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185 W. State Street
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SMOKING AND LUNG CANCER;

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Teaching Reference Guide

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185 W. State Street
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- NEW JERSEY (STATE) DEPARTMENT OF HEALTH
- NEW JERSEY STATE DEPARTMENT OF EDUCATION
- AMERICAN CANCER SOCIETY, NEW JERSEY DIVISION

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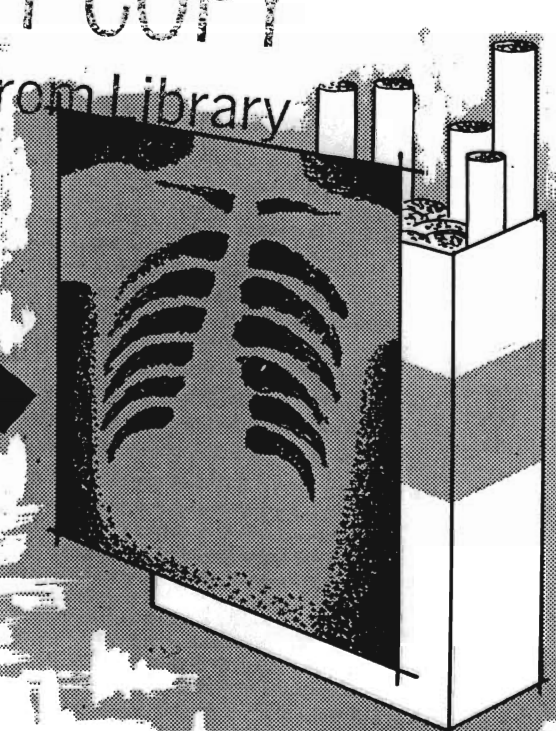


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FOREWORD

PAGE 1 In December 1960, deeply concerned about the increasing weight of scientific evidence linking
2 cigarette smoking and lung cancer, Dr. Roscoe P. Kandle, New Jersey State Commissioner of
3 Health, called for the formation of a State-wide planning committee representing school, health
4 and parents' groups. This Committee met initially in January of 1961. Through its efforts and
5 under the joint sponsorship of the New Jersey State Department of Health, the New Jersey Di-
6 vision of the American Cancer Society and the New Jersey State Department of Education, a
7 sourcebook for teachers on cigarette smoking and lung cancer was developed. Dr. George Krablin
8 and Dr. Kenneth Runquist of the faculty of Trenton State College, prepared the original source-
9 book material which was issued in a format designed for limited testing in the classroom. During
10 the 1961-62 school year approximately one hundred and twenty-five teachers in schools through-
11 out New Jersey developed teaching units based on this sourcebook material. The schools selected
12 for the test period were urban, suburban and rural. Grade levels ranged from five through the
13 senior college year. Units were presented in both self-contained and departmentalized settings.
14
15 Teacher response to the Sourcebook and to the idea of actively working on an important
16 health problem was most enthusiastic. In a number of schools, special teaching techniques were
17 revised. Student and parent groups became involved. At Newton High School (Sussex County)
18 a senior science seminar developed its own questionnaire and surveyed the smoking habits and
19 attitudes of the entire student body. These efforts — some highly successful and some fraught
20 with difficulty — culminated in a one day workshop held at Trenton State College in May, 1962.
21 Forty-two teachers representing all participating schools and grade levels, exchanged ideas and
22 information based on their experience. Their recommendations and suggestions laid the ground-
23 work for more comprehensive and specific revised edition of the Sourcebook. In the actual pre-
24 paration and writing of this material, Dr. Phyllis Busch of the faculty of Montclair State College,
25 added to the original material and the suggestions of participating teachers, a vast amount of
26 research and careful selection of appropriate teaching methods and techniques. I believe you
27 will find the final draft of the Sourcebook to be an invaluable tool, filled with ideas which can
28 make consideration of the subject of smoking and lung cancer, an exciting and worthwhile ex-
29 perience.

30 The problem is real. The concern of this Department, the New Jersey State Department of
31 Health and the New Jersey Division, American Cancer Society, is evident. We will support your
32 interest and activity in every possible way, recognizing that conviction on the part of a teacher
33 and close personal contact with students are among the most effective means for changing atti-
34 tudes and behavior.

Robert S. Fleming
Assistant Commissioner of Education
Division of Curriculum and Instruction
New Jersey State Department of Education

PREFACE

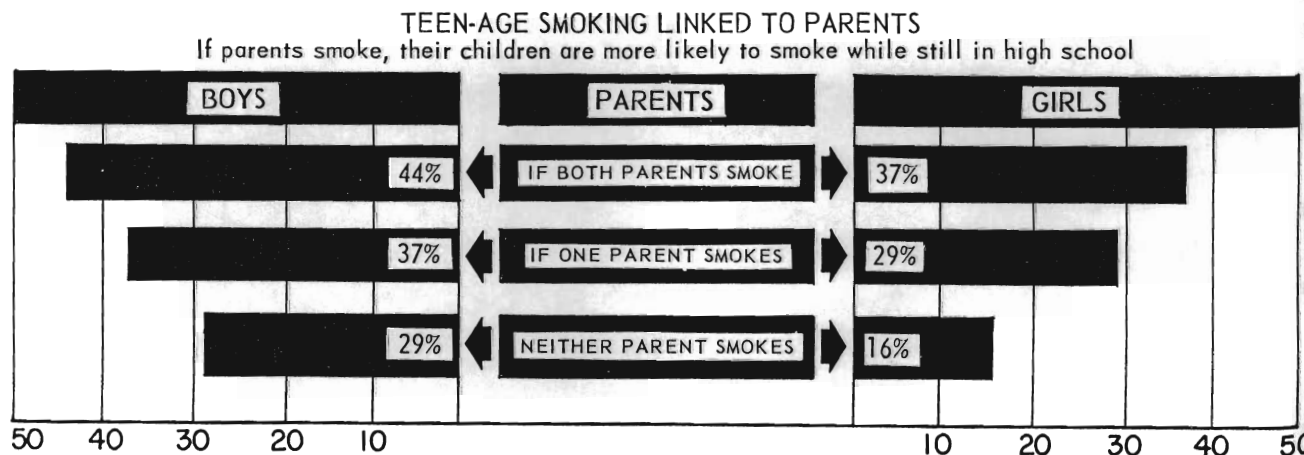
To the Teacher:

Cigarette smokers increase their chances of developing lung cancer. There is no evidence to contradict this conclusion. This does not mean that smoking cigarettes is considered to be the sole cause of lung cancer, for air pollutants, including auto exhaust and other irritants, are also a contributing factor to lung cancer.

From the practical standpoint, there is ample evidence to justify advising the public and particularly young people that cigarette smoking is one of the causative factors in lung cancer, and that it has a detrimental effect in diseases of the heart and circulatory system and other chronic diseases and that abstention from smoking is a means of lowering the incidence of lung cancer.

Smoking is a habit based on psychological and physical factors which may be obscure or deep-seated in an individual. Research studies on why teen-agers begin to smoke show that the motivations are complex, that they are strong and that the decision to smoke is not made in terms of good or poor health practices.

One million children now in school will die of lung cancer disease, if present trends continue, before they reach 70. Today about 44 per cent of all high school seniors and 21 per cent of all freshmen smoke — one in three high school students. The American Cancer Society's Teen-Age Program on Cigarettes and Lung Cancer seeks to help both parents and youngsters arrive at decisions based on the evidence. The program was based on a year's study of student attitudes towards smoking in Portland, Oregon, and ways of influencing them. Single most important factor in a youngster's smoking is whether or not his parents or other siblings smoke.



The work was developed with four grade levels in mind: elementary school, junior high school, senior high school, and college. The material is presented in a series of seven logical **PROBLEMS**, with **SUGGESTED METHODS OF PROCEDURE** which can be followed in solving these problems. Each teacher should select from among the several suggested solutions to each problem, one or several which may be appropriate to the grade and to the ability of his class. The time element must also be considered here, since some solutions may take more than one lesson.

Although answers and solutions are suggested, the teacher should permit the class to seek and develop its own results for most effective learning.

The Appendix contains background material useful to the teacher. Included also is a section suggesting additional ideas and techniques for brighter and/or more interested students, some "Debatable Statements," a statement from the United States Public Health Service and a reprint of a questionnaire on smoking.

The bibliography has been brought up to date although the teacher must remain alert for new material which is constantly appearing in the daily press, books, and magazines.

Films have been reviewed and are annotated. The best evaluation of a unit such as this is to design some means to find out how much smoking among your students has decreased following the teaching of the unit.

The relation of tobacco to the health of the American people is causing great and increasing concern, not only to the American Cancer Society but also to the American Heart Association, the American Public Health Association and the National Tuberculosis Association. A precise statement of this problem has been made public for the United States Public Health Service by the Surgeon General.* Statements of varying degrees of concern also have been made by health officials of Holland, Great Britain, Sweden, Canada, the International Union Against Cancer, and similar agencies.

In view of available information, a clear responsibility exists to make sure that these scientific facts are made known to our young people before they make a decision to start smoking. This responsibility is shared by the school with parents and with community health agencies.

This source book has been designed to facilitate the teaching of a unit, "Smoking and Lung Cancer" by presenting the essentials from which the teacher may prepare a series of lessons.

SOME MOTIVATING TECHNIQUES

- A. A teacher always has his goals in sight. He selects, with an eye for the achievement of these goals, those learning experiences most appropriate to his program. Effective teaching begins with stimulation of the students. This stimulation consists of conveying to the student a realization of the importance of the proposed learning experiences.

The list of motivating techniques which follow suggests a variety of ways in which the teacher might try to accomplish this important introductory step: stimulating the student to want to learn that which is vital about smoking and lung cancer. The suggestions are purposefully varied so that each teacher may select whichever technique (s) he knows to be most appropriate for his class.

1. It is easy to collect many clippings on smoking. Distribute one to each student or pair of students. After clippings have been read, discuss the fact that so much is being written on cigarette smoking and lung cancer today.
2. "It is estimated that 1,000,000 children now in school will die of lung cancer before they are 70." Discuss this statement.
3. Present slides, charts, or both, of normal cells and cancerous cells.
4. Invite a doctor or nurse to address the group on cancer in general or lung cancer in particular.
5. Call attention to a bulletin board which you have posted with articles on lung cancer and smoking.
6. Show one of several films on the topic. It may be of a general introductory nature on cancer such as "Man Alive" or a more serious one dealing with lung cancer.
7. The smoking device (Appendix, p. 00) can help students to determine whether nicotine affects goldfish favorably or not.
8. Using a smoking device, collect some nicotine-stained cotton and permit the students to smell it.
9. Discuss what is known about statistics of the use of cigarettes and the number of deaths from lung cancer. Start by reading these two excerpts from *Scientific American* of July, 1962.
 - a. "In the period from the early 1920's to 1960, the consumption of manufactured cigarettes in the United States rose from about 750 per adult per year to 3,900 per adult per year. During the same period the consumption of tobacco in all other forms declined by about 70 per cent. The net result was that consumption rose about 30 per cent."
 - b. "During the past half-century, total death rates — including death rates from almost all infectious diseases and some non-infectious ones — have declined rapidly. Lung cancer is a striking exception. Deaths from lung cancer in the United States have climbed from 4,000 in 1935 to 11,000 in 1945 and to 36,000 in 1960. The toll in 1960 was approximately equal to the number of deaths caused by traffic accidents."

PROBLEMS

It is not enough to keep revising scientific information in order to bring it up to date. It is equally important to revise the methods of presenting scientific data. Teaching encompasses more than a presentation of a body of established facts. We must not represent any phase of science as a body of irrevocable truths since these "truths" are constantly being changed. It is this element of change which must be understood and appreciated.

Teaching by introducing problems and guiding the students in the solution of these problems results in achieving the necessary scientific facts, together with an understanding of the kinds of processes in which scientists engage as they seek to understand our world. It is this continuous inquiry which results in changing concepts.

The seven problems which follow can each be solved in a number of different ways. Several solutions are suggested for each problem. The teacher may find one or more suitable for his class. Stimulating discussion may lead to an entirely new method of solution. It is in such activity that teaching is most exciting and most creative. In fact, new solutions should lead to new problems which should lead to new solutions and so on.



Thus, when the teacher engages in teaching as inquiry, he succeeds in presenting both the facts of science as they stand for the moment, and an appreciation of the methods of science as they may lead to new facts tomorrow.

PROBLEM I. WHAT IS CANCER?

SUGGESTED METHODS OF PROCEDURE

1. Take a short neighborhood walk to an area where even a few trees and weeds grow. Look for irregular growths and swellings on tree trunks, leaves, and stems of plants such as goldenrods. These swellings or galls are the result of irritation of plant tissues by insects.
2. The film "From One Cell" distinguishes between normal and cancerous cells.
3. Artificially induced plant growths can be stimulated in the laboratory. Here are three investigations which may demonstrate cancer-like growths:
 - a. Obtain a mixture of 100 parts of lanolin to one part of indolacetic acid (or naphthaleneacetic acid or indolebutyric acid)* and some young tomato plants. Apply a small amount of this mixture to the stem of a plant. Use a glass rod. Results should be apparent in a few hours. Enlarged cells will cause the plant to bend away from the area of application. Continued observation should be made. Roots often appear at this area. An experiment may be set up where students investigate whether other plants react similarly.
 - b. Grow several kidney beans. When some leaves have appeared, cut the stem just below the new compound leaf's petiole. Apply some of the chemical mixture to the stump. Watch for the appearance of a growth. Encourage experiments with a variety of plants in order to compare reactions of different kinds of plants.
 - c. If the stems of growing plants such as beans, sunflower, etc. are painted with diluted tar or a solution of ammonia in water, irregular masses of cells will be stimulated to grow. Again encourage experimentation with varieties of substances and plants.
4. Obtain slides showing the differences between normal and pathogenic cells.**
5. Discuss how lung cancer develops. (One excellent reference is Hammond's article (Bibliography C-9).

* This mixture can be obtained in a prepared form from a biological supply company.

** One such source is Carolina Biological Supply Co., Elon College, N. C. Send for information.

UNDERSTANDINGS

Cancer is an uncontrolled growth of cells. Normally, the rate at which cells divide is regulated. After normal cells divide they change to become adapted for different functions. They form parts of tissues and organs. Cancer cells do not develop into tissues and organs. Once Cancer cells start multiplying they ordinarily continue.

Tumors are masses of cells resulting from abnormal cell growth.

If a lump of useless cells has a covering which localizes it, the growth is a benign tumor. Such tumors may be harmless.

If a growth is not enclosed in a covering, it is considered a malignant tumor and can spread to other parts of the body. Cancer may spread by growing out into other tissues. Or pieces of abnormal growth may enter the blood and be carried elsewhere to start another growth. Early Cancer detection can often prevent this spread.

The passageways in the lungs are the trachea (windpipe) and its branches (the two bronchi and their smaller subdivisions, the bronchioles). The lining of this pathway consists of two layers of epithelial cells. The outer layer has hairlike bits of protoplasm, cilia, which are constantly in motion. This motion causes the movement of fluid which is normally found on these surfaces, to be directed toward the mouth. The fluid carries foreign particles. When these reach the mouth, one either swallows this material or expectorates it. Tobacco smoke has been shown to affect these cilia in such a manner that their action is either slowed down or stopped altogether. This results in allowing cancer producing substances from inhaled cigarette smoke or from polluted air to accumulate, irritate the thin linings, and cause cancer.

NOTES:

**USE THESE PAGES FOR ADDITION OF TEACHING IDEAS,
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PROBLEM II. WHAT ARE THE CAUSES OF CANCER?

SUGGESTED METHODS OF PROCEDURE

1. Show the ACS film "Cancer — A Research Story."
2. Discuss suggested causes of cancer — virus, irritations, radiation, etc.
3. Contrast **experimental evidence** observable in the experiments presented in problem I with **statistical evidence** such as is presented in the following reports:

"Men over 50 with a history of regular cigarette smoking have a death rate from all causes that is approximately 52 per cent above the death rate for men who have never smoked. Cancer of the lung and diseases of the heart account for most of the differences."

"Cancer of the lung is a rare disease among men who never smoked, but second only to heart disease as a cause of death in those smoking two packs a day."

"All together, fifteen similar studies have arrived at the same view — a decided association between the use of tobacco and cancer of the mouth and lung. No statistical study has proved contrary data."

"Of 19,797 sections of lung tissue from 402 men who died in Veterans' Hospital, East Orange, New Jersey, little or no dormant cancer cells were found in the tissues of non-smokers, but in the lungs of regular smokers, dormant cancer cells were found. The more the man had smoked, the greater the number of cells were present capable of developing into cancer."
4. Do research reports on experiments with tarlike tobacco products and cancer such as the work of A. H. Roffo in 1939. (Referred to in article listed in bibliography under C-9.)
5. Perform experiments on plants and animals designed to stimulate cancerous growths. For details see bibliography B-12.

UNDERSTANDINGS

The basic cause of cancer is still unknown.

Chronic inflammations, repeated injuries, or repeated irritations are frequently associated with cancer. Types of irritations which can produce cancer are:

1. Mechanical — such as skin irritations by warts or lip irritation by pipes.
2. Chemicals such as coal tars, dyes, lead compounds, nickel compounds, dusts containing radioactive particles.
3. Heat from repeated burning of areas of the skin and lips.
4. Prolonged exposure to sun.
5. Exposures to such substances as X-rays or radioisotopes.

Cancer is not inherited. There is, however, a familial tendency in certain types of cancer (familial polyposis).

Cancer is not contagious; some recent investigation which is linking cancer with a virus suggests a possibility of contagion. However, there is no general acceptance of this idea at present.

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PROBLEM III. WHAT DO WE KNOW ABOUT

SMOKING AND CANCER IN GENERAL?

SUGGESTED METHODS OF PROCEDURE

1. The history of tobacco and smoking habits in this country and elsewhere is interesting. (See Bibliography pamphlet B-2, p. 6)
2. Discuss the ingredients of tobacco and their effect on the body. (See Bibliography pamphlet B-2 and introduction in article C-12 listed in Appendix)
3. Numerous experiments have been performed which are designed to increase our information in this area. These should be discussed. Here is an example of one:
In 1953 Dr. Ernest L. Wynder of Sloan-Kettering Institute wanted to find out whether cigarette smoke had any factors in it which were cancer-producing. He collected tobacco tars during a process which simulated human smoking habits as closely as possible. A machine did the smoking and a popular brand of cigarettes was used. As the smoke condensed, a dark brown liquid formed. This was collected. Of 81 mice who had this tar product applied to them over a series of two months, 36 developed cancer of the skin. It took 71 weeks for this cancer to appear. Sixty-two mice were alive at the end of the year; fifty-eight per cent developed cancer. (Seventy-one weeks is about half the life span of these mice. This corresponds roughly with the fact that in the human, about 30-35 years of smoking precedes signs of lung cancer.)
4. Experiments to demonstrate cancer development on mice by using tar derivatives might be shown here. See Appendix, p. 00

UNDERSTANDINGS

Smoking became more prevalent than ever after World War I. Women began to smoke in public at that time.

Some 150 substances have been identified when tobacco is burned.

The physiological effects are produced by the nicotine. Nicotine affects nerve tissue and thus affects many organs.

Tobacco tar, when applied to the skin of mice, in a dose comparable to the tar from a pack of cigarettes per day, produced cancers in more than half the number of animals. It is difficult to use mice in smoking experiments because their breathing system has a more efficient means of filtering the air which they breathe in than human beings have. Furthermore, humans inhale the smoke through their mouths. If mice are exposed to large enough doses of smoke to be comparable to human inhaling, it usually results in killing the animals.

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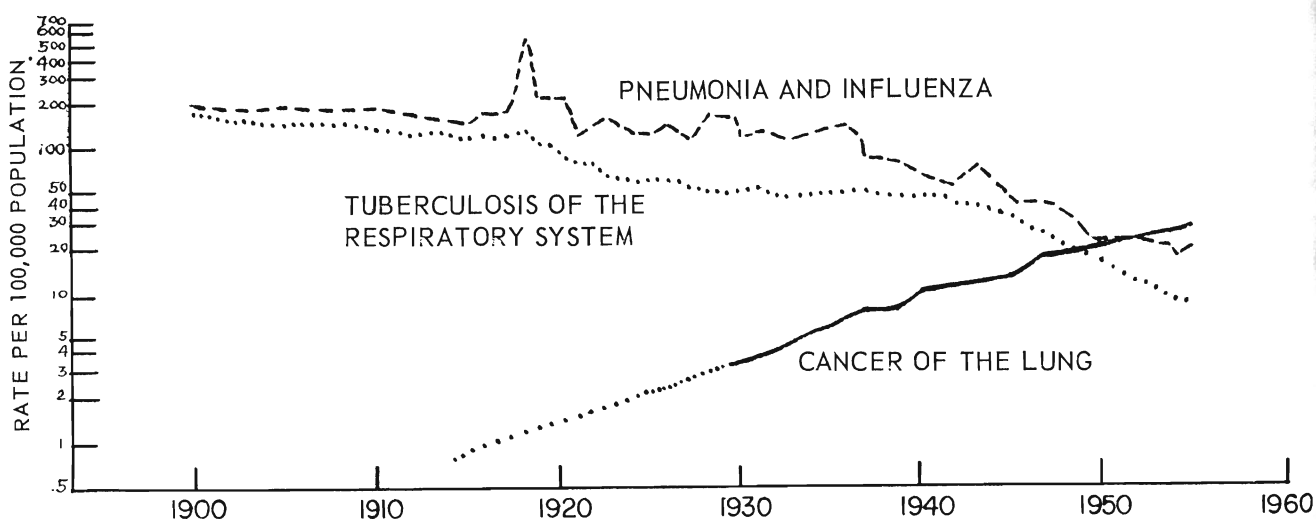
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PROBLEM IV. WHAT EVIDENCE IS AVAILABLE FROM CURRENT RESEARCH ON THE ASSOCIATION BETWEEN LUNG CANCER AND SMOKING?

SUGGESTED METHODS OF PROCEDURE

1. Analyse the findings from several research studies. A series of graphs, tables, etc., such as the eight which follow ("a" through "h") could be duplicated and distributed to the students. Together with each of these sets of data, present the problem which was investigated. From the information thus assembled, permit the **STUDENTS** to analyse the results and present **THEIR** observed conclusions.
 - a. **WHAT HAS BEEN THE TREND IN DEATH RATES FOR PNEUMONIA, INFLUENZA, TUBERCULOSIS OF THE BREATHING SYSTEM AND CANCER OF THE LUNG AMONG WHITE MALES IN THE U. S. FROM 1900 to 1955?**



NOTE TO THE TEACHER:

Note that according to the above graph, whereas lung cancer has increased, the other lung diseases have decreased. One may interpret this to mean that there is a relation between the rise of cancer and a drop of the other pulmonary diseases. This shows a weakness in this type of study, called the time-trend association.

In 1914 the death rate per 100,000 males from lung cancer was .7; in 1956 it rose to 28.4. What caused this? Apparently something which entered the lungs was responsible. Among such suspicious substances are cigarette fumes, motor vehicle exhaust fumes, fuel oil fumes, coal soot, dust from asphalt highways. These have been shown to be cancer-inducing in the laboratory. Only the use of coal has generally decreased. Thus, there appears to be a direct relation between the incidence of lung cancer and one of these agents.

b. IS A RISE OF LUNG CANCER FOUND IN ANY OTHER COUNTRY? The following data is from the Doll-Hill study (Bibliography C-5) which has been initiated in the United Kingdom, and is still in progress.

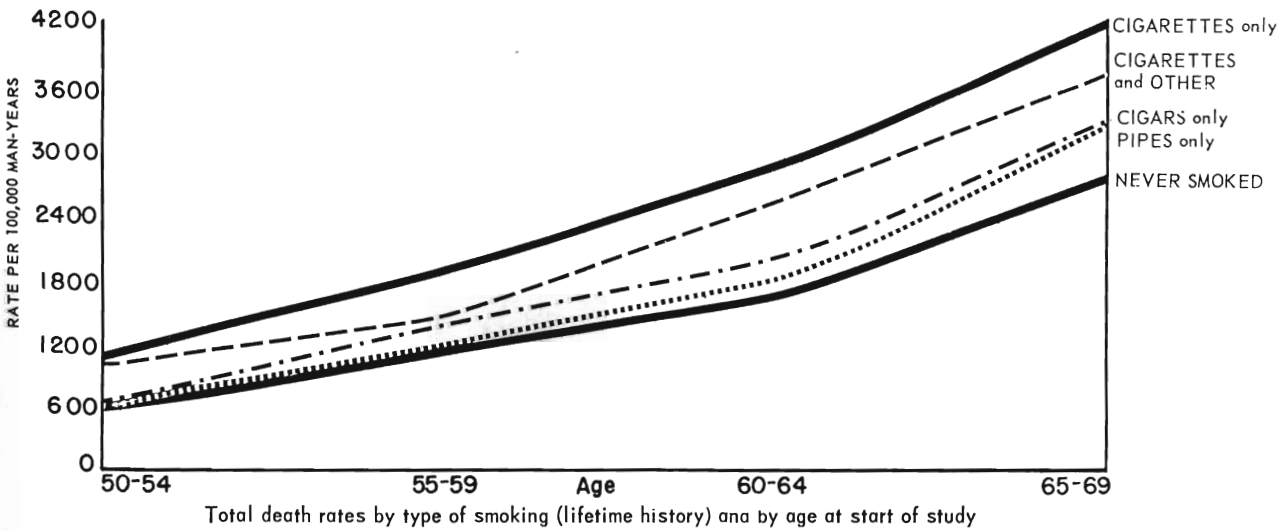
Period	* Pd.	Cancer of Lung-Men	Cancer of Lung-Women
1916-20		146	87
1921-25		255	121
1926-30		481	177
1931-35		1,158	324
1936-40		2,020	463
1941-45		3,090	566
1946-50		5,031	761
1951-55		7,348	980
1956-59		9,108	1,202

* From table — P. 14, **Smoking and Health**, Report of the Royal College of Physicians of London.

Note to the teacher:

This study includes both men and women. There is a very great increase in lung cancer among both sexes in the United Kingdom. This is in keeping with similar findings in the United States.

c. HAS ANY RELATIONSHIP BETWEEN TOTAL DEATH RATES AND SMOKING BEEN FOUND?



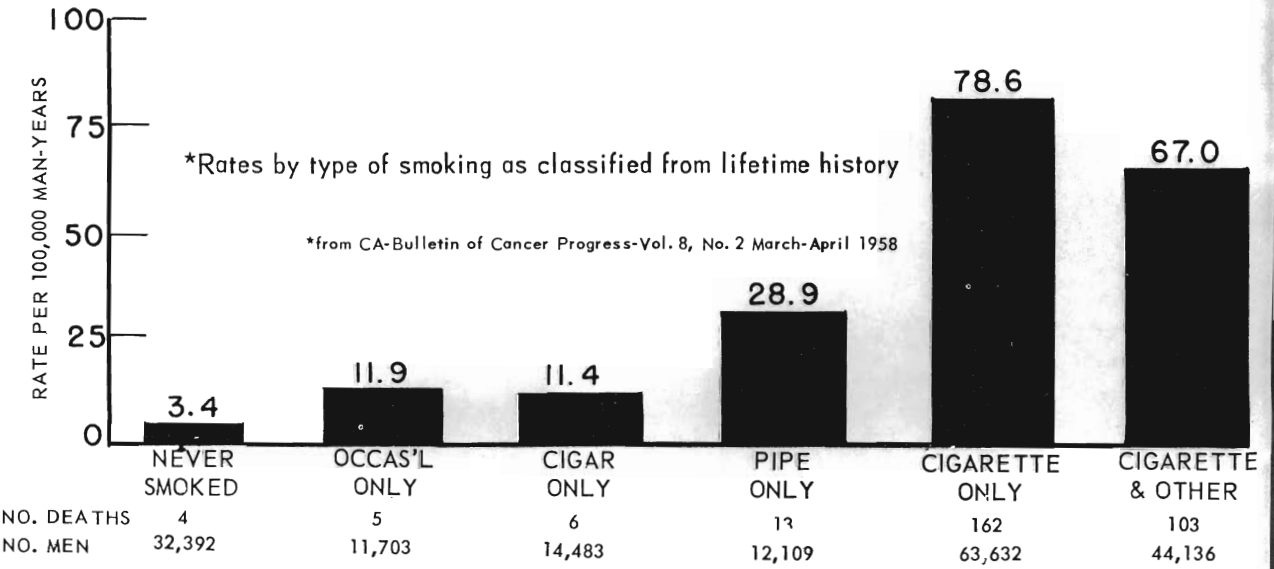
(See explanatory note which follows on page 26)

Note to the Teacher:

Graph "c." at the bottom of page 25 is from the Hammond-Horn study, 1958 (Bibliography C-9). A very high degree of association exists between total death rates and cigarette smoking; a lower degree of association exists between total death rates and cigar smoking; a small degree of association exists between total death rates and pipe smoking.

This type of study is known as the **PROSPECTIVE** study, is considered to be the most reliable, and is currently in use in the many countries carrying on such research. In this type of study, investigators are trained to give carefully designed questionnaires to large numbers of people. Regular checkups are made on these people. Causes of death are investigated. Data is then assembled and studied.

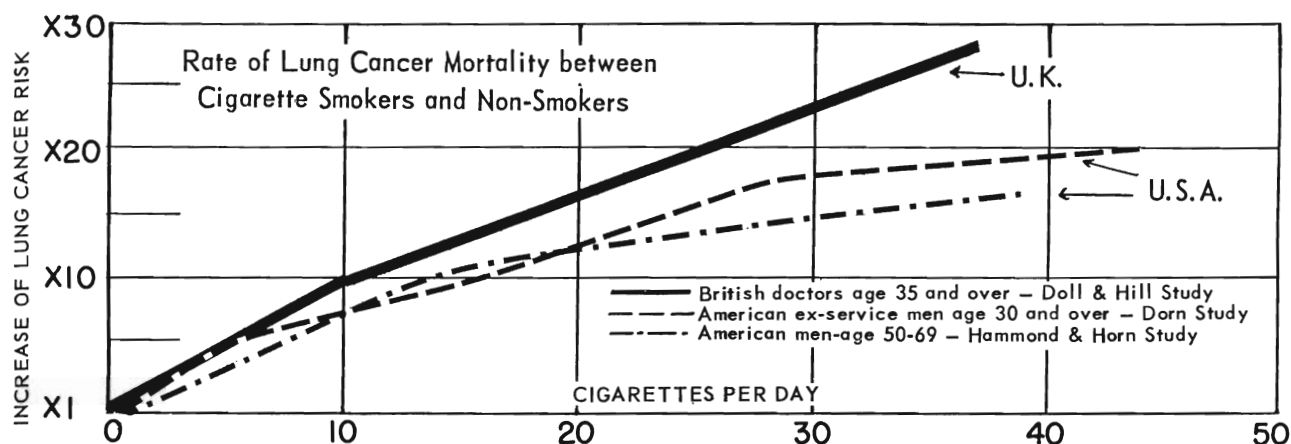
d. **WHAT RELATIONSHIP EXISTS BETWEEN LUNG CANCER AND SMOKING?** (We have already learned that lung cancer is increasing and that the total death rate of smokers is greater than that of non-smokers)



Note to the Teacher:

Association between lung cancer and smoking is very high, especially between lung cancer and cigarette smoking. The graph indicates that 3.4 deaths from lung cancer per 100,000 man-years for men who never smoked occurred, as compared with 78.6 deaths from lung cancer per 100,000 man-years for men or those who smoked cigarettes only.

e. WHAT IS THE RELATIONSHIP BETWEEN DEATH FROM LUNG CANCER AND THE NUMBER OF CIGARETTES SMOKED?

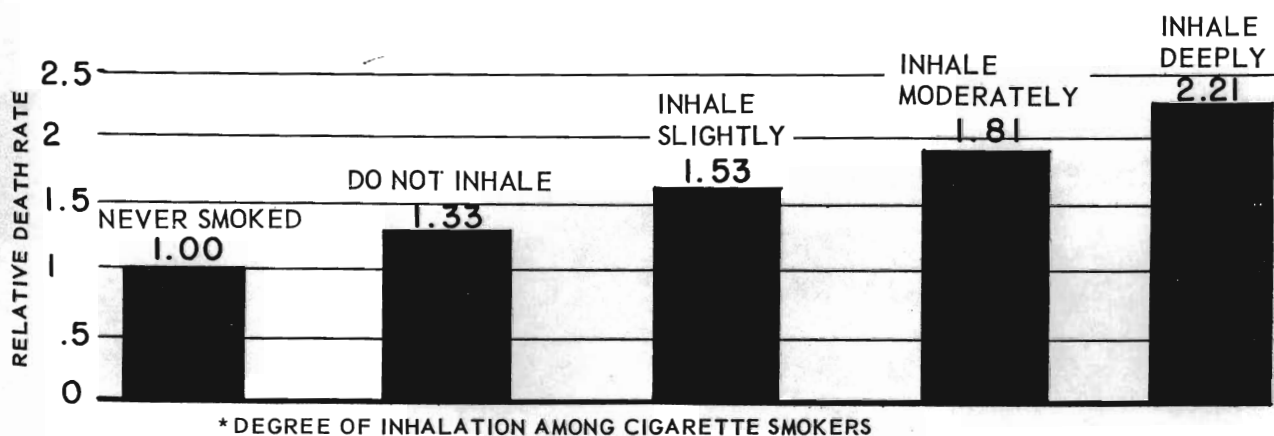


from the 1962 Report of the Royal College of Physicians - Smoking and Health, p. 17 (Bibliography, A-8).

Note to the Teacher:

Three independent studies show that the danger of death from lung cancer increases with the number of cigarettes smoked. Note: British smokers leave smaller stubs on their cigarettes and live in more polluted air in industrial areas.

f. WHAT IS THE RELATIONSHIP BETWEEN THE TOTAL DEATH RATE AND THE DEGREE OF INHALING?



*from E.C. Hammond, "The Effects of Smoking", SCIENTIFIC AMERICAN July, 1962, p. 47.

Note to the Teacher:

This is from the newest study being conducted in the United States. (Bibliography C-9). It involves 1,079,000 men and women over the age of 30. It was started in 1959 and will run for six years. The above data is for the first 10-1/2 months. Many problems concerning cigarette smoking will be investigated. Among these is the degree of inhalation. This graph shows that there is a great increase in death rate as the degree of inhalation increases.

CITIES AS COMPARED TO RURAL AREAS?



Note to the Teacher:

Death rates from lung cancer were found to be higher in cities than in the country, 39% lower in rural areas. Lung cancer was high among regular cigarette smokers and low among men who never smoked, regardless of **WHERE** they lived.

h. HOW DOES DEATH FROM LUNG CANCER AFFECT FORMER SMOKERS?



Note to the Teacher:

Men smoking one pack or more of cigarettes a day in 1952 had a much higher death rate than those who previously smoked this much but had given it up for from one to ten years. Those who stopped ten years or more had an even lower death rate. The number of years one smokes cigarettes, as well as the number of cigarettes smoked, appears to be significant.

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2. Instead of presenting the material, as outlined above in (1), students may present the details of this research plus others in order to assemble all the known facts based upon such investigations from available original sources. (See bibliography)
 3. Compare prospective surveys made in Great Britain with some made in the United States. (See bibliography A-8, B-6, C-1, C-5, C-9)
 4. Distribute copies of "A Statement of the United States Public Health Service." (Copies may be made from statement in appendix.) Discuss.

Understandings

1958

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low

During the sixty years from 1900 to 1960 total death rates decreased rapidly. The one exception is lung cancer. Deaths from this disease numbered 4,000 in 1935; 11,000 in 1945; 36,000 in 1960. It is estimated that the number of deaths from lung cancer in 1960 was equal to the number of deaths from traffic accidents. (This fact will be emphasized again)

Investigations in other countries corroborate this finding, that deaths from lung cancer are increasing.

Men with a history of regular cigarette smoking only have the highest death rate, and men who never smoked have the lowest death rate.

Persons who smoke cigarettes develop lung cancer much more frequently than do non-smokers of the same age. Cigarette smoking is the major cause of lung cancer. Also, danger of death from lung cancer increases as the number of cigarettes smoked is increased.

Death rate increases as the degree of inhaling cigarette smoke increases.

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Although death rates from lung cancer were found to be higher in cities than in rural areas, death rates from lung cancer were higher among cigarette smokers than among non-cigarette smokers, whether urban or rural.

Death rates from lung cancer drop among those who have given up smoking and who cut down on their smoking; the longer the period of non-smoking, the lower the death rate.

NOTES:

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PROBLEM V. HOW EFFECTIVE ARE FILTERS AS A SAFETY MEASURE FOR PROTECTING SMOKERS AGAINST THE EFFECTS OF TAR?

SUGGESTED METHODS OF PROCEDURE

1. Read the following statements which the Public Health Service believes to be justified by studies which have been made thus far. Then discuss them.
"No method of treating tobacco or filtering the smoke has been demonstrated to be effective in materially reducing or eliminating the hazard of lung cancer.
Unless the use of tobacco can be made safe, the individual person's risk of lung cancer can be reduced by the elimination of smoking."
2. Bring in a variety of filter tip cigarette ads. Discuss why the ads are an admission by the cigarette companies that cigarette smoke is harmful.
3. Have someone report on the test on filter cigarettes conducted by **Consumer Reports**, December 1958.
4. Report on experimental inadequacies of filters. **New York Times**, August 25, 1962, page 24 and bibliography C-3.
5. Try some of the following experiments.
 - a. Which brand of cigarettes leaves the greatest tar residue?
 - b. Which filter is most effective in cutting down the amount of tar which is inhaled?
 - c. Other ideas for investigation will present themselves to the students.

Set up the apparatus as illustrated on page 00. The parts are inexpensive and easily available from scientific supply houses. The depth of color on the wet filter paper will be used as a measure of comparison of the amounts of tar residues left by this smoking device.

Place the lighted cigarette which you are testing tightly into the stem of the buchner funnel. Turn on the aspirator (you can use an exhaust pump.)* Allow the cigarette to burn down to a predetermined length.

Remove the wet filter paper. Examine. Write the name of the cigarette tested on the filter paper. Set aside. Continue with other samples to be tested. After all cigarettes have been tested, examine filter papers and compare results.

* See Appendix, p. 00 for a suggestion on how to make a simpler aspirator.

OR

UNDERSTANDINGS

Fifty-four per cent or more of all cigarettes have filters.

Filters on cigarettes of the same brand vary. Some filter-tip cigarettes yield more tar than non-filter cigarettes.

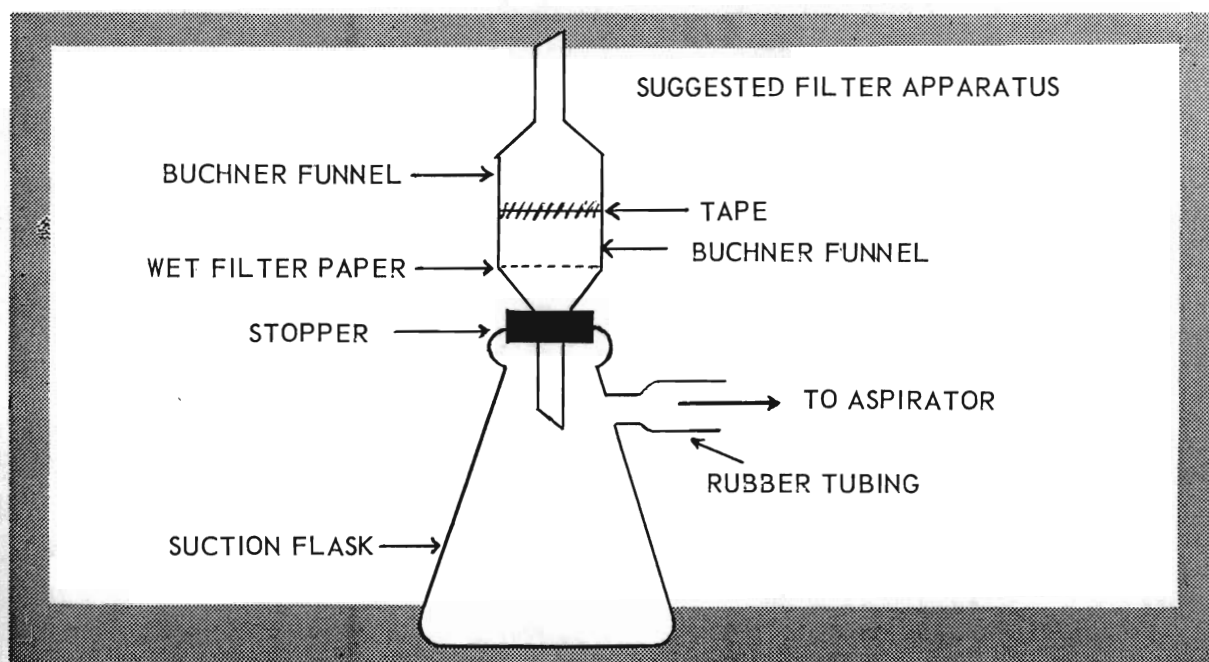
Demand for more taste has prompted some manufacturers to use stronger tobacco with their filters so that the filter is of no value.

Many brands of filter-tip cigarettes now on the market do have a lower tar content and nicotine content than non-filter tip cigarettes.

Filters are made of cellulose acetate which is derived from cotton. Although this is used by all the manufacturers, the effectiveness of the material as a filter depends upon the way each manufacturer handles the material and how tightly it is rolled.

It took three years and millions of dollars to develop cellulose acetate filters. Scientists employed by tobacco industries were searching for a white, clean, tasteless, odorless filtering material.

Filter tips do not eliminate the danger of lung cancer from smoking.



NOTES:

**USE THESE PAGES FOR ADDITION OF TEACHING IDEAS,
CURRENT INFORMATION, ARTICLES OF INTEREST**

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PROBLEM VI. WHY DO PEOPLE SMOKE?

SUGGESTED METHODS OF PROCEDURE

1. A questionnaire which had previously been distributed might be discussed. A copy of one which has been used in a New Jersey school is in the appendix.
2. Discuss the article on teenage smoking (see appendix page 00) Bibliography B-9 is also helpful.
3. Conduct a discussion on this topic which will culminate in a questionnaire which the class develops. The students should then arrange to distribute, collect, study, and report on the results. This activity could be divided among a number of teams.

UNDERSTANDINGS

The most important factor which appears to determine whether or not a student will smoke is the existence of a family history of smoking. (See Preface, "Teen-Age-Smoking Linked to Parents.")

Next in importance, is a combination of the personality needs of the student and the need of the student to achieve status among his peers.

Whatever satisfaction is derived from smoking, smoking becomes a habit. Once it becomes a habit, the person continues to smoke from the habitual use of tobacco, whether or not the original reason for his having started still exists.

NOTES:

**USE THESE PAGES FOR ADDITION OF TEACHING IDEAS,
CURRENT INFORMATION, ARTICLES OF INTEREST**

PROBLEM VII. SHALL I SMOKE?

SUGGESTED METHODS OF PROCEDURE

1. Show the filmstrip from the American Cancer Society, "To Smoke or Not to Smoke."
2. Invite a speaker from the American Cancer Society or invite a neighborhood doctor to address the group on the topic of smoking. Plan class questions in advance of the speech.
3. Plan a debate. (See Appendix for **DEBATABLE STATEMENTS**)
4. Distribute available free literature on the topic of smoking and discuss. One title is "Shall I Smoke?"
5. Have the class plan and carry out a campaign to try to influence the entire student body not to smoke.
6. Plan a PTA meeting designed to bring the latest knowledge to parents. Include some demonstrations. Be prepared to discuss the relationship between teenage smoking and parent smoking (See Preface) and the seriousness of the conflicts which children develop as a result.

UNDERSTANDINGS

There is no question about the association between lung cancer and smoking, particularly cigarette smoking. This information was not known ten or twenty years ago.

During the last thirty years deaths from lung cancer increased rapidly while deaths from other types of cancer increased slowly.

It is estimated that 1,000,000 students now in school will die of lung cancer before they are seventy.

Ten times as many smokers as non-smokers die of lung cancer. One-fourth of all doctors who were cigarette smokers gave up smoking when all this new evidence became available.

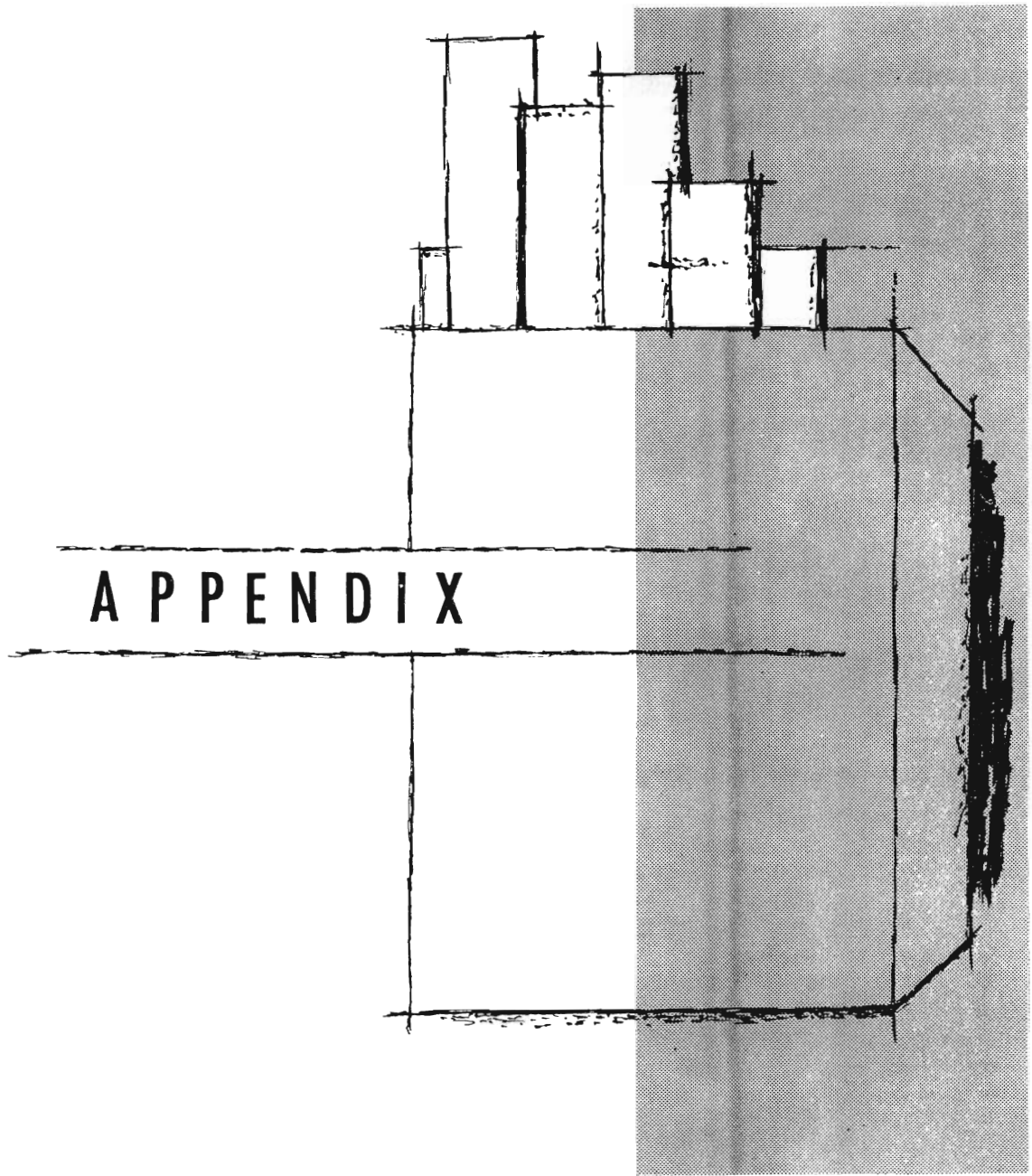
Parents will be interested to have affirmed what they may have read, that coronary disease is the leading cause of death among men in the United States today. In 1960 it accounted for 35% of the death rate among men in their 40's and 50's. Among cigarette smokers the death rate was 70% higher than non-smokers. (Two studies which may be useful and which deal with smoking as it relates to coronary disease are reported in the **NEW ENGLAND JOURNAL OF MEDICINE**, April 19, 1962. These studies were carried out in Framingham, Mass. and in Albany, N. Y. A large number of healthy men (4,120) were examined, and found to be free of any symptom of coronary artery disease. After six years, records of death among this group showed that symptoms of coronary artery disease as well as death from this disease occurred far more frequently among the men of this group who were cigarette smokers than among those who were non-smokers.)

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CURRENT INFORMATION, ARTICLES OF INTEREST**

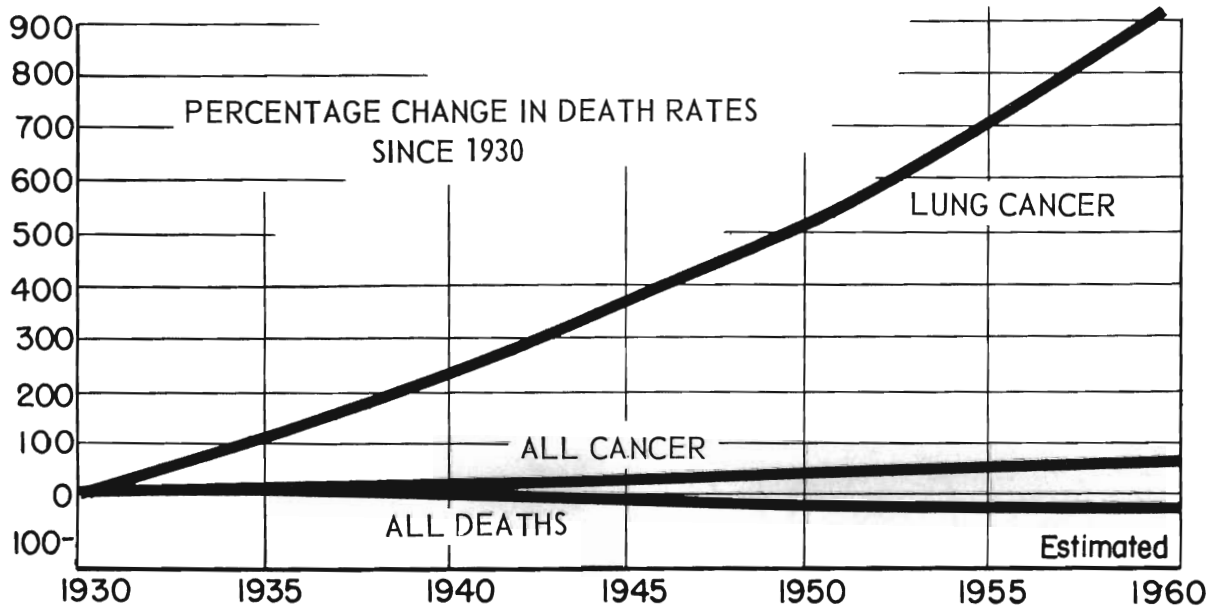
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CURRENT INFORMATION, ARTICLES OF INTEREST**



SOME SUMMARY NOTES ON CIGARETTE SMOKING AND LUNG CANCER

A statement by the Board of Directors of the American Cancer Society in January of 1960 indicates the grave concern of that organization over the tenfold increase of deaths from lung cancer among men during the previous 29 years.



This same statement, published in the March 26, 1960 issue of The Journal of The American Medical Association, reveals the determination of the Society to disseminate, especially among teenagers, the growing body of information which links smoking and lung cancer.

Smoking — Disease Relationship

There is no longer time for conjecture about the relationship between smoking and lung cancer — it does exist. Evidence already recorded from at least twenty-eight studies in eight different countries shows that lung cancer occurs predominantly among cigarette smokers.

One of the best studies made, which, incidentally, included a large section of its sampling from among citizens of New Jersey, reveals the following about men in the 50 to 70 year age group:

1. That the more they smoked, the higher was their death rate from all causes. Death rates among smokers of two or more packs a day were more than two times as high as they were for non-smokers.
2. That lung cancer deaths were more than ten times as high among regular cigarette smokers than among men who had never smoked.
3. That men who stopped smoking had lower death rates than those who continued.

4. That deaths from other cancers, such as of the mouth, esophagus, tongue, and larynx occurred five times as often among smokers as among non-smokers.
5. That deaths from lung diseases other than cancer were nearly three times as high among cigarette smokers as among non-smokers.
6. That coronary death rates were nearly two and a half times as high for two or more pack-a-day smokers as for non-smokers.

This type of evidence continues to mount, and, in fact, there is no evidence of any kind coming in which refutes the belief that excessive cigarette smoking is one of the principal causes of lung cancer. It is clearly a one-sided picture.

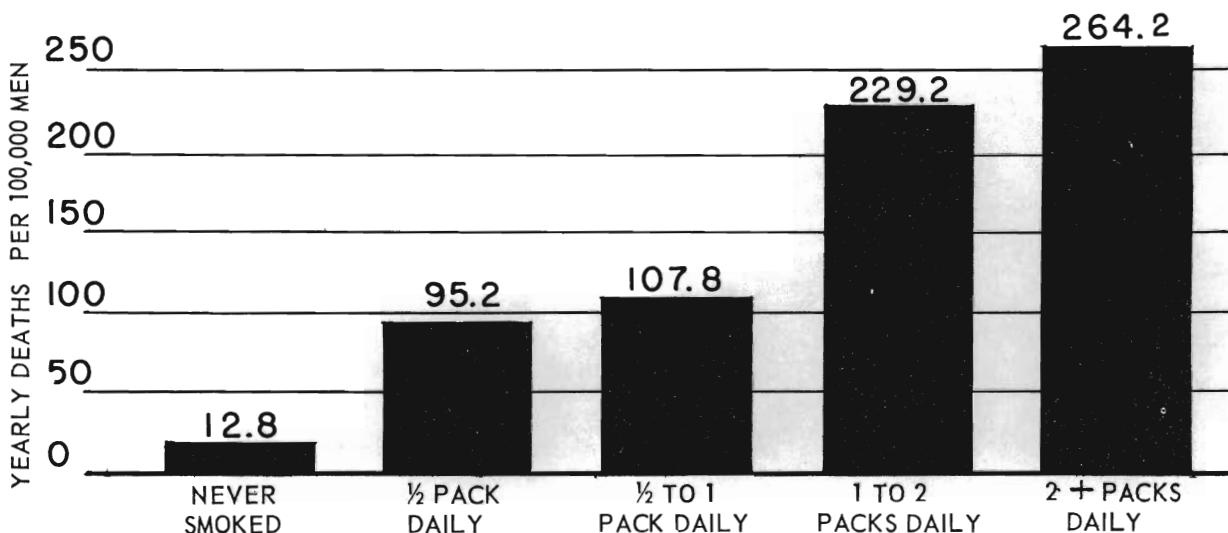
At the base of the problem lies the fact that since 1920 the average annual consumption of cigarette tobacco among persons over fourteen years of age in the United States has jumped from about a pound and a half, all the way up to ten pounds.

During the same period of time the average consumption of cigars has been cut almost in half, and the use of pipe-smoking tobacco has dropped to one fourth of its 1920 level.

The connection between cigarette smoking and lung cancer, which is suggested by their somewhat similar and concurrent increases, is made more definite still by the consistently greater incidence of lung cancer among cigarette smokers than among cigar or pipe smokers.

Current scientific evidence reveals the following additional items of value in teaching young people:

1. Lung cancer occurs in direct proportion to the number of cigarettes smoked.



- 2. Inhalers tend to have more lung cancer than non-inhalers.
- 3. Pre-cancerous lung cell changes are found more frequently among autopsied smokers than non-smokers.
- 4. Smoke which is produced by burning tobacco contains at least eight chemicals which are known to be cancer producing when applied to or injected into animals.

Most of the research accomplished to date has concerned men; however, it is known that the present lung cancer incidence among women is at the same level as the men's incidence twenty years ago and is steadily rising.

Although the specific lung cancer causative agent in smoke is not completely isolated, the best judgment on causation at present is that certain substances in the smoke have a direct action (rather than a concomitant or secondary action) on certain susceptible tissues with which there is contact.

It is also known that tobacco smoke tends to decrease the efficiency of the cilia in their efforts to keep the bronchial linings cleared of foreign materials. Therefore, not only does smoke bring undesirable agents into the lungs but it also inhibits the defensive process against such cancer producing agents.

Smoking Reduction Difficulties

If the evidence which now links cigarette smoking and lung cancer were present in similar quality and quantity in almost any other disease picture, it would be considered a more than adequate basis for using strong measures to eliminate the apparent causative activity. Smoking, however, is so richly supported by advertising, has attracted so many millions, and is so intimately involved with national economic and tax structures, that to achieve a major downward change in cigarette consumption is a most difficult accomplishment.

Filters

The use of various types of cigarette filters has been advanced by the tobacco industry as a ray of hope in an otherwise very bleak picture. The willingness of the industry to expend many, many millions of dollars on research and the changeover to filters certainly indicates the concern of the tobacco industry with the connection between smoking and lung cancer.

There is no conclusive evidence that filters do in fact change smoking into a relatively safe activity. At this point, no long-term studies of filter use are available, and since the actual causative agent of lung cancer in cigarette smoke has not yet been defined, it is impossible to assess a filter's efficiency in the removal of the agent.

It is known, of course, that certain filters do remove a portion of the tars which result from the burning of tobacco and also some of the nicotine present. While most scientists believe this removal process should help to reduce the risk of lung cancer from smoking, it is, of course, still best to encourage youth not to smoke at all in the face of all existing knowledge.

Perhaps one of the strongest deterrents to smoking and its attendant lung cancer danger lies in the fact that lung cancer is not only very difficult to detect and of a type which spreads quickly to other parts of the body, but even after diagnosis, is infrequently curable. Roughly one lung cancer case in twenty is cured.

It is important for young people to know that a recent survey indicates that about a fourth of the physicians who were smokers have already stopped smoking and that many more have reduced the amount which they smoke.

The American Cancer Society also estimates that proportionately twice as many physicians have stopped smoking as compared to the general male population. We should, of course, encourage the lead made by the physicians, who are certainly the best medically informed segment of the population!

Related Problems

This unit is aimed specifically at lung cancer, but teenage smoking is a broad problem, and good teaching may well correlate this unit with other smoking-connected health problems such as coronary heart disease, bronchitis and emphysema, as well as the social problems of tobacco cost, offensive odors, fire hazards, or other objections.

In one of the reprinted articles following, Daniel Horn, former Director of Program Evaluation, American Cancer Society, not only gives much information on teenage smoking as a health problem, but also reports on the reactions of teenagers to the problem and to certain educational attempts to help solve the problem.

The Portland, Oregon study, and others since, indicate that teenagers will respond to good teaching and that many will either stop smoking or not start if they are objectively presented with the facts and are urged to think it through themselves.

Although many scientists
and physicians are convinced
that cigarettes can cause
lung cancer, more Americans
are smoking than
ever before.

Here is the full story
behind this strange situation

by Walter Goodman

Scientific evidence linking cigarette smoking to the almost invariably fatal disease of lung cancer has been accumulating for more than a decade. In the past ten years many public-health officials, physicians and scientists here and abroad have become convinced that heavy cigarette smokers are far more likely to die of lung cancer than non-smokers; that the more a person smokes, the greater his chances of getting lung cancer; and that giving up cigarettes even after smoking them for years lessens the danger.

Despite this weight of authoritative opinion Americans smoked a record number of cigarettes last year — about 455 billion. At least in part, this remarkable response is the result of the tobacco industry's activities. In 1953, after several reports had been issued connecting smoking with lung cancer, smokers became uneasy and cigarette consumption slumped. Early in 1954 representatives of tobacco manufacturers, growers and warehousemen set up the Tobacco Industry Research Committee (T.I.R.C.) to represent them on the cigarette-health issue.

The T.I.R.C., following a course of action proposed by one of the country's largest public-relations firms, has consistently disputed and minimized the evidence connecting smoking and cancer, drawn attention away from tobacco to other possible causes of lung cancer, and accused reputable scientists of constituting an "antismoking" group. While their industry's spokesmen have been defending cigarettes, (Continued

This article originally appeared in the June, 1960 issue of Redbook magazine.

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however, the tobacco companies themselves have been spending hundreds of millions of dollars to develop and advertise new types of cigarettes which might seem safer to smokers.

To judge by cigarette sales figures, which have been climbing since 1955, the industry's two-pronged approach has been immensely successful—if not a model of consistency. As one public-health officer put it: "If the smoking-lung cancer link isn't established, why are they going to all that trouble manufacturing filter cigarettes?"

Cancer researchers' attention has been forcibly drawn to smoking by a peculiar fact. While the death rates from most major diseases have gone down in this country over the past few decades, the lung-cancer death rate has gone up. Deaths from lung cancer have multiplied—rising from 2,500 in 1930 to 36,000 this year. Such a rapid rise, most observers have concluded, cannot be explained simply by improved methods of diagnosis or by some subtle change in human beings themselves.

Researchers have had to ask: What marked changes in Americans' habits and living conditions since the beginning of the century explain the extraordinary increase in this particular disease? Two changes struck them as particularly significant—the immense population shift to the cities with their ever-multiplying numbers of automobiles and industrial plants, and the phenomenal rise in cigarette smoking—almost tenfold since World War I. These were singled out because scientists know that things that burn produce carcinogens, substances capable of causing cancer, and because smoke—whether from cigarettes or exhaust pipes—is inhaled into the lungs, the area where the disease strikes.

Starting with these facts, investigators went on to seek other connections between smoking and cancer. One obvious way of finding such connections was simply to ask lung-cancer patients whether they smoked, and if so, how much. More than 20 reports have now been published here and abroad which show that lung-cancer victims are far more likely to be heavy cigarette smokers than people who do not get the disease.

Another approach was to ask large numbers of people about their smoking habits and then to keep a health record of them for the rest of their lives. Three large-scale studies of this kind have revealed that an abnormal number of heavy cigarette smokers die from coronary artery and pulmonary diseases, and several types of cancer. The findings on lung cancer have been particularly striking. It is these reports which, more than anything else, have impressed experts in the field.

The Doll-Hill Study: More than 40,000 British physicians over the age of 35 have so far been observed for four and one half years. Those who continued to smoke more than 25 cigarettes a day from the beginning of the study have had a death rate from lung cancer nearly 40 times that of nonsmokers.

The Hammond-Horn Study: This American Cancer Society study covers 187,783 men between the ages of 50 and 69. After almost four years of observa-

tion, during which 11,305 of the men died, regular smokers were found to have a death rate from lung cancer ten times that of nonsmokers. Reports of lung-cancer deaths were carefully checked, and those which could be verified by microscopic diagnosis were called "well-established"

Statement to Redbook Magazine

The Federal Food, Drug and Cosmetic Act does not embrace control of tobacco products unless these products are described as having therapeutic value. In such cases they are subject to the drug provisions of the Federal Food, Drug and Cosmetic Act, enforced by the Food and Drug Administration, and to the advertising regulations of the Federal Trade Commission.

This Department has not recommended legislation for additional regulatory control of tobacco products. It must be borne in mind that the particular element in tobacco which creates the health hazard has not been definitively identified. When scientific research can identify and directly relate this element to the hazard of smoking as borne out by the statistics, the Department will be in a better position to know whether regulatory legislation should be requested in the interest of public health.

Meanwhile, statements by Surgeon General Burney identifying smoking as the principal causative factor in the increase in the rate of lung cancer are consistent with the statutory responsibility of the Public Health Service to inform the medical profession and the public on matters involving important public health issues. I feel that Dr. Burney and his associates have rendered a valuable public service in giving us their frank conclusions on this major issue.

ARTHUR S. FLEMMING
Secretary of Health,
Education and Welfare

cases. Cigarette smokers accounted for 265 of the 293 microscopically proved lung-cancer deaths. There were only four people in the group who had never smoked at all. On the basis of this study, a nonsmoker has one chance in 270 of getting lung cancer; a two-pack-a-day smoker has one chance in ten of dying from the disease.

The Dorn Study: In the first two and one half years of this continuing study of 249,000 U.S. veterans, Public Health Service researchers found that the death rate from lung cancer for men who regularly smoked more than a pack of cigarettes a day was nearly 16 times that of nonsmokers.

Not all observers find these figures convincing. Their most prominent critic has been Dr. Joseph Berkson, head of the Division of Biometry and Medical Statistics at the Mayo Clinic, who helped set up the Hammond-Horn study. But Dr. Berkson, who considers the findings "spu-

rious, is in a small minority. Most experts who have studied the statistical evidence have been impressed by the size of the studies and the consistency with which cigarette smoking has been connected with lung cancer.

Still another approach to the cigarette-cancer problem is to start with the human lung and, in a sense, work backward. After a minute analysis of lung tissue obtained in autopsies of 402 men, Dr. Oscar Auerbach, of the East Orange, New Jersey, V.A. hospital, found that the degree of lung damage corresponded to the number of cigarettes that these men had smoked each day. While abnormal cells, ranging from slightly unusual to cancerous, were found in the lungs of fewer than half of the nonsmokers, they were present in more than 99 per cent of the heavy smokers. Moreover, the abnormalities found in the lungs of nonsmokers and light smokers were few and slight, while those in the lungs of heavy smokers were "many and glaringly apparent."

In trying to pinpoint the elements in cigarette smoke that may be at the root of the trouble, laboratory workers have so far discovered eight carcinogenic substances in cigarette tar—the condensed smoke which the smoker inhales.

Despite evidence that tar concentrates produce cancer on the backs of certain strains of mice, rats and rabbits, however, these concentrates have not been shown to produce cancer in an animal—or human—lung.

"I would not go further than to say that the statistical studies have created a conjecture to the effect that cigarette smoking may somehow, directly or indirectly, enter into the complex web of lung cancer pathogenesis," Dr. Robert Hockett, T.I.R.C. Associate Scientific Director, told REDBOOK. "If it were possible to produce cancers regularly in the lungs of a significant proportion of animals by the same kind and degree of smoke exposure that human smokers experience, then the conclusion that smoking is a direct and specific factor in lung cancer might perhaps be defensible. But all such inhalation experiments with animals have been negative and there have been a great many such experiments at the hands of experienced investigators."

The problem is extremely complicated. Emphasizing the difficulty of performing such experiments, Dr. Ernest Wynder, of New York's famed Memorial Sloan-Kettering Cancer Center, a pioneer in this field, says, "The trouble is we can't get mice to inhale the way people do." But he adds, "Although we are not sure exactly how lung cancer is produced, the evidence leaves no doubt that smoking is one of its main causes."

U.S. Surgeon General Leroy E. Burney, who regards heavy cigarette smoking as a principal cause of lung cancer, concedes that experimental proof has not yet been supplied, and everyone agrees that many questions remain to be answered. Some nonsmokers get lung cancer too, and various environmental factors, notably air pollution, seem to share the guilt. (City dwellers have a higher lung-cancer rate than people in rural areas, and men may be more vulnerable than women because they spend more time in cities.) A number of scientists suspect that a virus

is at work, and some suggest that cigarette smoke simply irritates lung tissues and makes them more susceptible to cancer-causing agents. It is possible, too, that some people are constitutionally more likely to succumb to the disease than others.

The nature of cancer is still a mystery, and even scientists who are convinced that cigarettes do cause lung cancer commend the T.I.R.C.'s Scientific Advisory Board for allocating \$3,700,000 for studying tobacco use and human health. No scientist disagrees with tobacco industry spokesmen when they call, as they often have, for more research into the entire problem. Taken as a whole, however, the evidence against cigarettes is heavy.

The history of medicine, moreover, teaches that the protection of a nation's health often cannot wait on absolute proof. When Edward Jenner recommended vaccination with cowpox against smallpox in 1796, he did not know the "cause" of smallpox, but he did know that dairymaids who contracted the minor disease of cowpox from the cows they handled did not subsequently get smallpox. In 1854 Dr. John Snow observed that most of the Londoners who were falling ill in their city's cholera epidemic drank water from a single pump in Broad Street; on the basis of this "statistical" evidence, he removed the handle of the pump. The cause of cholera was not defined until 40 years later.

Reviewing these medical milestones in an open letter to T.I.R.C. Scientific Director Dr. Clarence Cook Little in *The Atlantic*, Dr. David D. Rutstein, head of the Department of Preventive Medicine at Harvard Medical School, pointed out that . . . the evidence for the association between cigarette smoking and lung cancer is stronger than Jenner's evidence when he recommended vaccination against smallpox. This association is as strong as the basis for John Snow's recommendations for the control of cholera in London. Why do you insist that we find the 'cause' of lung cancer before public health authorities be permitted to make any effort to control this disease?"

In 1958 an editorial in the *New England Journal of Medicine* expressed the irritation of many doctors over the tobacco industry's role in the smoking-cancer "controversy": "To refuse to admit that there is a bona fide medical problem comes close to fatuousness. To continue to dismiss the problem as though it were a hotly debated matter of semantics borders on chicanery. One might as well dismiss the problems of addiction and intoxication that arise from the excessive consumption of alcohol as though they were bugaboos constructed by overly apprehensive parents to oppress high-minded distillers of spirituous liquors."

Public-health officials in several countries have issued policy statements declaring flatly that cigarette smoking is a cause of lung cancer. In England a campaign has been launched to warn smokers of the risk they are running. In this country experts chosen by the American Cancer Society, the American Heart Association, the National Cancer Institute and the National Heart Institute joined in 1957 to study the evidence, and concluded: "The sum total of scientific evidence es-

tablishes beyond reasonable doubt that cigarette smoking is a causative factor in the rapidly increasing incidence of human epidermoid carcinoma (cancer) of the lung." A few weeks ago a study group of experts from seven countries which was sponsored by the UN World Health Organization arrived unanimously at a similar conclusion.

The question now, while scientists continue to seek a better understanding of the disease, is how best to go about decreasing the risk of lung cancer in a nation of 58 million cigarette smokers who average slightly over a pack a day.

The tobacco industry's efforts to deal with this problem are complicated by the fact that relatives of several people who died of lung cancer, as well as some survivors of the disease, are suing the makers of the brands they smoked. An admission by the industry itself that cigarettes can cause lung cancer would hardly aid their defense. Nonetheless, manufacturers have been making changes in cigarettes and, up to recently, implying in their advertisements that the new brands are not as harmful as the old ones.

Less than two per cent of the cigarettes smoked in this country in 1952 had filter tips; today filtered cigarettes account for half of all the cigarettes sold. By steadily increasing the efficiency of their filters and by developing "high-porosity" papers, cigarette producers have reduced the tar and nicotine in the smoke so substantially in some cases that little tobacco taste gets through to the smoker. A number of manufacturers have recently added menthol, a reassuringly medicinal flavor which makes up for the absence of any other taste in their well-filtered cigarettes. The tobacco industry reportedly is also experimenting with additives which would cut down on the suspected cancer-initiating compounds in the smoke—the aromatic polycyclic hydrocarbons created when tobacco burns at high temperatures.

Cigarette advertising, which is approaching the \$200 million-a-year mark, is now devoted chiefly to the new filtered, "ventilated," mentholated brands. Much of it appears on television and reaches millions of children and teen-agers. Self-control or moderation is never recommended in cigarette advertisements.

Are filter cigarettes safe? The Surgeon General says no. "The filters presently in use," Dr. Burney recently pointed out, "do not eliminate, but merely reduce, the tar. It is questionable whether, from a health point of view, any so-called minimum exposure to such a hazard should be accepted." Ironically, while some scientists feel that better filters represent a step in the right direction, the T.I.R.C.'s Scientific Director, Dr. Little, has questioned efforts to eliminate from cigarette smoke "an agent that hasn't yet been identified or the presence of which hasn't yet been proven."

Since 1955 almost 200 cigarette-advertising claims, mostly for filters, have been discontinued or modified as a result of quiet pressure by the Federal Trade Commission. One of the commission's rare public complaints was filed not long ago against advertisements for one brand which stated that it gave "least tar and nicotine" and implied that the govern-

ment endorsed this claim. The objectionable advertisements were subsequently discontinued.

Until recently Charles E. Grandy, Director of the FTC's Bureau of Consultation, which handles the commission's voluntary cigarette program, could take action only when an advertisement was substantially unjustified. "For example," he explains, "if some firm claimed that its brand was lowest in tar, then it had to be significantly lower than the others. If a cigarette was described as being 'safe' or 'not harmful,' then we would probably move in. But we couldn't eliminate all the implications of an advertisement." The implications, however, apparently carried great weight with smokers. According to a 1958 study by the FTC, 40 per cent of the people who switched to filter tips did so in the belief that they were thereby protecting their health.

In February, FTC Chairman Earl W. Kintner declared that the many competing claims for filters "were confusing to the public and possibly misleading in view of the absence of a satisfactory uniform testing method and proof of advantage to the smoker." The major cigarette advertisers, he announced, had therefore agreed to eliminate references to the effectiveness of their filters in removing tar and nicotine as well as any references to the health benefits of filter cigarettes.

Some observers have proposed that cigarettes be placed explicitly under the Federal Food, Drug and Cosmetics Act. This, they argue, would enable the government to take the same kind of action against cigarettes that it took last November against cranberries on the basis of far less evidence of harm to human beings.

Asked by REDBOOK whether he would favor such legislation, Arthur S. Fleming, Secretary of Health, Education and Welfare, declared: "It must be borne in mind that the particular element in tobacco which creates the health hazard has not been definitively identified. When scientific research can identify and directly relate this element to the hazard of smoking as borne out by the statistics, the Department will be in a better position to know whether regulatory legislation should be requested in the interest of the public health."

Although Surgeon General Burney has now made two official statements identifying cigarettes as a major cause of lung cancer, the U.S. Public Health Service, which he heads, has not begun any continuing public information program on the subject. Dr. John R. Heller, head of the National Cancer Institute and Dr. Burney's chief technical adviser on cancer, explains why: "The public health is endangered by many things—alcohol, accidents, eating too much. It is the duty of the Public Health Service to put out the available facts to the medical profession. We don't think it's our business to launch crusades. It's up to local medical groups, state health services and individual physicians to spread the facts in their own communities."

Are local groups spreading the facts? Are they responding to the American Public Health Association's call for a "broad education effort" directed particularly at teen-agers? REDBOOK asked the

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question of the governors, chief health officers and medical societies of every state in the country. Most medical associations report they have printed studies about the connection between smoking and cancer in their journals, a few of which have recently banned cigarette advertising. As a group, the medical societies feel that doctors in their states have been sufficiently informed and that it is up to the private physician to pass the information along to his patients.

The editor of the A.M.A. *Journal*, Dr. John H. Talbott, wrote in a December editorial that "neither the proponents nor the opponents of the smoking theory have sufficient evidence to warrant the assumption of an all-or-none authoritative position." He recommended that local physicians advise patients in accordance with their own appraisal of the facts. At least one cigarette company, apparently impressed by how everyone is shifting the burden of education to the individual physician, sent out its samples to many doctors, with the suggestion that the doctor prescribe the brand "for those of your patients who should smoke a low tar and nicotine delivery cigarette. . . ."

Most state governments are acting even less energetically than the medical societies. The majority report that they are including information on smoking in their over-all cancer-education programs, but that is the limit of their activity; some apparently are not even doing this much. New York State is notable for singling out the cigarette-cancer link as meriting a full-scale campaign of its own. Wisconsin reports that it hopes to begin an "aggressive educational program against smoking" this year. A few state legislators have proposed labeling cigarettes as harmful.

A year before his death in March, Senator Richard L. Neuberger, of Oregon, asked for federal aid to the states in educating school children about the physical effects of tobacco and alcohol. He told the Senate that he was disturbed by the flood of "glamour advertising" beseeching youths "to begin a habit which the Public Health Service warns may lead to one of the most dread diseases known to mankind."

The mass media, which collect many millions of dollars from tobacco advertising each year, have failed to fill the information gap on this subject. In the spring of 1955 the C.B.S. television program "See It Now" competently reviewed the evidence up to that time in two half-hour programs. Nothing more has been done by C.B.S.; nothing whatever has been done by the other major national networks.

The nation's newspapers carry reports of the various scientific findings as they are announced, usually accompanied by the industry's standard rebuttal. Full roundup features, however, are rare. Some papers, like the New York *Daily News*, have run editorials making light of the whole subject. On the other hand, the small-circulation York (Pennsylvania) *Gazette and Daily* recently banned tobacco advertising.

Several relatively small magazines, notably *Consumer Reports*, have published full reports as well as the results of their own research. Among the multimillion-cir-

culation publications *The Reader's Digest*, which does not accept cigarette advertising, has covered the story most thoroughly over a period of years. Last November, *Digest* editors Lois Mattox Miller and James Monahan characterized the tobacco industry's case as a "weak and unconvincing minority report," and the *Digest's* widely read studies of filter effectiveness deserve much of the credit for the superior filters now on the market.

No other magazine has been as active and forthright in this field. Some years ago, for example, *Cosmopolitan* assigned a team of reputable writers to do an article on environmental causes of cancer. After receiving the manuscript, the magazine's editors asked the writers to add a statement to the effect that the cigarette-lung cancer link was discredited. The writers refused, and insisted that their names be taken off the story.

Two paragraphs written by someone else were inserted, stating in effect that "the cigarette seems to be all but exonerated" as a cause of lung cancer, and the article was printed in May, 1956, with a fictitious by-line.

The most dynamic efforts at informing the public are being made today by the American Cancer Society. The A.C.S. is concentrating on high-school students, more than 40 per cent of whom, according to one survey, become habitual smokers by the end of their senior year. Most high schools already devote some attention to alcohol, narcotics and tobacco in their health-education programs, but a recent Cancer Society review of 18 widely used textbooks in biology, general science and health courses showed that these books were out of date. Before organizing an educational campaign, Dr. Daniel Horn, the society's Director of Program Evaluation, interviewed 22,000 high-school students in Portland, Oregon, to determine what approach would be most effective in dissuading young people from taking up smoking. The best approach, he found, was to give students the evidence in a matter-of-fact way.

The major item produced so far in the A.C.S. campaign does just that. It is a film strip, entitled "To Smoke or Not to Smoke," which has been prepared for the 1960-61 school term. The film simply presents the evidence connecting lung cancer and smoking. "There is no longer any doubt in the minds of most scientists who are close to the lung-cancer problem that smoking can and does cause lung cancer," the narrator concludes. "To smoke or not to smoke. It's your decision. It's your future."

California's high schools have been the first to make instruction on the risks of smoking part of their regular classroom program. New York City's Commissioner of Health, Dr. Leona Baumgartner, announces that New York's schools will soon include a similar program in their curriculum. In Duval County, Florida, parents, cooperating with the local medical society, recruited 50 doctors to give talks on smoking to high-school students throughout the county.

The Cancer Society's Dr. Horn hopes that many parents will have a chance to

see the new A.C.S. film strip. "Adults can stop smoking," he points out. "A survey of more than 4,000 Massachusetts doctors showed that 52 per cent of them smoked cigarettes in 1954 but only 31 per cent smoke them today. And about half of the smokers use less than a pack a day."

Just as the Cancer Society's advice to nonsmokers is not to begin, its advice to those who already have the habit is stop. The Hammond-Horn study showed a sizable decrease in the lung-cancer death rate of onetime heavy smokers who had given up cigarettes. Dr. Michael B. Shimkin, the National Cancer Institute's chief of biometrics and epidemiology, estimates that the elimination of the cigarette habit would cut lung-cancer deaths by 60 per cent. Smokers are advised to check with a doctor, however, before taking any pills to supplement their will power.

Those who find it impossible to stop altogether may be able to cut down. The less one smokes, studies show, the less his chance of getting lung cancer. Since pipe and cigar smokers have a lung-cancer death rate well below cigarette smokers—possibly because almost none of them inhale—the inveterate male smoker might consider taking up either a pipe or cigars.

For those who continue to smoke cigarettes, caution suggests switching to brands low in tar and puffing less frequently and less deeply. Since no one is certain what exactly must be filtered out of a cigarette before it becomes safe, the low-tar brands may be harmful too, but indications are that the danger lies somewhere in the tobacco smoke which enters the lungs. In other words, switching to low-tar filtered brands is not certain to protect anyone, but it may help. (Government technicians are now at work developing a standard test for measuring tar and nicotine in cigarette smoke.)

Filters hold out an unfortunate temptation, however. An FTC survey made in 1958 disclosed that 30 per cent of filter-tip users were smoking more than they did when plain tips were in fashion. Anyone who is smoking more is to some degree undoing whatever benefits there may be in filters. The more one smokes, of filters or plain tips, the more tar enters his lungs. Since the second half of a burning cigarette produces more tar than the first, dropping the half-smoked butt in an ash-tray may be a prudent, if expensive, practice.

Lung cancer is the leading cause of cancer deaths in this country. It is the second most common cause of death for men in their forties. One million children now living will die of lung cancer unless remarkable progress in treatment or a significant change in the nation's way of life saves them. Cancer researchers believe we now have the opportunity to save many of them.

A great deal remains to be learned about cancer of all kinds, but many important facts are known. Physicians and educators urge that all Americans—and teen-agers in particular—be given more reliable information about the hazards of smoking than they are now getting in such abundance from commercial sources.

... THE END

PATTERNS OF TEENAGE SMOKING

By DANIEL HORN, Ph.D.
Director of Program Evaluation
American Cancer Society

Presented at Forty-ninth Annual Conference of State and Local Health Officials
War Memorial Building
Trenton, New Jersey
March 24, 1960

Just within the last three years, there has been a surge of interest in teenage smoking. Studies in this area have been started both here and abroad and a few of these have now been reported in the literature. To review this subject, I have 10 questions to ask—and at least some partial answers to suggest.

1. Why are we interested in teenage smoking?
 2. Does cigarette smoking cause lung cancer?
 3. Have people accepted this relationship?
 4. Are people agreed that teenage smoking should be reduced?
 5. How many teenagers smoke and when do they take it up?
 6. What sort of smoking do they do?
 7. Why do teenagers smoke?
 8. What can be done about teenage smoking?
 9. How about adult smoking? Is it worth trying to reduce it?
 10. What recommendations can those in cancer control make?
1. *Why Are We Interested In Teenage Smoking?*

For a number of years, most states have required that a certain amount of time in the school curriculum be devoted to teaching about the use of tobacco. Usually this is thrown together in a teaching unit on alcohol, narcotics, and tobacco. Most of the health text books in general use still say the same things that were said 10, 15, or 20 years ago. But in the use of tobacco, something new has taken place. It is within the last decade that the problem of lung cancer has impressed itself on most of us and that a wide variety of studies has im-

plified cigarette smoking as a primary cause of lung cancer. Reasoning runs something like this: If cigarette smoking causes lung cancer, perhaps it is too late to do anything about our own smoking. Perhaps it is too hard for adults to break the habit. But if we can persuade children not to take it up, this may be feasible; this may be the eventual solution to the lung cancer problem. Hence the interest in teenage smoking. A basic theme of cancer control is *Early Detection*; our interest in smoking represents a desire to detect lung cancer before it is even there—in other words to prevent it from occurring in the first place.

2. *Does Cigarette Smoking Cause Lung Cancer?*

There is such an extensive literature on this subject, almost all of it published within the past 10 years, that one could hardly do justice to it in an hour, much less within a few minutes.

The essential features of the evidence are these: Lung cancer has grown from a relatively uncommon disease to one of the most common forms of cancer. Even in the last 30 years, the number of deaths from lung cancer in the United States has gone from 2,500 to 36,000; for example, the State of Illinois this year or the State of New Jersey within a few years will have almost as many deaths reported from lung cancer in one year alone as were recorded in the entire United States in 1930. Although a part of this increase undoubtedly reflects better diagnosis, the major portion of the increase must reflect a tremendous rise in the incidence of the disease.

First, numerous studies in many countries showed that lung cancer patients included more smokers than did compar-

able control groups. Then, three long-term follow up studies in the United States and England showed that among men who smoke, the lung cancer rate is high; among those who do not smoke, it is negligible. Furthermore, one or more of these studies showed that this relationship is primarily with cigarette smoking rather than with pipe or cigar smoking; that the effect is more or less proportional to the quantity of cigarettes smoked, but is appreciable even in light smokers; that ex-smokers show a sharply reduced rate over those who continue to smoke cigarettes; and that the relationship is equally marked in both urban and rural dwellers, although rates may be slightly lower among those who live in the country, suggesting that air pollution may be a minor factor.

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 "It is difficult to see how anyone can study the evidence and arrive at any conclusion other than that cigarette smoking is the major cause of lung cancer."—Daniel Horn, Ph.D.  
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Other studies have shown that tar collected from cigarettes can cause cancer when applied to the skin of a mouse. More recent studies have shown that histological changes varying from reparative functioning to suspiciously pre-cancerous lesions or carcinoma, in-situ, occur in the lungs of smokers in much greater frequency than in the lungs of non-smokers studied at autopsy, and that these changes are correlated with the quantity of cigarettes smoked. Physiological studies of the effect of both nicotine and tobacco smoke in reducing protective efficiency of the cilia in removing foreign particles from the bronchial lining have given another important clue to the mechanisms that may be involved. It is difficult to see how anyone can study the evidence and arrive at any conclusion other than that cigarette smoking is the major cause of lung cancer.

3. *Have People Accepted This Relationship?*

To a large degree yes, although certainly not completely.

Review committees of scientists and physicians have studied the evidence in both the United States and England and have in each case concluded unanimously that the case is proved "beyond reasonable doubt." Surgeon-General Leroy Burney's recent report represents the position of the United States Public Health Service in accepting this relationship. Among thoracic surgeons and cancer research scientists even as of 1955, only two or three percent denied the relationship. About 60 percent accepted it and the rest were still uncertain. More recently, a sample of practicing physicians shows that two out of three accept the relationship, one in five tends to reject it and one in seven is still on the fence. In the general public, about three out of five accept the relationship and among teenagers, two out of three accept it, with only one in 40 rejecting it. The results of scientific studies, reported in the public press have helped produce these results, despite the barrage of advertising and counter-claims of the tobacco industry.

4. *Are People Agreed That Teenage Smoking Should Be Reduced?*

This proposition produces a surprising degree of unanimity. A study of Massachusetts physicians in 1959 showed 93 percent agreeing that teenagers should be warned about cigarette smoking. Of those dissenting, a number did so only from the feeling that the efforts would be ineffective rather than from opposition to the aims of such a program.

In the general public, this proposition also meet with strong majority approval. What is especially interesting is that this approval is voiced equally by both smokers and non-smokers. Smokers, in general, show more opposition to accepting the relationship between smoking and lung cancer, and tend to disapprove of educational campaigns against smoking carried out among adults. But even smokers approve an educational effort among teenagers. Perhaps this is an admission of an underlying conviction of the hazards of smoking, or perhaps it is simply a reaction of "go ahead and do what you can among

the youngsters, so long as you leave me alone."

What, then, do we know about teenage smoking?

5. *How Many Teenagers Smoke and When Do They Take It Up?*

Most of the figures I shall quote about teenage smoking come from a national survey of high school students conducted for the American Cancer Society by a private youth survey organization, although many of the relationships first were identified in our study of smoking in the Portland, Oregon high schools.

At the end of the last school year one high school student in three was a regular cigarette smoker. Most of these smoked every day, but we included the few who smoke one or two days a week if they did so with regularity. More boys than girls smoke, 38 percent against 29 percent. There is a fairly regular increase from 21 percent smokers at the end of the freshman year to 44 percent at the end of the senior year.

Since previous experience indicates that one can expect about 60 percent of these youngsters to become smokers eventually, we estimate that 10 percent of those who are going to become smokers develop the habit with some degree of regularity before the teens—about 65 percent develop it during their high school years—and the remaining 25 percent take up smoking after high school. Somewhere around 10 percent of those not smoking regularly become regular smokers each school year. It is clear that the junior and senior high school years are crucial years in the development of the smoking habit.

6. *What Sort Of Smoking Do Teenagers Do?*

At a time when approximately 50 percent of cigarettes sold were filter tipped, at least 80 percent of high school girls and 56 percent of high school boys who smoked were using only filter tips, and others used them part of the time. This may reflect a high level of concern with the health hazards of smoking and an attempt to protect themselves—or it may merely be a sign of the success of the

tobacco industry in keying their filter-tip advertising to the desires of the teen-age market.

Solitary smoking is rather uncommon, (about 5 percent), smoking only in groups somewhat more common (about 16 percent). Most high school smokers engage in smoking both when alone and when in groups.

By adult standards, teenage smoking is light. Only about one in six of those who smoke regularly consume a pack or more a day and these are largely concentrated in the senior class. After all, it probably takes well over 20 hours and \$1.50 a week to consume a pack of cigarettes every day, and restrictions on smoking in the school, near school grounds, or at home limit the time available for smoking.

7. *Why Do Teenagers Smoke?*

To answer this question, we must first ask who are the teenagers who smoke and how do they differ from the ones who do not smoke? The direct question, "Why do you smoke," is the most unrewarding question that can be asked, for it usually leads to stereotyped responses.

In our Portland study, we found that first, and most important, is whether or not the parents smoke. Smoking by older siblings is frequently part of this pattern. In any event, what seems to be important is that smoking is accepted by the family as a normal and expected form of behavior. As such, smoking by the younger members of the family is part of growing up. This factor accounts for from one-third to one-half of the smoking in the Portland study.

Second, the motivation is a syndrome of intercorrelated measures that seem to have in common the failure to achieve peer-group status or satisfactions. Smoking is high among those who have fallen behind their age equals in school, do not participate in extracurricular activities, and are taking the scholastically less demanding course of school work. This group—a minority in the school population—has not achieved satisfaction from its peer-group relationships, at least as defined this way. It may well be that in this group, smoking is a compen-

satory form of behavior, a symptom of other problems of emotional health. This factor accounts for about one-quarter of the smoking in the Portland series.

“Long-term studies showed that among men who smoke cigarettes, the lung cancer rate is high; among those who do not smoke, it is negligible. The effect is more or less proportional to the quantity of cigarettes smoked, but is appreciable even in light smokers. Ex-smokers show a sharply reduced rate over those who continue to smoke cigarettes. The relationship is equally marked in both urban and rural dwellers.”—Daniel Horn, Ph.D.

Third, is the finding that there was more smoking in the Catholic schools than in the public schools of Portland. Several hypotheses to explain this finding have been suggested, ranging from a rebellious reaction to discipline to the comparison of the tolerant attitude of Catholics towards smoking as compared to rather strong condemnation of tobacco by a few Protestant sects. Unfortunately, we do not have the data to answer this question. However, in collecting information on parental attitudes toward smoking, it becomes clear that roughly 10 percent of all high school smokers smoke *despite* parental prohibitions against smoking—these being parental attitudes as reported by the students. More girls than boys show this kind of rebellious smoking and there is somewhat more defiance against paternal prohibitions than against maternal prohibitions.

In validating these findings in the nationwide survey, we found that when both parents smoke, 40 percent of the students smoke; if one parent smokes, this drops to 33 percent; and if neither parent smokes, it drops to 23 percent. What is most revealing is that if one or both parents has given up smoking, with neither parent smoking currently, the rate of student smoking drops down to about the same level as among children whose parents have never smoked. Even when one parent gives up smoking and

the other continues, the rate among the children is substantially below that in families where both parents continue to smoke.

Smoking by an older brother or sister is equally striking. Among those who have at least one older sibling and have at least one older sibling who smokes, 44 percent smoke in high school. If none of their older siblings smokes, the rate is cut in half—22 percent smoke.

As part of our studies, we developed a brief five-item test of attitudes toward smoking. This was highly correlated with smoking behavior. Among the 13 percent holding the most favorable attitudes toward smoking three out of five smoked; among the four percent holding the most unfavorable attitudes, only one out of nine smoked.

I have already mentioned parental attitudes toward their children's smoking. Strong disapproval, or even outright forbidding of smoking results in much less smoking than does approval, indifference, or even mild disapproval.

The whole constellation of family smoking practices, family attitudes toward smoking, and student attitudes toward smoking, is probably the most crucial factor in determining smoking by a high school student. In addition, satisfactions obtained in accepted peer-group relationships militate against the taking up of smoking.

8. *What Can Be Done About Teenage Smoking?*

In our experiments in the Portland Schools, we found that it was in fact possible to reduce the rate of taking up smoking during the school year. We tested five different approaches to presenting information on the hazards of cigarette smoking

Essentially, the theme of the most successful approach was this: “You’ve heard a lot of arguments about smoking cigarettes, but there is something new to be said on the subject. Scientists have recently found out that smoking of cigarettes causes lung cancer. This is something that was not formerly known, now there is not much doubt. Here is some of the evidence . . . Think about it before you decide whether or not to smoke.”

As such, the appeal is a logical one to the intelligence of our youth, and it met with an excellent response. True, there were many who did not respond. But so far, the evidence suggests that this approach was most effective among those who smoked as part of a family pattern and not for the more individual patterns of compensatory smoking or rebellious smoking.

"If both parents smoke, 40 percent of the teenagers smoke; if one parent smokes, this drops to 33 percent; and if neither parent smokes, it drops to 23 percent."—Daniel Horn, Ph.D.

The extent of the response, namely the reduction over a period of months in the rate of recruitment of new smokers from 13.0 percent to 7.7 percent in the boys and from 6.4 percent to 2.1 percent in the girls, may seem small. Yet, carried on cumulatively for a period of four years it would mean that about 20 percent of our high school students that would otherwise become regular smokers by graduation time would not do so.

But we need more than a one-shot program. The American Cancer Society has prepared materials suitable for science classes, others suitable for health education classes—filmstrips, posters, leaflets, questionnaires on smoking and attitudes towards smoking as teaching aids. These are not only useful in the schools, but for youth groups, in general, and to physicians, public health officials, and health educators outside the schools. These materials are readily obtained from local units of the American Cancer Society. At the moment, our only long-term solution to the menace of lung cancer is to reduce cigarette smoking.

9. *How About Adult Smoking? Is It Worth Trying To Reduce It?*

Even if every teenager in the country stopped smoking tomorrow, never to take it up again, it would be at least 30 years before it would begin to have any appreciable effect on the lung cancer death rate. How about the adult

smokers who are dying of lung cancer this year—nearly 100 a day in the United States—perhaps double that figure 10 years from now?

Many are pessimistic about the prospects of affecting adult smoking. I am not. If 30,000,000 people can switch to filters in five years, largely because of concern about health; if one-fourth of physicians who were smoking cigarettes five years ago have quit; why cannot large numbers of adults be motivated to modify their smoking in ways that make it less dangerous? Especially now that we have another motive to add to self-preservation, that is, that one's own children's smoking is largely dependent on the example we set, and the attitudes we express.

So I come to the last question:

10. *What Recommendations Can Those In Cancer Control Make—Physicians—Public Health Workers—Health Educators?*

I think this is practical advice about smoking cigarettes:

If you don't smoke, don't start.

If you do smoke, give it up.

If you can't give it up, cut down.

If you can't cut down, switch to low-nicotine, low tar cigarettes, don't inhale deeply, don't smoke the cigarette to a shortbutt.

How much to cut down? If you smoke a pack a day, cut down to 19 or 18. Of course, 15 or 10 is even better. Combine this with the use of low-nicotine, low-tar cigarettes. Nobody has *proved* these to be safer than ordinary cigarettes, but there is a chance that they are, just as deep inhalation or smoking the cigarette to a short butt probably increases exposure.

The point is that cigarette smoking is a health hazard—the more you smoke, the greater the hazard. Any action you take that reduces your smoking or your exposure to the harmful ingredients in the smoke has a good chance of reducing the risk you take.

If enough people can heed some part of this advice, perhaps the dire predictions of the growth of the lung cancer problem will never come to pass.

ADDITIONAL IDEAS AND TECHNIQUES

There are many opportunities for additional individual and group investigations. Some are elementary and some are more advanced. Although all suggestions are related to cancer studies, not all deal directly with lung cancer. However, some ideas and techniques are offered so that those students who are motivated to penetrate further, may be guided in their efforts. Reports from those engaged in this work will not only stimulate the researchers but help to keep this serious topic before the remainder of the students.

1. A number of ideas are suggested in the following remarks taken from "Project Pointers" of March 21, 1962, a regular column appearing in **SCIENCE WORLD**.

NICOTINE AND TAR EFFECTS

A FIELD of research that few high school students have tackled concerns the effects of tobacco tar and nicotine upon animals. Small fish and amphibians are easily available as subjects, and are normally hardy. The apparatus needed is rather simple.

Bottle A in Figure 1 contains the experimental subjects. Tobacco is burned in a briar or clay pipe, and the smoke fed through a glass tube into the water in the bottle. A hand vacuum pump, or a running-water aspirator, must be connected at the right-hand end of the apparatus to provide a partial vacuum so that the pipe will "smoke" its tobacco. A cigarette holder and cigarette may be used in place of the pipe, if you wish to try comparison experiments.

Part of the smoke is trapped in the water in bottle A, and passes through a glass tube into bottle B. Bottle B is for a carbon monoxide experiment involving animal blood, which will be described below. The tube between the two bottles contains small pellets of absorbent cotton. These must fit into the tube without clogging it. You can test by blowing gently through the tube. (Note: Fire-polish the ends of all glass tubing.)

Goldfish are good subjects to start with, as nicotine poisoning makes the fish roll to one side. As soon as this happens, remove the fish immediately and place in freshly aerated water.

The tar that collects on the cotton pellets is highly dangerous to animals. If a tarry pellet is touched to the tongue of a frog, the frog will go into a temporary collapse.

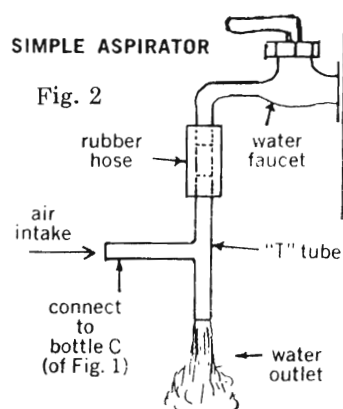
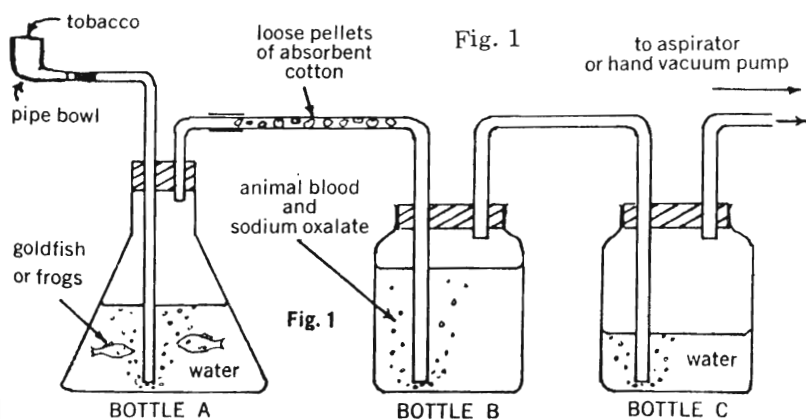
These tars may contain carcinogenic agents (cancer-causing chemicals). A test for this can be made on shaved skin on the backs of laboratory mice. The tar is held in place by small strips of adhesive tape or "Scotch" tape. Run this test for six months. Examine the area for tumor or lesion formation. If the mouse is sacrificed, the growth can be examined for cancer cells. The tissues must be fixed in permanent microscope slides. Perhaps you can get the help of a local hospital pathologist for this phase of the investigation.

Bottle B is for testing the effects of carbon monoxide in the tobacco smoke on animal blood. The blood can be obtained in a butcher shop, though you will probably have to order it ahead of time. Keep the blood from coagulating by adding one part of sodium oxalate solution to 9 parts of blood.

Smoke coming through the tube from bottle A to bottle B will cause the blood to turn a deeper red as the hemoglobin takes on carbon monoxide. As a result, **carboxyhemoglobin** is formed. This is what happens in carbon monoxide poisoning. The hemoglobin loses its ability to release oxygen.

You can show this by adding a fresh yeast culture to the blood. Also add a yeast culture to a control batch of blood. In the control, yeast enzymes cause the hemoglobin to release oxygen, which comes off as bubbles in a foam at the surface. In the experimental bottle, this oxygen release is impaired.

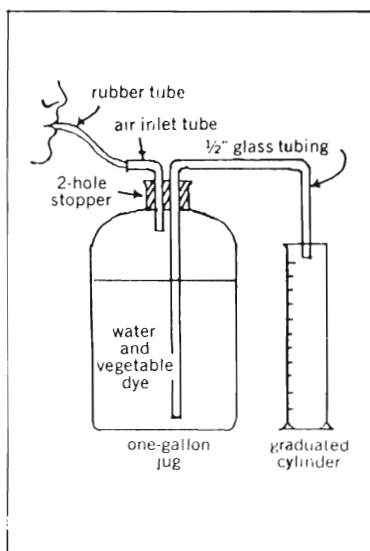
Bottle C is simply a trap, to keep blood from frothing into the pump or aspirator. Figure 2 shows a simple running-water aspirator you can make with a "T" tube, if you have no pump.



2. An Article, "The Evolution of a Tool for Research" by Angelo C. Alaimo, published in **STAR 58** by the National Science Teachers Association, Washington, D. C., presents more advanced suggestions for experimental investigations, including a superior mouse-smoking device.

3. In **SMOKING DEMONSTRATION PROJECT, OUTLINE FOR GRADES 7 THROUGH 12**, some interesting and pertinent information is available as well as a chapter on classroom demonstrations and techniques. This excellent booklet is available for fifty cents from American Cancer Society, Connecticut Division, 1044 Chapel Street, New Haven 10, Connecticut.

4. A method for measuring lung capacity is presented.



The equipment used is a one gallon, clear glass "cider" jug and a large graduated cylinder. The jug is fitted with a two-hole stopper and $\frac{1}{2}$ " diameter glass tubing, as in diagram.

The bottle is filled with water colored with vegetable dye. A long bent tube extends through the stopper and well below the water level. The other end of the tube is over the mouth of the graduated cylinder. The subject blows through a rubber tube attached to a short piece of glass tubing that passes through the stopper. The pressure of his breath forces water out of the jug into the graduate.

The volume of water displaced each time the subject inhales is a measure of the amount of air displaced from his lungs. By use of a long rubber tube, you can compare the change in volume while the subject is at rest with the changes when he is running in place or doing other physical or mental tasks.

from *Science World*, March 21, 1962

5. For students with a year of biology, the following hypothesis may be a challenging one to study. Information pro and con can be found. One source is E. C. Hammond's article, "The Effects of Smoking," **SCIENTIFIC AMERICAN**, July, 1962. The hypothesis is that normal epidermal cells which line the lung passages are successful only in an environment free of tobacco smoke, whereas cancer inducing epidermal cells are adapted to survive in an environment containing tobacco smoke.

DEBATABLE STATEMENTS

The following excerpts which have appeared in various publications can be used in debates for or against associating cigarette smoking with death from lung cancer. Some of these sources are promoted by the tobacco industries.

1. "Of the many research projects here and abroad that are seeking to track down fundamental causes of bronchogenic carcinoma, (lung-cancer) a majority are based on the premise that this type of malignancy is dependent on some environmental factor — specific agent or group of agents outside the body that comes into contact with lung tissue, most likely during the process of breathing, and by continuous exposure causes the lung cells to undergo malignant change."

from "Science Looks at Smoking"
by Eric Northrup
Coward-McCann, Inc. N. Y., 1957

2. "Whether the attraction of tobacco is based mainly on a pleasure principle or on its subtle tranquilizing influence, it is wise to remember that for many persons, breaking the habit is a nerve-wracking experience; indeed, it is one that few individuals manage to effect gracefully."

from "Science Looks at Smoking"
by Eric Northrup

3. "There is not sufficient definitive evidence to establish a simple cause and effect explanation of the complex problem of lung cancer. So far, various experiments on inhalation of cigarette smoke in animals have failed to produce a single cancer similar to the most prevalent type of lung cancer in humans."

from "What You Should Know about Smoking"
by William Cole
Stevens Publications, San Rafael, Cal. 1961

4. "There is no longer any doubt that cigarette smokers have a higher death rate than nonsmokers. New biological studies help to explain how tobacco smoke damages the lungs, heart and other body tissues."

from SCIENTIFIC AMERICAN, July, 1962

5. "Anti-smoking campaigns seem strangely in conflict with the growing recognition by scientists that many aspects of human experience may be involved in the origins of our major health problems — cancer and heart disease."

by T. V. Hortnett, Chairman of the
Tobacco Interest Research Committee
in **Herald-Tribune** - June 26, 1962

6. "The American Cancer Society, eager to snuff out smoking among college students, began a campaign to persuade university presidents to ban tobacco company sponsorship of radio and TV broadcasts of inter-collegiate athletic events."

from **TIME**, July 6, 1962

7. "Many investigators who have tried to produce lung cancer in rodents by exposing them to tobacco smoke have not succeeded in doing so."

from **SCIENTIFIC AMERICAN**, July, 1962

8. **SMOKING AND HEALTH** — Surgeon General Luther L. Terry has announced appointment of an advisory committee "to study the effect of cigarette smoking on health."

"The Administration will have to decide — if not this year, then next — whether it should take steps similar to those already being taken in Britain, and by private health organizations in this country, to educate the public — and particularly the younger generation — to the potential dangers of excessive smoking of cigarettes."

from **NEW YORK TIMES** — June 14, 1962

9. **SAN FRANCISCO**, July 25, — The tobacco business was denounced here today by a doctor.

"I have seen more than 2,500 cases of cancer of the lung, said Dr. Alton Oschner, director of the Oschner Clinic in New Orleans and former chairman of the Department of Surgery at Tulane University.

"There is nothing good you can say about tobacco," he said, and asserted of the tobacco companies that "their tactics are exactly the same as those of the dope peddler."

from **NEW YORK TIMES** — July 26, 1962

A STATEMENT OF THE UNITED STATES PUBLIC HEALTH SERVICE

It is a statutory responsibility of the Public Health Service to inform members of the medical profession and the public on all matters relating to important public health issues. The relationship between smoking and lung cancer constitutes such an issue and falls within this responsibility of the Public Health Service.

The Public Health Service believes that the following statements are justified by studies to date. 1. The weight of evidence at present implicates smoking as the principal etiological factor in the increased incidence of lung cancer. 2. Cigarette smoking particularly is associated with an increased chance of developing lung cancer. 3. Stopping cigarette smoking even after long exposure is beneficial. 4. No method of treating tobacco or filtering the smoke has been demonstrated to be effective in materially reducing or eliminating the hazard of lung cancer. 5. The nonsmoker has a lower incidence of lung cancer than the smoker in all controlled studies, whether analyzed in terms of rural areas, urban regions, industrial occupations, or sex. 6. Persons who have never smoked at all (cigarettes, cigars, or pipe) have the best chance of escaping lung cancer. 7. Unless the use of tobacco can be made safe, the individual person's risk of lung cancer can best be reduced by the elimination of smoking.

Leory E. Burney, M.D.
Surgeon General
November 1959

QUESTIONNAIRE INSTRUCTIONS FOR SCHOOLS

for the
Student Questionnaire for use in the
Teen-age Program on Cigarettes and Lung Cancer

The following questionnaire is designed to help determine the smoking habits and attitudes of students. Instructions for using and tabulating the questionnaire are also attached along with a sample copy of the questionnaire itself.

The questionnaire may be obtained in quantity from your local Unit of the American Cancer Society.

It is suggested that this questionnaire be given to students both immediately before and some time after any educational program on smoking and lung cancer.

If this program extends over the school semester it is suggested that the questionnaire be given near the beginning of the school semester and again near the end of the semester.

Questionnaires should not be individually identified or signed but should be kept together by class groupings.

At the end of the semester, it might be of interest for your school to post a graph showing the proportion of smokers in the school.

INSTRUCTIONS FOR THE STUDENT QUESTIONNAIRE ON SMOKING

A. QUESTIONNAIRE

Have each class member fill out the questionnaire at the beginning of the semester.

- Stress the need to check only one item in each of the first three questions.
- Stress the need to check one box for each of the statements in Question #4 of the questionnaire.
- The questionnaires should not be identified by name.

B. TABULATION - To determine cigarette smokers and nonsmokers by sex and grade. (For purposes of this questionnaire, a smoker is one who checks either A, B, or C in Question #1. A nonsmoker is one who checks D or E.)

- Sort questionnaires into two piles -- one with all A's, B's and C's in the first pile, and the second pile with all D's and E's. A small proportion of the questionnaires will be so badly filled out that they cannot be classified. This group, usually less than 1%, should be placed in a separate "miscellaneous" pile.
- Next sort each group by boys and girls. This would mean four separate piles.
- If sorting for an entire school, there would be four separate piles for each school grade. For any large sorting, it is helpful to line up shoe boxes with appropriate labels.
- To score the attitude question #4 of the questionnaire, give one point for each check mark that falls within the five boxed areas as indicated on the section of the questionnaire reproduced below. The total score is the sum of these points and can range from 5 (very unfavorable attitude to smoking) to 0 (very favorable attitude towards smoking).
- Calculate the average score for each grade and for boys and girls separately and separately for smokers and nonsmokers within these groups by adding up all these scores and dividing by the number of scores.

Key for Scoring Question #4 of the Questionnaire

4. INDICATE HOW YOU FEEL ABOUT THE FOLLOWING STATEMENTS. CHECK THE BOX WHICH BEST REPRESENTS YOUR FEELING ABOUT EACH OF THE FIVE STATEMENTS

Strongly agree	Mildly agree	Neither agree nor disagree	Mildly disagree	Strongly disagree	
☐	☐	☐	☐	☐	A. Smoking costs more than the pleasure is worth.
☐	☐	☐	☐	☐	B. When I have children I hope that they never smoke.
☐	☐	☐	☐	☐	C. There is nothing wrong with smoking.
☐	☐	☐	☐	☐	D. Smoking is a dirty habit.
☐	☐	☐	☐	☐	E. There is nothing wrong with smoking as long as a person smokes moderately.

WAS THE PROGRAM EFFECTIVE?

If you would like to get a rough idea of any change in students' smoking habits, you could:

- a. Give the questionnaire to class members who will be receiving information on smoking and lung cancer.
- b. At the same time, have the questionnaire given to a comparable group of students who will not be receiving any information on smoking and lung cancer. This "control group" should be of the same grade and comparable in general scholastic level. It would be helpful to use some code to identify the control group, such as "C" in the upper right-hand corner.
- c. Tabulate both sets and record results, computing the percentage of smokers by class and by boys and girls.
- d. At the end of the semester, give each group a second questionnaire.
- e. Tabulate both sets.
- f. Compare the degree of change between members of the sample group and those of the control group.

By using the control group as the "norm", you can compute the expected change during the semester. Any major deviation from this in the sample group could be attributed to the information on smoking and lung cancer.

Under the procedures outlined, this is admittedly a very rough gauge of possible change, but valid within limitations and should be of interest to students and teachers.

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SECONDARY SCHOOL QUESTIONNAIRE ON SMOKING

CHECK THE ONE STATEMENT (AND ONLY ONE) THAT BEST DESCRIBES YOUR CIGARETTE SMOKING AT PRESENT:

- ☐ A. I smoke half-a-pack or more of cigarettes just about every day.
- ☐ B. I smoke cigarettes just about everyday, but less than half-a-pack a day.
- ☐ C. I do not smoke cigarettes every day, but I do smoke them at least one day a week.
- ☐ D. I have smoked cigarettes (including trying them just to see what they were like) but do not smoke them at all regularly (at least one day a week) at the present time.
- ☐ E. I have never smoked cigarettes at all.

Check one

3. Present School Class

Boy ☐ Girl ☐

7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐

INDICATE HOW YOU FEEL ABOUT THE FOLLOWING STATEMENTS. CHECK THE BOX WHICH BEST REPRESENTS YOUR FEELING ABOUT EACH OF THE FIVE STATEMENTS

Strongly agree	Mildly agree	Neither agree nor disagree	Mildly disagree	Strongly disagree	
☐	☐	☐	☐	☐	A. Smoking costs more than the pleasure is worth.
☐	☐	☐	☐	☐	B. When I have children I hope that they never smoke
☐	☐	☐	☐	☐	C. There is nothing wrong with smoking.
☐	☐	☐	☐	☐	D. Smoking is a dirty habit.
☐	☐	☐	☐	☐	E. There is nothing wrong with smoking as long as a person smokes moderately.

SCHOOL _____

CITY OR TOWN _____

CLASS _____
(i.e., Health Education, etc.)

COUNTY _____

DATE _____
Month Day Year

CIGARETTE SMOKING AND LUNG CANCER

BIBLIOGRAPHY AND FILM LIST

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CIGARETTE SMOKING AND LUNG CANCER

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B. PAMPHLETS AND BOOKLETS

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- B-2 American Cancer Society: SMOKING DEMONSTRATION PROJECT (Outline for grades 7-12) An excellent teaching aid pamphlet of 32 pages available from the Society's Connecticut Division, 1044 Chapel St., New Haven, 10 Conn. Cost: 50 cents each.
- *B-3 American Cancer Society: TEACHING ABOUT CANCER (1957) A 48-page booklet of cancer information for teachers, with a good bibliography.
- *B-4 American Cancer Society: TO SMOKE OR NOT TO SMOKE (1960) A concise six-page handout.
- *B-5 American Cancer Society: WHY LEARN ABOUT CANCER? (1958) A four-page leaflet.
- B-6 Bureau of Cancer Control, New York State Department of Health; CIGARETTE SMOKING AND LUNG CANCER, Health Education Service, P. O. Box 7283, Albany 2, New York, 1959. A 32-page booklet with excellent information.
- *B-7 American Cancer Society: SHALL I SMOKE? A four-page flyer for distribution to high school students.
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CIGARETTE SMOKING AND LUNG CANCER

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C. PERIODICAL REFERENCES

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*Available free of charge from the American Cancer Society, New Jersey Division, Inc., 621-3 Central Avenue, Newark, New Jersey.

CIGARETTE SMOKING AND LUNG CANCER

BIBLIOGRAPHY AND FILM LIST

D. FILMS AND FILMSTRIPS

The following films and filmstrips have been reviewed by teachers on the faculties of junior and senior high schools in New Jersey. Their comments and recommendations follow the general information about each item. It is hoped this information will prove helpful in selecting appropriate material for your students. In addition it is recommended that you preview each film prior to classroom use so that appropriate introductory comments and a plan for follow-up discussion may be prepared.

When ordering films it is suggested that at least three weeks time be allowed between the date of your request and the date upon which you wish to use the film.

D-1 **CANCER** 10 min film, sound and color.

Resume: This film briefly explains mitosis of normal cells and the uncontrolled growth of cancerous cells. Through a case history, which has a successful outcome, it stresses the importance of knowing cancer's "seven danger signals." The material in the film is accurate, up-to-date and fairly well organized. However, some of the medical techniques, shown in connection with the case history, may arouse apprehension on the part of viewers.

General evaluation: Fair — there are many more superior films for classroom use.

Suggested audiences: Adult groups — particularly those having little exposure to cancer education, since the information presented is very elementary.

Source: Encyclopedia Britannica Films, 202 East 44th St. New York 17.

***D-2 CANCER — A RESEARCH STORY** 28 min film, sound and color.

Resume: The contributions to cancer research made by a variety of scientists including geneticists, virologists, chemists, physiologists, botanists and physicians are explored in this film. Examination of research activities based upon the question "Can Cancer Be Inherited?" Highlights the interrelationship of research work in the fields of genetics, physiology and chemistry. This film is accurate, up-to-date and well organized; it has no major weaknesses or technical deficiencies.

General evaluation: Excellent

Suggested audiences: 9th grade, senior high and college students (at the 9th grade level it is recommended that this film be preceded by the film FROM ONE CELL and that the presentation of this material be tied in with courses in biology or health); adult groups (prior use of the film FROM ONE CELL or brief introductory discussion of cell structure would be helpful).

***D-3 FROM ONE CELL — 15 minute film, sound and color.**

Resume: Starting with observations of simple one-celled animals this film continues on through a description of cellular life in the human being. The relationship of cell reproduction and growth to the healing process is outlined. The film closes with an analysis of the principles of cell growth as they relate to cancer. The information presented in this film is accurate, up-to-date and well organized. Excellent photography, animation of sections dealing with cell growth and the healing process as well as the clarity of the entire presentation make this film a particularly valuable teaching tool.

General Evaluation: Very good.

Suggested Audiences: Grades 9-12 and college students (This film effectively relates information about the growth of cancer cells to the students knowledge of normal cell development.)

***D-4 IS SMOKING WORTH IT — 16 minute film, sound and color.**

Resume: A presentation scientifically valid, up-to-date statistical data related to the long-term use of cigarettes and the rising incidence of lung cancer. This film, which is based on studies done in many parts of the world, attempts to stimulate student thinking and decision making regarding their own behavior. The approach used is factual rather than emotional. Attitudes of both smokers and non-smokers are explored.

General Evaluation: Very good although opening sequences are somewhat difficult to understand due to a poor sound tract. This is probably the only film of its kind on the subject.

Suggested Audiences:

Junior and senior high school students (suitable for both classroom and assembly use.) Young adult, parent and other adult groups.

***D-5 MAN ALIVE — 12½ minute film, sound and color.**

Resume: Using the cartoon approach, this film deals with the psychology of fear, particularly as it relates to cancer. It attempts to show the "lack of good sense" behind irrational behavior motivated by fear. The material contained in MAN ALIVE is vital, factual and of widespread interest. Although it deals with a serious problem, it is presented humorously.

General Evaluation: Good. Requires skilled discussion leadership. Also, since this film was produced approximately ten years ago, the statistical data presented should be brought up to date by the teacher or lecturer.

Suggested Audiences:

All other young adult and adult groups.
Junior and senior high school students.

D-6 TOBACCO AND THE HUMAN BODY — 15 minute film, sound, black and white.

Resume: Through diagrammatic views this film contrasts the normal functioning of the respiratory and circulatory systems with the functioning of these systems when tobacco is used. A series of excellent laboratory procedures are used to show the chemical effects of carcinogenic substances and other irritants upon the body. A brief history of the smoking of tobacco is also presented.

General Evaluation: Excellent

Suggested Audiences: Grades 9-12 and college students (Fits in nicely with health or biology instruction on circulation and respiration.)
Adult groups (this film would be excellent for P.T.A. or other organizational meetings. It should be followed by a discussion period under the direction of a physician, health or science teacher.)

Source: Encyclopedia Britannica Films
Preview Department, 202 East 44th Street, New York 17, New York

***D-7 THE CANCER CHALLENGE TO YOUTH — 15 minute, sound and color**

Resume: This teaching filmstrip covers the subject of cancer generally from the standpoint of possible causative factors and methods for detection, treatment and control. It contains material related to cell pathology which would be of particular value in teaching of the biological sciences. It would also be a helpful teaching tool in health classes. Students are used in the presentation.

General Evaluation: Excellent

As with all filmstrips, this material is most suitable for use in the individual classroom. Sufficient time should be allowed for discussion. At least one full-class period is required.

Suggested audiences: Junior and senior high school students, particularly biology and health classes. Also suitable for small discussion groups of parents and other adult groups.

***D-8 TO SMOKE OR NOT TO SMOKE — 25 minute, sound and color**

Resume: Using actual students in a high school situation, this filmstrip discusses the facts related to statistical evidence linking smoking and lung cancer. The results of studies from around the world are reviewed and the question TO SMOKE OR NOT TO SMOKE is approached from a number of angles. The filmstrip is open ended, designed to stimulate follow-up discussion and individual decisions on the part of student viewers.

General Evaluation: Excellent.

Specifically devoted to the subject of cigarette smoking and lung cancer, this is one of the most informative and provocative visual aids currently available.

Suggested audiences: Junior and senior high school students. Also, small discussion groups of parents and other adults.

***D-9 I'LL CHOOSE THE HIGH ROAD — 15 minute, sound and color**

Resume: Designed for pupils at about the sixth grade level, this brand new filmstrip (1963) has the aim of alerting these younger pupils to the health liabilities of cigarette smoking. When used by schools as a forerunner to the Society's smoking materials for teen-agers, the filmstrip should effectively widen and augment the total educational effort in schools concerning cigarette smoking.

621 Central Avenue, Newark, N. J.

General Evaluation: Excellent

Suggested Audiences: Elementary school pupils. Also small discussion groups of parents and other adults.

*Film available from American Cancer Society, New Jersey Division,
621 Central Avenue, Newark, N. J.

CREDITS

IN ADDITION TO CREDITS GIVEN IN THE TEXT, THE FOLLOWING CREDITS ARE ALSO
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1. The first four paragraphs of "Preface" and pages 29-33 Appendix — "Limited Pre-test Issue of A Sourcebook for Teachers — Cigarette Smoking and Lung Cancer" (George H. Krablin, Ed. D. and Kenneth Runquist, Ed. D., 1961)
2. Article, "Are the Facts Being Filtered?" by Walter Goodman — This article originally appeared in the June, 1960 issue of **Redbook Magazine**.
3. Article, "Patterns of Teenage Smoking" by Daniel Horn, Ph. D., reprinted from **Public Health News**, Vol. 41, number 6, June, 1960
4. Article, "Nicotine and Tar Effects," reprinted by permission of the **Scholastic Magazine** from **Science World**, edition 2, March 21, 1962 issue.

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ATLANTIC COUNTY

Brigantine School, North
Miss Kathleen Ciccarone
Mr. Roger Maxwell
Mrs. Helen Simon
Minetola Jr. High School
Mr. Charles Cowell
Mrs. Edna Smith

BERGEN COUNTY

Fairleigh Dickinson University
Mr. Harry Gershenowitz

CAMDEN COUNTY

Earlton School
Mr. Walter Sickles
Kinston School
Mr. Michael Trechock
Heritage Junior High School
Mr. David Martin
Delaware Township High School
Mr. George Gerstle

ESSEX COUNTY

Barringer High School
Mr. Anthony Noparano
Mr. Matthew Lombardi
Clinton Place Junior High
Mrs. Marjorie Baylor
Mrs. Goldie Grindlinger
Miss Marcia Krouser
Mrs. Ruth Weinberg
Mr. Anthony Capasso
Mr. Max Plasner
Mr. Sidney Rothford
Montclair State College
Richard Tews, Ed. D.
John A. Redd, Ed. D.

GLOUCESTER COUNTY

Glassboro Campus School
Mr. Hugh Ward

Glassboro State College
Miss Leah Beverly
Evelyn Reade, Ed. D.

MERCER COUNTY

Trenton State College
George Krablin, Ed. D.
Kenneth Runquist, Ed. D.

MONMOUTH COUNTY

Monmouth Regional High School
Martha Schelling, R. N.
Catherine Delione, R. N.

Eatontown Elementary School
Mr. Norbert Corvair
Mr. Noah Marshall
Mr. Joseph Nesser
Miss Patricia Robrey
Mr. Carl Shelton
Miss Vincerre Waxwood
Mr. Wayne Bailey
Mr. William Connell
Mr. James Flohr
Mr. Tony Iacopina
Mr. Francis Kulah
Mr. Michael Petroni

Shrewsbury Elementary School
Mrs. Eva Bortman
Mrs. R. Noland
Mr. Kenneth Noland
Mrs. Eunice Pickering
Mr. Max Wallenburg
Mrs. June Denny
Miss Yvonne Edmond
Mr. Joseph Giger
Mrs. Alfreda Loichle
Mr. Walter Spillane

MORRIS COUNTY

Canfield Avenue School
Mr. Charles J. Bartek
Mrs. Mary Taylor
Mr. Stephen Goin
Mr. M. Douglas Laurie, Jr.
Mrs. Joanne Nicoletti
Mr. Charles V. Raffey, Jr.

PASSAIC COUNTY

Clifton Junior High School #10
Mrs. Virginia Capulo
Mr. John Hargreaves

SUSSEX COUNTY

Hardyston Township School

Mr. Harold Christianson
Mrs. Jeannette Cox
Mrs. Elsbeth Mateer
Mr. James R. Sailor
Mr. Ben Velthaven

Newton High School

Mr. Arthur Disque
Mr. Louis Balducci
Mr. Kenneth Marron
Mrs. Hazel Gordon
Mrs. Virginia Trudgeon
Mrs. Maxine Crisman
Mr. Ben Cummings

Sparta High School

Mr. Galand Anderson
Mr. Richard Cassels
Mr. William Schroder
Miss Peg Ewing
Miss Edith Patton

UNION COUNTY

Roosevelt Junior High School

Mrs. Ruth Foster
Mr. Garland Harris
Mrs. Martha Nelson
Mr. William Odenkirk
Miss Alice Ruth
Edison Junior High
Mr. George Rosnagle
Miss Victoria Nelosi
Mr. Robert Dedrick

Union Senior High School

Mr. Joseph Bezzaro
Miss Arline Pittenger

Burnet Junior High School
Mr. Arthur Engleken
Mr. James Daw

Kawameeh Junior High School
Miss Catherine Stephens

SOURCE BOOK FOR TEACHERS
ON CIGARETTE SMOKING AND LUNG CANCER

Pre-Test Project Committee

THOMAS ADAMS	— Division of Curriculum and Instruction, New Jersey State Department of Education
LILLIAN BAJDA	— Division of Local Health Services, New Jersey State Department of Health
STELLA BOOTH, M. D.	— Cancer Control Program, New Jersey State Department of Health
GEOFFREY ESTY, M. D.	— Division of Curriculum and Instruction, New Jersey State Department of Education
FLORENCE FIORI	— Division of Consultation Services, New Jersey State Department of Health
LILLIAN HAUFLE	— Division of Curriculum and Instruction, New Jersey State Department of Education
ROBERT HEARN	— American Cancer Society, New Jersey Division
EVELYN READE, Ed. D.	— Department of Health and Physical Education, Glassboro State College

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New Jersey State Department of Health.