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Study of bronchogenic carcinoma deaths in Douglas County in 1958-1959

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A STUDY OF BRONCHOGENIC CARCINOMA DEATHS IN DOUGLAS
COUNTY IN 1958-1959

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INTRODUCTION

Deaths due to bronchogenic carcinoma have been increasing at an alarming rate in the past 25 years. This increase has been marked enough to create a serious public health problem in this country. In fact, the disease is increasing faster and causing more deaths in this country than any other cancer in the adult male population. The National Office of Vital Statistics' figures show that in 1939 there were 8,000 deaths due to carcinoma of the lung; in 1949 there were 16,600, and in 1958 there were 34,000. This is in excess of a four-fold increase within a period of twenty years (15).

It is a fact that carcinoma of the lung is increasing, but why is this true? Most of the investigators in the field believe that this increase is due to the increase in smoking, especially cigarette smoking. If tobacco smoke is an etiologic agent, then it becomes even more a problem because cigarette sales continue to increase. If an etiologic relationship exists, and most evidence available indicates that it does, then carcinoma of the lung will probably continue to increase also.

It is not the purpose of this paper to review the literature dealing with carcinoma of the lung, but it seems worth while to note that recently there has been

a great increase in the consumption of cigarettes. The etiology of lung cancer is not well understood. Most investigators feel that there is more than one etiologic agent. At the present time, the flow of evidence points increasingly toward smoking, and primarily cigarette smoking, as the principal factor causing the catastrophic increase in the incidence of bronchogenic carcinoma.

There is voluminous literature concerning the association of bronchogenic carcinoma with cigarette smoking (10). If cigarette smoking is etiologically related to the development of this cancer, a problem of immense proportions is evident. The following table shows the great increase in consumption of cigarettes in the United States.

1945	--	260	billion	cigarettes	sold
1950	--	360	"	"	"
1955	--	380	"	"	"
1960	--	472	"	"	"

Evidence indicates that as a population increases its use of cigarettes, many years elapse before the higher tolls from bronchogenic carcinoma appear. Our high tolls of today appear to reflect the lower cigarette consumption of 10 to 20 or 30 years ago, but recent far greater consumption may result in even higher tolls

among the American people. Further, the incidence of the disease among women is only about one-sixth that among men. Only since about 1940 have large numbers of women smoked cigarettes. Perhaps they actually are not so subject to the cancer as are men, even though exposures are equal, but there also remains the possibility that the latent period for them as a large group has not yet elapsed. If the incidence rate among women does finally approach that among men, the toll from the disease will indeed be great, and with the greater per capita consumption year by year by men, there may result an even higher incidence of the neoplasm among men. Substantial evidence indicates that individual risk increases with individual consumption.

In view of the national problem, it seems worth while to study the problem in Douglas County as revealed by an analysis of death certificates filed in this county. This study is a part of a continuing local study, made year by year, and deals primarily with deaths of Douglas County residents who died in Douglas County. Data from the death certificates of non-residents who died in Douglas County were not included in this survey, and data concerning Douglas County residents who died elsewhere were not included, because the death certificates are filed in the county of death and are not available for analysis.

In making this study, I went over all the death certificates of deaths occurring in 1959, which amounted to about 4,500 certificates, and recorded each case in which primary carcinoma of the lung was mentioned. The data was listed under the headings of Name, Age, Sex, Occupation, Interval (between diagnosis and death), Autopsy, and Date of Death. Then the cases of carcinoma of the lung were analyzed as to Male:Female ration, Median Age at Death of the total cases, Median age at death of autopsied cases, Deaths as to Age Groups, and Interval from onset until death.

DEATHS IN DOUGLAS COUNTY, NEBRASKA FROM CARCINOMA OF LUNG

1959

Certified Death	Age	Sex	Occupation	Interval	Post	Date
1	56	M	Salesman	?	Yes	1/10/59
2	71	M	Self empl.	?	No	1/13/59
3	55	M	Printer	2 mo.	No	1/15/59
4	45	M	Laborer	7 mo.	Yes	1/14/59
5	89	M	Brewer	1½ yr.	Yes	1/16/59
6	74	M	Engineer	2 yr.	Yes	1/18/59
7	59	M	Laborer	?	No	1/24/59
8	69	M	Steamfitter	18 mo.	No	2/1/59
9	73	M	Cleaner	10 mo.	No	2/2/59
10	63	M	Salesman	3 wk.	No	2/5/59
11	51	M	Clerk	6 mo.	Yes	2/11/59
12	67	M	Fire Capt.	3 wk.	No	2/17/59
13	78	F	Housewife	2¼ yr.	No	2/13/59
14	67	M	Bricklayer	?	No	2/14/59
15	67	M	Laborer	4 mo.	No	2/16/59
16	73	M	Auditor	6 mo.	Yes	2/19/59
17	54	M	Pressman	3 yr.	Yes	3/1/59
18	64	M	Cooker	10 mo.	Yes	2/26/59
19	58	M	Engineer	1 yr.	No	3/3/59
20	65	M	Laborer	?	No	3/4/59
21	67	M	Butcher	5 mo.	No	2/21/59

Certified Death	Age	Sex	Occupation	Interval	Post	Date
22	72	M	Engineer	?	Yes	3/19/59
23	56	M	Truckdriver	6 mo.	No	3/11/59
24	43	M	Tavern owner	?	Yes	4/15/59
25	53	M	Dry cleaner	6 mo.	Yes	4/13/59
26	52	M	Clerk	1½ yr.	No	4/23/59
27	57	M	Engineer	2 mo.	Yes	4/23/59
28	62	M	Newspaper	2½ yr.	No	4/23/59
29	53	F	Housewife	6 mo.	No	4/29/59
30	70	M	Warehsmn.	6 mo.	Yes	4/24/59
31	66	M	Laborer	1 yr.	No	4/30/59
32	63	M	Janitor	9 mo.	Yes	5/10/59
33	76	M	Meat packer	1 yr.	No	5/10/59
34	62	M	Engineer	3 mo.	No	5/21/59
35	66	M	City govt.	3 mo	Yes	6/12/59
36	67	M	Laborer	?	Yes	6/13/59
37	81	M	Grain insptr	5 yr.	No	6/20/59
38	63	M	Switchman	?	Yes	6/24/59
39.	72	M	Painter	?	No	6/30/59
40	69	M	Mechanic	18 mo.	No	7/11/59
41	69	M	Publisher	6 mo.	Yes	7/30/59
42	63	M	Truckdriver	2 mo	No	7/31/59
43	75	M	Car repr'r.	?	No	8/2/59
44	37	M	Foundryman	12 mo.	Yes	8/7/59

Certified Death	Age	Sex	Occupation	Interval	Post	Date
45	65	M	Farmer	6 mo.	No	8/7/59
46	64	M	Storekeeper	9 mo.	Yes	8/11/59
47	54	M	Serviceman	3 mo.	No	8/27/59
48	56	M	Meat smoker	6 mo.	Yes	9/5/59
49	56	M	Carpenter	3 yr.	No	9/12/59
50	80	M	Furn. dlr.	?	No	9/10/59
51	81	F	Housewife	1 yr.	Yes	9/16/59
52	49	M	Repairman	4 mo.	Yes	9/21/59
53	50	F	Saleslady	6 mo.	Yes	9/22/59
54	63	M	Laborer	18 mo.	Yes	9/23/59
55	68	M	Farmer	6 mo.	Yes	9/28/59
56	62	M	Steamfitter	28 mo.	No	9/28/59
57	67	M	Salesman	4 mo.	No	10/7/59
58	68	M	Laborer	?	Yes	10/12/59
59	67	M	Stockrm. man	6 mo.	No	10/18/59
60	68	M	Blacksmith	?	Yes	10/16/59
61	59	M	Truckdriver	2 yr.	Yes	10/21/59
62	68	M	Laborer	2 yr.	No	10/22/59
63	71	M	Lawyer	9 mo.	Yes	10/24/59
64	45	M	Butcher	?	No	10/31/59
65	73	M	Iron mouldr.	?	No	11/5/59
66	73	M	Watchman	4 yr.	No	11/4/59
67	70	M	Photogrhr.	1 yr.	No	11/19/59

Certified Death	Age	Sex	Occupation	Interval	Post	Date
68	69	M	Accountant	6 mo.	No	11/23/59
69	45	M	U.S. Govt.	3 mo.	Yes	11/25/59
70	50	M	Cab driver	2½ yr.	No	11/23/59
71	62	M	Advertising	?	Yes	12/1/59
72	44	M	Steel worker	?	Yes	12/22/59
73	66	M	M.D.	2 mo.	No	12/30/59

ANALYSIS OF 1959 DEATHS

Total deaths of Douglas County residents from lung cancer in 1959 - 73.

Males	69	(94.5%)
Females	4	(5.5%)

Ratio of males to females -- 17.2:1

This is a very striking figure especially considering that the national ratio is 6:1, males to females. However, this is a small series and one must be cautious in drawing any conclusions from these figures. This may actually indicate a significantly higher male to female ratio in this area as compared to the national figures, but a larger series is needed to be more meaningful. Pure chance will throw a series of this size too often.

Median age at death of total cases:

Total cases	65 years
Males	65 years
Females	64 years (Ages were 49, 50, 78, and 81)

Autopsy cases: 33

This is 45.2% of the total cases.

Median age at death of the autopsied cases:

Total cases	63 years

Males --- 63 years

Females - Ages were 50 and 81.

These median ages correspond closely to the median ages of all people who died of carcinoma of the lung whether autopsied or not. This gives some support to the belief that the diagnoses were correct in the non-autopsied cases.

Deaths as to age groups:

Age Group	No. of Cases
35-39	1
40-44	2
45-49	4 (7 were under 50; 9.6%)
50-54	9 (16 were under 55; 21.9%)
55-59	8 (24 were under 60; 33.0%)
60-64	11 (35 were under 65; 48.0%)
65-69	20 (55 were under 70; 75.3%)
70-74	11 (66 were under 75; 90.4%)
75-79	3 (7 were over 75; 9.6%)
80-84	3
85-89	1

This grouping shows that carcinoma of the lung strikes a considerable proportion of people in the middle-age group, i.e. men who have important family responsibilities and are still in the years of peak productivity.

At this time I thought that it would be worth while to examine the interval from estimated onset until death from this disease. The information is taken from the section of the death certificate where the attending physician gives the interval from onset to death, to the best of his knowledge. There can be several inaccuracies in this method, however. In most cases, bronchogenic carcinoma is not diagnosed until symptoms have appeared, which may be some time following the actual onset of the disease. Although these estimates may be inaccurate, it should be interesting to note the course of lung carcinoma once it has struck.

The following is an analysis of those cases in which an interval was given. Of the total, 73, the interval was given in 55 cases.

Range of the intervals: 3 weeks to 5 years

Median length of intervals: 6 months

Intervals broken down as to time periods:

Time Period	No. of Cases	
0-3 months	11	(20% died within 3 mo.)
3-6 months	17	(50.8% died within 6 mo.)
6-12 months	12	(72.7% died within 1 yr.)
1-2 years	8	(88.8% died within 2 yr.)
2-3 years	5	(96.4% died within 3 yr.)
Over 3 years	2	(only 3.6% lived over 3 Yr.)

These statistics show that, on the average, carcinoma of the lung has a very rapid course, at least from the time of first known evidence. Many of the 73 victims apparently appeared to be entirely healthy when the year began, yet had succumbed long before the year was over.

DEATHS IN DOUGLAS COUNTY, NEBRASKA, FROM CARCINOMA OF LUNG
1958

Certified Death	Age	Sex	Occupation	Interval	Post	Date
1	54	M	Laborer	1 yr.	Yes	1/4/58
2	44	M	Clerk	1 yr.	Yes	1/22/58
3	79	M	Butcher	8 mo.	No	1/38/58
4	67	M	Creamery	6 mo.	No	2/14/58
5	57	M	Farmer	6 mo.	No	2/28/58
6	64	M	Unknown	4 yr.	No	2/27/58
7	52	M	Salesman	2 mo.	No	2/28/58
8	76	M	Teamster	1 yr.	No	3/4/58
9	81	F	Housewife	?	No	3/6/58
10	81	M	Carpenter	?	No	3/11/58
11	75	M	Messenger	3 mo.	No	3/19/58
12	65	M	Baker	3 mo.	No	3/20/58
13	85	F	Housewife	4 mo.	No	3/31/58
14	65	M	Store keeper	8 mo.	Yes	4/5/58
15	55	M	Carpenter	6 mo.	Yes	4/10/58
16	53	M	Sheet metal	3 mo.	No	4/14/58
17	64	M	Iron buyer	6 week	No	4/15/58
18	62	M	Engineer	6 mo.	No	4/19/58
19	77	M	Machinist	$2\frac{1}{2}$ yr.	No	5/9/58
20	70	M	Dry cleaner	10 mo.	No	5/12/58

Certified Death	Age	Sex	Occupation	Interval	Post	Date
21	55	M	Clerk	?	No	5/14/58
22	71	M	Laborer	?	No	5/20/58
23	75	M	Car inspect.	?	No	5/22/58
24	70	M	Expressman	18 mo.	Yes	5/18/58
25	64	M	Machine op.	5 wk.	No	5/25/58
26	60	M	Salesman	1 yr.	No	5/29/58
27	59	M	Attorney	2 mo.	Yes	6/10/58
28	72	M	Laborer	?	No	6/9/58
29	62	M	Storekeeper	?	Yes	6/20/58
30	51	M	Carpenter	3 mo.	No	6/17/58
31	64	M	Salesman	?	No	6/22/58
32	71	M	Shoemaker	6 mo.	No	6/6/58
33	65	M	Florist	6 mo.	No	7/3/58
34	52	M	Laborer	?	Yes	7/7/58
35	59	M	Merchant	1 yr.	No	7/10/58
36	84	F	Housewife	6 wk.	Yes	7/20/58
37	65	M	?	?	No	7/21/58
38	65	M	Business agt.	1 yr.	No	8/2/58
39	46	M	Upholsterer	4 mo.	Yes	8/22/58
40	63	M	Hotel mgr.	2 yr.	No	9/9/58
41	68	M	Dentist	3 mo.	Yes	9/5/58
42	60	F	Housewife	2 yr.	No	9/10/58
43	62	M	Inspector	6 mo.	Yes	9/5/58

Certified Death	Age	Sex	Occupation	Interval	Post	Date
44	48	F	Housewife	15 mo.	No	9/28/58
45	46	M	Bartender	6 wk.	Yes	10/9/58
46	55	M	Laborer	1½ yr.	No	10/11/58
47	78	M	Bartender	10 mo.	No	10/21/58
48	65	M	Executive	4 mo.	No	10/25/58
49	59	M	Salesman	6 mo.	Yes	10/26/58
50	73	M	Stockyd.	10 mo.	Yes	10/21/58
51	59	M	Furniture	3 mo.	No	11/11/58
52	67	F	Housewife	3 mo.	No	11/12/58
53	66	M	Clerk	4 mo.	Yes	11/13/58
54	57	F	Housewife	3 mo.	No	11/22/58
55	51	M	Inspector	18 mo.	No	11/29/58
56	57	M	Warehs. wkr.	1 yr.	Yes	11/27/58
57	54	M	Sign painter	6 mo.	Yes	11/27/58
58	78	M	Tailor	?	No	12/8/58
59	79	M	Laborer	3 mo.	Yes	12/16/58
60	58	M	Baker	?	No	12/14/58
61	71	M	Laborer	3 mo.	Yes	12/23/58
62	58	M	Linotype op.	6 mo.	No	12/26/58
63	78	M	USNR	6 mo.	Yes	12/17/58
64	65	M	Postal clerk	4 yr.	No	12/31/58
65	49	M	Blacksmith	?	Yes	12/29/58
66	78	M	Auto dealer	2 yr.	No	12/30/58

A study of deaths due to primary carcinoma of the lung occurring in the same population was made by a College of Medicine medical student, Philip Weingart, in 1959. I thought it would be interesting and also would make a more meaningful study to include the 1958 records not only as a comparison with the 1959 statistics, but also as a combined study of a larger series of cases. Again, the cases listed here are only those of Douglas County residents who died in Douglas County.

ANALYSIS OF THE 1958 DEATHS

Total deaths of Douglas County residents from lung cancer in 1958 - 66

> Males   59 (89.3%)
>
> Females   7 (11.7%)
>
> Ratio of males to females -- 9.4:1

This ratio of 9.4:1 is quite striking in comparison to that of the 1959 statistics where the ratio was 17.2:1. This seems to point up the fact that any ratio or value derived from a small series such as this can be markedly altered by chance.

Since the people living in Douglas County were exposed to much the same environmental conditions in 1959 as in 1958, it is difficult to ascribe this difference in the male:female ratio to any dramatic change in the cigarette consumption, atmospheric contamination, etc. in only a one-year period. Perhaps more conclusions can be drawn when a larger series has been collected in future years.

Median age at death:

> Total cases   64 years
>
> Males   64 years
>
> Females   67 years

There is very little difference in the cases of 1958 and those of 1959 in which the median for the total cases and males was 65 years and that for females was 64 years.

Autopsy cases: 22 (33% of cases)

Median age at death of autopsy cases:

Total cases   61 years

Males   59 years

Females   One case 84 years old

This is compared to a median age of 63 years for both total cases and males in 1959.

Analysis of deaths as to age groups, 1958 series:

Age Group	No. of Cases
40—44	1
45—49	4 (5 were under 50; 7.6%)
50—54	7 (12 were under 55; 18.2%)
55—59	12 (24 were under 60; 36.4%)
60—64	10 (34 were under 65; 51.5%)
65—69	11 (45 were under 70; 68.2%)
70—74	7 (52 were under 75; 78.8%)
75—79	10 (62 were under 80; 93.9%)
80—84	4 (4 were over 80; 6.1%)

Deaths were analyzed as to interval from estimated onset until death according to the information given

on the death certificates. Of the total cases, 66, the
interval was given in 51 or 77.3% of cases.

Range of the intervals: 2 months to 4 years

Median length of interval: 6 months

Intervals broken down as to time periods:

Time Period	No. of Cases	
0-3 months	14	(27.6% died within 3 mo.)
3-6 months	15	(57.0% died within 6 mo.)
6-12 months	13	(82.3% died within 1 yr.)
1-2 years	6	(94.1% died within 2 yr.)
2-3 years	1	(96.1% died within 3 yr.)
Over 3 years	2	(only 4% of cases lived over 3 yr.)

In a study of 117,000 patients who died of carcinoma
during the period 1949-1959, the five-year survival in
cases of primary carcinoma of the lung was only 4%. This
survival ratio was lower than that for any other common
primary carcinoma. The study involved data from ninety-
nine hospitals in this country (18).

Combined statistical analysis of all deaths due to
bronchogenic carcinoma among Douglas County residents who
died in Douglas County during 1958 and 1959 are as follows:

Total deaths in 1958 and 1959: 139

Males: 128 (92.1%)

Females: 11   (7.9%)

Ratio, Males:Females   12.6:1

Median age at death:

    Total cases   64 years

    Males   64 years

    Females   67 years

Autopsy cases: 55   (39% of the total)

Median age at death of autopsy cases:

    Total cases   62 years

    Males   62 years

    Females   3 cases, ages 50, 81, and 84

Death as to age groups:

Age Groups	No. of Cases
35-39	1
40-44	3
45-49	8 (12 were under 50; 8.6%)
50-54	16 (28 were under 55; 20.0%)
55-59	20 (48 were under 60; 34.5%)
60-64	21 (69 were under 65; 50.0%)
65-69	31 (100 were under 70; 71.2%)
70-74	18 (118 were under 75; 85.0%)
75-79	13 (21 were over 75; 15.0%)
80-84	6
85-89	2

Deaths as to interval from estimated onset of the disease until death: of the total cases, 139, the interval was given in 106 (76%) of cases.

Range of the intervals: 3 weeks to 6 years

Median interval: 6 months

Intervals broken down as to time periods:

Time Period	No. of Cases
0-3 months	25 (23.6% died within 3 mo.)
3-6 months	33 (54.7% died within 6 mo.)
6-12 months	24 (77.4% died within 1 yr.)
1-2 years	14 (90.6% died within 2 yr.)
2-3 years	6 (96.2% died within 3 yr.)
Over 3 years	4 (3.8% lived over 3 yr.)

DISCUSSION

As I have stated before, this paper is not a review of the literature concerning carcinoma of the lung. However, I have reviewed several articles written on this public health problem and present the conclusions here.

The Public Health Service is concerned with the increasing death rate from lung cancer in the United States, and interested in the increase in other parts of the world. Carcinoma of the lung is increasing more rapidly and causing more deaths than any other type of cancer in the adult male population in the United States (15). Many investigators feel that this increase is due primarily to cigarette smoking, but others think the increased volume of exhaust gases and industrial vapors may be responsible (9). However, the evidence accumulated over the past 30 years is pointing more and more toward excessive cigarette smoking as one of the causes (1).

Lombard and Snegireff (14) have studied an extensive series of patients known to have died of carcinoma of the lung. In their series, there were four variables which showed significant correlation and association: frequency of chronic respiratory conditions, heavy cigarette smoking, heavy consumption of alcohol, and outdoor work. Of these four, cigarette smoking had by far the

strongest relationship to lung cancer. About four-fifths of the people with lung cancer were heavy cigarette smokers; about one-third had frequent or chronic respiratory conditions; about one-fifth were engaged in outdoor occupations; and one-seventh used alcohol excessively.

Doll and Hill (4) have carried on a continuing study of 40,701 British physicians. Among male physicians of 35 years of age and over, in the initial four and a half years of the study, 1,714 deaths occurred, including 84 from cancer of the lung. Deaths from lung cancer increased steadily with increasing amounts smoked; for nonsmokers, the age-adjusted death rate was 7 per 100,000 of this population; for light smokers, 47; for moderate smokers, 86; and for heavy smokers (more than 25 cigarettes daily), 166. Giving up smoking reduced the danger of subsequently developing cancer of the lung. The decrease was greatest in those who had given up the habit for a decade or more. Those who continued to smoke more than 25 cigarettes daily from the beginning of the study had a mortality from lung cancer nearly 40 times that of the non-smokers.

Hammond and Horn (7) have been conducting a longitudinal study of 187,783 white men aged 50 to 69. Analysis with regard to lung cancer at the end of 44 months supports the findings of Doll and Hill. The 32,392

men who never smoked had an age-adjusted death rate from all types of lung cancer of 12.8 per 100,000 man-years. On the other hand, the 63,332 men who gave a history of excessive cigarette smoking showed an age-adjusted death rate of 127.2, a ratio of 10 to 1.

The study by Hammond and Horn is of particular interest since the reports of the individual deaths due to lung cancer were carefully checked and in most cases verified by microscopic section. Adenocarcinoma of the lung was excluded from this analysis because of the small number of cases, 32, and also because of the general feeling that adenocarcinoma may be less associated with smoking than are other forms of lung neoplasm.

Within the group of "well-established cases", the difference in death rates between the non-smoker and the heavy smoker was striking, the ratio being 64 to 1. For those who had previously smoked cigarettes but had stopped, the death rate was significantly reduced, and as the period without smoking lengthened, the death rate became progressively lower, although it never reached the rate of those who had never smoked.

The Dorn study's population (5) consisted of 249,000 United States government life insurance policy holders. At the end of two and a half years of this continuing study, there had been 7,382 deaths in the group. The

increased proportion of deaths from any cause among the
smokers as compared with the non-smokers was greatest
for cancer of the lung. The death rate from this malig-
nancy among regular smokers of cigarettes was about ten
times that in the non-smoking group. Regular cigarette
smokers who had stopped smoking cigarettes before the
study began in 1954, had a lower mortality than those
who continued to smoke; however, this rate was still
30% greater than for non-smokers.

In June, 1956, the American Cancer Society, the
American Heart Association, the National Cancer Institute
and the National Heart Institute, by joint action, organ-
ized the Study Group on Smoking and Health to review the
effects of tobacco smoking on health and to recommend fur-
ther needed research. After six two-day conferences, ex-
haustive examination of the literature, and discussion
with scientists representing specialized areas of research
concerned with the subject, the Study Group made this of-
ficial statement (10): "The sum total of scientific evi-
dence establishes beyond reasonable doubt that cigarette
smoking is a causative factor in the rapidly increasing
incidence of human epidermoid carcinoma of the lung."

The second group, the British Medical Research
Council, in 1957 published the following conclusions (16):

"1) A very great increase has occurred during the past 25 years in the death rate from lung cancer in Great Britain and other countries.

2) A relatively small number of the total cases can be attributed to specific industrial hazards.

3) A proportion of cases, the exact extent of which cannot yet be defined, may be due to atmospheric pollution.

4) Evidence from many investigations in different countries indicates that a major part of the increase is associated with tobacco smoking, particularly cigarettes.

5) The identification of several carcinogenic substances in tobacco smoke provides a rational basis for such a causal relationship."

Since carcinoma of the lung is a disease that also occurs in non-smokers, it is evident that factors other than tobacco contribute to its etiology. The major exogenous factors are air pollution and occupational exposure to carcinogens. The latter accounts for only a small percentage of lung cancer deaths.

Air pollution may be the "urban factor" which would help explain the higher death rate from lung cancer in urban as compared with rural areas (11). The major sources of air pollution are exhaust products of gasoline

and diesel engines, incomplete combustion products of petroleum and coal, many asphalt and bituminous products used in construction and road paving, and certain industrial effluents. The carcinogenic substances contained in these pollutants include polycyclic aromatic hydrocarbons such as 3,4 benzpyrene, 3,4 benzfluoranthene, some aliphatic oxides, and various inorganic compounds (12). With the exception of coal, all sources of air pollution have increased in recent years and therefore could be environmental factors contributing to the rise in lung cancer (8). There are also noncarcinogenic pollutants which are irritants and may affect the body's defense mechanism against inhaled carcinogens (12).

Some investigators have found that low socio-economic groups have an increased incidence of lung cancer (2). However, the low-income group, by economic necessity, is apt to live near industrial centers where the air is more heavily contaminated with pollutants and air-borne carcinogens than it is in peripheral residential areas. It is also true that the low socio-economic group, as a whole, receives less adequate medical care and lives in a less hygienic environment than the more economically fortunate portion of society. Thus, it is difficult to measure any direct effect of socio-economic factors alone.

Until 1926, lung cancer death rates among men and women in Massachusetts were approximately equal. As lung cancer rapidly increased, its distribution between the sexes changed. In 1956, in both Massachusetts and the country as a whole, the mortality in men was more than five times that in women (15). This difference is not easily explained. There may be a true sex difference in susceptibility to the causes of increase in lung cancer, but the data are not conclusive.

Studies of apparent differences in smoking habits also have not accounted adequately for the variation in death rates between men and women. But there is conclusive evidence (6) that non-smoking women have about the same lung cancer death rate as non-smoking men; that among women, the light smoker carries a risk of lung cancer twice that of the non-smoker; and for the woman smoking more than one pack a day, the hazard is five times greater.

Hammond and Horn (7) have shown that a person who smokes cigarettes has almost three times the risk of dying from lung cancer as the pipe smoker and seven times that of the cigar smoker. It is possible that this relatively favorable status of pipe or cigar smokers may be due to the more adverse physical characteristics of cigarette smoke. Cigarettes burn at considerably higher

temperatures than pipes or cigars (17). Undoubtedly too,
deep inhalation of smoke is associated almost entirely
with cigarette smoking (3). Others maintain that the
lower death rates of persons who do not smoke cigarettes
exclusively merely reflect their less extensive use of
cigarettes.

SUMMARY

This report reflects a study of the deaths of
Douglas County residents who died in Douglas County of
primary carcinoma of the lung. The data were obtained
by an investigation of all the death certificates filed
in Douglas County for the year of 1959. A total of ap-
proximately 4,500 certificates were studied. Addition-
ally, data compiled by Philip Weingart concerning lung
cancer deaths of Douglas County residents in 1958 were
used in one part of this study.

The compilation and analysis of these cases is a
part of a continuing study of carcinoma of the lung in
Douglas County being carried on by the Department of
Preventive Medicine and Public Health of the College
of Medicine, University of Nebraska.

Using these data, compilations and analysis were
made. The total number of deaths was 139 for the two
years. The male to female ratio was 12.6:1. The med-
ian ages at death were: males - 64 years, females - 67
years, and total cases - 64 years. The interval to
death after the first manifestations of the disease
were noted was a median of 6 months.

In addition, the autopsied cases were analyzed
separately. Total autopsied cases were 55, or 39% of

the total. Median ages at death were 62 years for males
and 62 years for total cases.

CONCLUSIONS

1. Carcinoma of the lung is increasing in the United States. In fact, a four-fold increase of deaths from this disease has occurred in the past 20 years.

2. A great majority of the deaths from this disease are males.

3. This is a rapidly progressing disease with a short course from onset until death in most cases.

4. Clinical diagnosis of the disease correlates very well with the autopsy diagnosis.

5. A very large number of the victims are in a relatively young and productive age group. Evidence indicates that the median age of people acquiring the disease is lowering somewhat.

6. Evidence indicates that smoking is the principal factor causing the increase of carcinoma of the lung.

7. Cigarette smoking is associated with an increased chance of developing lung cancer.

8. Stopping cigarette smoking is beneficial.

9. The non-smoker has a lower incidence of lung cancer than the smoker as evidenced in all reported studes.

10. Persons who have never smoked at all have the best chance of never developing carcinoma of the lung.

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