Lung Cancer Mortality, 1949–51

Supplemental Tables

The data were compiled by Miss Rose Sachs, statistician, formerly with the Field Studies Branch, Division of Air Pollution, Public Health Service, under the direction of Dr. Richard A. Prindle, deputy chief of the division. Miss Sachs is now with the Heart Disease Control Branch, Division of Chronic Diseases, Public Health Service.

"Comparative Mortality Among Metropolitan Areas of the United States, 102 Causes of Death," Public Health Service Publication No. 562, was issued in 1957. Section I of this report, "Ratios of Age-Adjusted Mortality for 163 Metropolitan Areas to Total United States, 102 Causes, White Population by Sex, 1949–51," includes ratios for cancer of the lung (malignant neoplasm of trachea, bronchus, and lung) specified as primary (ISC 162), and for cancer of the lung unspecified as to whether primary or secondary (ISC 163). The separate mortality ratios published for each of these two causes have not been of maximum value because in practice reported deaths from lung cancer unspecified (ISC 163) include varying proportions of deaths from primary lung cancer in different areas.

The supplemental tables presented here fulfill the need for mortality ratios for all reported lung cancer combined (ISC 162 and 163). Table 1 presents lung cancer mortality ratios for white males and white females for each of the 163 standard metropolitan areas. Ratios based on less than 16 deaths are shown in parentheses, in keeping with the selection of 16 as the critical number in the original publication. Table 2 shows the frequency distributions of the mortality ratios presented in table 1.

The mortality ratio in this study is an index of the relationship of the lung cancer mortality of a race-sex group in a standard metropolitan area to the lung cancer mortality of the corresponding race-sex group in the total United States. For example, a ratio of 1.3 for lung cancer for white males in the Detroit metropolitan area means that white male mortality from lung cancer in that area is about 30 percent higher than the corresponding mortality for all white males in the United States in the same years. The approximate nature of these values should be borne in mind.

The number of white male deaths from lung cancer in each standard metropolitan area is usually several times the number of white female deaths (table 1, columns 4 and 5). The magnitude of this difference is not measured by the difference between the mortality ratios (table 1, columns 6 and 7).

The white male lung cancer mortality ratio for all standard metropolitan areas is 1.2 (table 1, column 6). The mortality ratios of the 163 areas range from 0.4 to 2.0 (table 2). More than half of the areas (97) have ratios between 0.8 and 1.2.

The white female lung cancer mortality ratio for all standard metropolitan areas is 1.1. The range, too, is slightly lower than the range for males.

The lung cancer mortality ratios were derived by the same formula and from the same data used in the preparation of section I of the original publication. A shortcut for computing these ratios by machine was developed and used. In both the original formula and the shortcut 10 age groups were used. The original formula, in which mortality means deaths from a specified cause, is shown below.

$$\left.\begin{array}{l}\text{Mortality ratio for}\\ \text{race-sex group of}\\ \text{SMA}\end{array}\right\} = \left\{\frac{\text{Reported deaths, SMA race-sex group}}{\text{Sum of 10 products: (SMA race-sex-age population group} \times \text{U.S. age-group death rate)}}\right\} \times \left\{\frac{\text{Sum of 10 products: (U.S. race-sex-age population group} \times \text{U.S. age-group death rate)}}{\text{Reported deaths, U.S. race-sex group}}\right\}$$

Table 1. Ratios of age-adjusted lung cancer mortality of 163 metropolitan areas to U.S. total, white population, by sex, 1949–51

Standard metropolitan area	1950 population (thousands)			Lung cancer: Number of deaths 1949–51		Lung cancer: Mortality ratios	
	Total population	White males	White females	White males	White females	White males	White females
Total	85, 572	38, 006	39, 308	29, 075	5, 938	1. 2	1. 1
1. New York, N.Y[1]	9, 556	4, 238	4, 468	4, 730	840	1. 6	1. 3
2. Chicago, Ill	5, 495	2, 424	2, 467	2, 141	423	1. 3	1. 2
3. Los Angeles, Calif	4, 368	1, 973	2, 119	1, 458	369	1. 1	1. 1
4. Philadelphia, Pa	3, 671	1, 565	1, 622	1, 381	296	1. 4	1. 2
5. Newark-Jersey City, N.J[1]	3, 356	1, 547	1, 613	1, 489	265	1. 5	1. 1
6. Detroit, Mich	3, 016	1, 338	1, 316	994	180	1. 3	1. 1
7. Boston, Mass.[1]	2, 876	1, 357	1, 462	1, 018	245	1. 1	1. 0
8. San Francisco-Oakland, Calif	2, 241	1, 020	1, 011	823	145	1. 3	1. 0
9. Pittsburgh, Pa	2, 213	1, 028	1, 048	702	154	1. 1	1. 1
10. St. Louis, Mo.	1, 681	711	753	603	128	1. 3	1. 1
11. Cleveland, Ohio	1, 466	641	670	580	115	1. 3	1. 2
12. Washington, D.C	1, 464	545	577	376	63	1. 4	. 9
13. Baltimore, Md	1, 337	528	542	491	76	1. 6	1. 0
14. Minneapolis-St. Paul, Minn	1, 117	533	568	318	71	. 9	. 9
15. Buffalo, N.Y	1, 089	513	528	526	65	1. 6	. 9
16. Cincinnati, Ohio	904	387	421	327	60	1. 3	. 9
17. Milwaukee, Wis	871	416	432	293	67	1. 1	1. 1
18. Kansas City, Mo	814	351	375	300	60	1. 3	1. 1
19. Houston, Tex	807	326	330	194	36	1. 3	1. 1
20. Seattle, Wash	733	351	352	245	56	1. 0	1. 1
21. Portland, Oreg	705	340	349	223	58	. 9	1. 1
22. New Orleans, La	685	234	251	257	43	2. 0	1. 3
23. Providence, R.I	682	325	346	250	45	1. 2	. 8
24. Atlanta, Ga	672	245	261	137	28	1. 1	. 9
25. Dallas, Tex	615	257	275	143	45	1. 1	1. 4
26. Louisville, Ky	577	247	264	141	36	1. 0	1. 0
27. Denver, Colo	564	266	277	159	44	1. 0	1. 1
28. Birmingham, Ala	559	170	180	128	22	1. 4	1. 0
29. San Diego, Calif	557	277	256	168	35	1. 1	1. 0
30. Indianapolis, Ind	552	234	252	166	41	1. 1	1. 1
31. Worcester, Mass	546	267	277	153	36	. 8	. 8
32. New Haven, Conn.[1]	546	261	268	215	43	1. 2	1. 1
33. Hartford, Conn.[1]	540	256	267	206	33	1. 2	. 9
34. Youngstown, Ohio	528	247	247	167	29	1. 0	. 9
35. Albany-Schenectady-Troy, N.Y	514	247	258	256	29	1. 5	. 7
36. Bridgeport, Conn.[1]	504	238	249	199	47	1. 3	1. 3
37. Columbus, Ohio	503	222	229	144	21	1. 1	. 6
38. San Antonio, Tex	500	234	233	115	24	1. 1	. 9
39. Miami, Fla	495	211	219	197	37	1. 3	1. 1
40. Rochester, N.Y	488	231	248	188	40	1. 1	1. 0
41. Memphis, Tenn	482	148	155	92	21	1. 3	1. 1
42. Dayton, Ohio	457	205	210	103	23	. 9	. 9
43. Springfield-Holyoke, Mass	456	218	230	151	33	1. 0	. 9
44. Norfolk-Portsmouth, Va	446	180	143	117	15	1. 8	(1. 0)
45. Allentown-Bethlehem-Easton, Pa	438	215	220	149	34	1. 0	1. 1
46. Akron, Ohio	410	189	194	111	20	. 9	. 8
47. Tampa-St. Petersburg, Fla	409	170	182	172	35	1. 2	1. 1
48. Toledo, Ohio	396	182	186	142	24	1. 1	. 9
49. Wilkes-Barre-Hazelton, Pa	392	190	201	118	24	1. 0	. 9
50. Fall River-New Bedford, Mass	382	181	196	128	26	1. 1	. 8
51. Omaha, Nebr	366	172	177	106	26	. 9	1. 0
52. Fort Worth, Tex	361	159	163	73	17	. 9	. 9
53. Wheeling, W. Va.-Steubenville, Ohio	354	171	172	132	26	1. 2	1. 1
54. Syracuse, N.Y	342	166	170	142	22	1. 3	. 9
55. Knoxville, Tenn	337	152	159	58	20	. 8	1. 2
56. Phoenix, Ariz	332	155	155	82	19	1. 0	1. 1
57. Richmond, Va	328	114	126	91	27	1. 4	1. 5

See footnote at end of table.

Table 1. Ratios of age-adjusted lung cancer mortality of 163 metropolitan areas to U.S. total, white population, by sex, 1949–51—Continued

Standard metropolitan area	1950 population (thousands)			Lung cancer			
				Number of deaths 1949–51		Mortality ratios	
	Total population	White males	White females	White males	White females	White males	White females
58. Oklahoma City, Okla	325	144	153	86	26	1. 1	1. 4
59. Charleston, W. Va	322	147	148	57	13	. 9	(. 9)
60. Nashville, Tenn	322	124	134	82	19	1. 3	1. 1
61. Jacksonville, Fla	304	109	114	71	11	1. 3	(. 9)
62. Harrisburg, Pa	292	135	141	92	20	1. 1	1. 0
63. Johnstown, Pa	291	145	143	64	12	. 7	(. 7)
64. San Jose, Calif	291	138	142	73	30	. 9	1. 5
65. Grand Rapids, Mich	288	138	143	87	21	1. 0	1. 0
66. Utica-Rome, N.Y	284	139	143	81	12	. 8	(. 5)
67. Canton, Ohio	283	134	136	87	18	1. 0	. 9
68. San Bernardino, Calif	282	138	135	92	26	1. 1	1. 4
69. Sacramento, Calif	277	133	126	114	17	1. 4	1. 0
70. Fresno, Calif	277	130	127	74	13	1. 0	(. 9)
71. Tacoma, Wash	276	146	121	66	18	. 8	1. 0
72. Salt Lake City, Utah	275	134	137	55	11	. 8	(. 7)
73. Flint, Mich	271	129	128	71	9	1. 0	(. 6)
74. Wilmington, Del	268	116	120	85	15	1. 2	(. 9)
75. Scranton, Pa	257	123	133	73	22	. 9	1. 1
76. Reading, Pa	256	124	128	65	14	. 7	(. 7)
77. Duluth, Minn.-Superior, Wis	253	128	123	82	23	. 8	1. 3
78. Tulsa, Okla	252	111	117	54	7	. 9	(. 5)
79. Peoria, Ill	251	122	122	83	12	1. 1	(. 7)
80. Chattanooga, Tenn	246	97	104	46	20	. 9	1. 7
81. Huntington, W. Va.-Ashland, Ky	246	117	121	58	14	. 9	(1. 0)
82. Lancaster, Pa	235	113	119	47	22	. 7	1. 3
83. Davenport, Iowa-Rock Island-Moline, Ill	234	115	116	65	14	. 9	(. 8)
84. Mobile, Ala	231	75	78	54	12	1. 6	(1. 5)
85. Trenton, N.J	230	105	105	89	19	1. 3	1. 2
86. Des Moines, Iowa	226	104	113	72	19	1. 1	1. 2
87. Wichita, Kans	222	103	109	56	20	1. 0	1. 5
88. Spokane, Wash	222	110	109	49	16	. 6	1. 0
89. Erie, Pa	219	107	109	63	10	1. 0	(. 7)
90. South Bend, Ind	205	99	97	49	14	. 9	(1. 1)
91. York, Pa	203	99	100	43	12	. 7	(. 8)
92. Stockton, Calif	201	93	88	58	9	. 9	(. 8)
93. Charlotte, N.C	197	71	76	18	7	. 6	(. 9)
94. Little Rock-N. Little Rock, Ark	197	72	77	52	9	1. 2	(. 9)
95. Beaumont-Port Arthur, Tex	195	75	76	49	7	1. 4	(. 9)
96. El Paso, Tex	195	98	92	36	14	1. 0	(1. 6)
97. Greensboro-High Point, N.C	191	74	80	24	7	. 7	(. 8)
98. Brockton, Mass	189	91	95	48	21	. 7	1. 3
99. Binghamton, N.Y	185	89	94	57	12	1. 0	(. 9)
100. Fort Wayne, Ind	184	87	91	43	18	. 8	1. 4
101. Shreveport, La	177	53	57	36	13	1. 3	(1. 9)
102. Lansing, Mich	173	85	85	30	6	. 7	(. 6)
103. Columbus, Ga	171	63	54	27	3	1. 4	(. 6)
104. Madison, Wis	169	85	84	27	11	. 6	(1. 0)
105. Portland, Maine	169	82	87	73	14	1. 3	(1. 0)
106. Greenville, S.C	168	67	70	30	11	1. 0	(1. 6)
107. Corpus Christi, Tex	165	80	78	22	6	. 8	(1. 0)
108. Charleston, S.C	165	50	46	33	8	1. 7	(1. 7)
109. Augusta, Ga	162	54	52	18	5	. 8	(. 9)
110. Austin, Tex	161	70	68	30	3	. 9	(. 4)
111. Evansville, Ind	160	73	78	39	11	. 9	(1. 0)
112. Baton Rouge, La	158	53	53	18	4	. 9	(. 8)
113. Manchester, N.H	157	76	81	43	10	. 8	(. 8)
114. Saginaw, Mich	154	72	72	39	12	. 9	(1. 3)
115. Rockford, Ill	152	73	75	23	10	. 5	(1. 0)

Table 1. Ratios of age-adjusted lung cancer mortality of 163 metropolitan areas to U.S. total, white population, by sex, 1949–51—Continued

Standard metropolitan area	1950 population (thousands)			Lung cancer			
				Number of deaths 1949–51		Mortality ratios	
	Total population	White males	White females	White males	White females	White males	White females
116. Savannah, Ga	151	45	48	33	6	1. 5	(1. 1)
117. Lorain-Elyria, Ohio	148	72	70	38	11	. 9	(1. 2)
118. Hamilton-Middletown, Ohio	147	69	70	32	7	. 8	(. 8)
119. Winston-Salem, N.C	146	50	54	24	5	1. 0	(. 9)
120. Albuquerque, N. Mex	146	72	70	17	9	. 6	(1. 5)
121. Columbia, S.C	143	45	47	28	8	1. 4	(1. 5)
122. Jackson, Miss	142	37	41	21	3	1. 2	(. 7)
123. Altoona, Pa	140	67	72	41	8	. 9	(. 7)
124. Montgomery, Ala	139	38	40	25	2	1. 4	(. 4)
125. Raleigh, N.C	136	48	48	21	5	1. 0	(1. 0)
126. Macon, Ga	135	42	45	21	2	1. 1	(. 4)
127. Roanoke, Va	133	56	59	17	6	. 5	(. 8)
128. Pittsfield, Mass	133	64	67	53	12	1. 2	(1. 1)
129. Atlantic City, N.J	132	53	57	50	16	1. 2	1. 5
130. Springfield, Ill	131	61	66	63	12	1. 5	(1. 2)
131. Waco, Tex	130	54	54	25	7	. 8	(1. 0)
132. Kalamazoo, Mich	127	61	63	40	7	1. 1	(. 8)
133. Asheville, N.C	124	53	56	15	3	(. 5)	(. 4)
134. Lincoln, Nebr	120	58	60	24	7	. 6	(. 7)
135. Orlando, Fla	115	44	48	33	7	1. 0	(. 9)
136. Galveston, Tex	113	45	44	31	4	1. 4	(. 9)
137. Springfield, Ohio	112	50	52	25	12	. 8	(1. 6)
138. Racine, Wis	110	54	54	25	6	. 7	(. 8)
139. Jackson, Mich	108	53	50	46	8	1. 3	(1. 1)
140. Topeka, Kans	105	47	51	19	5	. 6	(. 6)
141. Terre Haute, Ind	105	49	52	39	9	1. 1	(1. 1)
142. Springfield, Mo	105	50	53	20	7	. 6	(. 9)
143. Cedar Rapids, Iowa	104	51	53	35	9	1. 0	(1. 1)
144. Sioux City, Iowa	104	50	52	37	12	1. 1	(1. 6)
145. Durham, N.C	102	33	34	16	6	1. 1	(1. 6)
146. Lubbock, Tex	101	48	45	14	3	(. 7)	(. 8)
147. Lexington, Ky	101	42	42	17	7	. 7	(1. 2)
148. Waterloo, Iowa	100	48	50	27	4	. 9	(. 6)
149. Decatur, Ill	99	46	49	32	8	1. 1	(1. 1)
150. Wichita Falls, Tex	98	51	42	14	3	(. 6)	(. 6)
151. Green Bay, Wis	98	49	49	10	1	(. 4)	(. 2)
152. St. Joseph, Mo	97	45	49	27	4	. 8	(. 5)
153. Gadsden, Ala	94	39	41	15	1	(. 9)	(. 3)
154. Muncie, Ind	90	42	43	14	4	(. 6)	(. 7)
155. Pueblo, Colo	90	44	44	26	5	. 9	(. 8)
156. Bay City, Mich	88	44	44	29	3	1. 2	(. 5)
157. Lima, Ohio	88	41	42	12	3	(. 4)	(. 5)
158. Amarillo, Tex	87.	41	42	25	4	1. 3	(. 9)
159. Ogden, Utah	83	41	41	20	1	1. 0	(. 2)
160. Kenosha, Wis	75	38	37	22	5	. 9	(1. 0)
161. Sioux Falls, S. Dak	71	35	36	16	1	. 8	(. 2)
162. San Angelo, Tex	59	28	28	9	3	(. 6)	(1. 0)
163. Laredo, Tex	56	27	29	6	3	(. 5)	(1. 0)

[1] A few standard metropolitan areas are different from those used by the Bureau of the Census: Boston includes Lawrence and Lowell, Mass., New Haven includes Waterbury, Conn.; Hartford includes New Britain-Bristol, Conn.; and Bridgeport includes Stamford-Norwalk, Conn. The New York-Newark-Jersey City standard metropolitan area was divided into two metropolitan areas, New York and Newark-Jersey City.

SOURCE: "Comparative Mortality Among Metropolitan Areas of the United States, 102 Causes of Death," PHS Publication No. 562, October 1957, was based on mortality data from the former National Office of Vital Statistics and detailed population data were supplied by the Scripps Foundation. These data were used in the preparation of this table.

Table 2. Frequency distribution of lung cancer mortality ratios in 163 metropolitan areas of the United States, white population, by sex, 1949–51

Lung cancer mortality ratio	Number of SMA's with specified ratios		Lung cancer mortality ratio	Number of SMA's with specified ratios	
	White male	White female		White male	White female
Total	163	163	----------	----------	----------
			1.1	24	28
2.0	1	----------	1.0	22	25
1.9	----------	1	.9	25	29
1.8	1	----------	.8	15	16
1.7	1	2	.7	10	10
1.6	4	5	.6	10	7
1.5	4	7	.5	4	5
1.4	10	4	.4	2	4
1.3	19	7	.3	----------	1
1.2	11	9	.2	----------	3

SOURCE: Table 1.

Radiation as Working Hazard

The widow of a uranium miner was awarded $11,466 in death benefits by the Colorado Industrial Commission in its first case judging the effects of radiation as a working hazard. Additional sums were provided for medical and funeral expenses under the Workmen's Compensation Act.

The death of 43-year-old Robert D. Johnson in 1958 was attributed to lung cancer caused by exposure to radioactive materials. He had operated three uranium mines near Uravan, Colo., from 1949 until his death.

An autopsy disclosed excessive amounts of radio-lead in bones, kidneys, liver, and muscles. Testimony at the hearing traced the origin of the radio-lead to inhalation of radioactive substances. Radio-lead is the end product of radioactive materials called "radon daughters," which are produced by radon gas emitted by disintegrating radium in uranium mines. Radon gas, which is continually being released by rock containing radium, is the primary health problem in uranium mines, according to testimony by Duncan A. Holaday of the Division of Occupational Health, Public Health Service.

Johnson was one of 3,300 uranium miners being studied by the Public Health Service to determine radiation effects in uranium mines. Air samples taken for the study from one of the mines worked by Johnson contained 42 to 72 times the safe working-level concentration of radon gas and radon daughters. Johnson had dug shafts and drifts in each of his mines to reach high-grade ore. These operations took 6 months to 1 year in each case and were done in close quarters without natural or forced ventilation.

Dr. Victor Archer, Public Health Service specialist in radiological health, testified, "I think that our data together with the data from European mines, combined with our basic radio-biological knowledge, make a very strong case that exposure at high levels in such an atmosphere would be very likely to produce or accelerate cancer."