS-I, the lung cancer death rate among male smokers was nearly twelvefold that for never-smokers, whereas the rate in women smokers had just begun to increase above that in never-smokers. Two decades later, the death rate among women smokers in CPS-II closely approached that of male smokers in CPS-I, whereas the rate in male smokers had again nearly doubled from CPS-I to CPS-II.

Lung Cancer Mortality by Amount and Duration of Smoking The differences between smokers in CPS-I and CPS-II with regard to number of cigarettes smoked per day and duration of smoking are potential explanations for the differences in age-specific lung cancer death rates between the two studies. Because of the difficulties in standardizing duration-specific rates described in Chapter 5, the most direct comparison of the lung cancer risks attributable to smoking between CPS-I and CPS-II is to compare stratum-specific lung cancer death rates in the two studies for 5-year age- and duration-specific strata among smokers of 20 and 40 cigarettes per day. Appendixes 3 and 4 present 5-year

Figure 5

Age-specific death rates from lung cancer among current cigarette smokers and lifelong never-smokers, based on smoking status at enrollment in CPS-I or CPS-II, according to attained age



^aRate per 100,000 person-years.

Table 5
Age-adjusted death rates, rate ratios, and rate differences for lung cancer^a—current cigarette smokers vs. never-smokers in CPS-I and CPS-II^b

Sex	CPS-I		CPS-II	
	Never-Smokers	Current Cigarette Smokers	Never-Smokers	Current Cigarette Smokers
Men				
Number of deaths	85	1,035	124	1,781
Rate ^c	15.7	187.1	14.7	341.3
Rate ratio	1.0	11.9	1.0	23.2
(95% CI)		(9.5-14.9)		(19.3-27.9)
Rate difference ^c		171.4		326.6
(95% CI)		(157-186)		(309-344)
Women				
Number of deaths	212	157	310	1,014
Rate ^c	9.6	26.1	12.0	154.6
Rate ratio	1.0	2.7	1.0	12.8
(95% CI)		(2.1-3.5)		(11.3-14.7)
Rate difference ^c		16.6		142.6
(95% CI)		(11-22)		(132-153)

^a Disease codes refer to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-7) and Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-9) (World Health Organization, 1957 and 1977, respectively) for CPS-I and CPS-II, respectively. Codes from ICD-7 and ICD-9 for lung cancer are 162-63 and 162, respectively.

^b Based on followup from 1959-65 (CPS-I) and 1982-88 (CPS-II) and tobacco smoking status at enrollment.

^c Age-adjusted death rates are directly standardized to the combined CPS-I and CPS-II person-years. Death rates and rate differences are expressed per 100,000 person-years.

Key: CPS = Cancer Prevention Study; CI = confidence interval.

age- and duration-specific strata among smokers of 20 and 40 cigarettes per day for males and females of all races with duration of smoking fixed at entry into the study and without excluding individuals who had cancer at entry into the study. Table 6 presents the lung cancer death rates for both studies for those strata in Appendix 3 with five or more lung cancer deaths and the results of subtracting the rates in CPS-II from those in CPS-I in strata where five or more deaths occurred in each study. There were too few deaths among women in CPS-I for meaningful comparison. The 50-plus duration category is excluded because of the potential for residual confounding by age and duration in this category, given the longer durations of smoking found among current smokers in CPS-II.

Consistent and substantial increases in lung cancer death rates were found among males in the two longer duration (and correspondingly older age) categories for smokers of 20 cigarettes per day. There was no trend toward higher rates in the difference between CPS-I and CPS-II for the two shorter duration categories for 20 cigarettes per day. When smokers of 40 cigarettes per day are examined, CPS-II has modestly higher rates (5 to 10 percent) in all age and duration categories.

Table 6
Comparison of lung cancer death rates between CPS-I and CPS-II for males of all races with prevalent cancers included

Lung Cancer Death Rates for Males of All Races, 20 Cigarettes Per Day, Duration Fixed at Entry Into the Study, 5+ Deaths in Cell														
CPS-I Rates					CPS-II Rates					CPS-II – CPS-I Difference in Rates				
Age	Duration				Age	Duration				Age	Duration			
	30-34	35-39	40-44	45-49		30-34	35-39	40-44	45-49		30-34	35-39	40-44	45-49
50-54	64.5	154.7			50-54	100	107.4			50-54	35.5	-47.3		
55-59	122.8	127.4	149.9		55-59	101.3	225.9	289.5		55-59	-21.5	98.5	139.6	
60-64		220.7	269.5	312.6	60-64		139.9	323.9	440.5	60-64		-80.8	54.4	127.9
65-69			330.2	449.5	65-69		550.5	583.7	563.2	65-69			253.5	113.7
70-74				304.1	70-74			722.9	551.9	70-74				247.8
75-79					75-79			2,225.5		75-79				

Lung Cancer Death Rates for Males of All Races, 40 Cigarettes Per Day, Duration Fixed at Entry Into the Study, 5+ Deaths in Cell

Lung Cancer Death Rates for Males of All Races, 40 Cigarettes Per Day, Duration Fixed at Entry Into the Study, 5+ Deaths in Cell														
CPS-I Rates					CPS-II Rates					CPS-II – CPS-I Difference in Rates				
Age	Duration				Age	Duration				Age	Duration			
	30-34	35-39	40-44	45-49		30-34	35-39	40-44	45-49		30-34	35-39	40-44	45-49
50-54	67.8				50-54	188	174.4			50-54	120.2			
55-59	136.1	189.8	327.1		55-59	161.5	235.2	354.8		55-59	25.4	45.4	27.7	
60-64		319.7	478.6	374.6	60-64		540.7	526.0	404.4	60-64		221	47.4	29.8
65-69			803.5	785.7	65-69		811.1	851.7	836.6	65-69			48.0	50.9
70-74					70-74			1,380.3	1356.2	70-74				

Note: Rates are those presented in Appendix 3. Rates are presented for all cells with five or more lung cancer deaths. Subtractions for the rates in CPS-II minus CPS-I are done only for cells with five or more deaths in the cell for both studies. Person-years of observation and deaths accrue in the age group the individual was in at the year of followup (age advanced) but accrue to the duration category at the time of entry to the study (duration fixed).

Key: CPS = Cancer Prevention Study.

We tested the possibility that including prevalent cases of lung cancer or smokers of various races could bias these results. Appendixes 5 and 6 present 5-year age- and duration-specific strata among smokers of 20 and 40 cigarettes per day for white males and females and with persons reporting prevalent cancers excluded. Table 7 presents the lung cancer death rates for both studies for those *st2ata* in Appendix 5 with five or more lung cancer deaths and the results of subtracting the rates in CPS-II from those in CPS-I in strata where five or more deaths occurred in each study. No clear trend in the differences between the two studies is evident for smokers of 40 cigarettes per day or for smokers of 20 cigarettes per day who had smoked for less than 40 years. White males who smoked 20 cigarettes for longer than 40 years had lung cancer death rates that were higher in CPS-II than in CPS-I.

Coronary Heart Disease Age-specific death rates from CHD are shown in Figure 6 and Appendixes 21 and 22. In both sexes, CHD death rates were higher in smokers than in never-smokers in both CPS-I and CPS-II. However, CHD death rates decreased markedly from CPS-I to CPS-II regardless of smoking status. The temporal trend was so large that smokers in CPS-II generally had lower death rates from CHD than did lifelong never-smokers in CPS-I (men beginning at age 65 and women beginning at age 60). Because the fall in death rates occurs among lifelong never-smokers as well as active cigarette smokers, reasons for the fall in age-specific death rates must include factors other than smoking cessation.

Age-adjusted death rates from CHD (Table 8) decreased from CPS-I to CPS-II by more than 50 percent. The fall in background CHD rates was slightly larger in proportionate terms among never-smokers than among smokers. Thus, on a relative scale the RR associating current cigarette smoking and CHD death increased from 1.7 to 1.9 in men and from 1.4 to 1.8 in women from CPS-I to CPS-II, respectively. On an absolute scale, the fall in background death rates caused the RD (per 100,000 person-years) to decrease from 486.8 to 253.4 in men and from 113.9 to 96.8 in women. CHD also contributed a smaller proportion of the total excess mortality among smokers in CPS-II than in CPS-I (see below).

Chronic Obstructive Pulmonary Disease Table 9 shows that age-adjusted death rates from COPD (per 100,000 person-years) increased among current male cigarette smokers from 73.6 in CPS-I to 103.9 in CPS-II and from 17.6 to 61.6 among female cigarette smokers. Age-specific death rates from COPD (Appendices 23 and 24) in smokers rose from CPS-I to CPS-II at nearly all ages in women and in those older than age 65 in men. The increase over time in death rates from COPD among smokers resembles the pattern seen with lung cancer, although COPD causes fewer excess deaths due to cigarette smoking.

Stroke Age-adjusted death rates from stroke (Table 10) decreased by more than 55 percent from CPS-I to CPS-II among both smokers and never-smokers. As with CHD, the fall in background death rates was proportionately larger in never-smokers than smokers. Thus, the RR between current cigarette smoking and death from stroke increased from 1.3 to 1.9 in men and from

Table 7
Comparison of lung cancer death rates between CPS-I and CPS-II for white males with prevalent cancers excluded

Lung Cancer Death Rates for White Males, 20 Cigarettes Per Day, Duration Fixed at Entry Into the Study, 5+ Deaths in Cell														
CPS-I Rates					CPS-II Rates					CPS-II – CPS-I Difference in Rates				
Age	Duration				Age	Duration				Age	Duration			
	30-34	35-39	40-44	45-49		30-34	35-39	40-44	45-49		30-34	35-39	40-44	45-49
50-54	64	138.2			50-54	80.1	85.6			50-54	16.1	-52.6		
55-59	120.9	124.8	135.1		55-59	101.7	197.8	235.5		55-59	-19.2	73	100.4	
60-64		209.8	254.4	289.8	60-64		156.6	296.4	395.6	60-64		-53.2	42	105.8
65-69			342.7	442.6	65-69		542.7	509	587.7	65-69			166.3	145.1
70-74				320.1	70-74			687	533.2	70-74				213.1

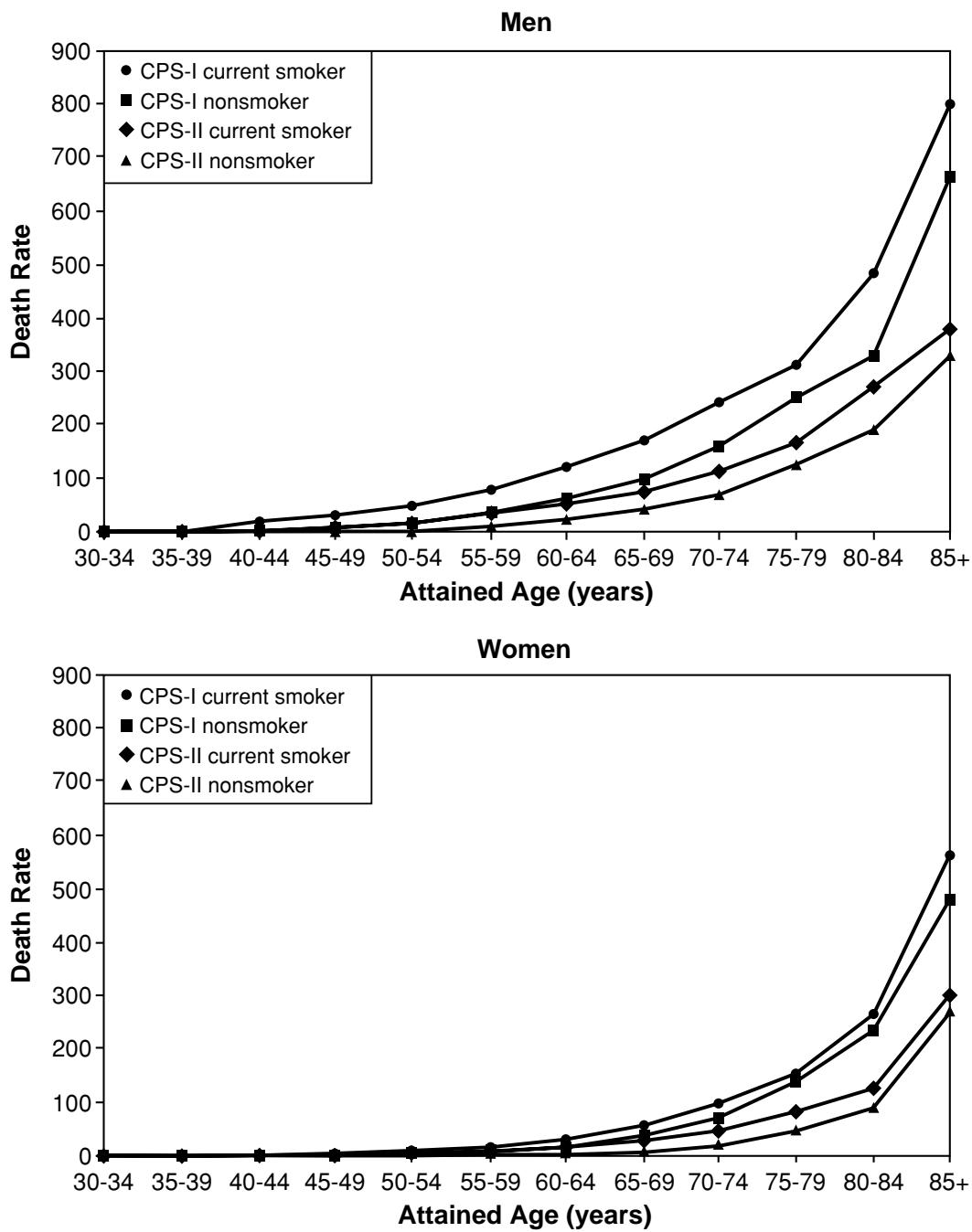
Lung Cancer Death Rates for White Males, 40 Cigarettes Per Day, Duration Fixed at Entry Into the Study, 5+ Deaths in Cell														
CPS-I Rates					CPS-II Rates					CPS-II – CPS-I Difference in Rates				
Age	Duration				Age	Duration				Age	Duration			
	30-34	35-39	40-44	45-49		30-34	35-39	40-44	45-49		30-34	35-39	40-44	45-49
50-54	69.1				50-54	187.6	185.5			50-54	118.5			
55-59	139.6	194.3	333.9		55-59	107.3	228.2	341.6		55-59	-32.3	33.9	7.7	
60-64		247.3	466.1		60-64		568.4	475.9	434.2	60-64		321.1	9.8	
65-69			850.1	814.2	65-69		855.3	930.1	747.7	65-69		80	-66.5	
70-74					70-74				1,062.5	70-74				

Note: Rates are those presented in Appendix 5. Rates are presented for all cells with five or more lung cancer deaths. Subtractions for the rates in CPS-II minus CPS-I are done only for cells with five or more deaths in the cell for both studies. Person-years of observation and deaths accrue in the age group the individual was in at the year of followup (age advanced) but accrue to the duration category at the time of entry to the study (duration fixed).

Key: CPS = Cancer Prevention Study.

Figure 6

Age-specific death rates from coronary heart disease among current cigarette smokers and lifelong never-smokers, based on status at enrollment in CPS-I or CPS-II, according to attained age



^a Rate per 100,000 person-years.

Table 8

Age-adjusted death rates, rate ratios, and rate differences for coronary heart disease^a—current cigarette smokers vs. never-smokers in CPS-I and CPS-II^b

Sex	CPS-I		CPS-II	
	Never-Smokers	Current Cigarette Smokers	Never-Smokers	Current Cigarette Smokers
Men				
Number of deaths	3,769	6,068	2,536	2,722
Rate ^c	681.2	1,168.0	294.6	548.0
Rate ratio (95% CI)	1.0	1.7 (1.6-1.8)	1.0	1.9 (1.8-2.0)
Rate difference ^c (95% CI)		486.8 (440-533)		253.4 (227-280)
Women				
Number of deaths	7,065	1,248	3,717	1,161
Rate ^c	305.6	419.5	118.3	215.1
Rate ratio (95% CI)	1.0	1.4 (1.3-1.5)	1.0	1.8 (1.7-2.0)
Rate difference ^c (95% CI)		113.9 (79-149)		96.8 (82-111)

^aDisease codes refer to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-7) and Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-9) (World Health Organization, 1957 and 1977, respectively), for CPS-I and CPS-II, respectively. Codes for coronary heart disease are 420 and 410-414, respectively.

^bBased on followup from 1959-65 (CPS-I) and 1982-88 (CPS-II) and tobacco smoking status at enrollment.

^cAge-adjusted death rates are directly standardized to the combined CPS-I and CPS-II person-years.

Death rates and rate differences are expressed per 100,000 person-years.

Key: CPS = Cancer Prevention Study; CI = confidence interval.

1.2 to 1.8 in women from CPS-I to CPS-II. The RD (per 100,000 person-years) between smokers and never-smokers changed minimally, decreasing from 55.5 to 50.4 in men and increasing from 25.1 to 34.0 in women. Appendixes 25 and 26 present age-, sex-, and smoking-specific death rates for stroke.

Other Smoking-Related Cancers As shown in Table 11, age-adjusted death rates from smoking-related cancers other than lung cancer increased among smokers from 102.5 to 120.1 in men and from 45.8 to 53.4 in women from CPS-I to CPS-II. Both the RR and the RD increased as well, paralleling the pattern seen with lung cancer. Age-specific death rates from other cancers were higher in CPS-I compared with CPS-II among smokers of both sexes at nearly every age, although the trend was less consistent among women (Appendices 27 and 28).

All-Cause Mortality Age-adjusted death rates from all causes (Table 12) decreased substantially from CPS-I to CPS-II among lifelong never-smokers, reflecting smokers the decrease in death rates from vascular diseases was partially offset by increased smoking-related deaths from lung cancer, other cancers,

Table 9

Age-adjusted death rates, rate ratios, and rate differences for COPD^a—current cigarette smokers vs. never-smokers in CPS-I and CPS-II^b

Sex	CPS-I		CPS-II	
	Never-Smokers	Current Cigarette Smokers	Never-Smokers	Current Cigarette Smokers
Men				
Number of deaths	44	284	78	422
Rate ^c	8.0	73.6	8.9	103.9
Rate ratio (95% CI)	1.0	9.3 (6.6-12.9)	1.0	11.7 (9.1-15.0)
Rate difference ^c (95% CI)		65.7 (54-77)		95.0 (83-107)
Women				
Number of deaths	61	56	143	303
Rate ^c	2.6	17.6	4.8	61.6
Rate ratio (95% CI)	1.0	6.7 (4.4-10.2)	1.0	12.8 (10.4-15.9)
Rate difference ^c (95% CI)		15.0 (9-21)		56.8 (49-65)

^a Disease codes refer to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-7) and Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-9) (World Health Organization, 1957 and 1977, respectively), for CPS-I and CPS-II, respectively. Codes from ICD-7 and ICD-9 for chronic obstructive pulmonary disease are 500-502, 527.1, and 490-492, 496, respectively.

^b Based on followup from 1959-65 (CPS-I) and 1982-88 (CPS-II) and tobacco smoking status at enrollment.

^c Age-adjusted death rates are directly standardized to the combined CPS-I and CPS-II person-years.

Death rates and rate differences are expressed per 100,000 person-years.

Key: CPS = Cancer Prevention Study; CI = confidence interval.

and COPD. Thus, the all-cause RR increased from 1.7 to 2.3 in men and from 1.2 to 1.9 in women in CPS-I and CPS-II, respectively. The all-cause RD (per 100,000 person-years) was essentially unchanged in men but increased in women from 244.6 to 508.7.

Age-specific and smoking-specific death rates from all causes are shown in Appendixes 29 and 30. The all-cause death rate in men ages 40 to 69 was about three times higher in smokers than never-smokers in CPS-II and was about twice as high in CPS-I (Peto et al., 1992). The increased RR in middle-aged men reflected both the increasing risk of lung cancer in smokers and the decreasing cardiovascular mortality, regardless of smoking status.

Attributable Risk in Smokers Table 13 shows that the proportion of all deaths among current cigarette smokers attributable to cigarette smoking (etiologic fraction in the exposed group) increased from CPS-I to CPS-II from 42.2 to 57.1 percent in men and from 18.7 to 47.9 percent in women. Table 14 shows the percentage of the all-cause RD contributed by various diseases. Lung cancer contributed a larger proportion of the all-cause RD in CPS-II. This proportion increased from 14.7 to 28.1 percent in men and from

Table 10

Age-adjusted death rates, rate ratios, and rate differences for stroke^a—current cigarette smokers vs. never-smokers in CPS-I and CPS-II^b

Sex	CPS-I		CPS-II	
	Never-Smokers	Current Cigarette Smokers	Never-Smokers	Current Cigarette Smokers
Men				
Number of deaths	1,126	960	501	476
Rate ^c	198.1	253.6	57.3	107.6
Rate ratio (95% CI)	1.0	1.3 (1.2-1.4)	1.0	1.9 (1.6-2.2)
Rate difference ^c (95% CI)		55.5 (30-81)		50.4 (38-63)
Women				
Number of deaths	3,319	537	1,331	423
Rate ^c	141.1	166.2	40.6	74.5
Rate ratio (95% CI)	1.0	1.2 (1.0-1.4)	1.0	1.8 (1.6-2.1)
Rate difference ^c (95% CI)		25.1 (3-47)		34.0 (26-42)

^aDisease codes refer to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-7) and Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-9) (World Health Organization, 1957 and 1977, respectively), for CPS-I and CPS-II, respectively. Codes from ICD-7 and ICD-9 for stroke are 33033-4 and 430-438, respectively.

^bBased on followup from 1959-65 (CPS-I) and 1982-88 (CPS-II) and tobacco smoking status at enrollment.

^cAge-adjusted death rates are directly standardized to the combined CPS-I and CPS-II person-years.

Death rates and rate differences are expressed per 100,000 person-years.

Key: CPS = Cancer Prevention Study; CI = confidence interval.

6.8 to 28.0 percent in women in CPS-I and CPS-II, respectively (Table 14). The corresponding proportions contributed by CHD decreased from 41.7 to 21.8 percent in men and from 46.6 to 19.0 percent in women.

DISCUSSION We found that the risk of premature death among active cigarette smokers continued unabated from the 1960's to the 1980's. Despite major changes in cigarettes, patterns of smoking, and background death rates from cardiovascular diseases, the absolute difference in all-cause death rates between smokers and lifelong never-smokers more than doubled in women and remained nearly constant in men over this interval. In relative terms, the overall death rate for men ages 40 to 69 in CPS-II was about three times higher in smokers than in never-smokers compared with the doubling observed in CPS-I (Peto et al., 1992).

Of the various diseases caused by smoking, the largest increase in death rates was because of lung cancer. Although remaining essentially constant in lifelong never-smokers, lung cancer death rates increased almost sixfold among female smokers and nearly doubled among male cigarette smokers from CPS-I to CPS-II (Table 5). This increase in the 6-year CPS-II followup

Table 11

Age-adjusted death rates, rate ratios, and rate differences for other smoking-related cancers^a—current cigarette smokers vs. never-smokers in CPS-I and CPS-II^b

Sex	CPS-I		CPS-II	
	Never-Smokers	Current Cigarette Smokers	Never-Smokers	Current Cigarette Smokers
Men				
Number of deaths	205	536	290	610
Rate ^c	37.5	102.5	34.6	120.1
Rate ratio (95% CI)	1.0	2.7 (2.3-3.3)	1.0	3.5 (3.0-4.0)
Rate difference ^c (95% CI)		64.9 (53-77)		85.6 (74-97)
Women				
Number of deaths	567	190	553	332
Rate ^c	25.2	45.8	21.0	53.4
Rate ratio (95% CI)	1.0	1.8 (1.5-2.3)	1.0	2.6 (2.2-2.9)
Rate difference ^c (95% CI)		20.6 (11-30)		32.4 (26-39)

^a Disease codes refer to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-7) and Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-9) (World Health Organization, 1957 and 1977, respectively), for CPS-I and CPS-II, respectively. Codes from ICD-7 and ICD-9 for other smoking-related cancers include lip/oral cavity/pharynx, 140-148 and 140-149, respectively; esophagus, 150 in both versions; pancreas, 157 in both versions; larynx, 161 in both versions; kidney/bladder/other urinary, 180-181 and 188-189, respectively.

^b Based on followup from 1959-65 (CPS-I) and 1982-88 (CPS-II) and tobacco smoking status at enrollment.

^c Age-adjusted death rates are directly standardized to the combined CPS-I and CPS-II person-years (Appendix 2). Death rates and rate differences are expressed per 100,000 person-years.

Key: CPS = Cancer Prevention Study; CI = confidence interval.

is slightly larger than that seen in the 4-year CPS-II followup reported in the 1989 U.S. Surgeon General's report (U.S. Department of Health and Human Services, 1989). Both analyses suggest that the epidemic of lung cancer in the United States has been confined largely to smokers, at least among the white, predominantly middle-class populations that CPS-I and CPS-II participants represent. The rising lung cancer risk among smokers is presumably an important factor in sustaining lung cancer death rates in the general U.S. population. Although the percentage of men who currently smoke cigarettes has decreased from 52 percent in 1965 to 28 percent in 1992 (Centers for Disease Control and Prevention, 1994; U.S. Department of Health and Human Services, 1993), the lung cancer death rate in U.S. men has leveled rather than declined since 1980 (Boring et al., 1994). The substantial decrease in lung cancer risk that occurs 5 to 15 years after cessation (U.S. Department of Health and Human Services, 1990) may be partially offset by increasing risk among persons who continue to smoke.

Table 12
Age-adjusted death rates, rate ratios, and rate differences for deaths from all causes—current cigarette smokers vs. never-smokers in CPS-I and CPS-II^a

Sex	CPS-I		CPS-II	
	Never-Smokers	Current Cigarette Smokers	Never-Smokers	Current Cigarette Smokers
Men				
Number of deaths	8,919	13,551	7,448	9,899
Rate ^b	1,605	2,773	874.0	2,037
Rate ratio (95% CI)	1.0	1.7 (1.7-1.8)	1.0	2.3 (2.3-2.4)
Rate difference ^b (95% CI)		1,168.1 (1,095-1,241)		1,162.7 (1,113-1,213)
Women				
Number of deaths	24,007	4,921	15,450	6,232
Rate ^b	1,047	1,291	550.0	1,059
Rate ratio (95% CI)	1.0	1.2 (1.2-1.3)	1.0	1.9 (1.9-2.0)
Rate difference ^b (95% CI)		244.6 (186-303)		508.7 (478-540)

^aBased on followup from 1959-65 (CPS-I) and 1982-88 (CPS-II) and tobacco smoking status at enrollment.

^bAge-adjusted death rates are directly standardized to the combined CPS-I and CPS-II person-years (Appendix 2).

Death rates and rate differences are expressed per 100,000 person-years.

Key: CPS = Cancer Prevention Study; CI = confidence interval.

Table 13
Percentage of deaths attributable to active smoking among current cigarette smokers in CPS-I and CPS-II^a

Disease	Percent in Men		Percent in Women	
	CPS-I	CPS-II	CPS-I	CPS-II
Lung Cancer	91.6	95.7	63.4	92.2
Coronary Heart Disease	41.5	46.2	27.0	45.1
Chronic Obstructive Pulmonary Disease	89.2	91.4	85.0	92.2
Stroke	21.9	46.8	15.2	45.7
Other Smoking-Related Cancers	63.4	71.2	45.0	60.8
All Causes	42.2	57.1	18.7	47.9

^aAttributable risk among exposed persons (Rothman, 1986) based on Tables 5 and 8 through 12.

Key: CPS = Cancer Prevention Study.

Table 14

Percentage of the total rate difference for all causes between smokers and never-smokers contributed by various diseases^a

Disease	Percent in Men		Percent in Women	
	CPS-I	CPS-II	CPS-I	CPS-II
Lung Cancer	14.7	28.1	6.8	28.0
Coronary Heart Disease	41.7	21.8	46.6	19.0
Chronic Obstructive Pulmonary Disease	5.6	8.2	6.1	11.2
Stroke	4.7	4.3	10.3	6.7
Other Smoking-Related Cancers	5.6	7.4	8.4	6.4
Other Conditions	27.7	30.2	21.8	28.7

^aBased on the cause-specific rate difference divided by the all-cause rate difference in Tables 5 and 8 through 12.

Key: CPS = Cancer Prevention Study.

Caution is urged in interpreting the comparison of lung cancer death rates at "equivalent" levels of self-reported smoking. Information on the number of cigarettes smoked at enrollment may not mirror the lifelong patterns of smoking that cause lung cancer. Cigarette consumption during adolescence and early adulthood was probably heavier among smokers in CPS-II than in CPS-I for several reasons. First, manufactured cigarettes were more available in the 1940's and 1950's than in the 1920's and 1930's (U.S. Department of Health and Human Services, 1989). CPS-II smokers born in the late 1920's typically began smoking after World War II when cigarettes were plentiful and there were few prohibitions against smoking. Second, birth cohort analyses of the U.S. general population show that the peak prevalence of smoking among white men increased with each successive birth cohort from 1900 to 1929 and decreased thereafter (Burns, 1994). Similarly, age-specific death rates from lung cancer death rates have decreased among U.S. men born after 1930 (Devesa et al., 1989; Gilliland and Samet, 1994). Thus, the large increase in death rates from CPS-I to CPS-II probably reflects unmeasured heavier smoking in CPS-II during the 1940's and 1950's as well as the measured increase in daily consumption and duration of smoking.

Other factors that could influence the intensity of cigarette smoking are that CPS-II smokers may include more addicted "hard core" smokers who cannot quit despite health and social concerns. Partly to compensate for the lower tar and nicotine content of modern cigarettes (U.S. Department of Health and Human Services, 1989), CPS-II smokers may inhale more deeply, take more puffs per cigarette, or retain the smoke longer in their lungs than did smokers in the past (Benowitz et al., 1983 and 1986; Herning et al., 1981; Russell et al., 1980; U.S. Department of Health and Human Services, 1988). Strong social prohibitions against smoking may have caused CPS-II smokers to underreport usage or to reduce their consumption in an effort to quit.

Smokers in the 1980's also may have been more vulnerable to the carcinogens in tobacco smoke because of lower dietary intake of fresh fruits and vegetables (Subar et al., 1990; Willett, 1990). Finally, the large decrease in cardiovascular mortality from CPS-I to CPS-II could contribute somewhat to the increasing lung cancer death rates, although most potential confounding resulting from competing causes was eliminated by stratifying person-years at risk into 5-year age intervals.

Despite the many uncertainties that constrain the ability to compare the intrinsic carcinogenicity of cigarettes from these two eras, the net effect of all changes in the cigarette and the smoking of cigarettes has been a large increase rather than decrease in lung cancer mortality in smokers. Although low-tar, filter-tip cigarettes have been shown to slightly reduce lung cancer risk compared with nonfiltered cigarettes in several epidemiologic studies (Hammond, 1980; Hammond et al., 1976; Lubin et al., 1984a and 1984b; Vutuc and Kunze, 1982; Wynder et al., 1970), the potential benefits of these products are clearly overwhelmed by the more potent adverse changes in smoking behavior and perhaps by other unidentified factors. The evaluation of cigarettes has not protected smokers from fatal lung cancer.

The falling death rates from CHD and stroke seen in this study reflect major nationwide declines that began for CHD in the mid-1960's and for stroke in the 1940's or earlier (Cooper et al., 1978; Higgins and Thom, 1989; Moriyama et al., 1971; Ragland et al., 1988; Russell et al., 1980). Data suggest that much of the decline results from factors other than smoking cessation because mortality decreased among both current smokers and lifelong never-smokers, groups largely unaffected by smoking cessation. Much of the nationwide decline in CHD mortality probably reflects reduced mortality resulting from therapeutic advances. We measured mortality rather than incidence and could not distinguish between changes in incidence because of diet, exercise, antihypertensive or antithrombotic therapy, control of lipids, or improvement in survival because of medical care. Most of these factors, as well as smoking cessation, are thought to play some role in the nationwide CHD decline (Cooper et al., 1978; Higgins and Thom, 1989; Moriyama et al., 1971; Ragland et al., 1988; Russell et al., 1980), although their relative importance is unknown.

Because CPS-I and CPS-II include mostly white middle-class Americans (Garfinkel, 1985; Stellman and Garfinkel, 1986), it cannot be concluded that the trend of falling CHD mortality will affect all segments of the U.S. population equally. For the poor and minorities in particular, more limited access to medical treatment and prevention may result in a slower decline in CHD mortality (Cooper et al., 1978) and proportionately greater CHD mortality as a cause of excess death in smokers. Because the poor are increasingly overrepresented among the 46 million Americans who smoke, the authors' data may underestimate the excess in CHD mortality among smokers in the general population.

In summary, CPS-I and CPS-II suggest that the epidemic of tobacco-caused deaths in the United States has not been static but has varied dynamically over time as smoking patterns have evolved and background risks have changed. Nonetheless, cigarette smoking remains the single largest preventable cause of premature mortality in the United States.

CONCLUSIONS Measured changes in smoking practices from CPS-I to CPS-II were mixed. A smaller percentage of men smoked cigarettes in 1982 than in 1959, and cigarette brands had lower tar content as measured by machine smoking. However, both men and women smokers consumed more cigarettes per day, on average; women in 1982 began smoking earlier, smoked longer, and reported inhaling cigarette smoke more deeply.

Temporal trends in cigarette smoking from CPS-I to CPS-II generally resembled trends seen in representative U.S. surveys. A greater decrease in smoking prevalence among men occurred comparing CPS-I and CPS-II participants than in NHIS-65 to NHIS-83 participants, probably because of the higher educational background of the CPS study participants.

Among cigarette smokers, lung cancer death rates from CPS-I to CPS-II nearly doubled in men and increased almost sixfold in women. Lung cancer rates remained essentially constant in lifelong never-smokers.

Comparisons of cigarettes-per-day-, age-, and duration-specific strata reveal modest increases in the lung cancer death rates in CPS-II compared with CPS-I for males of all races who smoked 40 cigarettes per day and when prevalent cancers are included. No consistent difference between the rates for the two studies is noted for the comparison of strata-specific rates of white males who smoked 20 cigarettes per day until they have smoked more than 40 years. The rates for smokers of 20 cigarettes per day who have smoked for 40 to 49 years are substantially higher in CPS-II than in CPS-I for males of all races with prevalent cancers included and for white males with prevalent cancers excluded.

The evolution of cigarettes has not protected smokers from fatal lung cancer. Rather, the potential benefits of reduced tar, as measured by machine smoking, appear to be overwhelmed by adverse changes in smoking practices and perhaps by other unidentified factors.

Although smoking cessation clearly reduces the risk of CHD and stroke, much of the temporal decline in CHD and stroke mortality from CPS-I to CPS-II appeared to reflect factors other than smoking cessation because similar reductions were seen among current cigarette smokers and lifelong never-smokers.

The percentage of all deaths attributable to active cigarette smoking was higher in CPS-II than in CPS-I, increasing from 42.2 to 57.1 percent in men and from 18.7 to 47.9 percent in women.

The two major diseases contributing to accelerated mortality among smokers reversed from CPS-I to CPS-II: Lung cancer became the largest single contributor in 1982, with CHD in second place.

REFERENCES

- Benowitz, N.L., Hall, S.M., Herning, R.I., Jacob, P. III, Jones, R.T., Osman, A.L. Smokers of low-yield cigarettes do not consume less nicotine. *New England Journal of Medicine* 309: 139-142, 1983.
- Benowitz, N.L., Jacob, P. III, Kozlowski, L.T., Yu, L. Influence of smoking fewer cigarettes on exposure to tar, nicotine, and carbon monoxide. *New England Journal of Medicine* 315: 1310-1313, 1986.
- Boring, C.C., Squires, T.S., Tong, T., Montgomery, S. Cancer statistics, 1994. *CA Cancer Journal for Clinicians* 44(1): 7-26, 1994.
- Burns, D.M. Tobacco smoking. In: *Epidemiology of Lung Cancer*, J.M. Samet (Editor). New York: Marcel Dekker, 1994, pp. 15-49.
- Centers for Disease Control. Differences in the age of smoking initiation between blacks and whites—United States. *MMWR. Morbidity and Mortality Weekly Report* 40(44): 754-757, 1991.
- Centers for Disease Control and Prevention. Cigarette smoking among adults—United States 1992, and changes in the definition of current cigarette smoking. *MMWR. Morbidity and Mortality Weekly Report* 43(43): 801-803, 1994.
- Cooper, R., Stamler, J., Dyer, A., Garside, D. The decline in mortality from coronary heart disease, U.S.A., 1968-1975. *Journal of Chronic Diseases* 31(12): 709-720, 1978.
- Devesa, S.S., Blot, W.J., Fraumeni, J.F. Declining lung cancer rates among young men and women in the United States: A cohort analysis. *Journal of the National Cancer Institute* 81: 1568-1571, 1989.
- Doll, R., Hill, A.B. Mortality of British doctors in relation to smoking: Observations on coronary thrombosis. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 205-268.
- Doll, R., Peto, R. Mortality in relation to smoking: 20 years' observation on male British doctors. *British Medical Journal* 2: 1525-1536, 1976.
- Federal Trade Commission. "Tar," Nicotine and Carbon Monoxide of the Smoke of 208 Varieties of Domestic Cigarettes." Internal Federal Trade Commission report, March 1983. 18 pp.
- Flanders, W.D. Approximate variance formulas for standardized rate ratios. *Journal of Chronic Diseases* 37: 449-453, 1984.
- Garfinkel, L. Changes in the cigarette consumption of smokers in relation to changes in tar/nicotine content of cigarettes smoked. *American Journal of Public Health* 69: 1274-1276, 1979. (Cites the only published source of tar content in 1959 as Foster D. Snell Inc., in the November 1959 issue of *Reader's Digest*.)
- Garfinkel, L. Selection, follow-up, and analysis in the American Cancer Society prospective studies. *National Cancer Institute Monographs* 67: 49-52, 1985.
- Garfinkel, L., Stellman, S.D. Smoking and lung cancer in women: Findings in a prospective study. *Cancer Research* 48: 6951-6955, 1988.
- Gilliland, F.D., Samet, J.M. Lung cancer. In: *Trends in Cancer Incidence and Mortality*. R. Doll, J.F. Fraumeni, and C.S. Muir (Editors). Plainview, NY: Cold Spring Harbor Laboratory Press, 1994, pp. 175-195.
- Hammond, E.C. Smoking in relation to mortality and morbidity. Findings in first thirty-four months of followup in a prospective study started in 1959. *Journal of the National Cancer Institute* 32: 1161-1188, 1964.
- Hammond, E.C. Smoking in relation to the death rates of one million men and women. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 127-204.
- Hammond, E.C. The long-term benefits of reducing tar and nicotine in cigarettes. In: *Banbury Report 3: A Safe Cigarette?*, G.B. Gori and F.G. Bock (Editors). Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press, 1980, pp. 13-18.
- Hammond, E.C., Garfinkel, L., Seidman, H., Lew, E.A. Tar and nicotine content of cigarette smoke in relation to death rates. *Environmental Research* 12(3): 263-274, 1976.
- Hammond, E.C., Garfinkel, L., Seidman, H., Lew, E.A. Some recent findings concerning cigarette smoking. In: *Origins of Human Cancer*, H.H. Hiatt, J.D. Watson, and J.A. Winstein (Editors). Cold Spring Harbor, NY: Cold Spring Harbor Laboratory Press, 1977, pp. 101-112.
- Herning, R.I., Jones, R.T., Bachman, J., Mines, A.H. Puff volume increases when low-nicotine cigarettes are smoked. *British Medical Journal* 283(6285): 187-189, 1981.
- Higgins, M., Thom, T. Trends in CHD in the United States. *International Journal of Epidemiology* 18(3 Suppl 1): S58-S66, 1989.
- Kahn, H.A. The Dorn study of smoking and mortality among U.S. veterans: Report on eight and one-half years of observation. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 1-125.

- Kovar, M.G., Poe, G.S. *The National Health Interview Survey Design, 1973-1984, and Procedures, 1975-1983.* (Vital and Health Statistics, Series 1, No. 18.) DHHS Publication No. (PHS) 85-1320. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, Health Resources Administration, National Center for Health Statistics, 1985.
- Lubin, J.H., Blot, W.J., Berrino, F., Flamant, R., Gillis, C.R., Kunze, M., Schmahl, D., Visco, G. Modifying risk of developing lung cancer by changing habits of cigarette smoking. *British Medical Journal* 288: 1953-1956, 1984a.
- Lubin, J.H., Blot, C.W., Berrino, F., Flamant, R., Gillis, C.R., Kunze, M., Schmahl, D., Visco, G. Patterns of lung cancer risk according to type of cigarette smoked. *International Journal on Cancer* 33: 569-576, 1984b.
- Massey, J.T., Moore, T.F., Parsons, V.L., Tadros, W. *Design and Estimation for the National Health Interview Survey, 1985-1994.* (Vital and Health Statistics, Series 2, No. 110.) DHHS Publication No. (PHS) 87-1384. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, Health Resources Administration, National Center for Health Statistics, 1989.
- Moriyama, I., Kreuger, D.E., Stamler, J. *Cardiovascular Diseases in the United States.* Cambridge, MA: Harvard University Press, 1971.
- National Center for Health Statistics. *Health Interview Survey Procedures, 1957-1974.* (Vital and Health Statistics, Series 1, No. 11.) DHEW Publication No. (HRA) 75-1311. Hyattsville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, Health Resources Administration, National Center for Health Statistics, 1975.
- Peto, R., Lopez, A.D., Boreham, J., Thun, M., Heath, C. Mortality from tobacco in developed countries: Indirect estimation from national vital statistics. *The Lancet* 339: 1268-1278, 1992.
- Ragland, K.E., Selvin, S., Merrill, D.W. The onset of decline in ischemic heart disease mortality in the United States. *American Journal of Epidemiology* 127: 516-531, 1988.
- Rothman, K.J. *Modern Epidemiology.* Boston: Little, Brown, 1986.
- Russell, M.A., Jarvis, M., Iyer, R., Feyerabend, C. Relation of nicotine yield of cigarettes to blood nicotine concentrations in smokers. *British Medical Journal* 280: 972-976, 1980.
- Shopland, D.R., Eyré, H.J., Pechacek, T.F. Smoking-attributable cancer mortality in 1991: Is lung cancer now the leading cause of death among smokers in the United States? *Journal of the National Cancer Institute* 83: 1142-1148, 1991.
- Stellman, S.D., Garfinkel, L. Smoking habits and tar levels in a new American Cancer Society prospective study of 1.2 million men and women. *Journal of the National Cancer Institute* 76: 1057-1063, 1986.
- Subar, A.F., Harlan, L.C., Mattson, M.E. Food and nutrient intake differences between smokers and nonsmokers in the U.S. *American Journal of Public Health* 80: 1323-1329, 1990.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Nicotine Addiction. A Report of the Surgeon General.* DHHS Publication No. (CDC) 88-8406. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1988.
- U.S. Department of Health and Human Services. *Reducing the Health Consequences of Smoking: 25 Years of Progress: A Report of the Surgeon General, 1989.* DHHS Publication No. (CDC) 89-8411. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1989.
- U.S. Department of Health and Human Services. *The Health Benefits of Smoking Cessation: A Report of the Surgeon General, 1990.* DHHS Publication No. (CDC) 90-8416. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1990.
- U.S. Department of Health and Human Services. *Health United States.* DHHS Publication No. (PHS) 94-1232. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, National Center for Health Statistics, 1993, p. 102.
- Vutuc, C., Kunze, M. Lung cancer risk in women in relation to tar yields of cigarettes. *Preventive Medicine* 11: 713-716, 1982.
- Willett, W.C. Vitamin A and lung cancer. *Nutrition Reviews* 48: 201-211, 1990.
- World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death.* 7th Revision. Geneva: World Health Organization, 1957.
- World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death.* 9th Revision. Geneva: World Health Organization, 1977.
- Wynder, E.L., Mabuchi, K., Beattie, E.J. The epidemiology of lung cancer: Recent trends. *Journal of the American Medical Association* 213: 2221-2237, 1970.

ACKNOWLEDGMENTS We thank Ms. Catherine Boring, Dr. David Burns, Mr. Lawrence Garfinkel, Dr. Gary Giovino, Dr. Jonathan Samet, and Dr. John Slade for their suggestions. We are also indebted to Ms. Stacy Adams, Ms. Audrey Earles, and Ms. Kim Crews for their skill and dedication in producing this chapter.

APPENDICES 1 Through 30

APPENDIX 1**Distribution of the Cancer Prevention Study (CPS)-I and CPS-II Full Cohorts, by Birth Cohort and Age at Enrollment**

	Decade of Birth										
	1850	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950
CPS-I											
Persons	15	1,134	14,675	73,219	197,006	359,051	321,625	84,313	—	—	—
Percent	0.0	0.1	1.4	7.0	18.7	34.2	30.6	8.0	—	—	—
Age at enrollment	100-109	90-99	80-89	70-79	60-69	50-59	40-49	30-39	—	—	—
CPS-II											
Persons	—	—	13	912	13,225	88,464	261,902	415,840	322,399	71,095	11,256
Percent	—	—	0.0	0.1	1.1	7.5	22.1	35.1	27.2	6.0	0.9
Age at enrollment	—	—	103-112	93-102	83-92	73-82	63-72	53-62	43-52	33-42	30-32

APPENDIX 2**Standard Populations Used To Compute Age-Standardized Death Rates and Smoking Prevalence**

Age	Person-Years CPS-I and CPS-II ^a	Age at Baseline CPS-I and CPS-II ^b
30-34	120,780	51,203
35-39	382,619	84,593
40-44	684,255	171,619
45-49	1,591,398	382,258
50-54	2,343,338	401,847
55-59	2,296,964	361,256
60-64	1,968,333	291,430
65-69	1,506,638	213,021
70-74	1,013,392	131,189
75-79	564,855	66,945
80-84	250,957	27,283
85+	120,886	13,321

^a Represents the age distribution of all person-years during the first 6 years of followup in both studies combined, used to standardize death rates.

^b Represents the distribution of baseline age of 2,195,965 subjects in CPS-I and CPS-II, used to standardize smoking prevalence. Excludes persons of race other than black or white.

Key: CPS = Cancer Prevention Study.

APPENDIX 3

Deaths and Death Rates From Lung Cancer, by Amount and Duration of Current Cigarette Smoking: Men (all races—includes prevalent cancers)

Never-Smokers

Age	CPS-I (N = 66,154)			CPS-II (N = 94,958)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	6	105,584	5.7	7	127,821	5.5
55-59	13	95,592	13.6	7	132,430	5.3
60-64	16	76,190	21.0	14	121,174	11.6
65-69	14	60,654	23.1	22	102,124	21.5
70-74	13	43,770	29.7	25	71,536	34.9
75-79	8	25,766	31.0	21	40,363	52.0
80-84	8	11,858	67.5	16	17,946	89.2
85+	2	5,658	<u>35.3</u>	7	8,069	<u>86.8</u>
			18.8			17.7

20 Cigarettes Per Day Smoked for 30 to 34 Years

Age	CPS-I (N = 6,690)			CPS-II (N = 3,150)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	25	38,751	64.5	14	14,003	100.0
55-59	22	17,921	122.8	9	8,883	101.3
60-64	2	3,246	61.6	4	2,293	174.4
65-69	2	596	335.7	3	700	428.7
70-74	0	184	—	1	222	450.1
75-79	0	90	—	0	63	—
80-84	0	25	—	0	2	—
85+	0	18	—	0	0	—

20 Cigarettes Per Day Smoked for 35 to 39 Years

Age	CPS-I (N = 9,008)			CPS-II (N = 4,921)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	21	13,576	154.7	7	6,520	107.4
55-59	36	28,260	127.4	33	14,608	225.9
60-64	23	10,423	220.7	10	7,146	139.9
65-69	4	1,854	215.8	8	1,453	550.5
70-74	1	326	306.5	2	288	693.6
75-79	0	77	—	0	85	—
80-84	0	11	—	0	23	—
85+	0	6	—	0	4	—

APPENDIX 3 (continued)**20 Cigarettes Per Day Smoked for 40 to 44 Years**

Age	CPS-I (N = 6,743)			CPS-II (N = 5,516)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	2	1,971	101.5	1	1,045	95.7
55-59	15	10,008	149.9	22	7,599	289.5
60-64	46	17,068	269.5	47	14,513	323.9
65-69	21	6,360	330.2	39	6,682	583.7
70-74	3	1,068	281.0	10	1,383	722.9
75-79	0	169	—	5	225	2,225.5
80-84	1	36	2,758.6	0	34	—
85+	0	2	—	1	9	10,909.1

20 Cigarettes Per Day Smoked for 45 to 49 Years

Age	CPS-I (N = 3,288)			CPS-II (N = 3,154)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	15	—	0	137	—
55-59	3	1,184	253.3	3	947	316.8
60-64	17	5,439	312.6	23	5,222	440.5
65-69	36	8,010	449.5	45	7,989	563.2
70-74	7	2,302	304.1	15	2,718	551.9
75-79	3	316	950.9	3	374	801.8
80-84	0	45	—	1	56	1,777.8
85+	0	8	—	0	11	—

20 Cigarettes Per Day Smoked for 50 or More Years

Age	CPS-I (N = 2,457)			CPS-II (N = 4,199)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	0	—	0	12	—
55-59	0	15	—	1	195	512.8
60-64	3	848	353.9	8	1,326	603.3
65-69	14	3,546	394.8	52	5,745	905.1
70-74	27	4,878	553.5	86	8,606	999.3
75-79	21	2,157	973.6	64	4,449	1,438.6
80-84	3	557	519.6	20	1,133	1,764.6
85+	0	126	—	2	215	929.5

APPENDIX 3 (continued)

40 Cigarettes Per Day Smoked for 30 to 34 Years

Age	CPS-I (N = 1,967)			CPS-II (N = 1,750)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	8	11,807	67.8	20	10,639	188.0
55-59	7	5,144	136.1	8	4,952	161.5
60-64	2	785	254.9	4	1,027	389.5
65-69	2	140	1,431.1	1	179	558.7
70-74	0	31	—	0	56	—
75-79	0	7	—	0	9	—
80-84	0	5	—	0	5	—
85+	0	3	—	0	1	—

40 Cigarettes Per Day Smoked for 35 to 39 Years

Age	CPS-I (N = 2,485)			CPS-II (N = 3,394)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	4	4,650	86.0	10	5,735	174.4
55-59	15	7,903	189.8	25	10,631	235.2
60-64	8	2,502	319.7	22	4,069	540.7
65-69	0	366	—	5	616	811.1
70-74	0	60	—	1	87	1,152.7
75-79	0	9	—	0	14	—
80-84	0	0	—	0	0	—
85+	0	0	—	0	0	—

40 Cigarettes Per Day Smoked for 40 to 44 Years

Age	CPS-I (N = 1,592)			CPS-II (N = 3,229)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	2	718	278.7	3	981	305.8
55-59	10	3,057	327.1	21	5,919	354.8
60-64	18	3,761	478.6	45	8,555	526.0
65-69	8	996	803.5	22	2,583	851.7
70-74	0	105	—	5	362	1,380.3
75-79	0	4	—	0	49	—
80-84	0	0	—	0	6	—
85+	0	0	—	0	0	—

APPENDIX 3 (continued)**40 Cigarettes Per Day Smoked for 45 to 49 Years**

Age	CPS-I (N = 651)			CPS-II (N = 1,538)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	0	5	—	0	113	—
55-59	2	371	539.1	1	765	130.7
60-64	5	1,335	374.6	13	3,214	404.4
65-69	11	1,400	785.7	30	3,586	836.6
70-74	0	273	—	11	811	1,356.2
75-79	0	30	—	2	73	2,739.7
80-84	0	1	—	0	5	—
85+	0	0	—	0	0	—

40 Cigarettes Per Day Smoked for 50 or More Years

Age	CPS-I (N = 375)			CPS-II (N = 1,366)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	0	0	—	0	9	—
55-59	0	3	—	2	141	1,415.9
60-64	3	209	1,436.0	7	743	942.1
65-69	5	699	715.1	21	2,293	916.0
70-74	6	655	916.7	33	2,660	1,240.8
75-79	5	225	2,220.6	16	1,034	1,547.8
80-84	0	47	—	2	206	970.9
85+	0	3	—	0	51	—

^aRate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 4

Deaths and Death Rates From Lung Cancer, by Amount and Duration of Current Cigarette Smoking: Women (all races—includes prevalent cancers)

Never-Smokers

Age	CPS-I (N = 260,036)			CPS-II (N = 266,430)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	20	388,546	5.1	18	309,700	5.8
55-59	23	373,403	6.2	25	345,629	7.2
60-64	38	316,344	12.0	42	340,560	12.3
65-69	34	254,315	13.4	47	280,728	16.7
70-74	28	176,096	15.9	63	206,345	30.5
75-79	25	100,201	24.9	44	135,257	32.5
80-84	21	48,439	43.4	41	71,175	57.6
85+	9	25,046	35.9	25	41,281	60.6
			11.5			15.0

20 Cigarettes Per Day Smoked for 30 to 34 Years

Age	CPS-I (N = 4,963)			CPS-II (N = 5,963)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	5	20,798	24.0	16	20,621	77.6
55-59	4	11,910	33.6	16	15,370	104.1
60-64	1	4,869	20.5	11	5,821	189.0
65-69	1	2,197	45.5	3	2,453	122.3
70-74	0	831	—	2	1,061	188.5
75-79	0	302	—	2	375	533.9
80-84	0	58	—	0	105	—
85+	0	24	—	0	31	—

20 Cigarettes Per Day Smoked for 35 to 39 Years

Age	CPS-I (N = 2,582)			CPS-II (N = 6,793)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	3,093	—	5	5,448	91.8
55-59	0	6,422	—	25	18,119	138.0
60-64	3	3,427	87.6	27	11,707	230.6
65-69	3	1,552	193.2	10	3,458	289.2
70-74	0	629	—	1	1,207	82.9
75-79	0	183	—	3	461	651.1
80-84	0	61	—	0	124	—
85+	0	13	—	0	19	—

APPENDIX 4 (continued)20 Cigarettes Per Day Smoked for 40 to 44 Years

Age	CPS-I (N = 771)			CPS-II (N = 5,690)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	97	—	0	318	—
55-59	0	785	—	8	4,976	160.8
60-64	3	1,804	166.3	23	14,857	154.8
65-69	2	1,001	199.9		9,112	384.1
70-74	0	427	—	11	2,622	419.5
75-79	0	157	—	8	857	934.0
80-84	0	32	—	3	247	1,213.3
85+	0	11	—	0	85	—

20 Cigarettes Per Day Smoked for 45 to 49 Years

Age	CPS-I (N = 202)			CPS-II (N = 2,878)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	0	—	0	6	—
55-59	0	41	—	0	201	—
60-64	0	211	—	7	3,207	218.3
65-69	1	471	212.1	27	8,009	337.1
70-74	0	221	—	17	3,850	441.6
75-79	0	80	—	7	866	808.6
80-84	0	36	—	1	193	518.4
85+	0	3	—	0	54	—

20 Cigarettes Per Day Smoked for 50 or More Years

Age	CPS-I (N = 98)			CPS-II (N = 2,450)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	0	—	0	0	—
55-59	0	0	—	0	14	—
60-64	0	30	—	2	240	834.2
65-69	1	118	847.5	19	2,699	703.9
70-74	0	195	—	30	5,843	513.5
75-79	0	107	—	15	3,427	437.7
80-84	0	39	—	7	977	716.6
85+	0	6	—	3	202	1,482.7

APPENDIX 4 (continued)

40 Cigarettes Per Day Smoked for 30 to 34 Years

Age	CPS-I (N = 478)			CPS-II (N = 1,517)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	4	2,491	160.6	10	7,300	137.0
55-59	2	1,207	165.7	8	4,093	195.5
60-64	0	390	—	3	1,185	253.2
65-69	1	166	601.2	0	353	—
70-74	0	51	—	0	91	—
75-79	0	7	—	0	34	—
80-84	0	0	—	0	8	—
85+	0	0	—	0	0	—

40 Cigarettes Per Day Smoked for 35 to 39 Years

Age	CPS-I (N = 325)			CPS-II (N = 2,008)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	1	472	211.8	4	2,361	169.4
55-59	0	878	—	10	5,928	168.7
60-64	0	453	—	9	3,067	293.4
65-69	0	137	—	3	713	420.5
70-74	0	53	—	0	153	—
75-79	0	7	—	1	47	2,142.9
80-84	0	0	—	0	8	—
85+	0	0	—	0	0	—

40 Cigarettes Per Day Smoked for 40 to 44 Years

Age	CPS-I (N = 87)			CPS-II (N = 1,462)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	30	—	0	124	—
55-59	0	149	—	4	1,936	206.6
60-64	0	204	—	24	4,114	583.4
65-69	0	68	—	6	1,756	341.6
70-74	0	27	—	1	369	270.7
75-79	0	11	—	0	115	—
80-84	0	7	—	0	31	—
85+	0	0	—	0	1	—

APPENDIX 4 (continued)**40 Cigarettes Per Day Smoked for 45 to 49 Years**

Age	CPS-I (N = 20)			CPS-II (N = 649)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	0	0	—	0	9	—
55-59	0	3	—	0	92	—
60-64	0	25	—	6	970	618.4
65-69	0	63	—	11	1,888	582.5
70-74	0	14	—	3	591	507.3
75-79	0	2	—	1	139	720.7
80-84	0	2	—	0	19	—
85+	0	0	—	0	0	—

40 Cigarettes Per Day Smoked for 50 or More Years

Age	CPS-I (N = 10)			CPS-II (N = 475)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	0	0	—	0	0	—
55-59	0	0	—	0	1	—
60-64	0	5	—	0	83	—
65-69	0	21	—	4	689	580.7
70-74	0	18	—	7	1,164	601.5
75-79	0	7	—	5	467	1,071.2
80-84	0	0	—	1	108	922.4
85+	0	0	—	0	65	—

^aRate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 5

Deaths and Death Rates From Lung Cancer in Those With Comparable Histories of Cigarette Smoking: Men (white race—excludes prevalent cancers)

Never-Smokers

Age	CPS-I (N = 62,916)			CPS-II (N = 84,913)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	5	101,888	4.9	3	116,506	2.6
55-59	13	91,971	14.1	3	120,910	2.5
60-64	14	73,004	19.2	10	110,092	9.1
65-69	12	57,813	20.8	14	91,920	15.2
70-74	13	41,354	31.4	18	63,295	28.4
75-79	7	24,138	29.0	11	34,706	31.7
80-84	8	10,988	72.8	12	15,176	79.1
85+	2	5,239	<u>38.2</u>	5	6,551	<u>76.3</u>
			18.3			12.8

20 Cigarettes Per Day Smoked for 30 to 34 Years

Age	CPS-I (N = 6,476)			CPS-II (N = 2,770)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	24	37,478	64.0	10	12,485	80.1
55-59	21	17,365	120.9	8	7,869	101.7
60-64	2	3,178	62.9	3	1,988	150.9
65-69	2	589	339.6	3	589	509.6
70-74	0	180	—	1	178	563.1
75-79	0	88	—	0	51	—
80-84	0	25	—	0	1	—
85+	0	18	—	0	0	—

20 Cigarettes Per Day Smoked for 35 to 39 Years

Age	CPS-I (N = 8,651)			CPS-II (N = 4,400)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	18	13,024	138.2	5	5,838	85.6
55-59	34	27,253	124.8	26	13,143	197.8
60-64	21	10,008	209.8	10	6,385	156.6
65-69	4	1,748	228.8	7	1,290	542.7
70-74	0	305	—	2	248	805.1
75-79	0	75	—	0	68	—
80-84	0	10	—	0	19	—
85+	0	5	—	0	4	—

APPENDIX 5 (continued)**20 Cigarettes Per Day Smoked for 40 to 44 Years**

Age	CPS-I (N = 6,486)			CPS-II (N = 4,850)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	1	1,885	53.0	1	955	104.7
55-59	13	9,624	135.1	16	6,794	235.5
60-64	42	16,509	254.4	38	12,819	296.4
65-69	21	6,127	342.7	30	5,894	509.0
70-74	3	1,022	293.6	8	1,180	678.0
75-79	0	168	—	4	195	2,049.5
80-84	1	36	2,758.6	0	27	—
85+	0	2	—	0	1	—

20 Cigarettes Per Day Smoked for 45 to 49 Years

Age	CPS-I (N = 3,123)			CPS-II (N = 2,782)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	15	—	0	111	—
55-59	3	1,118	268.4	3	821	365.6
60-64	15	5,176	289.8	18	4,551	395.6
65-69	34	7,682	442.6	42	7,146	587.7
70-74	7	2,187	320.1	13	2,438	533.2
75-79	1	290	344.5	3	320	937.5
80-84	0	39	—	1	47	2,127.7
85+	0	8	—	0	11	—

20 Cigarettes Per Day Smoked for 50 or More Years

Age	CPS-I (N = 2,287)			CPS-II (N = 3,578)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	0	—	0	12	—
55-59	0	14	—	1	175	572.0
60-64	1	792	126.2	7	1,168	599.4
65-69	14	3,345	418.5	43	4,984	862.8
70-74	26	4,582	567.5	75	7,365	1,018.3
75-79	18	2,024	889.5	49	3,792	1,292.2
80-84	3	525	571.2	18	973	1,849.3
85+	0	115	—	1	183	547.7

APPENDIX 5 (continued)

40 Cigarettes Per Day Smoked for 30 to 34 Years

Age	CPS-I (N = 1,914)			CPS-II (N = 1,641)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	8	11,577	69.1	19	10,128	187.6
55-59	7	5,013	139.6	5	4,658	107.3
60-64	2	761	263.0	4	971	412.1
65-69	2	139	1,436.3	1	160	625.7
70-74	0	31	—	0	51	—
75-79	0	7	—	0	9	—
80-84	0	4	—	0	5	—
85+	0	3	—	0	1	—

40 Cigarettes Per Day Smoked for 35 to 39 Years

Age	CPS-I (N = 2,417)			CPS-II (N = 3,209)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	4	4,525	88.4	10	5,392	185.5
55-59	15	7,721	194.3	23	10,078	228.2
60-64	6	2,426	247.3	22	3,871	568.4
65-69	0	356	0.0	5	585	855.3
70-74	0	60	0.0	0	71	0.0
75-79	0	9	0.0	0	6	0.0
80-84	0	0	0.0	0	0	0.0
85+	0	0	0.0	0	0	0.0

40 Cigarettes Per Day Smoked for 40 to 44 Years

Age	CPS-I (N = 1,539)			CPS-II (N = 3,001)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	1	702	142.6	3	915	328.0
55-59	10	2,995	333.9	19	5,562	341.6
60-64	17	3,647	466.1	38	7,985	475.9
65-69	8	941	850.1	22	2,365	930.1
70-74	0	101	—	4	327	1,222.6
75-79	0	4	—	0	49	—
80-84	0	0	—	0	6	—
85+	0	0	—	0	0	—

APPENDIX 5 (continued)**40 Cigarettes Per Day Smoked for 45 to 49 Years**

Age	CPS-I (N = 626)			CPS-II (N = 1,419)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	0	5	—	0	102	—
55-59	2	365	547.6	1	704	142.0
60-64	4	1,297	308.3	13	2,994	434.2
65-69	11	1,351	814.2	25	3,344	747.7
70-74	0	261	—	8	753	1,062.5
75-79	0	25	—	2	66	3,045.7
80-84	0	0	—	0	3	—
85+	0	0	—	0	0	—

40 Cigarettes Per Day Smoked for 50 or More Years

Age	CPS-I (N = 356)			CPS-II (N = 1,213)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	0	0	—	0	9	—
55-59	0	3	—	2	137	1,456.3
60-64	3	207	1,449.9	5	682	732.7
65-69	5	667	750.2	15	2,083	720.3
70-74	5	625	799.6	26	2,373	1,095.8
75-79	4	220	1,815.4	15	918	1,634.1
80-84	0	44	—	1	170	589.1
85+	0	3	—	0	38	—

^aRate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 6

Deaths and Death Rates From Lung Cancer in Those With Comparable Histories of Cigarette Smoking: Women (white race—excludes prevalent cancers)

Never-Smokers

Age	CPS-I (N = 238,983)			CPS-II (N = 225,190)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	14	364,599	3.8	14	271,833	5.2
55-59	21	348,195	6.0	20	300,943	6.6
60-64	29	292,936	9.9	27	292,653	9.2
65-69	25	234,033	10.7	25	237,357	10.5
70-74	22	160,720	13.7	34	171,648	19.8
75-79	21	90,455	23.2	27	111,271	24.3
80-84	16	43,436	36.8	27	57,612	46.9
85+	8	22,403	35.7	18	32,626	55.2
			9.8			11.3

20 Cigarettes Per Day Smoked for 30 to 34 Years

Age	CPS-I (N = 4,631)			CPS-II (N = 5,213)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	5	19,759	25.3	14	18,275	76.6
55-59	4	11,195	35.7	11	13,551	81.2
60-64	1	4,547	22.0	9	5,073	177.4
65-69	0	2,016	—	2	2,120	94.3
70-74	0	746	—	2	935	214.0
75-79	0	253	—	1	330	303.0
80-84	0	47	—	0	93	—
85+	0	19	—	0	29	—

20 Cigarettes Per Day Smoked for 35 to 39 Years

Age	CPS-I (N = 2,401)			CPS-II (N = 5,919)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	2,940	—	3	4,817	62.3
55-59	0	5,995	—	21	15,932	131.8
60-64	2	3,192	62.7	21	10,217	205.5
65-69	2	1,438	139.1	9	3,008	299.2
70-74	0	566	—	1	1,040	96.2
75-79	0	173	—	1	370	270.6
80-84	0	59	—	0	99	—
85+	0	9	—	0	18	—

APPENDIX 6 (continued)**20 Cigarettes Per Day Smoked for 40 to 44 Years**

Age	CPS-I (N = 721)			CPS-II (N = 4,902)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	82	—	0	255	—
55-59	0	733	—	7	4,238	165.2
60-64	3	1,702	176.3	18	13,004	138.4
65-69	2	931	214.8	28	7,881	355.3
70-74	0	402	—	8	2,243	356.7
75-79	0	157	—	7	727	962.6
80-84	0	32	—	1	206	485.6
85+	0	11	—	0	63	—

20 Cigarettes Per Day Smoked for 45 to 49 Years

Age	CPS-I (N = 177)			CPS-II (N = 2,433)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	0	—	0	2	—
55-59	0	41	—	0	156	—
60-64	0	196	—	7	2,750	254.6
65-69	1	406	246.6	23	6,793	338.6
70-74	0	187	—	14	3,282	426.6
75-79	0	72	—	6	744	806.2
80-84	0	30	—	0	174	—
85+	0	2	—	0	52	—

20 Cigarettes Per Day Smoked for 50 or More Years

Age	CPS-I (N = 86)			CPS-II (N = 2,033)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	0	—	0	0	—
55-59	0	0	—	0	10	—
60-64	0	24	—	0	203	—
65-69	1	100	999.2	11	2,274	483.6
70-74	0	178	—	24	4,882	491.6
75-79	0	103	—	13	2,887	450.3
80-84	0	37	—	5	811	616.2
85+	0	2	—	3	159	1,890.8

APPENDIX 6 (continued)

40 Cigarettes Per Day Smoked for 30 to 34 Years

Age	CPS-I (N = 443)			CPS-II (N = 1,361)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	4	2,355	169.9	8	6,623	120.8
55-59	2	1,135	176.3		83,711	215.6
60-64	0	357	—	2	1,050	190.4
65-69	1	142	705.1	0	292	—
70-74	0	51	—	0	61	—
75-79	0	7	—	0	33	—
80-84	0	0	—	0	8	—
85+	0	0	—	0	0	—

40 Cigarettes Per Day Smoked for 35 to 39 Years

Age	CPS-I (N = 304)			CPS-II (N = 1,775)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	1	445	224.8	2	2,113	94.7
55-59	0	824	—	9	5,297	169.9
60-64	0	423	—	7	2,702	259.1
65-69	0	127	—	3	613	489.6
70-74	0	48	—	0	135	—
75-79	0	6	—	1	43	2,312.1
80-84	0	0	—	0	5	—
85+	0	0	—	0	0	—

40 Cigarettes Per Day Smoked for 40 to 44 Years

Age	CPS-I (N = 80)			CPS-II (N = 1,258)		
	Number of Deaths	Person-Years	Rate ^a	Number of Deaths	Person-Years	Rate ^a
50-54	0	29	—	0	112	—
55-59	0	138	—	3	1,690	177.5
60-64	0	179	—	20	3,531	566.4
65-69	0	65	—	6	1,510	397.4
70-74	0	27	—	1	310	323.0
75-79	0	11	—	0	93	—
80-84	0	7	—	0	26	—
85+	0	0	—	0	1	—

APPENDIX 6 (continued)**40 Cigarettes Per Day Smoked for 45 to 49 Years**

Age	CPS-I (N = 16)			CPS-II (N = 554)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	0	0	—	0	6	—
55-59	0	3	—	0	72	—
60-64	0	23	—	5	830	602.1
65-69	0	48	—	10	1,623	616.2
70-74	0	7	—	3	510	588.4
75-79	0	2	—	1	128	779.7
80-84	0	2	—	0	19	—
85+	0	0	—	0	0	—

40 Cigarettes Per Day Smoked for 50 or More Years

Age	CPS-I (N = 9)			CPS-II (N = 401)		
	Number of Deaths	Person- Years	Rate ^a	Number of Deaths	Person- Years	Rate ^a
50-54	0	0	—	0	0	—
55-59	0	0	—	0	1	—
60-64	0	4	—	0	62	—
65-69	0	16	—	4	584	685.5
70-74	0	18	—	6	1,020	588.1
75-79	0	7	—	4	389	1,029.4
80-84	0	0	—	1	97	1,029.2
85+	0	0	—	0	54	—

^aRate per 100,000 person-years. Age-adjusted rate standardized to CPS-I and CPS-II 6-year person-years distribution (Appendix 2).

Key: CPS = Cancer Prevention Study.

APPENDIX 7**Number and Percentage of Men Who Currently Smoke or Formerly Smoked Cigarettes^a When Enrolled in CPS-I (1959) or CPS-II (1982), by Age and Race**

White Men												
Age	Percentage of Those Enrolled											
	Number		Cigarette Smokers				Pipe/Cigar Smokers Only		Never-Smokers		Unclassifiable	
	CPS-I	CPS-II	Current	Former	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II
30-34	10,189	7,623	59.5	31.9	10.2	18.5	4.5	3.7	21.2	44.0	4.7	1.9
35-39	17,218	9,298	57.8	33.5	12.2	25.3	5.6	5.4	18.5	33.9	5.9	2.0
40-44	31,947	15,087	56.4	31.5	13.1	31.6	5.5	6.4	19.0	28.5	6.1	2.0
45-49	94,993	68,835	54.5	28.4	15.3	34.7	5.6	7.8	18.5	27.3	6.2	1.8
50-54	92,933	87,127	51.1	26.8	16.8	38.9	6.7	7.7	18.6	24.6	6.9	2.0
55-59	71,328	91,343	45.5	24.7	18.5	43.1	7.9	8.2	20.0	21.8	8.1	2.3
60-64	52,083	79,467	38.4	21.1	19.9	44.3	9.9	8.9	21.8	22.9	9.9	2.8
65-69	35,982	58,269	31.5	18.1	19.6	45.3	11.8	8.6	25.2	24.2	11.9	3.9
70-74	20,490	35,577	25.2	14.6	17.5	46.6	14.3	9.2	29.7	24.4	13.3	5.2
75-79	9,750	17,109	18.0	11.0	14.5	44.4	16.9	10.8	35.0	26.7	15.6	7.1
80-84	3,841	5,944	13.9	8.1	11.3	41.5	20.1	12.5	38.5	28.9	16.3	9.1
85+	1,700	2,440	7.4	5.8	6.8	34.9	23.1	16.7	45.2	32.6	17.5	10.0

APPENDIX 7 (continued)

Black Men												
Age	Percentage of Those Enrolled											
	Number		Cigarette Smokers				Pipe/Cigar Smokers Only				Never-Smokers	Unclassifiable
			Current	Former	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II
30-34	539	609	67.7	42.2	5.4	14.6	3.2	2.1	21.3	36.0	2.4	5.1
35-39	800	655	68.1	42.4	5.6	18.2	4.9	2.0	17.4	30.8	4.0	6.6
40-44	1,012	938	63.1	41.7	6.0	21.1	6.2	3.9	19.7	27.7	4.9	5.5
45-49	1,790	2,809	61.1	39.8	7.0	25.0	8.2	5.3	18.9	25.5	4.8	4.5
50-54	1,746	3,191	52.8	37.0	8.0	26.8	11.5	5.8	20.3	23.9	7.5	6.6
55-59	1,355	3,149	46.1	35.4	8.9	29.6	14.8	7.2	22.2	20.5	8.0	7.2
60-64	873	2,795	38.3	29.1	8.6	30.8	16.2	8.9	26.6	23.7	10.4	7.6
65-69	736	2,072	32.1	29.1	8.0	30.0	18.6	9.9	28.7	22.1	12.6	8.9
70-74	481	1,437	27.2	24.1	11.2	29.4	19.1	10.3	29.1	23.9	13.3	12.3
75-79	273	711	21.3	18.4	10.6	28.7	19.1	12.0	36.3	25.5	12.8	15.5
80-84	102	303	16.7	12.5	11.8	27.4	16.7	16.2	30.4	26.7	24.5	17.2
85+	46	142	8.7	15.5	8.7	20.4	23.9	16.9	47.8	36.6	10.9	10.6

^a Defined as cigarette smoking with or without pipes or cigars.

Key: CPS = Cancer Prevention Study.

APPENDIX 8**Number and Percentage of Women Who Currently Smoke or Formerly Smoked Cigarettes^a When Enrolled in CPS-I (1959) or CPS-II (1982), by Age and Race**

Age	White Women									
	Percentage of Those Enrolled									
	Cigarette Smokers									
	Number		Current		Former		Never-Smokers		Unclassifiable	
Age	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II
30-34	17,868	11,803	42.7	25.2	7.1	17.8	48.6	53.4	1.6	3.6
35-39	34,640	18,891	41.0	26.5	7.6	23.0	49.8	46.6	1.6	3.9
40-44	73,263	44,665	39.2	24.7	7.4	23.5	51.9	47.7	1.6	4.2
45-49	114,005	92,077	36.2	24.3	7.0	22.6	55.2	48.5	1.6	4.5
50-54	102,887	106,281	29.1	22.8	6.0	22.5	63.2	49.7	1.7	5.0
55-59	79,027	108,015	21.0	21.3	4.7	22.2	72.5	51.0	1.8	5.6
60-64	58,577	92,195	14.3	18.4	3.7	21.1	80.1	53.8	1.9	6.7
65-69	42,583	68,992	10.1	15.7	3.0	21.0	84.7	54.7	2.2	8.6
70-74	25,717	44,662	6.9	11.8	2.4	18.3	88.5	59.2	2.3	10.7
75-79	13,595	23,968	4.7	8.0	2.0	13.7	90.5	66.1	2.8	12.3
80-84	6,389	9,964	2.7	5.0	1.4	9.5	93.2	71.7	2.8	13.9
85+	3,167	5,392	1.1	2.7	1.0	5.4	94.4	77.2	3.4	14.7

APPENDIX 8 (continued)

Age	Black Women									
	Number		Percentage of Those Enrolled							
			Cigarette Smokers		Current		Former		Never-Smokers	
Age	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II	CPS-I	CPS-II
30-34	1,207	1,365	47.1	31.8	4.3	9.2	45.2	51.7	3.5	7.3
35-39	1,548	1,543	43.4	34.1	4.2	13.8	49.4	43.2	3.1	8.9
40-44	2,090	2,617	36.5	30.1	4.6	14.0	54.5	45.7	4.4	10.1
45-49	2,714	5,035	29.6	30.2	4.5	15.0	61.9	44.1	4.1	10.8
50-54	2,299	5,383	21.8	29.6	3.8	15.1	69.5	44.1	4.9	11.1
55-59	1,837	5,202	16.2	25.9	3.7	15.1	75.6	46.1	4.6	12.8
60-64	1,202	4,238	11.2	21.4	2.9	14.2	80.9	49.7	5.0	14.7
65-69	972	3,415	7.1	15.9	2.6	13.3	83.4	53.2	6.9	17.6
70-74	601	2,224	4.8	12.1	1.8	10.3	87.5	58.1	5.8	19.5
75-79	310	1,229	3.2	7.0	1.3	7.9	90.3	63.9	5.2	21.2
80-84	133	607	1.5	7.4	3.0	5.3	87.2	63.9	8.3	23.4
85+	66	368	0.0	5.7	0.0	5.4	97.0	68.2	3.0	20.7

^a Assumed to be cigarette smoking only.

Key: CPS = Cancer Prevention Study.

APPENDIX 9**Number and Percentage of Men Who Currently Smoke or Formerly Smoked Cigarettes^a When Enrolled in NHIS-I (1965) or NHIS-II (1983), by Age and Race**

White Men														
Age	Unweighted Number		Cigarette Smokers						Percentage of Those Enrolled					
			Current		Former		Pipe/Cigar Smokers Only Ever		Never-Smokers		Unclassifiable			
	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83		
30-34	3,394	906	59.4	37.7	17.7	23.9	7.3	4.4	15.2	33.6	0.5	0.4		
35-39	3,645	795	58.2	39.9	21.1	25.9	6.8	4.6	13.5	29.3	0.4	0.2		
40-44	3,843	664	56.3	41.8	21.9	30.0	8.3	5.9	13.1	22.3	0.4	—		
45-49	3,602	599	55.8	40.7	21.7	35.3	7.9	6.6	14.4	17.5	0.3	—		
50-54	3,431	632	54.7	35.4	23.8	37.4	7.8	6.5	13.4	20.4	0.3	0.3		
55-59	2,898	655	48.9	34.8	26.9	43.2	9.9	7.2	13.9	14.5	0.5	0.3		
60-64	2,275	596	42.4	28.7	29.9	49.0	11.5	7.2	15.3	15.0	1.0	0.2		
65-69	1,926	490	33.7	24.5	32.5	51.3	15.4	6.9	17.5	17.3	0.9	—		
70-74	1,482	388	29.6	26.6	28.7	45.8	22.3	7.2	18.9	20.2	0.5	0.2		
75-79	969	246	23.4	13.8	24.9	58.8	26.6	13.2	23.5	14.3	1.6	—		
80-84	497	118	15.8	10.0	25.4	42.8	34.7	13.3	23.3	33.9	0.8	—		
85+	231	77	9.3	2.4	18.5	43.9	37.3	11.8	32.1	41.9	2.8	—		

APPENDIX 9 (continued)

Age	Black Men													
	Unweighted Number		Cigarette Smokers				Pipe/Cigar Smokers Only				Never-Smokers		Unclassifiable	
			Current		Former		Ever		Never		NHIS-65	NHIS-83	NHIS-65	NHIS-83
	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83
30-34	320	82	68.4	42.2	8.8	21.9	6.6	0.9	16.2	35.0	—	—	—	—
35-39	315	72	67.9	48.6	12.6	19.3	8.2	2.4	10.4	29.7	0.9	—	—	—
40-44	382	69	66.3	41.8	12.0	26.5	6.3	4.6	13.9	25.8	1.6	—	1.4	—
45-49	301	51	63.2	51.6	14.2	18.1	10.4	4.3	11.2	26.0	0.9	—	—	—
50-54	313	55	61.2	44.3	16.2	31.9	8.4	3.0	13.7	20.8	0.6	—	—	—
55-59	263	50	53.8	36.1	13.8	39.1	17.5	3.7	13.8	19.3	1.1	—	1.9	—
60-64	173	52	48.8	45.3	18.1	37.7	19.8	5.5	12.6	11.6	0.6	—	—	—
65-69	165	35	47.6	47.1	20.0	25.1	16.1	11.8	15.2	16.0	1.1	—	—	—
70-74	107	33	41.6	31.6	22.9	29.7	21.9	13.5	12.6	25.2	1.0	—	—	—
75-79	59	14	23.3	39.5	20.0	39.9	31.9	7.5	24.8	13.2	—	—	—	—
80-84	31	7	12.2	28.4	34.1	28.4	24.5	1.5	24.9	41.7	4.2	—	—	—
85+	15	2	14.0	—	5.6	—	34.1	—	46.3	—	—	—	—	—

^a Defined as cigarette smoking with or without pipes or cigars.

Key: NHIS = National Health Interview Survey.

APPENDIX 10**Number and Percentage of Women Who Currently or Formerly Smoked Cigarettes^a When Enrolled in NHIS-I (1965) or NHIS-II (1983), by Age, Race, and Sex**

Age	White Women									
	Percentage of Those Enrolled									
	Unweighted Number		Cigarette Smokers							
			Current		Former		Never-Smokers		Unclassifiable	
Age	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83
30-34	3,676	1,220	43.2	31.5	10.3	15.9	46.2	52.6	0.3	—
35-39	4,018	1,040	45.2	34.9	10.6	18.0	44.1	47.1	0.2	—
40-44	4,149	880	42.5	34.7	9.3	17.9	48.0	47.4	0.2	—
45-49	3,949	757	40.2	34.5	9.7	19.4	49.9	46.1	0.2	0.1
50-54	3,708	768	35.9	32.2	9.4	17.2	54.5	50.6	0.2	—
55-59	3,099	789	30.1	30.0	8.1	19.9	61.5	50.0	0.4	—
60-64	2,576	765	20.4	26.0	7.3	19.4	72.0	54.5	0.3	0.1
65-69	2,327	671	14.3	21.9	5.3	22.3	79.9	55.7	0.6	0.1
70-74	1,780	544	10.5	12.4	4.5	25.0	84.3	62.4	0.7	0.2
75-79	1,233	399	5.3	10.4	4.4	17.5	89.1	72.1	1.3	—
80-84	717	244	4.1	3.2	3.5	9.9	91.3	87.0	1.1	—
85+	384	155	2.8	1.2	1.4	7.2	95.6	91.6	0.3	—

APPENDIX 10 (continued)

Age	Black Women										
	Unweighted Number		Percentage of Those Enrolled								
			Cigarette Smokers		Never-Smokers		Unclassifiable				
Age	NHIS-65	NHIS-83	Current	Former	NHIS-65	NHIS-83	NHIS-65	NHIS-83	NHIS-65	NHIS-83	
30-34	433	171	47.4	39.0	7.4	4.0	44.8	57.0	0.4	—	
35-39	454	128	44.9	36.5	7.3	10.3	47.6	53.2	0.2	—	
40-44	491	92	40.8	27.3	6.7	10.1	52.4	62.6	—	—	
45-49	424	85	37.7	48.3	5.9	11.1	55.8	40.6	0.6	—	
50-54	358	90	25.9	38.7	8.5	9.8	65.3	51.5	0.3	—	
55-59	277	84	18.6	32.0	6.3	20.9	75.1	46.0	—	1.2	
60-64	251	60	14.1	22.1	5.4	21.5	79.7	56.4	0.9	—	
65-69	214	49	11.6	22.0	5.1	11.6	82.3	66.4	0.9	—	
70-74	137	42	4.4	14.4	5.4	9.1	88.8	76.4	1.5	—	
75-79	76	36	5.8	5.2	5.9	13.1	88.3	81.7	—	—	
80-84	44	14	3.4	13.6	—	—	96.6	86.4	—	—	
85+	30	17	—	—	—	5.5	100.0	94.5	—	—	

^a Assumed to be cigarette smoking only.

Key: NHIS = National Health Interview Survey.

APPENDIX 11

**Mean^a Number of Cigarettes Smoked Per Day at Baseline (plus 5th and 95th percentiles)
Among Current Cigarette Smokers, by Sex, Study, and Age**

Age	Men				Women			
	CPS-I		CPS-II		CPS-I		CPS-II	
	Mean	(5th-95th)	Mean	(5th-95th)	Mean	(5th-95th)	Mean	(5th-95th)
30-34	22.3	(4.8-40)	23.4	(3-40)	15.9	(4.8-29.2)	20.2	(3-40)
35-39	23.2	(4.8-40)	25.5	(4-50)	16.1	(4.8-29.2)	21.1	(3-40)
40-44	23.4	(4.8-40)	26.6	(5-50)	15.8	(4.8-29.2)	21.0	(3-40)
45-49	23.5	(4.8-40)	27.1	(5-50)	15.6	(4.8-29.2)	20.8	(4-40)
50-54	23.2	(4.8-40)	26.8	(5-50)	15.2	(4.8-29.2)	20.4	(4-40)
55-59	21.9	(4.8-40)	26.1	(5-50)	14.6	(4.8-29.2)	19.9	(4-40)
60-64	20.1	(4.8-40)	24.3	(5-40)	13.7	(4.8-29.2)	19.1	(4-40)
65-69	18.2	(4.8-40)	22.0	(5-40)	12.9	(4.8-29.2)	17.7	(4-40)
70-74	16.3	(4.8-29.2)	20.0	(4-40)	11.9	(4.8-20)	16.5	(3-40)
75-79	14.5	(4.8-29.2)	17.5	(3-40)	11.2	(4.8-20)	15.8	(3-30)
80-84	13.4	(4.8-29.2)	15.4	(2-40)	9.5	(4.8-20)	13.7	(3-30)
85+	12.7	(4.8-29.2)	14.3	(2-40)	6.9	(4.8-20)	14.3	(2-40)

^aBased on published mean values of categories in CPS-I (Hammond et al., 1977) and continuous data in CPS-II.

Key: CPS = Cancer Prevention Study.

APPENDIX 12**Number and Percentage of Current Cigarette Smokers at Each Age, by Cigarettes Smoked Per Day: Men, CPS-I and CPS-II**

Age	Study	Cigarettes Per Day (%)						Number of Persons
		1-9	10-19	20	21-39	40	41+	
30-34	CPS-I	6.9	18.6	39.6	23.8	8.8	2.2	5,062
	CPS-II	11.7	16.7	29.9	23.7	13.3	4.7	
35-39	CPS-I	6.6	15.7	39.0	25.6	10.6	2.5	8,089
	CPS-II	10.0	14.5	26.4	25.0	17.4	6.8	
40-44	CPS-I	6.5	15.7	39.1	24.2	11.4	3.0	13,864
	CPS-II	8.1	12.1	25.6	26.1	20.1	7.9	
45-49	CPS-I	6.4	15.7	38.5	24.6	11.9	3.0	38,826
	CPS-II	8.1	12.1	25.6	26.1	20.1	7.9	
50-54	CPS-I	7.1	16.6	38.6	23.0	11.9	2.8	34,490
	CPS-II	7.7	11.8	27.9	25.8	19.3	7.5	
55-59	CPS-I	8.5	19.2	39.6	20.4	10.1	2.2	22,443
	CPS-II	7.8	13.4	29.1	24.6	18.4	6.6	
60-64	CPS-I	11.3	23.2	39.7	16.5	7.8	1.4	12,936
	CPS-II	9.3	15.6	32.7	22.4	15.3	4.8	
65-69	CPS-I	14.6	27.3	39.3	12.5	5.6	0.8	6,649
	CPS-II	11.2	19.9	35.5	18.5	11.9	3.1	
70-74	CPS-I	20.2	30.8	35.4	8.9	4.1	0.5	2,835
	CPS-II	14.2	24.0	35.9	14.9	9.0	2.1	
75-79	CPS-I	28.1	30.9	31.8	6.6	2.3	0.3	919
	CPS-II	20.7	27.0	34.0	11.5	5.6	1.3	
80-84	CPS-I	31.5	33.5	28.4	4.7	1.9	—	257
	CPS-II	30.1	28.9	26.6	8.7	4.0	1.7	
85+	CPS-I	37.9	31.0	25.9	3.4	—	1.7	58
	CPS-II	43.0	18.6	26.7	3.5	5.8	2.3	

Key: CPS = Cancer Prevention Study.

APPENDIX 13**Number and Percentage of Current Cigarette Smokers at Each Age, by Cigarettes Smoked Per Day: Women, CPS-I and CPS-II**

Age	Study	Cigarettes Per Day (%)						Number of Persons
		1-9	10-19	20	21-39	40	41+	
30-34	CPS-I	22.9	29.6	32.8	11.3	3.1	0.3	7,933
	CPS-II	15.7	23.1	31.1	18.0	9.5	2.5	3,452
35-39	CPS-I	22.1	30.0	32.6	11.3	3.7	0.3	14,556
	CPS-II	13.8	21.1	31.7	20.7	10.1	2.7	5,505
40-44	CPS-I	21.9	31.2	33.3	10.3	3.1	0.3	28,764
	CPS-II	14.2	20.5	32.6	19.2	11.0	2.4	11,613
45-49	CPS-I	22.6	32.3	32.3	9.4	3.1	0.3	40,928
	CPS-II	14.3	21.7	32.1	19.0	10.7	2.3	23,440
50-54	CPS-I	24.6	32.1	31.5	8.5	3.1	0.3	29,422
	CPS-II	14.6	22.0	33.8	17.4	10.1	2.0	25,020
55-59	CPS-I	27.4	31.9	30.7	6.9	2.8	0.3	16,148
	CPS-II	14.3	23.8	34.6	16.4	9.2	1.6	23,271
60-64	CPS-I	31.5	31.4	28.8	5.9	2.2	0.2	7,998
	CPS-II	15.1	25.5	35.9	14.5	7.8	1.3	16,756
65-69	CPS-I	35.6	31.5	26.3	4.5	1.8	0.2	4,006
	CPS-II	17.0	28.9	36.3	10.8	6.1	0.9	10,437
70-74	CPS-I	40.6	31.3	24.0	2.8	1.3	0.1	1,627
	CPS-II	20.7	31.2	34.4	7.9	5.0	0.8	4,968
75-79	CPS-I	43.0	32.9	21.0	2.4	0.7	—	575
	CPS-II	22.8	31.2	33.7	7.7	4.1	0.5	1,746
80-84	CPS-I	57.5	24.8	15.7	2.0	—	—	153
	CPS-II	32.2	31.6	27.8	5.1	2.4	0.9	450
85+	CPS-I	81.8	12.1	3.0	3.0	—	—	33
	CPS-II	31.9	30.4	26.7	4.4	5.9	0.7	135

Key: CPS = Cancer Prevention Study.

APPENDIX 14**Number and Percentage of Current Cigarette Smokers at Each Age, by Cigarettes Smoked Per Day: White Men, NHIS-65 and NHIS-83**

Age	Study	Cigarettes Per Day (%)						Number of Persons
		1-9	10-19	20	21-39	40	41+	
30-34	NHIS-65	10.2	16.8	43.4	15.9	10.5	3.3	1,972
	NHIS-83	6.4	19.8	33.4	21.5	15.3	3.6	
35-39	NHIS-65	10.2	16.7	39.1	17.9	12.2	3.9	2,037
	NHIS-83	7.8	12.7	36.8	23.8	14.6	4.4	
40-44	NHIS-65	9.2	16.1	39.2	17.4	13.8	4.4	2,090
	NHIS-83	11.1	13.1	28.0	25.2	15.3	7.2	
45-49	NHIS-65	10.1	17.9	38.6	16.3	13.4	3.9	1,934
	NHIS-83	5.4	7.6	31.0	24.2	23.5	8.3	
50-54	NHIS-65	10.1	17.2	40.3	15.4	12.9	4.1	1,805
	NHIS-83	6.7	9.7	34.0	21.4	21.6	6.7	
55-59	NHIS-65	14.0	19.4	37.3	13.6	12.1	3.6	1,350
	NHIS-83	7.2	10.8	34.8	24.1	17.6	5.5	
60-64	NHIS-65	17.3	22.2	36.0	13.2	8.5	2.8	914
	NHIS-83	4.4	15.1	44.6	12.6	19.1	4.1	
65-69	NHIS-65	19.8	28.5	31.8	10.2	7.4	2.4	623
	NHIS-83	11.4	21.6	33.7	17.1	13.8	2.4	
70-74	NHIS-65	25.2	27.8	32.5	8.4	5.0	1.2	409
	NHIS-83	26.2	21.5	32.1	10.2	9.0	0.9	
75-79	NHIS-65	28.5	34.0	28.1	5.2	2.7	1.5	206
	NHIS-83	20.4	45.4	21.8	12.4	0.0	0.0	
80-84	NHIS-65	34.5	31.7	26.3	4.2	3.3	0.0	69
	NHIS-83	16.1	43.7	24.0	8.0	8.1	0.0	

Key: NHIS = National Health Interview Survey.

APPENDIX 15**Number and Percentage of Current Cigarette Smokers at Each Age, by Cigarettes Smoked Per Day: White Women, NHIS-65 and NHIS-83**

Age	Study	Cigarettes Per Day (%)						Number of Persons
		1-9	10-19	20	21-39	40	41+	
30-34	NHIS-65	18.2	25.7	37.0	12.9	5.2	1.0	1,541
	NHIS-83	14.5	24.3	36.7	14.7	8.3	1.7	
35-39	NHIS-65	17.2	27.1	36.4	12.1	6.2	1.0	1,748
	NHIS-83	11.3	22.9	41.0	12.1	10.3	2.4	
40-44	NHIS-65	18.1	24.7	38.2	10.3	6.9	1.8	1,705
	NHIS-83	6.8	19.5	41.3	17.9	12.6	1.9	
45-49	NHIS-65	18.2	28.6	37.2	9.5	5.7	0.9	1,512
	NHIS-83	10.4	17.5	40.0	16.8	11.5	3.9	
50-54	NHIS-65	21.1	30.6	33.3	8.4	5.7	1.0	1,270
	NHIS-83	12.5	19.4	40.5	15.5	10.8	1.4	
55-59	NHIS-65	22.5	27.4	35.6	7.9	5.5	1.3	896
	NHIS-83	12.1	24.6	41.1	11.5	8.2	2.4	
60-64	NHIS-65	24.4	29.8	33.2	7.2	4.5	1.0	506
	NHIS-83	14.4	29.7	36.6	10.8	6.2	2.3	
65-69	NHIS-65	35.3	26.7	31.2	3.5	3.0	0.3	313
	NHIS-83	19.5	29.3	38.1	8.5	3.9	0.7	
70-74	NHIS-65	34.6	33.6	23.8	6.3	1.7	0.0	173
	NHIS-83	23.2	20.2	36.4	12.6	7.6	0.0	
75-79	NHIS-65	47.5	22.9	24.8	1.6	3.2	0.0	60
	NHIS-83	22.4	35.2	32.9	7.2	2.3	0.0	
80-84	NHIS-65	57.2	13.4	14.6	7.9	6.9	0.0	28
	NHIS-83	12.5	24.9	62.6	0.0	0.0	0.0	

Key: NHIS = National Health Interview Survey.

APPENDIX 16
Cumulative Percentage of Cigarette Smokers Who Began Smoking Cigarettes Before Given Ages, by Sex, Study, and Birth Cohort

Sex	Age of Initiation	Study	1860	1870	1880	1890	1900	1910	1920	1930	1940	1950
Women												
	<15	CPS-I	—	—	0.8	0.8	1.2	3.3	3.9	—	—	—
		CPS-II	—	—	—	3.1	2.8	5.1	4.5	6.9	11.3	11.2
	<20	CPS-I	—	—	5.0	7.1	20.8	48.0	59.7	—	—	—
		CPS-II	—	—	—	13.4	26.4	47.1	52.8	63.1	71.6	72.5
	<25	CPS-I	—	—	10.6	17.8	48.0	76.6	87.5	—	—	—
		CPS-II	—	—	—	25.6	50.4	72.6	81.3	87.6	91.7	92.6
	<30	CPS-I	—	—	17.3	32.5	67.0	87.0	95.1	—	—	—
		CPS-II	—	—	—	38.6	65.6	83.4	89.7	93.9	96.2	98.6
Men												
	<15	CPS-I	—	18.7	15.8	13.8	12.2	12.4	12.1	—	—	—
		CPS-II	—	—	—	24.7	18.1	17.6	16.1	17.4	19.1	17.0
	<20	CPS-I	—	53.9	55.8	61.2	66.1	70.4	77.1	—	—	—
		CPS-II	—	—	—	61.2	66.6	69.4	74.1	74.5	78.9	79.0
	<25	CPS-I	—	72.3	75.9	86.3	90.8	93.3	96.9	—	—	—
		CPS-II	—	—	—	85.3	87.4	90.5	94.2	94.8	95.8	96.6
	<30	CPS-I	—	75.8	83.2	92.3	95.8	97.5	99.2	—	—	—
		CPS-II	—	—	—	90.0	93.5	96.4	97.7	97.9	98.6	99.8

Key: CPS = Cancer Prevention Study.

APPENDIX 17

Mean Number of Years Smoked at Baseline^a (plus 5th and 95th percentiles) Among Current Cigarette Smokers, by Sex, Study, and Age

Age	Men				Women			
	CPS-I		CPS-II		CPS-I		CPS-II	
	Mean	(5th-95th)	Mean	(5th-95th)	Mean	(5th-95th)	Mean	(5th-95th)
30-34	14.9	(9-21)	14.6	(7-21)	13.2	(5-17)	13.4	(5-19)
35-39	19.2	(13-26)	19.5	(11-26)	17.1	(6-22)	18.2	(8-25)
40-44	24.3	(17-31)	24.5	(16-31)	21.4	(8-27)	22.6	(10-29)
45-49	28.5	(20-36)	28.7	(20-36)	24.4	(9-32)	26.3	(12-33)
50-54	33.1	(24-41)	33.6	(23-40)	26.1	(8-36)	30.4	(15-38)
55-59	37.7	(28-45)	38.3	(27-46)	26.9	(9-40)	34.1	(17-43)
60-64	42.3	(29-51)	42.7	(30-50)	28.5	(12-44)	38.0	(20-48)
65-69	46.4	(29-56)	47.5	(35-56)	30.4	(16-48)	41.8	(20-53)
70-74	50.1	(28-61)	52.2	(38-61)	32.8	(20-53)	44.1	(20-57)
75-79	53.8	(29-66)	55.6	(35-65)	35.6	(25-56)	45.0	(16-61)
80-84	57.8	(32-70)	60.0	(30-71)	39.1	(30-64)	45.8	(13-66)
85+	62.7	(36-78)	63.1	(10-79)	44.5	(35-69)	47.8	(20-72)

^aBased on published mean values of categories in CPS-I (Hammond et al., 1977) and continuous data in CPS-II.

Key: CPS = Cancer Prevention Study.

APPENDIX 18**Percentage Distribution of Measured Tar Content^a of Cigarette Brand Currently Smoked at Enrollment in CPS-I and CPS-II**

Sex	Number ^b of Subjects	Percentage by Tar Content (mg)					
		<6.0 mg	6.0-11.9 mg	12.0-16.9 mg	17.0-20.9 mg	21.0-25.7 mg	25.8-35.7 mg
Men							
CPS-I	128,427	—	0.4	12.4	29.2	17.5	40.6
CPS-II	91,209	19.5	23.5	38.8	11.1	7.1	—
Women							
CPS-I	135,604	—	0.7	25.3	34.9	15.7	23.3
CPS-II	123,442	18.9	31.7	38.6	7.5	3.3	—

^a Tar content based on Garfinkel, 1979, and Federal Trade Commission, 1983.

^b Excludes cigarette smokers who did not specify the brand of cigarettes currently smoked. Total number of smokers shown in Table 4.

Key: CPS = Cancer Prevention Study.

APPENDIX 19**Age-Specific Deaths and Death Rates From Lung Cancer as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Men, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	0	—	3	8.1	1	4.6	1	5.9
40-44	1	4.0	16	28.1	0	—	4	18.7
45-49	4	6.0	66	45.6	4	6.0	26	41.4
50-54	6	5.7	162	75.3	7	5.5	136	115.3
55-59	13	13.6	217	131.5	7	5.3	260	206.1
60-64	16	21.0	229	231.2	14	11.6	381	361.1
65-69	14	23.1	183	341.1	22	21.5	400	581.6
70-74	13	29.7	97	403.4	25	34.9	343	909.0
75-79	8	31.0	53	612.7	21	52.0	170	1,118.3
80-84	8	67.5	8	334.9	16	89.2	51	1,227.7
85+	2	35.3	1	178.5	7	86.8	9	919.0
Total	85		1,035		124		1,781	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 20**Age-Specific Deaths and Death Rates From Lung Cancer as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Women, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	0	—	0	—	1	2.0	1	4.0
40-44	1	0.7	11	9.5	0	—	4	8.9
45-49	13	4.3	28	13.6	4	1.9	43	42.4
50-54	20	5.1	41	19.4	18	5.8	93	64.7
55-59	23	6.2	21	15.6	25	7.2	175	119.9
60-64	38	12.0	29	41.3	42	12.3	215	176.6
65-69	34	13.4	17	48.2	47	16.7	232	286.3
70-74	28	15.9	8	51.6	63	30.5	142	310.0
75-79	25	24.9	2	34.5	44	32.5	77	400.0
80-84	21	43.4	0	—	41	57.6	24	417.6
85+	9	35.9	0	—	25	60.6	8	499.6
Total	212		157		310		1,014	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 21**Age-Specific Deaths and Death Rates From Coronary Heart Disease as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Men, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	2	12.9	18	48.7	2	9.1	5	29.6
40-44	10	39.7	101	177.4	3	13.4	18	84.1
45-49	54	80.7	443	305.9	18	26.8	92	146.6
50-54	174	164.8	1,065	495.1	72	56.3	251	212.9
55-59	329	344.2	1,289	781.0	157	118.6	407	322.7
60-64	477	626.1	1,215	1,226.8	277	228.6	576	545.9
65-69	596	982.6	914	1,703.7	414	405.4	531	772.1
70-74	707	1,615.3	586	2,437.1	490	685.0	437	1,158.2
75-79	650	2,522.7	272	3,144.4	497	1,231.3	254	1,670.9
80-84	392	3,305.7	116	4,856.3	340	1,894.6	113	2,720.3
85+	377	6,663.3	45	8,030.9	266	3,296.6	37	3,778.1
Total	3,768		6,064		2,536		2,721	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 22**Age-Specific Deaths and Death Rates From Coronary Heart Disease as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Women, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	1	1.4	5	8.3	1	2.0	0	—
40-44	12	7.9	22	19.1	5	5.9	4	8.9
45-49	44	14.6	82	39.9	8	3.8	28	27.6
50-54	131	33.7	177	83.9	25	8.1	66	45.9
55-59	253	67.8	220	163.4	84	24.3	112	76.7
60-64	585	184.9	219	311.9	211	62.0	198	162.6
65-69	989	388.9	208	589.8	353	125.7	249	307.2
70-74	1,281	727.4	156	1,005.7	523	253.5	219	478.2
75-79	1,415	1,412.2	89	1,537.3	717	530.1	163	846.7
80-84	1,152	2,378.3	44	2,634.7	694	975.1	73	1,270.2
85+	1,201	4,795.2	24	5,657.0	1,096	2,655.0	48	2,997.7
Total	7,064		1,246		3,717		1,160	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 23**Age-Specific Deaths and Death Rates From Chronic Obstructive Pulmonary Disease as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Men, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	0	—	0	—	0	—	0	—
40-44	0	—	2	3.5	0	—	0	—
45-49	0	—	2	1.4	0	—	2	3.2
50-54	1	0.9	16	7.4	2	1.6	15	12.7
55-59	2	2.1	54	32.7	3	2.3	28	22.2
60-64	7	9.2	65	65.6	4	3.3	46	43.6
65-69	9	14.8	56	104.4	8	7.8	102	148.3
70-74	4	9.1	45	187.1	18	25.2	98	259.7
75-79	11	42.7	31	358.4	15	37.2	85	559.2
80-84	2	16.9	10	418.6	13	72.4	33	794.4
85+	8	141.4	3	535.4	15	185.9	13	1,327.4
Total	44		284		78		422	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 24

Age-Specific Deaths and Death Rates From Chronic Obstructive Pulmonary Disease as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Women, CPS-I and CPS-II

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	0	—	0	—	0	—	0	—
40-44	1	0.7	2	1.7	0	—	0	—
45-49	1	0.3	4	1.9	0	—	2	2.0
50-54	3	0.8	7	3.3	2	0.6	12	8.3
55-59	1	0.3	9	6.7	6	1.7	24	16.4
60-64	6	1.9	11	15.7	11	3.2	44	36.1
65-69	5	2.0	6	17.0	16	5.7	68	83.9
70-74	9	5.1	9	58.0	24	11.6	65	141.9
75-79	15	15.0	7	120.9	24	17.7	39	202.6
80-84	14	28.9	1	59.9	29	40.7	30	522.0
85+	6	24.0	0	—	31	75.1	19	1,186.6
Total	61		56		143		303	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 25**Age-Specific Deaths and Death Rates From Stroke as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Men, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	0	—	3	8.1	0	0	2	11.9
40-44	4	15.9	14	24.6	1	4.5	1	4.7
45-49	7	10.5	48	33.1	4	6.0	14	22.3
50-54	33	31.3	111	51.6	6	4.7	28	23.7
55-59	46	48.1	140	84.8	13	9.8	49	38.8
60-64	80	105.0	177	178.7	35	28.9	83	78.7
65-69	114	188.0	170	316.9	52	50.9	91	132.3
70-74	201	459.2	146	607.2	80	111.8	83	220.0
75-79	225	873.3	91	1,052.0	113	280.0	81	532.8
80-84	213	1,796.2	42	1,758.3	108	601.8	36	866.6
85+	203	3,587.9	18	3,212.4	89	1,103.0	8	816.9
Total	1,126		960		501		476	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 26**Age-Specific Deaths and Death Rates From Stroke as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Women, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	2	2.7	6	10.0	1	2.0	1	4.0
40-44	14	9.2	15	13.0	1	1.2	3	6.7
45-49	31	10.3	50	24.3	6	2.9	22	21.7
50-54	85	21.9	100	47.4	16	5.2	36	25.0
55-59	102	27.3	84	62.4	23	6.7	58	39.7
60-64	203	64.2	88	125.3	55	16.1	50	41.1
65-69	340	133.7	64	181.5	104	37.0	78	96.2
70-74	458	260.1	56	361.0	135	65.4	81	176.9
75-79	654	652.7	39	673.6	215	159.0	61	316.9
80-84	687	1,418.3	24	1,437.1	273	383.6	19	330.6
85+	741	2,958.6	7	1,650.0	501	1,213.6	13	811.9
Total	3,317		533		1,330		422	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 27**Age-Specific Deaths and Death Rates From Other Smoking-Related Cancers as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Men, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	1	6.5	0	0.0	0	0.0	1	5.9
40-44	0	0.0	6	10.5	2	8.9	3	14.0
45-49	5	7.5	29	20.0	1	1.5	17	27.1
50-54	10	9.5	92	42.8	16	12.5	54	45.8
55-59	18	18.8	112	67.9	31	23.4	93	73.7
60-64	34	44.6	108	109.1	45	37.1	133	126.0
65-69	39	64.3	102	190.1	53	51.9	118	171.6
70-74	37	84.5	48	199.6	56	78.3	103	273.0
75-79	33	128.1	26	300.6	50	123.9	58	381.6
80-84	24	202.4	12	502.4	20	111.4	25	601.8
85+	4	70.7	1	178.5	16	198.3	5	510.6
Total	205		536		290		610	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 28**Age-Specific Deaths and Death Rates From Other Smoking-Related Cancers as Underlying Cause Among Lifelong Never-Smokers and Current Cigarette Smokers: Women, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	0	0.0	0	0.0	2	4.0	1	4.0
40-44	3	2.0	8	6.9	2	2.4	2	4.4
45-49	10	3.3	22	10.7	4	1.9	10	9.9
50-54	29	7.5	34	16.1	20	6.5	27	18.8
55-59	42	11.2	43	32.0	31	9.0	41	28.1
60-64	64	20.2	31	44.1	68	20.0	73	60.0
65-69	95	37.4	18	51.0	97	34.6	78	96.2
70-74	115	65.3	23	148.3	119	57.7	55	120.1
75-79	103	102.8	7	120.9	95	70.2	28	145.4
80-84	69	142.4	3	179.6	66	92.7	12	208.8
85+	35	139.7	1	235.7	48	116.3	5	312.3
Total	565		190		552		332	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 29**Age-Specific Deaths and Death Rates From All Causes Among Lifelong Never-Smokers and Current Cigarette Smokers: Men, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	19	122.7	85	229.8	16	72.9	37	219.3
40-44	48	190.6	236	414.6	21	93.7	65	303.6
45-49	168	251.1	958	661.6	102	151.8	268	427.1
50-54	437	413.9	2,181	1,013.8	283	221.4	800	678.5
55-59	741	775.2	2,694	1,632.3	487	367.7	1,367	1,083.8
60-64	1,011	1,326.9	2,603	2,628.3	815	672.6	1,925	1,824.2
65-69	1,298	2,140.0	2,161	4,028.0	1,120	1,096.7	1,984	2,884.9
70-74	1,566	3,577.8	1,433	5,959.6	1,321	1,846.6	1,760	4,664.5
75-79	1,497	5,810.0	764	8,832.2	1,389	3,441.2	1,113	7,321.7
80-84	1,100	9,276.2	308	12,894.2	981	5,466.5	434	10,447.8
85+	1,026	18,134.2	118	21,058.9	899	11,141.6	135	13,784.9
Total	8,911		13,541		7,434		9,888	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

APPENDIX 30**Age-Specific Deaths and Death Rates From All Causes Among Lifelong Never-Smokers and Current Cigarette Smokers: Women, CPS-I and CPS-II**

Age	CPS-I				CPS-II			
	Never-Smokers		Current Cigarette Smokers		Never-Smokers		Current Cigarette Smokers	
	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
35-39	73	100.1	67	111.4	40	80.6	22	88.8
40-44	230	150.7	230	199.2	93	109.3	50	110.9
45-49	638	211.4	600	291.6	255	122.4	256	252.6
50-54	1,247	320.9	932	442.0	564	182.1	501	348.5
55-59	1,696	454.2	906	673.1	927	268.2	874	598.8
60-64	2,371	749.5	756	1,076.6	1,401	411.4	1,140	936.3
65-69	3,140	1,234.7	545	1,545.4	1,871	666.5	1,243	1,533.7
70-74	3,700	2,101.1	425	2,739.9	2,216	1,073.9	1,020	2,227.0
75-79	3,933	3,925.1	241	4,162.7	2,487	1,838.7	658	3,417.9
80-84	3,406	7,031.6	147	8,802.4	2,245	3,154.2	285	4,959.2
85+	3,552	14,182.1	55	12,964.1	3,331	8,069.2	171	10,679.2
Total	23,986		4,904		15,430		6,220	

^aDeath rate per 100,000 person-years.

Key: CPS = Cancer Prevention Study.

Age and the Exposure-Response Relationships Between Cigarette Smoking and Premature Death in Cancer Prevention Study II

Michael J. Thun, Dena G. Myers, Cathy Day-Lally, Mohan M. Namboodiri, Eugenia E. Calle, W. Dana Flanders, Stacy L. Adams, and Clark W. Heath, Jr.

INTRODUCTION In the United States and other developed countries, cigarette smoking causes most cases of lung cancer and chronic obstructive pulmonary disease (COPD) (U.S. Department of Health, Education, and Welfare, 1964 and 1979; U.S. Department of Health and Human Services, 1984, 1989, and 1990) and a substantial fraction of deaths from coronary heart disease (CHD) (U.S. Department of Health, Education, and Welfare, 1964, 1971, and 1979; U.S. Department of Health and Human Services, 1983, 1989, and 1990) and stroke (U.S. Department of Health, Education, and Welfare, 1964; U.S. Department of Health and Human Services, 1983, 1989, and 1990). Because of the vast number of deaths caused by tobacco, there is a continuing need to quantify the epidemic, both in developed countries, where cigarette smoking has evolved over several generations (Peto et al., 1992 and 1994), and in other countries, where manufactured cigarettes have only recently been introduced (U.S. Department of Health and Human Services, 1992).

Cancer Prevention Study II (CPS-II), begun by the American Cancer Society (ACS) in 1982 (Garfinkel, 1985; Stellman and Garfinkel, 1986; Garfinkel and Stellman, 1988), is the largest and most recent prospective study of smoking and disease. The large size of the cohort facilitates quantification of the dose-response relation between cigarette smoking and premature mortality and estimation of the smoking-attributable risks for many diseases (Shopland et al., 1991). Relative risk estimates from CPS-II (disregarding dose) already have been used extensively to estimate smoking-attributable mortality in the United States (U.S. Department of Health and Human Services, 1989; Shultz et al., 1991 and 1992), Latin America (U.S. Department of Health and Human Services, 1992), and nearly 50 other developed countries (Peto et al., 1992 and 1994).

This chapter extends previous analyses of CPS-II data by examining the exposure-response relation between current age, years of smoking, cigarettes smoked per day, and premature mortality from major tobacco-related diseases. It considers particularly whether the quantitative relationships differ according to the age of the smoker and the epidemiologic measure used to assess risk. Thun and colleagues (Chapter 4) consider whether these quantitative relationships changed over the time between Cancer Prevention Study I (CPS-I) (1959 through 1965) and CPS-II (1982 through 1988).

BACKGROUND AND ISSUES CONSIDERED	The excess risk of mortality of smokers is typically measured as the rate ratio (RR = death rate in smokers divided by that in lifelong nonsmokers) (Rothman, 1986; Cornfield and Haenszel, 1960). An alternative measure is the rate difference (RD = death rate in smokers minus that in never-smokers) (Rothman, 1986). These measures provide different insights into the risk associated with smoking. The RR generally is used to assess etiologic or causal associations. It expresses the death rate among smokers as a multiple of that in never-smokers, indirectly reflecting the proportion of deaths attributable to smoking among the exposed. The RD represents the absolute increase in death rates among exposed persons. It reflects more directly the burden of premature mortality on individuals and society (Rothman, 1986).
The Effect of Age on the RR and RD	Age-related factors profoundly influence many chronic diseases. Because background death rates are included in the calculations of both the RR and RD, age-related changes in background risk potentially influence both measures. For CHD and stroke in particular, hypertension and other age-related factors cause mortality to increase dramatically with age in nonsmokers as well as in smokers (U.S. Department of Health and Human Services, 1983). In countries where background CHD mortality is high, the age-related increase in background risk causes the RR to decrease and the RD to increase with aging (Hennekens et al., 1984). In the British Doctors Study, death rates from CHD were 5.7 times higher among cigarette smokers than among nonsmokers at ages 35 to 44 but were approximately equal to those of nonsmokers at ages 75 to 84 (Doll and Hill, 1966; Rothman, 1986). Similar patterns were seen in CPS-I (Hammond, 1966) and the U.S. Veterans' Study (Kahn, 1966). Although the age-related changes in RR have not been emphasized, calculations of deaths from smoking have considered at least two age groups (35 to 64, ≥ 65) in estimating deaths from CHD and stroke in several recent reports on smoking and disease (Peto et al. 1992 and 1994; U.S. Department of Health and Human Services, 1992).
Age and Susceptibility to Cancer	There are at least two hypotheses on the relationship of age to cancer risk; these arguments have been extended to lung cancer and smoking. Peto and colleagues (1975 and 1985) contend that increasing age alone does not increase biologic susceptibility to cancer but merely allows time for exposures to accumulate, genetic damage to occur, and tumors to become manifest. Others theorize that aging impairs immunity, reduces DNA (deoxyribonucleic acid) repair, and causes loss of cell regulation, which may amplify injury by carcinogens (Anisimov, 1989; Miller, 1991; Holiday, 1984). Understanding the relative effects of age and years of smoking is particularly important in an era when many cigarette smokers begin smoking in adolescence and continue through life. The concept that age might accelerate the carcinogenic process has potential implications for both cancer prevention and research emphasis.

Age, Years of Smoking, and Cigarettes Smoked Per Day	Most studies have not been large enough to sharply separate the effects of age, years of smoking, and daily cigarette consumption. Widely cited and informative analyses were published by Doll and Peto (Doll and Peto, 1978; Peto, 1986) based on a 20-year followup of the British Doctors Study (Doll and Peto, 1976). Among men who currently were smoking ≤40 cigarettes per day and who began smoking between ages 16 and 25, lung cancer incidence was proportional to the fourth or fifth power of duration, as estimated by [age (in years)—22.5], but only to the second power of the number of cigarettes smoked per day (Doll and Peto, 1978; Peto, 1986). Age-22.5 served as a proxy for the number of years of smoking. The results have been widely interpreted as showing that the duration of smoking has a greater effect on lung cancer risk than does the daily number of cigarettes smoked (Moolgavkar et al., 1989; Higgenson, 1988). However, the statistical modeling was based on only 124 cases of lung cancer (Doll and Peto, 1978), and the use of age-22.5 to reflect duration left open the possibility that older smokers might be more susceptible to a given duration of smoking and amount of daily cigarette consumption because effect modification by age could not be assessed in these analyses (Moolgavkar et al., 1989; U.S. Department of Health and Human Services, 1990; Wu-Williams and Samet, 1994; Burns, 1994).
	CPS-II provides an unusual opportunity to examine age as a potential modifier of the effect of smoking because the study provides direct information on both age and years of smoking, includes 3,229 lung cancer deaths, and is sufficiently large to support stratified analyses, which require fewer assumptions than statistical modeling.
SUBJECTS AND METHODS	Subjects in the analyses were drawn from CPS-II (Garfinkel, 1985; Garfinkel and Stellman, 1988), a nationwide prospective mortality study of 1,185,106 men and women, begun by the ACS in 1982.
Selection Criteria	CPS-II subjects were recruited by ACS volunteers in all 50 States, the District of Columbia, Puerto Rico, and Guam. Volunteers contacted their friends, neighbors, and acquaintances and sought to enroll all household members age 30 or older if at least one family member was 45 years or older (Garfinkel, 1985). A similar approach was used effectively in the Hammond-Horn or 10-State study (Hammond and Horn, 1958a and 1958b) and the CPS-I (Hammond, 1964 and 1966; Hammond and Garfinkel, 1961; U.S. Department of Health and Human Services, 1990).
Followup	The authors' analyses are based on 6-year followup, from the month of enrollment in 1982 through August 31, 1988. In this interval, the participants' vital status was determined every 2 years through personal contact by the volunteers. The analyses were restricted to deaths identified by the volunteers during the first 6 years. In the entire cohort, 79,802 participants (6.7 percent) had died, 1,083,600 (91.4 percent) were alive, and 21,704 (1.8 percent) were lost to followup during this interval. Persons lost to followup were considered alive until the end of followup. Death certificates were obtained for 94.1 percent of the persons known to have died. The underlying cause of death was coded according to an

abbreviated version of the *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-9)* (World Health Organization, 1977).

Information on Tobacco Smoking At enrollment, participants completed a four-page questionnaire on demographic and lifestyle factors, including tobacco use (questions on smoking appear as Appendix 1). The distribution of smoking responses among all CPS-II participants is shown in Table 1. "Never-smokers," subsequently called nonsmokers, were persons who answered "no" to question 2 and did not respond to questions 3 through 7. "Current cigarettes only" included persons who answered "yes" to question 2, who had never smoked pipes or cigars, and who left blank the questions on former smoking. Current smokers were considered to have complete data if they specified the "age began smoking" and "average number smoked per day." The duration of smoking was defined as "total years smoked" reported by the respondent or, if missing, the difference between age of initiation and age at enrollment. In the dose-response analyses, duration was considered fixed at the time of enrollment, except as otherwise specified. However, person-years of observation (PYO's) and deaths accrued at the age of the individual during the year of followup. That is, smokers were considered to be continuing smokers for purposes of age classification (age was advanced), but the years of smoking were fixed at entry into the study.

Analytic Cohort All analyses were restricted to 482,681 lifelong nonsmokers and 228,682 current cigarette (only) smokers with complete data on years of smoking and daily cigarette consumption. We excluded former cigarette smokers, persons ever smoking pipes or cigars, and those whose smoking status was unclassifiable (Table 1). Dose-response analyses were further restricted to persons ages 50 to 79 years who were either lifelong nonsmokers or current cigarette smokers of ≥ 20 years duration on enrollment.

Rate Comparisons in Never-Smokers and Current Smokers We compared death rates from lung cancer (ICD-9, 162), CHD (ICD-9, 410-414), stroke (ICD-9, 430-438), COPD (ICD-9, 490-492, 496) (World Health Organization, 1977), and all combined causes of death among current cigarette smokers and lifelong nonsmokers. The numerators used in calculating the rates were age-, gender-, and cause-specific deaths as coded by underlying (Tables 2 through 12) or contributing (Appendices 2 and 3) causes of death as stated on death certificates. The denominators were person-years at risk within the corresponding age and gender (Appendix 4). Figures 1 through 10, using age-specific death rates, RR's, and RD's, illustrate how age modifies the apparent effect of smoking on premature mortality. Age-adjusted death rates (Tables 2 through 12) were directly standardized to the 1980 U.S. population (Appendix 5) (U.S. Department of Health and Human Services, 1985). Ninety-five percent confidence intervals for the age-adjusted RR's and RD's were calculated using approximate variance formulas (Rothman, 1986). For each fatal endpoint, we calculated the percentage of deaths attributable to smoking among all current cigarette smokers (Table 4) ($(\text{death rate in smokers} - \text{rate in nonsmokers}) / \text{death rate in smokers}$) $\times 100$, or alternatively

Table 1
Smoking habits of Cancer Prevention Study II participants

Smoking Habits	Men		Women		Total
	N	%	N	%	
Never-Smokers ^a	127,163	(25.0)	355,518	(52.6)	482,681
Current Cigarettes Only					
Data complete	101,888	(20.0)	126,794	(18.7)	228,682
Data incomplete ^b	3,196	(0.6)	8,298	(1.2)	11,494
Former Cigarettes Only					
Data complete	140,988	(27.7)	122,059	(18.0)	263,047
Data incomplete ^b	9,558	(1.9)	16,896	(2.5)	26,454
Ever Pipe or Cigar	101,600	(20.0)	NA ^c	NA ^c	101,600
Unclassifiable	24,186	(4.8)	46,962	(6.9)	71,148
Total	508,579		676,527		1,185,106
Total in Analyses ^d	229,051		482,312		711,363

^a "Never-smokers" defined as never having smoked at least one cigarette, cigar, or pipe daily for 1 year's time.

^b Data missing on years of smoking or daily cigarette consumption.

^c Women not asked about pipe or cigar smoking.

^d Excludes persons with incomplete or unclassifiable data, former smokers, and those who ever smoked pipes or cigars.

Key: NA = not available.

$(RR - 1/RR) \times 100$ (Rothman, 1986). We estimated this smoking-attributable fraction (SAF) within 5-year age intervals and over all ages.

Exposure-Response Analyses We calculated death rates from lung cancer, CHD, and all combined causes of death by attained age (50 to 59, 60 to 69, 70 to 79), years of smoking at baseline (20 to 29, 30 to 39, 40 to 49, ≥ 50), cigarettes smoked per day (1 to 19, 20, 21 to 39, 40, 41+), and sex (Appendices 6 through 17). Stratification was possible only for the most common diseases in persons ages 50 to 79 and those reporting at least 20 years of smoking. Within each stratum of age, smoking, and sex we measured the RR and RD compared with lifelong nonsmokers of comparable age and sex.

Figure 11 shows the RD values for lung cancer in relation to cigarette exposure using three rather than five categories of cigarettes per day (Appendices 18 through 21) to increase the stability of the rate estimates. All the RD values based on three or more deaths in both smokers and nonsmokers were positive. However, those based on fewer than three deaths (not shown) were sometimes negative. We did not use these values. We repeated the analyses allowing the years of smoking to progress during followup as well as age (Appendices 22 through 25). Based on a comparison of Appendixes 18 through 21 and 22 through 25, we assessed whether

continued smoking during followup was distorting the apparent effect of age on the exposure-response relationships.

Many other exposure-response analyses not discussed here are included in the appendixes for archival purposes. These stratify on either age and cigarettes per day (Appendices 26 through 37) or age and years of smoking (Appendices 38 through 59) but not on all three variables simultaneously.

Stratified vs.

Standardized

Exposure-Response

Analyses

The description of exposure-response relationships over all ages was constrained by several factors. First, even in a large study like CPS-II, cause-specific deaths and person-years at risk are sparse when stratified simultaneously by several variables.

Although broader categories of age and years of smoking might improve the statistical power of subgroup analyses, there would be concern for residual confounding. Second, because most deaths caused by smoking occurred at least 30 years after initiation and because age and years of smoking were strongly collinear, the PYO's largely lie along the diagonal from middle age/medium duration to old age/long duration. Death rates in cells off this diagonal were estimated poorly because there were essentially no PYO's. Neither direct nor indirect standardization could be used to summarize the effect of years of smoking across all age strata. Direct standardization would necessarily assign finite weights to empty cells, treating these rates as zeros rather than as unmeasurable. Indirect standardization would weight smokers with short duration more heavily toward younger ages and long-term smokers toward older ages.

RESULTS

**Never-Smokers vs.
Current Smokers**

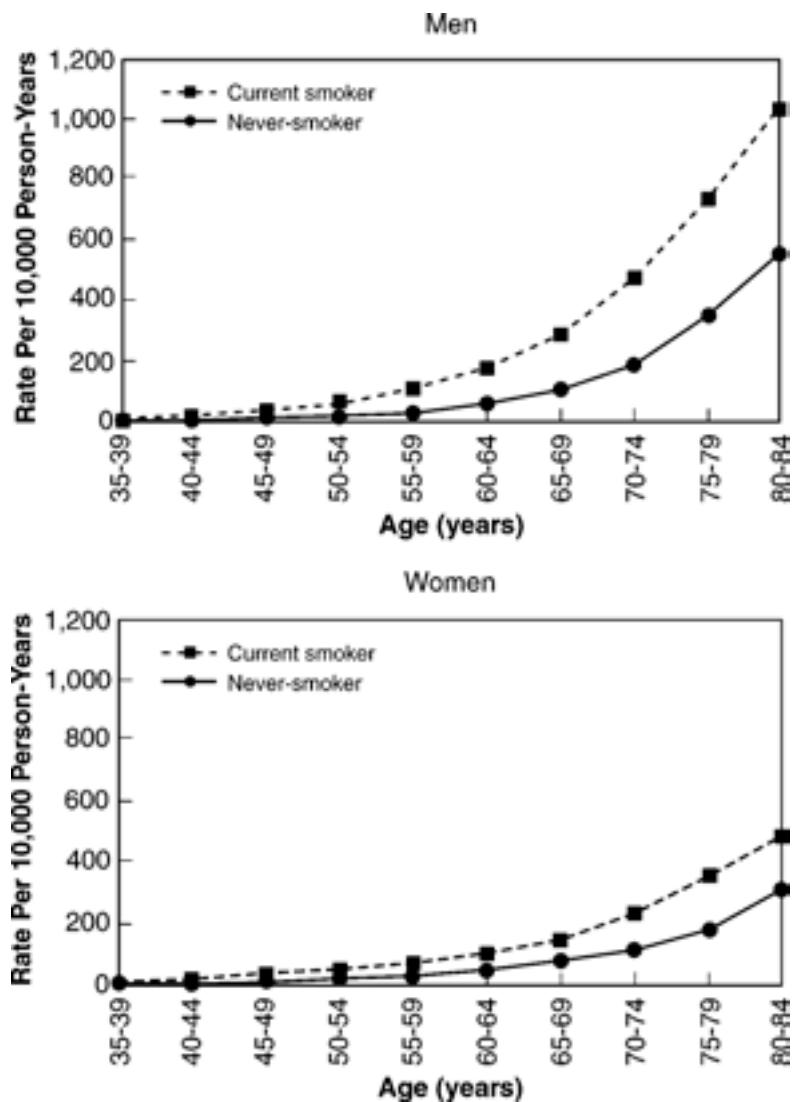
Death rates from all combined causes were substantially higher in men and women who smoked cigarettes than in lifelong nonsmokers (Figure 1 and Tables 2 and 3). Because the death rates increased more steeply with age in smokers than in nonsmokers (Figure 1), the absolute difference in death rates

All Causes of Death

(RD) increased with the age of the smoker (Figure 2). The RD associated with any current cigarette smoking peaked among smokers at 4,981.3 deaths per 100,000 person-years in men (Table 2) and 1,805 in women (Table 3) at the oldest ages. (Note: Death rates in Figure 1 are presented per 10,000 person-years, whereas those in Tables 2 and 3 are per 100,000.)

In contrast, when the death rate in smokers was expressed relative to that in nonsmokers, the effect of smoking as reflected by the RR decreased rather than increased beyond age 65 (Figure 2). Among men, all-cause death rates between ages 35 and 59 were about three times higher in smokers than nonsmokers, whereas rates were 1.9 times higher at age 80 and older (Table 2). Among women, the all-cause RR peaked at 2.3 times higher for smokers vs. nonsmokers at ages 60 to 69 and decreased to 1.6 times higher in the oldest age group (Table 3). The decline in the all-cause RR with age indicates that, even though the death rate of smokers increases faster with age than that of nonsmokers, it does not keep pace on a multiplicative scale with the rising background risk in nonsmokers beyond age 59 in men and age 69 in women.

Figure 1
All-cause death rates in current cigarette smokers and lifelong nonsmokers, by age and sex



The age-related decline in RR also implies that the percentage of deaths from all causes attributable to smoking decreases among older cigarette smokers (Table 4). This proportion varies with the RR; in CPS-II it peaked at 69 percent among male smokers ages 40 to 44 (Table 4) and at 57 percent among female smokers ages 65 to 69. Among smokers of all ages, 52 percent of deaths in men and 43 percent in women were attributable to smoking.

Table 2

All-cause mortality among lifelong nonsmokers and current cigarette smokers: Men, Cancer Prevention Study II

Age	Age Specific					
	Nonsmokers		Current Cigarette Smokers		RR	RD ^a
Deaths	Rate ^a	Deaths	Rate ^a			
35-39	16	72.9	37	219.3	3.0	146.4
40-44	21	93.7	65	303.6	3.2	209.9
45-49	102	151.8	268	427.1	2.8	275.3
50-54	283	221.4	800	678.5	3.1	457.1
55-59	487	367.7	1,367	1,083.8	3.0	716.0
60-64	815	672.6	1,925	1,824.2	2.7	1,151.7
65-69	1,120	1,096.7	1,984	2,884.9	2.6	1,788.2
70-74	1,321	1,846.6	1,760	4,664.5	2.5	2,817.9
75-79	1,389	3,441.2	1,113	7,321.7	2.1	3,880.5
80+	981	5,466.5	434	10,447.8	1.9	4,981.3
Total	6,535		9,753			

Age Standardized to 1980 U.S. Population		
	Nonsmokers	Current Cigarette Smokers
Death Rate ^a	751.7	1,560.0
Rate Ratio	1.0	2.1
(95% CI)	—	(2.0-2.2)
Rate Difference ^a	—	808.1
(95% CI)	—	(750.6-865.5)

^a Death rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

Lung Cancer Death rates from lung cancer (per 100,000 person-years) diverged markedly with age between smokers and nonsmokers (Figure 3 and Tables 5 and 6). Background death rates were much lower for lung cancer than for other diseases in nonsmokers but increased rapidly between ages 45 and 74 years in smokers (Figure 3). Figure 4 illustrates that the absolute difference (RD) between the rates of smokers and nonsmokers increased dramatically with age, especially in men. However, the ratio of death rates (RR) was biphasic, first increasing (in men) and later decreasing (in both sexes). The RR in men increased from 7 (at ages 45 to 49) to 39 (at ages 55 to 59) and then decreased to 13.8 (at age 80 and older) (Table 5). In women, there were insufficient observations to evaluate death rates in those younger than age 45, but the RR decreased from 22.1 at ages 45 to 49 years to 7.3 at age 80 and older (Table 6).

Much less variability with age occurred in the percentage of fatal lung cancers attributable to smoking (SAF, Table 4) than in the RR (Table 5 and Figure 4). The SAF among smokers averaged 95 percent in men and

Table 3

All-cause mortality among lifelong nonsmokers and current cigarette smokers: Women, Cancer Prevention Study II

Age	Age Specific			RR	RD ^a
	Nonsmokers		Current Cigarette Smokers		
	Deaths	Rate ^a	Deaths	Rate ^a	
35-39	40	80.6	22	88.8	1.1
40-44	93	109.3	50	110.9	1.0
45-49	255	122.4	256	252.6	2.1
50-54	564	182.1	501	348.5	1.9
55-59	927	268.2	874	598.8	2.2
60-64	1,401	411.4	1,140	936.3	2.3
65-69	1,871	666.5	1,243	1,533.7	2.3
70-74	2,216	1,073.9	1,020	2,227.0	2.1
75-79	2,487	1,838.7	658	3,417.9	1.9
80+	2,245	3,154.2	285	4,959.2	1.6
Total	12,099		6,049		
Age Standardized to 1980 U.S. Population					
	Nonsmokers		Current Cigarette Smokers		
Death Rate ^a	485.5		842.8		
Rate Ratio (95% CI)	1.0		1.8 (1.7-1.8)		
Rate Difference ^a (95% CI)	—		357.3 (320.4-394.2)		

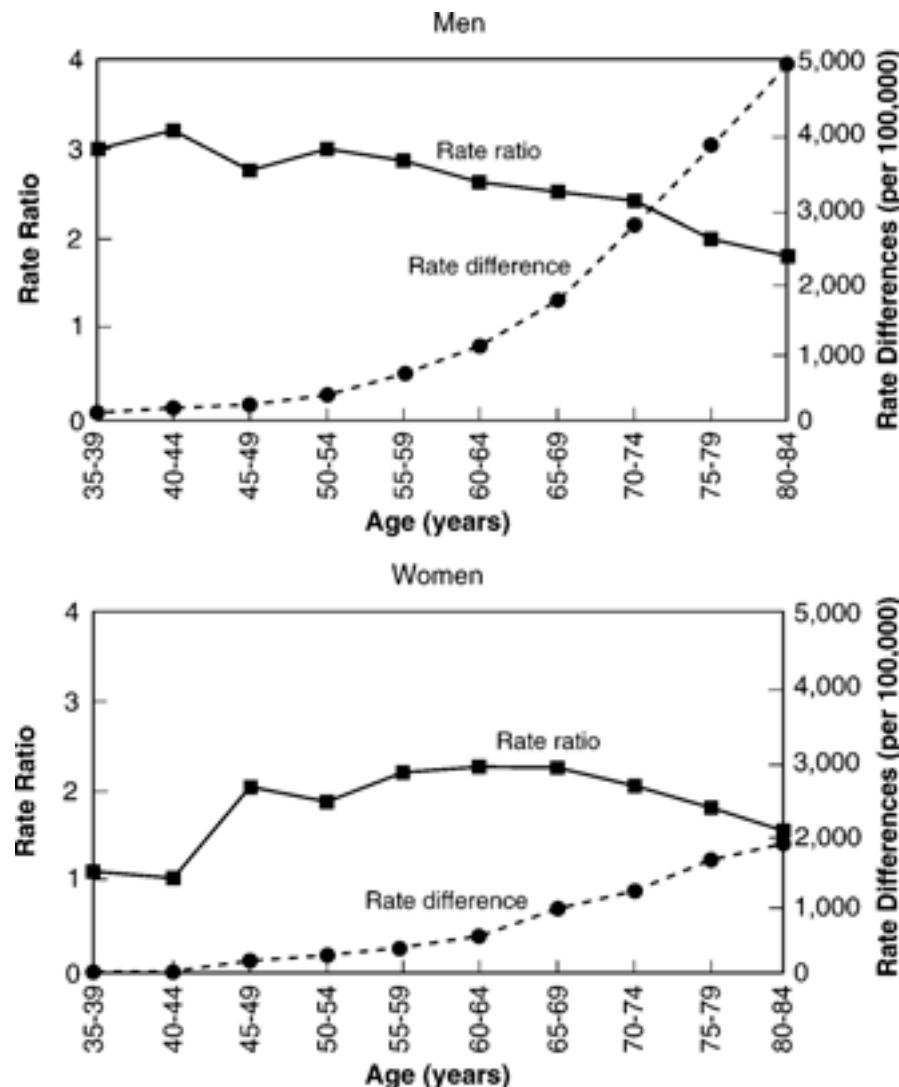
^aDeath rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

92 percent in women in all age 35 and older combined, always exceeding 85 percent (Table 4). The relative stability of this measure reflects the nonlinear relation between it and the RR ($SAF = (RR-1)/RR \times 100$); 50 percent of its impact occurs as the RR decreases from 2.0 to 1.0. RR values above 10 (Table 5 and Figure 4) correspond to SAF values above 90 percent (Table 4).

Coronary Heart Disease Age-specific death rates from coronary heart disease followed a pattern similar to that for all-cause mortality; smokers had higher death rates at all ages, yet the background risk among nonsmokers rose substantially with age (Figure 5). Consequently, the difference in death rates (RD) rose progressively with age (for women it declined slightly only for those older than age 79), whereas the ratio (RR) peaked at 6.3 in men (ages 40 to 44) and at 7.2 in women (ages 45 to 49) and declined progressively with further aging (Figure 6 and Tables 7 and 8). The percentage of CHD deaths attributable to smoking among cigarette smokers declined more dramatically with age than did the percentage of lung cancer deaths (increasing slightly

Figure 2
All-cause rate ratios and rate differences in current cigarette smokers and lifelong nonsmokers, by age and sex



only in men age 80 and older) (Table 4). The SAF decreased in men from 84 percent at ages 40 to 44 years to 26 percent at ages 75 to 79 years and in women from 86 percent at ages 45 to 49 years to 23 percent at age 80 and older. As the RR approached 1.0 at older ages (Tables 7 and 8), the attributable percentage (Table 4) diminished rapidly, as anticipated.

Stroke Age-specific patterns of stroke mortality (Figures 7 and 8, Tables 9 and 10) were similar to those seen with CHD. The RD's increased progressively with age, whereas the RR's in men followed a biphasic pattern and in women

Table 4

Percentage of deaths attributable to smoking (SAF)^a among current cigarette smokers in Cancer Prevention Study II

	Age										All Ages Combined
	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80+	
Men											
Lung cancer	—	—	86	95	97	97	96	96	95	93	95
CHD	69	84	82	74	63	58	47	41	26	31	41
Stroke	—	—	73	80	75	63	62	49	47	31	36
COPD	—	—	—	88	90	92	95	90	93	91	91
All causes	67	69	64	67	66	63	62	60	53	48	52
Women											
Lung cancer	—	—	95	91	94	93	94	90	92	86	92
CHD	—	—	86	82	68	62	59	47	38	23	37
Stroke	—	—	87	79	83	61	62	63	50	—	28
COPD	—	—	—	92	89	91	93	92	91	92	93
All causes	9	2	51	48	55	56	57	52	46	36	43

^a Smoking-attributable fraction (SAF) = $\frac{(RR-1)}{RR} - \frac{1}{RR}$. SAF for all ages is based on RR values directly standardized to 1980 U.S. age distribution.

Key: CHD = coronary heart disease; COPD = chronic obstructive pulmonary disease; RR = rate ratio.

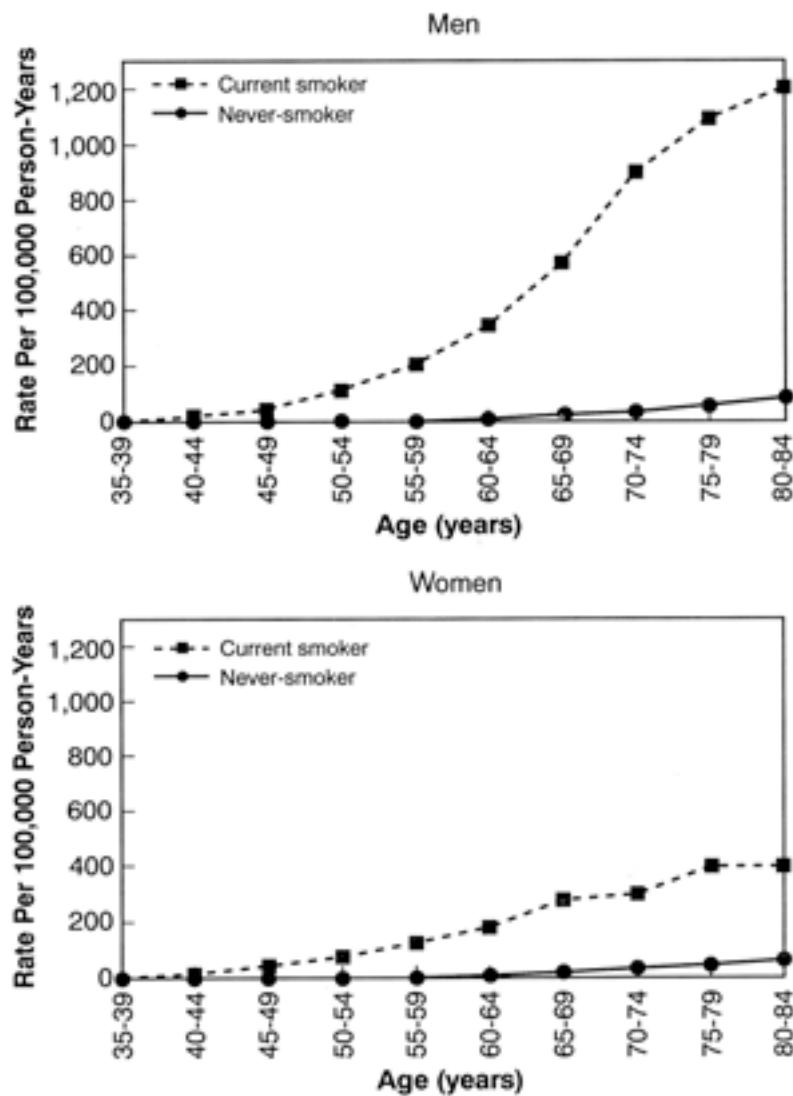
fluctuated somewhat before decreasing consistently after age 74. The percentage of fatal strokes attributable to cigarette smoking also declined dramatically with age among smokers (Table 4). In men this fraction fell from 80 percent at ages 50 to 54 years to 31 percent at ages ≥80 years; in women it decreased erratically from 87 percent at ages 45 to 49 years to virtually 0 percent at ages ≥80 years.

Chronic Obstructive Pulmonary Disease Chronic obstructive pulmonary disease resembled lung cancer in the wide divergence in death rates between smokers and nonsmokers (Figure 9) and the high proportion of deaths attributable to cigarettes among smokers (Tables 4, 11, and 12). Although the RD's consistently increased with age (Figure 10), the RR's fluctuated somewhat erratically between 8 and 19 in men (Table 11) and between 9.5 and 15 in women (Table 12). The SAF remained at or above 88 percent at all ages in both sexes.

**Summary of Rates
in Current Smokers
vs. Lifelong Nonsmokers**

The magnitude of the adverse effects of cigarette smoking on mortality among all smokers differed quantitatively depending on the disease, the age and sex of the smoker, and the epidemiologic measure used to assess risk. The absolute risk of a smoker dying prematurely in CPS-II increased with the age of the smoker, whereas the relative risk first increased and then decreased with age. The percentage of deaths attributable to smoking (SAF) varied more with age for cardiovascular diseases than for lung cancer or COPD because the

Figure 3
Lung cancer death rates in current cigarette smokers and lifelong nonsmokers, by age and sex



mathematical relation between the RR and attributable risk was nonlinear and the attributable percentage decreased rapidly as the RR approached 1.0.

**Dose-Response
Among Current
Cigarette Smokers**

Whereas the previous analyses considered mortality risks among all cigarette smokers together in relation to age, the next section examines the separate and joint effects of age, years of smoking, and current daily cigarette consumption on death rates.

Table 5
Mortality from lung cancer as underlying cause of death among lifelong nonsmokers and current cigarette smokers: Men, Cancer Prevention Study II

Age	Nonsmokers		Current Cigarette Smokers		Age Specific	
	Deaths	Rate ^a	Deaths	Rate ^a	RR	RD ^a
35-39	1	4.6	1	5.9	—	1.4
40-44	0	—	4	18.7	—	18.7
45-49	4	6.0	26	41.4	7.0	35.5
50-54	7	5.5	136	115.3	21.1	109.9
55-59	7	5.3	260	206.1	39.0	200.8
60-64	14	11.6	381	361.1	31.3	349.5
65-69	22	21.5	400	581.6	27.0	560.1
70-74	25	34.9	343	909.0	26.0	874.1
75-79	21	52.0	170	1,118.3	21.5	1,066.3
80+	16	89.2	51	1,227.7	13.8	1,138.6
Total	117		1,772			

Age Standardized to 1980 U.S. Population		
Nonsmokers	Current Cigarette Smokers	
Death Rate ^a	11.3	229.4
Rate Ratio	1.0	20.3
(95% CI)	—	(16.4-25.1)
Rate Difference ^a	—	218.1
(95% CI)	—	(202.0-234.2)

^aDeath rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

Lung Cancer Dose-Response Figure 11 illustrates that the excess death rates (RD) from lung cancer increased with age, years of smoking, and cigarettes smoked per day.

In this stratified presentation, death rates within each subgroup of age, cigarette smoking, and sex (e.g., men ages 60 to 69 who at enrollment had smoked 1 to 19 cigarettes per day, for 20 to 29 years) were compared with rates in age-comparable lifelong nonsmokers (Appendices 18 to 21 and Tables 5 and 6). In men, the RD was higher in older smokers than in younger smokers for a comparable amount of reported smoking. For example, men ages 60 to 69 who had smoked for 20 to 29 years and reported smoking 1 to 19 cigarettes per day currently had excess death rates from lung cancer similar to those of younger men, ages 50 to 59, who had smoked for 10 to 29 years longer (Figure 11 and Appendix 20). There is potential for substantial residual confounding between age and years of smoking within these 10-year categories, and the confounding may be particularly strong in the 50-plus duration category. Such residual confounding limits interpretation of the differences in age-specific rates for duration-specific categories in Figure 11 and Appendix 20. However, within these broad

Table 6
Mortality from lung cancer as underlying cause of death among lifelong nonsmokers and current cigarette smokers: Women, Cancer Prevention Study II

Age	Nonsmokers		Current Cigarette Smokers		RR	RD ^a
	Deaths	Rate ^a	Deaths	Rate ^a		
35-39	1	2.0	1	4.0	—	2.0
40-44	0	—	4	8.9	—	8.9
45-49	4	1.9	43	42.4	22.1	40.5
50-54	18	5.8	93	64.7	11.3	58.9
55-59	25	7.2	175	119.9	16.6	112.7
60-64	42	12.3	215	176.6	14.3	164.3
65-69	47	16.7	232	286.3	17.1	269.5
70-74	63	30.5	142	310.0	10.2	279.5
75-79	44	32.5	77	400.0	12.3	367.5
80+	41	57.6	24	417.6	7.3	360.0
Total	285		1,006			

Age Standardized to 1980 U.S. Population		
	Nonsmokers	Current Cigarette Smokers
Death Rate ^a	8.6	101.3
Rate Ratio (95% CI)	1.0 —	11.9 (10.1-13.7)
Rate Difference ^a (95% CI)	— —	92.7 (83.7-101.7)

^aDeath rate and rate difference per 100,000 person-years.

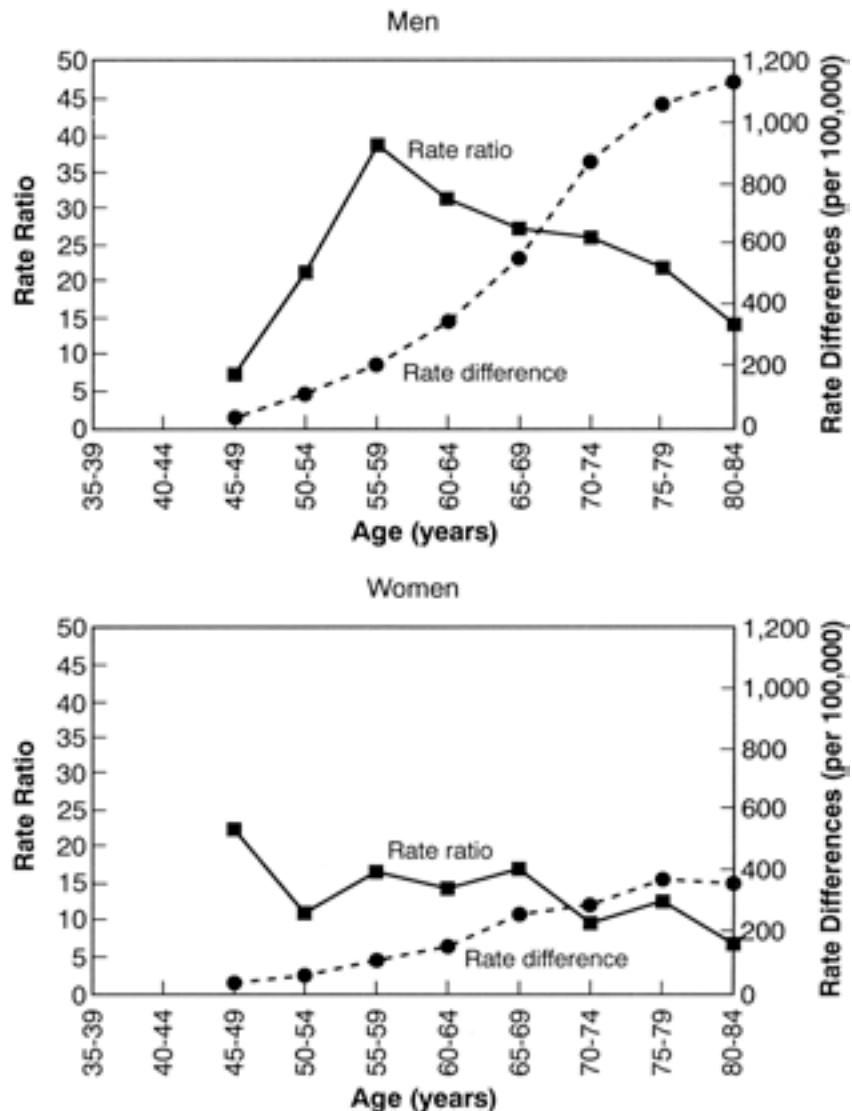
Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

intervals of age, years of smoking, and daily cigarette consumption, older males, but not females, have consistently higher excess lung cancer death rates (RD) than younger individuals in the same duration category.

Coronary Heart Disease and All-Cause Mortality Appendices 10 to 17 present exposure-response data on CHD and all-cause mortality stratified by age, years of smoking, and current daily cigarette consumption. Interpretation of these data as complicated by substantial potential for selection bias. Persons who experience nonfatal symptoms of CHD or who reduce their smoking because of other known risk factors may thereby distort the underlying dose-response relationships. This potential for survivor bias among older persons who continue to smoke heavily is greater for CHD than for lung cancer. The all-cause mortality pattern represents a hybrid of major smoking-related diseases and is similarly vulnerable to selection bias among older smokers.

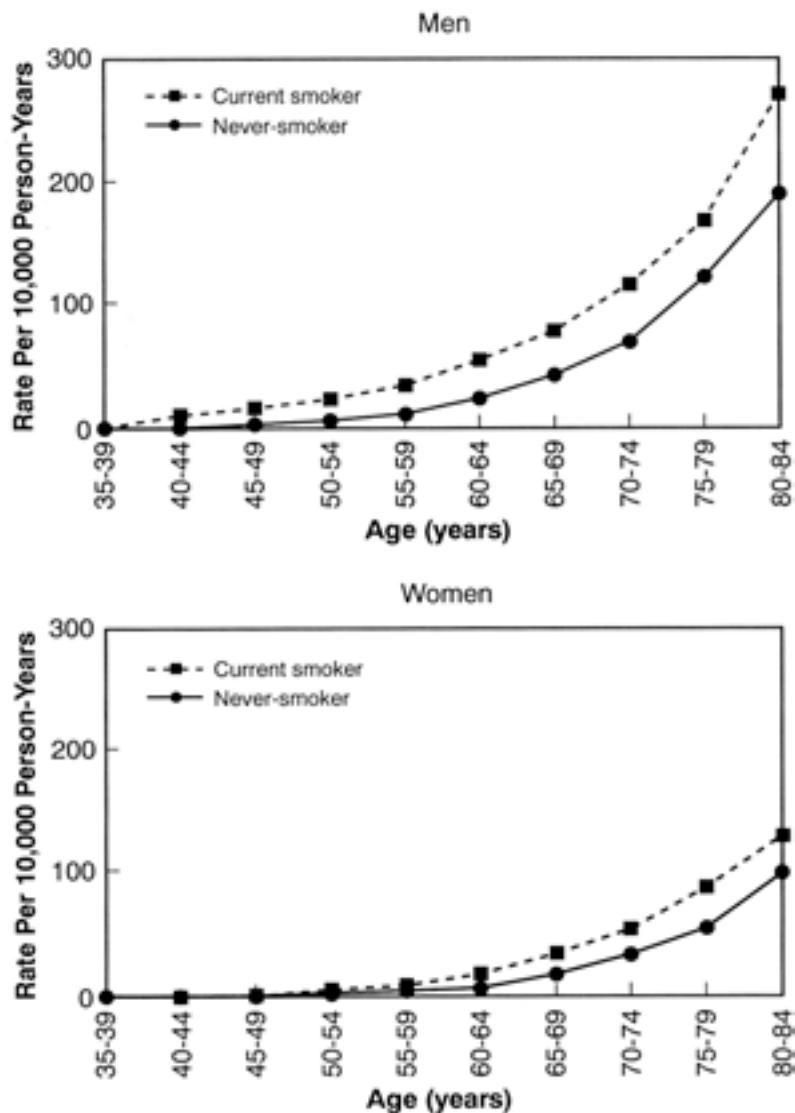
DISCUSSION Our principal findings were that active cigarette smoking consistently and strongly increased the risk of death from lung cancer, CHD, stroke,

Figure 4
Lung cancer rate ratios and rate differences in current cigarette smokers and lifelong nonsmokers, by age and sex



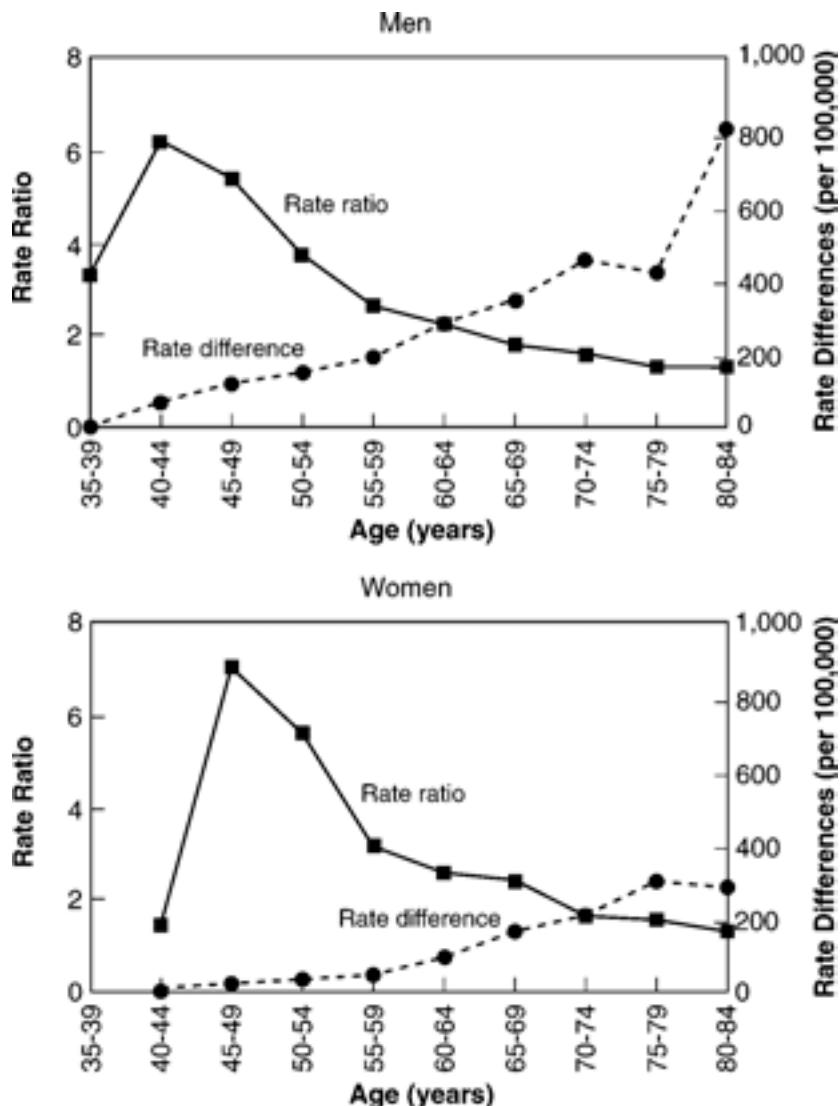
COPD, and death from all causes. However, the magnitude of these adverse effects differed depending on the cause-of-death category, the smoker's age, the number of years of smoking, and the number of cigarettes smoked per day. Relative and absolute measures of risk had different patterns of variation with age for some outcomes. Our results have different implications for the various audiences, including individuals who smoke, epidemiologists who measure the impact of the evolving tobacco epidemic, and researchers interested in carcinogenesis.

Figure 5
Coronary heart disease death rates in current cigarette smokers and lifelong nonsmokers, by age and sex



Significance to Smokers The enormous contribution of cigarette smoking to premature mortality is evident: An estimated 52 percent of deaths in men and 43 percent of deaths in women who continued to smoke were attributable to smoking. This percentage has been rising in U.S. women (Chapter 4) because women began to smoke during adolescence later in this century than did U.S. men. CPS-II demonstrates that the absolute risk of a smoker being killed by cigarette smoking increases rather than decreases with age. Because some

Figure 6
Coronary heart disease rate ratios and rate differences in current cigarette smokers and lifelong nonsmokers, by age and sex



of this risk is reversible (Shopland et al., 1991), an important message for smokers is that "the damage is not yet done." The 1990 U.S. Surgeon General's Report shows that smokers who quit by age 50 experience only modest increased mortality compared with lifelong nonsmokers and that there are substantial benefits from quitting at any age (Shopland et al., 1991). Middle-aged smokers should be considered a high-priority group for smoking cessation programs and for research to improve the success rate of attempted quitting.

Table 7

Mortality from coronary heart disease as underlying cause of death among lifelong nonsmokers and current cigarette smokers: Men, Cancer Prevention Study II

Age	Nonsmokers		Current Cigarette Smokers		Age Specific	
	Deaths	Rate ^a	Deaths	Rate ^a	RR	RD ^a
35-39	2	9.1	5	29.6	3.3	20.5
40-44	3	13.4	18	84.1	6.3	70.7
45-49	18	26.8	92	146.6	5.5	119.8
50-54	72	56.3	251	212.9	3.8	156.6
55-59	157	118.6	407	322.7	2.7	204.1
60-64	277	228.6	576	545.9	2.4	317.3
65-69	414	405.4	531	772.1	1.9	366.7
70-74	490	685.0	437	1,158.2	1.7	473.2
75-79	497	1,231.3	254	1,670.9	1.4	439.6
80+	340	1,894.6	113	2,720.3	1.4	825.7
Total	2,270		2,684			

Age Standardized to 1980 U.S. Population		
	Nonsmokers	Current Cigarette Smokers
Death Rate ^a	240.9	408.0
Rate Ratio (95% CI)	1.0 —	1.7 (1.6-1.8)
Rate Difference ^a (95% CI)	— —	167.1 (138.3-195.8)

^a Death rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

Implications for Estimating Attributable Risk Relative risk estimates among current smokers in CPS-II have been used to estimate the number of deaths caused by cigarette smoking in the United States (U.S. Department of Health and Human Services, 1989; Shultz et al., 1991 and 1992), Latin America (U.S. Department of Health and Human Services, 1992), and many other developed countries (Peto et al., 1992 and 1994). All these applications use age-adjusted rather than age-specific RR estimates, yet the age variability observed in CPS-II is not likely to alter substantively the estimates of smoking-related deaths for several reasons.

First, these methods provide approximate rather than precise estimates of the number of deaths caused by tobacco. The estimates are necessarily crudest in countries where mortality registration is incomplete and prevalence data on smoking are limited. Methods developed by Peto and colleagues (1992 and 1994) and jointly by the Centers for Disease Control and Prevention (CDC) and the Pan-American Health Organization (U.S. Department of Health and Human Services, 1992) use lung cancer mortality to index past smoking

Table 8

Mortality from coronary heart disease as underlying cause of death among lifelong nonsmokers and current cigarette smokers: Women, Cancer Prevention Study II

Age	Age Specific					
	Nonsmokers		Current Cigarette Smokers		RR	RD ^a
Deaths	Rate ^a	Deaths	Rate ^a			
35-39	1	2.0	0	—	—	(2.0)
40-44	5	5.9	4	8.9	1.5	3.0
45-49	8	3.8	28	27.6	7.2	23.8
50-54	25	8.1	66	45.9	5.7	37.8
55-59	84	24.3	112	76.7	3.2	52.4
60-64	211	62.0	198	162.6	2.6	100.6
65-69	353	125.7	249	307.2	2.4	181.5
70-74	523	253.5	219	478.2	1.9	224.7
75-79	717	530.1	163	846.7	1.6	316.6
80+	694	975.1	73	1,270.2	1.3	295.1
Total	2,621		1,112			

Age Standardized to 1980 U.S. Population		
	Nonsmokers	Current Cigarette Smokers
Death Rate ^a	115.4	181.9
Rate Ratio	1.0	1.6
(95% CI)	—	(1.4-1.7)
Rate Difference ^a	—	66.5
(95% CI)	—	(48.7-84.3)

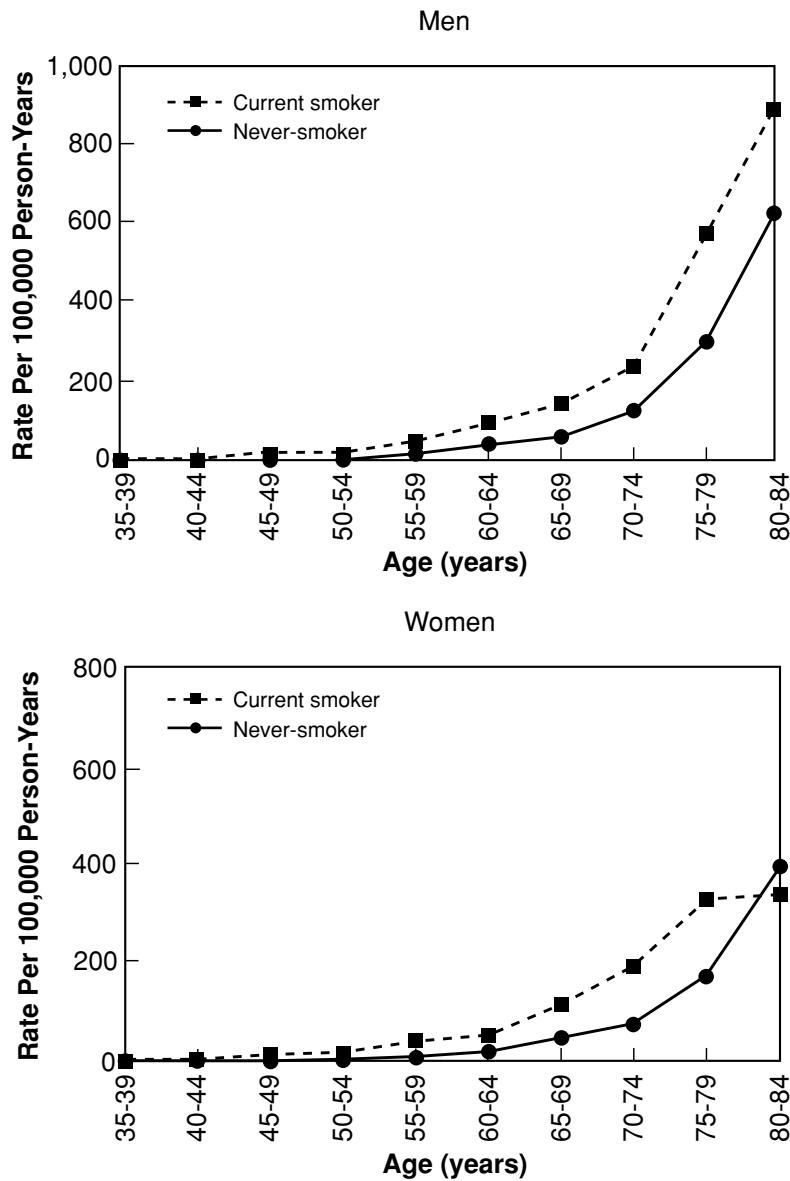
^a Death rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

habits. The RR values from CPS-II are adjusted, based on the death rate from lung cancer in the country of interest relative to that of nonsmokers in the United States. These evolving methods provide interim estimates, pending the availability of regional data on the prevalence of smoking and associated death rates.

The CDC's Office of Smoking and Health has assessed the effect of age variability in RR estimates on its estimates of deaths from tobacco smoking in the United States. When age-specific rather than age-adjusted RR estimates from CPS-II are included in the calculations, the attributable risk estimates decrease by approximately 10 percent in men. This decrease is similar to the difference between the CDC estimate (418,690 deaths from smoking) (Centers for Disease Control and Prevention, 1993) and the Peto and colleagues' estimate (461,000 deaths) (Peto et al., 1992 and 1994) for the United States in 1990. Both estimates are intended to be general approximations that could reasonably differ by at least 10 percent in either direction. In a recent study

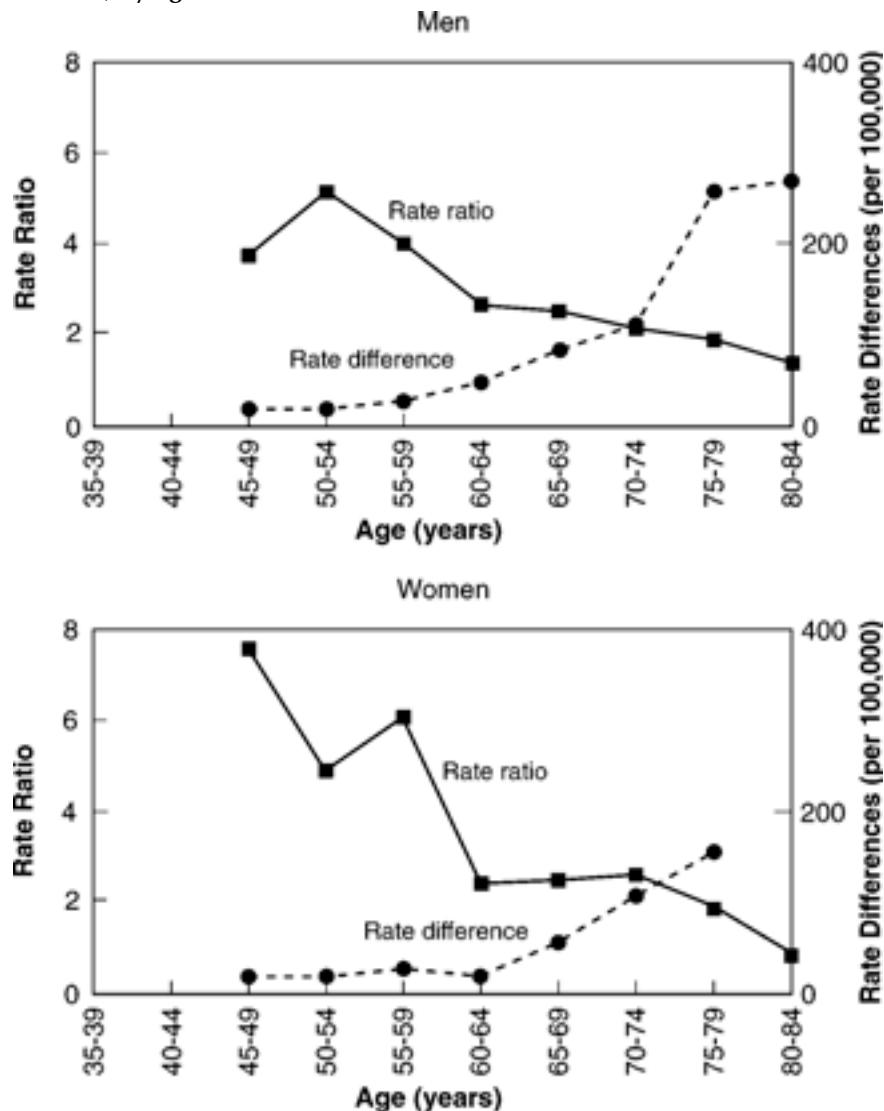
Figure 7
Stroke death rates in current cigarette smokers and lifelong nonsmokers, by age and sex



in Oregon, the CDC estimates were shown to agree well with physician reporting on death certificates (McAnulty et al., 1994).

Future refinements in the attributable risk calculations should consider stabilizing the age standard with which the RR estimates are weighted and perhaps choosing weights that resemble the age distribution of deaths from smoking-related causes. Information on years of smoking or cigarettes

Figure 8
Stroke rate ratios and rate differences in current cigarette smokers and lifelong nonsmokers, by age and sex



smoked per day probably will not improve these estimates in the near future because longitudinal information on dose is rarely available.

Age and Biological Susceptibility Our findings raise the possibility that age may increase a smoker's biological susceptibility to lung cancer, although the evidence is limited by the data available on smoking. Current cigarette consumption reported at enrollment in CPS-II may systematically underestimate past consumption among older smokers because average daily consumption decreases with age after approximately age 50 in

Table 9

Mortality from stroke as underlying cause of death among lifelong nonsmokers and current cigarette smokers: Men, Cancer Prevention Study II

Age	Nonsmokers		Current Cigarette Smokers		Age Specific	
	Deaths	Rate ^a	Deaths	Rate ^a	RR	RD ^a
35-39	0	0.0	2	11.9	—	11.9
40-44	1	4.5	1	4.7	—	0.2
45-49	4	6.0	14	22.3	3.8	16.3
50-54	6	4.7	28	23.7	5.1	19.0
55-59	13	9.8	49	38.8	4.0	29.0
60-64	35	28.9	83	78.7	2.7	49.8
65-69	52	50.9	91	132.3	2.6	81.4
70-74	80	111.8	83	220.0	2.0	108.2
75-79	113	280.0	81	532.8	1.9	252.8
80+	108	601.8	36	866.6	1.4	264.8
Total	412		468			

Age Standardized to 1980 U.S. Population		
	Nonsmokers	Current Cigarette Smokers
Death Rate ^a	55.5	87.2
Rate Ratio	1.0	1.6
(95% CI)	—	(1.3-1.9)
Rate Difference ^a	—	31.7
(95% CI)	—	(17.8-45.6)

^a Death rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

cross-sectional surveys (Chapter 4). The broad categories by which we stratified age, years of smoking, and cigarettes smoked per day leave ample room for residual confounding. Cigarette smokers who report taking up the habit after age 30 may differ in their smoking practices, reporting patterns, or other unidentified ways from those who begin in adolescence. The absolute excess death rate from lung cancer (RD) also may differ from the RR in its relation to age or other factors.

Statistical and Methodological Implications Even if age does not modify the carcinogenic response to cigarette smoke in a biological sense, it does affect the empirical quantitative relationships between smoking and both the RD and RR for lung cancer. One implication is that epidemiologists should consider including interaction terms between smoking and age in statistical models that consider either the RR or RD as the measure of effect. A second implication is that residual confounding by cigarette smoking should be minimized by including variables on age, years of smoking, cigarettes per day, and interaction terms when controlling for smoking in studies in which other risk factors are of primary interest. Otherwise, it will be difficult to

Table 10

Mortality from stroke as underlying cause of death among lifelong nonsmokers and current cigarette smokers: Women, Cancer Prevention Study II

Age	Age Specific					
	Nonsmokers		Current Cigarette Smokers		RR	RD ^a
Deaths	Rate ^a	Deaths	Rate ^a			
35-39	1	2.0	1	4.0	2.0	2.0
40-44	1	1.2	3	6.7	5.7	5.5
45-49	6	2.9	22	21.7	7.5	18.8
50-54	16	5.2	36	25.0	4.9	19.8
55-59	23	6.7	58	39.7	6.0	33.0
60-64	55	16.1	50	41.1	2.5	25.0
65-69	104	37.0	78	96.2	2.6	59.2
70-74	135	65.4	81	176.9	2.7	111.5
75-79	215	159.0	61	316.9	2.0	157.9
80+	273	383.6	19	330.6	0.9	(53.0)
Total	829		409			

Age Standardized to 1980 U.S. Population		
Nonsmokers	Current Cigarette Smokers	
Death Rate ^a	44.1	61.1
Rate Ratio	1.0	1.5
(95% CI)	—	(1.2-1.7)
Rate Difference ^a	—	17.1
(95% CI)	—	(6.9-27.2)

^aDeath rate and rate difference per 100,000 person-years.

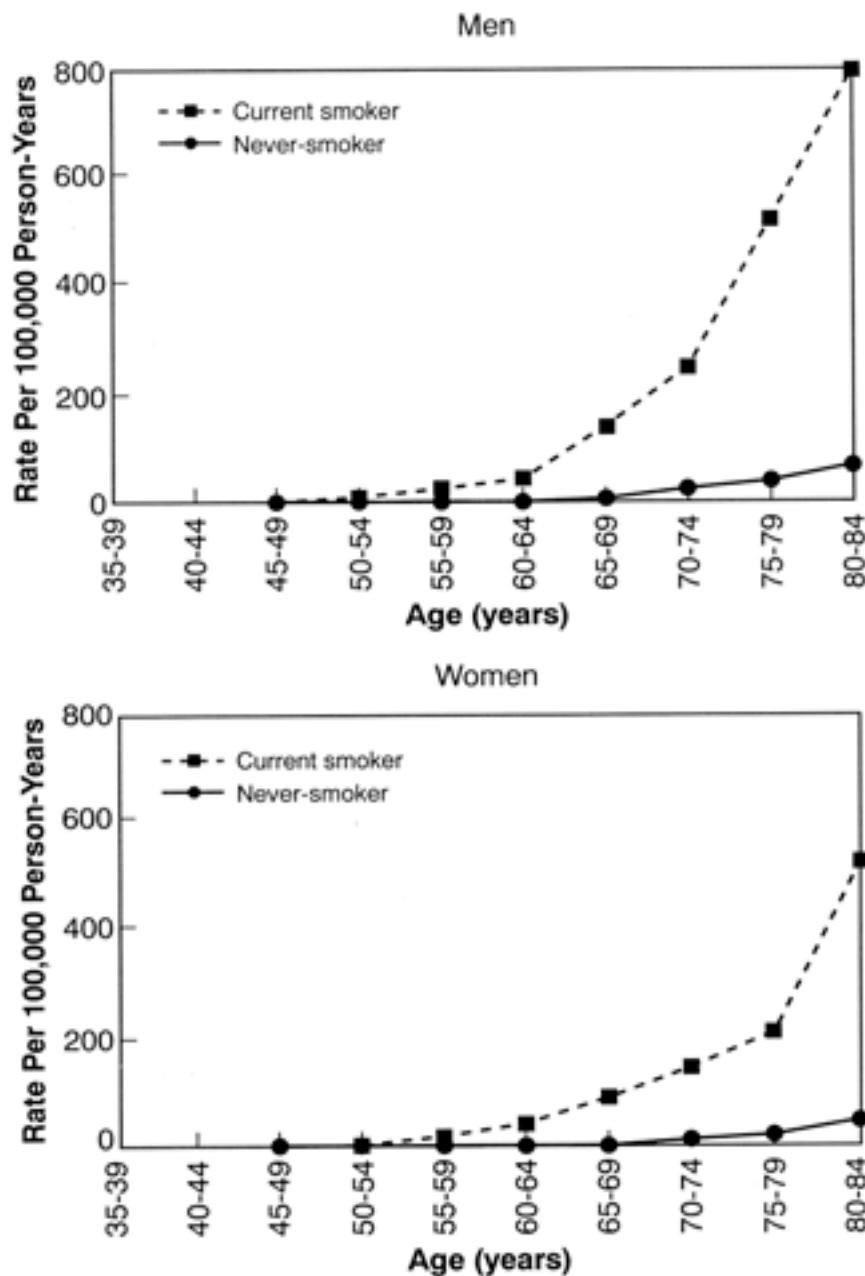
Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

distinguish weak associations with occupation or nutrition, for example, from residual confounding by smoking.

CONCLUSIONS

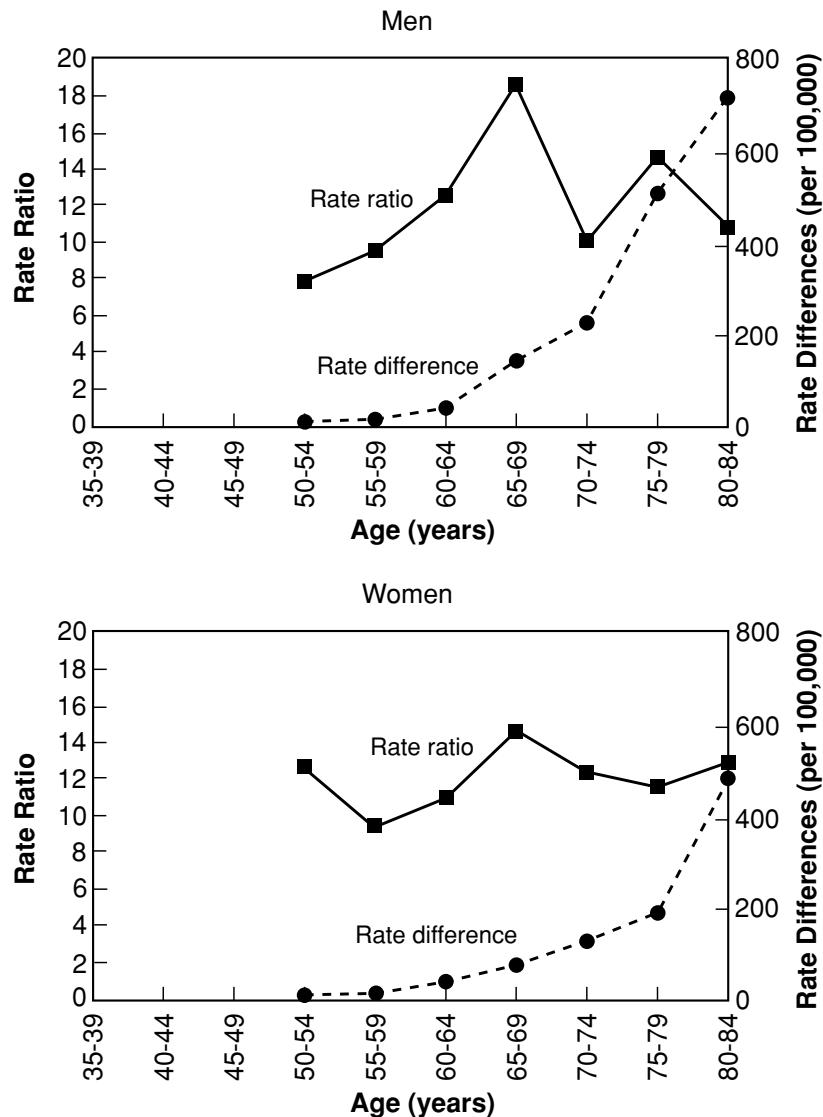
- Among current cigarette smokers in CPS-II, 52 percent of deaths from all causes in men and 43 percent in women were attributable to cigarette smoking, based on age-adjusted death rates standardized to the 1980 U.S. population.
- Cigarette smoking was strongly associated with death from lung cancer, CHD, stroke, and COPD. However, the magnitude of its adverse effect on premature mortality varied with the disease, the age and sex of the smoker, the years of smoking and daily cigarette consumption, and the epidemiologic measure used to assess risk.
- The absolute risk of dying prematurely because of cigarette smoking increased with the age of the smoker as reflected by the rising RD. Thus, the burden of risk that smoking imposes on an individual and society increases rather than decreases with the smoker's age.

Figure 9
Chronic obstructive pulmonary disease death rates in current cigarette smokers and lifelong nonsmokers, by age and sex



- In relative terms, the RR associated with cigarette smoking initially increased and then decreased with age for all the major smoking-related diseases. The initial increase reflected the time lag required for tobacco-induced injury to progress to fatal disease. The decrease

Figure 10
Chronic obstructive pulmonary disease rate ratios and rate differences in current cigarette smokers and lifelong nonsmokers, by age and sex



at older ages occurred because factors other than smoking caused a larger fraction of deaths in older than in younger smokers.

- Age-specific patterns of CHD and stroke were generally similar, as were the patterns for lung cancer and COPD. The etiologic fraction (percentage of deaths attributable to smoking) decreased more sharply with age for CHD and stroke than for lung cancer or COPD, in part reflecting the nonlinear relation between the RR and attributable risk as the RR approaches 1.0.

Table 11

Mortality from chronic obstructive pulmonary disease as underlying cause of death among lifelong nonsmokers and current cigarette smokers: Men, Cancer Prevention Study II

Age	Age Specific					
	Nonsmokers		Current Cigarette Smokers		RR	RD ^a
Deaths	Rate ^a	Deaths	Rate ^a			
35-39	0	—	—	—	—	—
40-44	0	—	—	—	—	—
45-49	0	—	2	3.2	—	3.2
50-54	2	1.6	15	12.7	8.1	11.1
55-59	3	2.3	28	22.2	9.8	19.9
60-64	4	3.3	46	43.6	13.2	40.3
65-69	8	7.8	102	148.3	18.9	140.5
70-74	18	25.2	98	259.7	10.3	234.5
75-79	15	37.2	85	559.2	15.1	522.0
80+	13	72.4	33	794.4	11.0	722.0
Total	63		409			

Age Standardized to 1980 U.S. Population		
	Nonsmokers	Current Cigarette Smokers
Death Rate ^a	8.5	89.9
Rate Ratio	1.0	10.6
(95% CI)	—	(7.9-14.3)
Rate Difference ^a	—	81.4
(95% CI)	—	(66.6-96.2)

^aDeath rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

- Excess mortality from all causes of death increased with the smoker's age and the years of smoking.
- Whether or not age alters biological susceptibility to tobacco-induced lung cancer, it changes the quantitative relation between any cigarette smoking and premature death and alters the exposure-response relations of defined levels of smoking. Epidemiologists should include interaction terms between age and smoking when studying or controlling for the effect of smoking.
- The reliance on RR as the sole epidemiologic measure of association between a particular risk factor and a disease provides an incomplete picture of that disease's occurrence. Prospective studies also should examine and present death rates and RD's associated with the exposure.

Table 12

Mortality from chronic obstructive pulmonary disease as underlying cause of death among lifelong nonsmokers and current cigarette smokers: Women, Cancer Prevention Study II

Age	Age Specific					
	Nonsmokers		Current Cigarette Smokers		RR	RD ^a
Deaths	Rate ^a	Deaths	Rate ^a			
35-39	0	—	0	—	—	—
40-44	0	—	0	—	—	—
45-49	0	—	2	2.0	—	2.0
50-54	2	0.6	12	8.3	12.9	7.7
55-59	6	1.7	24	16.4	9.5	14.7
60-64	11	3.2	44	36.1	11.2	32.9
65-69	16	5.7	68	83.9	14.7	78.2
70-74	24	11.6	65	141.9	12.2	130.3
75-79	24	17.7	39	202.6	11.4	184.9
80+	29	40.7	30	522.0	12.8	481.3
Total	112		284			

Age Standardized to 1980 U.S. Population		
	Nonsmokers	Current Cigarette Smokers
Death Rate ^a	4.2	56.8
Rate Ratio (95% CI)	1.0 —	13.4 (10.5-17.2)
Rate Difference ^a (95% CI)	— —	52.6 (42.1-63.0)

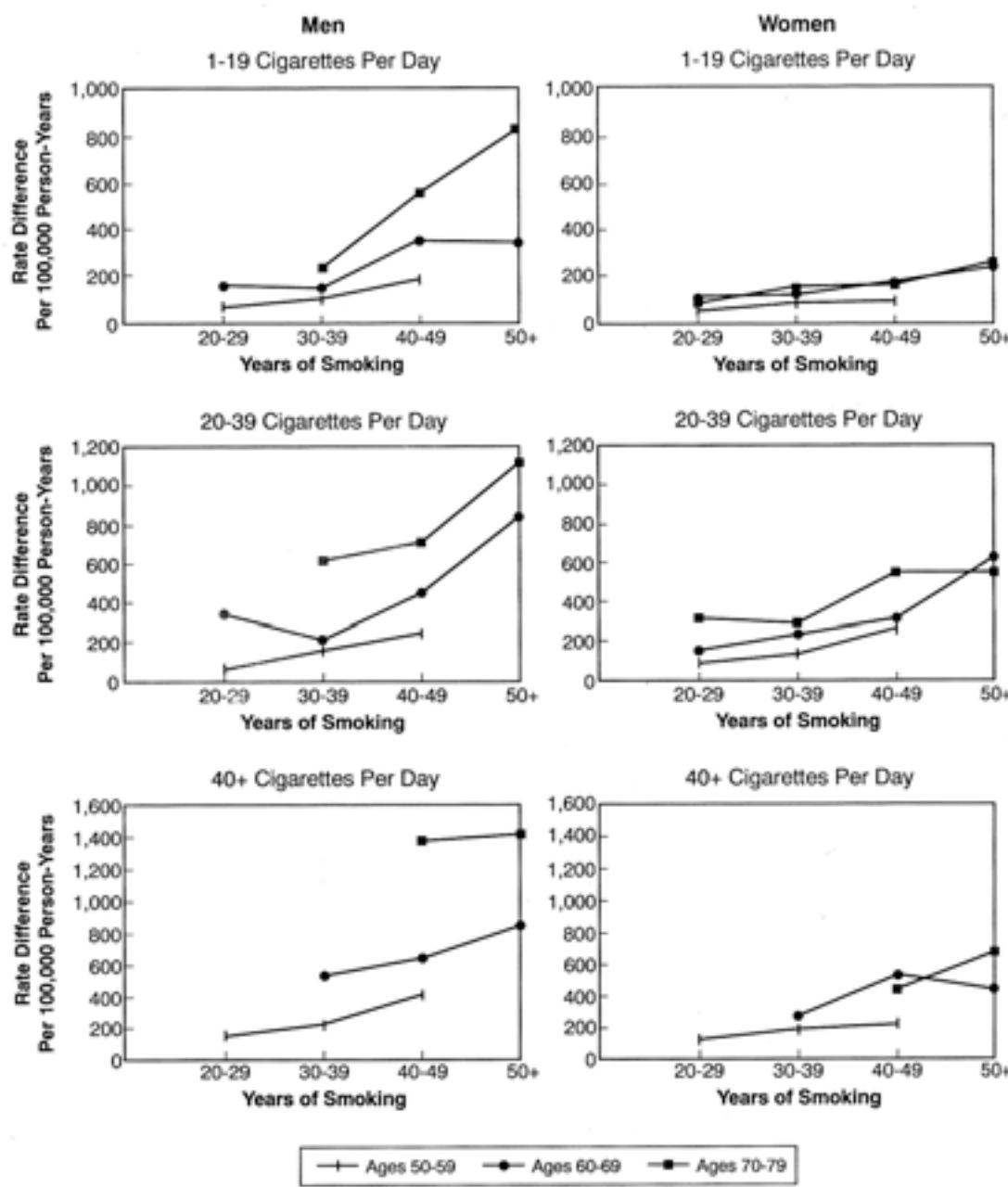
^aDeath rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

- Programs that prevent young people from starting smoking and enable those who already smoke to quit by middle age would have the greatest short- and long-term impact on the tobacco epidemic.

Figure 11

Excess death rates (RD) from lung cancer, by age, years of smoking, and cigarettes per day—
Cancer Prevention Study II: Duration fixed at time of enrollment^a



^aGraphs portray only positive RD values based on cells containing three or more deaths in smokers and never-smokers.

REFERENCES

- Anisimov, V.N. Age-related mechanisms of susceptibility to carcinogenesis. *Seminars in Oncology* 16: 10-19, 1989.
- Burns, D.M. Tobacco smoking. In: *Epidemiology of Lung Cancer*, J.M. Samet (Editor). New York: Marcel Dekker, 1994, pp. 15-49.
- Centers for Disease Control and Prevention. Cigarette smoking-attributable mortality and years of potential life lost—United States, 1990. *Morbidity and Mortality Weekly Report* 42(33):645-649, 1993.
- Cornfield, J., Haenszel, W. Some aspects of retrospective studies. *Journal of Chronic Diseases* 11: 523-534, 1960.
- Doll, R., Hill, A.B. Mortality of British doctors in relation to smoking: Observations on coronary thrombosis. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 205-268.
- Doll, R., Peto, R. Mortality in relation to smoking: 20 years' observation on male British doctors. *British Medical Journal* 2: 1525-1536, 1976.
- Doll, R., Peto, R. Cigarette smoking and bronchial carcinoma: Dose and time relationships among regular smokers and lifelong non-smokers. *Journal of Epidemiologic Community Health* 32: 303-313, 1978.
- Garfinkel, L. Selection, follow-up, and analysis in the American Cancer Society prospective studies. *National Cancer Institute Monographs* 67: 49-52, 1985.
- Garfinkel, L., Stellman, S.D. Smoking and lung cancer in women: Findings in a prospective study. *Cancer Research* 48: 6951-6955, 1988.
- Hammond, E.C. Smoking in relation to mortality and morbidity. Findings in first thirty-four months of follow-up in a prospective study started in 1959. *Journal of the National Cancer Institute* 32: 1161-1188, 1964.
- Hammond, E.C. Smoking in relation to the death rates of one million men and women. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 127-204.
- Hammond, E.C., Garfinkel, L. Smoking habits of men and women. *Journal of the National Cancer Institute* 27: 419-442, 1961.
- Hammond, E.C., Horn, D. Smoking and death rates—report on forty-four months of follow-up of 187,783 men. I. Total mortality. *Journal of the American Medical Association* 166: 1159-1172, 1958a.
- Hammond, E.C., Horn, D. Smoking and death rates—report on forty-four months of follow-up of 187,783 men. II. Death rates by cause. *Journal of the American Medical Association* 166: 1294-1308, 1958b.
- Hennekens, C.H., Mayrent, S.L., Buring, J.E. Epidemiological aspects of aging, mortality, and smoking. In: *Smoking and Aging*, R. Bosse and C. Rose (Editors). Lexington, MA: Lexington Books, 1984, pp. 117-129.
- Higgenson, J. Changing concepts in cancer prevention: Limitations and implications for future research in environmental carcinogenesis. *Cancer Research* 48: 1381-1388, 1988.
- Holiday, R. The aging process is a key problem in biomedical research. *Lancet* 2(8416): 1386-1387, 1984.
- Kahn, H.A. The Dorn study of smoking and mortality among U.S. veterans: Report on eight and one-half years of observation. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 1-125.
- McAnulty, J.M., Hopkins, D.D., Grant-Worley, J.A., Baron, R.C., Fleming, D.W. A comparison of alternative systems for measuring smoking-attributable deaths in Oregon, USA. *Tobacco Control* 3: 115-119, 1994.
- Miller, R.A. Gerontology as oncology. *Cancer* 68: 2496-2501, 1991.
- Moolgavkar, S., Dewanji, A., Luebeck, G. Cigarette smoking and lung cancer: Reanalysis of the British doctors' data. *Journal of the National Cancer Institute* 81: 415-420, 1989.
- Peto, R. Influence of dose and duration of smoking on lung cancer rates. In: *Tobacco: A Major International Health Hazard*, D. Zaridze and R. Peto (Editors). IARC Scientific Publications No. 74. Lyon, France: International Agency for Research on Cancer, 1986, pp. 23-33.
- Peto, R., Lopez, A.D., Boreham, J., Thun, M., Heath, C. Mortality from tobacco in developed countries: Indirect estimation from national vital statistics. *Lancet* 339: 1268-1278, 1992.
- Peto, R., Lopez, A.D., Boreham, J., Thun, M., Heath, C. *Mortality From Smoking in Developed Countries 1950-2000: Indirect Estimation From National Vital Statistics*. Oxford, UK: Oxford University Press, 1994.

- Peto, R., Parish, S.E., Gray, R.G. There is no such thing as aging and cancer is not related to it. In: *Age-Related Factors in Carcinogenesis*, A. Likhachev, V. Anisimov, and R. Montesano (Editors). IARC Scientific Publications No. 58. Lyon, France: International Agency for Research on Cancer, 1985, pp. 43-53.
- Peto, R., Roe, F.J., Lee, P.N., Levy, L., Clack, J. Cancer and aging in mice and men. *British Journal of Cancer* 32: 411-426, 1975.
- Rothman, K.J. *Modern Epidemiology*. Boston: Little, Brown, 1986.
- Shopland, D.R., Eyre, H.J., Pechacek, T.F. Smoking-attributable cancer mortality in 1991: Is lung cancer now the leading cause of death among smokers in the United States? *Journal of the National Cancer Institute* 83: 1142-1148, 1991.
- Shultz, J.M., Novotny, T.E., Rice, D.P. Quantifying the disease impact of smoking with SAMMEC II software. *Public Health Reports* 106: 326-333, 1991.
- Shultz, J.M., Novotny, T.E., Rice, D.P. *Smoking-Attributable Mortality, Morbidity, and Economic Costs (SAMMEC) Version 2.1 [Software and Documentation]*. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, 1992.
- Stellman, S.D., Garfinkel, L. Smoking habits and tar levels in a new American Cancer Society prospective study of 1.2 million men and women. *Journal of the National Cancer Institute* 76: 1057-1063, 1986.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Cardiovascular Disease: A Report of the Surgeon General*. DHHS Publication No. (PHS) 84-50204. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health, 1983.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Chronic Obstructive Lung Disease. A Report of the Surgeon General*. DHHS Publication No. (PHS) 84-50205. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health, 1984.
- U.S. Department of Health and Human Services. *Vital Statistics of the United States, 1980*. Vol. II, Mortality, Part A. DHHS Publication No. 85-1101. Hyattsville, MD: U.S. Department of Health and Human Services, National Center for Health Statistics, 1985.
- U.S. Department of Health and Human Services. *Reducing the Health Consequences of Smoking: 25 Years of Progress: A Report of the Surgeon General, 1989*. DHHS Publication No. (CDC) 89-8411. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1989.
- U.S. Department of Health and Human Services. *The Health Benefits of Smoking Cessation: A Report of the Surgeon General, 1990*. DHHS Publication No. (CDC) 90-8416. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1990.
- U.S. Department of Health and Human Services. Prevalence and mortality. In: *Smoking and Health in the Americas: A 1992 Report of the Surgeon General, in collaboration with the Pan American Health Organization*. DHHS Publication No. (CDC) 92-8419. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1992.
- U.S. Department of Health, Education, and Welfare. *Smoking and Health. Report of the Advisory Committee to the Surgeon General of the Public Health Service*. Public Health Service Publication No. 1103. Rockville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, 1964.
- U.S. Department of Health, Education, and Welfare. *The Health Consequences of Smoking. A Report to the Surgeon General*. DHEW Publication No. (PHS) 71-7513. Rockville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, 1971.
- U.S. Department of Health, Education, and Welfare. *Smoking and Health. A Report of the Surgeon General*. DHEW Publication No. (PHS) 79-50066. Rockville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, Office of the Assistant Secretary for Health, Office on Smoking and Health, 1979.
- World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death*. 9th Revision. Geneva: World Health Organization, 1977.
- Wu-Williams, A.H., Samet, J.M. Lung cancer and cigarette smoking. In: *Epidemiology of Lung Cancer*, J.M. Samet (Editor). New York: Marcel Dekker, 1994, pp. 71-108.

ACKNOWLEDGMENTS We thank Ms. Catherine Boring, Dr. David Burns, Mr. Lawrence Garfinkel, Dr. Gary Giovino, Dr. Jonathan Samet, and Dr. John Slade for their suggestions. We also are indebted to Ms. Audrey Earles for her skill and dedication in producing this chapter.

Appendices 1 Through 59

APPENDIX 1**Questions on Tobacco Smoking in Men—Cancer Prevention Study II Baseline^a**

2. Do you now or have you ever smoked cigarettes, cigars, or pipes, at least one a day for one year's time?
 Yes No

3. If never smoked, skip to question 6.
 If you currently smoke cigarettes, cigars, or pipes, fill in the information below:

Current Smokers	Cigarettes	Cigars	Pipes
Average number smoked per day			
Age began smoking			
Inhalation:			
Do not inhale			
Years smoked	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
nonfiltered cigarettes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

4. Current brand of cigarette:
 a) Size: Regular King 100 mm 120 mm
 b) Nonfiltered Filtered Menthol
 c) Years smoked this brand: _____

5. If you have quit smoking cigarettes, cigars, or pipes, fill in the information below:

Ex-Smokers	Cigarettes	Cigars	Pipes
Average number smoked per day			
Age began smoking			
Age quit			
Inhalation:			
Did not inhale			
Inhaled slightly			
Inhaled moderately			
Inhaled deeply			
Total years smoked			
Years smoked	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
filtered cigarettes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Years smoked	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
nonfiltered cigarettes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

6. Last brand of cigarette smoked:
 a) Size: Regular King 100 mm 120 mm
 b) Nonfiltered Filtered Menthol
 c) Years smoked this brand: _____

7. Current and ex cigarette smokers. Fill in the following information for:
 1) The first brand smoked regularly; and
 2) The brand of cigarette smoked for the longest period of time.

Brand Name	Size	Filtered		Menthol		Number Per Day	Years
		Yes	No	Yes	No		
1.							
2.							

^a Questions for women did not include those on cigar and pipe habits but were otherwise the same as for men.

APPENDIX 2**Mortality From Lung Cancer as any Mention on Death Certificate Among Lifelong Nonsmokers and Current Cigarette Smokers: Cancer Prevention Study II, Men**

Age	Age Specific					
	Nonsmokers		Current Cigarette Smokers		RR	RD ^a
	Deaths	Rate ^a	Deaths	Rate ^a		
35-39	1	4.6	1	5.9	1.3	1.3
40-44	0	0.0	4	18.7	—	18.7
45-49	4	6.0	27	43.0	7.2	37.0
50-54	7	5.5	143	121.3	22.2	115.8
55-59	7	5.3	269	213.3	40.4	208.0
60-64	14	11.6	402	381.0	33.0	369.4
65-69	23	22.5	428	622.4	27.6	599.9
70-74	26	36.3	367	972.7	26.8	936.4
75-79	24	59.5	184	1,210.4	20.4	1,150.9
80+	16	89.2	57	1,372.2	15.4	1,283.0
Total	122		1,882			

Age Standardized to 1980 U.S. Population		
	Nonsmokers	Current Cigarette Smokers
Death Rate ^a	11.9	246.4
Rate Ratio (95% CI)	1.0 —	20.6 (16.8-25.4)
Rate Difference ^a (95% CI)	— —	234.5 (217.6-251.3)

^a Death rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

APPENDIX 3**Mortality From Lung Cancer as any Mention on Death Certificate Among Lifelong Nonsmokers and Current Cigarette Smokers: Cancer Prevention Study II, Women**

Age	Age Specific					
	Nonsmokers		Current Cigarette Smokers		RR	RD ^a
Deaths	Rate ^a	Deaths	Rate ^a			
35-39	1	2.0	1	4.0	2.0	2.0
40-44	0	0.0	4	8.9	—	8.9
45-49	4	1.9	44	43.4	22.6	41.5
50-54	18	5.8	96	66.8	11.5	61.0
55-59	29	8.4	178	122.0	14.5	113.6
60-64	45	13.2	225	184.8	14.0	171.6
65-69	53	18.9	241	297.4	15.8	278.5
70-74	67	32.5	152	331.9	10.2	299.4
75-79	44	32.5	79	410.4	12.6	377.9
80+	42	59.0	26	452.4	7.7	393.4
Total	303		1,046			

Age Standardized to 1980 U.S. Population		
	Nonsmokers	Current Cigarette Smokers
Death Rate ^a	9.2	106.4
Rate Ratio (95% CI)	1.0 —	11.6 (10.0-13.4)
Rate Difference ^a (95% CI)	— —	97.2 (87.8-106.6)

^a Death rate and rate difference per 100,000 person-years.

Key: RR = rate ratio; RD = rate difference; CI = confidence interval.

APPENDIX 4

**Person-Years at Risk In Lifelong Nonsmokers and Current Cigarette Smokers
(Cancer Prevention Study II: 1982-88)**

Age	Never-Smokers		Current Cigarette Smokers	
	Men	Women	Men	Women
30-34	9,189	17,552	6,203	8,077
35-39	21,944	49,633	16,869	24,784
40-44	22,407	85,111	21,408	45,081
45-49	67,204	208,331	62,754	101,349
50-54	127,821	309,700	117,909	143,772
55-59	132,430	345,629	126,134	145,951
60-64	121,174	340,560	105,523	121,752
65-69	102,124	280,728	68,771	81,048
70-74	71,536	206,345	37,732	45,801
75-79	40,363	135,257	15,201	19,252
80-84	17,946	71,175	4,154	5,747
85+	8,069	41,281	979	1,601

APPENDIX 5
Standard Populations Used To Compute Age-Standardized Death Rates

Age	1980 U.S. ^a
30-34	77,516
35-39	61,644
40-44	51,510
45-49	48,951
50-54	51,689
55-59	51,271
60-64	44,528
65-69	38,767
70-74	30,008
75-79	21,160
80-84	12,956
85+	9,888

^a 1980 U.S. represents the age distribution of all persons ages 30 and older per standard million in 1980 (U.S. Department of Health and Human Services. *Vital Statistics of the United States, 1980, Vol. II, Mortality, Part A.* DHHS Publication No. 85-1101. Hyattsville, MD: U.S. Department of Health and Human Services, Public Health Service, National Center for Health Statistics, 1985).

APPENDIX 6**Number of Deaths and Death Rates^a From Lung Cancer in Current Cigarette Smokers,
by Amount and Duration of Smoking: Cancer Prevention Study II, Men**

Cigarettes Per Day	Age	Number of Years Smoked							
		20-29		30-39		40-49		50+	
		Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1-19	50-59	7	62.5	28	99.2	10	173.7	0	—
	60-69	4	170.3	16	154.6	83	346.8	16	330.1
	70-79	1	227.1	3	265.5	27	575.3	105	842.5
20	50-59	8	68.5	63	143.1	26	267.3	1	482.7
	60-69	6	359.9	25	215.7	154	447.6	60	848.5
	70-79	2	870.8	3	455.1	33	702.1	150	1,149.0
21-39	50-59	8	78.3	77	181.0	19	211.4	0	—
	60-69	3	348.2	20	226.3	124	485.8	37	876.5
	70-79	0	—	3	1,206.4	19	886.1	73	1,203.5
40	50-59	8	115.9	63	197.1	25	321.4	2	1,328.9
	60-69	1	156.9	32	543.2	110	613.2	28	922.4
	70-79	0	—	1	603.9	18	1,389.3	49	1,326.7
41+	50-59	4	159.5	30	254.4	16	458.8	0	—
	60-69	0	—	10	484.7	44	755.7	5	552.0
	70-79	0	—	1	2,020.2	6	1,687.8	19	2,183.7

^a Rates per 100,000 person-years.

APPENDIX 7**Number of Deaths and Death Rates^a From Lung Cancer in Current Cigarette Smokers, by Amount and Duration of Smoking: Cancer Prevention Study II, Women**

Cigarettes Per Day	Age	Number of Years Smoked							
		20-29		30-39		40-49		50+	
		Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1-19	50-59	9	28.8	37	66.6	3	62.6	0	—
	60-69	7	66.2	35	132.3	50	143.8	7	235.5
	70-79	3	102.8	6	124.9	18	170.3	28	238.0
20	50-59	14	53.8	62	104.1	8	145.5	0	—
	60-69	11	141.9	51	217.6	92	261.5	21	714.5
	70-79	3	190.4	8	257.8	43	524.8	45	485.5
21-39	50-59	12	97.8	54	157.8	12	381.4	0	—
	60-69	4	199.9	24	238.4	58	362.0	5	395.2
	70-79	3	1,279.3	3	489.7	14	222.0	19	689.8
40	50-59	6	95.5	32	162.6	4	185.1	0	—
	60-69	1	86.2	15	282.0	47	538.4	4	518.1
	70-79	1	525.2	1	307.6	5	411.8	12	736.0
41+	50-59	2	180.6	7	169.1	1	213.9	0	—
	60-69	0	—	1	116.1	7	494.9	0	—
	70-79	0	—	0	—	2	1,028.8	2	786.9

^a Rates per 100,000 person-years.

APPENDIX 8**Rate Difference (RD) and Rate Ratio (RR) From Lung Cancer, by Amount and Duration of Cigarette Smoking and Current Age: Duration Fixed. Cancer Prevention Study II, Men**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	57.1	11.6	93.8	18.4	168.3	32.2	—	—
	60-69	154.2	10.6	138.5	9.6	330.7	21.5	314.0	20.5
	70-79	—	—	224.4	6.5	534.2	14.0	801.4	20.5
20	50-59		12.7	137.7	26.5	261.9	49.5	—	—
	60-69	343.8	22.4	199.6	13.4	431.5	27.8	832.4	52.7
	70-79	—	—	414.0	11.1	661.0	17.1	1,107.9	28.0
21-39	50-59	72.9	14.5	175.6	33.5	206.0	39.1	—	—
	60-69	332.1	21.6	210.2	14.1	469.7	30.2	860.4	54.4
	70-79	—	—	1,165.3	29.4	845.0	21.6	1,162.4	29.3
40	50-59	110.5	21.5	191.7	36.5	316.0	59.5	—	—
	60-69	—	—	527.1	33.7	597.1	38.1	906.3	57.3
	70-79	—	—	—	—	1,348.2	33.8	1,285.6	32.3
41+	50-59	154.1	29.5	249.0	47.1	453.4	85.0	—	—
	60-69	—	—	468.6	30.1	739.6	46.9	535.9	34.3
	70-79	—	—	—	—	1,646.7	41.1	2,142.6	53.1

^a Rate differences per 100,000 person-years.

APPENDIX 9**Rate Difference (RD) and Rate Ratio (RR) From Lung Cancer, by Amount and Duration of Cigarette Smoking and Current Age: Duration Fixed. Cancer Prevention Study II, Women**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	22.2	4.4	60.0	10.1	56.0	9.5	—	—
	60-69	51.9	4.6	118.0	9.3	129.5	10.1	221.2	16.5
	70-79	71.5	3.3	93.6	4.0	139.0	5.4	206.7	7.6
20	50-59	47.2	8.2	203.2	31.8	138.9	22.0	—	—
	60-69	127.6	9.9	203.3	15.2	247.2	18.3	700.2	50.0
	70-79	159.1	6.1	226.5	8.2	493.5	16.8	454.2	15.5
21-39	50-59	91.2	14.8	151.2	23.9	374.8	57.8	—	—
	60-69	185.6	14.0	224.1	16.7	347.7	25.3	380.9	27.6
	70-79	1,248.0	40.9	458.4	15.6	190.7	7.1	658.5	22.0
40	50-59	88.9	14.5	156.0	24.6	178.5	28.0	—	—
	60-69	—	—	267.7	19.7	524.1	37.8	503.8	36.2
	70-79	—	—	—	—	380.5	13.2	704.7	23.5
41+	50-59	—	—	162.5	25.6	—	—	—	—
	60-69	—	—	—	—	480.6	34.6	—	—
	70-79	—	—	—	—	—	—	—	—

^a Rate differences per 100,000 person-years.

APPENDIX 10**Number of Deaths and Death Rates^a From CHD in Current Cigarette Smokers, by Amount and Duration of Smoking: Cancer Prevention Study II, Men**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1-19	50-59	27	241.1	78	276.3	16	277.9	0	0.0
	60-69	8	340.6	58	560.3	154	643.5	42	866.5
	70-79	8	1,816.5	16	1,416.2	38	809.8	164	1,315.9
20	50-59	25	213.9	120	272.6	48	493.4	2	965.4
	60-69	5	299.9	59	509.0	251	729.5	77	1,088.9
	70-79	5	2,177.0	4	606.8	55	1,170.2	207	1,585.7
21-39	50-59	20	195.8	101	237.4	33	367.2	0	0.0
	60-69	2	232.2	31	350.8	155	607.2	47	1,113.4
	70-79	0	0.0	3	1,206.4	19	886.1	88	1,450.8
40	50-59	10	144.9	90	281.6	25	321.4	1	664.5
	60-69	3	470.8	27	458.3	109	607.6	30	988.3
	70-79	0	0.0	2	1,207.9	14	1,080.5	50	1,353.8
41+	50-59	5	199.4	32	271.3	19	544.8	0	0.0
	60-69	0	0.0	4	193.9	28	480.9	8	883.2
	70-79	0	0.0	0	0.0	0	0.0	7	804.5

^a Rates per 100,000 person-years.

APPENDIX 11**Number of Deaths and Death Rates^a From Coronary Heart Disease in Current Cigarette Smokers, by Amount and Duration of Smoking: Cancer Prevention Study II, Women**

Cigarettes Per Day	Age	Number of Years Smoking							
		20-29		30-39		40-49		50+	
		Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1-19	50-59	17	54.3	20	36.0	2	41.7	0	—
	60-69	11	104.0	45	170.1	75	215.8	9	302.8
	70-79	12	411.0	34	707.8	44	416.2	78	662.9
20	50-59	9	34.6	45	75.6	9	163.6	0	—
	60-69	16	206.4	49	209.0	100	284.2	15	510.4
	70-79	4	253.9	16	515.6	41	500.4	74	798.3
21-39	50-59	6	48.9	28	81.8	3	95.4	0	—
	60-69	3	149.9	16	158.9	45	280.9	4	316.2
	70-79	3	1,279.3	5	816.1	11	488.4	17	617.2
40	50-59	5	79.6	13	66.1	5	231.4	0	—
	60-69	0	—	7	131.6	19	217.7	7	906.6
	70-79	1	525.2	2	615.2	7	576.5	11	674.6
41+	50-59	0	—	5	120.8	1	213.9	0	—
	60-69	0	—	0	—	4	282.8	0	—
	70-79	0	—	0	—	0	—	1	393.4

^a Rates per 100,000 person-years.

APPENDIX 12**Rate Difference (RD) and Rate Ratio (RR) From Coronary Heart Disease, by Amount and Duration of Cigarette Smoking and Current Age: Duration Fixed. Cancer Prevention Study II, Men**

Cigarettes Per Day	Age	Number of Years Smoking							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	153.1	2.7	188.3	3.1	189.9	3.2	—	—
	60-69	31.1	1.1	250.8	1.8	334.0	2.1	557.0	2.8
	70-79	934.5	2.1	534.2	1.6	-72.2	0.9	433.9	1.5
20	50-59	125.9	2.4	184.6	3.1	405.4	5.6	—	—
	60-69	9.6	1.0	199.5	1.6	420.0	2.4	779.4	3.5
	70-79	1,295.0	2.5	275.2	0.7	288.2	1.3	703.7	1.8
21-39	50-59	107.8	2.2	149.4	2.7	279.2	4.2	—	—
	60-69	—	—	41.3	1.1	297.7	2.0	803.9	3.6
	70-79	—	—	324.4	1.4	4.1	1.0	568.8	1.6
40	50-59	56.9	1.6	193.6	3.2	233.4	3.7	—	—
	60-69	161.3	1.5	148.8	1.5	298.1	2.0	678.8	3.2
	70-79	—	—	—	—	198.5	1.2	471.8	1.5
41+	50-59	111.4	2.3	183.3	3.1	456.8	6.2	—	—
	60-69	—	—	-115.6	0.6	171.4	1.6	573.7	2.9
	70-79	—	—	—	—	—	—	-77.5	0.9

^a Rate differences per 100,000 person-years.

APPENDIX 13**Rate Difference (RD) and Rate Ratio (RR) From Coronary Heart Disease, by Amount and Duration of Cigarette Smoking and Current Age: Duration Fixed. Cancer Prevention Study II, Women**

Cigarettes Per Day	Age	Number of Years Smoking							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	37.7	3.3	19.4	2.2	—	—	—	—
	60-69	13.2	1.1	79.3	1.9	125.0	2.4	212.0	3.3
	70-79	48.0	1.1	344.8	1.9	53.2	1.1	299.9	1.8
20	50-59	18.0	2.1	59.0	4.5	147.0	9.8	—	—
	60-69	115.6	2.3	118.2	2.3	193.4	3.1	419.6	5.6
	70-79	-109.1	0.7	152.6	1.4	137.4	1.4	435.3	2.2
21-39	50-59	32.3	2.9	65.2	4.9	78.8	5.7	—	—
	60-69	59.1	1.7	68.1	1.8	190.1	3.1	225.4	3.5
	70-79	916.3	3.5	453.1	2.2	125.4	1.3	254.2	1.7
40	50-59	63.0	4.8	49.5	4.0	214.8	13.9	—	—
	60-69	—	—	40.8	1.4	126.9	2.4	815.8	10.0
	70-79	—	—	—	—	213.5	1.6	311.6	1.9
41+	50-59	—	—	104.2	7.3	—	—	—	—
	60-69	—	—	—	—	192.0	3.1	—	—
	70-79	—	—	—	—	—	—	—	—

^a Rate differences per 100,000 person-years.

APPENDIX 14**Number of Deaths and Death Rates^a From All Causes in Current Cigarette Smokers, by Amount and Duration of Smoking: Cancer Prevention Study II, Men**

Cigarettes Per Day	Age	Number of Years Smoking							
		20-29		30-39		40-49		50+	
		Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1-19	50-59	66	589.3	249	882.2	56	972.7	0	—
	60-69	33	1,405.1	166	1,603.6	466	1,947.2	135	2,785.1
	70-79	13	2,951.8	46	4,071.7	194	4,134.0	687	5,512.4
20	50-59	70	599.0	375	852.0	137	1,408.3	7	3,378.9
	60-69	28	1,679.5	183	1,578.6	834	2,424.0	261	3,691.0
	70-79	12	5,224.9	21	3,185.8	219	4,659.4	802	6,143.5
21-39	50-59	63	616.6	334	784.9	114	1,268.7	1	740.2
	60-69	15	1,741.1	129	1,459.6	576	2,256.4	160	3,790.2
	70-79	0	—	11	4,423.5	96	4,476.9	364	6,000.9
40	50-59	51	739.2	307	960.7	110	1,414.1	6	3,986.7
	60-69	5	784.6	113	1,918.1	462	2,575.5	105	3,459.1
	70-79	2	6,234.4	6	3,623.6	75	5,788.6	233	6,308.7
41+	50-59	18	717.9	113	958.2	60	1,720.5	0	—
	60-69	0	—	35	1,696.5	148	2,541.8	31	3,422.3
	70-79	0	—	2	4,040.4	14	3,938.1	53	6,091.4

^a Rates per 100,000 person-years.

APPENDIX 15

Number of Deaths and Death Rates^a From All Causes in Current Cigarette Smokers, by Amount and Duration of Smoking: Cancer Prevention Study II, Women

Cigarettes Per Day	Age	Number of Years Smoking							
		20-29		30-39		40-49		50+	
		Deaths	Rate	Deaths	Rate	Deaths	Rate	Deaths	Rate
1-19	50-59	108	345.0	220	396.1	22	459.2	0	—
	60-69	78	737.5	206	778.8	392	1,127.7	45	1,513.8
	70-79	45	1,541.4	118	2,456.5	203	1,920.3	302	2,566.7
20	50-59	102	391.8	310	520.5	37	672.7	0	—
	60-69	79	1018.9	281	1,198.8	486	1,381.3	67	2,279.7
	70-79	30	1,904.1	83	2,674.8	217	2,648.3	307	3,312.0
21-39	50-59	46	375.1	203	593.2	26	826.4	0	—
	60-69	18	899.7	91	903.9	247	1,541.7	26	2,055.2
	70-79	13	5,543.7	13	2,121.9	60	2,663.9	87	3,158.7
40	50-59	28	445.5	133	675.8	20	925.7	0	—
	60-69	6	517.3	62	1,165.7	138	1,580.9	19	2,460.9
	70-79	7	3,676.1	11	3,383.7	33	2,717.7	63	3,863.8
41+	50-59	6	541.8	32	773.0	5	1,069.5	0	—
	60-69	0	—	7	813.0	33	2,333.0	3	1,508.1
	70-79	0	—	3	8,391.6	5	2,571.9	5	1,967.2

^a Rates per 100,000 person-years.

APPENDIX 16**Rate Difference (RD) and Rate Ratio (RR) From All Causes, by Amount and Duration of Cigarette Smoking and Current Age: Duration Fixed. Cancer Prevention Study II, Men**

Cigarettes Per Day	Age	Number of Years Smoking							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	293.4	2.0	586.3	3.0	676.8	3.3	—	—
	60-69	538.5	1.6	737.0	1.9	1,080.6	2.2	1,918.5	3.2
	70-79	530.0	1.2	1,649.9	1.7	1,712.2	1.7	3,090.6	2.3
20	50-59	303.1	2.0	556.1	2.9	1,112.4	4.8	3,083.0	11.4
	60-69	812.9	1.9	712.0	1.8	1,557.4	2.8	2,824.4	4.3
	70-79	2,803.1	2.2	764.0	1.3	2,237.6	1.9	3,721.7	2.5
21-39	50-59	320.7	2.1	489.0	2.7	972.8	4.3	—	—
	60-69	874.5	2.0	593.0	1.7	1,389.8	2.6	2,923.6	4.4
	70-79	—	—	2,001.7	1.8	2,055.1	1.8	3,579.1	2.5
40	50-59	443.3	2.5	664.8	3.2	1,118.2	4.8	3,690.8	13.5
	60-69	-82.0	0.9	1,051.5	2.2	1,708.9	3.0	2,592.5	4.0
	70-79	—	—	1,201.8	1.5	3,366.8	2.4	3,886.9	2.6
41+	50-59	422.0	2.4	662.3	3.2	1,424.6	5.8	—	—
	60-69	—	—	829.9	2.0	1,675.2	2.9	2,555.7	3.9
	70-79	—	—	—	—	1,516.3	1.6	3,669.6	2.5

^a Rate differences per 100,000 person-years.

APPENDIX 17**Rate Difference (RD) and Rate Ratio (RR) From All Causes, by Amount and Duration of Cigarette Smoking and Current Age: Duration Fixed. Cancer Prevention Study II, Women**

Cigarettes Per Day	Age	Number of Years Smoking							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	117.5	1.5	168.6	1.7	231.7	2.0	—	—
	60-69	210.9	1.4	252.2	1.5	601.1	2.1	987.2	2.9
	70-79	164.6	1.1	1,079.7	1.8	543.5	1.4	1,189.9	1.9
20	50-59	164.3	1.7	293.0	2.3	445.2	3.0	—	—
	60-69	492.3	1.9	672.2	2.3	854.7	2.6	1,753.1	4.3
	70-79	527.3	1.4	1,298.0	1.9	1,271.5	1.9	1,935.2	2.4
21-39	50-59	147.6	1.6	365.7	2.6	598.9	3.6	—	—
	60-69	373.1	1.7	377.3	1.7	1,015.1	2.9	1,528.6	3.9
	70-79	4,166.9	4.0	745.1	1.5	1,287.1	1.9	1,781.9	2.3
40	50-59	218.0	2.0	448.3	3.0	698.2	4.1	—	—
	60-69	-9.3	1.0	639.1	2.2	1,054.3	3.0	1,934.3	4.7
	70-79	2,299.3	2.7	2,006.9	2.5	1,340.9	2.0	2,487.0	2.8
41+	50-59	314.3	2.4	545.5	3.4	842.0	4.7	—	—
	60-69	—	—	286.4	1.5	1,806.4	4.4	981.5	2.9
	70-79	—	—	7,014.8	6.1	1,195.1	1.9	590.4	1.4

^a Rate differences per 100,000 person-years.

APPENDIX 18**Deaths and Death Rates^a From Lung Cancer, by Amount^b and Duration of Cigarette Smoking and Current Age: Duration Fixed at Time of Enrollment: Cancer Prevention Study II, Men**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
1-19	50-59	7	62.5	28	99.2	10	173.7	0	—
	60-69	4	170.3	16	154.6	83	346.8	16	330.1
	70-79	1	227.1	3	265.5	27	575.3	105	842.5
20-39	50-59	16	73.0	140	161.7	45	240.5	1	292.2
	60-69	9	355.9	45	220.3	278	463.9	97	859.0
	70-79	2	676.4	6	660.9	52	759.7	223	1,166.3
40+	50-59	12	127.6	93	212.6	41	363.9	2	1,047.7
	60-69	1	123.7	42	528.0	154	648.1	33	837.3
	70-79	0	—	2	929.8	24	1,453.5	68	1,490.1

^a Death rate per 100,000 person-years. Only rates based on three or more deaths are included in Figure 11.^b Cigarettes per day categorized into three strata because of the limited number of deaths in many strata.

APPENDIX 19**Deaths and Death Rates^a From Lung Cancer, by Amount^b and Duration of Cigarette Smoking and Current Age: Duration Fixed at Time of Enrollment. Cancer Prevention Study II, Women**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
1-19	50-59	9	28.8	37	66.6	3	62.6	0	—
	60-69	7	66.2	35	132.3	50	143.8	7	235.5
	70-79	3	102.8	6	124.9	18	170.3	28	238.0
20-39	50-59	26	67.9	116	123.7	20	231.3	0	—
	60-69	15	153.8	75	223.8	150	292.9	26	618.5
	70-79	6	331.5	11	296.0	57	545.6	64	532.3
40+	50-59	8	108.2	39	163.7	5	190.3	0	—
	60-69	1	744.2	16	258.9	54	532.4	4	411.9
	70-79	1	456.6	1	277.2	7	496.9	14	742.8

^a Death rate per 100,000 person-years. Only rates based on three or more deaths are included in Figure 11.

^b Cigarettes per day categorized into three strata because of the limited number of deaths in many strata.

APPENDIX 20

Rate Difference (RD) and Rate Ratio (RR) From Lung Cancer, by Amount and Duration of Cigarette Smoking and Current Age: Duration Fixed at Time of Enrollment. Cancer Prevention Study II, Men

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	57.1	11.6	93.8	18.4	168.3	32.2	—	—
	60-69	154.2	10.6	138.5	9.6	330.7	21.5	314.0	20.5
	70-79	—	—	224.4	6.5	534.2	14.0	801.4	20.5
20-39	50-59	67.6	13.5	156.3	29.9	235.1	44.5	—	—
	60-69	339.8	22.1	204.2	13.7	447.8	28.8	842.9	53.4
	70-79	—	—	619.8	16.1	718.6	18.5	1,125.2	28.4
40+	50-59	122.2	23.6	207.2	39.4	358.5	67.4	—	—
	60-69	—	—	511.9	32.8	632.0	40.3	821.2	52.0
	70-79	—	—	—	—	1,412.4	35.4	1,449.0	36.3

^a Rate differences per 100,000 person-years graphed in Figure 11.

APPENDIX 21**Rate Difference (RD) and Rate Ratio (RR) From Lung Cancer, by Amount and Duration of Cigarette Smoking and Current Age: Duration Fixed at Time of Enrollment. Cancer Prevention Study II, Women**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	22.2	4.4	60.0	10.1	56.0	9.5	—	—
	60-69	51.9	4.6	118.0	9.3	129.5	10.1	221.2	16.5
	70-79	71.5	3.3	93.6	4.0	139.0	5.4	206.7	7.6
20-39	50-59	61.3	10.3	117.1	18.7	224.7	35.0	—	—
	60-69	139.5	10.8	209.5	15.7	278.6	20.5	604.2	43.3
	70-79	300.2	10.6	264.7	9.5	514.3	17.4	501.0	17.0
40+	50-59	101.6	16.4	157.1	24.8	183.7	28.8	—	—
	60-69	—	—	244.6	18.1	518.1	37.2	397.6	28.8
	70-79	—	—	—	—	465.6	15.9	711.5	23.7

^a Rate differences per 100,000 person-years graphed in Figure 11.

APPENDIX 22**Deaths and Death Rates^a From Lung Cancer, by Amount^b and Duration of Cigarette Smoking and Current Age: Duration Progresses Over Time. Cancer Prevention Study II, Men**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
1-19	50-59	1	27.6	28	92.6	15	113.6	1	709.9
	60-69	0	—	2	54.5	80	384.9	37	388.2
	70-79	0	—	0	—	12	518.7	124	891.3
20-39	50-59	2	33.9	94	116.6	105	249.8	2	388.8
	60-69	1	160.9	11	188.6	261	399.0	158	715.1
	70-79	0	—	3	1,121.6	23	787.8	257	1,237.1
40+	50-59	0	—	75	192.2	71	305.7	2	553.2
	60-69	0	—	7	316.2	152	596.1	71	849.2

^aDeath rate per 100,000 person-years.^bCigarettes per day categorized into three strata because of the limited number of deaths in many strata.

APPENDIX 23**Deaths and Death Rates^a From Lung Cancer, by Amount^b and Duration of Cigarette Smoking and Current Age: Duration Progresses Over Time. Cancer Prevention Study II, Women**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a	Deaths	Rate ^a
1-19	50-59	2	15.0	34	48.8	15	92.3	0	—
	60-69	1	21.0	18	119.4	61	122.2	22	241.2
	70-79	1	73.8	1	33.7	10	134.4	44	244.7
20-39	50-59	6	42.3	102	99.2	55	197.2	0	—
	60-69	1	25.7	27	167.5	176	260.3	63	491.9
	70-79	0	—	3	145.2	32	498.8	105	597.7
40+	50-59	2	75.3	34	141.2	17	218.5	0	—
	60-69	0	—	3	111.9	57	442.2	15	542.4
	70-79	0	—	1	495.4	2	264.9	20	771.9

^aDeath rate per 100,000 person-years.^bCigarettes per day categorized into three strata because of the limited number of deaths in many strata.

APPENDIX 24**Rate Difference (RD) and Rate Ratio (RR) From Lung Cancer, by Amount and Duration of Cigarette Smoking and Current Age. Duration Progresses Over Time: Cancer Prevention Study II, Men**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	—	—	87.2	17.2	108.2	21.1	—	—
	60-69	—	—	—	—	268.7	17.7	372.1	24.1
	70-79	—	—	—	—	477.6	12.6	850.2	21.7
20-39	50-59	—	—	111.2	21.7	244.5	46.4	—	—
	60-69	—	—	172.5	11.7	382.9	24.7	698.9	44.4
	70-79	—	—	1,080.5	27.3	746.6	19.2	1,196.0	30.1
40+	50-59	—	—	186.9	35.7	300.3	56.8	—	—
	60-69	—	—	300.0	19.6	579.9	37.0	833.1	52.7
	70-79	—	—	—	—	890.3	22.7	1,739.0	43.3

^a Rate differences per 100,000 person-years.

APPENDIX 25**Rate Difference (RD) and Rate Ratio (RR) From Lung Cancer, by Amount and Duration of Cigarette Smoking and Current Age: Duration Progresses Over Time. Cancer Prevention Study II, Women**

Cigarettes Per Day	Age	Duration of Smoking: Years							
		20-29		30-39		40-49		50+	
		RD ^a	RR	RD ^a	RR	RD ^a	RR	RD ^a	RR
1-19	50-59	—	—	42.2	7.4	85.8	14.1	—	—
	60-69	—	—	105.1	8.3	107.8	8.5	226.9	16.8
	70-79	—	—	—	—	103.1	4.3	213.4	7.8
20-39	50-59	35.7	6.4	92.7	15.1	190.7	30.1	—	—
	60-69	—	—	153.2	11.7	245.9	18.2	477.6	34.3
	70-79	—	—	113.9	4.6	467.5	15.9	566.4	19.1
40+	50-59	—	—	134.6	21.5	212.0	33.3	—	—
	60-69	—	—	97.6	7.8	427.9	30.9	528.1	37.9

^a Rate differences per 100,000 person-years.

APPENDIX 26

Person-Years at Risk in Lifelong Nonsmokers and Current Cigarette Smokers, by Age and Cigarettes Per Day: Cancer Prevention Study II, Men

Age	Never Smoked	Cigarettes Per Day					
		1-9	10-19	20	21-39	40	41+
30-34	9,189	744	1,087	1,827	1,484	782	280
35-39	21,944	1,843	2,684	4,822	4,046	2,540	935
40-44	22,407	1,945	2,833	5,749	5,307	4,050	1,525
45-49	67,204	5,098	7,832	16,290	16,243	12,325	4,966
50-54	127,821	9,528	13,933	31,287	30,769	23,316	9,077
55-59	132,430	9,657	15,511	35,942	32,064	24,009	8,952
60-64	121,174	8,917	15,085	32,027	25,142	18,134	6,219
65-69	102,124	6,898	11,961	23,159	14,499	9,454	2,802
70-74	71,536	4,647	8,149	13,465	6,430	4,020	1,021
75-79	40,363	2,483	3,833	5,322	2,112	1,180	271
80-84	17,946	1,006	1,145	1,292	446	222	44
85+	8,069	330	259	256	59	52	23

APPENDIX 27**Person-Years at Risk in Lifelong Nonsmokers and Current Cigarette Smokers, by Age and Cigarettes Per Day: Cancer Prevention Study II, Women**

Age	Never Smoked	Cigarettes Per Day					
		1-9	10-19	20	21-39	40	41+
30-34	17,552	1,277	1,901	2,525	1,454	726	192
35-39	49,633	3,711	5,450	7,668	4,845	2,443	668
40-44	85,111	6,147	9,429	14,571	8,885	4,913	1,137
45-49	208,331	14,642	21,403	32,757	19,385	10,784	2,378
50-54	309,700	20,712	31,286	47,139	26,421	15,110	3,104
55-59	345,629	21,227	33,253	49,761	24,833	14,138	2,739
60-64	340,560	17,947	29,645	42,749	19,181	10,438	1,792
65-69	280,728	12,823	21,746	29,114	10,618	5,834	912
70-74	206,345	8,439	13,700	16,253	4,476	2,555	378
75-79	135,257	4,116	6,113	6,569	1,454	861	140
80-84	71,175	1,494	1,840	1,811	369	193	41
85+	41,281	539	480	419	81	71	12

APPENDIX 28
Number of Deaths From All Causes, by Number of Cigarettes Currently Smoked

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	14	20	1	1	1	2	3	4	4	1	2	3	0	1
35-39	16	40	6	4	2	4	11	10	10	1	6	3	2	0
40-44	21	93	2	9	4	7	19	14	12	11	20	5	8	4
45-49	102	255	24	31	29	38	63	88	53	46	67	43	32	10
50-54	283	564	53	47	105	97	194	166	199	100	176	68	73	23
55-59	487	927	87	83	142	168	399	301	320	180	301	120	118	22
60-64	815	1,401	127	106	242	238	594	433	463	205	388	135	111	23
65-69	1,120	1,871	155	139	288	304	721	503	419	181	298	95	103	21
70-74	1,321	2,216	183	131	370	276	650	412	298	114	215	79	44	8
75-79	1,389	2,487	154	124	247	181	408	245	177	63	102	40	25	
80-84	981	2,245	97	53	114	92	155	100	43	26	21	12	4	2
85+	899	3,331	46	40	35	52	37	61	14	10	1	8	2	0

APPENDIX 29**Age-Specific and Age-Adjusted Death Rates^a From All Causes, by Number of Cigarettes Currently Smoked**

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	15.2	11.4	()	()	()	(10.5)	[16.4]	15.8	27.0	()	(25.6)	[41.3]	—	()
35-39	7.3	8.1	32.6	10.8	(7.5)	7.3	22.8	13.0	24.7	()	23.6	[12.3]	(21.4)	—
40-44	9.4	10.9	(10.3)	14.6	14.1	7.4	33.1	9.6	22.6	12.4	49.4	10.2	52.5	35.2
45-49	15.2	12.2	47.1	21.2	37.0	17.8	38.7	26.9	32.6	23.7	54.4	39.9	64.4	42.1
50-54	22.1	18.2	55.6	22.7	75.4	31.0	62.0	35.2	64.7	37.9	75.5	45.0	80.4	74.1
55-59	36.8	26.8	90.1	39.1	91.6	50.5	111.0	60.5	99.8	72.5	125.4	84.9	131.8	80.3
60-64	67.3	41.1	142.4	59.1	160.4	80.3	185.5	101.3	184.2	106.9	214.0	129.3	178.5	128.3
65-69	109.7	66.7	224.7	180.4	240.8	139.8	311.3	172.8	289.0	170.5	315.2	162.8	367.7	230.2
70-74	184.7	107.4	393.8	155.2	454.0	201.5	482.7	253.5	463.5	254.7	534.8	309.3	431.0	211.8
75-79	344.1	183.9	620.2	301.3	644.4	296.1	766.6	373.0	837.9	433.3	864.1	464.6	924.2	357.8
80-84	546.7	315.4	964.1	354.7	995.9	500.1	1,200.0	552.2	964.7	705.1	945.2	622.0	917.8	492.8
85+	1,114.2	806.9	1,392.5	742.6	1,350.0	1,083.9	1,446.3	1,455.0	2,386.4	1,238.4	()	1,128.1	(866.4)	—
Age Adjusted ^a	75.2	48.6	135.9	61.5	140.4	77.2	163.9	97.3	174.0	98.4	152.2	108.4	159.1	86.7

^a Age-adjusted death rates per 10,000 person-years standardized to 1980 U.S. population.

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 30
Number of Deaths From Lung Cancer, by Number of Cigarettes Currently Smoked

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-39	1	1	0	0	0	0	0	0	1	0	0	1	0	0
40-44	0	0	0	1	1	0	1	0	1	2	0	0	1	1
45-49	4	4	0	2	1	2	7	17	4	7	7	13	7	2
50-54	7	18	4	4	14	14	26	27	35	25	37	16	20	7
55-59	7	25	11	9	16	25	72	58	70	53	61	27	30	3
60-64	14	42	23	9	29	36	95	78	111	45	92	43	31	4
65-69	22	47	25	14	43	44	151	100	74	46	79	24	28	4
70-74	25	63	26	9	70	28	115	64	67	27	50	11	15	3
75-79	21	44	18	5	22	14	73	37	28	12	18	8	11	1
80-84	16	41	5	1	17	7	21	11	5	4	2	1	1	0
85+	7	25	3	1	1	3	3	3	1	1	0	0	1	0

APPENDIX 31**Age-Specific and Age-Adjusted Death Rates^a From Lung Cancer, by Number of Cigarettes Currently Smoked**

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35-39	()	()	—	—	—	—	—	—	—	—	—	—	—	—
40-44	—	—	—	()	()	—	()	—	()	(22.5)	—	—	52.5	35.2
45-49	6.0	1.9	—	13.7	()	(9.3)	43.0	51.9	24.6	36.1	56.8	120.5	141.0	(84.1)
50-54	5.5	5.8	42.0	19.3	100.5	44.7	83.1	57.3	113.8	94.6	158.7	105.9	220.3	225.5
55-59	5.3	7.2	113.9	42.4	103.2	75.2	200.3	116.6	218.3	213.4	254.1	191.0	335.1	[109.5]
60-64	11.6	12.3	257.9	50.1	192.2	121.4	296.6	182.5	441.5	234.6	507.3	412.0	498.5	223.2
65-69	21.5	16.7	362.4	109.2	359.5	202.3	652.0	343.5	510.4	433.2	835.7	411.4	999.4	438.5
70-74	34.9	30.5	559.5	106.6	859.0	204.4	854.0	393.8	1,042.1	603.2	1,243.8	430.6	1,469.1	[794.2]
75-79	52.0	32.5	725.0	121.5	573.9	229.0	1,371.7	563.3	1,325.5	825.5	1,524.9	929.2	4,066.5	()
80-84	89.2	57.6	496.9	()	1,485.1	380.5	1,625.8	607.4	1,121.7	1,084.7	(900.2)	()	()	—
85+	86.8	60.6	[908.2]	()	()	[625.3]	[1,172.6]	[715.6]	()	()	—	—	()	—
Age Adjusted ^a	11.3	8.6	138.4	33.5	164.5	71.6	244.6	122.2	257.5	184.1	273.4	166.0	516.1	156.7

^a Age-adjusted death rates per 100,000 person-years standardized to 1980 U.S. population.

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 32**Number of Deaths From Coronary Heart Disease, by Number of Cigarettes Currently Smoked**

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	0	0	0	0	0	0	0	0	0	1	0	0	0	0
35-39	2	1	2	0	0	0	0	0	1	0	1	0	1	0
40-44	3	5	1	0	1	0	6	2	3	1	5	0	2	1
45-49	18	8	9	3	11	7	23	9	16	4	24	5	9	0
50-54	72	25	14	7	35	13	67	19	65	18	51	7	19	2
55-59	157	84	27	5	48	19	129	48	91	20	75	16	37	4
60-64	277	211	44	20	86	40	205	81	116	38	107	18	18	1
65-69	414	353	45	29	92	66	191	103	119	31	62	17	22	3
70-74	490	523	53	30	90	72	179	80	65	23	46	14	4	0
75-79	497	717	32	30	57	47	94	62	47	15	21	8	3	1
80-84	340	694	25	19	32	21	40	27	9	3	7	2	0	1
85+	266	1,096	12	9	8	23	11	14	5	1	0	1	1	0

APPENDIX 33**Age-Specific and Age-Adjusted Death Rates^a From Coronary Heart Disease, by Number of Cigarettes Currently Smoked**

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	—	—	—	—	—	—	—	—	—	()	()	—	—	—
35-39	(0.9)	()	(10.9)	—	—	—	—	—	()	—	()	—	()	—
40-44	[1.3]	0.6	()	—	()	—	10.4	(1.4)	[5.7]	()	12.4	—	(13.1)	()
45-49	2.7	0.4	17.7	[2.1]	14.1	3.3	14.1	2.8	9.9	2.1	19.5	4.6	18.1	—
50-54	5.6	0.8	14.7	3.4	25.1	4.2	21.4	4.0	21.1	6.8	21.9	4.6	20.9	(6.4)
55-59	11.9	2.4	28.0	2.4	31.0	5.7	35.9	9.7	28.4	8.1	31.2	11.3	41.3	14.6
60-64	22.9	6.2	49.4	11.1	57.0	13.5	64.0	19.0	46.1	19.8	59.0	17.3	28.9	()
65-69	40.5	12.6	65.2	22.6	76.9	30.4	82.5	35.4	82.1	29.2	65.6	29.1	78.5	[32.9]
70-74	68.5	25.4	114.1	35.6	110.4	52.6	132.9	49.2	101.0	51.4	114.4	54.8	39.2	—
75-79	123.1	53.0	128.9	72.9	148.7	76.9	176.6	94.4	222.5	103.2	177.9	92.9	[110.9]	()
80-84	189.5	97.5	248.5	127.2	279.6	114.2	309.7	149.1	201.9	81.4	315.1	(103.7)	—	()
85+	329.7	265.5	363.3	167.1	308.6	479.4	430.0	333.9	852.3	()	()	()	—	—
Age Adjusted ^a	24.1	11.5	37.0	13.1	38.2	20.3	44.7	20.2	46.9	16.2	37.6	15.9	30.0	13.3

^aAge-adjusted death rates per 10,000 person-years standardized to 1980 U.S. population.

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 34
Number of Deaths From Stroke, by Number of Cigarettes Currently Smoked

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	0	1	0	0	0	1	0	0	0	0	0	0	0	0
35-39	0	1	0	0	0	0	0	1	1	0	1	0	0	0
40-44	1	1	0	0	0	0	0	2	1	0	0	0	0	1
45-49	4	6	1	7	0	3	6	3	2	6	2	3	3	0
50-54	6	16	4	1	4	7	7	15	5	6	6	6	2	1
55-59	13	23	3	1	3	14	14	24	14	12	12	7	3	0
60-64	35	55	6	6	10	11	32	19	14	8	16	5	5	1
65-69	52	104	13	4	12	28	39	30	15	11	10	4	2	1
70-74	80	135	13	12	20	20	28	37	13	7	8	5	1	0
75-79	113	215	11	14	24	17	26	23	14	4	5	2	1	1
80-84	108	273	14	2	8	6	10	6	3	2	1	2	0	1
85+	89	501	3	3	3	3	1	5	1	2	0	0	0	0

APPENDIX 35**Age-Specific and Age-Adjusted Death Rates^a From Stroke, by Number of Cigarettes Currently Smoked**

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	-	()	-	-	-	()	-	-	-	-	-	-	-	-
35-39	-	()	-	-	-	-	-	()	()	-	()	-	-	-
40-44	()	()	-	-	-	-	-	(13.7)	()	-	-	-	-	-
45-49	6.0	2.9	()	47.8	-	14.0	36.8	[9.3]	(12.3)	31.0	(16.2)	[27.8]	[60.4]	-
50-54	4.7	5.2	42.0	()	28.7	22.4	22.4	31.8	16.3	22.7	25.7	39.7	(22.0)	-
55-59	9.8	6.7	[31.1]	()	[19.3]	42.1	39.0	48.2	43.7	48.3	50.0	49.5	[33.5]	-
60-64	28.9	16.1	67.3	33.4	66.3	37.1	99.9	44.4	55.7	41.7	88.2	47.9	80.4	()
65-69	50.9	37.0	188.5	31.2	100.3	128.8	168.4	103.0	103.5	105.8	68.6	(71.4)	()	()
70-74	111.8	65.8	279.8	142.2	245.4	146.0	207.9	227.6	202.0	156.4	199.0	195.7	()	()
75-79	280.0	159.0	443.0	340.2	626.1	278.1	488.5	350.2	662.8	275.1	423.6	(232.3)	()	()
80-84	601.8	383.6	1,391.4	(133.9)	698.9	326.2	774.2	331.3	[673.0]	(542.4)	()	(1036.7)	-	()
85+	1,103.0	1,213.6	[908.2]	[556.9]	[1157.2]	[625.3]	()	(2,476.8)	-	-	-	-	-	-
Age Adjusted ^a	55.5	44.1	102.0	41.4	86.0	60.4	79.2	72.3	99.5	90.6	61.3	59.7	39.1	102.4

^aAge-adjusted death rates per 100,000 person-years standardized to 1980 U.S. population.

Key: - = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 36**Number of Deaths From Chronic Obstructive Pulmonary Disease, by Number of Cigarettes Currently Smoked**

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	1	0	0	0	0	2	1	0	0	0	0	0
50-54	2	2	1	0	1	1	2	6	4	3	3	2	4	0
55-59	3	6	1	1	2	1	8	12	9	5	7	4	1	1
60-64	4	11	4	2	6	9	15	18	12	3	8	10	1	2
65-69	8	16	6	13	16	11	40	24	15	11	19	9	6	0
70-74	18	24	10	11	18	7	37	32	18	11	12	3	3	1
75-79	15	24	8	3	15	15	32	15	17	4	11	2	2	0
80-84	13	29	4	2	97	13	1	2	5	7	1	2	1	0
85+	15	31	6	1	32	2	1	3	2	1	0	2	0	0

APPENDIX 37**Age-Specific and Age-Adjusted Death Rates^a From Chronic Obstructive Pulmonary Disease, by Number of Cigarettes Currently Smoked**

Age	Cigarettes Per Day													
	Never Smoked		1-9		10-19		20		21-39		40		41+	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F
30-34	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35-39	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40-44	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45-49	—	—	()	—	—	—	—	(6.1)	()	—	—	—	—	—
50-54	(1.6)	(0.6)	()	—	()	()	(6.1)	12.7	13.0	[11.4]	[12.9]	(13.2)	44.1	—
55-59	[2.3]	1.7	()	()	(12.9)	()	22.3	24.1	28.1	20.1	29.2	28.3	()	()
60-64	3.3	3.2	44.9	(11.1)	39.8	30.4	46.8	42.1	47.7	[15.6]	44.1	95.8	()	(111.6)
65-69	7.8	5.7	87.0	101.4	133.8	50.6	172.7	82.4	103.5	103.6	201.0	154.3	214.2	—
70-74	25.2	11.6	215.2	130.3	220.9	51.1	274.8	196.9	280.0	245.8	298.5	[117.4]	[293.8]	()
75-79	37.2	17.7	322.2	[72.9]	391.3	245.4	601.3	228.4	804.8	275.1	931.9	(232.3)	739.4	—
80-84	72.4	40.7	397.5	(133.9)	786.3	380.5	1006.5	662.6	1,121.7	1,898.3	()	(1,036.7)	()	—
85+	185.9	75.1	1,816.5	()	[1,157.2]	(416.9)	(781.8)	3,100.8	(3,409.1)	()	—	(2,820.2)	—	—
Age Adjusted ^a	8.5	4.2	74.7	23.4	76.0	33.1	88.7	97.7	140.3	96.2	79.2	106.0	112.7	25.2

^a Age-adjusted death rates per 100,000 person-years standardized to 1980 U.S. population.

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 38**Person-Years at Risk in Lifelong Nonsmokers and Current Cigarette Smokers, by Years of Smoking: Men**

Age	Never-Smokers	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	9,189	137	538	2,741	2,454	295	33	6	0	0	0	0	0	0
35-39	21,944	250	603	3,758	7,649	3,992	549	67	2	0	0	0	0	0
40-44	22,407	119	224	1,070	4,084	9,562	5,437	782	122	10	0	0	0	0
45-49	67,204	233	376	919	2,426	10,872	25,046	19,886	2,548	426	25	0	0	0
50-54	127,821	393	546	1,094	2,233	8,156	23,515	52,045	25,104	4,222	572	29	0	0
55-59	132,430	254	367	668	1,080	3,661	7,178	29,497	51,894	27,497	3,446	565	28	0
60-64	121,174	209	250	388	556	1,628	2,453	7,692	24,172	47,057	17,189	3,405	479	47
65-69	102,124	125	150	223	264	810	795	2,254	4,619	19,579	23,801	13,767	1,997	387
70-74	71,536	70	97	136	107	278	281	755	982	3,876	7,641	16,201	5,589	1,717
75-79	40,363	45	35	53	32	110	102	247	268	694	978	4,629	4,683	3,327
80-84	17,946	16	13	26	25	44	35	70	72	122	137	597	769	2,229
85+	8,069	7	2	29	13	9	4	16	5	17	16	67	53	743

APPENDIX 39**Person-Years at Risk in Lifelong Nonsmokers and Current Cigarette Smokers, by Years of Smoking: Women**

Age	Never-Smokers	Years of Smoking												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	17,552	396	906	3,865	2,697	207	6	0	0	0	0	0	0	0
35-39	49,633	802	1,713	6,172	10,827	4,857	404	9	0	0	0	0	0	0
40-44	85,111	820	1,416	3,044	8,947	20,970	9,189	670	26	0	0	0	0	0
45-49	208,331	1,471	2,080	3,560	7,134	25,979	41,840	18,381	855	51	0	0	0	0
50-54	309,700	1,629	2,098	3,874	5,998	16,505	35,081	61,243	16,417	909	20	0	0	0
55-59	345,629	1,223	1,570	3,085	4,015	10,571	14,836	43,871	51,607	14,530	607	36	0	0
60-64	340,560	760	1,125	2,198	2,685	6,594	8,066	16,609	32,976	41,252	8,803	680	3	1
65-69	280,728	462	605	1,417	1,477	3,361	3,656	7,183	9,370	24,365	21,690	7,171	278	14
70-74	206,345	312	332	741	799	1,747	1,764	3,160	3,234	7,076	10,563	13,847	2,056	170
75-79	135,257	140	166	323	309	756	682	1,222	1,264	2,380	2,409	5,867	2,929	807
80-84	71,175	53	74	116	103	213	219	372	420	718	525	1,221	866	847
85+	41,281	19	21	43	22	43	54	113	101	220	152	297	130	385

APPENDIX 40**Number of Deaths From All Causes, by Number of Years of Smoking: Men**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	14	0	0	3	6	1	1	0	0	0	0	0	0	0
35-39	16	0	1	6	16	12	2	0	0	0	0	0	0	0
40-44	21	0	1	3	13	32	13	2	1	0	0	0	0	0
45-49	102	0	0	4	7	36	101	97	16	7	0	0	0	0
50-54	283	2	1	2	10	40	140	347	205	47	6	0	0	0
55-59	487	1	2	4	8	29	59	290	536	375	49	13	1	0
60-64	815	2	4	1	5	18	30	103	345	896	415	96	9	1
65-69	1,120	3	3	3	3	15	18	56	122	485	690	501	71	14
70-74	1,321	2	4	4	3	8	9	18	39	133	335	790	309	106
75-79	1,389	0	3	5	2	8	2	12	17	56	74	304	355	275
80-84	981	1	1	3	1	5	1	5	3	12	14	53	82	253
85+	899	1	1	4	0	1	1	1	0	3	1	7	7	108

APPENDIX 41**Age-Specific Death Rates From All Causes, by Number of Years of Smoking: Men**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	15.2	—	—	[11.0]	24.5	()	()	—	—	—	—	—	—	—
35-39	7.3	—	()	16.0	20.9	30.1	(36.5)	—	—	—	—	—	—	—
40-44	9.4	—	()	[28.1]	31.8	33.5	23.9	(25.6)	()	—	—	—	—	—
45-49	15.2	—	—	43.5	28.9	33.1	40.3	48.8	62.8	164.5	—	—	—	—
50-54	22.1	(50.9)	()	(18.3)	44.8	49.0	59.5	66.7	81.7	111.3	104.9	—	—	—
55-59	36.8	()	(54.5)	59.9	74.1	79.2	82.2	98.3	103.3	136.4	142.2	230.0	()	—
60-64	67.3	(95.8)	159.9	()	90.0	110.6	122.3	133.9	142.7	190.4	241.4	282.0	188.0	()
65-69	109.7	[239.5]	[199.8]	[134.4]	[113.5]	185.3	266.6	248.4	264.1	247.7	289.9	363.9	355.6	361.6
70-74	184.7	(286.4)	411.7	294.1	[279.5]	287.3	320.4	238.4	397.0	343.1	438.4	487.6	552.9	617.2
75-79	344.1	—	[869.6]	934.4	(631.6)	727.8	(196.2)	485.3	634.1	807.3	756.8	656.7	758.1	826.6
80-84	546.7	()	()	[1,135.7]	()	1,147.2	()	716.0	[417.2]	987.0	1,020.7	887.4	1,066.3	1,135.0
85+	1,114.2	()	()	1,367.5	—	()	()	()	—	[1,722.5]	()	1,046.1	1,329.1	1,453.4

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 42**Number of Deaths From All Causes, by Number of Years of Smoking: Women**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	20	0	0	5	5	2	0	0	0	0	0	0	0	0
35-39	40	2	1	2	11	6	0	0	0	0	0	0	0	0
40-44	93	1	1	1	10	25	11	1	0	0	0	0	0	0
45-49	255	2	3	4	12	53	102	77	2	1	0	0	0	0
50-54	564	7	5	7	17	53	102	230	74	6	0	0	0	0
55-59	927	4	7	12	18	63	72	282	312	100	4	0	0	0
60-64	1,401	5	6	16	23	48	60	142	289	421	121	9	0	0
65-69	1,871	11	4	12	22	38	35	85	131	368	386	146	5	0
70-74	2,216	5	1	19	11	35	35	72	66	146	211	342	69	8
75-79	2,487	6	5	11	15	17	8	48	42	78	83	209	109	27
80-84	2,245	1	3	7	5	9	9	18	27	37	27	53	48	41
85+	3,331	1	2	3	2	2	2	7	12	23	16	37	18	46

APPENDIX 43**Age-Specific Death Rates From All Causes, by Number of Years of Smoking: Women**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	11.4	—	—	12.9	18.5	(96.8)	—	—	—	—	—	—	—	—
35-39	8.1	(24.9)	()	(3.2)	10.2	12.4	—	—	—	—	—	—	—	—
40-44	10.9	()	()	()	11.2	11.9	12.0	()	—	—	—	—	—	—
45-49	12.2	(13.6)	[14.4]	11.2	16.8	20.4	24.4	41.9	(23.4)	()	—	—	—	—
50-54	18.2	43.0	23.8	18.1	28.3	32.1	29.1	37.6	45.1	66.0	—	—	—	—
55-59	26.8	32.7	44.6	38.9	44.8	59.6	48.5	64.3	60.5	68.8	65.9	—	—	—
60-64	41.1	65.8	53.4	72.8	85.7	72.8	74.4	85.5	87.6	102.1	137.5	132.3	—	—
65-69	66.7	238.1	66.1	84.7	149.0	113.1	95.7	118.3	139.8	151.0	178.0	203.6	180.2	—
70-74	107.4	160.3	()	256.3	137.6	200.4	198.4	227.8	204.1	206.3	199.8	247.0	335.6	470.1
75-79	183.9	427.6	301.5	340.7	484.9	224.9	117.3	392.9	332.3	327.8	344.6	356.3	372.2	334.7
80-84	315.4	()	[403.6]	602.6	484.3	423.0	410.8	483.3	642.7	515.3	514.7	434.3	554.3	484.1
85+	806.9	()	(952.4)	[692.3]	(895.5)	(467.8)	(372.1)	619.5	1,184.2	1,044.3	1,051.5	1,244.4	1,383.7	1,196.4

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 44**Number of Deaths From Lung Cancer, by Number of Years of Smoking: Men**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-39	1	0	0	0	1	0	0	0	0	0	0	0	0	0
40-44	0	0	0	0	0	1	1	1	1	0	0	0	0	0
45-49	4	0	0	0	0	1	11	10	2	2	0	0	0	0
50-54	7	0	0	0	0	2	19	69	37	8	1	0	0	0
55-59	7	0	0	0	1	5	9	44	111	76	11	3	0	0
60-64	14	1	1	0	0	1	6	11	61	200	76	22	2	0
65-69	22	1	0	0	0	3	4	8	23	89	150	107	12	3
70-74	25	0	0	0	0	0	1	1	8	29	57	153	71	23
75-79	21	0	0	0	0	0	2	1	1	6	11	43	58	48
80-84	16	0	0	0	0	1	0	0	0	2	1	3	8	36
85+	7	0	0	0	0	0	0	0	0	1	0	1	0	7

APPENDIX 45**Age-Specific Death Rates From Lung Cancer, by Number of Years of Smoking: Men**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35-39	()	—	—	—	()	—	—	—	—	—	—	—	—	—
40-44	—	—	—	—	—	()	()	()	()	—	—	—	—	—
45-49	6.0	—	—	—	—	()	43.9	50.3	(78.5)	(470.0)	—	—	—	—
50-54	5.5	—	—	—	—	(24.5)	80.8	132.6	147.4	189.5	()	—	—	—
55-59	5.3	—	—	—	()	136.6	125.4	149.2	213.9	276.4	319.2	[530.7]	—	—
60-64	11.6	()	()	—	—	()	244.6	143.0	252.4	425.0	442.2	646.2	(417.8)	—
65-69	21.5	()	—	—	—	[370.6]	503.5	354.9	498.0	454.6	630.2	777.2	601.0	[774.9]
70-74	34.9	—	—	—	—	—	()	()	814.3	748.1	746.0	944.4	1,270.3	1,339.3
75-79	52.0	—	—	—	—	—	(1,962.4)	()	()	865.0	1,125.0	928.9	1,238.6	1,442.7
80-84	89.2	—	—	—	—	()	—	—	—	(1,645.0)	()	[502.3]	1,040.3	1,615.0
85+	86.8	—	—	—	—	—	—	—	—	—	—	()	—	942.0

APPENDIX 46**Number of Deaths From Lung Cancer, by Number of Years of Smoking: Women**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-39	1	0	0	0	1	0	0	0	0	0	0	0	0	0
40-44	0	0	0	0	2	2	0	0	0	0	0	0	0	0
45-49	4	1	0	1	2	6	20	13	0	0	0	0	0	0
50-54	18	0	0	0	2	8	16	49	18	0	0	0	0	0
55-59	25	0	2	1	0	5	14	51	74	28	0	0	0	0
60-64	42	0	0	1	1	5	7	26	67	84	22	2	0	0
65-69	47	1	0	3	1	2	9	10	23	71	77	34	1	0
70-74	63	0	1	0	1	3	4	3	6	21	38	55	10	0
75-79	44	0	1	0	0	2	1	4	5	9	14	24	11	6
80-84	41	0	0	0	0	1	0	2	0	3	2	4	4	8
85+	25	0	0	0	0	0	0	0	0	0	0	3	1	4

APPENDIX 47
Age-Specific Death Rates From Lung Cancer, by Number of Years of Smoking: Women

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35-39	()	—	—	—	()	—	—	—	—	—	—	—	—	—
40-44	—	—	—	—	(22.4)	(9.5)	—	—	—	—	—	—	—	—
45-49	1.9	()	—	()	(28.0)	23.1	47.8	70.7	—	—	—	—	—	—
50-54	5.8	—	—	—	(33.3)	48.5	45.6	80.0	109.6	—	—	—	—	—
55-59	7.2	—	(127.4)	()	—	47.3	94.4	116.2	143.4	192.7	—	—	—	—
60-64	12.3	—	—	()	()	75.8	86.8	156.5	203.2	203.6	249.9	(294.0)	—	—
65-69	16.7	()	—	[211.8]	()	(59.5)	246.2	139.2	245.5	291.4	355.0	474.1	()	—
70-74	30.5	—	()	—	()	[171.8]	226.7	[94.9]	185.5	296.8	359.8	397.2	486.4	—
75-79	32.5	—	()	—		()	327.4	395.6	378.2	581.3	409.1	375.6	743.7	—
80-84	57.6	—	—	—	—	()	—	(537.0)	—	[417.8]	(381.3)	327.7	461.9	944.5
85+	60.6	—	—	—	—	—	—	—	—	—	—	[1,009.0]	()	1,040.3

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 48**Number of Deaths From Coronary Heart Disease, by Number of Years of Smoking: Men**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	0	0	0	0	0	0	1	0	0	0	0	0	0	0
35-39	2	0	0	2	2	1	0	0	0	0	0	0	0	0
40-44	3	0	0	0	5	11	2	0	0	0	0	0	0	0
45-49	18	0	0	2	2	12	32	35	5	4	0	0	0	0
50-54	72	0	0	1	0	13	43	110	66	17	1	0	0	0
55-59	157	0	0	3	2	11	20	92	153	108	15	3	0	0
60-64	277	1	1	1	2	7	7	31	100	253	135	35	2	1
65-69	414	2	1	1	0	3	1	18	30	126	183	137	24	5
70-74	490	0	3	3	1	3	6	5	13	28	79	195	75	26
75-79	497	0	0	3	1	4	0	4	3	6	13	70	82	68
80-84	340	1	1	3	0	0	0	1	0	4	6	19	17	61
85+	266	1	0	0	0	0	1	0	0	1	0	3	3	28

APPENDIX 49
Age-Specific Death Rates^a From Coronary Heart Disease, by Number of Years of Smoking: Men

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	—	—	—	—	—	—	()	—	—	—	—	—	—	—
35-39	(0.9)	—	—	(5.3)	(2.6)	()	—	—	—	—	—	—	—	—
40-44	[1.3]	—	—	—	12.2	11.5	(3.7)	—	—	—	—	—	—	—
45-49	2.7	—	—	(21.8)	(8.3)	11.0	12.8	17.6	19.6	94.0	—	—	—	—
50-54	5.6	—	—	()	—	15.9	18.3	21.1	26.3	40.3	()	—	—	—
55-59	11.9	—	—	[44.9]	(18.5)	30.1	27.9	31.2	29.5	39.3	43.5	[53.1]	—	—
60-64	22.9	()	()	()	(36.0)	43.0	28.5	40.3	41.4	53.8	78.5	102.8	(41.8)	()
65-69	40.5	(159.7)	()	()	—	[37.1]	()	79.9	65.0	64.4	76.9	99.5	120.2	129.1
70-74	68.5	—	[308.8]	[220.6]	()	[107.8]	213.6	66.2	132.3	72.2	103.4	120.4	134.2	151.4
75-79	123.1	—	—	[566.0]	()	363.9	—	161.8	[111.9]	86.5	133.0	151.2	175.1	204.4
80-84	189.5	()	()	[1,135.7]	—	—	()	—	329.0	437.4	318.1	221.1	273.7	
85+	329.7	()	—	—	—	—	()	—	—	()	—	[448.3]	[560.6]	376.8

^aDeath rates are reported per 10,000 person-years of observation rather than per 100,000 person-years of observation.

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 50**Number of Deaths From Coronary Heart Disease, by Number of Years of Smoking: Women**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	0	0	0	0	1	0	0	0	0	0	0	0	0	0
35-39	1	0	0	0	0	0	0	0	0	0	0	0	0	0
40-44	5	0	0	0	0	3	1	0	0	0	0	0	0	0
45-49	8	0	0	0	1	10	9	8	0	0	0	0	0	0
50-54	25	0	0	3	3	11	10	24	13	2	0	0	0	0
55-59	84	0	0	0	4	11	5	27	47	17	1	0	0	0
60-64	211	1	0	2	7	9	8	28	39	76	27	1	0	0
65-69	353	5	3	3	1	8	5	22	28	75	65	33	1	0
70-74	523	2	0	10	1	8	5	21	14	24	34	85	13	2
75-79	717	0	2	1	5	5	2	14	8	20	25	51	23	7
80-84	694	0	1	2	0	3	2	5	12	12	3	10	12	11
85+	1,096	0	1	0	0	1	0	2	2	7	5	9	8	13

APPENDIX 51
Age-Specific Death Rates^a From Coronary Heart Disease, by Number of Years of Smoking: Women

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	—	—	—	—	()	—	—	—	—	—	—	—	—	—
35-39	()	—	—	—	—	—	—	—	—	—	—	—	—	—
40-44	0.6	—	—	—	—	[1.4]	()	—	—	—	—	—	—	—
45-49	0.4	—	—	—	()	3.9	2.2	4.4	—	—	—	—	—	—
50-54	0.8	—	—	[7.7]	[5.0]	6.7	2.9	3.9	7.9	(22.0)	—	—	—	—
55-59	2.4	—	—	—	10.0	10.4	3.4	6.2	9.1	11.7	()	—	—	—
60-64	6.2	()	—	(9.1)	26.1	13.7	9.9	16.9	11.8	18.4	30.7	()	—	—
65-69	12.6	108.2	[49.6]	[21.2]	()	23.8	13.7	30.6	29.9	30.8	30.0	46.0	()	—
70-74	25.4	(64.1)	—	134.9	()	45.8	28.3	66.5	43.3	33.9	32.2	61.4	63.2	(117.5)
75-79	53.0	—	(120.6)	()	161.6	66.2	(29.3)	114.6	63.3	84.1	103.8	86.9	78.5	86.8
80-84	97.5	—	()	(172.2)	—	[141.0]	(91.3)	134.3	285.7	167.1	[57.2]	81.9	138.6	129.9
85+	265.5	—	()	—	—	()	—	(177.0)	(197.4)	317.8	328.6	302.7	615.0	338.1

^a Rates are reported per 10,000 person-years of observations rather than per 100,000 person-years of observations.

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 52**Number of Deaths From Stroke, by Number of Years of Smoking: Men**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-39	0	0	0	0	0	2	0	0	0	0	0	0	0	0
40-44	1	0	0	0	0	1	0	0	0	0	0	0	0	0
45-49	4	0	0	1	0	6	2	4	1	0	0	0	0	0
50-54	6	0	0	0	1	2	9	8	7	1	0	0	0	0
55-59	13	0	0	0	0	1	3	5	19	16	5	0	0	0
60-64	35	0	0	0	0	1	1	5	15	47	11	3	0	0
65-69	52	0	0	0	0	0	3	1	5	22	40	15	5	0
70-74	80	1	0	0	0	0	0	1	3	3	13	41	17	4
75-79	113	0	0	1	0	0	0	0	0	6	4	30	27	13
80-84	108	0	0	0	0	0	0	0	1	0	1	5	7	22
85+	89	0	0	1	0	0	0	0	0	0	0	0	1	6

APPENDIX 53
Age-Specific Death Rates From Stroke, by Number of Years of Smoking: Men

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35-39	—	—	—	—	—	(50.1)	—	—	—	—	—	—	—	—
40-44	()	—	—	—	—	()	—	—	—	—	—	—	—	—
45-49	6.0	—	—	()	—	55.2	(8.0)	20.1	()	—	—	—	—	—
50-54	4.7	—	—	—	()	(24.5)	38.3	15.4	27.9	()	—	—	—	—
55-59	9.8	—	—	—	—	()	[41.8]	17.0	36.6	58.2	145.1	—	—	—
60-64	28.9	—	—	—	—	()	()	65.0	62.1	99.9	64.0	[88.1]	—	—
65-69	50.9	—	—	—	—	—	[377.6]	()	108.3	112.4	168.1	109.0	250.4	—
70-74	111.8	()	—	—	—	—	—	()	[305.4]	[77.4]	170.1	253.1	304.2	232.9
75-79	280.0	—	—	()	—	—	—	—	—	865.0	409.1	648.1	576.6	390.7
80-84	601.8	—	—	—	—	—	—	—	()	—	()	837.2	910.3	987.0
85+	1,103.0	—	—	()	—	—	—	—	—	—	—	—	()	807.4

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 54**Number of Deaths From Stroke, by Number of Years of Smoking: Women**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	1	0	0	0	1	0	0	0	0	0	0	0	0	0
35-39	1	0	0	0	0	1	0	0	0	0	0	0	0	0
40-44	1	0	0	0	0	2	1	0	0	0	0	0	0	0
45-49	6	0	2	0	0	4	6	9	1	0	0	0	0	0
50-54	16	3	0	0	0	3	7	18	5	0	0	0	0	0
55-59	23	0	0	0	1	2	6	18	24	7	0	0	0	0
60-64	55	1	0	1	0	1	4	3	17	13	8	2	0	0
65-69	104	0	0	2	0	0	4	5	11	28	23	5	0	0
70-74	135	0	0	2	0	0	3	5	7	10	15	29	8	2
75-79	215	0	0	1	3	1	2	5	4	5	10	19	11	0
80-84	273	0	0	0	1	0	0	2	1	1	5	5	1	3
85+	501	0	0	0	0	0	1	0	1	2	2	3	0	4

APPENDIX 55**Age-Specific Death Rates From Stroke, by Number of Years of Smoking: Women**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	()	—	—	—	()	—	—	—	—	—	—	—	—	—
35-39	()	—	—	—	—	()	—	—	—	—	—	—	—	—
40-44	()	—	—	—	—	(9.5)	()	—	—	—	—	—	—	—
45-49	2.9	—	(96.2)	—	—	15.4	14.3	49.0	()	—	—	—	—	—
50-54	5.2	[184.2]	—	—	—	[18.2]	20.0	29.4	30.5	—	—	—	—	—
55-59	6.7	—	—	—	()	(18.9)	40.4	41.0	46.5	48.2	—	—	—	—
60-64	16.1	()	—	()	—	()	49.6	[18.1]	51.6	31.5	90.9	(294.0)	—	—
65-69	37.0	—	—	(141.2)	—	—	109.4	69.6	117.4	114.9	106.0	69.7	—	—
70-74	65.4	—	—	(269.8)	—	—	[170.0]	158.2	216.4	141.3	142.0	209.4	389.1	(1,175.3)
75-79	159.0	—	—	()	[969.8]	()	(293.3)	409.2	316.5	210.1	415.2	323.9	375.6	—
80-84	383.6	—	—	—	()	—	—	(537.0)	()	()	953.1	409.7	()	[354.2]
85+	1,213.6	—	—	—	—	—	()	—	()	(908.1)	(1,314.3)	[1,009.0]	—	1,040.3

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 56**Number of Deaths From Chronic Obstructive Pulmonary Disease, by Number of Years of Smoking: Men**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	0	2	0	0	0	0	0	0	0
50-54	2	0	0	0	0	0	4	5	6	0	0	0	0	0
55-59	3	0	0	0	0	0	0	6	10	8	2	1	1	0
60-64	4	0	0	0	0	0	1	5	8	18	11	3	0	0
65-69	8	0	0	0	0	0	1	2	3	20	41	33	2	0
70-74	18	0	0	0	1	0	0	1	2	8	17	47	q8	4
75-79	15	0	0	0	0	0	0	0	3	10	6	19	22	25
80-84	13	0	0	0	0	0	0	1	0	1	0	2	7	22
85+	15	0	0	0	0	0	0	0	0	1	0	0	0	12

APPENDIX 57**Age-Specific Death Rates From Chronic Obstructive Pulmonary Disease, by Number of Years of Smoking: Men**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35-39	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40-44	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45-49	—	—	—	—	—	—	—	(10.1)	—	—	—	—	—	—
50-54	(1.6)	—	—	—	—	—	17.0	9.6	23.9	—	—	—	—	—
55-59	[2.3]	—	—	—	—	—	—	20.3	19.3	29.1	(58.0)	()	()	—
60-64	3.3	—	—	—	—	—	()	65.0	33.1	38.3	64.0	[88.1]	—	—
65-69	7.8	—	—	—	—	—	()	(88.7)	[65.0]	102.1	172.3	239.7	(100.2)	—
70-74	25.2	—	—	—	()	—	—	()	(203.6)	206.4	222.5	290.1	322.1	232.9
75-79	37.2	—	—	—	—	—	—	—	[1,119.1]	1,441.6	613.7	410.4	469.8	751.4
80-84	72.4	—	—	—	—	—	—	()	—	()	—	(334.9)	910.3	987.0
85+	185.9	—	—	—	—	—	—	—	—	()	—	—	—	1,614.9

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

APPENDIX 58**Number of Deaths From Chronic Obstructive Pulmonary Disease, by Number of Years of Smoking: Women**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35-39	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45-49	0	0	0	0	0	1	1	0	0	0	0	0	0	0
50-54	2	0	0	0	1	0	4	5	2	0	0	0	0	0
55-59	6	0	0	0	0	0	1	7	12	4	0	0	0	0
60-64	11	1	0	0	0	1	2	5	11	16	8	0	0	0
65-69	16	1	0	1	2	1	1	5	9	17	21	10	0	0
70-74	24	0	0	0	0	2	2	2	6	9	15	21	8	0
75-79	24	0	0	0	0	1	0	3	1	3	2	22	7	0
80-84	29	0	1	0	0	0	2	0	2	3	3	9	5	5
85+	31	0	0	0	0	0	0	2	0	1	1	5	4	6

APPENDIX 59**Age-Specific Death Rates From Chronic Obstructive Pulmonary Disease, by Number of Years of Smoking: Women**

Age	Never-Smokers	Number of Years Smoked												
		0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60+
30-34	—	—	—	—	—	—	—	—	—	—	—	—	—	—
35-39	—	—	—	—	—	—	—	—	—	—	—	—	—	—
40-44	—	—	—	—	—	—	—	—	—	—	—	—	—	—
45-49	—	—	—	—	—	—	()	()	—	—	—	—	—	—
50-54	(0.6)	—	—	—	()	—	11.4	8.2	(12.2)	—	—	—	—	—
55-59	1.7	—	—	—	—	—	()	16.0	23.3	27.5	—	—	—	—
60-64	3.2	()	—	—	—	()	(24.8)	30.1	33.4	38.8	90.9	—	—	—
65-69	5.7	()	—	()	(135.5)	()	()	69.6	96.1	69.8	96.8	139.4	—	—
70-74	11.6	—	—	—	—	(114.5)	(113.4)	(63.3)	185.5	127.2	142.0	151.7	389.1	—
75-79	17.7	—	—	—	—	()	—	[245.5]	()	[126.1]	(83.0)	375.0	239.0	—
80-84	40.7	—	()	—	—	—	(912.9)	—	(476.1)	[417.8]	[571.9]	737.4	577.4	590.3
85+	75.1	—	—	—	—	—	—	(1,769.9)	—	()	()	1,681.6	3,075.0	1,560.5

Key: — = 0 deaths; () = 1 death; (rate) = 2 deaths; [rate] = 3 deaths.

Smoking and Mortality: The Kaiser Permanente Experience

Gary D. Friedman, Irene Tekawa, Marianne Sadler, and Stephen Sidney

INTRODUCTION The Kaiser Permanente Medical Care Program cohort study described here obtained detailed baseline information about smoking habits from more than 60,000 subjects, age 35 and older, who entered the cohort between 1979 and 1986 and were followed up for mortality through 1987. This study population is ethnically and socioeconomically diverse, permitting interracial comparisons of the effects of cigarette smoking.

STUDY POPULATION AND METHODS In 1979 the Division of Research (then called the Department of Medical Methods Research), Kaiser Permanente Medical Care Program, Northern California Region, began a prospective cohort study aimed at assessing the risks associated with various aspects of tobacco smoking. The program provides comprehensive prepaid medical care to its subscribers, who number about 30 percent of the population in the areas served. The subscribers, most of whom join through employment groups, are ethnically, racially, and socioeconomically heterogeneous and are reflective of the local population except for being somewhat more educated, on average, and underrepresentative of the extremes of wealth and poverty (Hiatt and Friedman, 1982; Krieger, 1992). The program offered multiphasic health checkups (Collen and Davis, 1969) at its Oakland and San Francisco Medical Centers as a routine health appraisal, and starting in July 1979, persons receiving these checkups were asked to complete a detailed questionnaire about their smoking habits for a followup study. Altogether, 83 percent complied on at least one checkup. The multiphasic checkup program was discontinued in San Francisco in mid-1980 but is still operated in a modified form in Oakland. Administration of these smoking questionnaires continued in Oakland until late October 1986. About 2,000 persons who received another form of preventive health examination in San Francisco in 1981 also completed these questionnaires and are included in the total cohort of more than 100,000 persons.

The questions used to classify persons into the various smoking and racial categories are listed in Appendix A. Persons who did not specify a race were included in the "Other" category. Never-smokers were persons who responded that they had never used any tobacco product, without contradiction in their response to the questions about ever smoking cigarettes regularly for at least 1 year and still smoking cigarettes. If they did not affirm never using any tobacco product, never-smokers had to deny ever smoking cigarettes regularly for at least 1 year and either answer negatively or not at all to the question about their still smoking cigarettes. Former smokers were persons who responded "yes" to ever smoking cigarettes

regularly for at least 1 year and who reported having quit smoking cigarettes at least 2 years before completing the questionnaire. Current smokers were persons who responded "yes" to the question about ever smoking cigarettes regularly for at least 1 year and "yes" or "occasionally" to the question about still smoking cigarettes regularly. Only those reporting never using cigars or pipes regularly were included in any of these categories.

Followup for mortality used the California Automated Mortality Linkage System (CAMLIS) (Arellano et al., 1984) program for linkage with deaths within the State of California. If linkages were questionable, additional information was obtained from program membership data and medical records to rule in or out the match. In a test subset consisting of 4,696 members of this study cohort, this method was found to produce more false negatives (11 percent vs. 6 percent of known dead classified as alive) and fewer false positives (0.07 percent vs. 1.2 percent of known alive classified as dead) when compared with utilization of the National Death Index (Stampfer et al., 1984) in ascertainment of mortality (Arellano et al., 1984). In a previous study, similar mortality followup resulted in death ascertainment that was estimated to be 82 to 92 percent complete (Freidman et al., 1979). Causes of death and their coding by State vital statistics personnel were accepted as recorded. Another test revealed 97 percent agreement between these codes and the judgment of a physician in our department (Sidney et al., 1987). During the followup period, all deaths were coded by the *International Classification of Diseases: 9th Revision. Clinical Modification (ICD-9-CM)* (U.S. Department of Health and Human Services, 1991).

Followup of each subject started with his or her first health checkup, in which the tobacco questionnaire was completed, and ended at death or December 31, 1987.

Cigarette Smoking and Mortality Person-years of followup were allocated to age categories using attained age for each subject. Deaths were summarized for age categories by age at death, and age-specific rates were reported as deaths per 1,000 person-years. Age-specific relative risks for former and current smokers compared with nonsmokers were simple rate ratios. Relative risks adjusted for age were obtained using the Mantel-Haenszel (MH) method as applied to cohort studies (Breslow and Day, 1988). Tests of homogeneity over age also were performed.

The data from smaller subgroups were initially examined and frequently found to contain small numbers of events. It was decided to combine subgroups for age, number of cigarettes smoked per day, number of years of smoking, and number of years of cessation into the larger categories. These were as follows: number of cigarettes smoked per day (<20, ≥ 20), years of smoking (<20, 20-39, ≥ 40), years of cessation (2-10, 11-20, >20), and age (35-49, 50-64, 65-74, ≥ 75 years). Years of smoking in current smokers, years of cessation in former smokers, and age were incremented throughout followup under the assumption that smoking habits remained as initially reported.

Mortality rates and relative risk estimates (rate ratios) were calculated for all-cause, lung cancer, coronary heart disease (CHD), stroke, and chronic obstructive pulmonary disease (COPD) mortality. In addition to these 5 categories, analyses were performed for major cause-of-death groupings and causes of death with at least 10 deaths among current smokers and nonsmokers in both sexes combined. Smokers vs. nonsmokers in Asians, blacks, and whites were compared for the five cause-of-death categories listed above.

Relative risks are described as statistically significant if the 95-percent confidence interval, before rounding, did not include 1.0. The results of most of our analyses are presented in a descriptive fashion, and statements concerning differences among subgroups or trends do not necessarily imply that these were statistically significant.

RESULTS

Study Population

The 60,838 study subjects, age 35 and older, had a mean age at entry to the study of 50.9 years and comprised 36,035 (59 percent)

women and 24,803 (41 percent) men. More than half, 58 percent, of the subjects were white, 25 percent were black, 11 percent were Asian, and 6 percent were of other or unknown race. Overall, there were 16,279 (27 percent) current smokers, 11,935 (20 percent) former smokers, and 32,624 (54 percent) never-smokers (percentages are rounded). The percentage of current smokers among blacks was 36 percent, among whites was 25 percent, among Asians was 15 percent, and among those of other or unknown race was 25 percent. The distributions of study subjects and person-years of followup by sex, race, and smoking status are shown in Table 1. The mean length of followup was 6.1 years for all subjects.

Current Smoker/ Never-Smoker Mortality Risks by Sex and Race for All and Selected Causes of Death

All Causes

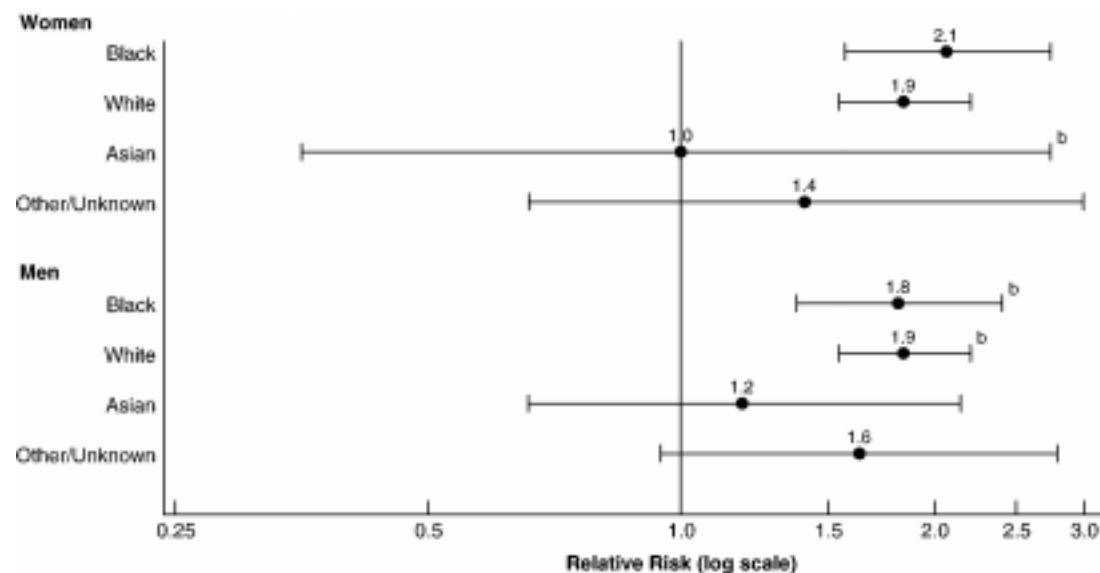
There was approximately a doubling in all-cause mortality rates in current smokers as compared with never-smokers in both black and white women. In women who were Asian or of other or unknown race, relative risks were lower, but confidence intervals were wide because of few deaths and were compatible with a twofold increase (Figure 1).

In black and white men the overall current smoker/never-smoker relative risk for all-cause mortality was slightly less than two. However, these combined relative risks do not reflect the significant heterogeneity among the age subgroups (Table 2). In blacks this heterogeneity was expressed as a progressive downward trend in elevated risk starting with the youngest men, ages 35 to 49 years. In whites smokers in the 50- to 64-year-old age range had the highest relative risk. The overall current smoker/never-smoker relative risk was lower in Asian men and men of other or unknown race, but confidence intervals were wide. There were too few men in these racial groups for the apparent substantial variation among age subgroups to be statistically significant.

Table 1
Study subjects and person-years of followup by sex, race, and cigarette smoking status

Subjects	Cigarette Smoking Status							
	Never		Former		Current		Total	
	N	Person-Years	N	Person-Years	N	Person-Years	N	Person-Years
Women—Total	21,080	131,955	5,871	35,261	9,084	55,166	36,035	222,382
Black	5,213	32,316	1,092	6,624	3,123	18,678	9,428	57,618
White	11,111	69,590	4,321	25,782	5,133	31,315	20,565	126,687
Asian	3,355	21,004	223	1,395	355	2,209	3,933	24,608
Other/unknown	1,401	9,045	235	1,460	473	2,964	2,109	13,469
Men—Total	11,544	69,887	6,064	36,927	7,195	43,718	24,803	150,532
Black	2,159	12,953	1,228	7,589	2,315	13,948	5,702	34,490
White	6,931	41,739	4,024	24,392	3,804	23,084	14,759	89,215
Asian	1,714	10,586	501	3,017	650	4,063	2,865	17,666
Other/unknown	740	4,609	311	1,929	426	2,623	1,477	9,161
Total	32,624	201,842	11,935	72,188	16,279	98,884	60,838	372,914

Figure 1
Age-adjusted relative risks (with 95-percent confidence intervals)^a of death due to all causes in current smokers as compared with never-smokers



^aBy Mantel-Haenszel method.

^bChi-squared test for heterogeneity showed significant ($p < 0.05$) variation in relative risks by age.

Table 2

Age-specific relative risks of death due to all causes by sex and race in current smokers as compared with never-smokers—mortality rates per 1,000 person-years

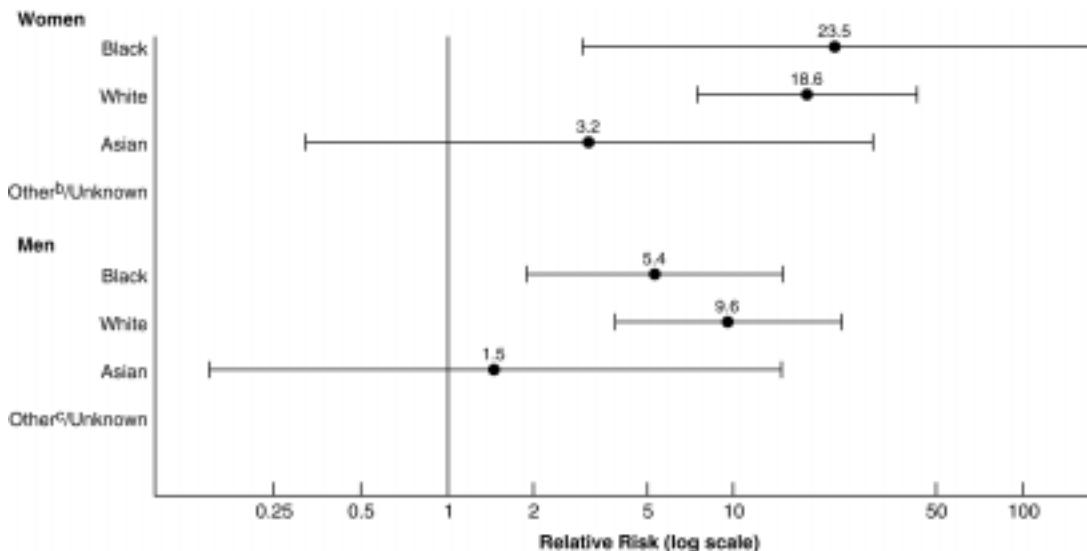
Race-Sex	Cigarette Smoking Status	Ages 35-49 Years			Ages 50-64 Years			Ages 65-74 Years			Ages 75+ Years		
		No. of Deaths	Mort. Rate	Rel. Risk	No. of Deaths	Mort. Rate	Rel. Risk	No. of Deaths	Mort. Rate	Rel. Risk	No. of Deaths	Mort. Rate	Rel. Risk
Black Women	Never	17	1.3	—	34	2.7	—	44	8.5	—	32	19.6	—
	Current	18	1.8	1.4	42	6.0	2.2	33	23.6	2.8	5	28.3	1.4
White Women	Never	12	0.6	—	56	2.3	—	107	6.9	—	245	25.0	—
	Current	16	1.3	2.2	63	5.1	2.2	77	14.3	2.1	41	34.0	1.4
Asian Women	Never	6	0.7	—	20	2.1	—	14	6.6	—	4	13.5	—
	Current	1	1.0	1.5	2	2.0	1.0	0	0.0	0.0	1	85.7	13.7
Other Women	Never	2	0.5	—	8	2.3	—	6	4.7	—	18	33.4	—
	Current	2	1.3	2.4	2	1.9	0.9	5	16.0	3.4	0	0.0	0.0
Black Men	Never	4	0.7	—	21	4.8	—	37	19.2	—	33	48.0	—
	Current	25	3.6	5.3	57	10.5	2.2	34	25.4	1.3	12	59.2	1.2
White Men	Never	37	2.2	—	54	3.9	—	97	12.5	—	144	44.1	—
	Current	36	3.3	1.5	95	11.0	2.8	72	24.5	2.0	41	56.1	1.3
Asian Men	Never	2	0.4	—	12	2.8	—	20	15.7	—	18	49.0	—
	Current	1	0.5	1.1	8	5.0	1.8	4	13.5	0.9	2	42.0	0.9
Other Men	Never	6	2.6	—	10	6.3	—	7	13.3	—	8	48.2	—
	Current	4	2.9	1.1	9	9.1	1.5	6	31.0	2.3	5	89.5	1.9

Lung Cancer Current smoker/never-smoker age-adjusted relative risks of dying of lung cancer were high in black women and white women and were only moderately high in Asian women, but confidence limits were wide in all three racial groups due to small numbers of deaths. There were no lung cancer deaths among women of other or unknown race. Among men these age-adjusted relative risks were highest in whites, next highest in blacks, and lowest in Asians and were indeterminate in those of other or unknown race. The confidence intervals in Asian women and men were compatible with either large or absent risk elevation in the current smokers (Figure 2).

Chronic Obstructive Pulmonary Disease Current smoker/never-smoker age-adjusted relative risks of dying of COPD were high in both black and white women and were indeterminate in the other two female racial groups. They were high in white men, fairly high in Asian men, and indeterminate in black men and those men of other or unknown race. Statistically significant elevation above a relative risk of 1.0 was seen in white women and men (Figure 3).

Coronary Heart Disease The risk of dying from CHD was elevated in current-smoking as compared with never-smoking women of all racial groups. Relative risk was highest and about equal in black and Asian women and was next highest in white women but was only slightly increased in women of other or unknown race. White men showed an elevated current smoker/never-smoker relative risk similar to that in black and Asian women, but they also

Figure 2
Age-adjusted relative risks (with 95-percent confidence intervals)^a of death due to lung cancer in current smokers as compared with never-smokers

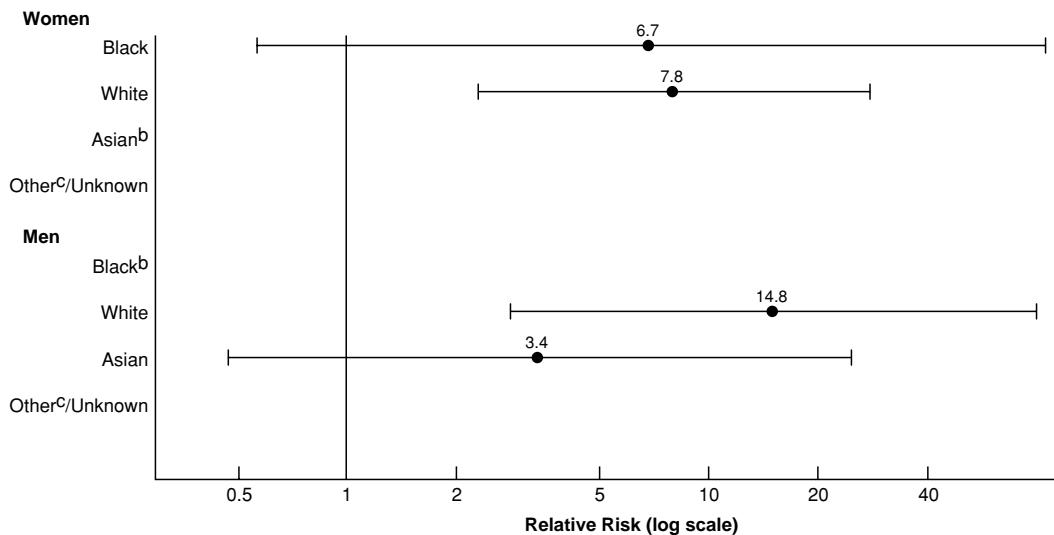


^aBy Mantel-Haenszel method.

^bIndeterminate relative risk due to absence of deaths among both never-smokers and current smokers.

^cIndeterminate relative risk due to absence of deaths among never-smokers.

Figure 3
Age-adjusted relative risks (with 95-percent confidence intervals)^a of death due to COPD in current smokers as compared with never-smokers



^aBy Mantel-Haenszel method.

^bIndeterminate relative risk due to absence of deaths among never-smokers.

^cIndeterminate relative risk due to absence of deaths among both never-smokers and current smokers. Friedman et al. Figure 3

showed significant heterogeneity of relative risk among the age subgroups. Relative risk elevation was fairly small in Asian men, virtually absent in black men, and reversed, with nonsmokers higher, in men of other or unknown race. Risk elevations were statistically significant in black and white women and white men (Figure 4).

Stroke Age-adjusted current smoker/never-smoker relative risks for stroke death were moderately elevated in black women and mildly elevated in women of other or unknown race (neither statistically significant), were not elevated in white women, and were indeterminate in Asian women. Among men relative risk was not elevated in blacks or whites and was indeterminate in Asians and those of other or unknown race (Figure 5).

Age-Specific Relative Risks for Mortality

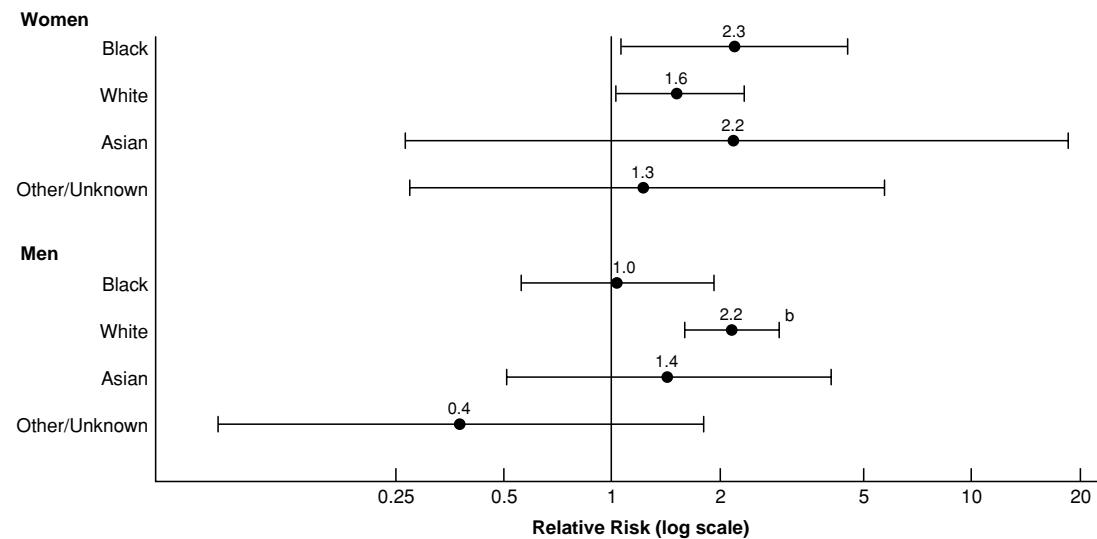
Quantity Smoked

Women in each age group showed an increase in risk of dying from any cause according to the number of cigarettes smoked (Table 3). This trend was most marked

in the two intermediate age groups, 50 to 64 years and 65 to 74 years, and was least marked among those 75 years or older. Lung cancer showed striking increases in relative risk among female smokers, with greater than twentyfold elevations over the nonsmoker mortality rate noted for female smokers of 20 or more cigarettes per day in those ages 35 to 49 years, 65 to 74 years, and 75 years and older and for female smokers of fewer than 20 cigarettes per day in the 65- to 74-year age group. There were

Figure 4

Age-adjusted relative risks (with 95-percent confidence intervals)^a of death due to CHD in current smokers as compared with never-smokers

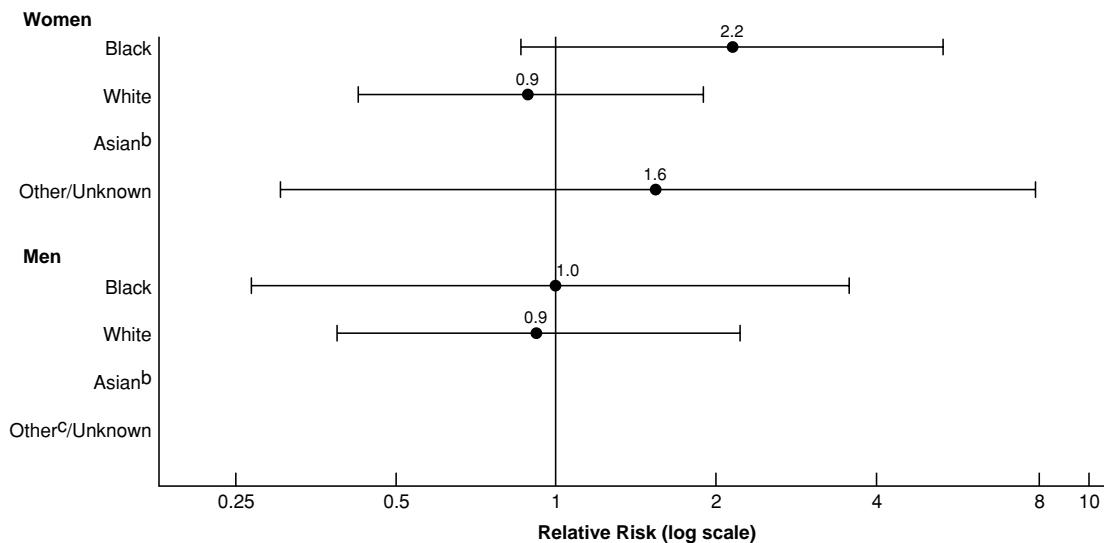


^a By Mantel-Haenszel method.

^b Chi-squared test for heterogeneity showed significant ($p < 0.05$) variation in relative risks by age.

Figure 5

Age-adjusted relative risks (with 95-percent confidence intervals)^a of death due to stroke in current smokers as compared with never-smokers



^a By Mantel-Haenszel method.

^b Indeterminate relative risk due to absence of deaths among current smokers.

^c Indeterminate relative risk due to absence of deaths among both never-smokers and current smokers.

Table 3

Age-specific relative risks of death due to all causes, lung cancer, COPD, CHD, and stroke in never-smokers and current smokers by quantity of cigarettes smoked—women

Age (Years)	Cigarette Smoking Status	Quantity (Cigarettes Per Day)	Person- Years	Number of Deaths				Relative Risk ^a					
				All Causes	Lung Cancer	COPD	CHD	Stroke	All Causes	Lung Cancer	COPD	CHD	Stroke
35-49	Never	—	45,768	37	1	0	2	1	1.0	1.0	1.0	1.0	1.0
	Current	≤19	12,086	12	1	0	0	1	1.2	3.8	— ^b	0.0	3.8
	Current	20+	12,851	25	7	0	3	3	2.4	24.9	—	5.3	10.7
50-64	Never	—	49,744	118	5	0	17	10	1.0	1.0	1.0	1.0	1.0
	Current	≤19	10,205	40	5	1	5	2	1.7	4.9	—	1.4	1.0
	Current	20+	10,950	69	16	1	12	5	2.7	14.5	—	3.2	2.3
65-74	Never	—	24,159	171	2	2	33	16	1.0	1.0	1.0	1.0	1.0
	Current	≤19	3,582	45	8	0	8	3	1.8	27.0	0.0	1.6	1.3
	Current	20+	3,583	70	11	5	11	4	2.8	37.1	16.9	2.2	1.7
75+	Never	—	12,285	299	3	4	82	38	1.0	1.0	1.0	1.0	1.0
	Current	≤19	806	23	1	2	7	1	1.2	5.1	7.6	1.3	0.4
	Current	20+	588	24	5	1	4	1	1.7	34.8	5.2	1.0	0.5
All ages ^a	Never	—	131,956	625	11	6	134	65	1.0	1.0	1.0	1.0	1.0
	Current	≤19	26,680	120	15	3	20	7	1.5	8.5	5.4	1.4	0.9
	Current	20+	27,973	188	39	7	30	13	2.5	21.7	13.9	2.2	1.9

^aRelative risk for all ages is age-adjusted by the MH method using the four age strata shown.

^bIndicates indeterminate relative risk due to absence of deaths among never-smokers.

Key: COPD = chronic obstructive pulmonary disease; CHD = coronary heart disease; MH = Mantel-Haenszel.

few deaths from COPD among women, yielding unstable rates and relative risks. Female smokers age 75 years or older and those ages 65 to 74 years who smoked 20 or more cigarettes all showed markedly elevated risks. CHD death was increased in a graded fashion in women ages 50 to 64 and 65 to 74 years, but there was virtually no increase in smokers age 75 and older. The few CHD deaths in women ages 35 to 49 years showed an uneven trend, with smokers of 20 or more cigarettes per day showing the highest risk and smokers of fewer than 20 cigarettes per day having the lowest risk. Smoking-associated relative risks of stroke tended to decrease with age; the risks were highest in women smokers ages 35 to 49 years and were lower in current smokers compared with never-smokers in women age 75 or older.

Among men there was a clear moderate dose-response trend in all-cause mortality according to quantity smoked in the 35- to 49- and 50- to 64-year age group (Table 4). Findings became less clear-cut in the older groups, with both smoking-quantity groups having about equal risk elevations in men ages 65 to 74 years and a mildly elevated risk found only in the 20-or-more cigarettes per day smokers among men age 75 and older. For lung cancer, zero cases in never-smokers made relative risk not determinable in the 35- to 49-year-olds, but large elevations in risk with a dose-response trend were noted in all the other age groups. Interestingly, these risk elevations were less marked than in women (differences not statistically significant). Large increases in risk also were noted in most of the male smoking groups for COPD, but small numbers of deaths limit the interpretability of the finding. CHD deaths were relatively elevated in all the male smoking groups except those age 75 or older who smoked fewer than 20 cigarettes per day. Dose-response was not apparent in 35- to 49-year-old men. Stroke mortality risk was elevated in all the fewer-than-20 cigarettes per day smokers except those ages 35 to 49 years. Smokers of at least 20 cigarettes per day showed no risk elevation except for men ages 35 to 49 years, but numbers of deaths were small.

Duration of Smoking Although there were some irregularities and inconsistencies, age-specific relative risks for all-cause mortality generally increased with duration of smoking in women (Table 5). This was even more apparent for lung cancer, where there were no deaths among those who smoked less than 20 years. Death due to COPD occurred in a few never-smoking women, but among smokers, it occurred only in those who had smoked at least 40 years. CHD showed positive trends in risk, with increasing duration in the two younger groups of women but with negative trends in the two older groups. Somewhat similar age-related diversity in risk trends by duration of smoking was seen for stroke.

Among men all-cause mortality was associated with increasing duration of smoking in 35- to 49- and 50- to 64-year-olds (Table 6). Excluding the relatively few less-than-20-year smokers in the older groups, with respect to all-cause mortality risk, duration was not associated in those ages 65 to 74 years and was inversely associated in those age 75 or older. Lacking relative risk estimates for lung cancer in 35- to 49-year-old men because

Table 4

Age-specific relative risks of death due to all causes, lung cancer, COPD, CHD, and stroke in never-smokers and current smokers by quantity of cigarettes smoked—men

Age (Years)	Cigarette Smoking Status	Quantity (Cigarettes Per Day)	Person- Years	Number of Deaths				Relative Risk ^a					
				All Causes	Lung Cancer	COPD	CHD	Stroke	All Causes	Lung Cancer	COPD	CHD	Stroke
35-49	Never	—	29,916	49	0	0	5	3	1.0	1.0	1.0	1.0	1.0
	Current	≤19	7,895	17	0	0	3	0	1.3	— ^b	—	2.3	0.0
	Current	20+	13,304	49	6	2	4	2	2.2	—	—	1.8	1.5
50-64	Never	—	24,020	97	5	1	29	3	1.0	1.0	1.0	1.0	1.0
	Current	≤19	5,575	49	6	3	14	2	2.2	5.2	12.9	2.1	2.9
	Current	20+	10,838	116	18	3	39	1	2.7	8.0	6.6	3.0	0.7
65-74	Never	—	11,466	161	5	2	52	10	1.0	1.0	1.0	1.0	1.0
	Current	≤19	1,740	44	3	3	11	2	1.8	4.0	9.9	1.4	1.3
	Current	20+	2,995	71	13	6	23	0	1.7	10.0	11.5	1.7	0.0
75+	Never	—	4,486	203	4	1	66	19	1.0	1.0	1.0	1.0	1.0
	Current	≤19	490	22	2	0	4	3	1.0	4.6	0.0	0.6	1.4
	Current	20+	545	37	5	1	9	1	1.5	10.3	8.2	1.1	0.4
All ages ^a	Never	—	69,887	510	14	4	152	35	1.0	1.0	1.0	1.0	1.0
	Current	≤19	15,700	132	11	6	32	7	1.6	4.7	9.2	1.4	1.4
	Current	20+	27,682	273	42	12	75	4	2.0	10.4	10.9	2.0	0.5

^a Relative risk for all ages is age-adjusted by the MH method using the four age strata shown.

^b Indicates indeterminate relative risk due to absence of deaths among never-smokers.

Key: COPD = chronic obstructive pulmonary disease; CHD = coronary heart disease; MH = Mantel-Haenszel.

Table 5

Age-specific relative risks of death due to all causes, lung cancer, COPD, CHD, and stroke in never-smokers and current smokers by duration of smoking—women

Age (Years)	Cigarette Smoking Status	Duration (Years Smoked)	Person- Years	Number of Deaths				Relative Risk ^a					
				All Causes	Lung Cancer	COPD	CHD	Stroke	All Causes	Lung Cancer	COPD	CHD	Stroke
35-49	Never	—	45,768	37	1	0	2	1	1.0	1.0	1.0	1.0	1.0
	Current	<20	8,962	8	0	0	1	0	1.1	0.0	— ^b	2.6	0.0
	Current	20-39	15,162	28	8	0	2	4	2.3	24.1	—	3.0	12.1
50-64	Never	—	49,744	118	5	0	17	10	1.0	1.0	1.0	1.0	1.0
	Current	<20	2,454	5	0	0	1	0	0.9	0.0	—	1.2	0.0
	Current	20-39	14,115	56	11	0	7	4	1.7	7.8	—	1.5	1.4
	Current	40+	3,761	40	7	2	7	3	4.5	18.5	—	5.4	4.0
65-74	Never	—	24,159	171	2	2	33	16	1.0	1.0	1.0	1.0	1.0
	Current	<20	502	6	0	0	2	0	1.7	0.0	0.0	2.9	0.0
	Current	20-39	2,125	39	4	0	8	4	2.6	22.7	0.0	2.8	2.8
	Current	40+	4,236	64	14	5	7	3	2.1	39.9	14.3	1.2	1.1
75+	Never	—	12,285	299	3	4	82	38	1.0	1.0	1.0	1.0	1.0
	Current	<20	100	3	0	0	1	0	1.2	0.0	0.0	1.5	0.0
	Current	20-39	366	10	1	0	3	2	1.1	11.2	0.0	1.2	1.8
	Current	40+	830	30	5	3	5	0	1.5	24.7	11.1	0.9	0.0
All ages ^a	Never	—	131,956	625	11	6	134	65	1.0	1.0	1.0	1.0	1.0
	Current	<20	12,018	22	0	0	5	0	1.2	0.0	0.0	1.9	0.0
	Current	20-39	31,768	133	24	0	20	14	1.9	12.0	0.0	1.9	2.4
	Current	40+	8,827	134	26	10	19	6	2.3	27.5	16.2	1.5	1.0

^a Relative risk for all ages is age-adjusted by the MH method using the four age strata shown.

^b Indicates indeterminate relative risk due to absence of deaths among never-smokers.

Key: COPD = chronic obstructive pulmonary disease; CHD = coronary heart disease; MH = Mantel-Haenszel.

Table 6

Age-specific relative risks of death due to all causes, lung cancer, COPD, CHD, and stroke in never-smokers and current smokers by duration of smoking—men

Age (Years)	Cigarette Smoking Status	Duration (Years Smoked)	Person- Years	Number of Deaths				Relative Risk ^a					
				All Causes	Lung Cancer	COPD	CHD	Stroke	All Causes	Lung Cancer	COPD	CHD	Stroke
35-49 ^b	Never	—	29,916	49	0	0	5	3	1.0	1.0	1.0	1.0	1.0
	Current <20	5,940	16	1	0	1	1	1	1.6	— ^c	—	1.0	1.7
	Current 20-39	14,563	48	5	2	5	1	—	2.0	—	—	2.1	0.7
50-64	Never	—	24,020	97	5	1	29	3	1.0	1.0	1.0	1.0	1.0
	Current <20	1,174	7	0	0	3	0	—	1.5	0.0	0.0	2.1	0.0
	Current 20-39	10,205	80	7	2	28	2	—	1.9	3.3	4.7	2.3	1.6
	Current 40+	4,367	74	17	4	21	1	—	4.2	18.7	22.0	4.0	1.8
65-74	Never	—	11,466	161	5	2	52	10	1.0	1.0	1.0	1.0	1.0
	Current <20	212	0	0	0	0	0	—	0.0	0.0	0.0	0.0	0.0
	Current 20-39	963	23	3	1	7	0	—	1.7	7.1	6.0	1.6	0.0
	Current 40+	3,285	80	12	7	22	1	—	1.7	8.4	12.2	1.5	0.3
75+	Never	—	4,486	203	4	1	66	19	1.0	1.0	1.0	1.0	1.0
	Current <20	90	0	0	0	0	0	—	0.0	0.0	0.0	0.0	0.0
	Current 20-39	138	12	1	0	4	0	—	1.9	8.1	0.0	2.0	0.0
	Current 40+	740	42	5	1	8	3	—	1.3	7.6	6.1	0.7	1.0
All ages ^a	Never	--	69,887	510	14	4	152	35	1.0	1.0	1.0	1.0	1.0
	Current <20	7,416	23	1	0	4	1	—	1.0	2.1	0.0	0.8	0.7
	Current 20-39	25,868	163	16	5	44	3	—	1.9	6.0	7.6	2.0	0.6
	Current 40+	8,401	196	34	12	51	5	—	2.0	11.4	13.1	1.6	0.8

^aRelative risk for all ages age-adjusted by the MH method using the four age strata shown.

^bOne man who reported smoking 40+ years was excluded.

^cIndicates indeterminate relative risk due to absence of deaths among never-smokers.

Key: COPD = chronic obstructive pulmonary disease; CHD = coronary heart disease; MH = Mantel-Haenszel.

of an absence of cases in never-smokers, one may still conclude from inspection of the number of cases and person-years that duration of smoking was associated with risk in that group. There were no lung cancer deaths in the less-than-20-year smokers in the three older age groups, but judging from smokers of longer duration, duration was strongly related to risk in 50- to 64-year-olds but not in 65- to 74-year-olds or those 75 years or older. Although inconclusive due to small numbers of cases, men's risk of death from COPD was related to duration, being highest in those who had smoked for at least 40 years. Risk of dying from CHD was related to increasing duration of smoking in a positive fashion among the 35- to 49- and 50- to 64-year-olds and, ignoring the few smokers of less than 20 years duration, in a slightly negative and markedly negative fashion in those ages 65 to 74 years and 75+ years or older, respectively. Little can be said about the relation of stroke to duration of smoking in men because of the paucity of deaths.

Duration of Quitting Among the women in the 50- to 64- and 65- to 74-year age group, all-cause mortality showed an inverse relationship to duration of quitting, with those who had quit for more than 20 years among the 50- to 64-year-olds having a lower risk than never-smokers (Table 7). In persons at least 75 years of age, those who had quit for 11 to 20 years and those who had quit for more than 20 years had virtually the same all-cause mortality risks. In the youngest group, the 35- to 49-year-olds, all-cause mortality was highest in those who had quit smoking for more than 20 years, but this was based on only two deaths. Lung cancer deaths among women were also few in number, and the expected decline in risk with increasing duration of quitting smoking was observed in the 50- to 64- and 75+-year age groups. Deaths due to COPD and stroke among the female ex-smokers were too few for meaningful observation of trends. A clearly declining trend in risk of death from CHD with increasing duration of quitting was seen only in women ages 65 to 74 years.

All-cause deaths among men showed decreasing risks with increased duration of quitting only in the 50- to 64- and 75+-year age groups (Table 8). This was also true for lung cancer but only in men ages 50 to 64 years. In the 65- to 74-year-olds who had quit for at least 20 years and those 75 years or older who had quit for 11 to 19 years, the risk of dying from lung cancer was lower than that of never-smokers. Based on small numbers of deaths, risk of dying from COPD was inversely related to duration of quitting smoking in the 65- to 74- and 75+-age groups, with large relative risks seen in men who had quit for less than 20 years. Declining risks of death due to CHD were associated with increased duration of quitting in men ages 50 to 64 and 75+ years. Former smokers in the 65- to 74-year age group had relative risks that were the same or lower than that of nonsmokers. A progressively declining trend of stroke deaths with increasing duration of quitting was seen only in the 65- to 74-year age group of men. Numbers of stroke deaths were very small, thereby hampering inference.

Table 7

Age-specific relative risks of death due to all causes, lung cancer, COPD, CHD, and stroke in never-smokers and former smokers by duration of quitting—women

Age (Years)	Cigarette Smoking Status	Duration (Years Smoked)	Person- Years	Number of Deaths				Relative Risk ^a					
				All Causes	Lung Cancer	COPD	CHD	Stroke	All Causes	Lung Cancer	COPD	CHD	Stroke
35-49	Never	—	45,768	37	1	0	2	1	1.0	1.0	1.0	1.0	1.0
	Former	2-10	5,493	0	0	0	0	0	0.0	0.0	—	0.0	0.0
	Former	11-20	6,027	4	0	0	0	1	0.8	0.0	—	0.0	7.6
	Former	>20	1,279	2	0	0	0	0	1.9	0.0	—	0.0	0.0
	Never	—	49,744	118	5	0	17	10	1.0	1.0	1.0	1.0	1.0
	Former	2-10	3,750	15	3	1	0	0	1.7	8.0	—	0.0	0.0
	Former	11-20	5,467	16	1	0	2	2	1.2	1.8	—	1.1	1.8
	Former	>20	4,405	7	0	0	0	1	0.7	0.0	—	0.0	1.1
65-74	Never	—	24,159	171	2	2	33	16	1.0	1.0	1.0	1.0	1.0
	Former	2-10	1,572	15	2	0	4	0	1.3	15.4	0.0	1.9	0.0
	Former	11-20	2,505	21	2	1	5	1	1.2	9.6	4.8	1.5	0.6
	Former	>20	2,641	20	3	1	2	2	1.1	13.7	4.6	0.6	1.1
75+	Never	—	12,285	299	3	4	82	38	1.0	1.0	1.0	1.0	1.0
	Former	2-10	394	15	1	0	5	1	1.6	10.4	0.0	1.9	0.8
	Former	11-20	722	23	1	0	7	2	1.3	5.7	0.0	1.5	0.9
	Former	>20	852	27	1	1	10	2	1.3	4.8	3.6	1.8	0.8
All ages ^a	Never	—	131,956	625	11	6	134	65	1.0	1.0	1.0	1.0	1.0
	Former	2-10	11,209	45	6	1	9	1	1.3	8.4	3.8	1.4	0.3
	Former	11-20	14,722	64	4	1	14	6	1.2	3.8	2.2	1.4	1.2
	Former	>20	9,178	56	4	2	12	5	1.1	4.4	4.0	1.1	0.9

^a Relative risk for all ages is age-adjusted by the MH method using the four age strata shown.

^b Indicates indeterminate relative risk due to absence of deaths among never-smokers.

Key: COPD = chronic obstructive pulmonary disease; CHD = coronary heart disease; MH = Mantel-Haenszel.

Table 8

Age-specific relative risks of death due to all causes, lung cancer, COPD, CHD, and stroke in never-smokers and former smokers by duration of quitting—men

Age (Years)	Cigarette Smoking Status	Duration (Years Smoked)	Person- Years	Number of Deaths				Relative Risk ^a			
				All Causes	Lung Cancer	COPD	CHD	All Causes	Lung Cancer	COPD	CHD
35-49	Never	—	29,916	49	0	0	5	3	1.0	1.0	1.0
	Former	2-10	5,571	12	1	0	1	1	1.3	— ^b	1.1
	Former	11-20	6,210	5	0	1	1	0	0.5	—	1.0
	Former	>20	1,149	3	0	0	2	0	1.6	—	10.4
50-64	Never	—	24,020	97	5	1	29	3	1.0	1.0	1.0
	Former	2-10	3,625	26	6	0	9	0	1.8	8.0	0.0
	Former	11-20	6,107	29	2	0	11	2	1.2	1.6	0.0
	Former	>20	4,670	19	1	0	6	1	1.0	0.0	1.1
65-74	Never	—	11,466	161	5	2	52	10	1.0	1.0	1.0
	Former	2-10	977	14	2	2	1	2	1.0	4.7	11.7
	Former	11-20	2,548	52	6	3	11	2	1.5	5.4	6.8
	Former	>20	3,507	43	1	1	12	0	0.9	0.7	1.6
75+	Never	—	4,486	203	4	1	66	19	1.0	1.0	1.0
	Former	2-10	253	16	3	2	7	1	1.4	13.3	35.5
	Former	11-20	671	40	0	2	16	4	1.3	0.0	13.4
	Former	>20	1,442	67	4	0	22	8	1.0	3.1	0.0
All ages ^a	Never	—	69,887	510	14	4	152	35	1.0	1.0	1.0
	Former	2-10	10,424	68	12	4	18	4	1.4	8.5	10.9
	Former	11-20	15,536	126	8	6	39	8	1.2	2.7	7.2
	Former	>20	10,767	132	6	1	42	9	1.0	1.6	0.9

^a Relative risk for all ages is age-adjusted by the MH method using the four age strata shown.

^b Indicates indeterminate relative risk due to absence of deaths among never-smokers.

Key: COPD = chronic obstructive pulmonary disease; CHD = coronary heart disease; MH = Mantel-Haenszel.

Current Smoker/Never-Smoker Relative Risks for Other Causes of Death

A survey of current smoker/never-smoker relative risk for a broad range of causes of death is provided in Tables 9 and 10. Shown are the numbers of deaths and age-adjusted relative risks for all the major cause-of-death groupings in the ICD-9-CM classification (U.S. Department of Health and Human Services, 1991) plus selected individual causes. Although all major groupings of causes are shown regardless of numbers of deaths, individual causes with fewer than 10 deaths in the total of female and male current smokers and never-smokers are not shown. Thus, certain causes that were of interest because of findings in previous studies are not shown here because of small numbers of deaths (e.g., cancer of the cervix in women, one death among current smokers and one death among never-smokers, respectively, and cancer of the urinary bladder, three and two deaths among male current smokers and never-smokers, respectively, and zero and four deaths among female current smokers and never-smokers, respectively).

Among women (Table 9) and men (Table 10) statistically significant elevations of relative risk in the current smokers were found for all causes of death combined, all neoplasms combined, cancer of the lung, all circulatory diseases combined, coronary (ischemic) heart disease, "other" heart and circulatory disease, all diseases of the respiratory system combined, COPD, and other (nonmotor vehicle) accidents.

Other statistically significant elevations were found for cancer of the pancreas and cirrhosis of the liver in women and for cancer of the stomach and all diseases of the digestive system combined in men.

COMMENT These data generally confirm the association of cigarette smoking with elevated risks of mortality from all causes combined, lung cancer, COPD, and CHD. This study cohort provided relatively short followup; the maximum was 81/2 years after completion of the questionnaire.

Racial diversity is an important feature of this cohort, but the relatively few decedents in the Asian and other or unknown race subgroups made their findings uncertain. Although they often differed from blacks and whites in the direction of lower risks associated with cigarette smoking, the confidence intervals for these findings were usually wide and overlapped the risk estimates for blacks and whites. Blacks were fairly similar to whites in their risk estimates for the major causes of death studied, except that black men and white women did not show the elevated risks for CHD and stroke, respectively, that were present in white men and black women.

Although there were some inconsistencies in the data, risk of total mortality and mortality from some of the major causes studied generally increased with both amount and duration of smoking. An inverse relationship of risk with duration of quitting was often but not consistently seen.

Findings for other specific causes of death in relation to cigarette smoking were often inconclusive due to small numbers. Thus, considerably more followup time is needed before this study cohort can provide substantial

Table 9

Age-adjusted relative risks of death due to other selected causes in current smokers as compared with never-smokers—women

Cause of Death	Current	Never	Relative Risk (95-percent CI)
All Causes	308	625	1.9 (1.7 - 2.2)
Infectious and Parasitic Diseases (<i>ICD-9-CM</i> 001-139)	0	11	0
Neoplasms (<i>ICD-9-CM</i> 140-239)	133	192	2.3 (1.9 - 2.9)
Cancer: Esophagus (<i>ICD-9-CM</i> 150)	1	2	3.7 (0.3 - 41.1)
Cancer: Stomach (<i>ICD-9-CM</i> 151)	3	14	0.8 (0.2 - 2.8)
Cancer: Colon (<i>ICD-9-CM</i> 153)	7	28	0.9 (0.4 - 2.1)
Cancer: Liver and biliary tract (<i>ICD-9-CM</i> 155-156)	5	4	3.5 (0.9 - 13.6)
Cancer: Pancreas (<i>ICD-9-CM</i> 157)	12	11	3.9 (1.7 - 9.3)
Cancer: Trachea, bronchus, lung (<i>ICD-9-CM</i> 162)	54	11	15.1 (7.7 - 29.7)
Cancer: Breast (<i>ICD-9-CM</i> 174-175)	15	35	1.2 (0.6 - 2.2)
Cancer: Corpus uteri (<i>ICD-9-CM</i> 182)	3	11	1.1 (0.3 - 4.2)
Cancer: Ovary (<i>ICD-9-CM</i> 183-183.0)	7	11	2.2 (0.8 - 5.9)
Cancer: Kidney (<i>ICD-9-CM</i> 189-189.1)	1	4	0.8 (0.1 - 7.5)
Cancer: Brain tumors (<i>ICD-9-CM</i> 191-192)	1	2	1.1 (0.1 - 11.9)
Cancer: Leukemias (<i>ICD-9-CM</i> 204-208)	2	5	1.3 (0.2 - 6.9)
Cancer: Other hematopoietic/lymphatic (<i>ICD-9-CM</i> 202-203)	2	5	1.7 (0.3 - 8.9)
Endocrine, Nutritional, and Metabolic Diseases and			
Immunity Disorders (<i>ICD-9-CM</i> 240-279)	4	16	0.9 (0.3 - 2.8)
Diabetes (<i>ICD-9-CM</i> 250)	3	14	0.7 (0.2 - 2.6)
Diseases of Blood and Blood-Forming Organs			
(<i>ICD-9-CM</i> 280-289)	3	4	2.8 (0.6 - 13.9)
Mental Disorders (<i>ICD-9-CM</i> 290-319)	1	4	1.5 (0.1 - 14.4)
Diseases of the Nervous System (<i>ICD-9-CM</i> 320-389)	4	11	1.6 (0.5 - 5.3)
Diseases of the Circulatory System (<i>ICD-9-CM</i> 390-459)	109	283	1.7 (1.4 - 2.2)
Ischemic heart disease (<i>ICD-9-CM</i> 410-414)	50	134	1.7 (1.2 - 2.4)
Hypertensive heart disease (<i>ICD-9-CM</i> 402, 404)	5	10	2.2 (0.7 - 6.5)
Cerebrovascular disease (<i>ICD-9-CM</i> 430-438)	20	65	1.3 (0.8 - 2.2)
Other heart and circulatory disease (<i>ICD-9-CM</i> 390-459)	33	68	2.1 (1.4 - 3.2)
Diseases of the Respiratory System (<i>ICD-9-CM</i> 460-519)	18	31	2.7 (1.5 - 4.9)
Asthma (<i>ICD-9-CM</i> 493)	2	6	1.5 (0.3 - 7.8)
Pneumonia (<i>ICD-9-CM</i> 480-486)	3	12	1.3 (0.4 - 4.7)
COPD, including chronic bronchitis (<i>ICD-9-CM</i> 491), emphysema (<i>ICD-9-CM</i> 492), and other chronic airway obstruction (<i>ICD-9-CM</i> 496)	10	6	9.0 (3.0 - 26.6)
Other respiratory disease (<i>ICD-9-CM</i> 460-519)	3	7	1.6 (0.4 - 6.3)
Diseases of the Digestive System (<i>ICD-9-CM</i> 520-579)	11	22	1.9 (0.9 - 3.9)
Cirrhosis of the liver (<i>ICD-9-CM</i> 571)	7	7	2.9 (1.0 - 8.4)
Diseases of the Genitourinary System (<i>ICD-9-CM</i> 580-629)	2	9	1.3 (0.3 - 6.6)
Complications of Pregnancy, Childbirth, and the			
Puerperium (<i>ICD-9-CM</i> 630-676)	0	0	^a
Diseases of Skin and Subcutaneous Tissue (<i>ICD-9-CM</i> 680-709)	0	1	0

Table 9 (continued)

Cause of Death	Current	Never	Relative Risk (95-percent CI)
Diseases of the Musculoskeletal System and Connective Tissue (<i>ICD-9-CM</i> 710-739)			
1	3	2.9	(0.3 - 27.5)
Congenital Anomalies (<i>ICD-9-CM</i> 740-759)			
1	1	2.2	(0.1 - 36.1)
Certain Conditions Originating in the Perinatal Period (<i>ICD-9-CM</i> 760-779)			
0	0	a	
Symptoms, Signs, and Ill-Defined Conditions (<i>ICD-9-CM</i> 780-799)			
2	2	3.3	(0.4 - 26.3)
Injury and Poisoning (<i>ICD-9-CM</i> 800-999)			
19	35	1.6	(0.9 - 2.9)
Motor Vehicle Accidents (<i>ICD-9-CM</i> 810-825, 929-929.0)	3	6	1.3 (0.3 - 5.6)
Other Accidents (<i>ICD-9-CM</i> 800-807, 826-828, 829.1-949)	10	14	2.5 (1.1 - 5.8)
Suicide (<i>ICD-9-CM</i> 950-959)	4	8	1.3 (0.4 - 4.4)
Homicide (<i>ICD-9-CM</i> 960-969)	1	6	0.5 (0.1 - 4.1)

^a Indicates indeterminate relative risk due to absence of deaths among never-smokers.

Key: CI = confidence interval; ICD-9-CM = International Classification of Diseases: 9th Revision. Clinical Modification (U.S. Department of Health and Human Services, 1991); COPD = chronic obstructive pulmonary disease.

Table 10
Age-adjusted relative risks of death due to other selected causes in current smokers as compared with never-smokers—men

Cause of Death	Current	Never	Relative Risk (95-percent CI)
All Causes	308	625	1.9 (1.7 - 2.2)
Infectious and Parasitic Diseases (<i>ICD-9-CM</i> 001-139)	10	18	0.9 (0.4 - 2.0)
Neoplasms (<i>ICD-9-CM</i> 140-239)	135	135	2.3 (1.8 - 2.9)
Cancer: Esophagus (<i>ICD-9-CM</i> 150)	4	3	3.3 (0.7 - 15.8)
Cancer: Stomach (<i>ICD-9-CM</i> 151)	12	11	2.4 (1.0 - 5.5)
Cancer: Colon (<i>ICD-9-CM</i> 153)	5	20	0.5 (0.2 - 1.4)
Cancer: Liver and biliary tract (<i>ICD-9-CM</i> 155-156)	3	6	0.9 (0.2 - 3.8)
Cancer: Pancreas (<i>ICD-9-CM</i> 157)	8	10	2.1 (0.8 - 5.6)
Cancer: Trachea, bronchus, lung (<i>ICD-9-CM</i> 162)	53	14	8.1 (4.4 - 15.0)
Cancer: Prostate (<i>ICD-9-CM</i> 185)	10	19	1.6 (0.7 - 3.6)
Cancer: Kidney (<i>ICD-9-CM</i> 189-189.1)	2	4	1.6 (0.3 - 8.8)
Cancer: Brain tumors (<i>ICD-9-CM</i> 191-192)	3	5	1.1 (0.3 - 4.7)
Cancer: Leukemias (<i>ICD-9-CM</i> 204-208)	5	7	1.7 (0.5 - 5.5)
Cancer: Other hematopoietic/lymphatic (<i>ICD-9-CM</i> 202-203)	2	10	0.5 (0.1 - 2.4)
Endocrine, Nutritional, and Metabolic Diseases and Immunity Disorders (<i>ICD-9-CM</i> 240-279)	8	10	1.5 (0.6 - 3.9)
Diabetes (<i>ICD-9-CM</i> 250)	1	7	0.3 (0.0 - 2.7)
Diseases of Blood and Blood-Forming Organs (<i>ICD-9-CM</i> 280-289)	1	1	2.8 (0.2 - 46.2)
Mental Disorders (<i>ICD-9-CM</i> 290-319)	5	4	2.3 (0.6 - 8.8)
Diseases of the Nervous System (<i>ICD-9-CM</i> 320-389)	3	10	0.8 (0.2 - 3.1)

Table 10 (continued)

Cause of Death	Current	Never	Relative Risk (95-percent CI)
Diseases of the Circulatory System (<i>ICD-9-CM</i> 390-459)	162	237	1.7 (1.3 - 2.0)
Ischemic heart disease (<i>ICD-9-CM</i> 410-414)	109	152	1.7 (1.3 - 2.2)
Hypertensive heart disease (<i>ICD-9-CM</i> 402, 404)	9	8	2.6 (1.0 - 6.9)
Cerebrovascular disease (<i>ICD-9-CM</i> 430-438)	11	35	0.8 (0.4 - 1.7)
Other heart and circulatory disease (<i>ICD-9-CM</i> 390-459)	32	38	2.0 (1.2 - 3.2)
Diseases of the Respiratory System (<i>ICD-9-CM</i> 460-519)	36	33	2.9 (1.8 - 4.7)
Asthma (<i>ICD-9-CM</i> 493)	1	1	2.0 (0.1 - 33.1)
Pneumonia (<i>ICD-9-CM</i> 480-486)	12	19	1.9 (0.9 - 3.9)
COPD, including chronic bronchitis (<i>ICD-9-CM</i> 491), emphysema (<i>ICD-9-CM</i> 492), and other chronic airway obstruction (<i>ICD-9-CM</i> 496)	18	4	10.0 (3.3 - 30.9)
Other respiratory disease (<i>ICD-9-CM</i> 460-519)	5	9	1.5 (0.5 - 4.4)
Diseases of the Digestive System (<i>ICD-9-CM</i> 520-579)	17	18	2.1 (1.1 - 4.2)
Cirrhosis of the liver (<i>ICD-9-CM</i> 571)	10	10	1.7 (0.7 - 4.1)
Diseases of the Genitourinary System (<i>ICD-9-CM</i> 580-629)	0	2	0
Diseases of Skin and Subcutaneous Tissue (<i>ICD-9-CM</i> 680-709)	0	2	0
Diseases of the Musculoskeletal System and Connective Tissue (<i>ICD-9-CM</i> 710-739)	0	1	0
Congenital Anomalies (<i>ICD-9-CM</i> 740-759)	0	0	^a
Certain Conditions Originating in the Perinatal Period (<i>ICD-9-CM</i> 760-779)	0	0	^a
Symptoms, Signs, and Ill-Defined Conditions (<i>ICD-9-CM</i> 780-799)	1	1	2.0 (0.1 - 33.1)
Injury and Poisoning (<i>ICD-9-CM</i> 800-999)	33	38	1.6 (1.0 - 2.5)
Motor vehicle accidents (<i>ICD-9-CM</i> 810-825, 929-929.0)	4	9	0.8 (0.3 - 2.8)
Other accidents (<i>ICD-9-CM</i> 800-807, 826-828, 829.1-949)	16	9	3.3 (1.4 - 7.6)
Suicide (<i>ICD-9-CM</i> 950-959)	7	13	1.0 (0.4 - 2.5)
Homicide (<i>ICD-9-CM</i> 960-969)	6	6	1.5 (0.5 - 4.8)

^aIndicates indeterminate relative risk due to absence of deaths among never-smokers.

Key: CI = confidence interval; ICD-9-CM = International Classification of Diseases: 9th Revision. Clinical Modification (U.S. Department of Health and Human Services, 1991); COPD = chronic obstructive pulmonary disease.

information about these less frequent causes of mortality and about racial differences.

REFERENCES

- Arellano, M.G., Petersen, G.R., Petitti, D.B., Smith, R.E. The California Automated Mortality Linkage System (CAMLIS). *American Journal of Public Health* 74: 1324-1330, 1984.
- Breslow, N.E., Day, N.E. (Editors). *Statistical Methods in Cancer Research, Volume II. The Design and Analysis of Cohort Studies*. IARC Scientific Publications. No. 82. Oxford: Oxford University Press, 1988.
- Collen, M.F., Davis, L.F. The multistate laboratory in health care. *Journal of Occupational Medicine* 11: 355-360, 1969.
- Friedman, G.D., Dales, L.G., Ury, H.K. Mortality in middle-aged smokers and nonsmokers. *New England Journal of Medicine* 300: 213-217, 1979.
- Hiatt, R.A., Friedman, G.D. The frequency of kidney and urinary tract diseases in a defined population. *Kidney International* 22: 63-68, 1982.
- Krieger, N. Overcoming the absence of socioeconomic data in medical records: Validation and application of a census-based methodology. *American Journal of Public Health* 82: 703-710, 1992.

- Sidney, S., Friedman, G.D., Siegelaub, A.B. Thinness and Mortality. *American Journal of Public Health* 77: 317-322, 1987.
- Stampfer, M.J., Willett, W.C., Speizer, F.E., Dysert, D.C., Lipnick, R., Rosner, B., Hennekens, C.H. Test of the National Death Index. *American Journal of Epidemiology* 119: 837-839, 1984.
- U.S. Department of Health and Human Services. *International Classification of Diseases: 9th Revision. Clinical Modification*. Volume 1, 4th Edition. DHHS Publication No. (PHS) 91-1260. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Health Care Financing Administration, 1991.

ACKNOWLEDGMENTS This study was initially funded by contract EC1-SHP-77-132 from Enviro Control, Inc. It was then supported by contract NCI-N1-CP-15681, grant R01 CA 36074, and currently by grant R35 CA 49761, all from the National Cancer Institute (NCI). Additional support for these analyses was provided by the Smoking and Tobacco Control Program within NCI. Dr. Diana Petitti formerly served as project director and contributed importantly to the progress of this investigation.

Appendix A

Portions of the Smoking Habit Questionnaire Used in This Study

If you have never used any tobacco product (cigarettes, cigars, tobacco pipe, chewing tobacco, snuff), check box below and then skip to questions 41-52.

25

Never used any tobacco product

If you have ever used any tobacco product (cigarettes, cigars, tobacco pipe, chewing tobacco, snuff), answer questions below, then answer questions 41-52.

1. Have you ever smoked cigarettes regularly for at least 1 year? (Here "regularly" means at least five cigarettes per week, almost every week.)

26

Yes If Yes, answer questions 2-19 below.
 No If No, skip to question 20.

2. How old were you when you started smoking cigarettes regularly?

37 - 38 years old

3. Do you still smoke cigarettes regularly?

29

Yes No, not at all
 No, but I still smoke cigarettes occasionally.

4. If you have stopped smoking cigarettes regularly, how many years ago did you stop? (If you stopped in the past year, write in 0.)

40 - 41 years ago

5. How many cigarettes do you smoke per day, on the average? Or, if you have stopped smoking regularly, how many did you smoke, on the average, before you stopped? (1 pack = 20 cigarettes)

45 - 46 cigarettes per day

* * * *

20. Have you ever smoked cigars regularly for at least 1 year? (Here "regularly" means at least two cigars per week, almost every week.)

35

Yes If Yes, answer questions 21-30 below.
 No If No, skip to question 31.

* * * *

31. Have you ever smoked a tobacco pipe regularly for at least 1 year? (Here "regularly" means at least two pipes full of tobacco per week, almost every week.)

30

Yes If Yes, answer questions 32-39 below.
 No If No, skip to question 40.

* * * *

62. What is your race?

37

Black White
 Oriental/Asian Japanese Chinese Filipino Other Oriental/Asian
 Other, specify _____

Former Cigarette Smoking and Mortality Among U.S. Veterans: A 26-Year Followup, 1954 to 1980

Zdenek Hrubec and Joseph K. McLaughlin

INTRODUCTION This chapter presents a detailed analysis of data from the most recent mortality followup of almost 300,000 U.S. veterans whose tobacco use was surveyed by questionnaire in the 1950's. The study, commonly referred to as the Dorn study, was initiated by Harold Dorn in an effort to help resolve the then ongoing controversy regarding the role of smoking in the etiology of lung cancer. Together with six other large cohort studies (Doll and Hill, 1956; Hammond and Horn, 1958; Dunn et al., 1960 and 1963; Best et al., 1961; Hammond, 1963) and several case-control studies, the early results of this investigation (Dorn, 1958 and 1959) provided the basis for the first of a series of reports by the U.S. Surgeon General on the health effects of smoking, which identified lung cancer and a number of other causes of death as smoking related (U.S. Department of Health, Education, and Welfare, 1964). Subsequent followup of subjects in these investigations, including this study of veterans, has contributed to achieving a consensus on the harmful health effects of smoking and the benefits of cessation.

Although an important contribution at the time, Dorn's analyses of mortality in this cohort covered a short followup time and included few deaths. Mortality was evaluated for several major cause-of-death groups, but the main focus was on all deaths and on lung cancer (Dorn, 1958 and 1959). A definitive examination of a broad range of death causes, carried out by Kahn (1966), was based on a followup of 8.5 years through December 1962 and covered 46,270 deaths and 2,626,000 person-years, including nonrespondents. A subsequent comprehensive review extended followup to 16 years, through 1969 (Rogot, 1974; Rogot and Murray, 1980). It covered 107,563 deaths and 3,500,000 person-years. This chapter evaluates deaths by cause over 26 years through September 30, 1980. By that time, 198,172 of the subjects were deceased, and 5,429,000 person-years had accumulated in the entire cohort. The study covers a longer period of mortality monitoring and a greater number of person-years of observation than any single investigation of the long-term effects of exposure to tobacco.

Smoking status in this study was assessed from replies to the original questionnaire, and no information is available on subsequent changes in smoking. During the long mortality followup of these subjects, there was a considerable decline in smoking among men in the United States, which undoubtedly also occurred in this cohort. Therefore, the results presented here are restricted to those who reported never having smoked regularly or

having quit smoking cigarettes at the time of the study. Although some who reported quitting smoking later may have resumed it, few of the never-smokers in this group of mature men are likely to have started smoking following the questionnaire. The long followup period permits assessment of smoking-related mortality over the entire range of middle and older ages. Analyses by calendar period and by duration of cessation evaluate the persistence of the smoking-related excess mortality. This study work was designed to make the data in this chapter as comparable as possible with previous reports on the veterans' study and also with the other chapters in this volume.

METHODS The methods used have been described in detail (Dorn, 1958; Kahn, 1966; Rogot, 1974 and 1978; Rogot and Murray, 1980; Rogot and Hrubec, 1989a and 1989b). Study subjects were identified in 1953 as holders of active Government life insurance policies administered by the Veterans Administration (VA) and as veterans who had served in the U.S. Armed Forces at some time from 1917 through 1940. A questionnaire, mailed to these subjects early in 1954, inquired primarily about tobacco use, occupation, and industry of employment. The first mailing produced a 68-percent response rate, and a remailing to nonrespondents in 1957 resulted in a final response rate of 84 percent. Almost all the subjects were white, and less than 0.5 percent were females (Kahn, 1966).

In the 1962 and 1969 followups, mortality was ascertained by means of life insurance claims to the VA. In the most recent followup, through September 30, 1980, the entire sample was processed through the VA's Beneficiary Identification and Records Locator Subsystem (BIRLS). BIRLS records deaths of veterans even when they have allowed their policies to lapse and has been shown to be 96-percent complete for World War I veterans with more than 15 days of service who are thus eligible for life insurance (Beebe and Simon, 1969). This high level of completeness was confirmed independently of the VA's record systems by matching a systematic sample of 1,000 study subjects against the death tapes of the Social Security Administration. Causes of death were coded by nosologists trained in the *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (ICD-7)* (World Health Organization, 1957) to maintain consistency with the original coding. An underlying cause of death is coded for 95 percent of the deaths.

This analysis is based primarily on the 95,783 never-regular and former-regular cigarette smokers, as determined from either the 1954 or 1957 questionnaire. This group generated 60,549 deaths and 1,807,479 person-years of followup. Causes of death also have been obtained for nonrespondents and for those who at time of the questionnaire smoked cigarettes or used other forms of tobacco, but these data are not examined here. To achieve maximum comparability with the previous reports (Kahn, 1966; Rogot and Murray, 1980; Rogot and Hrubec, 1989a and 1989b) and with available analytic software (Monson, 1974), 50 death causes or cause-of-death groups have been constructed (see Appendix A at the end of this chapter).

Never-smokers are those who reported never regularly smoking cigarettes, cigars, or pipes ($n = 55,049$). Regular smoking is considered lifetime consumption (at time of questionnaire) of more than 5 to 10 packs of cigarettes, 50 to 75 cigars, or 3 to 5 packages of pipe tobacco if this consumption involved, respectively, smoking daily at least one cigarette, cigar, or pipeful of tobacco. Former cigarette smokers smoked cigarettes regularly at any time in the past but did not regularly smoke cigarettes, cigars, or pipes ($n = 40,734$) at time of questionnaire.

It would be useful to exclude from the former smoker group subjects who stopped smoking shortly prior to the questionnaire, because some of them may have later resumed smoking. The available data identify those who stopped smoking in the 5 years prior to the questionnaire, but these subjects cannot be subdivided into more detailed categories of time since smoking stopped. Excluding the 39 percent who stopped within 5 years of the questionnaire did not appreciably affect findings for all former smokers. The entire group was examined explicitly by years since smoking stopped for total deaths and for the major smoking-related death causes. Other variables employed in the analysis were the highest number of cigarettes formerly smoked per day (none, 1 to 9, 10 to 20, 21 to 39, 40+), age at which subject started smoking cigarettes (<15, 15 to 19, 20 to 24, 25+), calendar year interval of followup (1954 to 1959, 1960 to 1964, 1965 to 1969, 1970 to 1974, 1975 to 1980), and age attained at followup (in 5-year age groups from 30 to 34 to 100 to 104 and 105+).

The data were evaluated by means of internally standardized relative risks (RR's), standardized mortality ratios (SMR's), and standardized annual mortality rates. In these analyses, person-years were accumulated from the year of questionnaire response, January 1, 1954, or 1957, to the date of death or to September 30, 1980, for those then alive. The 181 subjects with unknown year of death were retained until the cutoff date.

The RR's were computed by fitting Poisson regression models with maximum likelihood methods using the above-described variable groupings (Breslow and Day, 1988). The RR's for former smokers were obtained with respect to the never-smokers (RR = 1.0). Score tests of significance of trends were carried out (Preston et al., 1990). The RR analyses were adjusted for attained age in 5-year groups and for the calendar-year periods given above. Time-specific RR's are based on never-smoker mortality in the corresponding period. The procedures are described in detail in the footnotes following the tables.

The SMR's were obtained through a modification of the program by Monson (1974), who developed expected numbers of deaths for a number of causes or cause-of-death groupings by applying U.S. white male mortality rates for 5-year age and calendar-year groups. Because these external rates were based on different revisions of the ICD codes in effect during the period of followup, acceptable consistency over time could be established only for a limited number of cause-of-death groups. The correspondence between the definitions of groups in the RR and SMR analyses is shown in Appendix A.

The SMR's also could not be obtained for some of the cause groups used in the Kahn (1966) and Rogot and Murray (1980) analyses or for other groups of particular interest. In some cases, SMR groupings correspond only approximately. When SMR's could not be obtained, only the internally standardized RR's are presented, which compare well with the methods used by Rogot and Murray (1980) and Kahn (1966). The definitions of the groups used in the earlier sources also are given in Appendix A.

The rates were standardized directly to the age distribution of the 1980 total U.S. population older than age 30. Within the same calendar periods used for standardizing the RR's, in each 10-year group of attained age, the number of deaths was divided by the corresponding person-years and then multiplied by the proportion of the U.S. population older than 30 years in that age group during that time. The standardized rate is the sum of these computations over the age and calendar-time groups.

RESULTS

All Deaths

In the entire cohort ($n = 293,916$), including nonrespondents, mortality from all causes was low; the overall SMR was 77. Among all questionnaire respondents ($n = 248,046$), the SMR was 73; among never-smokers, 58; and among former smokers, 70. Compared with the risk of death of never-smokers, the risk of death from all causes was elevated for former cigarette smokers ($RR = 1.2$). Mortality was highest for those starting smoking younger than age 15, but even those who started at age 25 years or older were at excess risk (Table 1). The RRs were 1.3 from 1954 through 1964, 1.2 from 1965 through 1969, and 1.1 subsequently (Table 2). The SMR's were 70 in all periods, except 1970 through 1974, when the value was 69, but the standardized rates declined over time. Among never-smokers, with the 1954 to 1964 period as the baseline, the RR's for the 4 periods were, respectively, 1.0, 1.0, 0.9, and 0.8 (linear trend, $p < 0.001$). The RR's increased with amount of former smoking ($p < 0.001$, Table 3). Former cigarette smokers did not experience an appreciably reduced risk until 5 or more years following cessation. The RR for all those who stopped 40 or more years ago was 1.0 and appreciably increased only for those who had smoked 40+ cigarettes per day ($RR = 1.2$, 95-percent lower confidence limit = 1.01) (see Table 3).

Lung Cancer

The RR for lung cancer for former cigarette smokers of all ages was 3.6 (Table 1). Mortality was elevated among those who started smoking before age 15 and decreased regularly with later starting ages (Table 1). The RR varied unevenly in intervals of the 1954 to 1974 period but dropped to 2.8 in the 1975 to 1980 period with a significant linear trend (Table 2). The SMR was 54 during the 1954 to 1964 period but subsequently declined to 40. The RR's of never-smokers for lung cancer, with the 1954 to 1964 period as the baseline ($RR = 1.0$), were elevated in the subsequent periods, but there was no linear trend ($RR = 1.4$, 1.1, and 1.3, respectively). The RR was 6.9 for those smoking 40+ cigarettes per day (Table 4). During the first 5 years following stopping smoking, the risk of former cigarette smokers was high ($RR = 16.1$), but as cessation continued, it declined steeply. After 40 years of stopping smoking and among those who had smoked fewer than 10 cigarettes per day, the risk approximated that of never-smokers.

Table 1

U.S. veterans, former cigarette smokers:^a relative risks based on never-smokers (RR = 1.0),^b lower and upper 95-percent confidence limits on RR, standardized mortality ratio,^c age-standardized rates per 100,000 person-years,^d and number of deaths by cause^e and age started cigarettes

Age Started		All Deaths	Lung Cancer	Coronary Heart Disease	Chronic Obstructive Pulmonary Disease
Total— all ages ^f	RR	1.2	3.6	1.2	4.1
	LL	1.2	3.2	1.2	3.6
	UL	1.2	4.1	1.2	4.8
	SMR	70	45	68	—
	Rate	1,574	38	582	34
	Deaths	26,722	781	10,369	650
<15	RR	1.3	5.2	1.3	6.7
	LL	1.3	4.1	1.2	5.2
	UL	1.4	6.6	1.4	8.6
	SMR	77	64	72	—
	Rate	1,791	52	612	45
	Deaths	2,377	91	884	82
15-19	RR	1.2	4.4	1.2	4.7
	LL	1.2	3.8	1.2	4.0
	UL	1.3	5.1	1.3	5.6
	SMR	72	54	69	—
	Rate	1,585	47	568	35
	Deaths	10,998	388	4,258	295
20-24	RR	1.2	3.2	1.2	3.8
	LL	1.1	2.7	1.1	3.1
	UL	1.2	3.8	1.2	4.6
	SMR	68	39	67	—
	Rate	1,487	36	577	29
	Deaths	7,978	213	3,142	181
25+	RR	1.1	2.0	1.1	2.6
	LL	1.1	1.6	1.1	2.1
	UL	1.2	2.6	1.2	3.4
	SMR	66	27	64	—
	Rate	1,538	20	531	23
	Deaths	5,179	86	2,008	88
p of trend ^g		<0.001	<0.001	<0.001	<0.001

^a No cigar or pipe at time of questionnaire, but includes former cigar or pipe.

^b Estimated from a Poisson regression model, internally adjusted for attained age and (except Table 2) calendar time. See Tables 3 through 6 for never-smokers' SMR values, rate/100,000, and number of deaths.

^c 100 x observed/expected number of deaths. The expected number is obtained by multiplying age- and calendar-time-specific mortality rates by the corresponding person-years and summing appropriately.

^d Standardized to the age distribution of the total U.S. 1980 population within 5-year calendar periods.

^e For 1954 and 1957 questionnaire respondents, deaths were counted from year of questionnaire response to September 30, 1980. The underlying cause was coded according to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (World Health Organization, 1957).

^f Includes unknown age started smoking cigarettes.

^g Score test for linear trend, excluding unknown age started, the other age-started groups coded 12.5, 17.5, 22.5, and 33.5, adjusted for attained age and calendar time.

Key: RR = relative risk; LL = lower 95-percent confidence limit; UL = upper 95-percent confidence limit; SMR = standardized mortality ratio.

Table 2

U.S. veterans, former cigarette smokers:^a relative risks based on never-smokers (RR = 1.0),^b lower and upper 95-percent confidence limits on RR, standardized mortality ratio,^c age-standardized rates per 100,000 person-years,^d and number of deaths by cause^e and year of followup

Age Started		All Deaths	Lung Cancer	Coronary Heart Disease	Chronic Obstructive Pulmonary Disease
1954-1964	RR	1.3	4.8	1.3	8.3
	LL	1.3	3.8	1.3	6.0
	UL	1.4	6.0	1.4	11.4
	SMR	70	54	77	—
	Rate	1,688	46	704	36
	Deaths	8,587	318	3,709	247
1965-1969	RR	1.2	3.0	1.1	4.3
	LL	1.2	2.3	1.1	3.1
	UL	1.2	3.9	1.2	6.0
	SMR	70	43	68	—
	Rate	1,662	39	608	38
	Deaths	5,636	165	2,200	128
1970-1974	RR	1.1	3.6	1.1	3.0
	LL	1.1	2.6	1.0	2.2
	UL	1.2	4.8	1.2	4.0
	SMR	69	38	61	—
	Rate	1,440	35	508	34
	Deaths	5,982	147	2,212	125
1975-1980 ^f	RR	1.1	2.8	1.1	2.7
	LL	1.1	2.1	1.1	2.1
	UL	1.2	3.6	1.2	3.5
	SMR	70	40	62	—
	Rate	1,337	35	454	26
	Deaths	6,517	151	2,248	150
<i>p</i> of trend ^g		<0.001	0.004	<0.001	<0.001

^a No cigar or pipe at time of questionnaire but includes former cigar or pipe.

^b Estimated from a Poisson regression model, internally adjusted for attained age and (except Table 2) calendar time. See Tables 3 through 6 for never-smokers' SMR values, rate/100,000, and number of deaths.

^c 100 x observed/expected number of deaths. The expected number is obtained by multiplying age- and calendar-time-specific mortality rates by the corresponding person-years and summing appropriately.

^d Standardized to the age distribution of the total U.S. 1980 population.

^e For 1954 and 1957 questionnaire respondents, deaths were counted from year of questionnaire response to September 30, 1980. The underlying cause was coded according to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (World Health Organization, 1957).

^f Includes unknown duration of followup.

^g Score test for linear trend, followup interval groups coded 1960, 1967, 1972, and 1977, adjusted for attained age and amount smoked.

Key: RR = relative risk; LL = lower 95-percent confidence limit; UL = upper 95-percent confidence limit; SMR = standardized mortality ratio.

Table 3

U.S. veterans: relative risks based on never-smokers (RR = 1.0),^a lower and upper 95-percent confidence limits on RR, standardized mortality ratio,^b age-standardized rates per 100,000 person-years,^c and number of deaths from all causes^d among never-smokers and former cigarette smokers^e by duration of nonsmoking

Years Since Smoked at Followup		Smoking at Time of Questionnaire (1954 or 1957)						
		Never- Smoker	Former Smoker, by Number of Cigarettes					
			1-9	10-20	21-39	40+	Total	
Total ^f		RR	1.0	1.0	1.2	1.3	1.5	1.2
		LL	—	1.0	1.2	1.3	1.4	1.2
		UL	—	1.1	1.2	1.4	1.5	1.2
		SMR	58	61	68	75	84	70
		Rate	1,429	1,450	1,545	1,661	1,932	1,574
		Deaths	33,827	5,014	12,103	6,953	2,652	26,722
<5		RR	—	1.5	1.8	1.9	2.2	1.8
		LL	—	1.2	1.6	1.7	1.8	1.7
		UL	—	2.0	2.0	2.2	2.7	2.0
		SMR	—	75	88	93	106	90
		Rate	—	649	882	896	998	879
		Deaths	—	59	287	200	87	633
5-9		RR	—	1.3	1.4	1.8	1.7	1.5
		LL	—	1.1	1.3	1.6	1.5	1.5
		UL	—	1.5	1.5	1.9	1.9	1.6
		SMR	—	67	71	90	86	78
		Rate	—	927	1,128	1,320	1,263	1,181
		Deaths	—	178	733	592	213	1,716
10-19		RR	—	1.2	1.3	1.5	1.6	1.4
		LL	—	1.1	1.3	1.4	1.5	1.3
		UL	—	1.2	1.4	1.6	1.8	1.4
		SMR	—	64	72	82	90	76
		Rate	—	1,394	1,481	1,602	1,946	1,539
		Deaths	—	757	2,974	2,020	813	6,564
20-29		RR	—	1.1	1.1	1.3	1.4	1.2
		LL	—	1.0	1.1	1.2	1.3	1.2
		UL	—	1.1	1.2	1.3	1.5	1.2
		SMR	—	63	67	75	84	70
		Rate	—	1,459	1,533	1,536	1,847	1,525
		Deaths	—	1,058	3,598	2,287	892	7,835
30-39		RR	—	1.0	1.1	1.1	1.2	1.1
		LL	—	0.9	1.0	1.0	1.1	1.0
		UL	—	1.1	1.1	1.2	1.4	1.1
		SMR	—	58	64	65	74	63
		Rate	—	1,421	2,093	1,504	1,600	1,964
		Deaths	—	1,004	2,226	1,049	395	4,674

Table 3 (continued)

Years Since Smoked at Followup		Smoking at Time of Questionnaire (1954 or 1957)				
		Former Smoker, by Number of Cigarettes				
		Never-Smoker	1-9	10-20	21-39	40+
40+		All Deaths				
RR	—	1.0	1.1	1.0	1.2	1.0
LL	—	1.0	1.0	1.0	1.0	1.0
UL	—	1.1	1.1	1.1	1.3	1.1
SMR	—	63	65	64	71	64
Rate	—	1,663	1,461	1,376	1,634	1,483
Deaths	—	1,303	1,755	656	226	3,940
p of trend ^g	—	0.001	<0.001	<0.001	<0.001	<0.001

^aEstimated from a Poisson regression model, internally adjusted for attained age and (except Table 2) calendar time. See Tables 3 through 6 for never-smokers' SMR values, rate/100,000, and number of deaths.

^b100 x observed/expected number of deaths. The expected number is obtained by multiplying age- and calendar-time-specific mortality rates by the corresponding person-years and summing appropriately.

^cStandardized to the age distribution of the total U.S. 1980 population within 5-year calendar periods.

^dFor 1954 and 1957 questionnaire respondents, deaths were counted from year of questionnaire response to September 30, 1980. The underlying cause was coded according to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (World Health Organization, 1957).

^eNo cigar or pipe at time of questionnaire but includes former cigar or pipe.

^fIncludes unknown years since smoked.

^gScore test for linear trend, excluding unknown years; the years-since-smoked groups coded 2.5, 7.5, 15.0, 25.0, 35.0, and 45.0, adjusted for attained age and calendar time.

Key: RR = relative risk; LL = lower 95-percent confidence limit; UL = upper 95-percent confidence limit; SMR = standardized mortality ratio.

Coronary Heart Disease The RR's of former cigarette smokers for coronary heart disease were similar to the RR's for all deaths (RR = 1.2, Table 1). The RR was slightly higher for those who started smoking younger than age 15 and was lower for those who started at age 25 or older ($p < 0.001$). The RR was 1.3 in the 1954 to 1964 period and thereafter decreased to 1.1 (Table 2). The SMR was 77 during the 1954 to 1964 period but after 1970 stabilized at just more than 60. Among never-smokers, with the RR during the 1954 to 1964 period set to 1.0, the RR's in the subsequent periods were, respectively, 1.0, 0.9, and 0.8 (linear trend, $p < 0.001$). Mortality increased with the amount formerly smoked ($p < 0.001$, Table 5). The RR's were not clearly reduced until 20 or more years after stopping smoking. After 30 or more years, the mortality of former smokers was comparable with that of never-smokers and was not appreciably affected by the amount they had smoked.

Chronic Obstructive Pulmonary Disease The RR for chronic obstructive pulmonary disease of former cigarette smokers was high (RR = 4.1), with those starting at younger ages having greater risks (Table 1). An RR of 8.3 in the 1954 to 1964 period declined progressively over time to 2.7 from 1975 through 1980 (Table 2). The standardized rate appreciably exceeded 30 per

Table 4

U.S. veterans: relative risks based on never-smokers (RR = 1.0),^a lower and upper 95-percent confidence limits on RR, standardized mortality ratio,^b age-standardized rates per 100,000 person-years,^c and number of deaths from lung cancer^d among never-smokers and former cigarette smokers^e by duration of nonsmoking

Years Since Smoked at Followup		Smoking at Time of Questionnaire (1954 or 1957)						
		Never- Smoker	Former Smoker, by Number of Cigarettes					
			1-9	10-20	21-39	40+		
Total ^f		RR	1.0	1.4	3.3	5.0	6.9	3.6
		LL	—	1.0	2.8	4.2	5.6	3.2
		UL	—	1.8	3.9	5.9	8.5	4.1
		SMR	13	18	41	60	84	45
		Rate	21	15	36	54	65	38
		Deaths	325	62	332	262	125	781
<5		RR	—	7.6	12.5	20.6	26.9	16.1
		LL	—	2.3	7.1	11.9	13.6	10.4
		UL	—	24.9	21.7	35.6	53.4	24.8
		SMR	—	78	125	205	270	162
		Rate	—	36	61	91	112	73
		Deaths	—	3	20	22	11	56
5-9		RR	—	3.6	5.1	11.5	13.6	7.8
		LL	—	1.5	3.3	7.8	8.0	5.7
		UL	—	9.0	8.0	17.0	22.9	10.5
		SMR	—	38	52	111	132	77
		Rate	—	33	36	90	134	65
		Deaths	—	5	27	38	17	87
10-19		RR	—	2.2	4.3	6.8	7.8	5.1
		LL	—	1.3	3.4	5.4	5.6	4.2
		UL	—	3.6	5.4	8.7	10.9	6.1
		SMR	—	27	51	79	92	61
		Rate	—	40	39	78	58	51
		Deaths	—	15	104	100	42	261
20-29		RR	—	1.7	3.3	3.4	5.9	3.3
		LL	—	1.0	2.6	2.6	4.2	2.8
		UL	—	2.8	4.1	4.5	8.3	4.0
		SMR	—	22	42	42	74	42
		Rate	—	11	35	34	39	31
		Deaths	—	16	102	61	36	215
30-39		RR	—	0.5	2.1	2.8	4.5	2.0
		LL	—	0.2	1.5	1.9	2.6	1.6
		UL	—	1.3	2.9	4.3	7.9	2.6
		SMR	—	7	26	36	58	26
		Rate	—	5	22	26	50	21
		Deaths	—	5	39	25	13	82

Table 4 (continued)

Years Since Smoked at Followup		Smoking at Time of Questionnaire (1954 or 1957)				
		Former Smoker, by Number of Cigarettes				
		Never-Smoker	1-9	10-20	21-39	40+
40+		Lung Cancer				
RR	—	1.1	1.6	1.8	2.3	1.5
LL	—	0.6	1.0	0.9	0.9	1.1
UL	—	1.9	2.4	3.3	6.2	2.0
SMR	—	15	22	24	32	20
Rate	—	11	15	13	9	13
Deaths	—	12	23	10	4	49
p of trend ^g	—	<0.001	<0.001	<0.001	<0.001	<0.001

^a Estimated from a Poisson regression model, internally adjusted for attained age and (except Table 2) calendar time. See Tables 3 through 6 for never-smokers' SMR values, rate/100,000, and number of deaths.

^b 100 x observed/expected number of deaths. The expected number is obtained by multiplying age- and calendar-time-specific mortality rates by the corresponding person-years and summing appropriately.

^c Standardized to the age distribution of the total U.S. 1980 population within 5-year calendar periods.

^d For 1954 and 1957 questionnaire respondents, deaths were counted from year of questionnaire response to September 30, 1980. The underlying cause was coded according to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (World Health Organization, 1957).

^e No cigar or pipe at time of questionnaire but includes former cigar or pipe.

^f Includes unknown years since smoked.

^g Score test for linear trend, excluding unknown years, the years-since-smoked groups coded 2.5, 7.5, 15.0, 25.0, 35.0, and 45.0, adjusted for attained age and calendar time.

Key: RR = relative risk; LL = lower 95-percent confidence limit; UL = upper 95-percent confidence limit;
SMR = standardized mortality ratio.

100,000 person-years from 1954 through 1974 but finally declined to 26 per 100,000. When the 1954 to 1964 period was taken as the baseline (RR = 1.0), the RR's of never-smokers in the subsequent periods were 1.2, 1.2, and 1.1, respectively, with no significant linear trend. Mortality was highest among those who had smoked 40+ cigarettes per day (RR = 6.7, Table 6). The RR's were much elevated during the first 10 years following cessation, and although appreciably lower after 20 years, they remained well in excess of 1.0. The pattern of decreased risk with longer cessation was consistent within groups based on amount of former smoking, except among those smoking fewer than 10 cigarettes per day.

Other Causes of Death Statistically significant ($p < 0.05$) positive excess risks with former cigarette smoking were found for 27 of the 50 cause-of-death groups examined (Table 7). The cause-of-death groups for which there was no significantly deviant risk with former cigarette smoking are listed below with their RR estimates in parentheses. When the rounded values of the 95-percent confidence limits in Table 7 are ambiguous, more precise estimates of the confidence intervals are included with the RR's:

Table 5

U.S. veterans: relative risks based on never-smokers (RR = 1.0),^a lower and upper 95-percent confidence limits on RR, standardized mortality ratio,^b age-standardized rates per 100,000 person-years,^c and number of deaths from coronary heart disease^d among never-smokers and former cigarette smokers^e by duration of nonsmoking

Years Since Smoked at Followup		Smoking at Time of Questionnaire (1954 or 1957)						
		Never- Smoker	Former Smoker, by Number of Cigarettes					
			1-9	10-20	21-39	40+	Total	
Total ^f		RR	1.0	1.1	1.2	1.3	1.4	1.2
		LL	—	1.0	1.1	1.3	1.3	1.2
		UL	—	1.1	1.2	1.4	1.5	1.2
		SMR	57	60	66	74	79	68
		Rate	528	536	551	594	849	582
		Deaths	13,257	1,966	4,685	2,723	995	10,369
<5		RR	—	1.3	1.7	1.9	1.7	1.7
		LL	—	0.9	1.4	1.5	1.2	1.5
		UL	—	1.9	2.1	2.3	2.4	1.9
		SMR	—	76	101	108	99	100
		Rate	—	262	386	390	343	372
		Deaths	—	23	126	89	31	269
5-9		RR	—	1.2	1.4	1.7	1.7	1.5
		LL	—	0.9	1.2	1.5	1.4	1.4
		UL	—	1.5	1.6	1.9	2.1	1.6
		SMR	—	68	81	98	98	86
		Rate	—	347	449	529	622	493
		Deaths	—	71	325	253	96	745
10-19		RR	—	1.1	1.4	1.5	1.4	1.4
		LL	—	1.0	1.3	1.4	1.3	1.3
		UL	—	1.3	1.4	1.6	1.6	1.4
		SMR	—	66	78	84	82	78
		Rate	—	455	640	599	752	604
		Deaths	—	312	1,282	828	295	2,717
20-29		RR	—	1.1	1.1	1.3	1.4	1.2
		LL	—	1.0	1.0	1.2	1.3	1.1
		UL	—	1.2	1.2	1.3	1.6	1.2
		SMR	—	60	62	70	81	65
		Rate	—	535	543	570	880	576
		Deaths	—	404	1,329	851	343	2,927
30-39		RR	—	1.0	1.0	1.1	1.1	1.1
		LL	—	0.9	1.0	1.0	0.9	1.0
		UL	—	1.1	1.1	1.2	1.3	1.1
		SMR	—	59	60	62	64	60
		Rate	—	509	947	535	773	984
		Deaths	—	403	825	399	135	1,762

Table 5 (continued)

Years Since Smoked at Followup		Smoking at Time of Questionnaire (1954 or 1957)				
		Never- Smoker	Former Smoker, by Number of Cigarettes			
			1-9	10-20	21-39	40+
		Coronary Heart Disease				
40+	RR	—	1.1	1.0	1.0	1.1
	LL	—	1.0	0.9	0.9	0.9
	UL	—	1.2	1.1	1.2	1.4
	SMR	—	60	56	59	64
	Rate	—	981	423	404	359
	Deaths	—	502	605	244	82
<i>p</i> of trend ^g		—	0.251	<0.001	<0.001	0.025
						<0.001

^a Estimated from a Poisson regression model, internally adjusted for attained age and (except Table 2) calendar time. See Tables 3 through 6 for never-smokers' SMR values, rate/100,000, and number of deaths.

^b 100 x observed/expected number of deaths. The expected number is obtained by multiplying age- and calendar-time-specific mortality rates by the corresponding person-years and summing appropriately.

^c Standardized to the age distribution of the total U.S. 1980 population within 5-year calendar periods.

^d For 1954 and 1957 questionnaire respondents, deaths were counted from year of questionnaire response to September 30, 1980. The underlying cause was coded according to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (World Health Organization, 1957).

^e No cigar or pipe at time of questionnaire but includes former cigar or pipe.

^f Includes unknown years since smoked.

^g Score test for linear trend, excluding unknown years, the years-since-smoked groups coded 2.5, 7.5, 15.0, 25.0, 35.0, and 45.0, adjusted for attained age and calendar time.

Key: RR = relative risk; LL = lower 95-percent confidence limit; UL = upper 95-percent confidence limit; SMR = standardized mortality ratio.

- buccal cavity cancer (RR = 1.5);
- esophagus cancer (RR = 1.6, 0.99-2.17);
- stomach cancer (RR = 1.0);
- pancreas cancer (RR = 1.1);
- kidney cancer (RR = 1.1);
- skin cancer (RR = 1.1);
- brain cancer (RR = 1.1);
- malignant lymphoma (RR = 1.0);
- non-Hodgkin's lymphoma (RR = 1.0);
- Hodgkin's disease (RR = 0.9);
- multiple myeloma (RR = 1.0);
- chronic rheumatic heart disease (RR = 1.1);
- hypertension (RR = 1.1);

Table 6

U.S. veterans: relative risks based on never-smokers (RR = 1.0),^a lower and upper 95-percent confidence limits on RR, standardized mortality ratio,^b age-standardized rates per 100,000 person-years,^c and number of deaths from chronic obstructive pulmonary disease^d among never-smokers and former cigarette smokers^e by duration of nonsmoking

Years Since Smoked at Followup		Smoking at Time of Questionnaire (1954 or 1957)						
		Never- Smoker	Former Smoker, by Number of Cigarettes					
			1-9	10-20	21-39	Total		
Total ^f		RR	1.0	1.9	3.9	5.9	6.7	4.1
		LL	—	1.4	3.3	4.9	5.2	3.6
		UL	—	2.4	4.6	7.1	8.5	4.8
		Rate	9.3	16	29	63	49	34
		Deaths	243	64	282	218	86	650
<5		RR	—	0.0	22.7	37.7	21.1	24.1
		LL	—	0.0	9.2	15.1	4.6	11.2
		UL	—	—	56.2	93.8	97.0	51.8
		Rate	—	0	20	37	19	23
		Deaths	—	0	9	9	2	20
5-9		RR	—	7.6	17.8	20.5	10.2	16.5
		LL	—	2.7	11.1	12.2	4.0	10.9
		UL	—	21.5	28.5	34.4	26.2	24.9
		Rate	—	22	45	46	41	42
		Deaths	—	4	36	26	5	71
10-19		RR	—	1.3	6.9	9.8	15.4	7.8
		LL	—	0.5	5.3	7.4	11.0	6.3
		UL	—	3.1	9.0	13.0	21.6	9.7
		Rate	—	5	36	74	71	48
		Deaths	—	5	94	79	46	224
20-29		RR	—	1.7	2.8	5.4	4.6	3.5
		LL	—	1.0	2.1	4.1	3.0	2.8
		UL	—	2.9	3.6	7.0	7.1	4.2
		Rate	—	11	22	37	27	24
		Deaths	—	13	67	72	22	174
30-39		RR	—	2.4	2.4	2.2	2.6	2.4
		LL	—	1.5	1.7	1.4	1.2	1.9
		UL	—	4.0	3.4	3.6	5.6	3.1
		Rate	—	18	19	50	18	24
		Deaths	—	17	39	17	7	80

Table 6 (continued)

Years Since Smoked at Followup		Smoking at Time of Questionnaire (1954 or 1957)				
		Never- Smoker	Former Smoker, by Number of Cigarettes			
			1-9	10-20	21-39	40+
40+		Chronic Obstructive Pulmonary Disease				
RR	—	—	1.4	1.5	1.9	1.8
LL	—	—	0.8	1.0	1.0	0.6
UL	—	—	2.4	2.4	3.6	5.7
Rate	—	—	38	9	9	11
Deaths	—	—	15	21	10	3
<i>p</i> of trend ^g		—	0.527	<0.001	<0.001	<0.001

^a Estimated from a Poisson regression model, internally adjusted for attained age and (except Table 2) calendar time. See Tables 3 through 6 for never-smokers' SMR values, rate/100,000, and number of deaths.

^b 100 x observed/expected number of deaths. The expected number is obtained by multiplying age- and calendar-time-specific mortality rates by the corresponding person-years and summing appropriately.

^c Standardized to the age distribution of the total U.S. 1980 population within 5-year calendar periods.

^d For 1954 and 1957 questionnaire respondents, deaths were counted from year of questionnaire response to September 30, 1980. The underlying cause was coded according to the Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death (World Health Organization, 1957).

^e No cigar or pipe at time of questionnaire but includes former cigar or pipe.

^f Includes unknown years since smoked.

^g Score test for linear trend, excluding unknown years, the years-since-smoked groups coded 2.5, 7.5, 15.0, 25.0, 35.0, and 45.0, adjusted for attained age and calendar time.

Key: RR = relative risk; LL = lower 95-percent confidence limit; UL = upper 95-percent confidence limit; SMR = standardized mortality ratio.

- phlebitis and pulmonary embolism (RR = 1.2, 0.98-1.42);
- general arteriosclerosis (RR = 1.1, 0.97-1.21);
- influenza and pneumonia (RR = 1.1, 0.998-1.23);
- pneumonia (RR = 1.1, 0.98-1.21);
- diabetes (RR = 0.9, 0.73-1.02);
- chronic nephritis (RR = 1.3);
- nephritis, nephrosis, other kidney diseases (RR = 1.0);
- intestinal obstruction (RR = 1.2);
- accidents other than motor vehicle (RR = 1.0); and
- motor vehicle accidents (RR = 1.0).

Mortality from Parkinson's disease was significantly lower among former smokers (RR = 0.78, 0.65-0.95, *p* < 0.012) than among never-smokers.

The RR's of former smokers changed variously over time for the 50 different cause-of-death groups (Table 8). Although some still exceeded

Table 7

U.S. veterans, former cigarette smokers:^a relative risks based on never-smokers (RR = 1.0),^b lower and upper 95-percent confidence limits on RR, standardized mortality ratio,^c age-standardized rates per 100,000 person-years,^d and number of deaths by cause^e

<i>ICD-7 Cause-Of-Death Code Group^f</i>			
All Deaths: E000-999		Colon Cancer: 153	
RR	1.2	RR	1.4
LL	1.2	LL	1.2
UL	1.2	UL	1.5
SMR	70	SMR	100
Rate	1,574	Rate	45
Deaths	26,722	Deaths	740
All Cancer: 140-207		Rectum Cancer: 154	
RR	1.3	RR	1.3
LL	1.3	LL	1.0
UL	1.4	UL	1.5
SMR	69	SMR	71
Rate	266	Rate	8.9
Deaths	4,734	Deaths	186
Buccal Cavity Cancer: 140-144 (SMR: 140-148)		Liver Cancer: 155 (SMR: 155-156)	
RR	1.5	RR	1.5
LL	0.9	LL	1.2
UL	2.4	UL	2.0
SMR	26	SMR	84
Rate	1.8	Rate	6.7
Deaths	33	Deaths	95
Pharynx Cancer: 145-148 (For SMR see 140-148 above)		Pancreas Cancer: 157	
RR	2.6	RR	1.1
LL	1.1	LL	0.9
UL	6.2	UL	1.3
SMR	—	SMR	68
Rate	5.3	Rate	18
Deaths	14	Deaths	265
Esophagus Cancer: 150		Larynx Cancer: 161	
RR	1.6	RR	5.0
LL	1.0	LL	2.4
UL	2.2	UL	10.5
SMR	33	SMR	33
Rate	5.9	Rate	2.5
Deaths	50	Deaths	30
Stomach Cancer: 151		Lung Cancer: 162-163	
RR	1.0	RR	3.6
LL	0.9	LL	3.2
UL	1.2	UL	4.1
SMR	50	SMR	45
Rate	13	Rate	38
Deaths	230	Deaths	781

Table 7 (continued)

<i>ICD-7 Cause-Of-Death Code Group^f</i>			
Prostate Cancer: 177		Non-Hodgkin's Lymphoma: 200	
RR	1.1	RR	1.0
LL	1.0	LL	0.8
UL	1.2	UL	1.2
SMR	92	SMR	124
Rate	37	Rate	8.7
Deaths	817	Deaths	152
Kidney Cancer: 180		Hodgkin's Disease: 201	
RR	1.1	RR	0.9
LL	0.9	LL	0.6
UL	1.4	UL	1.3
SMR	77	SMR	77
Rate	6.3	Rate	1.4
Deaths	111	Deaths	31
Bladder Cancer: 181		Multiple Myeloma: 203	
RR	1.3	RR	1.0
LL	1.1	LL	0.8
UL	1.6	UL	1.3
SMR	71	SMR	107
Rate	12.8	Rate	4.8
Deaths	220	Deaths	97
Skin Cancer: 190-191		Leukemia: 204	
RR	1.1	RR	1.3
LL	0.8	LL	1.1
UL	1.5	UL	1.5
SMR	79	SMR	104
Rate	3.6	Rate	16
Deaths	69	Deaths	299
Brain Cancer: 193		All Cardiovascular Disease: 330-334, 400-468	
RR	1.1	RR	1.2
LL	0.9	LL	1.1
UL	1.4	UL	1.2
SMR	133	SMR	70
Rate	7.6	Rate	947
Deaths	116	Deaths	16,586
Malignant Lymphoma: 200, 201, 203		Coronary Heart Disease: 420	
RR	1.0	RR	1.2
LL	0.8	LL	1.2
UL	1.1	UL	1.2
SMR	111	SMR	68
Rate	15	Rate	582
Deaths	280	Deaths	10,369

Table 7 (continued)

<i>ICD-7 Cause-Of-Death Code Group^f</i>			
Chronic Rheumatic Heart Disease: 410-416		Phlebitis, Pulmonary Embolism: 463-466	
RR	1.1	RR	1.2
LL	0.9	LL	1.0
UL	1.4	UL	1.4
SMR	86	SMR	—
Rate	9.7	Rate	11.6
Deaths	180	Deaths	202
Hypertensive Heart Disease: 440-443		General Arteriosclerosis: 450	
RR	1.2	RR	1.1
LL	1.1	LL	1.0
UL	1.3	UL	1.2
SMR	—	SMR	—
Rate	34	Rate	47
Deaths	523	Deaths	571
Hypertension: 444-447		Influenza and Pneumonia: 480-493	
RR	1.1	RR	1.1
LL	0.9	LL	1.0
UL	1.4	UL	1.2
SMR	—	SMR	—
Rate	7.2	Rate	33
Deaths	165	Deaths	620
Myocardial Degeneration: 422		Pneumonia: 490-493	
RR	1.1	RR	1.1
LL	1.0	LL	1.0
UL	1.2	UL	1.2
SMR	—	SMR	49
Rate	36	Rate	31
Deaths	650	Deaths	576
Stroke: 330-334		Emphysema: 527.1 (SMR: 527)	
RR	1.1	RR	5.9
LL	1.0	LL	4.8
UL	1.1	UL	7.3
SMR	68	SMR	77
Rate	159	Rate	21
Deaths	2,806	Deaths	428
Aortic Aneurysm: 451		Bronchitis: 500-502	
RR	2.6	RR	3.3
LL	2.2	LL	2.3
UL	3.1	UL	4.5
SMR	—	SMR	—
Rate	25	Rate	8.6
Deaths	406	Deaths	108

Table 7 (continued)

<i>ICD-7 Cause-Of-Death Code Group^f</i>			
Chronic Obstructive Pulmonary Disease: 501-502, 527.1, 527.2 for deaths in 1969-1980			Duodenal Ulcer: 541 (For SMR see 540-541 above)
RR	4.1	RR	1.8
LL	3.6	LL	1.3
UL	4.8	UL	2.4
SMR	—	SMR	—
Rate	34	Rate	5.3
Deaths	650	Deaths	81
Asthma: 241			Liver Cirrhosis: 581
RR	2.3	RR	1.5
LL	1.3	LL	1.2
UL	3.9	UL	1.9
SMR	39	SMR	45
Rate	1.5	Rate	9
Deaths	34	Deaths	168
Tuberculosis: 001, 002 (SMR: 001-019)			Chronic Nephritis: 592
RR	1.6	RR	1.3
LL	1.1	LL	0.9
UL	2.5	UL	1.8
SMR	30	SMR	38
Rate	5.2	Rate	4
Deaths	46	Deaths	55
Diabetes: 260			Nephritis, Nephrosis, Other Kidney Diseases: 590-594, 600-603 (SMR: 590-603)
RR	0.9	RR	1.0
LL	0.7	LL	0.8
UL	1.0	UL	1.1
SMR	38	SMR	55
Rate	13	Rate	21
Deaths	222	Deaths	243
Parkinson's Disease: 350			Intestinal Obstruction: 570
RR	0.8	RR	1.2
LL	0.6	LL	0.9
UL	0.9	UL	1.7
SMR	—	SMR	—
Rate	8	Rate	5.7
Deaths	162	Deaths	71
Stomach Ulcer: 540 (SMR: 540-541)			Accidents Other Than Motor Vehicle: E800-E809, E836-E962 (SMR: E800-E962 less E810-E835)
RR	1.6	RR	1.0
LL	1.1	LL	0.9
UL	2.2	UL	1.1
SMR	52	SMR	61
Rate	4	Rate	37
Deaths	62	Deaths	383

Table 7 (continued)

ICD-7 Cause-Of-Death Code Group ^f			
Motor Vehicle Accidents: E810-835		Suicide: E963, E970-E979	
RR	1.0	RR	1.3
LL	0.8	LL	1.1
UL	1.2	UL	1.5
SMR	57	SMR	74
Rate	22	Rate	16
Deaths	193	Deaths	220

^a No cigar or pipe at time of questionnaire but includes former cigar or pipe.

^b Estimated from a Poisson regression model, internally adjusted for attained age and (except Table 2) calendar time. See Tables 3 through 6 for never-smokers' SMR values, rate/100,000, and number of deaths.

^c 100 x observed/expected number of deaths. The expected number is obtained by multiplying age- and calendar-time-specific mortality rates by the corresponding person-years and summing appropriately.

^d Standardized to the age distribution of the total U.S. 1980 population.

^e For 1954 and 1957 questionnaire respondents, deaths were counted from year of questionnaire response to September 30, 1980. The underlying cause was coded according to ICD-7 (World Health Organization, 1957).

^f Unless indicated in the heading, the cause-of-death group used in the rate and RR analysis is identical to that used in the SMR analysis. When they differ, the number of deaths shown is that used for rate and RR. See Appendix A for full definition of groups.

Key: RR = relative risk; ICD-7 = Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death; LL = lower 95-percent confidence limit; UL = upper 95-percent confidence limit; SMR = standardized mortality ratio.

1.0 with $p < 0.05$, the RR's decreased in the most recent period for all deaths, all cancers, most cancers at specific sites, all cardiovascular disease, coronary heart disease, chronic rheumatic heart disease, hypertensive heart disease, aortic aneurysm, emphysema, chronic obstructive pulmonary disease, tuberculosis, and stomach and duodenal ulcers. There was no clear time trend for cancers of the stomach, colon, larynx, and prostate and for myocardial degeneration, stroke, phlebitis and pulmonary embolism, general arteriosclerosis, influenza with or without pneumonia, bronchitis, asthma, and diabetes. Using the 1954 to 1964 period as a base, RR's increased subsequently for pharynx cancer, rectum cancer, Parkinson's disease, liver cirrhosis, chronic nephritis and suicide.

DISCUSSION Tobacco smoking adversely affects mortality, and although consensus has developed about the major tobacco-related causes of death (International Agency for Research on Cancer, 1986; U.S. Department of Health and Human Services, 1989), the relationship of some death causes to smoking is unclear. The work presented here and comprehensive analyses of earlier followups of the veteran cohort (Kahn, 1966; Rogot and Murray, 1980) include most of these cause-of-death groups of primary interest (Appendix A).

This chapter compares the mortality experience of subjects who reported being former cigarette smokers with those who reported never smoking regularly. Our ability to evaluate risks for those who were current smokers in the 1950's is reduced by the lack of data on subsequent changes in their

Table 8

U.S. veterans, former cigarette smokers:^a Relative risks based on never-smokers (RR = 1.0)^b for the entire followup period (1954 to 1980) and for 1970 to 1980, 1965 to 1969, and 1954 to 1964 by cause of death

Cause-Of-Death Group ^c	Entire Followup	Followup		
		1970-1980	1965-1969	1954-1964
All Deaths	1.2 ^d	1.1 ^d	1.2 ^d	1.3 ^d
All Cancers	1.3 ^d	1.2 ^d	1.3 ^d	1.5 ^d
Buccal cavity cancer.....	1.5	1.2	0.7	2.3 ^d
Pharynx cancer	2.6 ^d	3.1	7.5	1.1
Esophagus cancer	1.5	1.1	2.0	2.0
Stomach cancer	1.0	0.9	1.4 ^d	1.0
Colon cancer	1.4 ^d	1.4 ^d	1.4 ^d	1.3 ^d
Rectum cancer.....	1.3 ^d	1.5 ^d	1.5	1.1
Liver cancer	1.5 ^d	1.5	1.0	1.9 ^d
Pancreas cancer	1.1	0.9	1.1	1.3 ^d
Larynx cancer.....	5.0 ^d	4.7 ^d	4.5	5.4 ^d
Lung cancer	3.6 ^d	3.1 ^d	3.0 ^d	4.8 ^d
Prostate cancer	1.1 ^d	1.1	1.2	1.2
Kidney cancer.....	1.1	0.9	0.9	1.5 ^d
Bladder cancer.....	1.3 ^d	1.3	1.3	1.5 ^d
Skin cancer.....	1.1	0.9	1.2	1.6
Brain cancer	1.1	1.0	0.9	1.3
Malignant lymphoma	1.0	0.9	0.8	1.1
Non-Hodgkin's lymphoma	1.0	0.9	0.9	1.2
Hodgkin's disease	0.9	0.6	0.4	1.1
Multiple myeloma	1.0	1.0	0.7	1.1
Leukemia	1.3 ^d	1.1	1.3	1.5 ^d
All Cardiovascular Diseases	1.2 ^d	1.1 ^d	1.1 ^d	1.3 ^d
Coronary heart disease	1.2 ^d	1.1 ^d	1.1 ^d	1.3 ^d
Chronic rheumatic heart disease	1.1	1.1	0.9	1.3
Hypertensive heart disease	1.2 ^d	1.0	1.2	1.3 ^d
Hypertension	1.1	1.1	1.0	1.1
Myocardial degeneration	1.1 ^d	1.1	1.2	1.2 ^d
Stroke	1.1 ^d	1.1	1.1	1.1
Aortic aneurysm	2.6 ^d	2.4 ^d	2.8 ^d	2.8 ^d
Phlebitis, pulmonary embolism.....	1.2	1.1	1.5	1.1
General arteriosclerosis	1.1	1.1	1.1	1.1
Influenza and Pneumonia	1.1	1.1	1.2	0.9
Pneumonia	1.1	1.1	1.1	0.9
Emphysema	5.9 ^d	3.9 ^d	4.4 ^d	11.9 ^d
Bronchitis	3.3 ^d	3.3 ^d	3.2 ^d	3.2 ^d
Chronic Obstructive Pulmonary Disease ..	4.1 ^d	2.8 ^d	4.3 ^d	8.2 ^d

Table 8 (continued)

Cause-Of-Death Group ^c	Entire Followup	Followup		
		1970-1980	1965-1969	1954-1964
Asthma	2.3 ^d	2.5	1.7	2.6 ^d
Tuberculosis	1.6 ^d	1.4	1.0	2.0 ^d
Diabetes	0.9	0.8	0.9	0.8
Parkinson's Disease	0.8 ^d	0.8	1.1	0.6 ^d
Stomach Ulcer.	1.6 ^d	1.0	2.1	2.4 ^d
Duodenal Ulcer	1.8 ^d	1.3	1.5	2.2 ^d
Liver Cirrhosis	1.5 ^d	1.5 ^d	2.0 ^d	1.4
Chronic Nephritis.	1.3	1.3	1.5	1.2
Nephritis, Nephrosis, Other Kidney Diseases	1.0	0.9	1.0	1.1
Intestinal Obstruction	1.2	1.4	0.8	1.6
Accidents Other Than Motor Vehicle	1.0	0.9	1.0	1.1
Motor Vehicle Accidents	1.0	1.0	1.2	0.8
Suicide	1.3 ^d	1.4 ^d	1.3	1.2

^aNo cigar or pipe at time of questionnaire but includes former cigar or pipe.^bEstimated from a Poisson regression model, internally adjusted for attained age and calendar time. See Tables 3 through 6 for never-smokers' SMR values, rate/100,000, and number of deaths.^cSee Appendix A for definitions of cause-of-death groupings.^dp < 0.05 on two-sided test of never-smokers vs. all former cigarette smokers.

Key: RR = relative risk; SMR = standardized mortality ratio.

smoking. For men in the United States, the prevalence of cigarette smoking was at a peak near the time of the questionnaires, and it has declined since then (U.S. Department of Health and Human Services, 1982 and 1991). Although some study subjects who reported former smoking may have later resumed it, there should not be many among those who stopped 5 years or more prior to the questionnaire. All the subjects were older than 30 years at the time of the questionnaire, and among never-smokers, few are likely to have started smoking subsequently. Over a wide age range, veterans tend to have more education and higher income than their civilian counterparts (Hammond, 1980). Higher educational and occupational levels are associated with smoking cessation (Kabat and Wynder, 1987). It may be assumed that these veterans maintained smoking cessation during the followup period at least as well as all U.S. males in the corresponding year-of-birth cohorts.

The three data analytic approaches used in this work give rather consistent results, particularly for the RR's and the SMR's, which are methodologically similar (Table 9). The SMR's and standardized rates considered only age and calendar time by evaluating the mortality of this group in terms of a synthetic U.S. population followed over the same period. The Poisson regression models fitted RR's based on never-smokers and also took into account the amount of smoking when evaluating cessation duration.

Estimates of RR's for former smokers in this veteran cohort correspond roughly to those for former smokers in a comprehensive review (U.S. Department of Health and Human Services, 1989), based in part on data from the first sample of the Cancer Prevention Study I (CPS-I). Table 10 compares, on a time-specific basis, eight cause-of-death groups in this analysis with the corresponding groups in CPS-I. The CPS-I subjects were enrolled during 1959 to 1960 and were followed for 6 years, from 1959 through 1965. Our RR values for the entire followup period (1954 through 1980) are considerably lower than those from the CPS-I, but the differences appear to be primarily caused by the long followup of the veterans. The followup to the 1954 to 1964 period approximates the CPS-I in calendar time and duration, and the two sets of risk estimates are similar.

The entire veteran cohort experienced lower mortality than all U.S. white males at the same age and calendar time for almost all causes evaluated. Among all respondents, the SMR for overall mortality was 73. Notably, the lowest SMR's were for diseases related to alcohol use (larynx cancer, 43; liver cirrhosis, 53; esophagus cancer, 57) and to socioeconomic factors and medical care accessibility (tuberculosis, 26; pneumonia, 55). Drinking problems and alcohol-related diseases are more common among veterans of World War II and the Korean conflict than among others in the U.S. population (Remer, 1983; Richard et al., 1989), but the extent of alcohol use in this cohort of mostly World War I veterans is unknown.

Many different factors contribute to the low mortality of this cohort. The subjects are veterans who were screened during an induction physical examination. The screening took place many years prior to this study, but the effect may have persisted and may have been enhanced by access to medical care through the VA. In another study, World War II veterans exhibited reduced SMR's for various death causes, with an SMR for all cancer of 55 from 1947 through 1951 and 89 from 1967 through 1969 (Seltzer and Jablon, 1974).

Table 9

Comparison of RR's^a for former cigarette smokers^b estimated from Poisson regression, SMR's, and annual mortality rates

Source of Estimate	All Deaths	Lung Cancer	Coronary Heart Disease	Chronic Obstructive Pulmonary Disease
RR	1.2	3.6	1.2	4.1
SMR	1.2	3.5	1.2	--
Rate	1.1	1.8	1.1	3.7

^a Table 7 SMR values or rate in smoking group divided by the respective value for never-smokers.

^b No cigar or pipe at time of questionnaire but includes former cigar or pipe.

Key: RR = relative risk; SMR = standardized mortality ratio.

Table 10

Relative risk of death for former smokers by source of data, calendar period, and cause

Cause of Death	Cancer Prevention Study, 1959-1965 ^a	Source of Smoking Data			
		Present Study ^b			
		1954- 1980	1970- 1980	1965- 1969	1954- 1964
Buccal Cavity Cancer	2.7	1.5	1.2	0.7	2.3
Esophageal Cancer	1.3	1.5	1.1	2.0	2.0
Pancreatic Cancer	1.3	1.1	0.9	1.1	1.3
Larynx Cancer	8.6	5.0	4.7	4.5	5.4
Lung Cancer	5.0	3.6	3.1	3.0	4.8
Kidney Cancer	1.8	1.1	0.9	0.9	1.5
Bladder Cancer	1.8	1.3	1.3	1.3	1.5
Coronary Heart Disease	1.3 ^c	1.2	1.1	1.1	1.3

^a Source: U.S. Department of Health and Human Services, 1989.

^b From Table 8.

^c For ages 65+ at enrollment; relative risk = 1.6 for ages 35 to 64.

The study subjects were further selected in that all held active Government life insurance policies in 1953. This self-selection may be related to lower frequency of cigarette smoking among them than among all white males and perhaps to other health-related characteristics. In a 1955 census-based survey, a greater proportion of U.S. veterans were current cigarette smokers than were all U.S. white males of the same age (Haenszel et al., 1956). Nevertheless, the proportion of current smokers in the present sample was lower than among U.S. veterans or white males generally (Table 11).

The study subjects obtained a mean value of 57.4 with a standard deviation of 9.1 on socioeconomic scores normalized at a mean of 50 and a standard deviation of 10. These scores were developed from income and education distributions associated with each occupation of U.S. males (Green, 1970). Reduced mortality rates in the higher social class groups have been reported in England, where in the period from 1970 through 1972, the SMR's for lung cancer among males ranged from 50 in Class I to 150 in Class V (Registrar General, 1978). Smoking-adjusted SMR's, obtained from the September 1985 sample of the U.S. Current Population Survey, varied inversely with education and income (Rogot et al., 1988).

All Deaths In the first 5 years following cessation of smoking, mortality from all causes was comparable with that of current smokers but became dramatically lower thereafter. Thirty years after cessation, the RR's of moderate smokers were indistinguishable statistically from those of never-smokers, as were RR's in the highest smoking group after 40 years. There is no question that survival in the United States would improve greatly with a comprehensive cessation of cigarette smoking. Most likely the improvement would occur

Table 11

Percent of current cigarette smokers among veterans and U.S. males by source of smoking data and age group

Age Group ^a	Source of Smoking Data		
	Study Sample	Bureau of Census, Current Population Survey, February 1955	
		U.S. Veterans ^b	U.S. Males ^b
<34	63.1	61.1	59.9
35-44	55.8	59.7	59.1
45-54	46.1	58.4	54.1
55-64	35.7	43.4	41.5
>65	29.2	28.0	21.6
Total	37.9	43.7 ^c	41.1 ^c

^a Age at time of questionnaire.

^b Source: Haenszel et al., 1956.

^c Standardized to the age distribution of the study sample.

more quickly than indicated by these data because some study subjects stopped smoking due to medical indications, and some of those who stopped shortly before the questionnaire resumed smoking after having responded as former smokers.

Lung Cancer The RR's of former cigarette smokers were higher for larynx cancer, emphysema, and chronic obstructive pulmonary disease than for lung cancer, but the excess lung cancer risk involved more deaths (Table 7). After 40 or more years of cessation, lung cancer mortality was much reduced, but it remained 50 percent higher than for never-smokers. Among never-smokers, there was no time trend in the RR's and SMR's.

Coronary Heart Disease During the past 30 years, mortality rates for coronary heart disease have been declining in the United States (Gordon and Thom, 1975; Havlik and Feinleib, 1978). The decline also occurred in the veteran cohort of this study, and it has been especially pronounced among never-smokers (Rogot and Hrubec, 1989a). In the present analysis, the RR's and SMR's considered calendar time, and, thus, the time-specific analysis has been corrected for the secular declining trend. Adjustment for calendar time also was carried out in the analysis showing reduced RR's with years since smoking ceased, and the decline in risks shown is not affected by the overall secular trend.

Chronic Obstructive Pulmonary Disease Chronic obstructive pulmonary disease is not included as a category in the ICD-7 code for causes of death (World Health Organization, 1957). The category was reconstructed in this analysis (see Appendix A) following guidelines by the National Center for Health Statistics that were developed by surveying trends in clinical diagnosis over time. Because all deaths in this study were coded by the same revision, the coding

should have good internal time consistency. Death rates from chronic obstructive pulmonary disease have been increasing in the United States since the late 1940's, and the veteran cohort reflects this increase (Rogot and Hrubec, 1989b). Chronic obstructive pulmonary disease mortality among never-smokers was higher in the later periods than in the 1954 to 1964 period ($p < 0.001$), but the trend in the later time intervals was nonlinear. In contrast, the RR's of former smokers decreased steeply with calendar time and duration of nonsmoking; however, they remained elevated even 40 or more years after smoking stopped.

Other Causes It is accepted that smoking directly contributes to mortality from various forms of cancer and cardiovascular and respiratory diseases (International Agency for Research on Cancer, 1986; U.S. Department of Health, Education, and Welfare, 1964; U.S. Department of Health and Human Services, 1982). The meaning of the association of smoking with cancer sites also related to alcohol use is less clear, and it is difficult to interpret the association with renal diseases, liver cirrhosis, and intestinal obstruction. The low SMR's of the study subjects, particularly for liver cirrhosis, suggest that in this group there is less confounding of smoking with use of alcohol than in many other studies.

Although there was an overall decline in the RR estimates of former smokers over time, the RR's for many causes remained rather stable (Table 8). Despite the long duration of followup, among the 24 cause-of-death groups that had significantly ($p < 0.05$) elevated RR's for former smokers during the 1954 to 1964 period, there were 11 groups that still had significantly elevated RR's during the 1970 to 1980 period. For rectum cancer, liver cirrhosis, and suicide, there were significant excess risks for the 1970 to 1980 period but not for the 1954 to 1964 period. The earliest time interval, 1954 through 1964, represents approximately the period covered by the Kahn (1966) report, and the 1965 to 1969 period represents roughly the information added to it by the next comprehensive mortality ascertainment (Rogot and Murray, 1980). Our definition of former smokers corresponds to that used by Rogot, but it differs from Kahn's, who distinguished between smokers who stopped because of medical indications and others. The 1965 to 1969 period is short, and, therefore, the sampling error of the estimates is somewhat larger than that for the earliest and most recent periods. Some comparisons with the earlier publications may be affected by variation in the definition of the cause-of-death groups (Appendix A) and other methodologic problems.

Of the 50 cause-of-death groups examined, risks were persistently decreased with former cigarette smoking only for Parkinson's disease. The association between smoking and reduced Parkinson's disease mortality was noted previously by Kahn (1966), and it was confirmed in a subsequent case-control study (Nefzger and Quadfasel, 1968). The deficit in Parkinson's disease risk diminished with duration of smoking cessation, and it is now slight. For the majority of smoking-related death causes, mortality of former smokers continues to be higher than that of never-smokers. Because of the special nature of the veteran cohort, residual risks for all former U.S. smokers may be greater than those presented here.

REFERENCES

- Beebe, G.W., Simon, A.H. Ascertainment of mortality in the U.S. veteran population. *American Journal of Epidemiology* 89: 636-643, 1969.
- Best, E.W.R., Josie, G.H., Walker, C.B. A Canadian study of mortality in relation to smoking habits. A preliminary report. *Canadian Journal of Public Health* 52: 99-106, 1961.
- Breslow, N.E., Day, N.E. (Editors). *Statistical Methods in Cancer Research, Volume II. The Design and Analysis of Cohort Studies*. International Agency for Research on Cancer Scientific Publication No. 82. Oxford: Oxford University Press, 1988.
- Doll, R., Hill, A.B. Lung cancer and other causes of death in relation to smoking. *British Medical Journal* 2: 1071-1081, 1956.
- Dorn, H.F. The mortality of smokers and nonsmokers. In: *Proceedings of the Social Statistics Section of the American Statistical Association*. Washington, DC: American Statistical Association, 1958, pp. 34-71.
- Dorn, H.F. Tobacco consumption and mortality from cancer and other diseases. *Public Health Reports* 74: 581-593, 1959.
- Dunn, J.E., Buell, P., Breslow, L. California State Department of Public Health, Special Report to the Surgeon General's Advisory Committee on Smoking and Health, 1963.
- Dunn, J.E., Linden, G., Breslow, L. Lung cancer mortality experience of men in certain occupations in California. *American Journal of Public Health* 50: 1475-1487, 1960.
- Gordon, T., Thom, T. The recent decrease in CHD mortality. *Preventive Medicine* 4: 115-125, 1975.
- Green, L.W. Manual for scoring socioeconomic status for research on health behavior. *Public Health Reports* 85(9): 815-827, 1970.
- Haenszel, W., Shimkin, M.B., Miller, H.P. Tobacco smoking patterns in the United States. (Public Health Monograph No. 45. PHS Publication No. 463.) *Public Health Reports* 71(Suppl): 1-53, 1956.
- Hammond, E.C. Special Report to the Surgeon General's Advisory Committee on Smoking and Health, 1963.
- Hammond, E.C., Horn, D. Smoking and death rates. Part I. Total mortality. Part II. Death rates by cause. *Journal of the American Medical Association* 166: 1159-1172; 1294-1308, 1958.
- Hammond, R. 1979 *National Survey on Veterans: Summary Report*. Veteran's Administration Research Monograph No. 14. Office of the Controller, Reports and Statistical Service. Washington, DC: Supt. of Docs., U.S. Govt. Print. Off., 1980.
- Havlik, R.J., Feinleib, M. (Editors). *Proceedings of the Conference on the Decline in Coronary Heart Disease Mortality*. DHEW Publication No. 79-1610. Rockville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, q978.
- International Agency for Research on Cancer, Working Group on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. *Tobacco Smoking*. Lyon, France: International Agency for Research on Cancer, 1986, pp. 199-298.
- Kabat, G.C., Wynder, E.L. Determinants of quitting smoking. *American Journal of Public Health* 77: 1301-1305, 1987.
- Kahn, H.A. The Dorn study of smoking and mortality among U.S. veterans: Report on eight and one-half years of observation. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 1-125.
- Monson, R.R. Analysis of relative survival and proportional mortality. *Computers in Biomedical Research* 7: 325-332, 1974.
- Nefzger, M.D., Quadfasel, F.A. A retrospective study of smoking in Parkinson's disease. *American Journal of Epidemiology* 88: 149-158, 1968.
- Preston, D.L., Lubin, J.H., Pierce, D.A. *EPICURE: Generalized Regression Models for Epidemiologic Data*. Seattle, WA: HiroSoft International Corporation, 1990.
- Registrar General. *Occupational Mortality. Decennial Supplement for England and Wales, 1970-1972*. London: HMSO, 1978.
- Remer, S.G. The prevalence of alcoholism in a Veterans Administration medical center. *Military Medicine* 148: 735-739, 1983.
- Richard, M.S., Goldberg, J., Rodin, M.B., Anderson, R.J. Alcohol consumption and problem drinking in white male veterans and non-veterans. *American Journal of Public Health* 79: 1011-1015, 1989.
- Rogot, E. *Smoking and General Mortality Among U.S. Veterans 1954-1969*. DHEW Publication No. (NIH)74-544. Rockville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, National Heart and Lung Institute, Epidemiology Branch, 1974.

- Rogot, E. Smoking and life expectancy among U.S. veterans. *American Journal of Public Health* 68: 1023-1025, 1978.
- Rogot, E., Hrubec, Z. Trends in mortality from coronary heart disease and stroke among U.S. veterans: 1954-1979. *Journal of Clinical Epidemiology* 42: 245-256, 1989a.
- Rogot, E., Hrubec, Z. Trends in mortality from chronic obstructive pulmonary disease among U.S. veterans: 1954-1979. *American Review of Respiratory Disease* 140: S69-S75, 1989b.
- Rogot, E., Murray, J.L. Smoking and causes of death among U.S. veterans: 16 years of observation. *Public Health Reports* 95: 213-222, 1980.
- Rogot, E., Sorlie, P.D., Johnson, N.J., Glover, C.S., Treasure, D.W. *A Mortality Study of One Million Persons by Demographic, Social and Economic Factors: 1979-1981 Followup*. NIH Publication No. 88-2896. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, 1988.
- Seltzer, C.C., Jablon, S. Effects of selection on mortality. *American Journal of Epidemiology* 100: 367-372, 1974.
- U.S. Department of Health, Education, and Welfare. *Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health Service*. PHS Publication No. 1103. Rockville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, Centers for Disease Control, 1964.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Cancer. A Report of the Surgeon General*. DHHS Publication No. (PHS) 82-50179. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health, 1982.
- U.S. Department of Health and Human Services. *Reducing the Health Consequences of Smoking: 25 Years of Progress. A Report of the Surgeon General*, 1989. DHHS Publication No. (CDC) 89-8411. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1989.
- U.S. Department of Health and Human Services. *Strategies To Control Tobacco Use In the United States: A Blueprint for Public Health Action in the 1990's*. Smoking and Tobacco Control Monographs-1. NIH Publication No. 92-3316. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, National Institutes of Health, National Cancer Institute, 1991.
- World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death*. 7th Revision. Vol. 1. Geneva: World Health Organization, 1957.

Appendix A

Cause-of-Death Groups (ICD-7 [World Health Organization, 1957]) Used in SMR, Rate, and RR Analyses and in Kahn (1966) and Rogot and Murray (1980)

Cause Group	SMR ^a	Rate, RR	Kahn (1966)	Rogot and Murray (1980)
All Cancer	140-205	140-207 (WHO codes)	140-205	140-207
Buccal cavity cancer	140-148	140-144	140-144	140-144
Pharynx cancer above	(See group)	145-148	145-148	145-148
Esophagus cancer	150	150	150	150
Stomach cancer	151	151	151	151
Colon cancer	153	153	152-153	152-153
Rectum cancer	154	154	154	154
Liver cancer	155-156	155 (primary only)	—	155
Pancreas cancer	157	157	157	157
Larynx cancer	161	161	161	161
Lung cancer	162-163	162-163	162-163	162.1, 162.8, 163
Prostate cancer	177	177	177	177
Kidney cancer	180	180	180	180
Bladder cancer	181	181	181	181
Skin cancer	190-191	190-191	—	—
Brain cancer	193	193	—	193
Malignant lymphoma	Combined 200, 201, 203	200-201, 203	200, 201, 203	200, 201, 203, 206
Non-Hodgkin's lymphoma	200	200	—	—
Hodgkin's disease	201	201	—	—
Multiple myeloma	203	203	—	—
Leukemia	204	204	204	204, 207
All Cardiovascular Disease	Combined 300-334, 400-468	330-334, 400-468	330-334, 400-468	330-334, 400-468
Coronary heart disease	420	420	420	420
Chronic rheumatic heart disease	410-416	410-416	410-416	400-402, 410-416
Hypertensive heart disease	—	440-443	440-443	440-443
Hypertension	—	444-447	444-447	440-447
Myocardial degeneration	—	422	421-422	422
Stroke	330-334	330-334	330-334	330-334
Aortic aneurysm	—	451	451	451
Phlebitis, pulmonary embolism	—	463-466	—	463-466
General arteriosclerosis	—	450	450	450
Influenza and Pneumonia	—	480-493	480-493	480-481, 490-493
Pneumonia	490-493	490-493	(see group above)	
Emphysema	527	527.1	527.1	527.1
Bronchitis	—	500-502	500-502	500-502
COPD	—	501-502, 527.1, 527.2 for deaths in 1969-1980	—	—
Asthma	241	241	241	241
Tuberculosis	001-019	001, 002	001-008	001, 002
Diabetes	260	260	260	260

APPENDIX A (continued)

Cause Group	SMR ^a	Rate, RR	Kahn	Rogot
Parkinson's Disease	—	350	350	350
Stomach Ulcer	540-541	540	540	540, 542
Duodenal Ulcer	(See group above)	541	541	541
Liver Cirrhosis	581	581	581	581
Chronic Nephritis	592	592	(see group below)	
Nephritis, Nephrosis, Other Kidney Diseases	590-603	590-594, 600-603	592-594	590-594, 600-603
Intestinal Obstruction	—	570	—	—
Accidents, Other Than Motor Vehicle	E800-E809, E836-E962	E800-E809, E836-E962	E800-E962, E970-E991	E800-E965, E980-E999
Motor Vehicle Accidents	E810-E835	E810-E835	(see group above)	
Suicide	E963, E970-E979	E963, E960-E979	—	E970-E979

^a Entries in parentheses or with — indicate that corresponding SMR cause-of-death groups are not available. The SMR's were not obtained for these groups.

Key: ICD-7 = Manual of the International Statistical Classification of Diseases, Injuries, and Causes of Death;
 SMR = standardized mortality ratio; RR = relative risk; WHO = World Health Organization; COPD = chronic obstructive pulmonary disease.

Smoking Cessation and Decreased Risks Of Total Mortality, Stroke, and Coronary Heart Disease Incidence Among Women: A Prospective Cohort Study^a

Ichiro Kawachi, Graham A. Colditz, Meir J. Stampfer, Walter C. Willett, JoAnn E. Manson, Bernard Rosner, David J. Hunter, Charles H. Hennekens, and Frank E. Speizer

INTRODUCTION

Smoking Cessation in Relation to Total Mortality Rates

Former smokers are at lower risk of total mortality compared with continuing smokers (Doll and Hill, 1956; Hammond and Horn, 1958; Dunn et al., 1960; Best et al., 1961; Kahn, 1966; Hammond, 1966; Doll and Peto, 1976; U.S. Department of Health and Human Services, 1990). However, the time

required for the risk of total mortality among quitters to reach the level of never-smokers differs among studies, ranging from 6 to 10 years in one study (LaCroix et al., 1991) to 15 or more years in other studies (Rogot and Murray, 1980; U.S. Department of Health and Human Services, 1990). Few previous studies have been able to examine the temporal relationship between smoking cessation and decline in mortality risk while adjusting for other smoking-related factors, such as age at starting and number of cigarettes smoked.

Data about women have been sparse. For example, some large prospective studies with data on smoking cessation have been based solely on men (Kahn, 1966; Doll and Peto, 1976; Rogot and Murray, 1980). The British Female Doctors Study (Doll et al., 1980) had insufficient data to characterize the relationship between time since quitting and decline in mortality.

To address some of these deficiencies in the literature, we analyzed the health benefits of smoking cessation in the Nurses' Health Study, a large prospective cohort of women in the United States (Myers et al., 1987; Willett et al., 1987; Colditz, 1990). Our results describe the timing and extent of decline in risks of total and cause-specific mortality for patients considering cessation.

^aThis chapter (text, tables, and figures) is excerpted from three articles published previously. Please refer to Kawachi and colleagues (1993a, 1993b, and 1994) in the reference list at the end of this chapter.

Smoking Cessation and Decreased Risk of Stroke

Smoking is an established risk factor for stroke in both men and women (Shinton and Beevers, 1989). Based on a review of the available evidence, a U.S. Surgeon General's report, *The Health Benefits of Smoking Cessation. A Report of the Surgeon General, 1990*, concluded that smoking cessation reduces the risk of both ischemic stroke and subarachnoid hemorrhage compared with continued smoking (U.S. Department of Health and Human Services, 1990).

However, the relationship of time since quitting with risk of stroke has been addressed in only a few studies. In a review of case-control and prospective studies, risk of stroke returned to the level of never-smokers following smoking cessation, but time since quitting ranged from less than 5 to 15 years (U.S. Department of Health and Human Services, 1990; Donnan et al., 1989; Wolf et al., 1988; Colditz et al., 1988).

We analyzed 12 years of followup data from the Nurses' Health Study (Colditz, 1990) to examine the benefits of smoking cessation in relation to stroke incidence. In particular, we sought to characterize the relationship of time since stopping smoking with reductions in total and specific subtypes of stroke.

Smoking Cessation and Decreased Risk of Coronary Heart Disease

Cigarette smoking is a well-established risk factor for coronary heart disease (CHD) in men and women (U.S. Department of Health and Human Services, 1983). Although cessation of smoking reduces morbidity and mortality from CHD (U.S. Department of Health and Human Services, 1990), there have been conflicting reports of the time required for the excess risk to return to the level of never-smokers.

Some of smoking's effects that increase CHD risk (for example, increased platelet activation, elevated carbon monoxide levels, and coronary artery spasm) are immediately reversible, but other effects are either irreversible or are only slowly reversible (for example, development and progression of atherosclerosis) (McBride, 1992). Hence, it is possible that the smoker who stops will experience a component of rapid decline in risk compared with those who continue to smoke and a further component of risk that gradually falls to the level of never-smokers.

The available prospective epidemiological data are predominantly in middle-aged men, and they suggest that smoking cessation is accompanied by a halving of CHD risk after 1 year. These data also show that an additional 15 years are required for the risk to decline to the level of never-smokers (U.S. Department of Health and Human Services, 1990). However, a recent prospective study in predominantly elderly subjects suggested that risk in former smokers returns to that of never-smokers within 5 years of cessation (LaCroix et al., 1991). Further, several case-control studies, limited to nonfatal myocardial infarction (MI), have suggested that the excess CHD risk among former smokers dissipates completely less than 5 years after cessation (Rosenberg et al., 1985 and 1990; Dobson et al., 1991).

In the present study, we analyzed 12 years of followup data from the Nurses' Health Study (Colditz, 1990) to examine the relationship of time since stopping smoking with reduction in CHD incidence and mortality in middle-aged women.

METHODS

The Nurses' Health Study Cohort

The Nurses' Health Study (Colditz, 1990) cohort was established in 1976, when 121,700 female registered nurses 30 to 55 years of age completed a mailed questionnaire requesting information about risk factors for cancer and CHD, including current and past smoking habits; history of myocardial infarction, angina, cancer, diabetes, hypertension, high serum cholesterol levels, and menopause; and parental history of myocardial infarction. In addition, questions were included on height, weight, postmenopausal use of hormones, and history of oral contraceptive use. Since 1976, followup questionnaires have been mailed every 2 years to update information on smoking behavior, other cardiovascular risk factors, and the diagnosis of major illness. If no questionnaire was returned during the followup years, the most recent record of exposure status was used for the subsequent followup interval (for smoking-related variables, this occurred in less than 0.5 percent of the cohort). Further details of the Nurses' Health Study (Colditz, 1990) have been described elsewhere (Hennekens et al., 1979; Stampfer et al., 1985).

Exposure Data Women were categorized according to their smoking status as never-smokers, former smokers, or current smokers. Current smokers were further classified as using 1 to 4, 5 to 14, 15 to 24, 25 to 34, 35 to 44, or 45 or more cigarettes per day. On the 1976 questionnaire, smokers were asked the age at which they started to smoke. In the present analysis, current and former smokers were classified as starting smoking at younger than age 15, from 15 to 17, from 18 to 21, from 22 to 25, or at age 26 or older. For time since stopping, former smokers were categorized as having stopped for less than 2, between 2 and 4, between 5 and 9, between 10 and 14, or more than 15 years.

Alcohol intake may potentially confound the association between cigarette smoking and risk of total mortality and cardiovascular disease (CVD) because smokers tend to drink more, and alcohol intake reduces the risk of CVD mortality (Stampfer et al., 1988; Rimm et al., 1991). In 1980, we assessed average frequency of alcohol intake over the preceding year. The levels of alcohol intake were categorized into 0, 0.01-4.9, 5.0-14.9, 15.0-24.9, and 25.0-49.9 g/day. Our measure of alcohol intake has been validated as part of an overall validation study of the food frequency questionnaire, conducted within a random sample of 194 Boston participants (Colditz et al., 1987; Giovannucci et al., 1991). A high correlation (Spearman $r = 0.86$) was found between average daily intake of alcohol as assessed by 28 days of diet records and intake computed from the 1980 food frequency questionnaire.

Vigorous physical activity may similarly potentially confound the association between smoking and mortality, because smokers tend to exercise less and exercise reduces the risk of CVD (Berlin and Colditz, 1990). We identified women taking part in regular vigorous exercise by asking the following question in the 1980 questionnaire: "At least once a week, do you

engage in any regular activity similar to brisk walking, jogging, bicycling, etcetera, long enough to work up a sweat?" Activity level as assessed by self-reports of sweat-inducing episodes of exercise has been shown to be strongly correlated with resting heart rate (Washburn et al., 1987), obesity (Washburn et al., 1987; Washburn et al., 1990), and high-density lipoprotein cholesterol levels (Washburn et al., 1990).

- Ascertainment of Endpoints** For the analysis of smoking cessation and total mortality, the endpoints constituted deaths from all causes occurring after the date of return of the 1976 questionnaire but before June 1, 1988. The Total Mortality deaths were further grouped into four broad categories: total CVDs (*International Classification of Diseases: 8th revision. Tabular List [ICD-8]* codes 410-440 and 795); total cancers (*ICD-8* codes 140-207); total cancers, excluding lung cancer (*ICD-8* codes 140-161 and 163-207); and external causes of injury (all ICD "E" codes), which include accidents and suicides (U.S. Department of Health, Education, and Welfare, 1972).

The mortality surveillance included systematic searches of the National Death Index (Stampfer et al., 1984) and vital records of the States to discover deaths among women who did not respond during each questionnaire cycle. This search was supplemented by reports from next of kin and postal authorities. We estimate that more than 98 percent of the deaths in the cohort were ascertained by these methods (Stampfer et al., 1984).

The classification of individual causes of death was carried out by a physician review of death certificates. Deaths due to cancer, CVD, and external causes of injury were classified as confirmed if these were listed as the underlying causes on the death certificate.

- Ascertainment of Strokes were confirmed by medical records if they were characterized by a typical neurologic deficit, sudden or rapid in onset, lasting at least 24 hours, and attributable to a cerebrovascular event, according to criteria established in the National Survey of Stroke (Walker et al., 1981). Strokes were defined as incident if they occurred after the date of return of the 1976 questionnaire but before June 1, 1988.

Death due to stroke was ascertained by a physician review of hospital records or autopsy reports or the listing of stroke as the underlying cause on the death certificate. The ascertainment of death included a systematic search of State vital records and the National Death Index (Stampfer et al., 1984) to discover deaths among participants who did not respond during each questionnaire cycle. This search was supplemented by reports from next of kin and postal authorities. If death appeared to be from vascular causes, written permission was requested from the next of kin (subject to the regulations of vital records offices) to review the medical records. More than 98 percent of deaths in the cohort were estimated to have been identified by this method (Stampfer et al., 1984).

When nonfatal stroke was reported on a followup questionnaire, permission was sought to obtain and review the medical records. The review

was carried out by physicians blinded with respect to the risk factor status of participants. The followup rate for nonfatal events through 1988, calculated as a percentage of the total potential person-years of followup, was 94.4 percent for never-smokers, 94.8 percent for former smokers, and 92.4 percent for current smokers. The criteria of the National Survey of Stroke (Walker et al., 1981) were used to further categorize strokes as subarachnoid hemorrhage, intracerebral hemorrhage, or ischemic stroke.

Ascertainment of Coronary Heart Disease Incidence Cases of CHD were defined as incident if they occurred after the date of return of the 1976 questionnaire but before June 1, 1988. Incident CHD was further categorized as nonfatal MI or fatal CHD.

Nurses who reported having a nonfatal MI on a followup questionnaire were asked for permission to review their medical records. Nonfatal MIs were "confirmed" if they met the diagnostic criteria of the World Health Organization (i.e., symptoms plus either cardiac enzyme elevations or diagnostic electrocardiographic changes) (Rose and Blackburn, 1982). All record reviews were conducted by physicians blinded to exposure status. A myocardial infarction was defined as probable if medical records were not available but hospitalization was required and confirmatory information was obtained by interview or letter. The present analyses included definite and probable cases. Eighty-two percent of the total CHD cases included in the present study were "definite" by our criteria. The followup rate for nonfatal MI through 1988, calculated as a percentage of the total person-years of followup, was 94.4 percent for never-smokers, 94.7 percent for former smokers, and 92.4 percent for current smokers.

As for all other endpoints in the study, the ascertainment of death included a systematic search of State vital records and the National Death Index (Stampfer et al., 1984) to discover deaths among participants who did not respond during each questionnaire cycle. This search was supplemented by reports from next of kin and postal authorities. If death appeared to be from vascular causes, written permission was requested from the next of kin (subject to the regulations of vital records offices) to review the medical records. Fatal CHD was defined as fatal MI confirmed by hospital records or at autopsy or as CHD recorded on the death certificate if this was the underlying and most probable cause given and there was previous evidence of that condition. In no instance was the cause on the death certificate accepted without corroboration. Total coronary heart disease was defined as nonfatal MI plus fatal CHD.

Statistical Analysis The present analyses included 12 years of followup data from June 1976 to June 1988. The primary analysis used mortality (or incidence) rates with person-months of followup as the denominator. For each participant, person-months were allocated according to the 1976 exposure variables and were updated according to information on biennial followup questionnaires. For women who died, person-months were assigned according to the covariate status reported in the most recently completed questionnaire, and followup was terminated at the date of death.

Relative risks (RR's) were calculated as the rate of death in each smoking category divided by the corresponding rate in the reference category. For analyses evaluating the relative risk of mortality among current smokers, we used never-smokers as the reference category. To assess the impact on mortality risk among former smokers by time since stopping, we followed the suggestion of the 1990 U.S. Surgeon General's report (U.S. Department of Health and Human Services, 1990) and used current smokers as the reference category. All relative risks were age adjusted by 5-year intervals, and 95-percent confidence intervals (CI) were calculated (Miettinen, 1976). The attributable risk of mortality (i.e., the excess number of deaths per 100,000 person-years attributable to smoking) was calculated as the difference between the mortality rates between current or former smokers and never-smokers. When appropriate, we performed the Mantel test for linear trend across categories of smoking variables and reported the 2-tailed *p* values (Rothman and Boice, 1979). We also used proportional hazards models to simultaneously control for age, cigarette smoking, and other risk factors for CVD and cancer.

Previous reports have indicated that former smokers tend to have smoked fewer cigarettes per day (U.S. Department of Health and Human Services, 1990) and to have started smoking at an older age than continuing smokers (Myers et al., 1987). Thus, at any age of quitting, former smokers have less cumulative exposure to cigarettes, on average, than continuing smokers. Therefore, failure to adjust for differences in cumulative exposure between former and current smokers may exaggerate the benefits of cessation. Wherever appropriate, we adjusted the relative risks of death among former smokers by the daily number of cigarettes smoked and the age at which they started smoking.

We excluded from analysis all women who had reported angina, MI, stroke, and cancer (other than nonmelanoma skin cancer) at baseline. This left a total cohort of 117,001 women who were available for followup.

**Assessment of
Confounding by
Intermediate Variables**

In a prospective study of smoking and mortality involving repeated measurement of smoking status, nonfatal disease may act simultaneously as a confounding factor and an intermediate variable in the pathway between smoking and mortality (Robins, 1987 and 1989). For example, in analyzing the relationship between smoking and CHD mortality, intervening morbid events (such as nonfatal MI or angina) may act as a determinant of subsequent exposure to smoking as well as an independent risk factor for subsequent death from coronary heart disease.

We assessed the extent of such confounding by performing the G-computational algorithm, as described by Robins (1987 and 1989), on the relationship between cigarette smoking and fatal CHD, using nonfatal MI and angina in the analysis as the time-dependent covariates.

RESULTS

In 1976, 43.3 percent of the cohort members were never-smokers, 23.5 percent former smokers, and 33.2 percent current smokers.

**Characteristics
of Smokers**

By 1988, the corresponding proportions were 42.6 percent never-smokers, 35.3 percent former smokers, and 22.1 percent current smokers. Some but not all health-related habits were distributed similarly between never-, former, and current smokers (Table 1). For example, current smokers tended to engage less in vigorous exercise, have slightly lower body mass index, and were more likely to drink more than 15 g of alcohol per day.

Results for Total**Mortality**

Over the 12 years of observation, 2,847 deaths occurred during 1,374,556 person-years. These consisted of 566 deaths from CVDs; 247 deaths from lung cancer; 1,209 deaths from cancers, excluding lung cancer; 261 deaths from external causes of injury; and 564 deaths from other causes. The category of "External Causes of Injury" covers ICD-8 codes E800-E999 and includes all deaths from accident, poisoning, suicide, and other trauma (U.S. Department of Health, Education, and Welfare, 1972).

**Risks of Current
Smokers**

Total Mortality. Compared with women who had never smoked, current smokers experienced higher rates of total mortality (age-adjusted relative risk, 1.86; CI, 1.71 to 2.03) (Table 2). The age-adjusted relative risk increased with the number of cigarettes smoked per day (p , trend < 0.0001). Women who smoked 35 to 44 cigarettes per day had a relative risk of total mortality of 2.42 (CI, 2.01 to 2.90), whereas women who smoked

Table 1
Distribution of various potential self-reported risk factors according to smoking status among 117,001 Nurses' Health Study participants^a

Variable	Smoking Status		
	Never-Smoker	Former Smoker	Current Smoker
Percent of Subjects in 1980	43.2	26.4	30.4
Total Person-Years of Followup (1976-1988)	593,026	404,359	377,171
Pack-Years Smoked	0	17.1	33.8
Body Mass Index (kg/m ²)	24.2	24.0	23.3
Hypertension	16.3%	16.9%	14.9%
Diabetes	2.2%	2.3%	2.0%
High Cholesterol	5.0%	5.8%	5.5%
Parental Myocardial Infarction Before Age 60	13.1%	14.5%	15.1%
Postmenopausal Hormone Use	18.3%	19.6%	20.2%
Vigorous Exercise At Least Once Per Week	43.1%	47.3%	37.9%
Alcohol Intake >15 g Per Day	7.5%	16.7%	21.2%

^aPercentage prevalence of risk factors has been directly age standardized by 5-year age categories to the distribution of ages in the whole cohort in 1980.

Table 2

Total and cause-specific mortality by daily amounts of cigarettes consumed among current smokers—age-adjusted and multivariate RR's

Event	Never-Smoker	Former Smoker	Current Smoker	Cigarettes Used/Day Among Current Smokers ^a			
				1-14	15-24	25-34	≥35
Total Mortality							
Cases	933	799	1,115	234	480	215	153
RR ^b	1.00	1.28	1.86	1.41	1.99	2.06	2.57
RR ^c	1.00	1.29	1.87	1.51	2.02	2.09	2.63
	(1.14-1.46)	(1.65-2.13)	(1.26-1.81)	(1.74-2.35)	(1.71-2.55)	(2.12-3.27)	
Total Cardiovascular Diseases							
Cases	131	151	284	56	124	57	37
RR ^b	1.00	1.69	3.47	2.48	3.78	4.11	4.73
RR ^c	1.00	1.57	3.74	2.69	4.25	4.28	5.64
	(1.17-2.12)	(2.86-4.89)	(1.82-3.97)	(3.14-5.77)	(2.86-6.41)	(3.52-9.04)	
Total Cancer, Including Lung							
Cases	516	438	502	95	233	93	67
RR ^b	1.00	1.26	1.51	1.03	1.73	1.60	1.99
RR ^c	1.00	1.28	1.42	1.05	1.68	1.62	1.95
	(1.08-1.52)	(1.20-1.67)	(0.82-1.35)	(1.29-2.17)	(1.26-2.08)	(1.40-2.70)	
Total Cancer, Excluding Lung							
Cases	492	366	351	83	161	61	36
RR ^b	1.00	1.11	1.10	0.94	1.25	1.10	1.12
RR ^c	1.00	1.11	1.19	1.02	1.23	1.09	1.15
	(0.91-1.34)	(0.99-1.44)	(0.77-1.36)	(0.97-1.56)	(0.78-1.53)	(0.77-1.74)	
External Causes of Injury							
Cases	90	68	103	27	28	20	24
RR ^b	1.00	1.16	1.69	1.60	1.12	1.83	3.92
RR ^c	1.00	1.26	1.73	1.83	1.25	1.95	4.19
	(0.83-1.89)	(1.25-2.41)	(1.07-3.13)	(0.73-2.16)	(1.03-3.69)	(2.33-7.55)	

^a Cigarettes smoked per day were unknown for 33 cases, including 10 cardiovascular disease deaths, 4 lung cancer deaths, 10 cancers other than lung cancer, 4 accidents or suicides, and 5 deaths from all other causes.

^b Age-adjusted RR—95-percent CI in parentheses.

^c Multivariate RR, adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), body mass index, history of hypertension, high cholesterol levels, diabetes, parental history of myocardial infarction before age 60, postmenopausal estrogen therapy, menopausal status, past use of oral contraceptives, and age at starting smoking.

Key: RR = relative risk; CI = confidence interval.

45 or more cigarettes per day had a relative risk of 3.57 (CI, 2.52 to 5.04). The attributable risk of total mortality in current smokers compared with never-smokers was 120 per 100,000 person-years. Approximately 37 percent of all deaths among current smokers in this cohort was attributable to cigarette smoking.

Cause-Specific Mortality. The age-adjusted relative risk of CVD mortality among current smokers was 3.47 (CI, 2.85 to 4.22), and risk increased with the daily number of cigarettes used (p , trend = 0.002) (Table 2). Women who smoked only 1 to 4 cigarettes per day had an elevated risk of death from CVD (relative risk, 2.13; CI, 1.20 to 3.79), and those who smoked 45 or more cigarettes per day had a relative risk of 6.35 (CI, 3.26 to 12.34).

For total cancer mortality, including lung cancer, the overall age-adjusted relative risk among current smokers was 1.51 (CI, 1.33 to 1.70), and risk increased with the daily number of cigarettes used (p , trend < 0.0001). However, when lung cancers were excluded, the relative risk of cancer mortality among current smokers was not statistically significantly elevated (RR, 1.10; CI, 0.96 to 1.26), and there was no dose-response relationship with the daily amount of cigarettes used (p , trend > 0.2) (Table 2). This finding was explained by the fact that breast and colorectal cancer, two of the most common cancers in this cohort, had no association with cigarette smoking. The relative risk of deaths due to breast cancer among current smokers was 0.87 (CI, 0.68 to 1.12) and was 1.01 for colorectal cancer (CI, 0.69 to 1.46). On the other hand, the weak association between current smoking and total cancer after excluding lung cancer did not preclude the presence of strong associations between smoking and mortality from the less common cancers of individual sites, for example, cancers of the buccal cavity and pharynx (6 cases among current smokers; age-adjusted RR, 5.0; CI, 1.2 to 20.7), esophagus (7 cases among current smokers; age-adjusted RR, 11.1; CI, 2.1 to 58.9), and pancreas (26 cases among current smokers; age-adjusted RR, 1.9; CI, 1.1 to 3.4).

The age-adjusted relative risk of death from external causes of injury among current smokers was 1.69 (CI, 1.28 to 2.24), and risk increased with the daily number of cigarettes used (p , trend = 0.001).

Multivariate Models. The associations of cigarette smoking with total and cause-specific mortality changed only slightly after we controlled for potential confounders (including history of hypertension, diabetes, high serum cholesterol, relative weight, parental history of MI before age 60, past use of oral contraceptives, postmenopausal estrogen therapy, and age at starting smoking) in multivariate proportional hazards models (Table 2).

Decline in Risk Among Former Smokers *Total Mortality.* Compared with never-smokers, the age-adjusted relative risk of total mortality among former smokers was 1.28 (CI, 1.16 to 1.40) (Table 2). When we examined the relationship between time since quitting and the relative risk of total mortality, the risk among former smokers approached the level of never-smokers after 10 to 14 years of cessation (Table 3; Figure 1).

Table 3

Total and cause-specific mortality by time since quitting: Age-adjusted and multivariate RR's^a

Event	Never-Smoker	Current Smoker	Years Since Quitting Among Former Smokers ^b				
			<2	2-4	5-9	10-14	≥15
Total Mortality							
Cases	933	1,115	127	106	131	66	231
RR ^c	0.54	1.00	1.08	0.90	0.72	0.48	0.59
RR ^d	0.56	1.00	1.19	1.00	0.79	0.53	0.61
	(0.52-0.62)		(0.95-1.50)	(0.79-1.28)	(0.63-0.99)	(0.39-0.71)	(0.51-0.74)
Total Cardiovascular Disease							
Cases	131	284	20	24	32	9	39
RR ^c	0.29	1.00	0.66	0.78	0.67	0.26	0.40
RR ^d	0.30	1.00	0.76	0.90	0.75	0.29	0.42
	(0.24-0.37)		(0.43-1.32)	(0.54-1.51)	(0.47-1.18)	(0.13-0.63)	(0.27-0.66)
Total Cancer, Including Lung							
Cases	516	502	75	48	69	37	134
RR ^c	0.66	1.00	1.42	0.90	0.84	0.60	0.78
RR ^d	0.72	1.00	1.56	1.00	0.93	0.69	0.81
	(0.64-0.81)		(1.16-2.10)	(0.70-1.42)	(0.69-1.27)	(0.46-1.03)	(0.64-1.04)
Total Cancer, Excluding Lung							
Cases	492	351	49	33	57	34	127
RR ^c	0.91	1.00	1.35	0.90	1.00	0.79	1.06
RR ^d	0.99	1.00	1.37	0.97	1.12	0.91	1.10
	(0.86-1.13)		(0.95-1.95)	(0.63-1.47)	(0.80-1.57)	(0.60-1.39)	(0.84-1.42)
External Causes of Death							
Cases	90	103	11	8	8	5	25
RR ^c	0.59	1.00	1.11	0.81	0.55	0.41	0.68
RR ^d	0.60	1.00	1.22	0.99	0.63	0.70	0.72
	(0.45-0.80)		(0.57-2.54)	(0.41-2.39)	(0.26-1.53)	(0.25-1.99)	(0.41-1.27)

^a Reference category consists of current smokers.

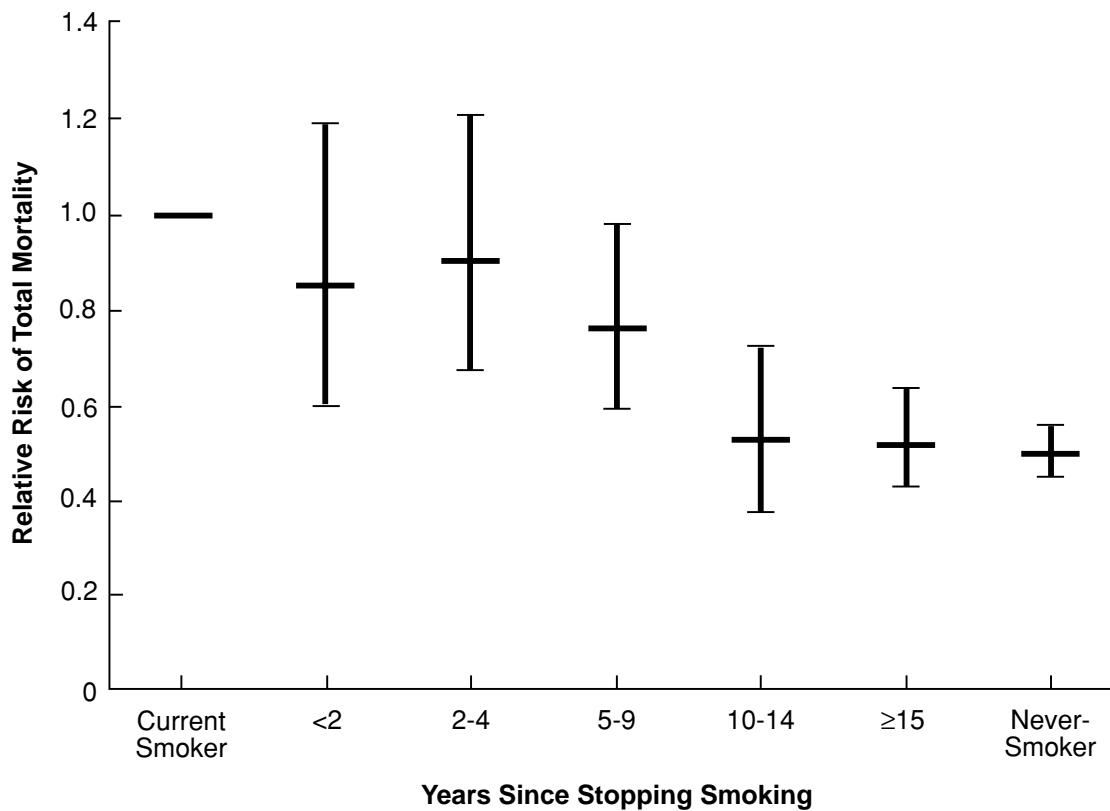
Time since quitting was missing for 138 cases, including 27 cardiovascular disease deaths, 9 lung cancer deaths, 66 deaths from cancers other than lung, 11 accidents or suicides, and 25 deaths from all other causes.

^c Age-adjusted RR—95-percent CI in parentheses.^d Multivariate RR, adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), body mass index, history of hypertension, diabetes, high cholesterol levels, postmenopausal estrogen therapy, menopausal status, past use of oral contraceptives, parental history of myocardial infarction before age 60, and daily number of cigarettes smoked during the period prior to stopping smoking.

Key: RR = relative risk; CI = confidence interval.

Figure 1

Risk of total mortality by time since quitting. Multivariate RR^a of total mortality by time since quitting (reference category: current smokers). Error bars represent 95-percent CIs.



^aNonfatal CHD, stroke, and cancer (except nonmelanoma skin cancer) were excluded at baseline and at the beginning of each successive 2-year followup period. Variables in model include age in 5-year categories, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), body mass index, history of hypertension, high cholesterol, diabetes, parental history of myocardial infarction before age 60, postmenopausal estrogen therapy, menopausal status, past use of oral contraceptives, age at starting smoking, and daily number of cigarettes consumed during the period prior to cessation.

Key: RR = relative risk; CI = confidence interval.

In terms of absolute risk, if 1,000 women ages 40 to 44 years quit smoking today, approximately 17 deaths would occur over the next 14 years, compared with 30 deaths if they had continued smoking; that is, a net saving of 13 lives per 1,000 women over a 14-year period. The absolute benefits of cessation increase with age. Thus, if 1,000 women age 60 or older quit smoking today, approximately 103 deaths would occur over a period of 14 years compared with 138 deaths if they had continued smoking; that is, a net saving of 35 lives per 1,000 women.

A slight increase in relative risks was apparent in the category of former smokers who had quit for more than 15 years compared with those who had quit for 10 to 14 years. This was compatible with chance because the

95-percent CIs of the relative risks beyond 10 years of cessation excluded the point estimates of the risks among former smokers who had quit for shorter durations; however, we cannot exclude the possibility that a small excess in risk extends beyond 15 years of abstinence.

Cause-Specific Mortality. For CVD, a 24-percent reduction in the risk of mortality was apparent within 2 years of giving up cigarettes; however, the excess risk did not approach the level of never-smokers until 10 to 14 years after cessation. For deaths from external causes of injury, the age-adjusted relative risks among former smokers fell to the level of never-smokers 5 to 9 years after cessation (Table 3).

A greater risk of total cancer was observed among former smokers compared with current smokers in the first 2 years following cessation (age-adjusted RR, 1.42; CI, 1.12 to 1.81). The excess risk fell to the level of never-smokers 10 to 14 years after cessation. However, when lung cancer was excluded from the analysis of total cancer mortality, an excess risk was apparent only within the first 2 years of quitting (age-adjusted RR, 1.35; CI, 1.00 to 1.81) (Table 3).

The observations regarding the relationship of time since quitting with the risks of total and cause-specific mortality remained unchanged after controlling for potential confounding factors, including history of hypertension, diabetes, high serum cholesterol, relative weight, parental history of MI before age 60, past use of oral contraceptives, postmenopausal estrogen therapy, the daily number of cigarettes used, and age at starting (Table 3).

Age at Starting To Smoke *Current Smokers.* We examined the relationship between age at starting and risk of total and cause-specific mortality among current smokers (Table 4). The relative risk of total mortality among current smokers who started smoking before age 15 was 2.80 (CI, 2.05 to 3.82), whereas for those who started after age 26 or older, the relative risk was 1.59 (CI, 1.28 to 1.97) (p , trend = 0.01). Starting smoking before age 15 was associated with the highest risk of death from CVD (age-adjusted RR, 8.72; CI, 5.58 to 13.65) and external causes of injury (age-adjusted relative risk, 3.22; CI, 1.37 to 7.55). Adjusting for multiple risk factors, including the daily number of cigarettes smoked, did not materially affect these observations (Table 4).

Former Smokers. Among former smokers the relationship between age at starting and the risks of total and cause-specific mortality was weaker and not statistically significant. These observations remained unchanged after adjusting for multiple risk factors, including the daily number of cigarettes consumed as well as time since quitting.

Assessment of the "Ill-Quitter" Effect Previous studies have suggested that recent quitters include a disproportionate number of those who have quit because they are ill (U.S. Department of Health and Human Services, 1990). This causes a spuriously elevated risk of mortality among former smokers during the early years following cessation. To address this problem, we carried out

Table 4

**Total and cause-specific mortality by age at starting smoking among current smokers:
Age-adjusted and multivariate RR's**

Event	Never-Smoker	Age at Starting To Smoke Among Current Smokers ^a				
		<15 Years	15-17	18-21	22-25	≥26 Years
Total Mortality						
Cases	933	38	175	657	149	88
RR ^b	1.00	2.80	1.86	1.88	1.95	1.59
RR ^c	1.00	3.15	1.85	1.77	1.86	1.45
		(2.16-4.59)	(1.51-2.28)	(1.54-2.03)	(1.50-2.32)	(1.15-1.92)
Cardiovascular Disease						
Cases	131	15	41	157	47	24
RR ^b	1.00	8.72	3.43	3.32	4.18	2.99
RR ^c	1.00	9.94	3.55	3.18	4.06	2.88
		(5.15-19.19)	(2.27-5.56)	(2.36-4.28)	(2.65-6.21)	(1.70-4.87)
Total Cancer, Including Lung						
Cases	516	11	77	300	73	38
RR ^b	1.00	1.46	1.48	1.54	1.70	1.23
RR ^c	1.00	1.64	1.43	1.43	1.69	1.10
		(0.84-3.20)	(1.06-1.93)	(1.18-1.74)	(1.24-2.29)	(0.75-1.62)
Total Cancer, Excluding Lung						
Cases	492	6	52	201	56	33
RR ^b	1.00	0.84	1.05	1.08	1.36	1.11
RR ^c	1.00	0.88	1.07	1.00	1.35	1.00
		(0.37-2.11)	(0.75-1.52)	(0.80-1.25)	(0.96-1.90)	(0.66-1.51)
External Causes of Death						
Cases	90	5	21	61	8	7
RR ^b	1.00	3.22	2.00	1.69	1.22	1.39
RR ^c	1.00	5.39	2.01	1.69	1.27	1.73
		(1.84-15.78)	(1.11-3.65)	(1.09-2.61)	(0.54-2.99)	(0.75-4.03)

^a Age at starting smoking was unknown for eight cases, including three deaths from cancers other than lung, one accident or suicide, and four deaths from all other causes.

^b Age-adjusted RR—95-percent CIs in parentheses.

^c Adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), history of hypertension, diabetes, high cholesterol levels, body mass index, past use of oral contraceptives, postmenopausal estrogen therapy, menopausal status, parental history of myocardial infarction before age 60, and daily number of cigarettes consumed.

Key: RR = relative risk; CI = confidence interval.

analyses in which women who reported nonfatal CVD (MI, angina, stroke) or cancer (excluding nonmelanoma skin cancer) at each biennial questionnaire were excluded from further followup. These exclusions left 1,980 deaths for analysis (Tables 5 and 6). Among current smokers, the strength of the association between daily number of cigarettes and risk of total mortality increased after excluding diseases at the beginning of each 2-year interval (Table 5). When we examined the relationship of time since quitting with risk of cancer mortality (including and excluding lung cancer), there was no longer an excess risk apparent among former smokers within the first 2 years of quitting, suggesting an association between cancer diagnosis and stopping smoking (Table 6).

Assessment of Confounding by Intermediate Variables

As explained in "Methods," in a prospective study involving repeated measurement of smoking status, nonfatal disease may act simultaneously as a confounding factor and an intermediate variable in the pathway between smoking and mortality (Robins, 1987 and 1989). We assessed the extent of such confounding by applying a method previously described (Robins, 1987 and 1989) to the association between cigarette smoking and fatal CHD, with nonfatal MI as the intermediate variable. When we performed this analysis, the risk estimate of CHD mortality was virtually identical to the crude estimate of risk. Therefore, we concluded that confounding by intermediate variables was unlikely to be a concern in the present study.

Assessment of Confounding by Alcohol Intake and Vigorous Exercise

To examine the possible confounding effect of alcohol consumption and vigorous exercise on cigarette smoking, we analyzed data from the 1980 to 1988 followup interval. Although the analysis was limited to 2,356 deaths in total, the age-adjusted association between daily number of cigarettes used and risk of total mortality remained virtually unchanged. The relative risk of total mortality increased from 1.56 (CI, 1.28 to 1.91) among women using 1 to 14 cigarettes per day to 2.53 (CI, 1.95 to 3.24) among women using 35 or more cigarettes per day. After adjusting for alcohol consumption and vigorous exercise, the risk of total mortality among former smokers still declined to the level of never-smokers 10 to 14 years after cessation.

Adjusting for alcohol intake and vigorous exercise resulted in a slight strengthening of the association between current smoking and CVD mortality. For example, the multivariate relative risk of CVD mortality increased from 2.69 to 3.08 among women using 1 to 14 cigarettes per day and from 4.28 to 4.93 among women using 25 to 34 cigarettes per day. However, the excess risk of CVD death among former smokers still took 10 to 14 years to decline to the level of never-smokers.

The risk of death from external causes of injury among current smokers compared with never-smokers fell from 1.69 (CI, 1.28 to 2.24) to 1.54 (CI, 1.10 to 2.17) after adjusting for alcohol intake and vigorous exercise. The excess risk among former smokers still approached the level of never-smokers 5 to 9 years after cessation.

Table 5

Total and cause-specific mortality by daily number of cigarettes consumed. Comparison of analyses with and without 2-year exclusion of disease at the start of each period: Multivariate RR's

Event	Never-Smoker	Former Smoker	Cigarettes Used/Day Among Current Smokers			
			1-14	15-24	25-34	≥35
Total Mortality						
Cases ^a	933	799	234	480	215	153
RR	1.00	1.29	1.51	2.02	2.09	2.63
Cases ^b	632	410	176	381	175	130
RR	1.00	1.15	1.56	2.17	2.23	3.16
		(1.01-1.29)	(1.26-1.94)	(1.82-2.59)	(1.77-2.80)	(2.49-4.02)
Cardiovascular Disease						
Cases ^a	131	151	56	124	57	37
RR	1.00	1.57	2.69	4.25	4.28	5.64
Cases ^b	111	106	47	114	52	33
RR	1.00	1.48	2.48	3.99	4.35	5.82
		(1.13-1.94)	(1.61-3.82)	(2.84-5.59)	(2.83-6.69)	(3.50-9.69)
Total Cancer, Including Lung						
Cases ^a	516	438	95	233	93	67
RR	1.00	1.28	1.05	1.68	1.62	1.95
Cases ^b	262	172	51	168	64	50
RR	1.00	1.03	1.11	2.13	1.82	2.96
		(0.85-1.26)	(0.76-1.62)	(1.62-2.81)	(1.24-2.65)	(2.03-4.34)
Total Cancer, Excluding Lung						
Cases ^a	492	366	83	161	61	36
RR	1.00	1.11	1.02	1.23	1.09	1.15
	244	140	43	100	33	22
RR	1.00	0.90	1.03	1.44	0.95	1.41
		(0.73-1.11)	(0.68-1.55)	(1.05-1.99)	(0.58-1.57)	(0.82-2.40)

^a Cases and multivariate RR's after baseline exclusion of coronary heart disease, stroke, and cancer except nonmelanoma skin cancer. Multivariate RR were adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), body mass index, history of hypertension, high cholesterol levels, diabetes, parental history of myocardial infarction before age 60, postmenopausal estrogen therapy, menopausal status, past use of oral contraceptives, and age at starting smoking.

^b Cases and multivariate RR's after exclusion of coronary heart disease, stroke, and cancer (except nonmelanoma skin cancer) at the beginning of each 2-year followup interval (95-percent CI in parentheses).

Key: RR = relative risk; CI = confidence interval.

Table 6

Total and cause-specific mortality by time since quitting. Comparison of analyses with and without 2-year exclusion of disease at the start of each followup period: Multivariate RR's

Event	Never-Smoker	Current Smoker	Years Since Quitting Among Former Smokers				
			<2	2-4	5-9	10-14	≥15
Total Mortality							
Cases ^a	933	1,115	127	106	131	66	231
RR	0.56	1.00	1.19	1.00	0.79	0.53	0.61
Cases ^b	632	884	51	58	84	46	137
RR	0.49	1.00	0.76	0.73	0.70	0.47	0.49
	(0.44-0.54)		(0.53-1.08)	(0.53-1.01)	(0.53-0.92)	(0.33-0.67)	(0.39-0.62)
Cardiovascular Disease							
Cases ^a	131	284	20	24	32	9	39
RR	0.30	1.00	0.76	0.90	0.75	0.29	0.42
Cases ^b	111	254	11	11	23	7	33
RR	0.29	1.00	0.63	0.53	0.67	0.27	0.46
	(0.23-0.37)		(0.28-1.45)	(0.25-1.13)	(0.40-1.15)	(0.11-0.65)	(0.29-0.74)
Total Cancer, Including Lung							
Cases ^a	516	502	75	48	69	37	134
RR	0.99	1.00	1.37	0.97	1.12	0.91	1.10
Cases ^b	562	339	13	19	33	20	53
RR	0.54	1.00	0.42	0.66	0.75	0.56	0.51
	(0.46-0.64)		(0.20-0.89)	(0.38-1.16)	(0.49-1.16)	(0.33-0.96)	(0.35-0.74)
Total Cancer, Excluding Lung							
Cases ^a	492	351	49	33	57	34	127
RR	0.60	1.00	1.22	0.99	0.63	0.70	0.72
Cases ^b	244	201	9	11	25	18	50
RR	0.85	1.00	0.44	0.71	1.03	0.85	0.81
	(0.71-1.03)		(0.18-1.08)	(0.34-1.48)	(0.63-1.69)	(0.48-1.51)	(0.54-1.20)

^a Cases and multivariate RR's after baseline exclusion of coronary heart disease, stroke, and cancer except nonmelanoma skin cancer. Multivariate RR's were adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), body mass index, history of hypertension, diabetes, high cholesterol levels, postmenopausal estrogen therapy, menopausal status, past use of oral contraceptives, parental history of myocardial infarction before age 60, and daily number of cigarettes smoked during the period prior to stopping smoking (95-percent CIs in parentheses).

^b Cases and multivariate RR's after exclusion of coronary heart disease, stroke, and cancer (except nonmelanoma skin cancer) at the beginning of each 2-year followup interval.

Key: RR = relative risk; CI = confidence interval.

Results for Stroke Incidence	During the 12 years of observation, 448 incident cases of definite stroke occurred during 1,372,918 person-years. These consisted of 275 ischemic strokes, 108 subarachnoid hemorrhages, 53 cerebral hemorrhages, and 12 strokes that were classified as "unspecified."
Risks of Current Smokers	Compared with women who had never smoked, current smokers experienced substantially higher rates of stroke (Table 7). For all types of stroke combined, the overall age-adjusted relative risk among current smokers was 2.58 (95-percent CI: 2.08-3.19). However, the relative risks differed considerably for subtypes of stroke: 4.96 (95-percent CI: 3.13-7.87) for subarachnoid hemorrhage, 2.25 (95-percent CI: 1.72-2.95) for ischemic stroke, and 1.46 (95-percent CI: 0.77-2.78) for cerebral hemorrhage. The risk of stroke increased with the number of cigarettes smoked daily (Table 2). Within the category of smokers of 35 or more cigarettes per day, women who smoked 35 to 44 cigarettes per day had a relative risk of total stroke of 4.05 (95-percent CI: 2.78-5.91) compared with never-smokers, whereas women who smoked 45 or more cigarettes per day had a relative risk of 5.38 (95-percent CI: 2.59-11.18) (p , trend = 0.0004).
	A statistically significant dose-response relationship also was found between daily cigarette consumption and the risk of ischemic stroke (p , trend = 0.03). There was a strong dose-response relationship between daily number of cigarettes smoked and risk of subarachnoid hemorrhage (Table 7). Within the category of smokers of 1 to 14 cigarettes per day, women who smoked 1 to 4 cigarettes per day had a relative risk of subarachnoid hemorrhage of 3.26 (95-percent CI: 1.03-10.33) compared with never-smokers, whereas women who smoked 5 to 14 cigarettes per day had a relative risk of 3.83 (95-percent CI: 1.88-7.80) (p , trend < 0.0004).
Decline in Risk Among Former Smokers	The association between cigarette smoking and total stroke, ischemic stroke, and subarachnoid hemorrhage persisted after control for potential confounders in multivariate proportional hazards models (Table 7). As expected, positive associations were found for known risk factors for stroke, such as history of high blood pressure (RR = 1.93, 95-percent CI: 1.51-2.48) and diabetes (RR = 3.57, 95-percent CI: 2.38-5.36). However, no associations were found between risk of total stroke and history of high serum cholesterol (RR = 0.99, 95-percent CI: 0.66-1.49), use of postmenopausal estrogen therapy (RR = 1.15, 95-percent CI: 0.88-1.51), or past use of oral contraceptives (RR = 1.12, 95-percent CI: 0.91-1.39). Too few cases of stroke (n = 2) occurred among current users of oral contraceptives to permit meaningful analysis.
	The risk of total stroke for former smokers was intermediate between nonsmokers and current smokers (RR = 1.34, 95-percent CI: 1.04-1.73). In the analyses of the relationship of time since stopping smoking with risks of total stroke as well as various subtypes (Table 8), we used current smokers as the reference category. For less than 2 years after cessation, the age-adjusted relative risk among former smokers compared with continuing

Table 7

Age-adjusted RR's of stroke (fatal and nonfatal combined), by daily number of cigarettes consumed among current smokers

Event	Never-Smoker	Former Smoker	Current Smoker	1-14	15-24	25-34	≥ 35
Total Stroke							
Cases	126	114	208	40	92	38	34
RR ^b	1.00	1.34	2.58	1.79	2.84	2.70	4.23
		(1.04-1.73)	(2.08-3.19)	(1.26-2.54)	(2.19-3.67)	(1.91-3.84)	(2.99-6.00)
RR ^c	1.00	1.35	2.73	2.02	3.34	3.08	4.48
		(0.98-1.85)	(2.18-3.41)	(1.29-3.14)	(2.38-4.70)	(1.94-4.87)	(2.78-7.23)
Subarachnoid Hemorrhage							
Cases	19	25	64	13	21	17	11
RR ^b	1.00	2.01	4.96	3.68	4.05	7.31	8.28
		(1.12-3.61)	(3.13-7.87)	(1.91-7.11)	(2.30-7.14)	(4.15-12.85)	(4.45-15.42)
RR ^c	1.00	2.26	4.85	4.28	4.02	7.95	10.22
		(1.16-4.42)	(2.90-8.11)	(1.88-9.77)	(1.90-8.54)	(3.50-18.07)	(4.03-25.94)
Ischemic Stroke							
Cases	85	70	120	23	58	19	18
RR ^b	1.00	1.20	2.25	1.54	2.69	2.06	3.43
		(0.88-1.65)	(1.72-2.95)	(0.98-2.44)	(1.95-3.72)	(1.27-3.36)	(2.13-5.51)
RR ^c	1.00	1.27	2.53	1.83	3.57	2.73	3.97
		(0.85-1.89)	(1.91-3.35)	(1.04-3.23)	(2.36-5.42)	(1.49-5.03)	(2.09-7.53)
Cerebral Hemorrhage							
Cases	19	16	18	4	10	<----- 4 ^d ----->	
RR ^b	1.00	1.27	1.46	1.18	2.01		1.18
		(0.66-2.44)	(0.77-2.78)	(0.40-3.46)	(0.94-4.28)		(0.41-3.46)
RR ^c	1.00	1.24	1.24	1.68	2.53		1.41
		(0.64-2.42)	(0.64-2.42)	(0.34-5.28)	(0.71-6.05)		(0.39-5.05)

^a Cigarettes smoked per day were unknown for four cases, including two subarachnoid hemorrhage and two ischemic stroke.

^b Age-adjusted RR.

^c Adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), history of hypertension, diabetes, high cholesterol levels, body mass index, past use of oral contraceptives, postmenopausal estrogen therapy, and age at starting smoking.

^d These two categories were combined due to small numbers.

Key: RR = relative risk.

smokers was 0.78, that is, a reduction in risk by 22 percent compared with continuing smokers. Nevertheless, this level of risk among former smokers was still about double that among never-smokers. During the interval between 2 and 4 years following cessation, the relative risk among former smokers was 0.46 (95-percent CI: 0.25-0.85). This indicated that almost 90 percent of the full potential benefit of cessation had occurred within those first 2 to 4 years, as the relative risk for never-smokers compared with current smokers was 0.39 (95-percent CI: 0.31-0.48) (Figure 2). Using never-smokers as the reference category, the age-adjusted relative risk of total stroke was 2.58 (95-percent CI: 2.08-3.19) among current smokers and was 1.17 (95-percent CI: 0.49-2.23) among former smokers who had stopped for 2 to 4 years. A similar pattern of decline was apparent after adjusting for other risk factors for stroke and daily number of cigarettes smoked in the followup period prior to stopping (Table 8).

To examine the possible confounding effect of alcohol consumption on cigarette smoking, we analyzed data from the 1980 to 1988 followup interval. Even after adjusting for alcohol consumption, the relationship of time since stopping smoking with risk of stroke remained virtually unchanged. Similarly adjusting for alcohol intake made virtually no difference to the relative risk estimate of daily number of cigarettes smoked and risks of stroke.

**Subtypes
of Stroke**

Within subtypes of stroke, the number of events occurring in former smokers was small so that the age-adjusted relative risk estimates tended to be imprecise, with correspondingly wide 95-percent CIs. For ischemic stroke, the point estimate of the age-adjusted relative risk among former smokers fell by 46 percent compared with current smokers within the first 2 years after stopping, a fall that represented about 80 percent of the potential benefit of stopping smoking. The risk among former smokers returned to the level of never-smokers during the interval between 2 and 4 years following cessation. After adjusting for other risk factors for ischemic stroke as well as for the daily number of cigarettes consumed and the age at starting, between 60 and 70 percent of the potential benefit of cessation still occurred within 2 years of cessation (Table 8).

The risk of subarachnoid hemorrhage among former smokers similarly fell with increasing duration since cessation. After more than 5 years, the age-adjusted relative risk of subarachnoid hemorrhage among former smokers had returned to the level of never-smokers ($RR = 0.24$, 95-percent CI: 0.09-0.60). The few cerebral hemorrhages occurring among former smokers precluded our ability to carry out a meaningful analysis (Table 8).

**Age at Starting
To Smoke**

We analyzed, separately for former and current smokers, the relationship of age at starting smoking with risks of stroke. Among current smokers, there appeared to be no relationship of the age at starting smoking with the age-adjusted relative risk of total stroke (p , trend = 0.76) or subtypes (Table 9). These findings remained unchanged after adjusting for other covariates, including the daily number of cigarettes consumed.

Table 8
Age-adjusted RR's of strokes (fatal and nonfatal combined), by time since quitting

Event	Never-Smoker	Current Smoker	Years Since Quitting ^a				
			<2	2-4	5-9	10-14	≥15
Total Stroke							
Cases	126	208	17	10	13	16	29
RR ^b	0.39	1.00	0.78	0.46	0.39	0.62	0.40
	(0.31-0.48)		(0.48-1.28)	(0.25-0.85)	(0.22-0.67)	(0.38-1.03)	(0.27-0.58)
RR ^c	0.37	1.00	0.73	0.59	0.39	0.60	0.39
	(0.29-0.46)		(0.40-1.33)	(0.28-1.21)	(0.20-0.77)	(0.32-1.12)	(0.24-0.64)
Subarachnoid Hemorrhage							
Cases	19	64	7	4	<----- 4 ^d ----->		7
RR ^b	0.20	1.00	1.12	0.64	0.24		0.31
	(0.13-0.32)		(0.52-2.44)	(0.23-1.73)	(0.09-0.60)		(0.15-0.64)
RR ^c	0.21	1.00	1.12	0.84	0.26		0.34
	(0.12-0.34)		(0.42-2.99)	(0.25-2.78)	(0.08-0.85)		(0.13-0.90)
Ischemic Stroke							
Cases	85	120	7	3	11	11	15
RR ^b	0.44	1.00	0.54	0.23	0.55	0.73	0.36
	(0.34-0.58)		(0.26-1.15)	(0.08-0.66)	(0.30-1.02)	(0.39-1.34)	(0.21-0.60)
RR ^c	0.40	1.00	0.56	0.96	0.50	0.69	0.35
	(0.30-0.52)		(0.22-1.40)	(0.27-3.45)	(0.23-1.07)	(0.32-1.48)	(0.17-0.70)

^a Years since quitting was missing for 29 cases, including 3 subarachnoid hemorrhage, 23 ischemic stroke, and 3 cerebral hemorrhage.

^b Age-adjusted RR.

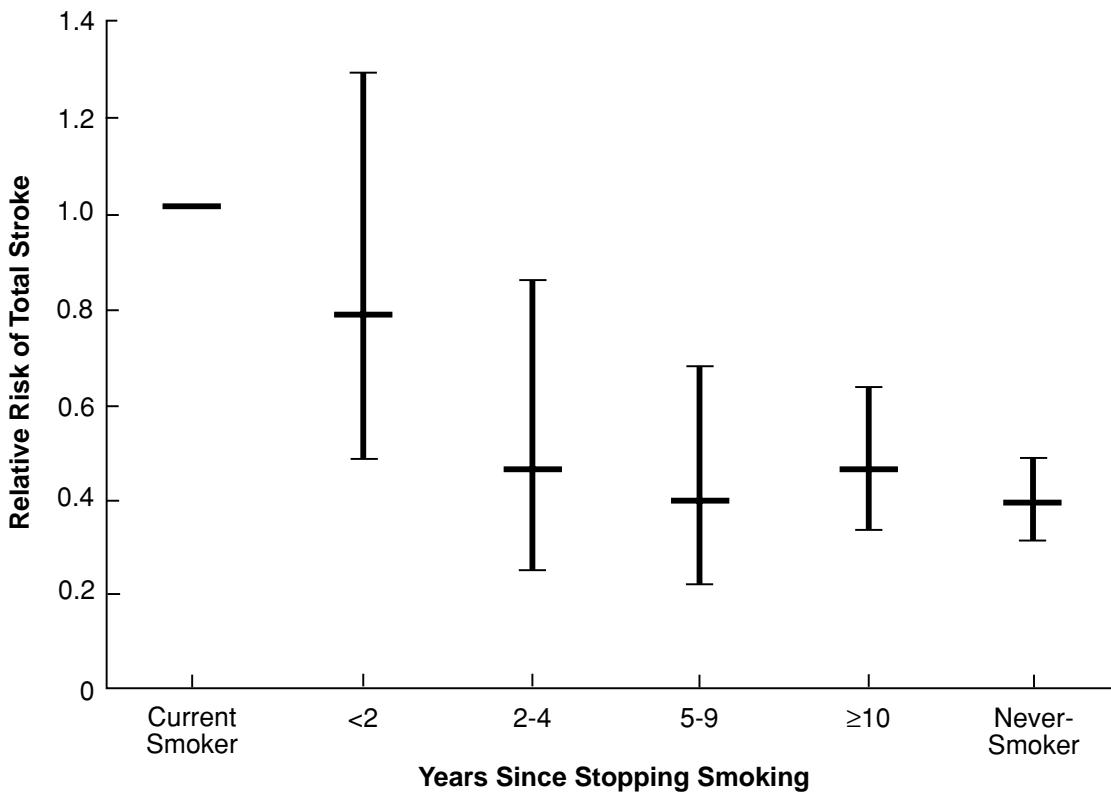
^c Adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), history of hypertension, diabetes, high cholesterol levels, body mass index, past use of oral contraceptives, postmenopausal estrogen therapy, and daily number of cigarettes consumed.

^d These two categories were combined due to small numbers.

Key: RR = relative risk.

By contrast, the earlier the age at starting among former smokers, the higher the age-adjusted relative risk of total stroke (p , trend = 0.01). This effect was caused mainly by the trend observed for ischemic stroke (p , trend = 0.01) but not for subarachnoid hemorrhage (p , trend = 0.55) (Table 10). These findings remained unchanged after adjusting for other covariates, including the daily number of cigarettes consumed as well as time since stopping. Too few cases of cerebral hemorrhage occurred among former smokers to permit analysis.

Figure 2
Risk of total stroke by time since quitting



Note: Age-adjusted relative risk of total stroke in relation to time since stopping smoking. Current smoker was the reference category. Error bars represent 95-percent confidence intervals.

Results for Coronary Heart Disease Incidence

During 12 years of followup, 970 incident cases of definite and probable CHD occurred during 1.37 million person-years. These included 745 cases of nonfatal MI and 225 cases of fatal CHD.

Risks Among Current Smokers

Compared with women who had never smoked, current smokers experienced substantially higher rates of CHD rates of CHD (Table 11). The age-adjusted relative risk among current smokers was 4.13 (95-percent CI: 3.04-5.63) for fatal CHD, 3.88 (95-percent CI: 3.28-4.58) for nonfatal MI, and 3.93 (95-percent CI: 3.39-4.55) for total CHD. Risk increased steeply with the number of cigarettes smoked so that women who smoked 45 or more cigarettes per day had age-adjusted relative risks of 10.00 (95-percent CI: 4.35-22.97) for fatal CHD, 4.64 (95-percent CI: 2.34-9.21) for nonfatal MI, and 5.74 (95-percent CI: 3.36-9.81) for total CHD. Even women consuming just 1 to 4 cigarettes per day doubled their risk of total CHD compared with never-smokers (age-adjusted RR = 1.94, 95-percent

Table 9

Age-adjusted RR's of stroke (fatal and nonfatal combined), by age at starting smoking among current smokers

Event	Never-Smoker	Age at Starting To Smoke Among Current Smokers ^a				
		<15 Years	15-17	18-21	22-25	≥26 Years
Total Stroke						
Cases	126	6	36	107	32	23
RR ^b	1.00	3.44 (1.60-7.41)	2.92 (2.04-4.18)	2.27 (1.76-2.92)	3.00 (2.08-4.34)	3.01 (1.97-4.59)
RR ^c	1.00	3.62 (1.41-9.28)	3.26 (2.00-5.31)	2.37 (1.68-3.35)	3.42 (2.09-5.61)	3.35 (1.98-5.68)
Subarachnoid Hemorrhage						
Cases	19	1	10	38	7	6
RR ^b	1.00	3.26 (0.50-21.34)	4.65 (2.30-9.38)	4.97 (3.03-8.16)	4.71 (2.14-10.37)	5.44 (2.39-12.35)
RR ^c	1.00	7.57 (0.68-84.07)	5.02 (1.90-13.24)	4.76 (2.50-9.08)	4.89 (1.74-13.75)	6.78 (2.21-20.81)
Ischemic Stroke						
Cases	85	4	21	58	19	16
RR ^b	1.00	3.53 (1.38-9.00)	2.62 (1.65-4.17)	1.86 (1.34-2.59)	2.60 (1.61-4.20)	3.07 (1.85-5.12)
RR ^c	1.00	5.96 (1.81-19.65)	3.16 (1.69-5.90)	2.08 (1.34-3.24)	3.15 (1.68-5.90)	3.79 (2.01-7.15)

^aAge at starting was missing for four cases, including two subarachnoid hemorrhage and two ischemic stroke.^bAge-adjusted RR.^cAdjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), history of hypertension, diabetes, high cholesterol levels, body mass index, past use of oral contraceptives, postmenopausal estrogen therapy, and daily number of cigarettes consumed.

Key: RR = relative risk.

CI: 1.23-3.08). To check the possibility that women who report smoking 1 to 4 cigarettes per day may represent a group who cut down from a previously high level of smoking, we reanalyzed the data by fixing smoking habits at baseline, that is, without updating the daily number smoked after each 2-year followup period. Smoking 1 to 4 cigarettes per day was still associated with a doubling of CHD risk (RR = 2.04, 95-percent CI: 1.32-3.16).

The strength of association between current cigarette smoking and total CHD remained unchanged after controlling for potential confounders, including body mass index, history of hypertension, diabetes, high cholesterol levels, previous use of oral contraceptives, use of postmenopausal estrogen therapy, menopausal status, parental history of MI before age 60, and age at starting smoking.

Table 10
Age-adjusted RR's of stroke (fatal and nonfatal combined), by age at starting smoking among former smokers

Event	Never-Smoker	Age at Starting To Smoke Among Former Smokers ^a				
		<15 Years	15-17	18-21	22-25	≥26 Years
Total Stroke						
Cases	126	3	24	65	12	4
RR ^b	1.00	2.11 (0.69-6.45)	2.10 (1.37-3.22)	1.22 (0.91-1.65)	1.08 (0.60-1.95)	0.78 (0.29-2.10)
RR ^c	1.00	4.30 (1.15-16.00)	2.07 (1.22-3.51)	1.23 (0.85-1.80)	1.14 (0.57-2.28)	1.30 (0.48-3.52)
Subarachnoid Hemorrhage						
Cases	19	0	7	13	3	1
RR ^b	1.00	3.67 (1.63-8.25)	1.62 (0.80-3.25)	2.14 (0.65-7.06)	1.60 (0.22-11.50)	
RR ^c	1.00	1.78 (0.64-4.92)	1.65 (0.72-3.78)	3.96 (0.92-16.99)	9.21 (1.43-59.32)	
Ischemic Stroke						
Cases	85	3	15	37	9	2
RR ^b	1.00	3.21 (1.08-9.49)	2.00 (1.17-3.41)	1.03 (0.70-1.52)	1.16 (0.58-2.30)	0.54 (0.13-2.20)
RR ^c	1.00	7.27 (1.82-29.02)	1.97 (1.02-3.81)	1.02 (0.63-1.67)	1.14 (0.51-2.57)	0.81 (0.17-3.80)

^a Age at starting was missing for six cases, including one subarachnoid hemorrhage, four ischemic stroke, and one cerebral hemorrhage.

^b Age-adjusted RR.

^c Adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), history of hypertension, diabetes, high cholesterol levels, body mass index, past use of oral contraceptives, postmenopausal estrogen therapy, and daily number of cigarettes consumed.

Key: RR = relative risk.

To examine the possible confounding effects of alcohol consumption and vigorous physical exercise on cigarette smoking, we analyzed data from the 1980 to 1988 followup interval. Controlling for these two additional variables resulted in little change in the strength of the observed association between smoking and total CHD risk.

Decline in Risk Among Former Smokers Risk of CHD among former smokers was intermediate between never-smokers and current smokers. Compared with never-smokers, the age-adjusted relative risk among former smokers was 1.63 (95-percent CI: 1.11-2.40) for fatal CHD, 1.47 (95-percent CI: 1.19-1.83) for nonfatal MI, and 1.51 (95-percent CI: 1.25-1.82) for total CHD. The relationship of time since stopping with CHD risk was examined (Table 12). In Table 12, the "baseline" consists of persisting active smokers. Thus never-smokers are at approximately one-fifth the risk of total CHD compared with continuing

Table 11

Daily number of cigarettes smoked and age-adjusted and multivariate RR's of fatal coronary heart disease and nonfatal myocardial infarction, compared with never-smokers

Event	Never-Smoker	Former Smoker	Cigarettes Smoked/Day Among Current Smokers ^a					
			1-4	5-14	15-24	25-34	35-44	≥45
Fatal Coronary Heart Disease								
Cases	49	53	4	18	53	28	14	4
RR ^b	1.00	1.63	1.87	2.78	4.29	5.36	5.56	10.00
			(1.11-2.40)	(0.69-5.09)	(1.66-4.67)	(3.00-6.15)	(3.53-8.14)	(3.26-9.50) (4.35-22.97)
RR ^c	1.00	1.62	<---- 2.85 ---->		4.85	6.96	<---- 7.84 ---->	
			(1.09-2.40)	(1.53-5.32)	(3.01-7.81)(3.90-12.43)		(3.71-16.57)	
Nonfatal Myocardial Infarction								
Cases	166	161	15	56	189	95	54	7
RR ^b	1.00	1.47	1.97	2.46	4.21	4.87	5.58	4.64
			(1.19-1.83)	(1.17-3.30)	(1.83-3.29)	(3.48-5.11)	(3.87-6.13)	(4.24-7.35) (2.34-9.21)
RR ^c	1.00	1.44	<---- 2.45 ---->		4.77	5.21	<---- 5.32 ---->	
			(1.16-1.79)	(1.69-3.56)	(3.64-6.26)	(3.73-7.28)	(3.61-7.86)	
Total Coronary Heart Disease								
Cases	215	214	19	74	242	123	68	11
RR ^b	1.00	1.51	1.94	2.53	4.22	4.97	5.57	5.74
			(1.25-1.82)	(1.23-3.08)	(1.96-3.26)	(3.56-5.00)	(4.06-6.08)	(4.36-7.11) (3.36-9.81)
RR ^c	1.00	1.48	<---- 2.53 ---->		4.79	5.49	<---- 5.49 ---->	
			(1.22-1.79)	(1.84-3.50)	(3.78-6.08)	(4.10-7.35)	(3.87-7.77)	

^a Daily number smoked was missing for four cases, including two cases of fatal coronary heart disease and two nonfatal myocardial infarction.

^b Age-adjusted RR.

^c Adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), history of hypertension, diabetes, high cholesterol levels, body mass index, past use of oral contraceptives, menopausal status, postmenopausal estrogen therapy, and age at starting smoking.

Key: RR = relative risk.

smokers. Within 2 years of cessation, the age-adjusted relative risk among former compared with current smokers was 0.53 (95-percent CI: 0.25-1.12) for fatal CHD, 0.85 (95-percent CI: 0.60-1.19) for nonfatal MI, and 0.77 (95-percent CI: 0.57-1.05) for total CHD. Although nearly one-third of the excess risk of total CHD was removed within 2 years of smoking, the risk among former smokers did not decline to the level of never-smokers until 10 years after cessation. This finding remained unchanged after adjusting for other cardiovascular risk factors, daily number of cigarettes smoked before stopping, and age at starting smoking.

To examine the possible confounding effects of alcohol consumption and vigorous physical exercise on the relationship of time since stopping with CHD risk, we analyzed data from the 1980 to 1988 followup interval. Controlling for these variables resulted in a slight increase in the relative risks of total CHD across categories of former smokers; however, it did not alter

Table 12

Time since quitting and age-adjusted and multivariate RR's of fatal coronary heart disease and nonfatal myocardial infarction, compared with current smokers

Event	Never-Smoker	Current Smoker	Years Since Quitting ^a				
			<2	2-4	5-9	10-14	≥15
Fatal Coronary Heart Disease							
Cases	49	123	7	9	14	4	13
RR ^b	0.24 (0.18-0.33)	1.00	0.53 (0.25-1.12)	0.68 (0.35-1.34)	0.68 (0.39-1.19)	0.26 (0.10-0.65)	0.31 (0.18-0.53)
RR ^c	0.23 (0.17-0.33)	1.00	1.47 (0.42-5.20)	0.58 (0.23-1.44)	0.72 (0.36-1.42)	0.28 (0.09-0.87)	0.32 (0.16-0.66)
Nonfatal Myocardial Infarction							
Cases	166	418	36	22	26	13	41
RR ^b	0.26 (0.22-0.30)	1.00	0.85 (0.60-1.19)	0.51 (0.34-0.78)	0.40 (0.27-0.59)	0.26 (0.15-0.43)	0.29 (0.21-0.39)
RR ^c	0.24 (0.20-0.28)	1.00	0.81 (0.51-1.29)	0.43 (0.25-0.74)	0.38 (0.23-0.62)	0.26 (0.13-0.49)	0.27 (0.18-0.41)
Total Coronary Heart Disease							
Cases	215	541	43	31	40	17	54
RR ^b	0.25 (0.22-0.30)	1.00	0.77 (0.57-1.05)	0.55 (0.39-0.79)	0.47 (0.34-0.64)	0.26 (0.17-0.40)	0.29 (0.23-0.38)
RR ^c	0.24 (0.20-0.28)	1.00	0.75 (0.49-1.15)	0.46 (0.29-0.74)	0.44 (0.30-0.66)	0.26 (0.14-0.45)	0.28 (0.20-0.40)

^a Years since quitting was missing for 29 cases, including 6 fatal coronary heart disease and 23 nonfatal myocardial infarction.

^b Age-adjusted RR.

^c Adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), history of hypertension, diabetes, high cholesterol levels, body mass index, past use of oral contraceptives, menopausal status, postmenopausal estrogen therapy, parental history of myocardial infarction before age 60, and daily number of cigarettes consumed.

Key: RR = relative risk.

the conclusion that 10 years of cessation were required for the risk to drop to the level of never-smokers.

Age at Starting To Smoke We analyzed, separately for former and current smokers, the relationship of age at starting smoking with the risk of CHD.

Among current smokers, the risk of CHD was increased at any age of starting to smoke. However, those who started to smoke before age 15 had the highest age-adjusted relative risks for total CHD (7.17, 95-percent CI: 4.88-10.53) (Table 13). After adjusting for potential confounding factors, including daily number of cigarettes smoked, the relative risk for those starting to smoke before age 15 increased to 9.25 (95-percent CI: 5.27-16.23). The confidence interval of this estimate excluded those of other categories of age at starting.

Table 13

Age at starting to smoke among current and former smokers and age-adjusted and multivariate RR's of total coronary heart disease, compared with never-smokers

Event	Never-Smoker	Age at Starting To Smoke ^a					
		<15 Years	15-17	18-21	22-25	≥26 Years	
Total Coronary Heart Disease—							
Former Smokers							
Cases	215	4	25	140	28	12	
RR ^b	1.00	1.72 (0.65-4.58)	1.35 (0.89-2.03)	1.57 (1.27-1.94)	1.44 (0.97-2.13)	1.34 (0.75-2.39)	
RR ^c	1.00	7.55 (2.54-22.45)	1.42 (0.84-2.40)	1.66 (1.28-2.16)	1.83 (1.12-2.98)	1.67 (0.83-3.36)	
Total Coronary Heart Disease—							
Current Smokers							
Cases	215	21	66	336	73	40	
RR ^b	1.00	7.17 (4.88-10.53)	3.21 (2.47-4.17)	4.17 (3.55-4.89)	3.91 (3.06-5.00)	3.19 (2.32-4.40)	
RR ^d	1.00	9.25 (5.27-16.23)	3.41 (2.38-4.89)	4.53 (3.59-5.71)	4.30 (3.03-6.12)	3.17 (2.10-4.78)	

^a Age at starting smoking was missing for five current smokers and five former smokers.

^b Age-adjusted RR.

^c Adjusted for coronary heart disease risk factors, plus time since quitting smoking.

^d Adjusted for age in 5-year intervals, followup period (1976 to 1978, 1978 to 1980, 1980 to 1982, 1982 to 1984, 1984 to 1986, or 1986 to 1988), history of hypertension, diabetes, high cholesterol levels, body mass index, past use of oral contraceptives, postmenopausal estrogen therapy, and daily number of cigarettes consumed.

Key: RR = relative risk.

Among former smokers, women who started before age 15 were also at highest risk of total CHD, although this finding was based on only a few cases ($n = 4$) (Table 13). After adjusting for potential confounding factors (including CHD risk factors, daily number of cigarettes smoked, and years since stopping), the relative risk of former smokers who started before age 15 was 7.55 (95-percent CI:2.54-22.45).

DISCUSSION

Studies of cigarette smoking carried out among women during the 1950's and 1960's reported relative risks of total mortality ranging between 1.3 and 1.4 (Doll and Hill, 1956; Hammond and Horn, 1958; Dunn et al., 1960; Best et al., 1961; Kahn, 1966; Hammond, 1966), whereas smokers in the Nurses' Health Study (Colditz, 1990) were at nearly 1.9 times the risk compared with never-smokers (Table 2). This may be explained partly by the fact that that study represents a younger age cohort, one likely to have higher relative risks. In addition, the higher relative risk estimates may be attributable to the increasing proportion of women in more recent birth cohorts who are heavier smokers and who started smoking at a young age. Data from National Health Interview Surveys indicate that the proportion of women starting to smoke before the age of 16 increased from 7.2 percent among women born from 1910 to 1914

to 20.2 percent among those born between 1950 and 1954 (U.S. Department of Health and Human Services, 1989). In the Nurses' Health Study (Colditz, 1990), women who started smoking before age 15 had the highest risk (multivariate RR = 3.15) of total mortality (Table 4). Furthermore, the observed deaths in this study were premature because they all occurred among women who were younger than 67 years of age during the 12 years of followup. A recent study of smoking-attributable deaths in developed countries estimated that those killed by tobacco between ages 35 and 69 lose an average of about 23 years of life (Peto et al., 1992).

The time required for the risk of total mortality among quitters to reach the level of never-smokers differs across studies. The Nurses' Health Study (Colditz, 1990) data indicate that the risk among former smokers declines to the level of never-smokers 10 to 14 years after cessation. This estimate of the time required is somewhat shorter than that of several of the previous studies. For example, the American Cancer Society Cancer Prevention Study I (ACS CPS-I) found that among former smokers of 20 or more cigarettes per day, risk of total mortality was still higher than that of never-smokers even 10 years after cessation (Hammond, 1966). In the more recent ACS CPS-II study, involving 4 years of followup among 521,555 men and 658,748 women, the risk of total mortality among female former smokers declined to the level of never-smokers 16 or more years after cessation (U.S. Department of Health and Human Services, 1990). Also, in the U.S. Veterans Study (Rogot and Murray, 1980), the overall mortality risk among male smokers remained elevated 15 or more years after cessation (RR = 1.47 among smokers of 10 to 20 cigarettes per day; RR = 1.22 among smokers of 21 to 39 cigarettes per day).

The differences among studies in estimates of the duration needed for a former smoker to have the same overall mortality risk as a never-smoker may be due partly to factors such as the lack of ascertainment of smoking status after enrollment in earlier studies (Hammond, 1966; U.S. Department of Health and Human Services, 1990; Rogot and Murray, 1980). In these studies, persons who smoked at enrollment but subsequently quit remained assigned to the current smoker category. This misclassification tends to obscure the benefits of cessation in comparison with continued smoking (U.S. Department of Health and Human Services, 1990). In contrast, the Established Populations for Epidemiologic Studies of the Elderly (EPESE) study (LaCroix et al., 1991), which updated smoking status at yearly intervals, reported that the relative risk of total mortality among formerly smoking women returned to the level of never-smokers 6 to 10 years after cessation.

A potential limitation of the present study is that our cohort consists of predominantly white middle-aged women selected with respect to a particular occupation (nursing). Although our findings might not be generalizable to older women or other ethnic groups, the qualitatively similar effects of smoking across population subgroups defined by age, gender, and race suggest that the biological effects of smoking cessation

are also not likely to differ in major ways across demographic groups. Smokers who quit may be unrepresentative in ways that could not be controlled in our analysis, although we adjusted for a broad range of potential confounding variables in our multivariate analyses. Finally, during the 12-year followup period, current smokers were marginally less likely to respond compared with former smokers. This could have potentially resulted in an underestimation of the benefits of cessation. However, the difference in response rates never exceeded 0.5 percentage points, making this an unlikely source of major bias.

The observation of an excess cancer mortality risk within the first 2 years of giving up smoking in the present study (Table 3) and in previous studies (U.S. Department of Health and Human Services, 1990) has been attributed to the ill-quitter effect. When analyses excluded women with CVD and cancer at the beginning of each 2-year followup interval, the excess risk among recent quitters was removed. The results in Tables 5 and 6 provide a comparison between the impact of stopping smoking before developing disease and the situation in which a proportion of smokers stop after the onset of disease. The benefits of smoking cessation, in terms of a reduction in all-cause as well as cause-specific mortality, occur sooner in the former case. If one stops smoking before the onset of disease, one will experience a 24-percent reduction in the risk of total mortality within 2 years of quitting (including a 37-percent reduction in CVD mortality) as well as rapid return of the risk of cancer mortality to the level of a never-smoker (Table 6). These benefits are more substantial and occur sooner than in the case of delaying the cessation of smoking until the onset of disease (Table 3).

The finding of an association between cigarette smoking and suicides/ accidents has been reported in previous studies, including the British Male Doctors Study (Doll and Peto, 1976) and the Multiple Risk Factor Intervention Trial (MRFIT) study (Smith et al., 1992). Although a recent report dismissed the association as causal due to lack of biologic plausibility (Smith et al., 1992), several studies have shown an association between cigarette smoking and depression (Perez-Stable et al., 1990; Glassman et al., 1990; Anda et al., 1990; Glass, 1990). The Nurses' Health Study (Colditz, 1990) collected no data on the mental health of participants prior to 1992. On the other hand, the association between smoking and external causes of injury persisted after controlling for alcohol intake in multivariate analysis. Whether this association is causal or whether smoking is merely correlated with one or more factors (as yet unidentified) predisposing one to accidents/suicide deserves further study.

Weight gain after smoking cessation is thought to be a factor contributing to continuing smoking by women (U.S. Department of Health and Human Services, 1990). In the Nurses' Health Study (Colditz, 1990), women who quit smoking had an average 1.4 to 2.8 kg greater weight gain over an 8-year followup period compared with current smokers (Colditz et al., 1992). Our analyses of total mortality, which balance adverse as well as desirable effects of smoking cessation, clearly indicate that the health

benefits of smoking cessation far exceed the risks posed by this magnitude of weight gain (U.S. Department of Health and Human Services, 1990; Colditz et al., 1992).

The best health advice remains not to start smoking at all, particularly at a young age. However, benefits of cessation are substantial and begin to accrue almost immediately after quitting.

Stroke Incidence The Nurses' Health Study (Colditz et al., 1992) data confirm that cigarette smoking is a major contributor to the risk of ischemic and hemorrhagic stroke among women (Colditz et al., 1988; Gill et al., 1989) and that cessation leads to a decline in risk (Donnan et al., 1989; Wolf et al., 1988; Colditz et al., 1988). For total stroke, most of the benefit of stopping occurred 2 to 4 years following cessation. The relationship of time since quitting with decline in risk of total stroke was independent of amount smoked, age at starting, or the presence of other risk factors.

Our data suggest that the effect of current cigarette smoking on ischemic stroke is due predominantly to short-term effects. Consistent with this hypothesis was the lack of a relationship in the present study between the age at starting and the risk of ischemic stroke among current smokers (Table 9). The acute effects of smoking on the risk of stroke appeared to overwhelm any chronic effects, such as those mediated by atherogenesis. Once the acute insults of smoking were removed (as in the case of former smokers), the underlying relationship of age at starting smoking with risk of ischemic stroke became apparent (Table 10).

Previous studies of subarachnoid hemorrhage have reported a persistently elevated risk among former smokers (Bell and Symon, 1979; Taha et al., 1982). In the present study, the risk among former smokers appeared to return to the level of never-smokers more than 5 years after cessation. However, the number of cases on which this observation is based was small, and we cannot rule out a persisting excess risk.

Overall, the data indicate that benefits of smoking cessation in terms of stroke reduction are available to all smokers regardless of age at starting and amounts smoked. Current smokers who stop can anticipate substantial reductions in their risk of stroke within 2 to 4 years following cessation.

Coronary Heart Disease Incidence Our data confirm that cigarette smoking is a major contributor to the risk of CHD in middle-aged women (Willett et al., 1987) and that cessation leads to a decline in risk (U.S. Department of Health and Human Services, 1990). In the present study, the excess risk of total CHD among former smokers dropped by one-third within 2 years of quitting. The substantial fall in CHD risk soon after stopping was consistent with previous reports (U.S. Department of Health and Human Services, 1990; LaCroix et al., 1991; Rosenberg et al., 1985 and 1990; Dobson et al., 1991). Contrary to several earlier reports indicating a relatively short time (i.e., less than 5 years) between cessation and complete removal of risk (LaCroix et al., 1991; Rosenberg et al., 1985 and 1990; Dobson et al., 1991), we found that CHD

risk among former smokers did not decline to the level of never-smokers until 10 to 14 years after cessation.

The predominant biologic effects of smoking on CVD have been thought to be related to current use. However, both the high risk associated with early age at starting smoking and the length of time required for complete removal of risk after cessation suggest an important contribution of cumulative exposure to cigarette smoking. This pattern of decline in CHD risk contrasts with the time course of decline in stroke risk after cessation. In middle-aged women, the hazards of smoking on stroke appear to be more strongly related to current use (Colditz et al., 1988), with risk among former smokers rapidly falling to the level of never-smokers 2 to 4 years after quitting (Wolf et al., 1988; see also "Decline in Risk Among Former Smokers").

Compared with cohort studies, case-control studies (Rosenberg et al., 1985 and 1990; Dobson et al., 1991) have tended to report shorter intervals between smoking cessation and complete reversal of CHD risk. In a hospital-based case control study, Rosenberg and colleagues (1985) reported that the risk of nonfatal MI among male former smokers returned to the level of never-smokers after 23 months. In a separate study of nonfatal MI among women, Rosenberg and coworkers (1990) found that the risk among former smokers was indistinguishable from that of never-smokers 36 months after cessation. In a population-based case-control study, Dobson and colleagues (1991) found that the risk among male and female former smokers returned to the level of never-smokers 4 years after cessation.

A case-control study, based on 263 women in the Nurses' Health Study (Colditz, 1990) cohort who reported a nonfatal MI on the 1976 baseline questionnaire, found that when compared with never-smokers, those who quit 1 to 4 or 5 to 9 years earlier had a significantly elevated risk of 1.5, whereas those who had quit 10 years or more earlier had a relative risk of 0.6 (Willett et al., 1981). However, because there were only 29 cases among former smokers, the estimates of risk by duration of quitting were not precise.

In contrast to the majority of case-control studies, cohort studies have generally reported longer intervals between quitting and the decline of CHD risk among former smokers to the level of never-smokers. In their prospective study of 188,000 white men ages 50 to 69 years, Hammond and Horn (1958) stated that it took 10 years for the risk of CHD deaths among former smokers to reach that of never-smokers, provided that they had smoked less than 1 packet of cigarettes per day. If they smoked more than 1 packet per day, the relative risk was 1.6 even 10 years after cessation. In other cohort studies, the relative risk of CHD mortality among former smokers relative to never-smokers was 1.16-1.26 at 5 to 9 years after cessation in the ACS CPS-I cohort (Hammond and Garfinkel, 1969); 1.4 at 5 to 9 years after cessation in the U.S. Veterans Study (Dorn, 1959; Kahn, 1966; Rogot and Murray, 1980); 1.3-1.4 at 5 to 9 years after cessation in the British Male Doctors Study (Doll and Peto, 1976); 1.6 at 20 years after cessation in the British Regional Heart Study (Cook et al., 1986; Cook and Shaper, 1986); 1.28 at 2 to 9 years after cessation in the Coronary Artery Surgery Study

registry (Omnenn et al., 1990); and 1.5 at 1 to 9 years after cessation in a Swedish cohort study (Cederlof et al., 1975). The 22-year followup report of the British Female Doctors Study (Doll et al., 1980) had insufficient data on former smokers to allow examination of CHD risk according to time since quitting.

Case-control studies have been suggested to be less susceptible to misclassification resulting from recidivism, that is, resumption of smoking among former smokers. In followup studies that measure smoking status only at entry into the study, coronary events that occur among former smokers who have resumed smoking are erroneously counted as occurring in former smokers instead of current smokers. This may result in a longer estimate of the time required for the risk to decline to the level of never-smokers (Rosenberg et al., 1985; Dobson et al., 1991). Although this type of misclassification may have occurred in cohort studies that ascertained smoking habits at baseline only (e.g., the ACS studies [Hammond, 1966; Stellman and Garfinkel, 1986; Hammond and Garfinkel, 1969], the U.S. Veterans Study [Dorn, 1959; Kahn, 1966; Rogot and Murray, 1980], and the Swedish cohort study [Cederlof et al., 1975]), in the present study smoking status was updated every 2 years. Most relapses among quitters occur within the first 2-year period after cessation (U.S. Department of Health and Human Services, 1990). Furthermore, within any 2-year followup period in the Nurses' Health Study (Colditz, 1990), an average of only 1,500 quitters (or about 4.8 percent of former smokers) resumed smoking. These numbers were too small to explain the discrepancy between previous case-control studies and the present study in the time taken for risk of CHD among former smokers to decline to the level of never-smokers.

Starting smoking before age 15 is associated with a particularly high risk of CHD. In American women, the age at initiation has been steadily falling. Data from National Health Interview Surveys indicate that the proportion of women starting to smoke before age 16 increased from 7.2 percent among women born from 1910 to 1914 to 20.2 percent among women born between 1950 and 1954 (U.S. Department of Health and Human Services, 1989). This highlights the need for public health measures to be directed especially at preventing young women from starting to smoke.

CONCLUSIONS

- Compared with never-smokers, women who currently smoke are at increased risks of total mortality (multivariate RR = 1.87, 95-percent CI: 1.65 to 2.13), total CHD incidence (multivariate RR = 4.23, 95-percent CI: 3.60 to 4.96), and total stroke incidence (multivariate RR = 2.73, 95-percent CI: 2.18 to 3.41).
- Starting smoking before age 15 is associated with particularly high risks of total mortality (multivariate RR = 3.15, 95-percent CI: 2.16 to 4.59) and total CHD incidence (multivariate RR = 9.25, 95-percent CI: 5.27 to 16.23).

- Compared with never-smokers, former smokers are at slightly higher risk of total mortality (multivariate RR = 1.29, 95-percent CI: 1.14 to 1.46), total CHD incidence (multivariate RR = 1.48, 95-percent CI: 1.22 to 1.79), and total stroke incidence (multivariate RR = 1.35, 95-percent CI: 0.98 to 1.85).
- The risk of total mortality among former smokers approaches the level of never-smokers 10 to 14 years after cessation. This conclusion remained unchanged after taking account of the ill-quitter effect.
- On stopping smoking, former smokers removed one-third of the excess risk of total CHD incidence within 2 years of cessation. The risk among former smokers declines to the level of never-smokers during the interval of 10 to 14 years following cessation.
- The risk of total stroke incidence among former smokers approaches the level of never-smokers during the interval of 2 to 4 years following cessation.
- The time course of decline in risk of total mortality, total CHD incidence, and total stroke incidence remained unchanged after adjusting for age at starting smoking and number of cigarettes smoked daily.

REFERENCES

- Anda, R.F., Williamson, D.F., Escobedo, L.G., Mast, E.E., Giovino, G.A., Remington, P.L. Depression and the dynamics of smoking. *Journal of the American Medical Association* 264: 1541-1545, 1990.
- Bell, B.A., Symon, L. Smoking and subarachnoid hemorrhage. *British Medical Journal* 1: 577-578, 1979.
- Berlin, J.A., Colditz, G.A. A meta-analysis of physical activity in the prevention of coronary heart disease. *American Journal of Epidemiology* 132: 612-628, 1990.
- Best, E.W.R., Josie, G.H., Walker, C.B. A Canadian study of mortality in relation to smoking habits. A preliminary report. *Canadian Journal of Public Health* 52: 99-106, 1961.
- Cederlof, R., Friberg, L., Hrubec, Z., Lorich, U. *The Relationship of Smoking and Some Social Covariates to Mortality and Cancer Morbidity. A Ten Year Followup in a Probability Sample of 55,000 Swedish Subjects Age 18-69*. Stockholm: Karolinska Institute, Department of Environmental Hygiene, 1975.
- Colditz, G.A. The Nurses' Health Study: Findings during 10 years of follow-up of a cohort of U.S. women. *Current Problems in Obstetrics, Gynecology and Fertility* 13: 129-174, 1990.
- Colditz, G.A., Bonita, R., Stampfer, M.J., Willett, W.C., Rosner, B., Speizer, F.E., Hennekens, C.H. Cigarette smoking and risk of stroke in middle-aged women. *New England Journal of Medicine* 318: 937-941, 1988.
- Colditz, G.A., Segal, M.R., Myers, A.H., Stampfer, M.J., Willett, W.C., Speizer, F.E. Weight change in relation to smoking cessation among women. *Journal of Smoking-Related Diseases* 3: 145-153, 1992.
- Colditz, G.A., Willett, W.C., Stampfer, M.J., Sampson, L., Rosner, B., Hennekens, C.H., Speizer, F.E. The influence of age, relative weight, smoking, and alcohol intake on the reproducibility of a dietary questionnaire. *International Journal of Epidemiology* 16: 392-398, 1987.
- Cook, D.G., Shaper, A.G. Stopping smoking and risk of ischaemic heart disease. (Letter.) *Lancet* 2: 1303-1309, 1986.
- Cook, D.G., Shaper, A.G., Pocock, S.J., Kussick, S.J. Giving up smoking and the risk of heart attacks. A report from the British Regional Heart Study. *Lancet* 2: 1376-1380, 1986.
- Dobson, A.J., Alexander, H.M., Heller, R.F., Lloyd, D.M. How soon after quitting smoking does risk of heart attack decline? *Journal of Clinical Epidemiology* 44: 1247-1253, 1991.
- Doll, R., Gray, R., Hafner, B., Peto, R. Mortality in relation to smoking: 22 years' observations on female British doctors. *British Medical Journal* 280: 967-971, 1980.
- Doll, R., Hill, A.B. Lung cancer and other causes of death in relation to smoking. A second report on the mortality of British doctors. *British Medical Journal* 2: 1071-1081, 1956.
- Doll, R., Peto, R. Mortality in relation to smoking: 20 years' observations on male British doctors. *British Medical Journal* 2: 1525-1536, 1976.
- Donnan, G.A., McNeil, J.J., Adena, M.A., Doyle, A.E., O'Malley, H.M., Neill, G.C. Smoking as a risk factor for cerebral ischaemia. *Lancet* 2: 643-647, 1989.

- Dorn, H.F. Tobacco consumption and mortality from cancer and other diseases. *Public Health Reports* 74: 581-593, 1959.
- Dunn, J.E., Jr., Linden, G., Breslow, L. Lung cancer mortality experience of men in certain occupations in California. *American Journal of Public Health* 50: 1475-1487, 1960.
- Gill, J.S., Shipley, M.J., Tsementzis, S.A., Hornby, R., Gill, S.K., Hitchcock, E.R., Beavers, G. Cigarette smoking: A risk factor for hemorrhagic and nonhemorrhagic stroke. *Archives of Internal Medicine* 149: 1053-2057, 1989.
- Giovannucci, E., Colditz, G., Stampfer, M.J., Rimm, E.B., Litin, L., Sampson, L., Willett, W.C. The assessment of alcohol consumption by a simple self-administered questionnaire. *American Journal of Epidemiology* 133: 810-817, 1991.
- Glass, R.M. Blue mood, blackened lungs. *Journal of the American Medical Association* 264: 1583-1584, 1990.
- Glassman, A.H., Helzer, J.E., Covey, L.S., Cottler, L.B., Stetner, F., Tipp, J.E., Johnson, J. Smoking, smoking cessation, and major depression. *Journal of the American Medical Association* 264: 1546-1549, 1990.
- Hammond, E.C. Smoking in relation to the death rates of one million men and women. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 127-204.
- Hammond, E.C., Garfinkel, L. Coronary heart disease, stroke, and aortic aneurysm. *Archives of Environmental Health* 19: 167-182, 1969.
- Hammond, E.C., Horn, D. Smoking and death rates—report on forty-four months of followup on 187,783 men. I. Total mortality. *Journal of the American Medical Association* 166: 1159-1172, 1958.
- Hennekens, C.H., Speizer, F.E., Rosner, B., Bain, C.J., Belanger, C., Peto, R. Use of permanent hair dyes and cancer among registered nurses. *Lancet* 1: 1301-1303, 1979.
- Kahn, H.A. The Dorn study of smoking and mortality among U.S. veterans: Report on eight and one-half years of observation. In: *Epidemiological Approaches to the Study of Cancer and Other Chronic Diseases*, W. Haenszel (Editor). National Cancer Institute Monograph No. 19. Bethesda, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, 1966, pp. 1-125.
- Kawachi, I., Colditz, G.A., Stampfer, M.J., Willet, W.C., Manson, J.E., Rosner, B., Speizer, F.E., Hennekens, C.H. Smoking cessation and decreased risk of stroke in women. *Journal of the American Medical Association* 269: 232-236, 1993a.
- Kawachi, I., Colditz, G.A., Stampfer, M.J., Willet, W.C., Manson, J.E., Rosner, B., Speizer, F.E., Hennekens, C.H. Smoking cessation and time course of decreased risks of coronary heart disease in middle-aged women. *Archives of Internal Medicine* 154: 169-175, 1994.
- LaCroix, A.Z., Lang, J., Scherr, P., Wallace, R.B., Cornoni-Huntley, J., Berkman, L., Curb, J.D., Evans, D., Hennekens, C.H. Smoking and mortality among older men and women in three communities. *New England Journal of Medicine* 324: 1619-1625, 1991.
- McBride, P.E. The health consequences of smoking. Cardiovascular disease. *Medical Clinics of North America* 76: 333-353, 1992.
- Miettinen, O. Estimation and estimability in case-referent studies. *American Journal of Epidemiology* 103: 226-235, 1976.
- Myers, A.H., Rosner, B., Abbey, H., Willett, W., Stampfer, M.J., Bain, C., Lipnick, R., Hennekens, C., Speizer, F. Smoking behavior among participants in the nurses' health study. *American Journal of Public Health* 77: 628-630, 1987.
- Omenn, G.S., Anderson, K.W., Kronmal, R.A., Vlietstra, R.E. The temporal pattern of reduction of mortality risk after smoking cessation. *American Journal of Preventive Medicine* 6: 251-257, 1990.
- Perez-Stable, E.J., Martin, G., Martin, B.V., Katz, M.H. Latinos in San Francisco. *American Journal of Public Health* 80: 1500-1502, 1990.
- Peto, R., Lopez, A.D., Boreham, J., Thun, M., Heath, C., Jr. Mortality from tobacco in developed countries: Indirect estimation from national vital statistics. *Lancet* 339: 1268-1278, 1992.
- Rimm, E.B., Giovannucci, E.L., Willett, W.C., Colditz, G.A., Ascherio, A., Rosner, B., Stampfer, M.J. Prospective study of alcohol consumption and risk of coronary disease in men. *Lancet* 338: 464-468, 1991.
- Robins, J. A graphical approach to the identification and estimation of causal parameters in mortality studies with sustained exposure periods. *Journal of Chronic Diseases* 40 (Suppl 2): 139S-161S, 1987.
- Robins, J. The control of confounding by intermediate variables. *Statistics in Medicine* 8: 679-701, 1989.
- Rogot, E., Murray, J.L. Smoking and causes of death among U.S. veterans: 16 years of observation. *Public Health Reports* 95: 213-222, 1980.
- Rose, G.A., Blackburn, H. *Cardiovascular Survey Methods*. 2nd Ed. Geneva: World Health Organization, 1982.

- Rosenberg, L., Kaufman, D.W., Helmrich, S.P., Shapiro, S. The risk of myocardial infarction after quitting smoking in men under 55 years of age. *New England Journal of Medicine* 313: 1511-1514, 1985.
- Rosenberg, L., Palmer, J.R., Shapiro, S. Decline in the risk of myocardial infarction among women who stop smoking. *New England Journal of Medicine* 322: 213-217, 1990.
- Rothman, K.J., Boice, J.D., Jr. *Epidemiologic Analysis With a Programmable Calculator*. DHEW Publication No. 79-1649. Washington, DC: Superintendent of Documents, U.S. Government Printing Office, 1979.
- Shinton, R., Beevers, G. Meta-analysis of relation between cigarette smoking and stroke. *British Medical Journal* 298: 789-794, 1989.
- Smith, G.D., Phillips, A.N., Neaton, J.D. Smoking as independent risk factor for suicide: Illustration of an artifact from observational epidemiology? *Lancet* 340: 709-712, 1992.
- Stampfer, M.J., Colditz, G.A., Willett, W.C., Speizer, F.E., Hennekens, C.H. A prospective study of moderate alcohol consumption and the risk of coronary disease and stroke in women. *New England Journal of Medicine* 319: 267-273, 1988.
- Stampfer, M.J., Willett, W.C., Colditz, G.A., Rosner, B., Speizer, F.E., Hennekens, C.H. A prospective study of postmenopausal estrogen therapy and coronary heart disease. *New England Journal of Medicine* 313: 1044-1049, 1985.
- Stampfer, M.J., Willett, W.C., Speizer, F.E., Dysert, D.C., Lipnick, R., Rosner, B., Hennekens, C.H. Test of the National Death Index. *American Journal of Epidemiology* 119: 837-839, 1984.
- Stellman, S.D., Garfinkel, L. Smoking habits and tar levels in a new American Cancer Society prospective study of 1.2 million men and women. *Journal of the National Cancer Institute* 76: 1057-1063, 1986.
- Taha, A., Ball, K.P., Illingworth, R.D. Smoking and subarachnoid hemorrhage. *Journal of Royal Society of Medicine* 75: 332-335, 1982.
- U.S. Department of Health, Education, and Welfare. *International Classification of Diseases: 8th Revision. Tabular List*. Vol. 1. DHEW Publication No. (PHS) 72-1693. Rockville, MD: U.S. Department of Health, Education, and Welfare, Public Health Service, 1972.
- U.S. Department of Health and Human Services. *The Health Consequences of Smoking: Cardiovascular Disease. A Report of the Surgeon General*. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Office on Smoking and Health, 1983.
- U.S. Department of Health and Human Services. *Reducing the Health Consequences of Smoking: 25 Years of Progress, 1989. A Report of the Surgeon General*. DHHS Publication No. (CDC) 89-8411. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1989.
- U.S. Department of Health and Human Services. *The Health Benefits of Smoking Cessation. A Report of the Surgeon General, 1990*. Department of Health and Human Services Publication No. (CDC) 90-8416. Rockville, MD: U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 1990.
- Walker, A.E., Robins, M., Weinfeld, F.D. The National Survey of Stroke: Clinical findings. *Stroke* 12(Suppl 1): I13-I44, 1981.
- Washburn, R.A., Adams, L.L., Haile, G.T. Physical activity assessment for epidemiologic research: The utility of two simplified approaches. *Preventive Medicine* 16: 636-646, 1987.
- Washburn, R.A., Goldfield, S.R., Smith, K.W., McKinley, J.B. The validity of self-reported exercise-induced sweating as a measure of physical activity. *American Journal of Epidemiology* 132: 107-113, 1990.
- Willett, W.C., Green, A., Stampfer, M.J., Speizer, F.E., Colditz, G.A., Rosner, B., Monson, R.R., Stason, W., Hennekens, C.H. Relative and absolute excess risks of coronary heart disease among women who smoke cigarettes. *New England Journal of Medicine* 317: 1303-1309, 1987.
- Willett, W.C., Hennekens, C.H., Bain, C., Rosner, B., Speizer, F.E. Cigarette smoking and nonfatal myocardial infarction in women. *American Journal of Epidemiology* 113: 575-582, 1981.
- Wolf, P.A., D'Agostino, R.B., Kannel, W.B., Bonita, R., Belanger, A.J. Cigarette smoking as a risk factor for stroke. The Framingham Study. *Journal of the American Medical Association* 259: 1025-1029, 1988.

ACKNOWLEDGMENTS The authors are indebted to the participants in the Nurses' Health Study for their continuing cooperation and to Mark Shneyder, Karen Corsano, Gary Chase, Barbara Egan, and Lisa Dunn for their expert help.

This study was supported by research grants HL-34594 and CA-40356 from the National Institutes of Health. Dr. Kawachi is the recipient of an Overseas Research Fellowship of the Health Research Council of New Zealand. Dr. Colditz is supported by a Faculty Research Award from the American Cancer Society—FRA 398.