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**Toward a Less Harmful
Cigarette**

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
NATIONAL CANCER INSTITUTE, BETHESDA, MARYLAND 20014

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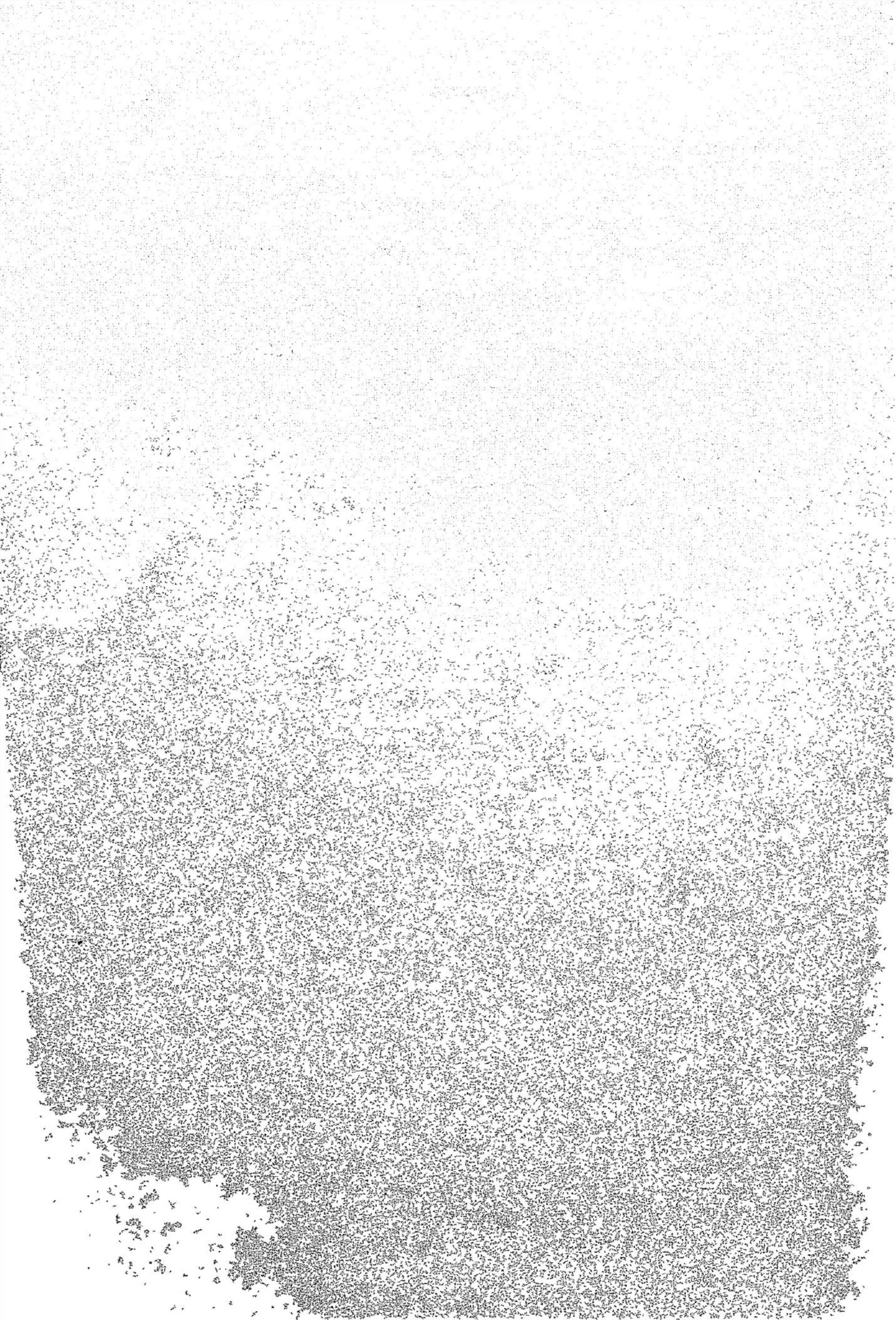
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PREFACE

The proposition that cigarette smoking is hazardous to human health is no longer controversial. We know now that the life expectancy of male cigarette smokers is 3.4 years shorter than that of nonsmokers. We also know that the lifespan of a two-pack-a-day smoker is reduced by 8.3 years. Confronting these figures are the equally cold statistics of 50 million Americans who continue to smoke and whose ranks are joined each year by one million youngsters.

Knowledge on the hazard to health of cigarette smoking has reached the stage where the emphasis can now shift from efforts aimed at determining the degree of hazard to those aimed at reducing or eliminating the hazard. Reduction of cigarette smoking is the prime means for reducing this health hazard. Another hopeful way to attack this major public health problem is through the development of a less hazardous cigarette. Many obstacles to be overcome in reaching this goal have been considered by a panel of experts. Their deliberations, as published in this monograph, should be useful to many: to those manufacturers who recognize their responsibility for helping produce and market less hazardous cigarettes, to scientists who must develop the capability for testing such products, and to regulatory agency personnel who may be called on to establish and monitor cigarette manufacturing standards.

The Public Health Service is prepared to assist in all these activities. We will share with industry the burden of research and help evaluate claims and set standards. Thirty years ago, if we had had today's knowledge about the hazards of smoking and had acted upon it, thousands of those dead or dying of cigarette-related diseases could have been saved. Thirty years from now there must be no need for such expression of regret.

WILLIAM H. STEWART, M.D.
SURGEON GENERAL
U.S. PUBLIC HEALTH SERVICE



FOREWORD

The scientific deliberations of this workshop will certainly unravel some of the complexities surrounding the problem of steps that should lead "Toward a Less Harmful Cigarette." In the three sessions that are to be devoted to this subject, we shall review evidence relating to dose and to specific factors in tobacco and tobacco smoke that may be injurious to health, and we shall discuss ways in which man's exposure to smoke as well as to specific possibly harmful smoke constituents can be reduced.

Available evidence indicates that diseases related to cigarette smoke occur roughly proportional to the number of cigarettes an individual smokes per day. Similarly, increasingly greater applications of tobacco-smoke condensate to animals lead to an increased incidence of tumors. Such findings have been interpreted to reflect a dose-response relationship. The basic data and their possible interpretation in respect to man will be discussed.

Next, our discussions will center on specific substances in tobacco and tobacco smoke already known or suggested to adversely affect human health. Although there are some indications of the effects on man of certain specific smoke constituents, most of this evidence is based upon laboratory studies. The carcinogenic effect of tobacco-smoke condensate on experimental animals has been ascribed to the interaction of specific smoke constituents. The nature of components specifically related to bronchitis and emphysema is less clear. Some laboratory evidence suggests that nicotine affects the cardiovascular system through its apparent influence on peripheral vascular circulation, mobilization of fatty acids, and blood coagulation.

We shall also deal with the practical application of our present knowledge. If we conclude that it would be germane to decrease or eliminate man's exposure to certain constituents of tobacco smoke, we need to discuss which information available from laboratory work might be helpful in attaining this goal. The participants' presentations will certainly contribute to a clearer definition of the "less harmful cigarette," hopefully, not only from an academic point of view but also in such a way that it can be applied to man's health.

I appreciate that so many investigators from this country and abroad, from private research institutions and industry, have taken time out of their busy schedules to attend this workshop. It is my earnest hope that the deliberations will help toward elucidating the task before us.

ERNEST L. WYNDER

INTRODUCTION

The particulate matter in cigarette smoke, commonly called tar, has long been known to contain carcinogenic chemicals, while nicotine, also in tobacco smoke, is highly toxic and is suspected of being a cause of cardiovascular disease, particularly coronary thrombosis. It has been well established that the degree of health damage caused by cigarette smoking is related to dosage as indicated by the amount smoked, the degree of inhalation, and the length of time that one has smoked.

The American Cancer Society, therefore, has long urged measures to reduce the tar and nicotine in cigarettes smoked by individuals who are unable or unwilling to give up smoking. To aid in the accomplishment of this, we first urged the Federal Trade Commission to permit and later urged the Commission to require that information concerning the tar and nicotine of cigarette smoke be provided on cigarette packages and in cigarette advertising. This information, we feel, would permit individuals who wish to do so to select cigarettes with a low tar and nicotine content and would encourage tobacco companies to produce and market low tar-nicotine cigarettes.

The reason that the American Cancer Society and the National Interagency Council on Smoking and Health have said little about this is that we do not wish to detract from efforts to get smokers to stop smoking and to discourage non-smokers, particularly boys and girls, from starting the habit. We have feared that publicity concerning the possibility of less harmful or so-called "safer" cigarettes would encourage youngsters to think that before smoking would cause them any harm, "safe" cigarettes would be available. We were concerned also that such publicity would lead to false hopes relative to the actual safety of cigarettes that can be produced.

However, in a conference such as this, we feel strongly that frank scientific discussion about the possibilities of developing cigarettes that will be less harmful and still satisfying to smokers is an important aspect of our efforts to reduce the tragic toll of illness, disability, and premature death caused by cigarette smoking.

The National Interagency Council on Smoking and Health, therefore, wishes to express its appreciation to Dr. Ernest L. Wynder who has organized this "work group"

and to those of you who have accepted his invitation to participate. We hope that you will discuss with complete frankness all aspects of this difficult, controversial, but important, subject and that out of your discussions will come suggestions and guidelines for future research and developments in this field.

Co-Chairman

HAROLD S. DIEHL, M.D.

Deputy Executive Vice-President

for Research and Medical Affairs

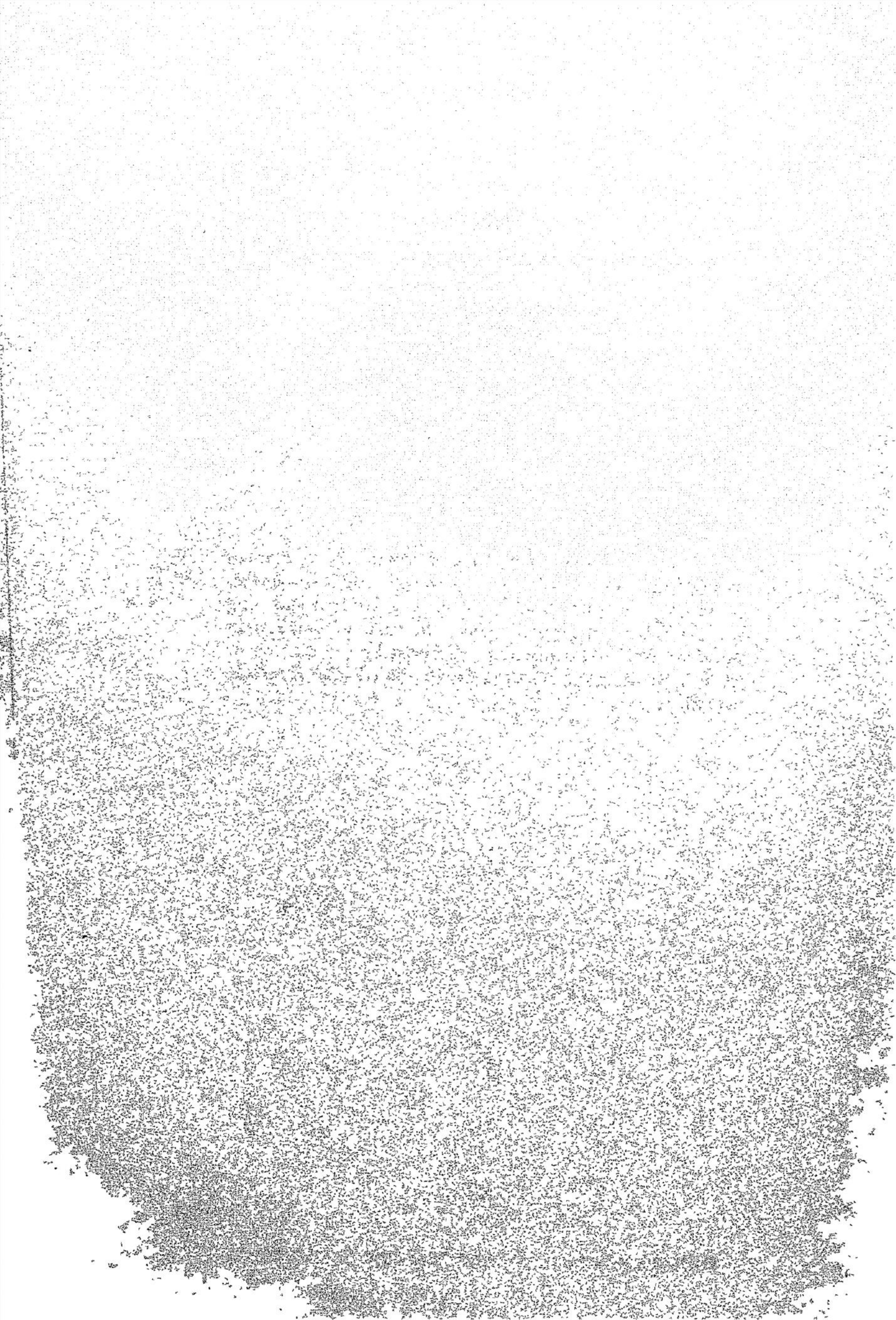
American Cancer Society, Inc.

New York, New York

Chapter I

Part 1—EPIDEMIOLOGICAL EVIDENCE

There exists a dose response between the number of cigarettes smoked and overall mortality and a specific relationship to death from myocardial infarction and lung cancer. There is general agreement that a reduction in total smoke exposure will be followed by a reduction in risk from diseases known to be associated with cigarette smoking.



Quantitative Relationship Between Cigarette Smoking and Death Rates

E. CUYLER HAMMOND, *Sc.D.*, *Department of Epidemiology and Statistics, American Cancer Society, Inc., New York, New York 10019*

THE three most commonly used indexes of degree of exposure to cigarette smoke are: 1) number of cigarettes smoked per day, 2) depth of inhalation of the smoke, and 3) years of cigarette smoking (or age at start of cigarette smoking). No matter which of these is used, death rates of current cigarette smokers increase with degree of exposure (1). In this paper we will only consider the first of the three indexes. Our major concern is with the shape of the curve indicating the relationship between death rates and the number of cigarettes smoked per day.

The solid line in text-figure 1 shows the death rate of men who never smoked regularly and the death rates of men smoking various numbers of cigarettes per day as reported in one study (1) for men in age group 45-54. It is similar to the dose-response curve found in many other studies of this subject. The shape has aroused considerable curiosity. Smoking as few as 1-9 cigarettes a day appears to result in a surprisingly large increase in death rates. Considering this, smoking 40 or more cigarettes per day appears to produce less additional effect than might have been expected from usual experience with dose-response relationship.

I have long suspected that, in actual fact, light cigarette smoking produces considerably less effect upon death rates and heavy cigarette smoking produces somewhat more effect upon death rates than would seem to be the case if the observations are taken at face value. My reasons are as follows:

Many cigarette smokers smoke about the same number of cigarettes each day over a period of years (2). However, depending upon circumstances, an individual smoker may stop smoking, increase his daily consumption, or decrease his daily consumption. State of health has considerable influence on this (3). That is, cigarette smokers often stop smoking or reduce their daily consumption if they become ill or have a heart attack. Some-