Geographic Study of Cancer Prevalence Within an Urban Population

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Differences in the distribution of cancer morbidity within 16 homogeneous areas in Pittsburgh, Pa.

THE ANALYSIS described here resulted from the question, "Is cancer uniformly distributed among an urban population?" Or conversely and more specifically, "Are there geographic differences in the prevalence of cancer within given age, sex, and racial groups of an urban population?"

An opportunity to consider such a question has been provided through data collected by the Public Health Service in 1947 and made available for study to the department of biostatistics of the Graduate School of Public Health, University of Pittsburgh. The method of collecting the data and findings with respect to cancer morbidity and mortality among residents of Pittsburgh has been described in the publication, Cancer Illness Among Residents of Pittsburgh, Pennsylvania (*1*).

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Selection of Geographic Areas

The courses of the Allegheny, Monongahela, and Ohio Rivers provide three natural subdivisions of the city of Pittsburgh, each with areas of low, medium, and high socioeconomic status. Therefore, it was decided to subdivide the three larger areas into smaller ones which might have greater socioeconomic homogeneity. The smaller areas were formed by adding together contiguous census tracts which resembled each other in (*a*) median income (1949) of white families and unrelated individuals, (*b*) percentage of nonwhite population, and (*c*) percentage of employed white men classified as craftsmen, foremen, and kindred workers, as operatives and kindred workers, and as laborers, except in mines. The data used were those of the 1950 census (*2*).

Sixteen smaller areas were obtained, ranging in population from 17,000 white individuals to 54,000. Within these areas, the median

income among white families ranged from $1,610 to $4,350, compared to a median income of $3,061 for white families within the city. In 1950, nonwhite individuals made up 12.3 percent of the city's population. Similar figures for the 16 areas ranged from 0.3 percent to 59.8 percent. In the same year, 53.5 percent of the city's employed white men were classified as craftsmen, operatives, laborers, and kindred workers. Among the areas, as few as 19.8 percent of the employed white men were so classified, and at the other extreme as many as 68.9 percent.

Population Base

While the cases of cancer were reported by single years of age, the only available census tract population data were by 5-year age groups for the years 1940 and 1950. Therefore, the 1947 population estimates which were obtained by averaging the two censuses were considered as the population bases for such age groups as 7–26, 27–46, and so forth, and the cases were compiled accordingly. For example, in each area, the 1940 census figure for white men in the 20–39 age group was averaged with the 1950 figure for white men in the ages 30–49, and the result was used as the 1947 population base for white men aged 27 through 46.

Method of Analysis and Results

A glance at the age-sex specific prevalence rates in tables 1 and 2 reveals that reported cases were not distributed uniformly throughout the 16 areas. For example, among white men in the 47–56 age group, the prevalence rate per 100,000 ranged from 358 (in area 11) to 1,032 (in area 1), and the city rate was 675. White women in this same age group throughout the city experienced a prevalence rate of 1,072 per 100,000, but the rates of the several areas ranged from 607 (in area 15) to 1,474 (in area 2).

The geographic variation in the distribution of cancer in Pittsburgh may be summarized in two successive stages. The first is the comparison of the "age-standardized" rates for the white population of the 16 areas. These rates are ranked in table 3, and each area is designated according to its rank. For example, the area with the highest rate has been called area 1; that with the lowest, area 16.

Tests for homogeneity showed that the variations seen in table 3 were extremely unlikely to have been due to "sample variation." For each of the three groups (total white population, white males, and white females), the probability that the rates could have come from a universe which experienced the city's rate was less than .001.

As a second stage in describing the differences among the several areas, the rate of each of the

Table 1. Population and cancer prevalence per 100,000 population for 16 small areas within Pittsburgh, 1947—white males

Area	Age group				
	7–26 years	27–46 years	47–56 years	57–66 years	67 years and over
	Population				
City	89,012	91,226	38,064	29,167	21,637
1	5,322	5,226	2,519	2,395	1,661
2	6,462	7,200	3,623	2,556	1,809
3	4,926	5,728	2,427	1,824	1,533
4	3,120	3,705	1,769	1,284	943
5	2,475	2,692	1,260	893	672
6	7,049	6,998	2,534	1,919	1,219
7	8,551	9,022	3,839	2,532	1,905
8	7,077	6,730	2,668	1,965	1,518
9	5,450	4,989	1,904	1,482	1,177
10	5,708	5,873	2,508	1,961	1,536
11	5,946	5,676	2,236	1,772	1,376
12	8,448	8,074	2,886	2,342	1,596
13	6,889	6,837	2,443	1,868	1,272
14	4,383	4,378	1,880	1,310	1,062
15	3,992	4,756	2,374	2,080	1,646
16	3,214	3,342	1,194	984	712
	Rate				
City	27	180	675	1,617	2,505
1	56	306	1,032	1,921	3,432
2	31	194	497	1,956	3,483
3	20	175	824	1,973	1,957
4	32	162	509	1,713	2,969
5	40	149	476	2,128	3,125
6	14	143	829	1,667	3,117
7	12	166	599	1,303	2,257
8	28	193	600	1,323	1,910
9	37	180	578	1,552	1,699
10	17	238	678	1,173	2,083
11	17	128	358	1,749	1,962
12	12	149	520	1,110	2,130
13	14	146	573	1,124	2,987
14	23	114	745	916	1,695
15	25	147	716	1,298	1,458
16	0	30	586	1,524	1,404

Table 2. Population and cancer prevalence per 100,000 population for 16 small areas within Pittsburgh, 1947—white females

Area	Age group				
	7–26 years	27–46 years	47–56 years	57–66 years	67 years and over
	Population				
City	92, 314	99, 789	38, 509	28, 980	24, 925
1	5, 360	5, 183	1, 814	1, 426	1, 152
2	6, 990	9, 606	4, 070	2, 912	2, 471
3	5, 378	6, 964	2, 744	2, 162	2, 070
4	3, 208	4, 798	2, 139	1, 731	1, 555
5	2, 610	3, 291	1, 360	1, 040	811
6	7, 366	7, 143	2, 470	1, 786	1, 462
7	8, 793	10, 083	3, 907	2, 724	2, 288
8	7, 402	7, 264	2, 694	1, 959	1, 722
9	5, 328	5, 264	1, 970	1, 503	1, 316
10	5, 789	6, 435	2, 798	2, 146	1, 902
11	6, 166	6, 144	2, 363	1, 880	1, 740
12	8, 860	7, 997	2, 818	2, 091	1, 679
13	6, 902	7, 025	2, 456	1, 709	1, 336
14	4, 458	4, 707	1, 894	1, 450	1, 210
15	4, 526	4, 963	1, 976	1, 628	1, 505
16	3, 178	2, 922	1, 036	833	706
	Rate				
City	41	345	1, 072	1, 750	2, 058
1	131	405	1, 323	2, 104	2, 604
2	57	593	1, 474	2, 438	2, 307
3	37	388	1, 385	2, 313	2, 850
4	62	542	1, 262	1, 502	2, 508
5	115	243	1, 250	1, 923	2, 219
6	14	308	931	1, 680	1, 710
7	34	228	947	1, 322	1, 792
8	13	248	1, 039	1, 940	2, 265
9	0	209	964	1, 929	2, 204
10	0	218	679	1, 538	1, 893
11	32	325	931	1, 383	1, 034
12	23	313	958	957	1, 727
13	58	142	692	995	1, 796
14	67	276	634	1, 448	1, 405
15	0	262	607	1, 044	1, 262
16	63	137	676	1, 441	991

16 areas has been compared with the corresponding rate for the remaining 15 areas combined and the difference examined in terms of the variance of the difference. When the prevalence rate of an area was greater than that of the combined remaining areas by an amount that exceeded the 5-percent level of significance, it was called "high." When an area's rate was less than that of the combined remaining 15 areas by the same amount, it was called "low." The areas regarded as having high or low rates and their levels of significance are shown in figures 1–4. Prevalence by age groups is shown in figures 1 and 2, and prevalence by primary site is shown in figures 3 and 4. The areas not shown differed from the city as a whole, but the differences were small or assumed to be due to sample variation. This second procedure points to high prevalence rates for the white males and females of area 1 and for the white females of area 2. The prevalence rates of areas 15 and 16 are low for both sexes.

High or Low Prevalence Areas

The discussion of areas within Pittsburgh will be directed principally to the two (areas 1 and 2) with the highest overall prevalence rates and the two (areas 15 and 16) with the lowest. From several points of view, area 1, consisting of the "downtown" and "hill" sections, can be considered toward the bottom, if not at the bottom, of the socioeconomic scale. On the other hand, area 2 is very close to the top of the scale. Both areas, however, experienced high prevalence rates.

Area 15, consisting of portions of the central and eastern sections of the "north side" of Pittsburgh, and area 16, consisting of Manchester and Woods Run, are the second and third lowest areas in economic status. Although similar to

Table 3. Cancer prevalence per 100,000 population in 16 areas comprising Pittsburgh, and for the city as a whole, 1947

Area	Total white population	White males	White females
1	780. 1	752. 9	805. 9
2	761. 0	638. 8	876. 6
3	690. 9	553. 7	820. 7
4	660. 6	561. 9	753. 9
5	648. 6	613. 1	682. 2
City	591. 4	542. 2	637. 9
6	580. 2	602. 0	559. 5
7	567. 5	627. 6	510. 7
8	544. 8	456. 7	628. 1
9	528. 5	460. 0	593. 3
10	484. 1	477. 1	490. 7
11	465. 1	447. 0	482. 2
12	458. 6	419. 5	495. 6
13	458. 3	497. 6	421. 1
14	432. 4	387. 2	475. 2
15	403. 9	417. 3	391. 2
16	382. 8	371. 2	393. 6

NOTE: Rates are standardized for age on the total population of Pittsburgh, 1947.

Prevalence of cancer among white men and women, by age, in 16 areas of Pittsburgh, 1947.

Figure 1. White men.

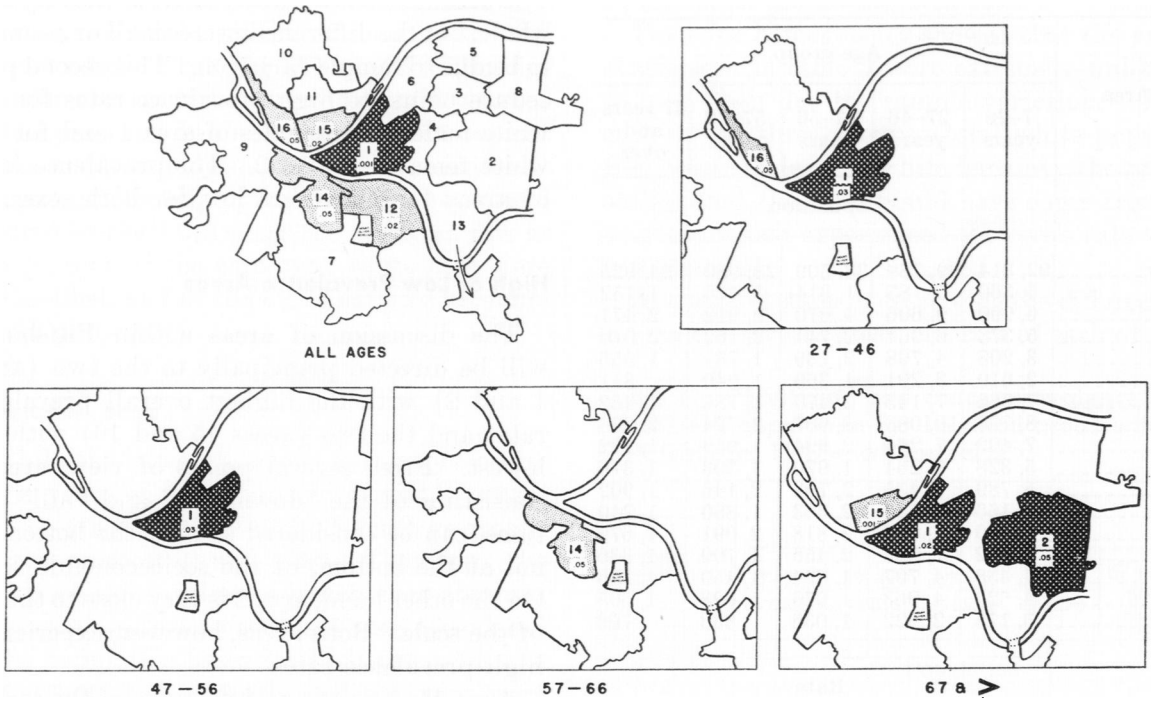
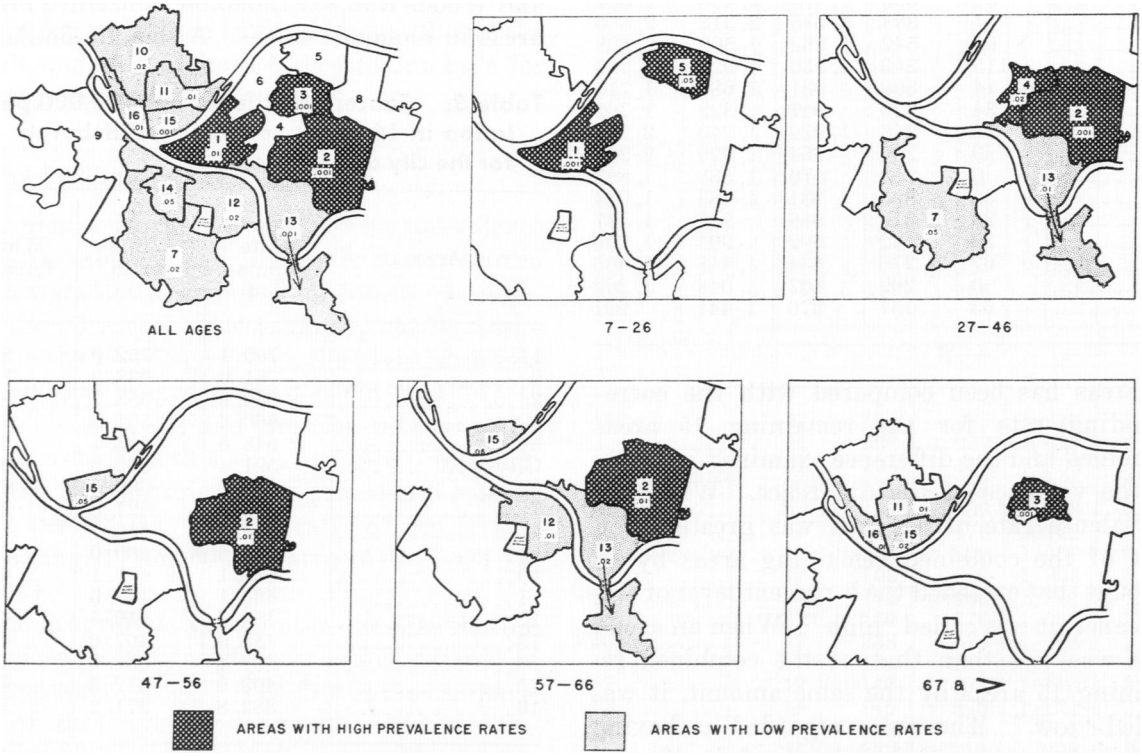


Figure 2. White women.



NOTE: Levels of significance are shown within study areas, which are designated by number. "All ages" refers to all persons in the study group, which did not include those of unknown age or under 7.

Prevalence of cancer among white men and women, by site, in 16 areas of Pittsburgh, 1947.

Figure 3. White men.

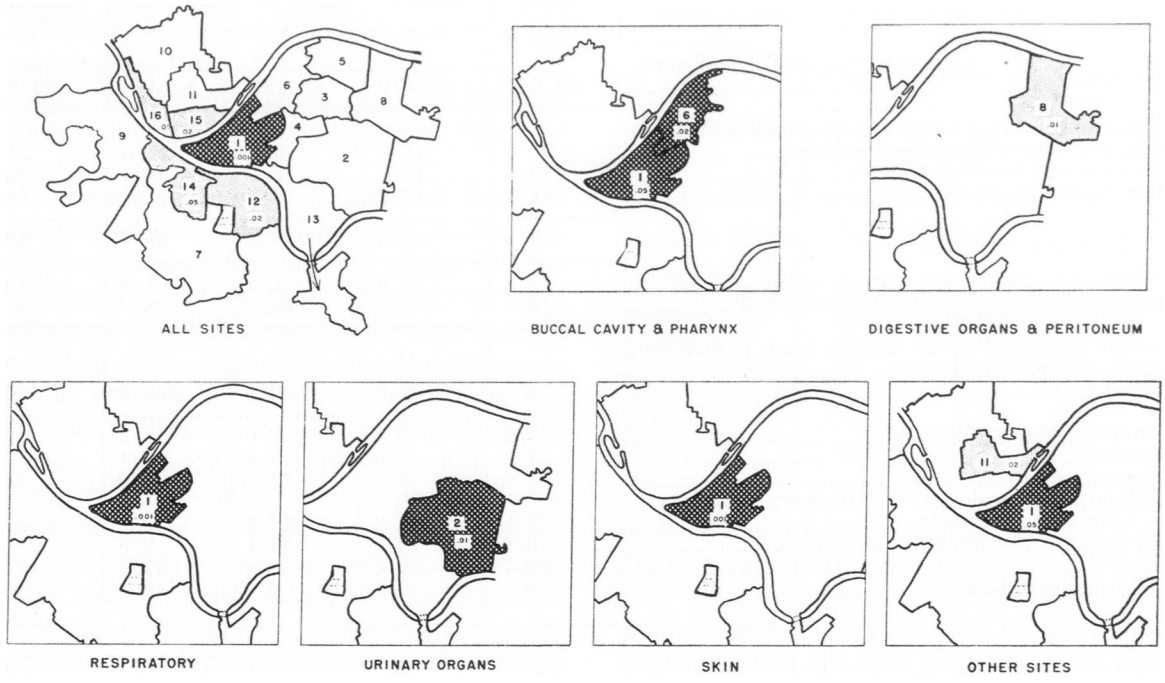
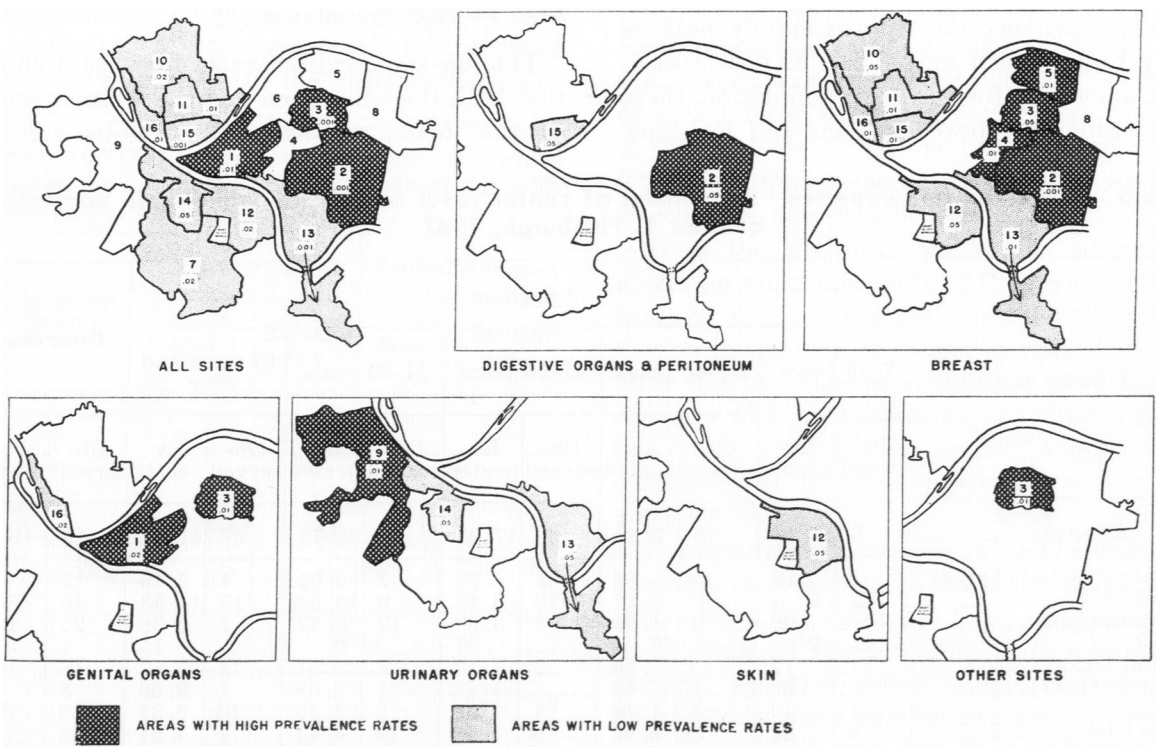


Figure 4. White women.



NOTE: Levels of significance are shown within study areas, which are designated by number. "Other sites" includes cancer of the brain, central nervous system, endocrine glands, bone, eye, soft tissues, and other leukemias and lymphomas.

Table 4. Selected demographic characteristics of Pittsburgh for areas 1, 2, 15, and 16

Characteristics	City	Area 1	Area 2	Area 15	Area 16
Median income, 1949, among white families and unrelated individuals	$3,061	$1,610	$3,721	$2,418	$2,610
Percentage of employed white men classified in 1950 as:					
Craftsmen, foremen, kindred workers	21.9	15.7	9.9	21.5	21.1
Operatives and kindred workers	20.0	18.6	7.1	23.2	29.2
Laborers, except mine	11.6	17.7	2.8	17.0	18.6
Total	53.5	52.0	19.8	61.7	68.9
Percentage of nonwhite population, 1950	12.3	59.8	1.5	1.8	19.5
Percentage of foreign-born population, 1950	10.9	17.2	13.7	8.9	11.4
Percentage distribution of foreign-born population, 1950, by country of birth:					
All countries	100.0	100.0	100.0	100.0	100.0
England, Wales, Scotland	7.2	2.8	7.0	6.3	5.4
Ireland	7.6	7.0	6.2	7.1	5.8
Germany, Austria	16.0	7.9	14.1	21.9	15.0
Poland, Czechoslovakia, Hungary, Yugoslavia, Lithuania, Rumania	28.8	25.3	26.9	33.1	41.0
Union of Soviet Socialist Republics	10.6	13.0	32.4	2.8	6.8
Italy	20.7	30.6	4.2	12.4	20.3
All other countries	9.1	13.4	9.3	16.4	5.6

area 1 in economic status, areas 15 and 16 differ from it with respect to ethnic and color groups and the proportion of individuals of foreign birth. For example, area 15 has practically no nonwhite persons and approximately half as many foreign-born individuals as does area 1. Also, among its foreign-born population, there are considerably fewer Italians and Russians. These and other demographic characteristics of the four areas are given in table 4.

Area 1—High Prevalence

The age-standardized rates for area 1 show that both the white men and the white women of the downtown and hill sections experi-

Table 5. Observed and expected [1] frequencies of cancer cases among the white male population of area 1, Pittsburgh, 1947

Primary site	Age group										Total cases	
	7–16 years		27–46 years		47–56 years		57–66 years		67 years and over			
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected	Observed [2]	Expected
All sites	3	1.48	16	9.40	26	17.05	46	38.73	57	41.61	153	108.0
Buccal cavity and pharynx	1	.12	3	.80	2	.93	2	2.05	4	2.46	12	6.4
Digestive	------	0	2	2.12	10	5.43	9	13.54	19	14.43	40	35.5
Respiratory	------	.06	2	1.03	3	3.00	12	6.32	7	3.38	24	13.8
Breast	------	0	------	0	------	.07	------	0	------	.15	1	.2
Genital organs	------	.12	------	.69	2	1.13	4	3.94	12	7.52	18	13.4
Urinary organs	------	.06	1	.63	------	1.19	1	3.69	1	2.69	3	8.3
Skin	------	.12	5	1.43	4	2.65	6	4.76	10	6.37	29	15.3
Other sites	2	1.00	3	2.69	5	2.65	12	4.43	4	4.61	26	15.4

[1] Expected frequencies calculated on the basis of city's age-sex specific rates.
[2] Observed frequencies total includes 5 of unknown age.

enced higher prevalence of cancer than did white men and women outside the area. The rate for the white men of the area was 43 percent higher than the rate for white men in the remaining portion of the city; that for the women, 28 percent higher; and in both instances, the level of significance was less than .001.

Of particular interest is the fact that the white men of area 1 experienced unusually high rates for cancer of the skin and of the respiratory system. In each case, the rate was practically twice that for men living elsewhere in the city, and the probability that the difference was due entirely to sample variation was less than .001. There were also indications that the rates were high for white men of the area for cancer of the buccal cavity, pharynx, and among "other sites," which includes cancer of the brain, central nervous system, endocrine glands, bone, eye, soft tissues, and the leukemias and lymphomas (table 5). Among the white women, the rate for cancer of the genital organs was high—60 percent above the city average.

With the somewhat startlingly high prevalence rates in area 1, one wondered how mortality among its reported cases compared with deaths among all reported cases. By the end of the study year, 59 of the 153 white men in area 1 with reported cases of cancer had died. Had the city rate prevailed, only 37 deaths would have occurred. Also, throughout all the age groups, the mortality rate was higher than that for the rest of the city, and the overall result was that the area led all others. High mortality rates were observed for all but two of the primary site groups. One of these groups was that of the urinary organs, a group for which lower prevalence rates were also observed. The other group was cancer of the skin. The women of area 1 fared somewhat better than the men so far as mortality during 1947 was concerned. Even then, their rates were next to the highest, which were observed in area 2.

Table 6. Cancer prevalence age-specific rates per 100,000 population among nonwhite males and females in area 1 compared with the rest of Pittsburgh, 1947

Age group (years)	Nonwhite males		Nonwhite females	
	Area 1	Remainder	Area 1	Remainder
	Number of cases			
7–26	2		4	
27–46	5	3	36	16
47–56	19	12	33	20
57–66	11	13	19	15
67 and over	9	10	22	15
	Rate			
7–26	35	0	63	0
27–46	79	63	502	304
47–56	595	548	1,374	994
57–66	713	1,081	1,586	1,304
67 and over	1,083	1,274	3,043	1,911

Table 7. Expected cancer cases when nonwhite age-specific rates for area 1 and rest of city are applied to the corresponding nonwhite populations of Pittsburgh, 1947

Primary site	Nonwhite males		Nonwhite females	
	Area 1	Remainder	Area 1	Remainder
All sites	81.7	86.8	213.8	141.1
Buccal cavity and pharynx	5.6	4.6	11.1	6.1
Digestive	30.5	19.6	32.2	20.7
Respiratory	15.5	12.0	2.0	2.0
Breast	0	0	38.5	33.8
Genital organs	7.2	22.1	100.8	60.9
Urinary organs	3.4	7.2	3.8	2.4
Skin	0	9.1	3.7	3.8
Other sites	19.6	12.2	21.8	11.3

Since the nonwhite population of area 1 makes up more than half of the area's population and 55 percent of the entire nonwhite population in the city, it seemed pertinent to ask: How did the nonwhite population of area 1 compare with the remaining nonwhite population? and how did the nonwhite population compare with the white population, within and outside area 1?

Practically no differences existed between the nonwhite men of the area and those outside. In fact, what little difference there was tended to be in favor of the nonwhite male within the district. The same cannot be said, however, for the nonwhite females who experienced higher rates than did the nonwhite females outside the section, at all ages and for all primary sites. The comparisons for the two nonwhite popula-

tions are shown in tables 6 and 7. Table 6 gives age-sex specific rates. Table 7 contains the expected frequencies which are obtained when the age-specific rates for the nonwhite population of area 1 and the corresponding rates for the remainder of the city are applied to the total nonwhite population of the city.

As in other cities, the reported prevalence rates for the white population exceeded those for the nonwhite population. This was especially true of the rates for males. White males in Pittsburgh experienced a rate which was 86 percent higher than the one for nonwhite males. With cancer of the skin excluded, the rate for the white males was still 66 percent higher. In area 1, though, the differences between the two racial groups were even more pronounced. There the age-adjusted rate for white males with skin cancer included exceeded that for the nonwhite males by 173 percent and by 138 percent with skin cancer excluded.

Area 2—High Prevalence

Area 2, with a high socioeconomic status, with very few of its men employed as craftsmen, operatives, or laborers, and with a large proportion of Russian-born individuals, experienced the highest cancer prevalence rate for white women and the second highest for white men. By age, this area led in rates for women aged 27 through 66 and for men aged 67 and over. Women of the area also experienced the highest mortality rate for cancer.

The most noticeable difference between this section and the other areas was its unusually high prevalence rate for breast cancer. With age distributions taken into account, breast cancer was reported twice as frequently among white women of area 2 as among white women in other parts of the city. The probability that this difference was due to sample variation alone was less than .001. By separate age groups, the breast cancer rates in the area surpassed all other areas in every age group except 47–56, for which area 5 had a higher rate. Among the women, high prevalence rates were also observed when the primary site of cancer was the digestive organs or the peritoneum.

It has been suggested that these high rates, especially those for breast cancer, may be the result of more comprehensive medical care asso-

Table 8. Observed and expected [1] frequencies of cancer cases among the white female population of area 2, Pittsburgh, 1947

Primary site	Age group					
	7–26 years	27–46 years	47–56 years	57–66 years	67 years and over	Total cases [2]
All sites:						
Observed	4	57	60	71	57	258
Expected	2. 88	33. 11	43. 65	50. 95	50. 86	181
Digestive organs:						
Observed	1	9	11	17	16	54
Expected	. 23	2. 89	9. 09	12. 16	16. 36	41
Breast:						
Observed	----------	29	20	29	21	102
Expected	. 08	11. 35	12. 89	13. 77	12. 10	50
Genital organs:						
Observed	----------	6	14	13	4	41
Expected	. 53	8. 95	12. 36	12. 96	7. 63	42
Other sites:						
Observed	3	13	15	12	16	61
Expected	2. 04	9. 92	9. 31	12. 06	14. 77	48
Ratio, observed to expected:						
All sites	1. 4	1. 7	1. 4	1. 4	1. 1	1. 4
Digestive organs	4. 3	3. 1	1. 2	1. 4	1. 0	1. 3
Breast	0	2. 6	1. 6	2. 1	1. 7	2. 0
Genital organs	0	. 7	1. 1	1. 0	. 5	1. 0
Other sites	1. 5	1. 3	1. 6	1. 0	1. 1	1. 3

[1] Expected frequencies calculated on the basis of city's age-sex specific rates.
[2] Observed frequencies total includes 9 of unknown age.

ciated with high socioeconomic status. There are some indications that this may be partially true, but at the same time, there are two reasons why such an explanation can hardly account for the entire excess. The first is that mortality data lend support to the morbidity evidence. For example, in 1947, mortality among women with breast cancer was highest in area 2. An idea of the high mortality is given by applying the area's age-specific mortality rates to the city's population. Had the area's rates prevailed throughout the city, one would have seen 221 deaths among white women with breast cancer instead of the actual number of 113. No other area gave an expected number as high as 221.

The second reason for doubting that extensive medical care explains entirely the high rates is that the differential does not appear, or if it does, not to the same degree, for other sites. This is demonstrated in table 8.

Areas 15 and 16—Low Prevalence

The lowest prevalence rates for cancer were reported for two adjacent areas on the north side of Pittsburgh, both areas of low socioeconomic status. With sample size taken into account, both areas showed low rates for white males and females. Also, one or both areas had low prevalence rates for the age groups 27–46 and 67 and older, among the men; and 47–56, 57–66, and 67 and older, among the women. The women experienced markedly low rates for cancer of the digestive organs, breast, and the genital organs.

In areas 15 and 16, mortality data did not correspond completely with the morbidity findings. Therefore, these areas of low prevalence are perhaps less sharply defined than the areas of high prevalence. The greatest dissimilarity between morbidity and mortality occurred among white men of area 15, the prevalence rate being the third lowest and the mortality rate the second highest. In area 16, however, mortality among men, as well as prevalence, was at its lowest. In both areas, mortality among women was similar to that of all women in the city.

Cancer of the Digestive Organs

Bigelow and Lombard (*3*), in their study of cancer mortality in Massachusetts, have referred to lower mortality from cancer of the stomach and the lower intestinal tract among Italian-born males in comparison to all foreign-born males. In view of this, some findings concerning area 8, which is predominantly Italian, may be of interest. Among the foreign-born population of area 8, two-thirds are of Italian birth. In 1947, among white males of the 16 areas, the lowest prevalence and mortality rates for cancer of the digestive organs were observed in area 8. If the age-specific prevalence rate of this area is applied to the city's population, we would expect 259 cases. This is much lower than the 472 cases actually reported for the city. Similar applications of age-specific mortality rates gave an expected number of 130 deaths for the city when the rates of area 8 were used, while the number of deaths occurring in the city among white men with cancer of the digestive organs totaled 253.

Summary and Discussion

It has been pointed out that during 1947, there were two distinct areas of Pittsburgh in which, if we take into account age distributions, the white population experienced high prevalence of cancer. These districts were first the "downtown" and "hill" region (area 1) and next the section usually referred to as Squirrel Hill (area 2).

Area 1, with the lowest economic status, the highest proportion of nonwhite population, and the greatest number of foreign-born individuals, led all areas in cancer prevalence and mortality among white males. Also, both the white and nonwhite females of the area experienced high prevalence and mortality. The nonwhite males, however, fared better than those who resided outside the area.

Among the white males of the downtown and hill districts, prevalence rates were especially high for cancer of the skin and of the respiratory system. Furthermore, their rates for cancer of the buccal cavity and pharynx and of a residual group termed "other sites" were relatively high. This same group of men, however, experienced more favorable rates for

cancer of the urinary organs than did all white men, and their rates for cancer of the genital organs and digestive organs were near the city average. Mortality data supported all prevalence data except, of course, those for cancer of the skin.

Second highest prevalence rates for the white population were observed in the Squirrel Hill area which, in contrast to area 1, is of high social and economic status. This area (area 2) led all others in cancer prevalence and mortality among white women and followed only area 1 in prevalence among white men. When women were considered separately, breast cancer was the principal reason for the area's top ranking. Women of the area also experienced high rates for cancer of the digestive organs.

The two areas with lowest prevalence rates included portions of the central and eastern parts of the "north side" (area 15) and Woods Run and Manchester (area 16). Both of these areas are of low economic status. In this respect, they resemble area 1, even though they have fewer nonwhite and foreign-born people.

One predominately Italian section (area 8) of Pittsburgh has been mentioned because its white men experienced the lowest rates for cancer of the digestive organs, both in prevalence and mortality. With all sites taken into consideration, the prevalence rate for these men was 16 percent lower than the city average, and only 5 areas had lower rates.

These findings in area 8 suggest that the presence of a rather large group of Italians of foreign birth in the downtown and hill districts was not a major factor in its high prevalence of cancer among white men. Also, in view of the excessive rates in the high socioeconomic area 2 and the favorable rates in the low socioeconomic areas 15 and 16, high rates in area 1 cannot be attributed to the mere fact that this section is of low socioeconomic status.

The high rates for cancer of the skin and the respiratory system among the white men of area 1 might suggest to some the possibility of air pollution as the major, or at least a contributory, cause. Such a hypothesis has been proposed by Stocks in his observation of an area of London with high mortality from cancer of the respiratory system (*4*). Surely, in the case of area 1 in Pittsburgh, one doubts that the atmospheric environment of this geographic section was a major cause of skin and respiratory cancer among the white men. To believe that it was, one would have to assume that it affected only the white men and not the white women or the nonwhite men and women residing in the area. The white women experienced no more cancer of the skin or respiratory system than did the white women in other parts of the city. Furthermore, respiratory cancer among the nonwhite people of the area was no higher than that observed among nonwhite individuals living elsewhere. Also, what evidence there is regarding air pollution in Pittsburgh does not suggest that the atmospheric environment of area 1 might be less favorable than that of other areas. During 1912–13, 1923–24, and 1929–30, the Mellon Institute of Industrial Research determined the amount of solids precipitated in the different sections of Pittsburgh. Meller reports that during none of these periods were the downtown and hill districts considered the dirtiest. In fact, this dubious honor was bestowed each time upon Woods Run, a part of area 16 (*5*). More recently, Ely has stated that specific atmospheric contaminants are quite uniformly distributed throughout the various sections of the city (*6*).

Another question which may be raised is: Does the comprehensive medical care usually associated with higher socioeconomic groups tend to "increase" the prevalence among these groups? In partial answer to this question, one can consider the "class of case" reported and the number of persons surviving through the study year.

Cases of cancer were of 3 categories: (*a*) first diagnosed in 1947, (*b*) diagnosed prior to 1947, but treated in 1947, (*c*) diagnosed and treated prior to 1947 and "only observed" in 1947. Among the cases reported for white men, only 9.3 percent were of the third category, and there was little variation in this proportion from one geographic area to another. Among the white women, however, 19.9 percent of the reported cases were of the third category, and the range among the areas was from 3.1 percent (area 16) to 33.6 percent (area 2). Also, the 6 areas with the highest proportion of cases in the third category showed the highest prevalence rates

Table 9. The relationship of cancer prevalence (measured in terms of expected cases), percentage of cases diagnosed and treated prior to 1947 and "only observed" in 1947, and percentage of cases surviving through 1947—white females, Pittsburgh

Area	Number of expected cases [1]	Percentage of cases "only observed"	Percentage of cases surviving through year
2	2, 494	33. 6	74. 8
3	2, 335	26. 2	68. 9
1	2, 293	23. 7	70. 2
4	2, 145	24. 2	71. 7
5	1, 941	28. 6	70. 0
8	1, 787	27. 8	71. 4

[1] Obtained by applying area's age-specific rates to the city's population.

and the lowest mortality among reported cases.

Table 9 suggests that among white females the prevalence rates, as well as the number of persons surviving through the year, may have been related to the number of cases which were diagnosed and treated prior to the study year and only observed during the study year. Surprisingly, the possible relationship was not limited to the higher socioeconomic groups since 3 of the 6 areas, area 1, area 3, and area 4, are of low socioeconomic status. Moreover, area 8 is of average socioeconomic status, and only areas 2 and 5 are of high socioeconomic status.

The possible effect of "only observed" cases on a prevalence rate does not invalidate the findings which showed high prevalence of cancer of the breast and digestive organs among white females in area 2, since these were supported by mortality data. Nevertheless, prevalence data covering a relatively short period (1 year) may be misleading when one considers subgroups of an urban population. Undoubtedly, the prevalence rates of different areas may be affected by such factors as early diagnosis versus late diagnosis, variation in survival rates, and the overreporting that might result from continued supervision after treatment. And in the extreme case, an area showing the lowest prevalence rate for a year may be experiencing consistently the highest mortality rates. In view of this and similar possibilities, information concerning cases at time of diagnosis (incidence) over a period of several years might be of greater value in delineating small areas than are prevalence data for a year.

Finally, the reason why one may wish to establish small areas which experience a great deal or relatively little cancer might be mentioned. Certainly, the delineation of such areas does not reveal the cause of their low or high rates. But it does provide the epidemiologist with geographic sections in which etiological investigations may prove worth while.

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