Public Health Reports

Vol. 56 • JANUARY 24, 1941 • *No. 4*

A STUDY OF THE EFFECT OF LEAD ARSENATE EXPOSURE ON ORCHARDISTS AND ON CONSUMERS OF SPRAYED FRUIT [1]

The manuscript of a Public Health Bulletin presenting the results of recent field work and laboratory work conducted by the Division of Industrial Hygiene of the National Institute of Health has been approved for publication.

This investigation comprises a study extending over three years of the possible injury to health of people exposed to lead arsenate, whether by ingestion on fruit (consumers), by inhalation of spray mist or dust (orchardists), or by other forms of exposure. It has included both an intensive field study of large groups of men, women, and children, as well as toxicological laboratory investigations of the effect of lead arsenate upon man and animals, and of similarly related problems. The possibility that lead arsenate could have been a factor, directly or indirectly, in other diseases was studied.

This bulletin reports the results of an epidemiologic study based on field operations extending over a 14-month period of 1,231 men, women, and children who live in an apple-growing region where large quantities of lead arsenate have been used for many years as insecticide sprays. Toxicologic studies of the effect of lead arsenate on man and laboratory animals are being published separately.

These 1,231 persons may be discussed conveniently in terms of classifications based on their exposure to lead arsenate. There were 488 male orchardists and 54 women, who, because of full-time or part-time work tending tanks, were classified as female orchardists.

Only six men and one woman had a *combination* of clinical and laboratory findings directly referable to the absorption of lead arsenate. Some physicians may interpret these cases as minimal lead arsenate intoxication. However, as regards lead, these cases do not come up to the criteria of the Committee on Lead Poisoning of the American Public Health Association for lead intoxication, incipient plumbism, or lead poisoning. These subjects were all orchardists and ranged in age from 23 to 68 years.

[1] Neal, Paul A., Dreessen, Waldemar, C., Edwards, Thomas I., Reinhart, Warren H., Webster, Stewart H., Castberg, Harold T., and Fairhall, Lawrence T.: A study of the effect of lead arsenate exposure on orchardists and consumers of sprayed fruit. Public Health Bulletin No. 267. In press. The text of this announcement is the complete summary of the bulletin.

None of the other persons included in the study had a combination of clinical and laboratory effects directly attributable to lead arsenate absorption. These include: 95 men and 145 women classified as consumers who had no occupational exposure to lead arsenate or to any other lead or arsenic compound; 158 men and 171 women, former orchardists or seasonal workers in apple-packing sheds, who were intermediate in exposure between the two foregoing groups; and 99 boys and girls under 15 years of age.

In the region in which these persons lived and worked, lead arsenate has been used for codling moth control since about 1900. During the 1938 season, as many as 10 cover sprays were applied in apple orchards, usually 3 pounds of lead arsenate per 100 gallons of water and from 40 to 50 gallons of spray per tree per cover. Mixing spray materials involves an average exposure of 57.4 mg. of lead per 10 cubic meters of air and 18.5 mg. of arsenic per 10 cubic meters of air (as lead arsenate). Spraying, which may be a full-time or part-time activity, exposed orchardists to an average atmospheric concentration of 4.5 mg. of lead per 10 cubic meters of air and 1.4 mg. of arsenic per 10 cubic meters of air. Other orchard activities tabulated and discussed involved measurable atmospheric lead and arsenic exposures as a result of dispersing spray residues adhering to leaves, branches, and fruit.

Measurable amounts of lead and arsenic were found, almost without exception, in the urine of consumers who reported eating no apples at all. This finding receives corroboration in analyses made by the same chemists on the urine of 28 men and 18 children who live in a suburban community near Washington, D. C., and who have no exceptional sources of exposure to lead and arsenic. These findings are consistent with recent reports in the literature of the widespread distribution of small amounts of lead and arsenic as natural constituents of food products and with published information on the lead content of drinking water and of the air in urban communities.

In an effort to investigate even minimal effects of lead arsenate exposure, the population, particularly consumers, was classified by the number of apples they reported eating annually. Separate systems of classification were set up for persons who reported eating commercially-washed apples almost exclusively, for persons who ate unwashed apples almost exclusively, and for persons who ate both washed and unwashed apples. Chemical analyses of unwashed apples of the kind eaten by residents of the district showed that the spray residue load averaged about 20 times the amount found on apples shipped in interstate commerce.

Clinical and laboratory data for 95 men and 145 women classified as consumers were analyzed in such a way as to trace the effects of the *increment* in lead and arsenate intake superadded to the usual

dietary and atmospheric sources of lead and arsenic. The additional amounts of these elements ingested as lead arsenate on sprayed apples and pears raised the concentration of lead in the blood of male and female consumers to an extent which is more conveniently expressed in micrograms than in milligrams, and also resulted in raising the concentration of lead and arsenic in the urine. For statistical reasons (asymmetrical distribution of urinary lead and urinary arsenic values) the latter two findings cannot be studied as closely as blood lead concentration. These additional amounts of lead arsenate ingested as spray residue were not accompanied by any effects on blood findings (hemoglobin content, erythrocyte count, or reticulocyte percentage) or on the occurrence of any clinical findings, whether considered separately or in association.

The medical records of men and women were sorted by a procedure designed to select all the case records in which lead arsenate intoxication needed to be considered in differential diagnosis. Case records in which symptoms, clinical findings, and laboratory findings are satisfactorily accounted for by diagnoses of common diseases are presented in abridged form; cases which presented problems in differential diagnosis are described in full; and the 7 cases which had a combination of clinical and laboratory findings directly referable to lead arsenate absorption are discussed in detail.

Although sprayers who apply lead arsenate sprays intermittently did not appear to be adversely affected, consideration should be given to the protection of the health of men who mix or apply lead arsenate sprays every working day of the season.

Special attention was given to medical examination of children because, in this district where orchards surround the communities or the houses in which they live, there are unusual opportunities for children to be exposed to lead arsenate insecticide sprays and spray residues on branches, leaves, and grass, in addition to the lead arsenate spray residues they ingest on apples. There was only one respect in which these children may have differed from children in other districts; their urinary lead and urinary arsenic values were higher than the corresponding values for a group of 18 children living near Washington, D. C., known to have no unusual exposure to lead or arsenic.

There was no indication of adverse effects of lead arsenate exposure on the health of these children.

The prevalence of other diseases, such as heart diseases, pulmonary tuberculosis, and neoplastic diseases, has been tabulated and discussed. Each type of illness was studied to find out whether its occurrence or course had been modified by lead arsenate exposure. Insofar as comparative data for other populations are available, no evidence was found that any of these forms of ill health was more

prevalent in this region than elsewhere, or that any cases of chronic diseases had been caused or influenced by lead arsenate exposure.

There was no indication obtainable from the marital histories of men and women examined at the field office of any effect on fertility attributable to lead arsenate exposure.

CANCER IN THE MENTALLY ILL[1]

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The frequency of tuberculosis as well as of heart diseases in mental hospitals has been frequently discussed. Little material dealing with cancer in mental hospital populations has been published. There are many more contributions to the problem of mental disease in cancer patients than to the forms and frequency of cancer among the mentally ill.

During the years 1930–39 there were admitted to St. Elizabeths Hospital, Washington, D. C., 9,503 patients. During the same period 4,529 patients were discharged and 2,665 died. The period of residence among all those who died ranges from a few weeks to almost 50 years. On the average 5,395 patients were on the rolls. During the 10 years under consideration, 227 cases of cancer among the patients were discovered, 119 among males and 108 among females. Of these patients 189 died in the hospital, 7 were discharged, and 31 were still alive on December 31, 1939. Of the 227 cancer patients, 69 were colored. In 155 of the cancer deaths a post-mortem examination was done.

TABLE 1.—*Deaths from all causes, and deaths from cancer, St. Elizabeths Hospital, 1930–39*

	Deaths	Examined post mortem	Not examined
All deaths	2,665	1,873	792
Deaths of cancer patients	189	155	34
Percentage of deaths from cancer	7.1	8.3	4.3

All forms of cancer which might be expected in such a sample, that is, carcinoma, sarcoma, hypernephroma, and malignant endothelioma, are represented among these 227 cases.

[1] From St. Elizabeths Hospital, Washington, D. C., the Department of Anatomy, Graduate School, New York University, New York City, and the Division of Preventive Medicine, Bureau of Medicine and Surgery, Navy Department, Washington, D. C.

The opinion or assertions contained herein are the private ones of the writers and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

DISTRIBUTION OF CANCER BY SITE, SEX, AGE, AND RACE

The female reproductive organs, the genital tract and breast, prove the most frequent site of cancer. In male mental patients the percentage of stomach cancers is higher in the colored than in the white patients. The proportion of genito-breast cancers to all other malignancies in female mental patients does not differ materially from that in the general population. In two groups of female patients, however, those under 50 years of age,[2] and those suffering with senile dementia, the proportion is different. In the 23 women under 50 years of age who developed cancer, the primary tumor appeared 19 times (i. e., in 82.6 ± 7.9 percent) in the genital organs or breast. This is higher than the ratio among the general population. Of the 30 women with senile dementia who had cancer, the primary tumor occurred 9 times (i. e., in 30.0 ± 8.3 percent) in the genital organs. Age alone does not explain this low percentage. Among 78 cancer cases with all types of psychosis except senile dementia, the genito-breast organs were affected in 43 cases (55.8 ± 5.6 percent). This is a high proportion.

In cancer of the upper alimentary tract, the ratio of cases among male mental patients is higher (43 percent instead of about 33 percent) and among female patients only slightly higher (19 instead of 15 to 16 percent) than among the general population. On the other hand, the ratio of cases of the digestive organs below the pylorus is low in both sexes.

METASTASES

In 15 out of 94 male cancer patients and in 11 out of 61 female patients examined post mortem, no metastases were found. One of these cases, a white woman, 44 years of age, the mother of 2 children, was admitted to St. Elizabeths Hospital in 1899. Twenty-eight years later, in 1927, the patient developed an ulcerated breast tumor, regarded then as inoperable. Daily dressing was ordered and continued throughout the intervening years. The tumor grew slowly and remained ulcerated throughout the patient's life. Ten years later, in 1937, the patient died suddenly of a spontaneous rupture of the heart and thrombosis of the coronary arteries. At the autopsy no metastases of the histologically verified adenocarcinoma of the breast were found; the cells themselves did not show mitotic figures.

As usual, secondary involvement was most frequent in the lymph glands and in the liver. The liver was secondarily involved in 61 cases (41 male and 20 female). The next sites in order of frequency were the lungs (15 cases in males and 14 in females); bones (18 cases); and the brain, peritoneum, adrenals, pleura, and kidneys.

[2] There were 23 females in this group.

TABLE 2.—*Distribution of primary tumors by site, sex, age, and race* [1]

Age (years)	Sex	Skin	Lip	Mouth, inner nose, pharynx	Esophagus	Stomach	Intestines	Gall bladder, liver	Kidney	Bladder, prostate	Uterus, vagina	Vulva	Ovary	Breast	Lung, larynx	Bones	Thyroid	Adrenals	Thymus	Pancreas	Lymphosarcoma, endothelioma	Eye	Other and primary undetermined	Total
White patients:																								
20–44	Male	2(2)	3(3)	----	----	1	2	----	----	2	----	----	----	----	1	----	----	----	----	----	1	----	----	12 (5)
	Female	----	----	----	----	----	1	----	----	----	2(1)	----	----	3(3)	----	----	----	----	----	----	----	----	----	6 (4)
45–64	Male	4(4)	3(3)	----	2	10	5	2	----	5	----	----	----	----	2	----	----	2	----	1	1	1	----	38 (7)
	Female	7(4)	1(1)	----	----	3	2	1	----	----	8(2)	2(1)	2(1)	5(2)	1	----	----	----	----	----	1	----	----	33(11)
Over 65	Male	1	----	4(2)	3	12	6	1	----	6	----	----	----	----	3	----	----	----	----	----	----	----	3	39 (2)
	Female	2(2)	----	1	1	4	3	2	1	2	4	----	1	6(1)	----	----	1	----	----	2	----	----	----	30 (3)
Age unknown	Female	----	----	----	----	----	----	----	----	----	1(1)	----	----	----	----	----	----	----	----	----	----	----	----	1 (1)
Colored patients:																								
20–44	Male	----	----	----	1	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	1
	Female	----	----	----	----	----	----	----	----	----	4(2)	1(1)	----	1	----	----	----	----	----	----	----	----	----	6 (3)
45–64	Male	----	----	----	1	8	----	1	----	1	----	----	----	----	1	2	----	----	----	----	----	----	----	14
	Female	----	----	----	----	3	----	----	----	1	3	----	----	4(1)	----	1	----	----	----	2	1	----	----	15 (1)
Over 65	Male	1	----	----	----	6	----	1	----	1	----	----	----	----	3	----	----	1	1	----	----	1(1)	----	15 (1)
	Female	----	----	----	1	2	4	----	----	2	----	1	1	3	----	----	----	----	----	----	1	----	1	17
Total		17(12)	7(7)	5(2)	9	49	23	8	1	20	22(6)	4(2)	4(1)	22(7)	11	3	1	3	1	5	5	2(1)	4	227(38)

[1] The figures in parentheses indicate living cases. These cases are included in the total of 227. Second and third primary tumors are not included in the table.

In St. Elizabeths Hospital special attention has been paid to the dissected brain. The chief sources of the intracranial metastases are malignancies of the lungs, the prostate, and the adrenals. Out of 8 cases of lung cancer, 5 sent metastases to the intracranial space; out of 7 cases of prostate cancer, 5 sent secondary deposits to the intracranial space; while 2 out of 3 cases of adrenal carcinoma had intracranial metastases. Of the 18 persons who died of cancer of one of the three mentioned organs, post-mortem examination revealed that 12, or 66.6 percent, had a secondary growth in either the brain or hypophysis, or in the meninges. Of the remaining 137 cases, 14, or 10.2 ± 2.5 percent, developed such metastases. Altogether, brain metastases, except those of the hypophysis, were found in 15 post-mortem examinations. In 8 of these 15 cases the primary tumor originated in either the lung (4), prostate (2), or adrenals (2). Thus, in cases of lung,[3] prostate, or adrenal cancer, brain metastases were encountered in 44.4 percent, while the corresponding figure for the remaining 137 autopsied cases is 5.1 ± 1.8 percent. The hypophysis showed secondary involvement in 3 male patients (prostate cancers) and in 2 female patients. One of the latter cases was an epithelioma of the eyelid, while in the second case the colon was primarily affected.

Of the 7 cases of malignancy of the prostate which were examined post mortem, 6 were carcinomas and one was a rare case of spindle-cell sarcoma. The 6 carcinomas metastasized, 3 of them into the hypophysis. One of the 3 other patients did not develop metastases in the hypophysis but suffered simultaneously from carcinoma of the prostate and from a primary carcinoma of the hypophysis. This patient had 3 primary tumors simultaneously—a large fibrosarcoma on the back, without metastases, associated with a microscopically small adenocarcinoma of the prostate presenting large metastases to the heart, lungs, mediastinal lymph nodes, and to the arachnoid. The third primary tumor in this patient was an early carcinoma of the hypophysis, different in its structure from the other 2 tumors, and without metastases.[4]

[3] In cases of lung cancer brain metastases were more frequent than observed in the literature (*Cf.* Hare, C., and Schwarz, G. A.: Arch. Int. Med., **64**: 542 (1939); Bloch, R. G., and Bogardus, G.: Arch. Int. Med., **66**: 395 (1940); Peller, S.: Human Biology, **11**: 130 (1939)).

[4] In our material there was still another case of a primary malignancy of the hypophysis. A 63-year-old white male had miliary adenocarcinoma of the hypophysis without metastases, associated with a melanosarcoma of the choroid metastasizing to the brain, to the orbit, lungs, heart, large intestines, pancreas, kidney, suprarenals, peritoneum, and to the retroperitoneal lymph nodes.

TABLE 3.—*The probability of developing metastases in the different organs*

[Based on 155 post-mortem examinations]

Primary tumor in—	Number of primary tumors	Metastases in—						
		Brain, other than hypophysis	Hypophysis	Leptomeninges	Dura mater	Lung	Liver	Bones
Prostate	7	----------	0.43	0.29	0.29	0.29	0.14	0.29
Lungs	8	0.62	----------	.25	.12	----------	.75	.50
Stomach	40	.02	----------	.02	----------	.10	.52	----------
Breast	9	.11	----------	----------	.11	.33	.22	.22
Female genital organs	16	----------	----------	----------	----------	.31	.19	.12
Adrenals	3	.66	----------	----------	----------	.33	.33	.66
Other organs	72	.03	----------	.01	----------	.19	.36	.08
Total	155	.09	.02	.04	.03	.19	.39	.12

NUMBER OF MULTIPLE PRIMARY TUMORS

Altogether there were 5 cases of synchronous multiple cancers. Two of them have been mentioned. The other 3 cases were: (1) A 68-year-old white male with adenocarcinoma of the stomach associated with a primary adenocarcinoma of the sigmoid; (2) an 86-year-old white male with adenocarcinoma of the stomach and a tumor, a "probable" fibrosarcoma of the dura, neither of them metastasizing; (3) a 68-year-old white female with a metastasizing adenocarcinoma of the sigmoid associated with a small (25 mm.) hypernephroma of the left kidney, without metastases. Among the colored patients there were 2 cases of primary multiplicity, myeloma and multiple hepatoma.

In the series of 155 cases examined post mortem there was 1 case of a doubtful metachronous multiplicity in a white female, 52 years of age, admitted to the hospital in 1920. On admission a scar (from an incised furuncle) was noticed on the left breast. In 1927 a cystectomy and oophorectomy were done. The histological diagnosis was fibrosarcoma with hemorrhage. In 1930 a secondary oophorectomy was done. No malignancy or secondary tumors were found. In June 1932 an ulcer developed in the previously mentioned scar on the left breast. The histological diagnosis was carcinoma. The patient died in October 1937. The post-mortem diagnosis was primary scirrhous carcinoma of the breast with metastases to the lung, pleura, and ribs. The reexamination of the section of the ovary, however, "throws considerable doubt upon the original diagnosis of fibrous sarcoma. It now appears much more like an ordinary ovary which is very much swollen up due to a large quantity of blood present. No malignant cells are found, the tissue is disorganized, it is true, but this is probably part of the original pathological process."

In how many of the allegedly metachronous cancers would a careful reexamination of the first primary tumor lead to similar conclusions?

PERCENTAGE OF CANCER DEATHS IN MENTAL PATIENTS

Of the 2,665 deaths at St. Elizabeths Hospital during the years 1930–39, 189, or 7.1±0.5 percent, were attributed to cancer. This is a low ratio, although it is higher than that given by Warren and Canavan [5] for Massachusetts mental hospitals, where, at post-mortem examination, 4.3 percent of all *sudden and unexpected deaths* were found to be due to cancer. In conformity with other authors Warren and Canavan conclude that patients in mental hospitals suffer considerably less from cancer than the general population of the same age distribution. This conclusion is unwarranted.

The cancer frequency and cancer ratio in an institution depend on many factors. The higher the percentage of discharges after a short time in the hospital the less accurate become the cancer statistics. Of the white patients in St. Elizabeths Hospital on January 1, 1940, 13.4 percent of the male and 14.3 percent of the female patients had been admitted during the year 1939; 25.1 percent and 31.6 percent, respectively, had been residents from 1 to 5 years; and 61.5 percent and 54.1 percent, respectively, had been residents for at least 6 years. The average residence in the hospital for white males was 10.3 years; for white females, 9.3 years; and for colored patients, male and female, 9.3 years.

TABLE 4.—*Years of residence of mentally ill patients over 45 years of age at the beginning of 1940, according to age and sex*

Age at time of investigation	White [1]		Colored [2]	
	Male	Female	Male	Female
45–54	13.5	9.9	10.7	10.3
55–64	17.0	14.1	15.8	13.0
65–74	17.9	12.9	14.0	12.3
75 and over	16.7	9.7	12.2	11.0

[1] Calculated on a random sample of 1,170 males and 519 females.
[2] Calculated on a random sample of 182 males and 187 females.

The average age of residents was 47.3 years for white males, 52.1 years for white females, 47.1 years for colored males, and 49.9 years for colored females. Of the male residents, white and colored, 12 percent were 65 years of age or over; of the female residents, 25 percent of the white and 18 percent of the colored were 65 years of age or over. Because of the age of the residents we should expect a much higher cancer ratio than 7.1 percent, which is the percentage recorded in official cancer mortality statistics for the age group 30–34.

The low percentage of cancer deaths is not explained by the practice of discharging patients. Of all the patients discharged there were only seven with a history of cancer. These were symptom-free

[5] New Eng. J. Med., 210:739 (1934).

on the date of discharge. In this group there were four who had a cured skin or lip cancer, one a successfully treated cancer of the vulva, one who had survived three years after mastectomy, and one, the only colored patient among them, had survived 1.5 years following hysterectomy.

A low cancer ratio may result from a high mortality due to other diseases. Of all mentally ill patients, those suffering with general paresis probably show the greatest increase in total mortality. General paresis in St. Elizabeths Hospital accounts for 13 percent of the admissions, as compared with an average of 8.4 percent for mental hospitals in the United States. About 70 percent of the patients admitted to St. Elizabeths Hospital were under 50 years of age. In this age group general paresis accounted for approximately 18 percent of all admissions. During the years 1930–39, 41 cancer patients were observed in the age group under 50 years of whom 8, or 19.5 percent, were also suffering from general paresis. Thus, general paresis patients may have a slightly higher cancer incidence than other mentally ill patients, while the cancer ratio may be lower when compared with the total for the mentally ill. The cancer ratio depends not only on the cancer incidence but also on the total mortality. The ratio of general paresis deaths to total deaths in St. Elizabeths Hospital is higher than the ratio of admissions for general paresis to total admissions. Of the patients under 55 years of age who died during the last 2½ years,[6] 23 ± 3 percent had suffered from general paresis (male, 27 percent, female, 17 percent; white, 21.5 percent; and colored, 24.2 percent). This is considerably greater than the percentage of general paresis among the total admitted. In the age group 55–64 the percentage of general paresis among those who died was 12.8 ± 2.1 percent (male, 15.5 percent; female, 7 percent; white, 11.7 percent; colored, 14 percent). This percentage is nearly as high as the ratio of admissions for general paresis to total admissions, regardless of age.

TABLE 5.—*General paresis and cancer, St. Elizabeths Hospital, 1930–39*

	Sex	Cancer cases			
		White		Colored	
		General paresis	Other psychotics	General paresis	Other psychotics
Under 50 years of age	Male	4	10	----	4
	Female	2	15	2	4
Over 50 years of age	Male	1	74	3	23
	Female	----	55	----	30

[6] Includes the first half of 1940.

TABLE 6.—*Deaths among patients with general paresis and other patients, St. Elizabeths Hospital*

[Unselected sample of 650 consecutive deaths, 1938, 1939, and January to June 1940]

Age at death	Male				Female			
	White		Colored		White		Colored	
	General paresis	Other patients	General paresis	Other patients	General paresis	Other patients	General paresis	Other patients
Under 55	14	48	18	39	6	25	7	39
55–64	8	42	6	34	1	26	2	14
65 and over	2	126	1	46	1	100		41
Age unknown			1	2			1	
Total	24	216	26	121	8	151	10	94

It may be said, therefore, that even today, since the advent of malaria treatment, general paresis patients have a higher total mortality and a somewhat higher cancer mortality than other mental patients. Because the excess in total mortality of general paresis patients is above that of cancer mortality, the cancer ratio is lower than for all mentally ill patients of approximately the same age. However, general paresis patients make up a small group, and are younger than the average psychotic resident. Thus, the low cancer ratio of the general paresis group is not responsible for the low ratio of cancer deaths (7.1 percent) in the whole series.

Since there are, among the 189 cancer deaths, a number of cases representing either mental disease in the course of cancer or at least cases entering the hospital as mentally ill cancer patients, the low cancer ratio is unexpected. Mental disturbance in cancerous persons, due either to cachexia or to psychic shock after operation, is well known.[7] Twenty-one of the 189 deaths from cancer in St. Elizabeths Hospital occurred during the first 3 months of residence. These patients were suffering from cancer prior to admission to the hospital.

The low cancer ratio in our series is either artificial or expresses a low cancer mortality. It is difficult to accept the former explanation when we know that 70 percent of all fatal cases were examined post mortem. There is, however, some explanation for a low cancer incidence and a low cancer ratio in the fact that the majority of our cases were either southern-born or had been living in the South for some time before the mental ailment was discovered. In populations exposed to strong sunlight and to outdoor life the cancer incidence remains approximately the same as among other persons. However, the distribution of the tumors by site differs considerably. Non-

[7] Klippel: Arch. Gen. de Med., 1892; and, more recently, Immerman, S. J.: New York Med. J., 106: 828 (1917).

Cases of mental disorder in cancer have been reported by Ewald, Stertz, Lange, Bonhoeffer, Urechia and Retezanu, Bostroem, Scheps, and others. The frequency of this phenomenon, however, is unknown.

fatal cancers of the skin and lip develop much more frequently among those exposed to strong sun rays, and the number of fatal tumors of the internal organs is about one-half the usual frequency among population groups living in large cities north of 40° latitude.[8] Thus, in the white population of States below 40° latitude the cancer mortality and the cancer ratio are lower than in States north of that latitude. Fifty-two percent of the white patients in St. Elizabeths Hospital were born in the South [9] and 89 percent were either born in the South or were at least residents of the South before admission. A low cancer mortality and a low cancer ratio among all deaths might result from this fact.

GEOGRAPHIC DISTRIBUTION OF WHITE CANCER PATIENTS

In the group of cancer patients we find almost the same percentage of southern-born as are found in the noncancerous population of the hospital. Among the white cancer patients there is only one group of persons (ex-soldiers) in whom the northern-born are more numerous.

TABLE 7.—*Place of birth of white cancer patients at St. Elizabeths Hospital, 1930–39 (north or south of 40° latitude)*

	Patients not connected with the armed forces						Male patients connected at some time with the armed forces		
	Male			Female					
	North	South	Unknown	North	South	Unknown	North	South	Unknown
Still alive [1]	4	[2] 3	1	[3] 7	[4] 10	[5] 2	[6] 2	[7] 3	1
Dead	19	26	1	17	30	3	23	6	
Total	23	29	2	24	40	5	25	9	1

[1] For exceptions, see footnotes 2 and 7.
[2] 1 of these 3 patients suffered from a pharynx tumor; 1 from a lip epithelioma (still living); and 1 died 4 years after the lip epithelioma was cured (without signs of cancerous disease at the time of death).
[3] Includes 2 surface epitheliomas.
[4] Includes 4 surface epitheliomas.
[5] Includes 1 surface epithelioma.
[6] Includes 1 parotid tumor.
[7] 2 of these patients are alive and well and 1 died after complete cure of the epithelioma of the eyelid. The post-mortem examination revealed no signs of malignancy.

Table 7 shows a very small number of nonfatal cancer cases. Among the 89 white male patients there were 13 cases of skin and lip cancer, 12 living and 1 dead; and among the 69 white female patients there were 10 cases, 7 of whom are living. It is worthy of note that the records of patients in St. Elizabeths Hospital show an unusually low percentage of histories of skin or lip cancers. According to the experience gained from the studies in the Navy,[10] Army,[11] and at the

[8] Peller, S., and Stephenson, C. S.: Am. J. Med. Sci., 194: 326 (1937); Peller, S., Stephenson, C. S., and Souder, C. G.: Am. J. Hyg., 32: 39 (1940); Mountin, J. W., and Dorn, H. F.: J. Am. Med. Assoc., 113: 2405 (1939).
[9] Calculated on a sample of 1,429 residents at the beginning of 1940.
[10] Peller, S., and Stephenson, C. S.: Am. J. Hyg., 29: 34 (1939).
[11] Peller, S., and Souder, C. G.: Army Med. Bull. No. 51, January 1940.

National Institute of Health,[12] we should expect at least twice as many surface cancers as were observed in this series. This is a conservative estimate. Perhaps there were some surface epitheliomas which developed and were cured prior to admission to this institution. We know of only 2 such cases.

The incompleteness of medical history for the time prior to admission is to be expected in mentally disturbed patients and should not be considered as a reflection on the hospital staff. In view of this observed deficit further exploration of this phase of the problem is indicated.

The recorded experience clearly indicates that persons living in southern climates, thus having a greater exposure to the rays of the sun throughout life, develop surface epitheliomas earlier than those living in northern climates. In the South skin epithelioma is by no means a disease of old people. A considerable portion of the residents is admitted to St. Elizabeths Hospital at an age which renders it very probable that some of them had the epithelioma long before admission. This is especially true for those patients who were living in and near Washington, D. C. At the time of admission they were much older and they were under observation in the hospital for a shorter period of time than were the ex-soldiers, two-thirds of whom were born in northern United States, Canada, or Europe.[13] The ex-soldiers, on the average, came to the hospital at a younger age and remained there for a longer time. Of the 227 cases of cancer, only 2 epitheliomas were reported for the prehospital period and both were in ex-soldiers.

CANCER FREQUENCY

In the years 1930–39 there were 26,514 person-years of observation for white males and 11,772 for white females, 8,532 for colored males, and 7,182 for colored females. The age distribution of the patients at time of admission is shown in table 8. To calculate the number of expected cancer deaths, the age distribution of the residents of the hospital for each one of the 10 years should be known, or at least for the first and the last year of the 10-year period. That would be analogous to the procedure of calculating the age-specific cancer mortality rates for the general population. However, the age distribution of residents was available only for those who were alive at the end of the 10-year period of study. A factor of uncertainty is, therefore, introduced into the calculations which excludes the consideration of small deviations, or small differences, between expected (calculated) and actual figures.

[12] Mountin and Dorn, op. cit., footnote 8.
[13] Except the southern peninsulas. The percentage of persons born in Europe is considerable among the older mentally ill patients, and, therefore, also among the cancer patients.

TABLE 8.—*Age of white patients at time of admission*

Age in years at time of admission	Percentage of patients who were admitted during 1932, 1935, and 1936		Percentage of patients who were residing in the hospital at the beginning of 1940			
			Men			Women [4]
	Men [1]	Women [2]	All [3]	Ex-soldiers	Others	
Under 34 [5]	49.7	25.6	59.5	[5]74.6	47.2	35.0
35–44	20.6	20.6	19.7	16.5	22.6	23.2
45–54	12.7	14.8	9.7	5.0	13.6	15.9
55–64	9.2	16.1	6.2	2.5	9.2	10.0
65 and over	7.8	22.8	4.8	1.3	7.4	15.9
Total	100	100	100	100	100	100

[1] An unselected sample of 913 men.
[2] An unselected sample of 378 women.
[3] An unselected sample of 989 men.
[4] An unselected sample of 440 women.
[5] 32.1 percent under 24 years of age.

TABLE 9.—*Years of residence in St. Elizabeths Hospital of persons who died from cancer, 1930–39*

Age at death	White males		White females	Colored	
	Ex-soldiers	Others		Males	Females
45–54	19.7	18.5	10.6	11.1	7.6
55–64	21.1	13.6	15.6	15.5	15.6
65 and over	24.2	12.8	12.0	10.6	8.3

The age-specific cancer rates of New York City, for 1935, were applied to the white population of St. Elizabeths Hospital. According to this method, 90.3 deaths among white males and 59.9 deaths among white females from cancer, totaling 150.2 deaths, would be expected. Actually, 75 deaths among males and 50 among females, or 125, were found. Including the death of 1 female, which occurred a few days after the end of the period of observation (January 1940), there would be 126 deaths, or 24 fewer deaths than expected. Seventy percent of all cases were examined post mortem.

There are no reliable official cancer statistics for the colored population. Assuming that the age-specific cancer death rates for colored persons equal those for the white population in New York, we should expect 28.3 deaths among males and 31.5 among females, or a total of 59.8. Actually, 29 deaths among males and 35 among females, or 64, were found.

TABLE 10.—*Age distribution of resident psychotic patients, St. Elizabeths Hospital Jan. 1, 1940*

Age on Jan. 1, 1940	White males		White females [2]	Colored	
	All [1]	Ex-soldiers		Male [3]	Female [4]
	Percent	*Percent*	*Percent*	*Percent*	*Percent*
Under 35	24.3	31.9	17.2	25.1	18.0
35–44	23.9	27.1	18.4	26.9	23.7
45–54	22.6	21.2	19.3	19.4	19.1
55–64	16.8	13.2	19.8	16.7	21.2
65–74	9.2	5.2	15.3	8.3	11.4
75 and over	3.0	1.3	9.6	3.4	6.6
Total	100	100	100	100	100

[1] An unselected sample of 1,170 (520 ex-soldiers).
[2] An unselected sample of 519.
[3] An unselected sample of 375.
[4] An unselected sample of 318.

The deficit in cancer deaths among psychotic patients is entirely confined to white persons who had no connection with the Army or Navy. Of the white patients in St. Elizabeths Hospital during the years 1930–39, 11,782 person-years were represented by the group of ex-soldiers. Ex-soldiers on the average were younger than the other white patients. On the basis of age 28.9 cancer deaths would be expected, but 32 deaths were recorded (including the Veterans' Administration patients). This group of patients, therefore, does not have a lower mortality than estimated. Perhaps the small surplus of 3 cases is entirely due to the fact that the Veterans' Administration patients were not included in the total of psychotic ex-soldiers, while all 3 such cases are included in the group of cancerous psychotic ex-soldiers. Excluding ex-soldiers, there remain 14,732 person-years of observation for white male and 11,772 for white female residents. The estimated number of cancer deaths for this group of patients is 62.3 and 59.4 for males and females, respectively, or a total of 121.7 ± 11.0, while actually 43 males and 50 females, or 93 persons, died of cancer. This is 28.7 fewer deaths than expected. The difference is 2.6 times its standard error.

In these calculations no distinction has been made between cancer which developed during residence in St. Elizabeths Hospital and cancer in persons who entered the hospital suffering from cancer. Of the 227 cancer cases observed in the hospital, at least 24 white and 8 colored persons entered the hospital suffering from malignant disease. Some of them were already in the highly cachectic terminal stage and died of cancer within a few weeks following admission. In addition to these 32 cases there were 14 other patients who did not exhibit signs of cancer at the time of admission, but in whom cancer was discovered within 6 months. Five of these 14 patients died before the end of the first year of residence.

In computing the cancer risk of an institutional population, patients entering the institution with manifest symptoms or a history of cancer should be omitted. Those patients who apparently were noncancerous prior to and at the time of admission but died soon thereafter of cancer should also be omitted. Twenty-one mentally ill persons (16 white and 5 colored) died of cancer in St. Elizabeths Hospital within the first 3 months of residence, 8 persons (5 white and 3 colored) died during the second 3 months, 8 died during the second half year following admission, 12 died during the second year, 14 died during the third year, and 126 died during the remaining years of residence. Of the 189 persons who died of cancer during 1930–39, the white patients had lived in St. Elizabeths Hospital an average of 14.9 years and the colored patients an average of 10.5 years.

During the first 6 months after admission 21 [14] white and 8 colored patients died from cancer, or one-sixth of the fatal white cancer cases and one-eighth of the fatal colored cancer cases. Thus, the greatest numbers of cancer deaths in St. Elizabeths Hospital are found during the first and second 3-month periods after admission. In at least one-sixth of the white cancer cases and in one-eighth of the colored cases one should speak of mental disease in admitted cancer patients, regardless of whether the mental disorder developed prior to cancer or in course of the disease. When the cancer risk of an aggregation of mentally ill persons is to be determined, this group of patients is, so to speak, a foreign body in the institution. It would be an error to include these cases in our mortality rates or incidence rates. This error has its analogy in the official mortality statistics of cities, which until now have not succeeded in separating nonresident from resident cancer deaths. In reporting the total number of cancer deaths which occurred these nonresident deaths must be included, whereas in calculating cancer mortality rates of a city as an expression of the cancer risk of the population, they must be omitted. Actually, in city statistics the error introduced is much smaller than it would be in our study. In our series there were 71 white cancer patients who were over 44 years of age at the time of admission. Of these, 16 died within the first 3 months of residence. Seven of the 71 patients had cancer at the time of admission and death occurred at intervals in excess of 3 months. Among the colored mental patients over 44 years of age, there were 5 deaths out of 40 cases, or 12.5 percent. It would be erroneous to include these 28 deaths, which represent 25.2 percent of all malignancies observed in psychotic patients over 44 years of age, in the calculation of the cancer risk of the hospitalized or institutionalized mental population.

[14] Nineteen counted as ill at time of admission.

The cancer risk of the mentally ill, on the basis of 38,286 person-years of observation for white patients and 15,714 person-years for colored patients is, therefore, less than given previously in this study.

TABLE 11.—*Actual and calculated cancer deaths, St. Elizabeths Hospital, 1930–39*

	Observed deaths				
	(a)	(b) Persons who died		(c)	(d)
	Total cancer deaths	In the first 3 months	Later, but were cancerous at time of admission	Observed deaths (a)−(b)	Expected deaths (on basis of white population, New York City, in 1935)
(1) White males:					
(A) Ex-soldiers	32		[1] 2	30	28.6±5.4
(B) Others	43	9	[2] 1	33 } 101	62.3±7.8 } 150.2±12.2 [4]
(2) White females	50	7	[3] 5	38	59.4±7.7
(3) Colored males	29	3		26	28.3
(4) Colored females	35	2	3	30 } 56	31.5 } 59.8±7.7 [4]
Total	189	21	11	157	210.1±14.6

[1] 1 died in the fourth month, 1 in the second half of the first year.
[2] Died in the second half of the first year.
[3] 3 died during the fourth to sixth months, 1 in the second year, and 1 in the fourth year. The latter case became psychotic following hysterectomy.
[4] The standard error of the difference between expectancy and the actual figure.

In the group of patients presented in 1 (A), 3, and 4 in table 11, the deviations between observed and expected number of deaths, as shown in columns (c) and (d), are not statistically significant and may be disregarded. However, the differences are considerable and significant between the expected and observed number of cancer deaths in the groups presented in 1 (B) and 2, that is, among white males who were not connected with the armed forces and among white females. In both of these groups the expectancy is 121.7±11.0 cancer deaths. Actually, only 71 occurred. In these two groups of white patients there were 27 additional cases of cancer in patients living on the last day of the observation period, December 31, 1939. Of these, 6 developed the malignancy before admission to the hospital. Some of the remaining 21 cancer cases (skin, lip, uterus, and breast) will die of the malignancy, but this figure would not supply the deficiency even if the time factor were disregarded.

Thirty-five percent of white male residents without military service were born in the North, and 65 percent were born south of 40° latitude. The corresponding figures for total cancer deaths in this group were 42 to 43 percent and 56.5 to 58.2 percent, respectively.[15]

An estimate of 74.1±8.6 cancer deaths was made for all white patients born north of 40° latitude, a large number of whom had been

[15] The southern-born white psychotic patients were, on the average, 4.2 years younger than those born farther north.

residing south of that parallel, while 54 deaths occurred. The difference of 20.1 is 2.3 times the standard error of the estimate. For white patients born south of 40° latitude, all of whom had lived all their lives or a considerable period of time in the South, 76.2 ± 8.7 cancer deaths were estimated, while only 47 occurred. The difference of 29.2 deaths is highly significant.

CANCER AND TUBERCULOSIS—CANCER TREND

In institutions for the mentally ill, tuberculosis is thought to be a greater menace than cancer. According to the latest official report,[16] 8.8 percent of all deaths in mental institutions were due to tuberculosis and 3.7 percent were due to cancer. In St. Elizabeths Hospital the percentage of cancer deaths is much higher. As elsewhere, the majority of the deaths are due to diseases of the circulatory organs (arteriosclerosis, hypertension, cerebral hemorrhage, syphilis of the vessels, heart and coronary disease). During 1936 there were 26 deaths from tuberculosis in St. Elizabeths Hospital, or 9.7 percent of all deaths, and 17 deaths from cancer.[17] According to our own study, there were 20 deaths from cancer, or 7.4 percent of all deaths. These figures for tuberculosis and cancer are higher than the average for mental institutions in the United States.

In the years 1938 and 1939 and in the first 6 months of 1940, 650 persons died in St. Elizabeths Hospital. (See table 6.) Of these 650 deaths, 47, or 7.2 percent, were due to tuberculosis (28 white and 19 colored) and 62, or 9.5 percent, to cancer (34 white and 28 colored). The percentage of cancer deaths for this 2½-year period is much higher than the average percentage of cancer deaths for the whole 10-year period, 1930–39. In the first 4 years of this period, 1930–33, 6.4 percent of all deaths in St. Elizabeths Hospital were due to cancer; in 1934–36, 7.0 percent; in 1937–39, 8.0 percent; and in 1938–39 and the first half of 1940, 9.5 percent. This increase in the cancer ratio is analogous to the steady increase of cancer ratios and cancer rates shown in the official mortality statistics for the United States.

It is our purpose to record the fact that in St. Elizabeths Hospital, as in the general population, the tuberculosis problem is decreasing in importance while the cancer problem is increasing. The change in the tuberculosis-cancer ratio is certainly due to a more rapid improvement in hygienic conditions in institutions than is evident in such conditions among civilian populations. The gaps in these conditions are greater for colored than for white persons. Therefore, life in the hospital has a greater effect on the tuberculosis-cancer ratio for colored than for white patients.

[16] Bureau of the Census, Vital Statistics—Special Reports, Deaths in Institutions, Vol. 7, No. 44, 1936.
[17] Op. cit., p. 327.

DISCUSSION

The low cancer mortality in the white residents of St. Elizabeths Hospital may be explained either by the assumption that the southern white population of the United States has low cancer mortality rates, or that the mentally ill have a lower cancer susceptibility than the average of the population. We find no supporting evidence for the latter assumption. Nevertheless, to reject this assumption it would be necessary to study cancer of the mentally ill in the northern part of the United States. In Norway [18] and in England [19] apparently no difference exists between the incidence of cancer in mental hospitals and in the general population. In our study 66 percent of the ex-soldiers were northern born. This group had cancer rates corresponding to the New York cancer experience. This sample, however, is too small to prove the point. Moreover, it is necessary to explain why this group does not have a lower cancer rate than the New York City population of corresponding ages. This would have been expected, in view of the results of studies previously carried on in the Army and the Navy. As mentioned before, there are included in this group of cancer patients beneficiaries of the Veterans' Administration as well as persons who many years ago served for a short time in the military service but were not entitled to the benefits of either the Veterans' Administration or the armed forces. Included in the study are persons who served in the Army for 2 or more years during the last half of the past century and who were admitted to St. Elizabeths Hospital 30, 40, or 50 years later. These cases of cancer were charged to the ex-soldiers, even if they were not so considered in the administration reports. Of the psychotic ex-soldiers who died of cancer, three-tenths served between 5 months and 3 years, and one-half between 5 months and 5 years. The records indicate that a comparatively small number of the psychotic ex-service men served or lived sufficiently long under climatic conditions which might have produced a superficial cancer. Thus, they were deprived of the protection which may be afforded by the preexistence of a superficial nonfatal cancer, and consequently developed internal cancer more frequently than the Army or Navy personnel.

The other assumption made above, i. e., that residents of St. Elizabeths Hospital have low cancer mortality rates because they have been a part of the southern white population of the United States, seems more probable. It would seem that the cancer rates are low in the white psychotic patients of St. Elizabeths Hospital because of the intensive exposure to sun which these patients had experienced

[18] Opsahl, R.: Norsk. Mag. Laegevidensk., 94: 771 (1933).

[19] Rudolf, G. M., and Ashby, W. R.: J. Ment. Sci., 80: 223 (1934); see also report in J. Ment. Sci., 76: 223 (1930).

for a long time prior to the development of mental disorder or prior to hospitalization. They have about the same age-specific cancer rates as the population of which they have been a part.

SUMMARY

1. An analysis is given of the 227 cancer cases which occurred in St. Elizabeths Hospital, Washington, D. C., among mental patients during a 10-year period; 189 of the cases were fatal; 155 were examined post mortem. Expected figures were calculated on the basis of the mortality statistics for New York City (1935).

2. The distribution of the fatal primary malignancies according to site does not reveal definite deviations from the expectancy. The percentage of skin and lip cancer among the patients is much smaller than expected. Further exploration of this deficit is indicated.

3. The ratio of cancer deaths for the 10-year period (7.1 percent) is low; the ratio for the years 1938–40 is higher than for the years 1930–37.

4. The cancer mortality of the white psychotic patients from the area in which the hospital is located is significantly lower than that of the corresponding white population of New York City. Two-thirds of the patients were born in the South; one-third were born in the North, but lived in the South before they were admitted to the hospital. For the group of patients born in the South, and residing there before admission, the mortality was 38.3 percent less than the expectancy, while for those who were born farther north and who migrated to the South it was 27.0 percent less than the expectancy.

5. The cancer mortality of the psychotic ex-soldiers and of the colored mental patients does not deviate from the data calculated on the cancer statistics of the white population of New York City. Of the white patients who were ex-service men, two-thirds were born north of 40° latitude. Only a small part of them was exposed to the climatic conditions of the South either in childhood or later.

6. The probability of metastasizing to the brain was studied for primary tumors of various organs. Cancer of lungs and adrenals has a higher probability of metastasizing to the cerebrum, exclusive of hypophysis, and cerebellum than cancer of all other organs. Cancer of the prostate has a much higher chance of metastasizing to the hypophysis, the leptomeninges, and the dura.

7. During the years 1938–40 the number of cancer deaths exceeded the number of tuberculosis deaths among the residents of St. Elizabeths Hospital; previous to 1938 tuberculosis deaths were more numerous.

ACKNOWLEDGMENTS

Grateful acknowledgment is made to Dr. Winfred Overholser, superintendent, St. Elizabeths Hospital, for the use of hospital records; to Mrs. Laura T. Anderson, senior clerk, Division of Preventive Medicine, Bureau of Medicine and Surgery, Navy Department, for editing; to J. A. McCalley, chief pharmacist's mate, United States Navy, for typing; and to G. B. Peterson, pharmacist's mate, first class, United States Navy, for collection of data.

AN INSTITUTIONAL OUTBREAK OF PNEUMONITIS [1]

III. HISTOPATHOLOGY IN MAN AND RHESUS MONKEYS IN THE PNEUMONITIS DUE TO THE VIRUS OF "Q" FEVER

By R. D. Lillie, *Senior Surgeon*, T. L. Perrin, *Passed Assistant Surgeon*, and Charles Armstrong, *Senior Surgeon*, *United States Public Health Service*

In the previous papers of this series, Hornibrook and Nelson (*1*) have described the epidemiological and clinical findings in an outbreak of pneumonitis at the National Institute of Health, and Dyer, Topping, and Bengtson (*2*) have reported the isolation of the causative agent and its identification with the virus of "Q" fever.

The purpose of this paper is to report the detailed pathologic findings in the fatal case, A. M., noted in Hornibrook and Nelson's report and to compare them with the findings in other human cases reported recently from other localities and with those in rhesus monkeys (*Macaca mulatta*) after intrapulmonary inoculation with the X, M, and P strains of "Q" fever virus. These virus strains were fully identified by Dyer, Topping, and Bengtson (*2*). One monkey inoculated with the sputum of case H. D. (*1*) gave pathologic findings identical with those seen in the other monkeys.

HUMAN CASE "A. M."

The patient was a white male, aged 59, gardener and incinerator operator. Onset as "cold" on April 17, 1940. Admitted to hospital on April 22, died on April 25. Had slight productive cough and chest pain on inspiration. Temperature on hospital admission 102° F., 103.5° F. maximum. Dullness over right lung from scapula to base posteriorly, smaller area on left. X-ray: "Pneumonitis" of right lower lobe, less on left. Blood: 6,200 white corpuscles, 82 percent neutrophils and 18 percent lymphocytes.

[1] From the Divisions of Pathology and of Infectious Diseases, National Institute of Health.

Gross post-mortem findings.[1]—Enlarged, dilated heart with widened mitral ring and no valve lesions. Moderate aortic atheroma. Congestion and edema of left lung, more marked in the lower lobe, congestion only of the right lower lobe; firm gray granular consolidation of right upper lobe posteriorly. Spleen is enlarged, soft and flabby; its pulp is soft and friable. Kidneys are of normal size, cortex 6 mm. thick, surface finely granular. Liver, gall bladder, adrenals, ureters, bladder, prostate, and pancreas show no significant alterations. There are large deposits of fat around pericardium and kidneys, and one inch of subcutaneous fat over the abdomen.

MICROSCOPIC FINDINGS

Lung.—There are two sections from the consolidated upper right lobe. Microscopically, these sections are diffusely consolidated, with alveoli, bronchioles, and most bronchi filled with an exudate which is chiefly fibrinocellular, and varies slightly in composition from field to field; in some areas it is difficult to make out alveolar outlines, and even bronchi and bronchioles are poorly defined. The exudate is usually quite compact, with fibrin as the chief component. The cells are of small to moderate number in each alveolus, are usually enmeshed in the fibrin, and consist chiefly of lymphocytes, plasma cells, and large mononuclear cells; red blood cells are numerous in scattered alveoli, but polymorphonuclears are few throughout. In addition to the cells noted above, elongated and pyknotic nuclei are common in the exudate, and proliferating fibroblasts are not uncommon; alveolar epithelium is prominent in some areas. In some small foci the fibrin is fragmented, and often phagocytic mononuclear cells slightly predominate in these areas. Bronchi and bronchioles, particularly the latter, are usually completely occluded by exudate similar to that present in alveoli; part or all of bronchial epithelium is usually desquamated, and the exudate appears to adhere to that portion of the wall which is denuded of epithelium. Interalveolar septa are slightly to moderately thickened with accumulation of lymphoid, plasma, and large mononuclear cells, and the capillaries contain little blood; definite fibrosis of variable degree is also noted. Lymphocyte and plasma cell infiltration of moderate degree is observed in peribronchial, perivascular, and pleural connective tissue, and there are focal accumulations of carbon-filled macrophages. A little fibrinocellular exudate on the pleura shows beginning organization. An occasional giant cell of the foreign body type is seen in the exudate; one of these is seen partially surrounding a fragmented corpus amylaceum.

[1] Acknowledgment is made to Doctor Aronstein and the staff of Providence Hospital for data on the gross post-mortem findings.

The remaining sections of lung show moderate congestion, accumulations of large mononuclear cells containing carbon and a very little hemosiderin in some alveoli, patchy areas of atelectasis with interalveolar fibrosis, chiefly subpleural, and patchy emphysema. In addition, one of the sections shows scattered, small, patchy peribronchial pneumonic areas. Bronchi in the latter areas contain purulent exudate, their epithelium has desquamated, and polymorphonuclears in moderate numbers infiltrate their walls which are focally necrotic. The pneumonic exudate consists of fibrin and variable proportions of polymorphonuclears, macrophages, and red blood cells. Gram-positive and gram-negative cocci are fairly numerous, and are chiefly intracellular. Peribronchial, perivascular, and pleural fibrosis is of moderate degree, and there is focal lymphocyte and plasma cell infiltration in these areas. Throughout all lung sections are small to moderate numbers of corpora amylacea. Pulmonary arteries, particularly in areas of atelectasis and fibrosis, show slight to moderate fibrosis of their walls.

Heart muscle.—Considerable irregular patchy fibrosis and fiber hypertrophy.

Abdominal aorta.—Moderate atherosclerosis, slight perivascular lymphocyte infiltration in media.

Liver.—Some centrolobular congestion, cell oxyphilia and necrosis, and intracapillary leucocytosis. Hyaline oxyphil globules and yellowish-brown pigment tinged green with polychrome methylene blue are seen in liver cells in centrolobular zones. Gall bladder and pancreas are negative.

Spleen.—Often deposition of oxyphil hyaline material with some nuclear debris in centers of splenic follicles. Pulp shows fairly marked diffuse congestion and sinus dilatation. Few neutrophil leucocytes and moderate numbers of large lymphoid and plasma cells are seen in the pulp.

Sternal marrow.—About half fatty and shows normal erythromyelopoietic activity.

Adrenal.—Slight congestion and scattered oxyphil karyopyknotic cortex cells. Lipoid content fairly high.

Prostate and *bladder.*—Normal.

Kidneys.—Patches of scarring and tubular atrophy and dilatation with glomerular obliteration and irregular lymphocyte infiltration, a small cortical adenoma, and, diffusely, swelling of glomeruli and convoluted tubule epithelium, few granular, oxyphil karyopyknotic tubules, and numbers of casts in collecting tubules.

PATHOLOGY IN MONKEYS

For comparison there are presented the pathologic findings in eight rhesus monkeys (*Macaca mulatta*) inoculated into the right lung with

four strains of "Q" fever virus. Data concerning inocula, strains, duration, and striking gross findings are given in table 1.

TABLE 1.—*Data on strains, inoculations, and gross lesions in monkeys*

Monkey	Strain	Source of inoculum	Passage generation	Day killed	Site of inoculation	Gross lesions at autopsy
566	M.	G. P. spleen	2d	5	Right lung	Purplish gray nodule 2×2.5 cm., right lower.
484	M.	Monkey 566	3d	5	do	Beefy red nodule right lower, red mottling left lower.
613	M.	Monkey 566	3d	5	do	Grayish nodule 2.5×2.5 cm., right lower.
652	M.	Monkey 544	3d	5	do	Consolidation upper part, right lower and focal in left lung.
480	P	G. P.	4th	6	do	Nodular consolidation left lung.
486	H.D.	Sputum	1st	13	do	Few small gray white foci, both lungs.
693	X	G. p. passage	ca. 125[1]	11	do	Small reddish nodules, right.
694	X	G. p. passage	ca. 125[1]	10	do	Small reddish patches, right.

[1] This strain was isolated in April 1938 and was passed through guinea pigs at approximately weekly intervals up to October 1940.

MICROSCOPIC FINDINGS

Lung.—The picture in all eight monkeys was similar, although the amount and extent of consolidation were variable. Consolidation is nodular or confluent nodular in type and generally peribronchial or peribronchiolar in location. The intranodular bronchi and bronchioles generally contain exudate which is variously seropurulent, mucopurulent, or serocellular in character, in the last instance containing neutrophil leucocytes, monocytes, desquamated epithelial cells, and, perhaps, erythrocytes. Alveolar contents are quite varied from nodule to nodule and often within the same field.

The least extensive and probably the earliest phase of the pneumonic process shows alveoli containing serum and neutrophil leucocytes. Partly hyalinized masses of fibrin were found in one monkey. Alveoli are found containing variable proportions of loosely packed neutrophil leucocytes and large, round, lightly basophil monocytes with leptochromatic nuclei and minute nucleoli. Septa in these areas are perhaps somewhat thickened and infiltrated by rather similar monocytes and fewer lymphocytes. Around larger vessels lymphocyte infiltration is more marked and monocytes are fewer. Septa are lined by coherent swollen vacuolated epithelial cells with vesicular nuclei and conspicuous nucleoli, and a few similar, but more vacuolated, cells participate in the alveolar exudate. In most of the consolidated areas interstitial infiltration is more pronounced and comprises more lymphocytes than monocytes; swollen vacuolated alveolar epithelium is more often seen; and alveoli are partly collapsed and filled by proliferating thick fusiform, stellate and polygonal epithelioid cells, less often slender fibroblasts, mingled still with rounded monocytes in greater or less numbers, and some neutrophil leucocytes, swollen foamy epithelial cells with their characteristic vesicular nuclei and

large nucleoli and, perhaps, lymphocytes. Larger vessels are densely mantled by lymphocytes or lymphocytes and monocytes. Periarterial lymphatics are often distended by serum, monocytes, and lymphocytes. Occasionally there is lymphocyte infiltration of the intima of small arteries.

The pleura over consolidated areas, focally elsewhere and about the hilus, shows patches of stratifying mesothelial proliferation with infiltration by neutrophil or, in three instances, eosinophil leucocytes, subjacent lymphocyte, or lymphocyte and monocyte infiltration; in two instances, subpleural and surface exudation of thready, metachromatically basophil material resembling mucus, and in two others patches of organizing fibrin.

It should be recorded that in rhesus monkeys pulmonary pictures are often complicated by pulmonary acariasis. Portions of parasites identified tentatively as *Pneumonyssus foxi* were seen in dilated bronchioles in five of the eight monkeys. Similarly dilated bronchioles with fibrosed atrophic mucosae densely infiltrated by lymphocytes but containing no parasite fragments were more numerous in the same five monkeys. Masses of light brown granular pigment, which stains blue-black with Romanowsky stains, mingled with small angular black particles, and fine acicular doubly refractile crystals were seen in the mucosae of such bronchi; doubly refractile material was present in the bodies of the parasites; and, in all of the monkeys, greater or less quantities of the same pigment were present in the sheaths of pulmonary arteries. This picture has appeared repeatedly in many monkeys from various other studies.

Sections of *heart* were made in six monkeys killed 5, 10, and 11 days after inoculation. All showed relatively few scattered foci of lymphocyte infiltration, usually perivascular, in the epicardial fat or myocardium, or both. Small foci of fibroblast proliferation in the ventricular muscle were noted in one. In one monkey vascular endothelial proliferation and perivascular infiltration by lymphocytes and plasma cells were noted (10 days).

The *larynx* showed, respectively, moderate and fairly dense mucosal and periglandular lymphocyte infiltration in the two monkeys in which it was studied. The trachea showed similar findings.

The *thyroid* of four monkeys and the *parathyroid* of one of them showed no lesions.

Focal periductal lymphocyte infiltration was seen in the *submaxillary gland* in two monkeys and in two others there were no lesions.

Occasional foci of lymphocyte infiltration were noted in the *esophagus* in the mucosa in one and in the muscularis in one; in a third monkey none were noted.

Gastric mucosa generally showed more or less lymphocyte infiltration, sometimes with plasma cells as well. This infiltration was more

marked in the fundus in two monkeys, about equal in one, and more in the antrum in three. Definite follicles with germinal centers were present in three. While lymphocyte infiltration is not uncommon in the gastric mucosa of monkeys, the impression is that it is increased in this series.

The *small intestine* was normal, or its mucosa showed a slight increase in lymphocyte content. No significant lesions of the *colon* were noted in five monkeys.

The *liver* was normal in two monkeys and there was a slight to moderate focal interstitial or periportal lymphocyte infiltration, or both, in the remaining five. Gall bladder was normal in two monkeys.

The *pancreas* showed no lesions in four monkeys.

The *adrenal* showed slight focal lymphocyte infiltration of the cortex in one and a lymphoid nodule at the medullary border in another. No lesions were seen in three monkeys.

Varying grades of swelling, granular degeneration, and dilatation of *renal* convoluted tubules, which contained granular or foamy oxyphil exudate, were observed in three monkeys. The kidney was normal in a fourth. Two monkeys showed normal tubules and a little lymphocyte infiltration in the sheath of an arcuate artery in one, sparse lymphocyte infiltration in the pelvic mucosa in the other.

The juvenile *testis* and *epididymis* were normal in two monkeys. The *tubal fimbria* was normal in one, the *ovary* showed an occasional focus of perivascular lymphocyte infiltration in another. In both of these female monkeys there was much endometrial hemorrhage. They showed also focal interstitial and perivascular lymphocyte infiltration in the myometrium and in the cervix.

The *urinary bladder* showed irregular diffuse and perivascular lymphocyte infiltration of the mucosa in each of two female monkeys.

Omentum was normal in one monkey and in another showed an occasional patch of surface mesothelial proliferation and swelling with subjacent fibroblast proliferation and infiltration by monocytes, eosinophils, and lymphocytes.

Skeletal muscle was normal except for slight sarcosporidiosis in one monkey.

Splenic follicles are moderate in size to rather large and usually exhibit pale germinal centers. Phagocytic follicular reticulum cells are infrequent. The blood content of the pulp is not greatly increased. There is usually a moderate pulp infiltration by lymphocytes, accompanied in one monkey by considerable numbers of neutrophil leucocytes in the blood spaces, and in three other monkeys by lesser numbers of large lymphoid and plasma cells. Slight to moderate swelling of sinus reticulo-endothelium was evident in three of the seven monkeys. free monocytes or macrophages in two. In one monkey a few

vague nodules of epithelioid cells and fragmenting leucocytes were seen in the spleen pulp and in the bone marrow.

Femoral marrow was studied in four monkeys. Nodules of irregularly disposed epithelioid cells and intact or fragmenting neutrophil leucocytes were seen in two, and another showed solid lymphocytic nodules. Otherwise, the marrow was about half fatty (midfemoral region) and contained considerable numbers of promyelocytes as well as neutrophil and eosinophil myelocytes, metamyelocytes, and leucocytes. In one there were considerable numbers of large pale cells with leptochromatic nuclei, possibly monoblasts; in another, increased numbers of megakaryocytes. Erythropoiesis was slightly or moderately active.

Some *lymph nodes* showed follicle swelling and hyperplasia and phagocytosis of nuclear debris by follicle phagocytes, sinus dilatation, and swelling of sinus endothelium and pulp reticulum cells. Other (abdominal) nodes showed essentially no lesions.

DISCUSSION

The pneumonic process appears to be essentially identical in the human case and in the eight monkeys, and corresponds closely, allowing for differences in nomenclature and concepts of the basic histology of the lung, with the picture described by Kneeland and Smetana (*3*). The presence of "round cell" exudate and of "organization of old exudate" in a case fatal on the sixteenth day (Longcope's Case 9) (*4*) is suggestive. The arterial necroses noted in Kneeland and Smetana's case and in one of Longcope's were absent in our human case and in the monkeys. Small foci of purulent pneumonia with gram-positive cocci were present in Kneeland and Smetana's case, in Longcope's Case 9, and in our human case, but absent in Longcope's Case 8 and in the monkeys.

Rickettsiae were not seen in any of our human or simian material.

The spleen also has shown a similar picture in our human case and in the monkeys. This picture may be the same as Kneeland and Smetana's "acute splenic tumor." Longcope does not discuss the spleen.

REFERENCES

(*1*) Hornibrook, J. W., and Nelson, K. R.: An institutional outbreak of pneumonitis. I. Epidemiological and clinical studies. Pub. Health Rep., **55**: 1936–1944 (1940).

(*2*) Dyer, R. E., Topping, N. H., and Bengtson, I. A.: An institutional outbreak of pneumonitis. II. Isolation and identification of causative agent. Pub. Health Rep., **55**: 1945–1954 (1940).

(*3*) Kneeland, Y., and Smetana, H. F.: Current bronchopneumonia of unusual character and undetermined etiology. Bull. Johns Hopkins Hosp., **67**: 229 (1940).

(*4*) Longcope, W. T.: Bronchopneumonia of unknown etiology (Variety X). A report of thirty-two cases with two deaths. Bull. Johns Hopkins Hosp., **67**: 268 (1940).

COURT DECISION ON PUBLIC HEALTH

Statutory provisions for protection of employees against gases, vapors, dust, etc., upheld.—(Tennessee Supreme Court; *Holliston Mills of Tennessee* v. *McGuffin*, 145 S.W.2d 1; decided November 23, 1940.) Section 5339 of the Tennessee Code required that every factory, etc., employing five or more persons should be so ventilated as to prevent the air from becoming injurious to the health of employees and as to render harmless, as far as practicable, all gases, vapors, dust, or other impurities generated in the course of the manufacturing process or handicraft carried on. Section 5340, relating to factories, etc., carrying on work producing dust, filaments, or injurious gases, required the providing of "exhaust fans, conveyors, receptacles, or blowers with pipes and hoods extending therefrom to each machine, contrivance or apparatus by which dust, filaments, or injurious gases are produced or generated" or the providing of "other mechanical means" for "carrying off or receiving and collecting such dust, filament, devitalized air, or other impurities as may be detrimental to the health of those in or about, or in connection with," the place. It was further required that the "fans, blowers, pipes and hoods shall be properly fitted and adjusted and of power and dimensions sufficient to effectually prevent the dust, filaments, or injurious gases produced or generated by said machines, contrivances, or apparatus from escaping into the atmosphere" of the rooms of the establishment where persons were employed.

The constitutionality of these statutory provisions was questioned in an action brought by an employee against the employer to recover for injuries alleged to have resulted from the employer's failure to install and maintain such ventilation machinery as would protect against the injurious effects of poisonous fumes and gases generated in the course of the operation of the plant. On appeal by the employer to the supreme court from an adverse judgment, one of the contentions advanced by the employer was that the said statute was unconstitutional because (1) it was so vague and indefinite in its terms that it did not give notice of just what would constitute a violation thereof, and (2) it delegated authority which belonged alone to the legislature, the officials named being empowered to determine what was and what was not required by, or a violation of, the law. The court found no merit in either of these grounds of alleged unconstitutionality.

Other contentions of the employer were also rejected and the judgment of the lower court in favor of the plaintiff was affirmed.

DEATHS DURING WEEK ENDED JANUARY 11, 1941

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 11, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	9,803	9,716
Average for 3 prior years	9,319	
Total deaths, first 2 weeks of year	19,055	18,966
Deaths under 1 year of age	567	561
Average for 3 prior years	554	
Deaths under 1 year of age, first 2 weeks of year	1,152	1,128
Data from industrial insurance companies:		
Policies in force	64,728,125	66,406,002
Number of death claims	12,669	12,708
Death claims per 1,000 policies in force, annual rate	10.2	10.0
Death claims per 1,000 policies, first 2 weeks of year, annual rate	9.2	9.0

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED JANUARY 18, 1941

Summary

Another rise in the incidence of influenza was recorded for the current week, with a total of 119,006 cases reported as compared with 89,828 for the preceding week—an increase of 32 percent as compared with 16 percent for the preceding week and a 70 percent increase for the week ended January 4. This is the largest number of cases of influenza reported to the Public Health Service for any week since January 12, 1929.

The disease has spread eastward through, and the current incidence is preponderantly highest in, the southern States. For the current week, 100,929 cases, or 85 percent of the total, were reported from the 3 southern geographic areas—South Atlantic, East South Central, and West South Central. The South Atlantic States recorded the largest number of cases and the largest numerical increase (from 13,629 to 46,255 cases). In this area the incidence increased in Virginia from 4,200 to 13,592, in West Virginia from 430 to 8,867, in South Carolina from 3,686 to 11,004, and in Georgia from 5,002 to 10,702.

Texas, with 30,713 cases, accounted for most of the 39,392 cases reported in the West South Central area, which, together with the other western areas, registered a decline. Slight increases were recorded for the New England, Middle Atlantic, and East North Central States, but the incidence in these sections has been, and is currently, low as compared with the western and southern areas.

Of the other 8 communicable diseases included in the weekly reports in the following table, only measles, poliomyelitis, and whooping cough were above the 5-year (1936–40) median. Of 51 cases of smallpox, 43 cases were reported in the two North Central groups of States.

Two cases of tularemia each were reported in Maryland and South Carolina, and of 21 cases of endemic typhus fever, 6 were in Texas and 5 in Georgia.

For the current week the Bureau of the Census reports 9,720 deaths in 88 major cities of the United States, as compared with 9,801 for the preceding week and with a 3-year (1938–40) average of 9,111.

Telegraphic morbidity reports from State health officers for the week ended January 18, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940	
NEW ENG.												
Maine	0	0	2	1,421	30	5	18	105	102	0	0	0
New Hampshire	0	0	0	1,000	------	------	6	20	22	0	0	0
Vermont	0	0	0	81	------	------	41	13	13	0	0	0
Massachusetts	3	15	6	------	------	------	364	210	370	0	0	1
Rhode Island	0	0	0	16	------	------	0	125	125	0	0	0
Connecticut	0	6	5	1,718	4	13	13	121	121	0	0	0
MID. ATL.												
New York [2]	18	28	39	[1] 215	[1] 19	[1] 22	1,504	175	400	4	1	6
New Jersey	18	9	15	95	25	15	645	23	42	3	0	2
Pennsylvania	24	30	36	------	------	------	1,862	61	131	3	2	6
E. NO. CEN.												
Ohio [2]	8	21	33	2,799	9	9	565	23	39	1	2	2
Indiana	11	19	22	703	58	44	55	4	8	0	1	2
Illinois	22	25	39	83	34	57	879	47	45	1	2	2
Michigan	5	12	12	238	6	6	1,088	465	465	0	0	2
Wisconsin	0	0	1	152	54	52	421	282	282	1	1	0
W. NO. CEN												
Minnesota	0	0	2	6	2	3	6	206	122	2	0	0
Iowa	8	0	5	285	3	9	183	36	36	0	0	0
Missouri	7	15	15	218	70	176	15	11	13	1	1	1
North Dakota	5	0	2	268	131	17	19	4	5	1	0	0
South Dakota	2	0	0	1	1	------	11	0	2	0	0	0
Nebraska	3	1	2	64	------	------	8	20	20	0	0	0
Kansas	4	7	9	2,040	125	12	169	174	15	0	1	0
SO. ATL.												
Delaware	0	0	1	54	------	------	20	2	8	0	0	0
Maryland [2]	3	13	10	300	59	27	11	3	143	0	0	2
District of Columbia	2	0	8	172	9	6	4	7	7	0	0	1
Virginia	12	9	25	13,592	1,128	------	194	14	69	1	0	2
West Virginia [2]	3	9	14	8,867	40	56	217	2	17	0	3	4
North Carolina [2]	28	27	29	750	403	35	169	86	86	0	2	2
South Carolina [2]	7	2	4	11,004	2,825	861	70	2	8	1	1	2
Georgia [2]	10	13	12	10,702	1,626	284	64	18	18	0	1	3
Florida	4	8	9	814	59	5	8	7	7	0	0	2
E. SO. CEN.												
Kentucky	5	9	10	2,666	29	37	65	27	55	0	1	7
Tennessee	9	12	14	3,994	185	185	49	47	47	1	3	3
Alabama [2]	10	10	14	8,622	1,085	313	87	42	42	1	1	1
Mississippi [2]	5	13	11	------	------	------	------	------	------	2	1	1
W. SO. CEN.												
Arkansas	11	10	15	3,999	1,799	218	61	0	5	1	0	1
Louisiana [2]	7	6	16	2,164	21	26	2	5	5	1	1	2
Oklahoma	13	7	15	2,516	422	191	0	1	3	0	0	2
Texas [2]	50	42	53	30,713	1,405	739	178	261	195	5	1	1
MOUNTAIN												
Montana	1	1	0	901	------	8	5	12	7	0	0	0
Idaho	0	0	0	3	------	1	0	4	59	0	0	0
Wyoming	4	1	0	942	3	------	4	9	2	0	0	0
Colorado	9	9	8	1,095	73	------	32	39	39	0	0	0
New Mexico	0	4	1	69	27	21	25	16	32	0	0	1
Arizona	8	5	7	711	230	145	64	9	6	0	0	0
Utah [2]	1	0	0	793	75	2	19	164	29	0	0	0
Nevada	1	------	------	109	------	------	0	------	------	0	------	------
PACIFIC												
Washington	2	0	1	448	9	1	60	521	112	2	0	1
Oregon	4	6	2	276	190	56	102	130	22	0	0	0
California [2]	20	11	36	2,327	295	131	105	246	246	4	3	1
Total	373	415	597	120,006	12,568	3,144	9,487	3,799	4,884	36	29	72
3 weeks	949	1,446	1,927	286,978	34,714	9,370	28,971	11,250	13,296	104	87	273

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 18, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940		Jan. 18, 1941	Jan. 20, 1940	
NEW ENG.												
Maine	0	0	0	6	3	16	0	0	0	0	0	0
New Hampshire	0	0	0	9	5	7	0	0	0	0	0	0
Vermont	0	0	0	12	3	6	0	0	0	0	0	0
Massachusetts	0	1	0	117	136	235	0	0	0	0	4	1
Rhode Island	0	0	0	5	8	25	0	0	0	0	0	0
Connecticut	0	0	0	50	78	75	0	0	0	1	1	1
MID. ATL.												
New York [2]	2	1	1	386	461	584	0	0	0	7	9	6
New Jersey	0	0	0	238	278	146	0	0	0	0	1	1
Pennsylvania	1	4	1	276	422	500	0	0	0	4	6	6
E. NO. CEN.												
Ohio [2]	1	1	2	223	251	300	0	0	3	2	2	2
Indiana	0	1	0	127	142	228	1	3	4	3	0	1
Illinois	2	0	0	380	449	558	0	1	21	2	6	6
Michigan	1	0	0	195	325	574	5	0	0	3	2	2
Wisconsin	4	0	0	135	137	303	10	12	13	1	0	0
W. NO. CEN.												
Minnesota	0	2	0	56	156	156	10	11	28	0	0	0
Iowa	0	1	0	54	87	165	9	3	15	3	1	1
Missouri	1	0	0	77	75	206	5	0	18	7	3	3
North Dakota	0	0	0	5	10	21	0	0	5	1	2	0
South Dakota	0	0	0	23	14	26	0	2	10	0	0	0
Nebraska	0	0	0	31	27	39	2	0	1	0	0	0
Kansas	3	0	0	94	89	198	1	0	26	0	0	1
SOUTH ATLANTIC												
Delaware	0	0	0	18	21	14	0	0	0	0	0	0
Maryland [2]	0	0	0	63	40	62	0	0	0	4	1	3
Dist. of Col	1	1	0	18	21	18	0	0	0	0	0	1
Virginia	0	0	0	39	29	29	0	1	0	2	3	6
West Virginia [2]	3	0	0	48	60	60	0	0	0	1	3	2
North Carolina [2]	1	1	0	66	61	45	0	0	0	0	1	2
South Carolina [2]	0	1	1	15	14	7	0	0	0	3	3	2
Georgia [2]	0	0	1	26	40	21	1	0	0	2	1	2
Florida	1	0	0	3	2	9	0	1	0	0	0	0
E. SO. CEN.												
Kentucky	0	1	0	54	76	81	0	0	0	0	0	2
Tennessee	2	0	1	92	97	38	0	0	0	2	2	2
Alabama [2]	0	0	1	26	20	18	0	0	0	0	3	3
Mississippi [2]	0	1	1	13	4	9	0	0	0	0	1	1
W. SO. CEN.												
Arkansas	0	0	0	9	17	11	0	16	5	4	3	3
Louisiana [2]	2	1	0	5	12	21	0	0	0	11	7	6
Oklahoma	0	0	0	26	25	51	5	1	1	2	2	2
Texas [2]	0	4	0	58	93	107	0	1	2	8	15	11
MOUNTAIN												
Montana	0	0	0	26	53	53	0	0	12	0	0	0
Idaho	2	3	0	13	11	38	0	0	8	0	0	0
Wyoming	1	0	0	6	10	10	0	0	1	0	0	0
Colorado	1	2	0	23	46	61	0	15	11	0	2	0
New Mexico	0	0	0	6	14	25	0	0	0	1	0	2
Arizona	0	0	0	2	17	17	0	0	0	1	0	0
Utah [2]	0	0	0	5	23	31	0	0	0	2	0	0
Nevada	0	------	------	0	------	------	0	------	------	0	------	------
PACIFIC												
Washington	2	0	0	38	78	67	0	0	4	2	0	0
Oregon	0	0	1	11	35	47	2	1	5	0	2	0
California [2]	1	7	1	107	154	262	0	12	12	2	5	5
Total	32	33	23	3,315	4,229	5,844	51	80	278	81	91	113
3 weeks	133	118	66	9,189	11,960	17,281	144	264	869	240	250	333

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended January 18, 1941, and comparison with corresponding week of 1940 and 5-year median—Continued

Division and State	Whooping cough	
	Week ended—	
	Jan. 18, 1941	Jan. 20, 1940
NEW ENG.		
Maine	10	60
New Hampshire	1	3
Vermont	18	40
Massachusetts	216	187
Rhode Island	13	12
Connecticut	75	72
MID. ATL.		
New York [1]	451	434
New Jersey	140	123
Pennsylvania	562	373
E. NO. CEN.		
Ohio [2]	383	128
Indiana	18	36
Illinois	133	84
Michigan	349	146
Wisconsin	115	150
W. NO. CEN.		
Minnesota	72	63
Iowa	43	2
Missouri	38	15
North Dakota	15	17
South Dakota	5	0
Nebraska	61	1
Kansas	65	11
SO. ATL.		
Delaware	7	3
Maryland [3]	80	86
District of Columbia	14	8
Virginia	89	43
West Virginia [3]	86	18
North Carolina [2]	370	45
South Carolina [2]	97	9
Georgia [2]	24	20
Florida	11	14
E. SO. CEN.		
Kentucky	23	77
Tennessee	49	42
Alabama [2]	52	19
Mississippi [3]		
W. SO. CEN.		
Arkansas	24	3
Louisiana [2]	4	14
Oklahoma	24	3
Texas [2]	199	111
MOUNTAIN		
Montana	6	5
Idaho	10	0
Wyoming	0	24
Colorado	33	8
New Mexico	12	32
Arizona	29	15
Utah [3]	50	87
Nevada	0	
PACIFIC		
Washington	103	30
Oregon	10	32
California [3]	436	163
Total	4,625	2,868
3 weeks	12,727	7,739

[1] New York City only.
[2] Typus fever, week ended Jan. 18, 1941, 21 cases, as follows: New York, 1; Ohio, 1; North Carolina, 2; South Carolina, 2; Georgia, 5; Alabama, 2; Louisiana, 1; Texas, 6; California, 1.
[3] Period ended earlier than Saturday.

PSITTACOSIS IN CONNECTICUT

Under date of January 8, 1941, a delayed report of a case of psittacosis was received from Dr. Stanley H. Osborn, Commissioner of Health of Connecticut. The patient was living in an apartment with a patient previously reported as having psittacosis (Public Health Reports, Dec. 20, 1940). The illness was so mild in the second case that a diagnosis of psittacosis was not made until Dr. Karl Meyer of San Francisco reported isolating psittacosis virus from the patient's sputum.

WEEKLY REPORTS FROM CITIES

City reports for week ended January 4, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	163	888	105	1,574	879	1,449	26	351	29	1,615	------
Current week [1]	72	12,794	131	3,660	636	808	4	307	22	1,128	------
Maine:											
Portland	0	------	0	1	6	0	0	0	0	26	30
New Hampshire:											
Concord	0	------	0	0	0	2	0	0	0	0	8
Manchester	0	------	0	0	1	8	0	0	0	0	13
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	------
Burlington	0	------	0	0	0	0	0	0	0	0	11
Rutland	0	------	0	0	0	0	0	0	0	0	7
Massachusetts:											
Boston	0	------	1	129	5	37	0	10	0	87	263
Fall River	1	------	0	0	0	0	0	0	0	0	25
Springfield	0	------	0	1	1	3	0	0	0	1	26
Worcester	0	------	0	80	6	5	0	0	1	0	67
Rhode Island:											
Providence	0	------	2	0	7	1	0	0	0	11	78
Connecticut:											
Bridgeport	0	------	0	0	1	4	0	0	0	2	32
Hartford	0	2	0	2	2	3	0	0	0	4	61
New Haven	0	1	1	2	3	9	0	0	0	16	53
New York:											
Buffalo	0	------	1	57	10	12	0	7	0	39	134
New York	15	77	1	1,021	66	132	0	60	2	137	1,540
Rochester	0	3	0	5	7	2	0	1	0	9	30
Syracuse	0	------	0	0	1	1	0	1	1	12	46
New Jersey:											
Camden	2	1	1	76	4	6	0	2	0	0	30
Newark	0	1	0	99	0	16	0	2	0	20	71
Trenton	0	------	0	2	9	28	0	1	0	4	63
Pennsylvania:											
Philadelphia	3	12	6	405	32	55	0	22	1	96	530
Pittsburgh	3	18	3	5	16	8	0	4	0	41	188
Reading	0	------	0	91	2	2	0	1	0	9	24
Scranton	0	------	------	0	------	0	0	------	0	4	------
Ohio:											
Cincinnati	2	------	1	6	13	14	0	3	0	7	135
Cleveland	0	26	1	89	14	20	0	8	0	55	181
Columbus	0	2	2	6	10	3	0	2	0	11	91
Toledo	0	2	2	0	4	11	0	2	0	9	75
Indiana:											
Anderson	1	------	0	0	0	3	0	0	0	0	5
Fort Wayne	0	------	0	2	3	1	0	1	0	0	28
Indianapolis	7	------	1	6	9	19	0	7	0	7	96
Muncie	0	------	0	0	5	0	0	0	0	0	15
South Bend	0	------	0	0	4	0	0	0	0	0	17
Terre Haute	0	------	1	0	2	1	0	0	0	0	27
Illinois:											
Alton	0	------	0	0	3	2	0	0	0	0	------
Chicago	11	10	3	723	38	126	0	27	1	95	691
Elgin	0	------	0	0	1	0	0	0	0	0	18
Springfield	0	------	0	1	4	5	0	0	0	0	20
Michigan:											
Detroit	5	4	0	643	26	71	1	10	0	126	301
Flint	0	------	1	24	1	8	0	0	0	4	30
Grand Rapids	0	------	0	4	4	5	0	0	0	13	39
Wisconsin:											
Kenosha	0	------	0	2	1	1	0	0	0	1	10
Madison	0	------	0	0	3	3	0	0	0	0	28
Milwaukee	0	------	0	20	0	15	0	0	0	47	88
Racine	0	------	0	2	0	6	0	0	0	1	15
Superior	0	------	0	1	0	2	0	0	0	0	9
Minnesota:											
Duluth	0	------	1	1	0	3	2	0	0	5	22
Minneapolis	0	------	0	0	1	7	0	0	0	3	113
St. Paul	0	------	0	1	11	8	0	0	1	12	64

[1] Figures for Barre estimated; report not received.

City reports for week ended January 4, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0	----	----	0	----	3	0	----	0	0	----
Davenport	1	1	----	0	----	2	0	----	0	0	----
Des Moines	18	----	0	1	0	2	0	0	0	0	31
Sioux City	0	----	----	0	----	4	0	----	0	4	----
Waterloo	0	----	----	0	----	1	0	----	0	2	----
Missouri:											
Kansas City	1	1	3	4	13	10	0	3	0	8	135
St. Joseph	0	----	0	0	4	0	0	1	0	0	31
St. Louis	3	36	0	3	28	35	0	10	2	18	294
North Dakota:											
Fargo	0	----	0	0	0	0	0	0	0	8	6
Grand Forks	0	----	----	0	----	0	0	----	0	0	----
Minot	0	----	0	0	0	0	0	0	0	0	7
South Dakota:											
Aberdeen	0	----	----	1	----	3	0	----	0	0	----
Sioux Falls	0	----	0	0	0	2	0	0	0	0	12
Nebraska:											
Lincoln	0	----	----	2	----	5	0	----	0	1	----
Omaha	0	----	1	0	3	3	1	1	0	0	51
Kansas:											
Lawrence	0	----	0	2	1	0	0	0	0	0	1
Topeka	0	3	0	3	4	0	0	1	0	1	36
Wichita	0	64	0	0	10	0	0	2	0	23	39
Delaware:											
Wilmington	0	----	0	7	4	2	0	0	0	2	41
Maryland:											
Baltimore	0	10	3	4	23	13	0	8	0	40	213
Cumberland	0	----	0	0	1	1	0	0	0	0	16
Frederick	0	----	0	0	0	0	0	0	0	0	5
Dist. of Col.:											
Washington	1	68	1	2	16	10	0	10	0	13	162
Virginia:											
Lynchburg	1	----	0	0	1	3	0	1	0	0	9
Norfolk	1	78	0	0	3	0	0	0	0	0	22
Richmond	0	----	3	2	0	2	0	1	1	0	57
Roanoke	1	----	0	26	0	0	0	0	0	1	29
West Virginia:											
Charleston	0	----	0	0	3	0	0	0	0	0	30
Wheeling	0	----	0	1	2	0	0	0	0	2	35
North Carolina:											
Gastonia	0	----	----	0	----	0	0	----	0	1	----
Raleigh	0	----	0	0	2	1	0	1	0	4	13
Wilmington	1	----	0	1	2	0	0	0	1	5	10
Winston-Salem	1	----	0	0	2	0	0	3	0	23	22
South Carolina:											
Charleston	0	145	0	11	4	0	0	0	0	2	23
Florence	0	14	0	5	1	0	0	0	0	2	10
Greenville	0	----	0	1	0	1	0	0	0	14	4
Georgia:											
Atlanta	0	263	0	0	10	3	0	3	0	0	86
Brunswick	0	----	0	0	0	0	0	0	0	1	3
Savannah	0	43	0	0	0	1	0	0	0	0	35
Florida:											
Miama	1	5	1	0	1	0	0	0	0	0	48
Tampa	0	2	2	0	1	0	0	1	0	0	27
Kentucky:											
Ashland	0	----	0	0	4	1	0	1	0	0	17
Covington	0	1	0	7	2	1	0	1	0	1	11
Lexington	0	----	0	73	2	0	0	0	0	1	16
Louisville	0	117	0	2	8	8	0	1	0	7	83
Tennessee:											
Knoxville	0	31	0	0	4	1	0	2	0	1	24
Memphis	0	192	9	15	7	4	0	9	0	5	94
Nashville	0	----	1	0	6	5	0	1	0	3	48
Alabama:											
Birmingham	1	----	1	6	6	3	0	0	0	5	67
Mobile	1	161	8	0	3	0	0	2	0	0	43
Montgomery	0	8	----	1	----	2	0	----	0	0	----
Arkansas:											
Fort Smith	0	71	----	0	----	0	0	----	0	0	----
Little Rock	0	417	0	1	2	4	0	0	0	0	15
Louisiana:											
Lake Charles	0	----	1	0	1	0	0	0	0	0	11
New Orleans	2	24	3	2	11	2	0	18	6	2	193
Shreveport	0	496	1	0	5	0	0	1	2	0	55

City reports for week ended January 4, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	0	263	1	0	11	3	0	0	0	0	55
Tulsa	2	------	0	3	14	2	1	1	0	2	60
Texas:											
Dallas	0	13	5	0	13	0	0	4	1	0	97
Fort Worth	0	------	4	7	4	1	0	1	0	2	48
Galveston	1	------	0	0	3	0	0	0	0	0	21
Houston	2	9,049	2	1	18	6	0	11	0	0	160
San Antonio	2	106	20	0	21	0	0	6	0	2	79
Montana:											
Billings	0	1	0	0	2	0	0	0	0	0	13
Great Falls	0	6	0	0	0	1	0	0	0	0	13
Helena	0	135	0	0	0	2	0	0	0	0	4
Missoula	0	193	0	0	1	2	0	0	0	0	13
Idaho:											
Boise	0	------	0	0	2	2	0	0	0	0	7
Colorado:											
Colorado Springs	0	------	0	1	1	3	0	2	0	3	12
Denver	0	402	11	20	16	5	0	4	0	7	140
Pueblo	1	------	0	31	3	1	0	1	1	0	15
New Mexico:											
Albuquerque	0	17	0	0	5	0	0	1	0	0	12
Utah:											
Salt Lake City	0	------	1	3	5	2	0	1	0	2	57
Washington:											
Seattle	0	------	6	1	2	1	0	2	0	3	80
Spokane	0	87	6	1	4	7	0	0	0	1	51
Tacoma	0	------	2	1	3	1	0	0	0	2	36
Oregon:											
Portland	0	104	7	0	5	4	0	2	0	0	107
Salem	0	33	--------	0	--------	0	0	--------	0	1	--------
California:											
Los Angeles	4	590	15	3	24	19	0	20	1	26	371
Sacramento	0	36	3	1	9	4	0	4	0	2	44
San Francisco	0	94	3	4	8	2	0	8	0	16	181

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Maine:				Maryland:			
Portland	1	0	0	Baltimore	0	0	1
Massachusetts:				North Carolina:			
Boston	1	1	0	Winston-Salem	1	1	0
New York:				Florida:			
New York	2	0	0	Miami	0	0	2
Pennsylvania:				Tennessee:			
Pittsburgh	1	1	0	Memphis	2	0	0
Indiana:				California:			
Fort Wayne	0	0	1	Los Angeles	1	0	0
Michigan:							
Detroit	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 1.
Pellagra.—Cases: Boston, 1; Savannah, 2; Birmingham, 3.
Typhus fever.—Cases: New York, 2; Miami, 2.

TERRITORIES AND POSSESSIONS

HAWAII TERRITORY

Plague.—Rats proved positive for plague have been found in Hamakua District, Island of Hawaii, as follows: Hamakua Mill area, December 2, 1940, 2 rats; December 3, mass inoculation of 12 rats and 1 mouse; Honokaa, December 14, 1 rat; Paauhau, December 2, 1 rat; December 9, 1 rat; December 11, 2 rats; December 18, 2 rats.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended December 14, 1940.—During the week ended December 14, 1940, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	2	1	3	3	1	1	4	2	18
Chickenpox		10	4	222	484	47	95	104	71	1,037
Diphtheria		19	2	37	4	3	2	1		68
Dysentery				3						3
Influenza		1,419			143	37	60		516	2,175
Measles		214	2	84	397	124	477	81	146	1,525
Mumps				101	103	44	7	15	8	278
Pneumonia		15			18	3	1		17	54
Poliomyelitis									1	1
Scarlet fever		13	2	117	91	14	7	6	20	270
Tuberculosis		26	3	68	52	5	21			175
Typhoid and paratyphoid fever				28	4		2		1	35
Whooping cough			1	330	162	8	30	13	15	559

DENMARK

Notifiable diseases—July–September 1940.—During the months of July, August, and September 1940, cases of certain notifiable diseases were reported in Denmark as follows:

Disease	July	August	September	Disease	July	August	September
Cerebrospinal meningitis	4	3	1	Measles	2,132	904	964
Chickenpox	503	314	407	Mumps	64	68	55
Diphtheria	74	48	79	Paratyphoid fever	12	8	7
Dysentery	45	71	44	Poliomyelitis	2	4	6
Epidemic encephalitis	1	4	3	Puerperal fever	13	23	15
Erysipelas	212	244	224	Scarlet fever	444	494	586
Gastroenteritis, infectious	3,182	3,893	2,542	Syphilis	35	48	42
German measles	314	179	166	Tetanus neonatorum	2	2	4
Gonorrhea	639	777	734	Typhoid fever	1	4	4
Influenza	1,979	2,280	2,905	Undulant fever	44	52	41
Malaria		1		Weil's disease		4	2
				Whooping cough	1,313	1,626	1,401

FINLAND

Communicable diseases—4 weeks ended November 2, 1940.—During the 4 weeks ended November 2, 1940, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	246	Poliomyelitis	54
Influenza	1,524	Scarlet fever	464
Paratyphoid fever	142	Typhoid fever	49

SWEDEN

Notifiable diseases—October 1940.—During the month of October 1940, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	4	Poliomyelitis	76
Diphtheria	22	Scarlet fever	1,283
Dysentery	7	Syphilis	39
Epidemic encephalitis	4	Typhoid fever	1
Gonorrhea	952	Undulant fever	7
Paratyphoid fever	37	Weil's disease	3

YUGOSLAVIA

Communicable diseases—4 weeks ended November 3, 1940.—During the 4 weeks ended November 3, 1940, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	55	2	Paratyphoid fever	32	2
Cerebrospinal meningitis	55	19	Poliomyelitis	6	
Diphtheria and croup	715	55	Scarlet fever	282	2
Dysentery	1,046	102	Sepsis	13	3
Erysipelas	171	6	Tetanus	40	18
Favus	11		Typhoid fever	514	88
Lethargic encephalitis	1	1	Typhus fever	10	2

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of December 27, 1940, pages 2408-2412. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Plague

Peru.—During the month of November 1940, plague was reported in Peru as follows: Lambayeque Department, 2 cases; Libertad Department, 3 cases; Lima Department, 2 cases, 1 death.

Yellow Fever

Brazil.—For the period February 1 to September 8, 1940, yellow fever was reported in Brazil as follows: Bahia State, 1 death; Espirito Santo State, 112 deaths; Minas Geraes State, 2 deaths; Para State, 1 death; Rio de Janeiro State, 4 deaths; Santa Catarina State, 2 deaths.

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