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PREVENTION AND TREATMENT OF AGRANULOCYTOSIS AND LEUKOPENIA IN RATS GIVEN SULFANILYLGUANIDINE OR SUCCINYL SULFATHIAZOLE IN PURIFIED DIETS

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Agranulocytosis with accompanying leukopenia has been reported by various investigators as an occasional result of the clinical use of sulfonamide drugs (*1*). Abnormalities in the white blood cell picture of experimental animals have been described for monkeys, rats, and dogs which were given certain deficient diets. The blood dyscrasia in monkeys has been called nutritional cytopenia or vitamin M deficiency (*2, 3, 4*) and that in rats panmyelophthisis (*5*). Both have been described as involving all of the blood elements—lymphocytes, granulocytes, erythrocytes and platelets. In dogs (*6, 7, 8*) a leukopenia and an anemia were noted.

During the past year, we have made extensive use of sulfaguanidine (sulfanilylguanidine) and, more recently, of sulfasuxidine (succinyl sulfathiazole) in nutrition experiments. Rats have been fed purified diets into which these drugs, singly, were incorporated. A report has been made on the occurrence of hyaline sclerosis and calcification of blood vessels (*9*).[1] Another report, describing other pathology, including a dermatitis which is cured by biotin, is in press (*10*). Agranulocytosis or granulocytopenia, leukopenia, and hypocellularity of bone marrow also have developed with regularity in these animals. Anemia has been found, but with comparative infrequency. This syndrome can be prevented to a large extent by the inclusion of whole dried liver in the diet. Treatment with whole dried liver or liver extract also has proved successful.

EXPERIMENTAL

Twenty-one-day-old albino rats at weaning were placed on diet 566, diet 566–S, diet 566–SL, or diet 698. The composition of these diets is given in table 1. Each rat was given a daily supplement of 100

[1] This report mentioned only 7 animals. Our series has now been extended to include 30 animals which have shown this pathology.

micrograms of thiamine, 200 micrograms of riboflavin, 100 micrograms of pyridoxine hydrochloride, 200 micrograms of calcium pantothenate, 1 mg. of niacin and 20 mg. of choline chloride.

TABLE 1

	Diet No.			
	566	566–S	566–SL	698
	Percent	*Percent*	*Percent*	*Percent*
Sulfaguanidine		1	1	
Sulfasuxidine				1
Glucose [1]	73	72	62	72
Whole dried liver			10	
Casein, purified [2]	18	18	18	18
Cod liver oil	2	2	2	2
Wesson oil	3	3	3	3
Salt mixture No. 550 [3]	4	4	4	4

[1] "Cerelose."
[2] Labco or Smaco "vitamin-free" casein.
[3] Prepared according to the directions of Osborne and Mendel (*11*), except that the sodium fluoride is reduced to 1 percent of their level and 0.313 gm. of $CuSO_4 \cdot 5H_2O$ (Eqivalent to 0.2 g. anhydrous $CuSO_4$) is added.

The average rate of gain in weight of representative rats on these four diets is shown in chart 1.

Forty rats receiving diet 566–S or diet 698 have been allowed to die, no change being made in the diet or supplement. Forty others have been given an additional supplementary feeding of whole dried liver, or liver extract [2] beginning after the weight gain of the animal had almost or completely ceased.

At various times total and differential white cell counts, hematocrit and hemoglobin determinations, and, occasionally, total red cell counts were made on the tail blood of representative animals. Hemoglobin was determined by the method of Sanford et al. (*12*), and hematocrit with the Van Allen hematocrit using 1.3 percent sodium oxalate. Total white counts were carried out in duplicate. Differential counts were made on smears stained with Wright's stain. One hundred cells on each of two slides were identified according to descriptions given by Scarborough (*13*).

The results of a number of blood examinations are given in tables 2, 3, 4, and 5. Table 2 shows data for rats on a stock diet [3] or on control diet 566; table 3, for rats receiving sulfaguanidine or sulfasuxidine (diets 566–S or 698); table 4, for rats receiving liver with sulfaguanidine (diet 566–SL); and table 5, for rats on diet 566–S or 698, treated with liver or liver extract.

[2] Eli Lilly's 343 or Lederle's 80-percent alcohol insoluble.
[3] Diet 516. The composition of this diet was given in an earlier publication (*14*).

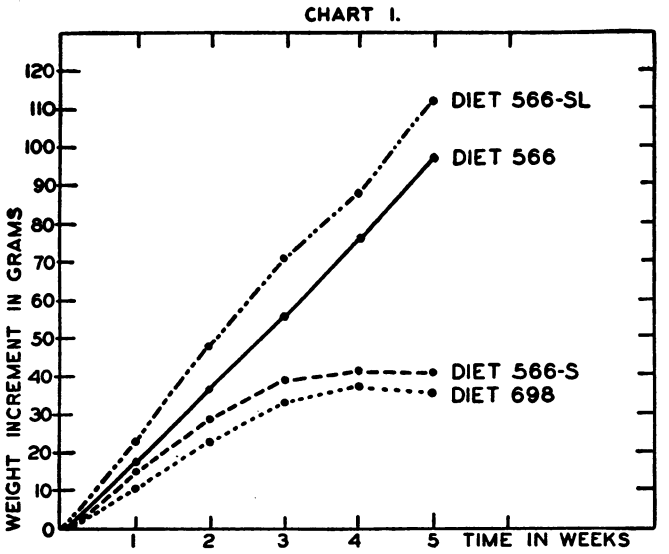

CHART 1.—Effect of sulfaguanidine and sulfasuxidine on rate of growth of rats.

Each curve represents an average for 16 animals, 8 males and 8 females, except 566-SL which represents an average for 4 males and 4 females.

TABLE 2.—*Blood counts on rats receiving a stock diet or basal diet 566*

Rat No.	Lot No.	Days on experiment	Total leucocytes	Percent granulocytes	Total granulocytes	Total lymphocytes	Hemoglobin	Hematocrit
				Stock Diet 516				
14798		69	9,000	28	2,520	6,500	17.3	49.9
14799		69	7,700	27.5	2,120	5,600	16.4	46.3
14800		39	10,600	28	2,970	7,600	14.3	45.8
14801		36	6,600	34	2,220	4,400	12.5	39.8
14211 [1]	E	105	9,000	20.5	1,840	7,200	14.4	45.8
				Diet 566				
13925	A	18	11,600	19.5	2,260	9,300	14.1	
		38	14,900	21	3,130	11,800	14.2	42.6
13926	A	18	22,200	18	4,000	18,200	14.5	38.2
		38	14,250	17	2,420	11,800	12.7	38.2
12254		417	12,200	29	3,540	8,700	23.3	74.4
12888		414	16,950	36	6,100	10,800	15.1	51.9

[1] This animal received 1 percent of sulfaguanidine in Diet 516

Histological examination of sectioned femoral, tibial, and vertebral bone marrow was done in a majority of the rats. These tissues were fixed in 10-percent formalin, decalcified in 5-percent formic acid and studied following Romanowsky staining.

TABLE 3.—*Blood counts on rats receiving sulfaguanidine (Diet 566–S) or sulfasuxidine (Diet 698)*

Rat No.	Lot No.	Days on experiment	Total leucocytes	Percent granulocytes	Total granulocytes	Total lymphocytes	Hemoglobin	Hematocrit
Diet 566-S								
13842	B	53	5,300	9	480	4,800	15.4	34.5
		80	1,750	0.5	10	1,700	16.4	47.4
13862	C	34	7,200	2	140	7,100		
		44	3,800	2	80	3,700		
		48	1,500	1.5	20	1,500	13.2	38.2
13863	C	34	6,700	2	130	6,600		
		44	5,300	2	110	5,200		
		48	1,800	1	20	1,800	13.0	33.8
13865	C	30	6,700	9.5	640	6,100	16.0	38.9
		44	6,000	4	240	5,800		
		48	750	2.5	20	700	17.2	50.0
13927	A	18	10,300	8	820	9,500	17.0	46.0
		38	4,600	3	140	4,500	2.5	10.1
13928	A	18	6,000	11	660	5,300	14.2	37.8
		38	3,400	0	0	3,400		51.0
14002	D	20	10,100	12	1,210	8,900	14.8	41.0
		28	4,300	19	820	3,500	15.2	40.0
		34	2,100	3	60	2,000	13.4	48.7
14003	D	20	11,400	10	1,140	10,300	14.7	40.2
		28	4,300	35	150	4,100	15.5	38.8
		34	3,300	0	0	3,300	13.0	54.5
14004	D	20	13,400	20	2,680	10,700	13.2	40.6
		28	9,500	16	1,520	8,000	17.5	40.1
		34	4,500	4	180	4,300	14.3	45.5
14005	D	20	8,300	12	1,000	7,300	14.3	35.4
		28	5,000	11.5	580	4,400	15.5	38.6
		34	2,800	1	30	2,800	10.9	
14210	E	40	6,200	5	310	5,900	11.6	36.1
		61	2,900	1	30	2,900	14.7	48.1
14243		30	9,100	4	360	8,700	15.4	47.3
		69	1,000	0	0	1,000	2.3	16.0
13864	C	30	2,800	2.5	70	2,700	13.8	32.2
14152		42	1,900	1	20	1,900	16.1	50.1
14529		33	4,100	10	410	3,700	16.4	46.7
14549		45	1,100	0	0	1,100	10.2	40.7
14554		35	1,100	1.5	20	1,100	9.1	33.8
14620		35	3,000	1	30	3,000	1.5	9.9
14624		35	2,750	7	190	2,600	3.7	19.6
14625		35	4,500	9	400	4,100	10.9	42.3
Diet 698								
14537		30	1,300	13	170	1,100	19.3	52.9
14543		30	3,500	1.5	50	3,400	14.4	45.8

TABLE 4.—*Blood counts on rats receiving whole dried liver in a diet containing sulfaguanidine (566–SL)*

Rat No.	Number days on experiment	Total leucocytes	Percent granulocytes	Total granulocytes	Total lymphocytes	Hemoglobin	Hematocrit
14110	82	9,250	17	1,570	7,700	15.4	49.4
14112	58	16,700	27.5	4,590	12,100	13.7	48.2
	158	12,100	24.5	2,960	9,100	13.5	47.6
14113	161	5,300	15	790	4,500	14.6	44.1
14117	40	8,700	11.5	1,000	7,700	11.8	45.4
	155	10,950	7	770	10,200	15.8	43.0
14118	56	13,600	17	2,310	11,300	16.3	44.2
	70	10,300	16.5	1,700	8,600	15.0	39.3
14119	67	10,000	3	300	9,700	19.5	51.3
14120	43	19,000	19	3,610	15,400	14.6	44.1
	52	13,000	18	2,340	10,700	14.7	40.6
	150	13,200	19	2,510	10,700	14.4	43.8
14111	160	9,450	20.5	1,940	7,500	14.3	46.5
14114	155	7,300	21	1,530	5,800	15.0	50.4
14115	154	14,300	16.5	2,360	11,900	15.5	49.4
14116	154	17,200	22	3,780	13,400	14.7	56.4
14121	66	10,500	13.5	1,420	9,100	15.5	47.9

TABLE 5.—*Blood counts on rats receiving sulfaguanidine or sulfasuxidine (Diet 566–S or 698) before and after treatment with whole dried liver or liver extract*

Rat No.	Lot No.	Diet	Treatment	Days on experiment	Total leukocytes	Percent granulocytes	Total granulocytes	Total lymphocytes	Hemoglobin	Hematocrit
13707	----	566–S	None	70	2,800	1	30	2,800	13.7	37.9
			½ gm. liver 3 days	80	14,100	49	6,900	7,200	13.0	37.5
13843	B	566–S	None	61	1,900	1	20	1,900	12.3	42.9
			½ gm. liver 3 days	70	4,150	41.5	1,720	2,400	11.8	36.3
13844	B	566–S	None	53	800	3	20	800	13.0	37.0
			½ gm. liver 3 days	59	5,200	23	1,200	4,000	15.7	44.6
14772	----	566–S	None	63	3,800	0.5	20	3,800	11.2	33.0
			½ gm. liver daily [1]	65	4,800	3	140	4,700	11.6	39.1
			½ gm. liver daily [1]	69	21,200	67	14,200	7,000	12.0	45.5
14776	----	566–S	None	56	2,000	2	40	2,000	10.4	35.5
			½ gm. liver daily [1]	58	4,350	8	350	4,000	10.2	37.5
			½ gm. liver daily [1]	60	10,900	21.5	2,340	8,600	9.6	41.3
14532	----	566–S	None	32	900	1	10	900	13.9	40.4
			80 mgm. Lilly's [1]	100	10,100	23	2,320	7,800	15.4	48.7
14533	----	566–S	None	30	2,300	14	320	2,000	14.2	42.3
			50 mgm. Lederle's [1]	100	14,600	18	2,630	12,000	14.6	44.5
14619	----	566–S	None	35	2,750	34	930	1,800	11.3	43.5
			50 mgm. Lederle's [1]	90	10,300	29	2,990	7,300	14.2	42.5
14621	----	566–S	None	35	850	3	30	800	11.6	39.8
			50 mgm. Lederle's [1]	91	13,300	27	3,590	9,700	6.8	27.1
14650	----	566–S	None	27	1,500	1	10	1,500	8.9	37.4
			80 mgm. Lilly's [1]	84	10,200	21	2,140	8,100	15.3	44.8
14651	----	566–S	None	27	2,650	6	160	2,500	8.5	34.8
			80 mgm. Lilly's [1]	84	6,600	26	1,720	4,900	14.0	42.1
14773	----	566–S	0.02 cc. biotin concentrate daily	63	1,650	2	30	1,600	9.3	31.7
			100 mgm. Lederle's [1]	65	3,150	2	60	3,100	7.4	40.4
			100 mgm. Lederle's [1]	67	5,050	3	150	4,900	8.5	34.0
			100 mgm. Lederle's [1]	77	15,500	42	6,510	9,000	13.4	41.2
14774	----	566–S	0.02 cc. biotin concentrate daily	63	1,300	3	40	1,300	9.7	31.9
			50 mgm. Lederle's [1]	65	2,200	30	660	1,500	5.5	22.3
			50 mgm. Lederle's [1]	67	5,200	31	1,610	3,600	5.1	26.3
			50 mgm. Lederle's [1]	77	11,500	69	7,930	3,600	10.7	37.9
14536	----	698	None	40	1,400	4	60	1,300	12.1	42.4
			80 mgm. Lilly's [1]	99	5,600	25	1,400	4,200	15.0	47.1
14538	----	698	None	33	2,400	9	220	2,200	15.4	44.6
			80 mgm. Lilly's [1]	99	8,400	17	1,430	7,000	15.6	46.5
14540	----	698	None	32	1,950	2	40	1,900	14.7	43.7
			80 mgm. Lilly's [1]	106	14,100	22	3,100	11,000	15.9	46.5

[1] Daily from previous count.

RESULTS

One effect of sulfaguanidine or sulfasuxidine, when given with our purified diet, has been to reduce the growth rate of young rats (chart 1). This effect has been small in the first week and comparatively small in the first 3 weeks but very apparent as the experiment progressed. During the fourth and especially the fifth weeks, the rats receiving the sulfonamide drugs on the average gained very little, while the weight of the controls receiving a comparable diet without the drug continued to increase at an undiminished rate. These results are in general agreement with those reported by Black et al. (*15*).

The effect of the administration of these sulfonamide drugs on the blood picture is indicated in table 3. A leukopenia and an agranulocytosis have developed consistently in the animals which have been studied, while an anemia has been observed in some cases.

Ten percent of whole dried liver in the diet containing sulfaguanidine has had a preventive action on both of these effects of the drug.

The rate of growth of these animals (chart 1) was somewhat greater than that of those on diet 566. The leukocyte counts were, in general, normal (table 4), even after as long as 5 months on experiment, while the average figures for granulocytes were somewhat low.

Treatment with liver or liver extract caused an increase of circulating white cells, particularly of granulocytes (table 5). The rate of growth of the treated animals was roughly comparable to that of the animals receiving diet 566–SL.

In rats showing granulocytopenia or agranulocytosis the marrow studies regularly showed decreased number of cells of the granulocyte series, particularly of adult, "staff," and young forms. In a few animals this decrease was slight, apparently affecting only the more mature forms. In some others there was a moderate decrease in the total number of marrow cells and in a few there was a marked decrease. In the latter instances, evidence of granulopoiesis was lacking, excepting in an occasional small group of cells, and even in such areas cells more mature than myelocytes were usually absent. Generally there was associated marrow congestion and in some cases evidence of increased erythropoiesis. This partial marrow aplasia (granulocytes) was more prominent in vertebral, epiphyseal, and diaphyseal marrow near epiphyseal cartilage, than in the remainder of shaft-marrow.

Bone marrow from rats receiving whole dried liver in the diet containing sulfaguanidine, was normal both as to cellularity and maturation of granulocytes. Maturation was also normal in the marrow of the two rats examined, which were treated with liver extract; in addition the marrow was hypercellular.

DISCUSSION

A point of considerable theoretical interest, and perhaps of practical importance as well, is the question of the mode of action of sulfaguanidine and sulfasuxidine in producing this agranulocytosis, leukopenia, and bone marrow aplasia. It has been suggested (*15*, *16*) that the effect on the rate of growth may be due to the lowering of the intestinal synthesis of essential growth factors. The question of a direct toxicity of these sulfonamide drugs was also discussed. In addition to these considerations, we feel that the possibility of an indirect toxicity playing a part should not be overlooked. For example, these drugs might conceivably interfere with the functioning of one or more enzyme systems in the animal body.

An argument which might be used in favor of a direct toxicity is the histological evidence that an aplastic change has taken place in the bone marrow. Marrow aplasia has long been regarded as a phenomenon of toxicity (*17*). On the other hand, the suggestion that sul-

faguanidine and sulfasuxidine act in experiments such as these by lowering the intestinal synthesis of essential growth factors has much in its favor. These drugs are known to act as intestinal antiseptics (*18, 19*), and it is known that B-vitamins are synthesized in the rumen of herbivora (*20, 21*).

Furthermore, it has been demonstrated recently in this laboratory (*10*) that one syndrome developed by the action of either sulfaguanidine or sulfasuxidine in rats can be treated successfully with crystalline biotin.

None of these observations are incompatible, however, with the suggestion that an interference phenomenon might play a part in the production of some of the effects of these sulfonamide drugs. It is possible that direct toxicity, indirect toxicity and the lowering of intestinal synthesis may all be involved.

SUMMARY

Rats given sulfaguanidine (sulfanilylguanidine) or sulfasuxidine (succinyl sulfathiazole) in purified diets develop an agranulocytosis, a leukopenia, and a hypocellularity of bone marrow.

This blood dyscrasia can largely be prevented or successfully treated with whole dried liver or with certain liver extracts.

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THE INCIDENCE OF CANCER IN SAN FRANCISCO AND ALAMEDA COUNTIES, CALIFORNIA, 1938 [1]

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In 1938 the United States Public Health Service began a series of ten studies of the incidence and prevalence of cancer in selected areas of the United States. The first seven of these studies have already been analyzed and the findings have been published (*1–7*). The findings of the eighth survey, which covered San Francisco and Alameda Counties, Calif., are reported in this paper. Reference should be made to the first of these reports (*1*) for a complete discussion of the general purpose of the cancer incidence studies, the nature of the data sought, and the technique employed in collecting the data. To recapitulate, all physicians, hospitals, and clinics in each survey area were requested to furnish records of all patients treated or observed for any malignant growth during a specified calendar year, in this instance, 1938. The information obtained permitted the identification of cases which had been reported by more than one source, and the separation of resident and nonresident cases.

The data were collected separately by county for San Francisco and Alameda Counties, and were tabulated in this form. On comparison, however, it was found that the differences in the nature and amount of

[1] From the Division of Public Health Methods, National Institute of Health. The data for this study were collected under the supervision of Arthur J. McDowell and Arthur Weissman. Miss Bess. A. Cheney was in immediate charge of the tabulation of the data which was done as a project, Number 65-2-22-356, of the Work Projects Administration. The entire survey was directed by Harold F. Dorn.

cancer reported in the two counties were so slight that the data could be combined and the two counties considered as one area.

The combined population of the two counties was 1,131,111,[2] the number of doctors in active practice, 1,803, and the number of hospitals, 94. Reports were received from all of the hospitals, and from all but 34 of the doctors. However, only 1,683 separate reports from doctors were actually received, since 86 doctors submitted joint reports with others. The total number of individual cases of cancer reported as treated or observed during the calendar year 1938 was 7,859. Of these patients, 5,773 were residents of one or the other county, and 2,086 were nonresidents; 3,434 were male, and 4,425, female. Only 137 of the patients were colored, and because of this small number no separation of the cases by color has been made.

TABLE 1.—*Percentage distribution of reported cancer cases by reporting source and number of sources, by sex, San Francisco and Alameda Counties, Calif., 1938*

Nature and number of reporting sources	Percent of reported cancer cases in each group		
	Both sexes	Male	Female
Doctor(s) only	34.8	31.3	37.5
Hospital(s) only	51.4	56.1	47.8
Doctor(s) and hospital(s)	13.8	12.6	14.7
All sources	100.0	100.0	100.0
1 source only	80.2	81.0	79.7
2 sources only	15.4	14.8	15.8
3 or more sources	4.4	4.2	4.5
All sources	100.0	100.0	100.0

Table 1 presents the reported cases according to the nature and the number of reporting sources. Over 65 percent of the cases were treated or observed by hospitals during 1938; the remainder were reported only by physicians and had received no hospital care during this period. A larger proportion of the male than of the female cases received hospital care; 69 percent of the male as against 62 percent of the female cases were reported either by hospitals only or by a combination of doctors and hospitals. About 20 percent of the cases were reported by two or more respondents.

In addition to collecting reports from hospitals and physicians, transcripts were made of all death certificates filed during 1938 which showed cancer as a cause of death.[3] Of the 1,974 cancer deaths recorded, 173 were resident deaths which had not been reported as

[2] The populations used hereinafter were obtained by using the preliminary count of the 1940 census in conjunction with the 1930 census figures. They represent an interpolated population, separate for each county, for the middle of the study year, based on the assumption of a steady arithmetic increase (or decrease) throughout the decade.

[3] This information was obtained from death certificates on file with the Health Department's Registrar of Births and Deaths in each of the counties.

cases by either hospitals or physicians. These, added to the reported cases, make the total resident cases 5,946.

The number of reported cases and recorded deaths are listed by residence, sex, and color in table 2. Also shown are the ratios of resident cases to resident deaths, and the crude prevalence and mortality rates for residents of the area.

TABLE 2.—*Number of reported cases of cancer and number of cancer deaths, by sex, color, and residence, with prevalence and mortality rates for residents, San Francisco and Alameda Counties, Calif., 1938*

	White		Colored		Total
	Male	Female	Male	Female	
Reported cancer cases	3,348	4,374	86	51	7,859
Residents	2,362	3,291	74	46	5,773
Nonresidents	986	1,083	12	5	2,086
Reported cancer deaths [1]	983	938	40	13	1,974
Residents reported as a case	733	768	34	11	1,546
Nonresidents reported as a case	163	89	2	1	255
Residents not reported as a case	87	81	4	1	173
Total resident cases [2]	2,449	3,372	78	47	5,946
Total resident deaths [3]	820	849	38	12	1,719
Ratio of resident cases to deaths	3.0	4.0	2.1	3.9	3.5
Prevalence rate per 100,000 population (residents)	444.9	639.7	223.2	253.2	525.7
Mortality rate per 100,000 population (residents)	149.0	161.1	108.7	64.7	152.0

[1] Obtained from the death certificates on file with the Boards of Health in San Francisco and Alameda Counties. These figures include all recorded deaths where cancer appeared on the death certificate, with the exception of a small number among nonresidents not reported as a case.
[2] Reported resident cases plus resident deaths not reported as a case.
[3] Irrespective of whether or not reported as a case.

The prevalence rate for both sexes combined, all colors, was 525.7 per 100,000 residents. The rate was higher for females than for males, and considerably higher for white than for colored.

In table 3, the San Francisco-Alameda case rate and case death ratio are compared with those of the seven areas previously reported in this series.

The crude prevalence rate for the San Francisco-Alameda area (525.7 per 100,000) is considerably higher than that for any of the areas previously surveyed. It will be recalled that the crude cancer prevalence rate of an area, computed by dividing the total number of cancer cases by the total number of persons in the population, is in part a reflection of the age composition of the population. Of two areas having the same number of residents and the same age-specific cancer prevalence rates, the one that has the larger proportion of its population in the older age groups, where cancer is most prevalent, will have a greater number of cases. Therefore, to a certain extent, the high rate in San Francisco-Alameda is attributable to the unusually old population in this area.

Unfortunately, the exact influence of the age composition factor on these prevalence rates cannot be determined as yet, because 1940

population figures by age have not been released by the Bureau of the Census. However, it seems certain that even after the rates have been adjusted for age this area will be among those with the highest rates.

TABLE 3.—*Prevalence rates of cancer cases among residents in each of eight study areas, with the ratio of cases to deaths*

Survey area (designated by its principal city)	Ratio of cases to deaths	Resident prevalence rate per 100,000 population	Survey area (designated by its principal city)	Ratio of cases to deaths	Resident prevalence rate per 100,000 population
San Francisco-Alameda	3.5	525.7	Chicago	2.6	344.9
New Orleans	3.6	427.1	Pittsburgh	2.9	332.4
Dallas-Fort Worth	4.7	394.0	Detroit	3.2	282.6
Atlanta	5.3	389.7	Birmingham	3.5	242.9

Other factors affecting prevalence rates are the completeness with which cases are diagnosed, treated, and then kept under observation if cured. Cancer control programs and the availability of excellent medical facilities in San Francisco-Alameda have probably played an important part in reducing the proportion of undiagnosed cases of cancer. Of course, as this proportion decreases, prevalence rates become higher. Also, this area ranked third among the surveyed areas in the proportion of resident cases reported which were under observation only during the study year. Twenty percent of the resident cases reported had required no treatment in 1938, but had visited the reporting physician or hospital to be examined for possible recurrences. Since the prevalence rates are based on these cases, as well as on cases that received treatment, they increase as the proportion of cured and arrested cases kept under observation increases. These rates, therefore, are affected by the completeness with which all cases are brought to medical attention for diagnosis and are kept under observation after treatment has been concluded.

As indicated in table 3, the rank of the areas in order of magnitude of prevalence rates is considerably different from their rank in order of magnitude of case-death ratios. The defects of the case-death ratio when used as a measure of prevalence have been discussed fully in an earlier paper (*5*) and will not be considered here. As will be seen later, there is considerable variation in the fatality of cancer, depending on the organ of the body which it attacks. It is largely as a result of this that the southern areas listed in table 3 have the largest number of cases per death, since they have many cases of relatively nonfatal skin cancers.[4] The ratio of cases to deaths in San Francisco-Alameda was higher than that of the northern areas surveyed. Some

[4] When, as in Atlanta, there are large numbers of skin cancer cases and a large part of the cured and arrested cases are kept under observation, the result is an exceptionally high case-death ratio.

part of this higher case-death ratio can be traced to the greater number of skin cancers and to the higher proportion of cured and arrested cases which were reported in this area.

The completeness of the reporting of diagnosed cancer cases is, of course, an important factor in the determination of the reliability of cancer incidence data. Another important factor is the accuracy with which cancer diagnoses are made. Table 4 shows the percentages of cancer cases of each primary site with microscopically confirmed diagnoses. In over 71 percent of the cases of all sites, the diagnoses were microscopically confirmed, a fairly high proportion in comparison with the other survey areas. The proportion of cases so confirmed for each primary site is associated with the accessibility of the tumor, and, as a result, varies considerably among the sites. Thus, uterus, breast, urinary system, and "other genital" rank high in percentages of microscopically confirmed diagnoses, whereas the digestive tract ranks lowest. Skin cancers, although easily accessible for tissue removal, are frequently diagnosed by clinical evidence only. This accounts for the finding that microscopic examinations were made in a relatively low percentage (61) of skin cancer cases. Cases reported by hospitals were diagnosed microscopically more frequently than were those reported by physicians only.

TABLE 4.—*Percentage of reported cancer cases with microscopically confirmed diagnosis, by primary site and whether reported by a hospital, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Percentage of cases of each site microscopically diagnosed		
	Cases reported by—		
	Doctors only	Hospitals [1]	All sources
Buccal cavity	62.1	80.8	73.4
Digestive tract	47.0	66.6	60.9
Respiratory system	53.3	71.8	67.2
Uterus	71.1	90.0	85.6
Prostate	54.2	69.3	65.3
Other genital system	85.5	86.7	86.3
Urinary system	69.1	84.1	79.6
Breast	76.0	84.0	80.8
Skin	50.7	73.9	61.0
Brain	[2]	75.9	71.8
Bones	[2]	67.6	62.5
All other sites	64.8	75.8	72.4
All sites	60.5	77.3	71.5

[1] This group includes cases reported by hospitals only and cases reported by both hospitals and doctors.
[2] There were too few cases in this group to yield a reliable percentage.

The most frequent primary sites of cancer reported were the digestive tract, skin, and buccal cavity among males, and the breast, uterus, and digestive tract among females. It will be noted that the digestive tract, the most frequent site of cancer in males, was only third most frequent in females (table 5).

TABLE 5.—*Percentage distribution by primary site of reported cases and recorded deaths from cancer, by sex; residents of San Francisco and Alameda Counties, Calif., 1938*

Primary site	Cases [1]		Deaths	
	Male	Female	Male	Female
Buccal cavity	13.2	2.8	4.7	1.3
Lip	7.6	.8	.5	----
Tongue	1.6	.6	1.3	.8
Mouth	.9	.2	.5	.1
Jaw	.5	.1	.6	.2
Pharynx	.6	.1	.8	.1
Others	2.0	1.0	1.0	.1
Digestive tract	32.5	18.7	56.2	36.9
Esophagus	1.9	.4	3.5	.9
Stomach and duodenum	12.5	5.2	24.3	12.9
Intestines	6.7	5.6	9.8	9.1
Rectum and anus	7.2	4.3	8.2	4.4
Liver and biliary passage	1.7	1.6	5.1	5.1
Pancreas	2.1	1.2	4.5	3.5
Others	.4	.4	.8	1.0
Respiratory system	7.3	1.3	11.4	2.8
Larynx	2.1	.1	2.2	.2
Lungs and pleura	3.0	.8	5.7	2.2
Others	2.2	.4	3.5	.4
Prostate	9.3	----	10.6	----
Uterus	----	21.2	----	19.0
Other genital system	2.1	6.4	.7	7.8
Urinary system	6.4	2.5	6.4	2.8
Breast	.4	29.7	.1	18.6
Skin	20.9	10.9	1.5	.8
Brain	1.1	.6	.7	.3
Bones	1.6	1.2	1.2	.9
All other sites	5.2	4.7	6.5	8.8
All sites	100.0	100.0	100.0	100.0

[1] These are all cases reported, and so include cases which died before the end of the study year as well as those alive at the end of the year. If the cases which died before the end of the year were excluded the change would increase the relative frequency of the less fatal sites and decrease that of the more fatal.

These primary sites are not equally accessible, nor do the different types of lesions respond equally well to treatment. For example, skin cancer is the most accessible, is usually diagnosed early in its development, and is, in general, the least malignant in type, while cancer of the digestive tract is often diagnosed late in its development and responds poorly to treatment. As a result, the frequency of occurrence of cancers of specific sites among living cases will not be the same as among dead cases. Thus, cancer of the digestive tract, which made up 32.5 and 18.7 percent of the living cases among males and females, respectively, was responsible for 56.2 and 36.9 percent of the recorded deaths. In contrast, skin and breast cancers were far less frequent among the dead than they were among the living cases. Cancers of the prostate and uterus were found in approximately equal proportions among the living and dead cases (fig. 1).

Of the reported male cases in San Francisco-Alameda, 3.7 percent occurred in persons under 30 years of age, and 45.5 percent in persons

under 60 years of age (table 6). Only 2.7 percent of the female cases were in persons under 30, but thereafter female cases tended to develop at earlier ages than the male, since 54.5 percent of them were under 60. In all of the areas surveyed, greater proportions of female than of male cases occurred before the age of 60.

Comparison of the proportion of cases occurring at ages over 60 in San Francisco-Alameda with those of the areas previously reported reveals that this proportion was relatively very high in San Francisco-

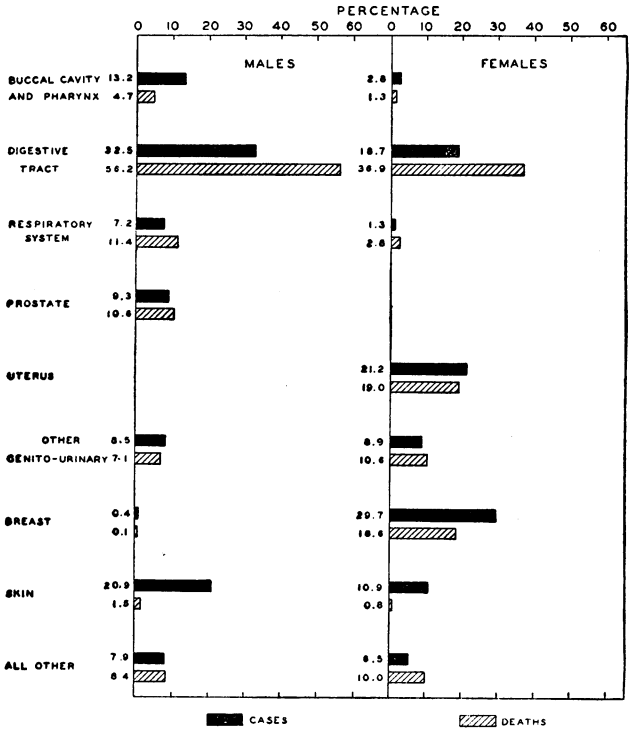

FIGURE 1.—Percentage distribution of reported cases and recorded deaths from cancer, by primary site and sex, among residents, San Francisco and Alameda Counties, Calif., 1938.

Alameda. This is, of course, a reflection of the age distribution of the populations.

The frequency of occurrence of cancer of certain organs varies with age. Among the male cases in San Francisco-Alameda cancer of only three sites developed at early ages in significant numbers; 53 percent of the brain cases, 51 percent of genital cases other than prostate, and 44 percent of the bone cases were in persons under 45 years of age, whereas the corresponding percentage for all cases was 13.

Approximately half the male cases of cancer of the buccal cavity, digestive tract, urinary system, skin, and brain appeared in persons

TABLE 6.—*Percentage distribution of all reported cases of cancer of known age by age and sex; San Francisco and Alameda Counties, Calif., 1938*

Age group	Percent of cases of known age in each age group		Age group	Percent of cases of known age in each age group	
	Males	Females		Males	Females
0-9	0.3	0.2	60-69	30.0	25.4
10-19	1.0	.6	70-79	19.4	15.7
20-29	2.4	1.9	80-89	4.9	4.0
30-39	4.8	7.3	90 and over	.2	.4
40-49	10.8	18.5			
50-59	26.2	26.0	All known ages	100.0	100.0

aged 45–64, and over 60 percent of the cases of the respiratory system were in this age group. The site showing the greatest concentration o cases in the ages 65 and over was the prostate (71.7 percent), but skin cancers also had a larger than average proportion of cases among the aged (46.7 percent).

TABLE 7.—*Percentage distribution by age of reported cases of cancer by primary site, males only, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Percent of cases of each site in each age group									Number of cases of known age
	Under 15	15-24	25-34	35-44	45-54	55-64	65-74	75 and over	All ages	
Buccal cavity	0.2	0.4	3.4	10.5	21.3	29.6	25.3	9.2	100.0	446
Lip	-----	-----	3.7	12.7	24.9	26.1	22.9	9.8	100.0	245
Others	.5	1.0	3.0	8.0	16.9	33.8	28.4	8.5	100.0	201
Digestive tract	.2	.3	1.9	7.0	17.8	33.4	28.2	11.3	100.0	1,063
Stomach and duodenum	-----	-----	2.3	8.8	16.9	32.6	29.0	10.4	100.0	396
Intestines	.5	.5	2.9	5.9	16.2	33.3	27.0	13.7	100.0	204
Rectum, anus	-----	.4	1.5	5.8	19.6	33.1	29.8	9.8	100.0	275
Others	.5	.5	.5	5.9	18.6	35.6	25.5	12.8	100.0	188
Respiratory system	.8	1.7	2.5	8.0	25.1	35.6	22.6	3.8	100.0	239
Lungs, pleura	.7	2.1	1.4	10.6	24.8	36.2	20.6	3.5	100.0	141
Others	1.0	1.0	4.1	4.1	25.5	34.7	25.5	4.1	100.0	98
Prostate	-----	-----	.3	.7	5.0	22.3	38.5	33.2	100.0	301
Other genital sites	1.5	9.1	22.7	18.2	7.6	16.7	18.2	6.1	100.0	66
Urinary system	-----	1.4	2.8	4.2	20.7	29.6	27.7	13.6	100.0	213
Skin	.2	1.5	2.1	6.3	16.9	26.3	29.1	17.6	100.0	608
Brain	12.3	8.8	15.8	15.8	33.3	12.3	1.8	-----	100.0	57
Bones	3.8	17.0	13.2	9.4	17.0	15.1	13.2	11.3	100.0	53
All other sites	4.1	4.6	6.7	12.4	21.6	29.9	12.4	8.2	100.0	194
All sites	.7	1.5	3.2	7.4	17.9	29.2	26.6	13.3	100.0	3,240

For females, the ages at which the various organs were attacked by cancer are shown in table 8. More o the cases of the respiratory system and skin occurred in females over 65 years of age than in males, but with the exception of these sites, in addition to those occurring exclusively in females, the age distributions of the cases among females follow those among males quite closely. Over 55 percent of the cases of the uterus, urinary system, and breast were in persons in

the age group 45–64 years and approximately 25 percent were in the group 65 years and over.

TABLE 8.—*Percentage distribution by age of reported cases of cancer by primary site, females only, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Percent of cases of each site in each age group									Number of cases of known age
	Under 15	15–24	25–34	35–44	45–54	55–64	65–74	75 and over	All ages	
Buccal cavity	------	2.6	3.5	7.9	22.8	25.4	19.3	18.4	100.0	114
Digestive tract	------	.8	2.7	7.7	19.7	27.9	24.9	16.2	100.0	770
Stomach, duodenum	------	1.5	2.5	4.5	23.7	22.2	24.2	21.2	100.0	198
Intestines	------	.4	2.9	8.8	18.1	29.8	23.5	16.4	100.0	238
Rectum, anus	------	------	3.4	9.3	21.6	32.4	23.5	9.8	100.0	204
Others	------	1.5	1.5	7.7	13.8	26.2	30.8	18.5	100.0	130
Respiratory system	4.0	------	6.0	6.0	16.0	22.0	22.0	24.0	100.0	50
Uterus	------	.2	5.0	16.2	29.3	27.1	16.5	5.8	100.0	988
Other genital sites	.4	1.9	4.8	13.8	34.9	21.9	19.3	3.0	100.0	269
Urinary system	3.8	1.0	1.0	3.8	13.3	21.0	37.1	19.0	100.0	105
Breast	------	.1	3.3	12.3	28.1	28.9	17.6	9.7	100.0	1,258
Skin	.5	.5	2.9	6.3	14.3	19.3	33.1	23.0	100.0	378
Brain	8.6	20.0	22.9	20.0	20.0	8.6	------	------	100.0	35
Bones	12.5	10.4	4.2	4.2	14.6	22.9	25.0	6.3	100.0	48
All other sites	2.0	3.9	8.8	8.8	20.0	27.8	21.5	7.3	100.0	205
All sites	.5	.9	4.1	11.3	24.8	26.3	20.9	11.1	100.0	4,220

The data collected in this survey make it possible to compute crude prevalence rates by primary site and sex. Prevalence rates are based on all cases existing in the resident population during a given period of time, regardless of the date of onset (or first diagnosis). Hence, all cases, whether diagnosed, treated, or observed for cancer during 1938, are included in the computation of these rates for San Francisco-Alameda.

TABLE 9.—*Percentage distribution by primary site of all reported cancer cases, with the prevalence rates per 100,000 for resident cases, by sex, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Percent of cases of each sex		Prevalence rates per 100,000 for resident cases	
	Male	Female	Male	Female
Buccal cavity	14.0	2.8	54.9	17.0
Lip	8.0	.8	31.6	5.1
Tongue	1.8	.5	6.8	3.5
Mouth	.7	.2	3.6	1.3
Jaw	.5	.2	2.1	.9
Pharynx	.6	.1	2.4	.4
Others	2.4	1.0	8.4	5.9
Digestive tract	31.6	17.8	135.2	114.6
Esophagus	1.8	.3	8.0	2.4
Stomach and duodenum	11.7	4.6	52.0	32.0
Intestines	6.2	5.5	28.0	34.4
Rectum and anus	8.1	4.7	29.9	26.4
Liver and biliary passages	1.5	1.3	7.2	9.5
Pancreas	1.9	1.0	8.5	7.3
Others	.4	.4	1.5	2.6

TABLE 9.—*Percentage distribution by primary site of all reported cancer cases, with the prevalence rates per 100,000 for resident cases, by sex, San Francisco, and Alameda Counties, Calif., 1938*—Continued

Primary site	Percent of cases of each sex		Prevalence rates per 100,000 for resident cases	
	Male	Female	Male	Female
Respiratory system	7.3	1.2	30.4	7.7
Larynx	2.4	.1	8.5	.5
Lungs and pleura	4.2	.9	19.0	5.7
Others	.7	.2	2.9	1.5
Prostate	9.0		39.0	
Uterus		22.8		129.6
Other genital system	2.0	6.4	8.9	39.0
Urinary system	6.4	2.5	26.5	15.0
Breast	.3	29.5	1.5	181.5
Skin	20.6	10.2	87.0	67.0
Brain	1.7	.8	4.6	3.5
Bones	1.5	1.2	6.5	7.1
All other sites	5.6	4.8	21.9	28.9
All sites	100.0	100.0	416.4	611.0

In this area, there were 416 cancer cases per 100,000 males, and 611 per 100,000 females. Malignancies of the digestive tract, the most common site of cancer among males, were reported for 135 per 100,000 males. The next most frequent sites for males, skin and buccal cavity, showed case rates of 87 and 55 per 100,000, respectively. Among females, the highest rates reported were for cancer of the breast, 181, uterus, 130, and digestive tract, 115. The case rate of skin cancer was also quite high among females, 67 per 100,000.

Since the prevalence rates were computed on the basis of all cases, including those which had not received any treatment during the study year, it is important to determine the extent to which differences among prevalence rates for the various sites might be due to differences in the reporting of cases under observation only during the study year in this area. Of the 5,773 resident cases of cancer reported as treated or observed during 1938, 1,133 were under observation only and had received no treatment during that year. In other words, in almost 20 percent of the cancer cases, the disease was arrested prior to 1938.[5] However, sharp differences were revealed among the primary sites in the proportions of cases that were under observation only. Almost 33 percent of the lip cases, 30 percent of the uterus cases, 26 percent of the skin cases and 26 percent of the breast cases had received no treatment and were under observation only during the study year. In contrast to this, for cancers of the digestive tract, respiratory system, prostate, and brain the proportions of cases under observation only were negligible. These proportions for the various

[5] This is a fairly high proportion, exceeded only by Atlanta and Detroit among the surveyed areas. In these areas the percentages were 26.6 and 20.6, respectively. The percentages were lowest for Chicago and New Orleans, 5.8 and 5.4, respectively.

sites may be considered as rough measures of relative fatality; the higher the proportion of observed (presumably arrested) cases, the lower the fatality.[6]

TABLE 10.—*Number and percentage distribution of resident cases of cancer under observation only during 1938, and percentages such cases were of all resident cases reported,*[1] *by primary site, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Number of cases	Percentage distribution	Percentage that cases under-observation-only were of all cancer cases
Buccal cavity	97	8.6	23.4
Lip	70	6.2	32.9
Others	27	2.4	13.4
Digestive tract	155	13.7	10.9
Stomach and duodenum	44	3.9	9.2
Intestines	48	4.2	13.6
Rectum, anus	52	4.6	16.3
Others	11	1.0	4.1
Respiratory system	15	1.3	6.8
Lungs, pleura	5	.4	3.5
Others	10	.9	12.8
Prostate	16	1.4	7.0
Uterus	215	19.0	30.4
Other genital sites	68	6.0	25.7
Urinary system	20	1.8	8.4
Breast	258	22.8	25.8
Skin	228	20.1	26.1
Brain	5	.4	10.9
Bones	17	1.5	22.1
All other sites	39	3.4	13.6
All sites	1,133	100.0	19.6

[1] Resident cases by site are presented in table 9 of the appendix.

As was found in previous studies, many more female than male cases were under observation in San Francisco-Alameda. Of the 1,629 cases reported as under observation only during 1938 (resident and nonresident), 1,117, or 69 percent, were female.

Incidence rates for San Francisco-Alameda (table 11) relate only to cases reported as first diagnosed during 1938, i. e., cases which originated during the study year. They exclude all others, even though they may have received treatment during this period. The influence of the cases under observation only is, of course, eliminated in these rates, as is the influence of all cases which originated prior to and were carried over into the study year.

Among cases first diagnosed during the study year, as among the total resident cases reported (table 9), the highest rates among males were for the digestive tract (93 per 100,000), the skin (47 per 100,000), and the buccal cavity (29 per 100,000). Among females, however,

[6] This does not hold true for skin cancers which are not followed up as carefully as are cancers of other sites. Were all cured skin cancers followed up and reported, the percentage of skin cancers under observation only would be much larger.

TABLE 11.—*Percentage distribution by primary site of all reported cancer cases first seen in 1938, with the incidence rates per 100,000 for resident cases, by sex, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Percentage distribution		Incidence rates per 100,000 for resident cases	
	Male	Female	Male	Female
Buccal cavity	12.9	3.4	28.5	9.7
Lip	6.8	1.4	14.7	3.8
Tongue	1.6	.3	3.8	1.1
Mouth	.6	.2	1.7	.5
Jaw	.5	.1	1.4	.2
Pharynx	.9	.1	2.1	.4
Others	2.6	1.2	5.0	3.7
Digestive tract	34.1	21.9	93.0	73.4
Esophagus	2.3	.5	5.8	1.8
Stomach and duodenum	12.5	6.4	34.9	22.7
Intestines	6.6	6.1	19.3	21.1
Rectum and anus	7.7	4.7	18.5	12.3
Liver and biliary passages	2.2	2.0	6.7	7.3
Pancreas	2.4	1.7	6.5	6.4
Others	.5	.5	1.4	1.8
Respiratory system	8.2	1.4	21.9	5.1
Larynx	2.0	----	4.4	.2
Lungs and pleura	5.4	1.2	15.6	4.2
Others	.8	.2	1.9	.7
Prostate	9.2	----	24.4	----
Uterus	----	19.7	----	57.5
Other genital system	1.8	6.4	4.6	20.9
Urinary system	6.4	3.0	15.7	10.1
Breast	.1	24.4	.3	76.2
Skin	18.5	11.8	46.5	37.4
Brain	2.1	1.2	3.2	2.7
Bones	1.2	1.4	3.1	4.2
All other sites	5.5	5.4	13.7	16.7
All sites	100.0	100.0	255.1	313.8

the order of the primary sites is not the same for the two types of rates. Cancer of the breast, the uterus and the digestive tract, in the order named, showed the highest prevalence rates. The highest incidence rates were for the breast (76 per 100,000), the digestive tract (73 per 100,000), and the uterus (58 per 100,000). This finding is consistent with the fact that cancer of the digestive tract is far more fatal than that of the uterus. If an equal number of cases of these two sites were to arise in a given year, producing identical incidence rates, the prevalence rate of cancer of the uterus in the ensuing year would be much higher than that of cancer of the digestive tract, since a much larger proportion of the cases of the uterus would have survived.

In order to determine what proportion of the cancer prevalence of the various sites was composed of cases first seen during the study year, the ratio of the new cases to the total resident cases was computed. Obviously, this ratio also indicates the proportion of the cases receiving medical care or observation which had been carried over into the study year from previous years.

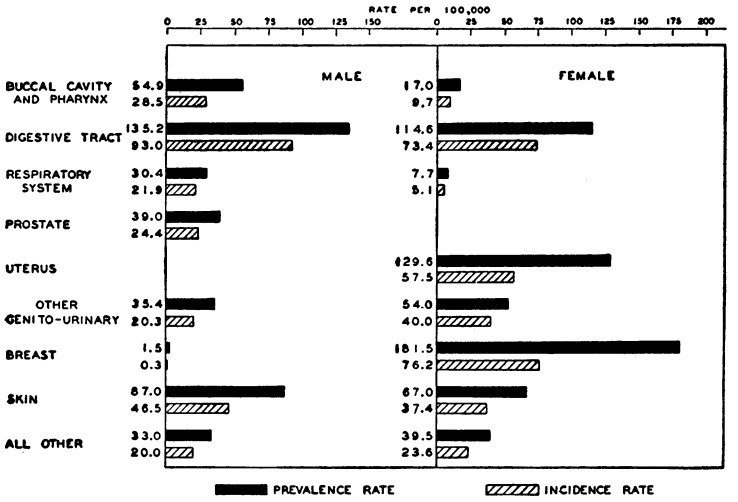

FIGURE 2.—Cancer prevalence and incidence rates per 100,000 residents, by sex, San Francisco and Alameda Counties, Calif., 1938.

TABLE 12.—*Percentages that cases first seen in 1938 were of all cancer cases,*[1] *by primary site and sex, resident cases only, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Percent		Primary site	Percent	
	Male	Female		Male	Female
Buccal cavity	52.0	57.0	Prostate	62.7	
Lip	46.5	75.0	Uterus		44.4
Others	59.6	49.2	Other genital sites	51.9	53.5
Digestive tract	68.8	64.1	Urinary system	59.4	67.1
Stomach and duodenum	67.1	70.9	Breast	22.2	42.0
Intestines	68.9	61.2	Skin	53.4	55.7
Rectum, anus	61.7	46.5	Brain	70.4	78.9
Others	80.4	79.8	Bones	47.4	59.0
Respiratory system	71.9	66.7	All other sites	62.5	57.6
Lungs and pleura	82.0	74.2			
Others	55.2	45.5	All sites	61.2	51.4

[1] The actual numbers of cases are presented in tables 9 and 11 of the appendix.

Of the 5,773 resident cases of cancer seen or treated in San Francisco-Alameda during 1938, 3,206, or 55.5 percent, were first diagnosed in the study year. Sixty-one percent of the total male cases originated during the study year, as against only 51 percent of the female cases. In this connection, it will be recalled that there were many more females under observation only during 1938 than males.

It is apparent from table 12 that, for the primary sites less susceptible to successful treatment, the cases reported were largely new ones. Among males, 72 percent of the respiratory system cases, 69 percent of the digestive tract cases, and 63 percent of the prostate cases were first diagnosed during the study year, as compared with 52 percent of the buccal cavity cases and 53 percent of the skin cases first diagnosed during that period. Among females, 64 percent of digestive

tract cancers were new, while only 44 and 42 percent of the cases of the uterus and breast were first seen during 1938.

In general, the survival period of cancer patients is extremely short. This conclusion is borne out by the data in tables 13 and 15. Thirty-nine percent of all cancer cases reported in San Francisco-Alameda had durations of under 6 months from the date of first diagnosis to death or the end of the study year (table 13), and over 60 percent of them had durations of under a year. Of course, there proportions are made up not only of patients who were alive at the end of the study year, but of patients who died before that date. Considered separately, the durations of cases alive at the end of the year were much longer than those of the dead cases; 31 percent of the living cases had durations of less than 6 months since first diagnosis, while 57 percent of the dead cases did not survive that period; 56 percent of the living cases had durations of less than a year, while 73 percent of the deceased patients had died before the passage of a year.

TABLE 13.—*Number and percentage of cases of cancer by the number of months since first diagnosis, and vital condition, San Francisco and Alameda Counties, Calif., 1938*

Number of months since diagnosis	Percentage			Number		
	All cases	Cases alive at end of year	Cases dead at end of year	All cases	Cases alive at end of year [1]	Cases dead at end of year
Under 6	38.5	31.4	57.0	3,021	1,789	1,232
6–11	21.9	24.2	15.8	1,723	1,382	341
12–17	9.4	10.0	7.8	741	572	169
18–23	6.2	6.6	5.2	488	376	112
24–29	4.5	4.8	3.6	353	276	77
30–35	3.5	3.9	2.3	274	224	50
36–41	2.5	2.8	1.7	194	157	37
42–47	2.0	2.4	1.2	161	136	25
48–53	1.7	2.0	.7	131	116	15
54–59	1.3	1.5	1.0	104	83	21
60 and over	8.3	10.3	3.0	650	585	65
Unknown	.2	.1	.7	19	3	16
Total	100.0	100.0	100.0	7,859	5,699	2,160

[1] Includes 234 cases of unknown vital condition.

Although the dead cases, to a much greater extent than the living, consisted of cancer of sites more difficult to treat, as indicated in table 14, another factor in addition to that of primary site should be taken into account in seeking an explanation of the difference in duration of living and dead cases. It is evident that even among cancer cases of the digestive tract and respiratory system the duration of the dead cases was much shorter than that of the living cases (table 15). It thus appears that not only the primary site of the cancer, but the stage of development of the cancer before diagnosis is made and treatment begun is also an important factor in determining the chances of survival of the patient.

TABLE 14.—*Percentage distribution by primary site of reported cancer cases,[1] classified by vital condition at end of year, San Francisco-Alameda Counties, Calif., 1938*

Vital condition at end of study year	Buccal cavity	Digestive tract	Respiratory system	Genito-urinary system	Breast	Skin	All others	All cases
Living	9.2	16.8	2.7	25.6	19.7	19.0	7.0	100.0
Dead	3.6	42.2	6.9	25.3	10.3	2.5	9.2	100.0

[1] Cases of unknown vital status are excluded.

TABLE 15.—*Percentage of cases of cancer with duration of less than certain specified number of months since diagnosis, classified by primary site and vital condition at the end of the year, San Francisco and Alameda Counties, Calif., 1938*

Duration in months since diagnosis	Buccal cavity		Digestive tract		Respiratory system		Genito-urinary system		Breast		Skin		All others	
	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Less than 6 months	35	39	39	67	39	68	29	51	22	31	31	26	33	63
Less than 12 months	63	55	63	82	66	85	51	67	43	45	57	52	58	78
Less than 18 months	73	74	74	89	77	93	62	76	52	56	68	56	67	84
Less than 24 months	79	84	81	92	81	97	69	83	60	63	74	67	75	88
Less than 30 months	82	88	83	94	86	97	75	87	66	71	80	81	79	92
Less than 36 months	86	92	87	96	88	97	79	90	72	77	83	87	83	93
Less than 42 months	88	92	89	96	89	98	82	93	75	81	86	89	85	95
Less than 48 months	89	94	90	97	91	98	84	94	80	84	88	89	87	95
Less than 54 months	90	96	92	97	94	98	86	95	83	86	90	91	88	95
Less than 60 months	91	97	93	98	95	98	89	96	84	88	91	93	89	96

SUMMARY

The number of cases of cancer under medical care in San Francisco and Alameda Counties, Calif., in 1938, was 7,859, of which 5,773 were residents and 2,086 were nonresidents. There were 1,974 cancer deaths recorded, of which 173 were resident cases not reported by doctors or hospitals. These, added to the reported cases, make the total resident cases 5,946.

The prevalence rate was 525.7 per 100,000 residents. To a certain extent the high prevalence rate in this area is attributable to the unusually old population.

The most frequent primary sites of cancer reported among males were the digestive tract, skin, and buccal cavity, and among females, the breast, uterus, and digestive tract.

Since the various primary sites cannot be treated with equal success, the frequency of occurrence of specific sites among the living cases was not the same as among dead cases. Cancers of the digestive tract and respiratory system were far more frequent among the dead than the living cases, while skin and breast cancers were far more frequent among the living cases.

The frequency of occurrence of cancer of certain organs varies with age. Brain and bone cancers were especially likely to develop at an

early age, while in nearly 3 out of 4 of the prostate cases the patient was 65 years of age or over.

There were 416 cancer cases per 100,000 males and 611 per 100,000 females. The incidence rates, relating only to those cases first seen in the study year, were 255 per 100,000 males and 314 per 100,000 females.

Thirty-nine percent of all cancer cases reported had durations of under 6 months from the date of first diagnosis to death or the end of the study year, and over 60 percent of them had durations of under a year. The durations of the cases reported as alive were longer than those of the dead; 56 percent of the living cases had durations of under a year, while 73 percent of the dead patients had died before passage of a year.

Appendix

The appendix tables, which present the absolute numbers of cases, are numbered to correspond with the tables in the text which are based upon them.

TABLE 1.—*Number of cases of cancer reported, by reporting source, and by number of sources, by sex and color, San Francisco and Alameda Counties, Calif., 1938*

Nature and number of reporting sources	Number of cancer cases reported						
	White		Colored		Total		All cases
	Males	Females	Males	Females	Males	Females	
Doctor(s) only	1,056	1,647	19	12	1,075	1,659	2,734
Hospital(s) only	1,868	2,083	58	32	1,926	2,115	4,041
Doctor(s) and hospital(s)	424	644	9	7	433	651	1,084
All sources	3,348	4,374	86	51	3,434	4,425	7,859
One source only	2,711	3,482	70	44	2,781	3,526	6,307
Two sources only	493	694	14	6	507	700	1,207
Three or more sources	144	198	2	1	146	199	345
All sources	3,348	4,374	86	51	3,434	4,425	7,859

TABLE 4.—*Number of cases of cancer reported, and the number with diagnosis microscopically confirmed, by primary site and reporting source, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Number of cases reported					
	By doctors only		By a hospital [1]		By all sources	
	With a biopsy [2]	Total	With a biopsy [2]	Total	With a biopsy [2]	Total
Buccal cavity	149	240	295	365	444	605
Digestive tract	257	547	882	1,324	1,139	1,871
Respiratory system	40	75	163	227	203	302
Uterus	170	239	696	773	866	1,012
Prostate	45	83	156	225	201	308
Other genital system	94	110	268	240	302	350
Urinary system	67	97	195	232	262	329
Breast	402	529	663	789	1,065	1,318
Skin	326	643	382	517	708	1,160
Brain	4	11	63	83	67	94
Bones	19	36	46	68	65	104
All other sites	81	125	213	281	294	406
All sites	1,654	2,735	3,962	5,124	5,616	7,859

[1] This group includes cases reported by both a doctor and a hospital.
[2] Biopsy is used here to denote any microscopic confirmation of diagnosis (i. e., biopsy or necropsy). A biopsy that did not show malignancy was not recorded as a biopsy.

TABLE 5.—*Number of reported cases and recorded deaths from cancer, by primary site and sex, among residents, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Cases		Deaths	
	Male	Female	Male	Female
Buccal cavity	321	93	40	11
Lip	185	28	4	
Tongue	40	19	11	6
Mouth	21	7	4	1
Jaw	12	5	5	2
Pharynx	14	2	7	1
Others	49	32	9	1
Digestive tract	791	626	482	318
Esophagus	47	13	30	8
Stomach and duodenum	304	175	208	111
Intestines	164	188	84	78
Rectum and anus	175	144	70	38
Liver and biliary passage	42	52	44	44
Pancreas	50	40	39	30
Others	9	14	7	9
Respiratory system	178	42	98	24
Larynx	50	3	19	2
Lungs and pleura	73	27	49	19
Others	55	12	30	3
Prostate	228		91	
Uterus		708		163
Other genital system	52	213	6	67
Urinary system	155	82	55	24
Breast	9	991	1	160
Skin	509	366	13	7
Brain	27	19	6	3
Bones	38	39	10	8
All other sites	128	158	56	76
All sites	2,436	3,337	858	861

TABLE 6.—*Number of reported cases of cancer by age of patient, for all cases by sex and color, and for resident cases by sex, San Francisco and Alameda Counties, Calif., 1938*

Age group	Number of reported cases of cancer							
	Resident cases		All cases, by color				All cases	
			White		Colored [1]			
	Male	Female	Male	Female	Male	Female	Male	Female
Under 5	4	3	6	6			6	6
5–9		1	3	3			3	3
10–14	8	6	15	13			15	13
15–19	9	11	17	14	2		19	14
20–24	19	18	29	24	2	2	31	26
25–29	31	36	41	52	5	1	46	53
30–34	37	81	58	118	1	1	59	119
35–39	60	128	93	187	2	4	95	191
40–44	97	200	140	285	4	2	144	287
45–49	122	367	200	487	6	8	206	495
50–54	242	419	362	538	13	12	375	550
55–59	344	390	455	538	18	7	473	545
60–64	338	421	457	560	16	6	473	566
65–69	351	384	486	501	12	4	498	505
70–74	278	307	363	373	2	4	365	377
75–79	213	241	262	286	2		264	286
80–84	93	103	111	119			111	119
85–89	42	43	49	49			49	49
90–94	4	13	5	14			5	14
95 and over	2	2	3	2			3	2
Unknown	142	163	193	205	1		194	205
All ages	2,436	3,337	3,348	4,374	86	51	3,434	4,425

[1] All residents except 12 males and 5 females.

TABLE 7.—*Number of male cases of cancer reported, by primary site and age of patient, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Age of patient									
	Under 15	15–24	25–34	35–44	45–54	55–64	65–74	75 and over	Unknown	All ages
Buccal cavity	1	2	15	47	95	132	113	41	35	481
Lip			9	31	61	64	56	24	28	273
Others	1	2	6	16	34	68	57	17	7	208
Digestive tract	2	3	20	74	189	355	300	120	21	1,084
Stomach, duodenum			9	35	67	129	115	41	7	403
Intestines	1	1	6	12	33	68	55	28	7	211
Rectum, anus		1	4	16	54	91	82	27	4	279
Others	1	1	1	11	35	67	48	24	3	191
Respiratory system	2	4	6	19	60	85	54	9	12	251
Lungs, pleura	1	3	2	15	35	51	29	5	4	145
Others	1	1	4	4	25	34	25	4	8	106
Prostate			1	2	15	67	116	100	7	308
Other genital sites	1	6	15	12	5	11	12	4	2	68
Urinary system		3	6	9	44	63	59	29	7	220
Skin	1	9	13	38	103	160	177	107	98	706
Brain	7	5	9	9	19	7	1		2	59
Bones	2	9	7	5	9	8	7	6		53
All other sites	8	9	13	24	42	58	24	16	10	204
All sites	24	50	105	239	581	946	863	432	194	3,434

TABLE 8.—*Number of female cases of cancer reported, by primary site and age of patient, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Age of patient									
	Under 15	15–24	25–34	35–44	45–54	55–64	65–74	75 and over	Unknown	All ages
Buccal cavity		3	4	9	26	29	22	21	10	124
Lip				2	7	5	7	7	10	38
Others		3	4	7	19	24	15	14		86
Digestive tract		6	21	59	152	215	192	125	17	787
Stomach, duodenum		3	5	9	47	44	48	42	5	203
Intestines		1	7	21	43	71	56	39	7	245
Rectum, anus			7	19	44	66	48	20	3	207
Others		2	2	10	18	34	40	24	2	132
Respiratory system	2		3	3	8	11	11	12	1	51
Lungs, pleura	2		2		6	9	10	8	1	38
Others			1	3	2	2	1	4		13
Uterus		2	49	160	289	268	163	57	24	1,012
Other genital sites	1	5	13	37	94	59	52	8	13	282
Urinary system	4	1	1	4	14	22	39	20	4	109
Breast		1	42	155	353	363	222	122	49	1,307
Skin	2	2	11	24	54	73	125	87	76	454
Brain	3	7	8	7	7	3				35
Bones	6	5	2	2	7	11	12	3	3	51
All other sites	4	8	18	18	41	57	44	15	8	213
All sites	22	40	172	478	1,045	1,111	882	470	205	4,425

TABLE 9.—*Number of cancer cases reported, by primary site and sex, with the number of resident cases, by color, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Number of cases					
	Resident cases				Total	
	White		Colored			
	Male	Female	Male	Female	Male	Female
Buccal cavity	313	91	8	2	481	124
Lip	182	28	3	----	273	38
Tongue	40	19	----	----	62	22
Mouth	21	7	----	----	24	9
Jaw	12	4	----	1	17	7
Pharynx	12	2	2	----	21	3
Others	46	31	3	1	84	45
Digestive tract	753	618	38	8	1,084	787
Esophagus	46	13	1	----	63	13
Stomach, duodenum	288	172	16	3	403	203
Intestines	156	187	8	1	211	245
Rectum, anus	169	142	6	2	279	207
Liver, biliary passage	38	50	4	2	52	57
Pancreas	48	40	2	----	63	44
Others	8	14	1	----	13	18
Respiratory system	166	42	12	----	251	51
Larynx	50	3	----	----	81	4
Lungs, pleura	106	31	5	----	145	38
Others	10	8	7	----	25	9
Prostate	227	----	1	----	308	----
Uterus	----	693	----	15	----	1,012
Other genital system	51	209	1	4	68	282
Urinary system	150	81	5	1	220	109
Breast	9	979	----	12	11	1,307
Skin	509	366	----	----	706	454
Brain	26	19	1	----	59	35
Bones	37	39	1	----	53	51
All other sites	121	154	7	4	193	213
All sites	2,362	3,291	74	46	3,434	4,425

TABLE 11.—*Total and resident cases of cancer first seen in 1938, by primary site and sex, San Francisco and Alameda Counties, Calif., 1938*

Primary site	Total cases reported		Resident cases	
	Male	Female	Male	Female
Buccal cavity	280	75	167	53
Lip	148	31	86	21
Tongue	34	7	22	6
Mouth	12	5	10	3
Jaw	11	3	8	1
Pharynx	19	3	12	2
Others	56	26	29	20
Digestive tract	738	486	544	401
Esophagus	49	10	34	10
Stomach and duodenum	270	143	204	124
Intestines	144	135	113	115
Rectum and anus	167	104	108	67
Liver and biliary passages	47	45	39	40
Pancreas	51	38	38	35
Others	10	11	8	10
Respiratory system	178	32	128	28
Larynx	43	1	26	1
Lungs and pleura	117	26	91	23
Others	18	5	11	4
Prostate	199		143	
Uterus		437		314
Other genital system	40	142	27	114
Urinary system	139	67	92	55
Breast	3	541	2	416
Skin	400	263	272	204
Brain	45	27	19	15
Bones	27	31	18	23
All other sites	119	120	80	91
All sites	2,168	2,221	1,492	1,714

TABLE 15.—*Number of cases of cancer with duration of less than certain specified number of months since diagnosis, classified by primary site and vital condition at the end of the year, San Francisco and Alameda Counties, Calif., 1938*

Duration in months since diagnosis	Buccal cavity		Digestive tract		Respiratory tract		Genito-urinary system		Breast		Skin		All others	
	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Less than 6 months	174	30	356	614	58	102	398	277	236	69	324	14	126	126
Less than 12 months	318	42	580	752	99	127	713	369	463	99	596	28	224	156
Less than 18 months	367	57	678	811	115	138	865	415	560	124	706	30	257	167
Less than 24 months	397	65	739	837	122	144	957	456	645	140	770	36	287	176
Less than 30 months	413	68	764	857	129	144	1,046	477	707	157	827	44	304	184
Less than 36 months	432	71	795	872	132	145	1,101	490	772	171	859	47	318	185
Less than 42 months	442	71	813	878	134	146	1,140	506	812	180	893	48	327	189
Less than 48 months	448	72	824	886	137	146	1,176	516	858	186	915	48	335	189
Less than 54 months	455	74	841	889	141	146	1,202	519	891	191	935	49	339	190
Less than 60 months	458	75	852	895	143	146	1,236	526	906	195	948	50	342	192
All durations [1]	503	77	917	912	150	149	1,396	547	1,077	222	1,038	54	384	199

[1] Contains 18 cases of unknown duration.

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DEATHS DURING WEEK ENDED OCTOBER 3, 1942

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

	Week ended Oct. 3, 1942	Corresponding week 1941
Data from 88 large cities of the United States:		
Total deaths	8,226	7,687
Average for 3 prior years	7,608	
Total deaths, first 39 weeks of year	324,711	327,118
Deaths per 1,000 population, first 39 weeks of year, annual rate	11.6	11.7
Deaths under 1 year of age	637	537
Average for 3 prior years	499	
Deaths under 1 year of age, first 39 weeks of year	22,204	20,409
Data from industrial insurance companies:		
Policies in force	65,065,862	64,508,975
Number of death claims	11,029	11,001
Death claims per 1,000 policies in force, annual rate	8.8	8.9
Death claims per 1,000 policies, first 39 weeks of year, annual rate	9.2	9.6

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 OCTOBER 10, 1942

Summary

Of the 9 common communicable diseases for which comparable weekly reports for prior years are available, usual seasonal increases were recorded for 6 (diphtheria, influenza, measles, meningococcus meningitis, scarlet fever, and smallpox), while decreases were reported for 3 (poliomyelitis, typhoid fever, and whooping cough). Possibly with the exception of meningococcus meningitis, the current incidence of none of these diseases is significantly high.

A total of 62 cases of meningococcus meningitis was reported during the week, as compared with 48 cases for the preceding week and a 5-year (1937–41) median of 27 cases. During most of the current year the incidence has been consistently above that for the corresponding week of any prior year since 1937. The total number of cases reported to date this year, however, is only 2,733, as compared with 4,548 cases for the same period in 1937. Currently the highest incidence is reported in the Pacific, South Atlantic, New England, and Middle Atlantic States.

The number of cases of poliomyelitis declined from 217 to 189, of which slightly more than one-half (95) were reported in the Middle Atlantic and East North Central States. Of 1,098 cases of influenza, 760 were reported in 3 States—Texas (458), South Carolina (195), and Virginia (107).

Of 550 cases of diphtheria, 245 occurred in the South Atlantic States. That area and the South Central areas apparently have the highest incidence. However, the total number of cases to date this year (9,924) is below that for the corresponding period of any prior year of record.

Other diseases reported during the week include 4 cases of anthrax (1 each in New Jersey, Pennsylvania, Missouri, and California), 16 cases of infectious encephalitis, 1 case of leprosy (in Louisiana),

4 cases of Rocky Mountain spotted fever (all in the eastern States), 4 cases of smallpox, 9 cases of tularemia, and 93 cases of endemic typhus fever (32 in Georgia and 29 in Texas).

A sharp increase was recorded in the death rate for 88 large cities in the United States, which was 12.2 per 1,000 population, as compared with 11.5 last week, 10.7 for the next earlier week, and a 3-year (1939–41) average of 10.8. Last year the death rate for this group of large cities did not reach 12.2 until the latter part of December.

Telegraphic morbidity reports from State health officers for the week ended October 10, 1942, and comparison with corresponding week of 1941 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 1937–41	Week ended		Median 1937–41	Week ended		Median 1937–41	Week ended		Median 1937–41
	Oct. 10, 1942	Oct. 11, 1941		Oct. 10, 1942	Oct. 11, 1941		Oct. 10, 1942	Oct. 11, 1941		Oct. 10, 1942	Oct. 11, 1941	
NEW ENG.												
Maine	0	0	1				6	50	8	0	0	0
New Hampshire	1	0	0				3	1	1	0	0	0
Vermont	0	0	0				20	0	5	0	0	0
Massachusetts	3	2	2				53	57	54	1	3	1
Rhode Island	3	1	0				7	5	4	1	0	0
Connecticut	0	0	2	3	6	1	10	24	3	2	0	0
MID. ATL.												
New York	9	17	12	[1] 15	[1] 3	[1] 7	76	76	65	16	3	3
New Jersey	1	2	7	7	12	8	29	24	24	0	0	0
Pennsylvania	6	12	18	4	1		60	86	86	4	2	1
E. NO. CEN.												
Ohio	18	11	25	4	6	4	18	23	19	2	0	1
Indiana	6	11	14	20	6	4	4	5	5	0	1	0
Illinois	10	20	20	4	8	8	18	13	18	5	1	1
Michigan [2]	8	7	10	10		1	24	57	54	2	1	2
Wisconsin	0	0	1	11	19	19	39	40	40	0	0	0
W. NO. CEN.												
Minnesota	2	3	4		2	1	4	3	3	1	0	0
Iowa	5	2	4	7			5	8	8	0	0	0
Missouri	4	7	7	4	1	2	11	14	3	0	0	0
North Dakota	3	2	2	8	7	1	11	18	4	0	0	0
South Dakota	3	12	2				3	2	2	3	1	0
Nebraska	2	2	2	2			11	2	2	0	0	0
Kansas	6	2	4	3	1	3	7	4	4	0	0	1
SO. ATL.												
Delaware	1	1	1				0	2	2	0	0	0
Maryland [3]	11	7	7	2	3	3	4	10	5	5	2	1
Dist. of Col	3	2	3		2		2	7	2	0	0	0
Virginia	39	37	64	107	114	45	11	24	9	4	1	2
West Virginia	10	5	16	6	11	8	1	49	5	1	0	0
North Carolina	90	59	99	2		1	5	34	31	2	1	1
South Carolina	48	50	20	195	200	168	7	76	2	0	3	0
Georgia	32	45	45	12	13	14	10	14	3	2	0	0
Florida	11	5	5		10	1	0	1	1	0	1	1
E. SO. CEN.												
Kentucky	16	16	28	1		4	2	7	12	1	2	1
Tennessee	8	23	34	15	8	8	6	28	15	0	1	1
Alabama	25	28	32	15	10	13	3	25	9	0	0	0
Mississippi [3]	23	17	17					0		1	0	0
W. SO. CEN.												
Arkansas	20	16	18	28	8	14	2	31	2	0	1	0
Louisiana	1	10	13	7	3	3	5	1	3	0	2	0
Oklahoma	10	14	16	31	44	38	3	7	5	0	0	0
Texas	61	43	43	458	361	170	15	11	11	0	0	0
MOUNTAIN												
Montana	2	2	1			2	6	11	12	1	0	0
Idaho	1	0	0	3		1	17	1	3	0	0	0
Wyoming	0	2	0	24	1		4	4	4	0	0	0
Colorado	18	9	9	31	50	11	8	18	10	0	0	0
New Mexico	0	0	3		2		0	4	8	0	0	0
Arizona	1	0	1	38	47	46	3	35	2	0	0	0
Utah [3]	0	0	0		1	1	113	8	7	0	0	0
Nevada	0	0					1	0		0	0	
PACIFIC												
Washington	5	0	0	1			69	9	9	1	0	0
Oregon	3	1	1	3	7	8	49	9	9	1	1	0
California	21	12	16	17	28	16	56	101	77	6	0	0
Total	550	517	630	1,098	995	705	821	1,039	939	62	27	27
40 weeks	9,924	10,396	15,438	85,868	495,495	163,687	470,869	829,533	351,834	2,733	1,614	1,614

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 10, 1942, and comparison with corresponding week of 1941 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended		Median 1937–41	Week ended		Median 1937–41	Week ended		Median 1937–41	Week ended		Median 1937–41
	Oct. 10, 1942	Oct. 11, 1941		Oct. 10, 1942	Oct. 11, 1941		Oct. 10, 1942	Oct. 11, 1941		Oct. 10, 1942	Oct. 11, 1941	
NEW ENG.												
Maine	0	4	0	3	10	9	0	0	0	0	3	3
New Hampshire	1	1	1	7	2	1	0	0	0	0	0	0
Vermont	5	0	1	5	1	7	0	0	0	0	0	0
Massachusetts	1	13	6	112	92	57	0	0	0	3	5	2
Rhode Island	0	2	0	9	7	3	0	0	0	0	0	0
Connecticut	2	5	1	23	18	18	0	0	0	4	1	3
MID. ATL.												
New York	20	79	43	133	90	104	0	0	0	10	16	17
New Jersey	13	25	9	44	39	38	0	0	0	3	7	7
Pennsylvania	10	42	18	102	94	120	0	0	0	13	13	15
E. NO. CEN.												
Ohio	4	21	12	122	100	126	0	0	0	6	12	16
Indiana	1	2	4	39	32	57	0	0	2	3	3	3
Illinois	35	25	25	103	75	159	0	0	0	16	8	17
Michigan [2]	5	31	31	61	74	114	0	1	0	3	5	6
Wisconsin	7	5	10	99	68	69	0	0	0	2	0	2
W. NO. CEN.												
Minnesota	2	19	19	40	43	53	0	0	0	0	0	1
Iowa	3	0	14	26	33	38	0	0	0	2	3	4
Missouri	7	2	2	36	25	41	0	2	0	9	11	11
North Dakota	2	1	0	4	18	12	0	0	0	0	0	1
South Dakota	0	1	1	21	13	12	1	0	0	0	3	1
Nebraska	5	0	1	7	16	5	0	0	0	0	1	1
Kansas	4	6	6	55	37	76	0	0	0	0	2	2
SO. ATL.												
Delaware	1	5	0	7	8	6	0	0	0	0	2	0
Maryland [2]	0	9	2	31	25	25	0	0	0	4	9	9
Dist. of Col	1	3	1	14	11	8	0	0	0	1	0	1
Virginia	1	11	2	50	39	34	0	0	0	6	62	14
West Virginia	2	5	4	62	38	46	0	0	0	6	10	7
North Carolina	11	8	3	110	57	72	0	0	0	4	5	6
South Carolina	3	8	1	8	13	11	0	0	0	3	3	5
Georgia	1	6	2	48	23	24	0	0	0	3	16	11
Florida	2	6	1	4	6	5	0	0	0	1	1	1
E. SO. CEN.												
Kentucky	2	8	6	26	53	53	1	0	0	10	17	17
Tennessee	3	16	3	67	42	42	1	0	0	5	12	12
Alabama	0	17	3	30	32	27	0	0	0	1	3	3
Mississippi [2]	2	6	2	15	17	17	0	0	0	3	4	4
W. SO. CEN.												
Arkansas	3	1	1	2	13	15	0	1	0	3	6	16
Louisiana	0	7	3	3	8	8	0	0	0	6	15	12
Oklahoma	0	2	4	22	13	28	0	1	1	2	4	15
Texas	7	5	5	35	29	32	0	0	0	9	-----	23
MOUNTAIN												
Montana	0	0	0	6	8	11	0	0	1	0	0	1
Idaho	0	0	0	10	12	11	0	0	0	1	0	0
Wyoming	0	1	0	0	9	9	1	0	0	0	0	0
Colorado	3	0	2	21	5	15	0	0	2	1	4	4
New Mexico	2	0	0	4	8	6	0	0	0	9	2	7
Arizona	1	0	0	6	3	4	0	0	0	5	1	1
Utah [2]	5	2	2	10	8	8	0	0	0	2	0	1
Nevada	0	0	-----	0	0	-----	0	0	-----	1	7	-----
PACIFIC												
Washington	2	6	6	17	12	22	0	0	0	0	2	3
Oregon	0	5	1	15	3	18	0	0	1	0	0	1
California	10	8	10	47	84	89	0	0	3	3	5	7
Total	189	429	403	1,721	1,466	1,654	4	5	33	163	283	344
40 weeks	3,024	7,274	7,274	96,437	96,798	124,297	644	1,184	8,374	5,513	6,938	10,434

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 10, 1942—Continued

Division and State	Whooping cough		Anthrax	Week ended October 10, 1942							
	Week ended			Dysentery			Encephalitis	Leprosy	Rocky Mountain spotted fever	Tularemia	Typhus fever
	Oct. 10, 1942	Oct. 11, 1941		Amebic	Bacillary	Unspecified					
NEW ENG.											
Maine	45	4	0	0	0	0	0	0	0	0	0
New Hampshire	0	13	0	0	0	0	0	0	0	0	0
Vermont	35	12	0	0	0	0	0	0	0	0	0
Massachusetts	156	99	0	0	1	0	1	0	0	0	0
Rhode Island	24	19	0	0	0	0	0	0	0	0	0
Connecticut	54	37	0	0	0	0	0	0	0	0	0
MID. ATL.											
New York	295	297	0	4	28	0	2	0	0	0	0
New Jersey	115	89	1	26	0	0	0	0	0	0	0
Pennsylvania	199	239	1	0	0	0	0	0	1	0	0
E. NO. CEN.											
Ohio	125	176	0	0	0	0	0	0	0	0	0
Indiana	23	6	0	0	0	0	0	0	0	0	0
Illinois	195	176	0	0	10	0	2	0	1	1	0
Michigan [2]	210	434	0	2	7	0	0	0	0	0	0
Wisconsin	151	191	0	0	0	0	0	0	0	0	0
W. NO. CEN.											
Minnesota	25	56	0	0	1	0	0	0	0	0	0
Iowa	17	31	0	0	0	0	0	0	0	0	0
Missouri	4	6	1	0	0	0	0	0	0	2	0
North Dakota	6	13	0	0	0	0	0	0	0	1	0
South Dakota	2	22	0	0	0	0	0	0	0	0	0
Nebraska	6	5	0	0	0	0	0	0	0	0	0
Kansas	16	29	0	0	0	0	2	0	0	0	0
SO. ATL.											
Delaware	0	3	0	0	0	0	0	0	0	0	0
Maryland [2]	75	36	0	0	0	12	0	0	1	0	0
Dist. of Col	16	17	0	0	0	0	0	0	0	0	0
Virginia	8	29	0	0	0	71	0	0	1	0	1
West Virginia	14	30	0	0	0	0	0	0	0	0	0
North Carolina	58	69	0	0	0	0	0	0	0	0	3
South Carolina	21	60	0	0	9	0	0	0	0	0	5
Georgia	10	10	0	1	0	0	0	0	0	1	32
Florida	7	5	0	0	1	0	0	0	0	0	6
E. SO. CEN.											
Kentucky	9	91	0	0	10	0	0	0	0	0	0
Tennessee	18	49	0	1	0	6	1	0	0	1	1
Alabama	24	6	0	0	0	0	0	0	0	0	4
Mississippi [2]	----	0	0	0	0	0	0	0	0	0	2
W. SO. CEN.											
Arkansas	10	2	0	0	6	0	0	0	0	1	0
Louisiana	0	3	0	1	3	0	0	1	0	0	2
Oklahoma	4	4	0	0	0	0	0	0	0	0	0
Texas	94	52	0	7	98	0	1	0	0	0	29
MOUNTAIN											
Montana	37	8	0	0	0	0	1	0	0	0	0
Idaho	0	2	0	0	0	0	0	0	0	0	0
Wyoming	3	4	0	0	0	0	0	0	0	0	0
Colorado	30	40	0	0	0	0	0	0	0	0	0
New Mexico	3	24	0	0	4	0	0	0	0	0	0
Arizona	6	16	0	0	0	17	0	0	0	0	0
Utah [2]	14	28	0	0	0	0	0	0	0	0	0
Nevada	2	6	0	0	0	0	0	0	0	1	0
PACIFIC											
Washington	23	42	0	0	0	0	5	0	0	0	0
Oregon	7	45	0	1	0	0	0	0	0	0	1
California	154	197	1	2	11	0	1	0	0	1	2
Total	2,350	2,832	4	45	189	106	16	1	4	9	88
40 weeks	141,736	168,264	----	----	----	----	----	----	----	----	----

[1] New York City only.
[2] Period ended earlier than Saturday.

WEEKLY REPORTS FROM CITIES

City reports for week ended September 26, 1942

This table lists the reports from 90 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
Atlanta, Ga	3	0	3	0	2	0	1	0	1	0	0	3
Baltimore, Md	0	0	2	0	1	9	11	2	9	0	0	52
Barre, Vt	0	0	------	0	0	0	0	0	0	0	0	0
Billings, Mont	0	0	------	0	0	0	1	0	1	0	0	1
Birmingham, Ala	0	0	2	0	1	0	4	0	3	0	0	1
Boise, Idaho	0	0	------	1	1	0	0	0	0	0	0	0
Boston, Mass	1	0	------	0	5	1	15	0	19	0	6	41
Bridgeport, Conn	0	0	------	0	0	0	1	0	0	0	1	0
Brunswick, Ga	0	0	------	0	0	0	0	0	0	0	0	0
Buffalo, N. Y	0	0	------	0	3	0	9	0	2	0	0	13
Camden, N. J	0	0	------	0	0	0	0	0	1	0	1	6
Charleston, S. C	0	0	5	0	0	0	2	2	0	0	0	3
Charleston, W. Va	0	0	1	0	0	0	0	0	1	0	0	0
Chicago, Ill	11	0	5	0	12	0	10	10	14	0	1	119
Cincinnati, Ohio	0	0	------	0	2	0	1	1	7	0	0	3
Cleveland, Ohio	5	0	1	0	2	0	6	3	18	0	0	44
Columbus, Ohio	0	0	------	0	1	0	1	0	2	0	0	10
Concord, N. H	0	0	------	0	0	0	0	0	0	0	0	0
Cumberland, Md	0	0	------	0	0	0	0	0	0	0	0	0
Dallas, Tex	3	0	------	0	2	0	4	0	3	0	0	5
Denver, Colo	1	0	12	0	1	0	2	1	1	1	0	12
Detroit, Mich	1	0	------	0	5	1	4	5	13	0	1	116
Duluth, Minn	0	0	------	0	0	0	1	1	2	0	0	10
Fall River, Mass	1	0	------	0	0	0	0	0	1	0	0	6
Fargo, N. Dak	0	0	------	0	1	0	2	1	1	0	0	0
Flint, Mich	0	0	------	0	0	0	2	2	0	0	0	7
Fort Wayne, Ind	0	0	------	0	0	0	1	0	0	0	0	0
Frederick, Md	0	0	------	0	0	0	0	0	0	0	0	0
Galveston, Tex	0	0	------	0	0	0	1	0	0	0	0	0
Grand Rapids, Mich	0	0	------	0	2	0	0	0	0	0	0	0
Great Falls, Mont	0	0	------	0	0	0	0	0	0	0	0	2
Hartford, Conn	1	0	------	0	0	0	0	3	0	0	0	12
Helena, Mont	0	0	------	0	0	0	0	0	0	0	0	1
Houston, Tex	6	0	------	0	0	0	3	0	0	0	0	1
Indianapolis, Ind	0	0	------	0	2	0	10	0	7	0	0	7
Kansas City, Mo	0	0	------	0	0	0	2	0	7	0	1	2
Kenosha, Wis	0	0	------	0	0	0	1	0	1	0	0	6
Little Rock, Ark	1	0	------	0	0	0	0	0	0	0	0	3
Los Angeles, Calif	2	0	11	0	9	0	4	1	9	0	0	11
Lynchburg, Va	4	0	------	0	0	0	0	0	0	0	0	1
Memphis, Tenn	0	0	------	0	0	0	5	0	0	0	2	2
Milwaukee, Wis	0	0	------	0	4	0	2	0	11	0	0	51
Minneapolis, Minn	0	0	------	0	1	0	1	2	10	0	0	19
Missoula, Mont	0	0	------	0	0	0	0	0	0	0	0	3
Mobile, Ala	2	0	------	1	0	0	0	0	0	0	1	0
Nashville, Tenn	0	0	------	0	0	0	2	0	3	0	0	2
Newark, N. J	0	0	1	0	6	0	0	2	4	0	0	14
New Haven, Conn	0	0	------	0	1	0	0	0	0	0	0	14
New Orleans, La	0	0	1	0	1	0	3	0	2	0	1	0
New York, N. Y	5	0	6	0	9	1	36	5	33	0	7	139
Omaha, Nebr	3	0	------	0	0	0	1	0	1	0	0	0
Philadelphia, Pa	2	0	1	1	11	0	26	0	16	0	2	95
Pittsburgh, Pa	0	0	------	0	4	0	5	2	2	0	0	12
Portland, Maine	0	0	------	0	1	0	1	0	1	0	0	17
Providence, R. I	0	0	------	0	0	0	0	0	3	0	0	31

City reports for week ended September 26, 1942—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
Pueblo, Colo.	0	0	------	0	0	0	0	0	0	0	0	4
Racine, Wis.	0	0	------	0	2	0	0	0	2	0	0	3
Raleigh, N. C.	0	0	------	0	0	0	0	0	3	0	0	5
Reading, Pa.	0	0	------	0	0	0	1	0	0	0	0	5
Richmond, Va.	0	0	2	0	0	0	1	0	4	0	0	3
Roanoke, Va.	0	0	------	0	0	0	0	0	0	0	0	0
Rochester, N. Y.	0	0	------	0	0	0	1	1	1	0	1	20
Sacramento, Calif.	0	0	------	0	1	0	1	0	1	0	0	6
Saint Joseph, Mo.	0	0	------	0	0	0	5	0	0	0	0	0
Saint Louis, Mo.	1	0	------	0	2	0	5	1	2	0	0	2
Saint Paul, Minn.	0	0	------	0	0	0	3	0	1	0	0	18
Salt Lake City, Utah	0	0	------	1	9	0	1	0	1	0	0	4
San Antonio, Tex.	0	0	------	0	0	0	1	0	0	0	0	3
San Francisco, Calif.	0	0	------	0	7	0	6	0	3	0	0	6
Savannah, Ga.	0	0	------	0	0	0	1	0	1	0	0	1
Seattle, Wash.	1	0	------	0	2	0	1	1	2	0	1	6
Shreveport, La.	5	0	------	0	0	0	0	0	1	0	1	0
South Bend, Ind.	0	0	------	0	2	0	0	0	0	0	0	0
Spokane, Wash.	0	0	------	0	5	0	2	0	8	0	0	0
Springfield, Ill.	0	0	------	0	0	0	1	0	1	0	0	3
Springfield, Mass.	0	0	------	0	0	0	2	0	17	0	0	0
Superior, Wis.	0	0	------	0	0	0	0	0	0	0	0	3
Syracuse, N. Y.	0	0	------	0	0	0	4	0	0	0	0	12
Tacoma, Wash.	0	0	------	0	7	0	0	0	1	0	0	2
Tampa, Fla.	0	0	------	0	0	0	2	0	0	0	0	0
Terre Haute, Ind.	1	0	------	0	0	0	0	0	0	0	0	0
Topeka, Kans.	0	0	------	0	0	0	1	0	1	0	0	0
Trenton, N. J.	0	0	------	0	4	0	0	0	0	0	0	0
Washington, D. C.	2	0	------	0	1	0	3	1	14	0	1	17
Wheeling, W. Va.	0	0	------	0	0	0	0	0	0	0	0	0
Wichita, Kans.	0	0	------	0	0	0	3	1	1	0	0	14
Wilmington, Del.	0	0	------	0	0	0	3	1	0	0	0	1
Wilmington, N. C.	0	0	------	0	0	0	0	0	0	0	0	4
Winston-Salem, N. C.	0	0	------	0	0	0	3	0	3	0	0	2
Worcester, Mass.	0	0	------	0	0	0	3	0	8	0	0	23

Dysentery, amebic—Cases: Birmingham, 1; Chicago, 1; New York, 1; Sacramento, 1.
Dysentery, bacillary—Cases: Atlanta, 1; Baltimore, 7; Chicago, 4; Detroit, 2; Los Angeles, 4; Minneapolis, 1; Nashville, 1; New York, 32; Philadelphia, 1; Richmond, 8; St. Paul, 1; San Francisco, 2.
Rocky Mountain spotted fever—Cases: Richmond, 1; St. Louis, 1.
Typhus fever—Cases: Atlanta, 1; Baltimore, 1; Birmingham, 4; Charleston, S. C., 2; Galveston, 1; Los Angeles, 1; Mobile, 2; Nashville, 1; New Orleans, 1; San Antonio, 2; Savannah, 2; Shreveport, 1; Winston-Salem, 1.

Rates (annual basis) per 100,000 population for the group of 90 cities included in the preceding table (estimated population, 1942, 34,134,198)

Period	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
		Cases	Deaths						
Week ended Sept. 26, 1942	9.47	8.10	0.61	20.16	35.59	43.54	0.15	4.28	162.99
Average for week 1937–41	12.66	7.26	1.70	[1] 21.15	42.15	50.79	0.31	8.49	164.73

[1] Median.

PLAGUE INFECTION IN CALIFORNIA

Plague infection has been reported proved in specimens collected in California as follows:

Eldorado County: August 4, 1942, in pools of 31 fleas from 9 golden mantled ground squirrels, *C. lateralis* sp., taken 1 mile south and 1 mile west of Meyers, and 28 fleas from 16 chipmunks, *Eutamias* sp., taken 3½ miles south of Meyers.

Los Angeles County: July 23, in tissue from 1 ground squirrel, *C. beecheyi*, taken 1 mile west of Gorman.

Modoc County: July 3, in a pool of 22 fleas from 16 chipmunks, *Eutamias* sp., taken in the Modoc National Forest, at Likely Saw Mill, 9 miles west of Likely.

Monterey County: August 5, in a pool of 50 fleas from 6 ground squirrels, *C. beecheyi*, taken from Fort Ord Military Reservation, Area E; August 7, in a pool of 155 fleas from 11 ground squirrels, same species, taken from the north portion of Area E, on the reservation.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague (rodent).—Rats proved positive for plague have been found in Paauhau Area, Hamakua District, Island of Hawaii, T. H., as follows: August 17, 1942, 1 rat; August 18, 2 rats; August 19, 1 rat; August 25, 1 rat; August 29, 1 rat.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended September 12, 1942.—During the week ended September 12, 1942, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis					5					5
Chickenpox				15	32	8	11	5	31	102
Diphtheria		22	2	8	1	5	1	1		40
Dysentery				8	3				5	16
German measles					3		7		4	14
Influenza					1				2	3
Lethargic encephalitis						2	1			3
Measles				13	13	6	23	2	4	61
Mumps		8	1	8	99	12	9	2	66	205
Pneumonia		1			5				4	10
Poliomyelitis	1	21	3	11	8	5	1	2	6	58
Scarlet fever		2	7	35	46	10	12	16	27	155
Trachoma									1	1
Tuberculosis			2	46	61			7	10	126
Typhoid and paratyphoid fever		1	3	6	4			2		16
Undulant fever						1			2	3
Whooping cough			1	532	81	20	8	6	14	662
Other communicable diseases		4		2	239	43	2	1	3	294

CUBA

Habana—Communicable diseases—4 weeks ended September 20, 1942.—During the 4 weeks ended September 20, 1942, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	13		Scarlet fever	3	
Malaria	8		Tuberculosis	9	1
Measles	15		Typhoid fever	22	1
Poliomyelitis	19	1			

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

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

Cholera

China—Shanghai.—During the week ended July 11, 1942, 1 case of cholera was reported in Shanghai, China.

Plague

Senegal—Tivaouane.—During the period September 1–10, 1942, 1 fatal case of plague was reported in Tivaouane, Senegal.

Typhus Fever

Hungary.—During the week ended September 5, 1942, 5 cases of typhus fever were reported in Hungary.

Morocco.—During the week ended September 12, 1942, 29 cases of typhus fever were reported in Morocco.

Tunisia.—During the period August 21–31, 1942, 101 cases of typhus fever were reported in Tunisia.

Turkey.—During the week ended September 19, 1942, 9 cases of typhus fever were reported in Turkey.

Yellow Fever

Ivory Coast—Bobo Dioulasso.—On September 21, 1942, 1 suspected case of yellow fever was reported in Bobo Dioulasso, Ivory Coast.

Sudan (French)—Region of Bafoulabe.—On September 18, 1942, 1 death from suspected yellow fever was reported in the Region of Bafoulabe, French Sudan.

AN INDEX TO THE LITERATURE OF THE SIPHONAPTERA OF NORTH AMERICA [1]

A Review

The geographical area covered by this index to the literature on fleas is the North American continent north of Mexico, and also Greenland.

In addition to the species catalog, which occupies the main body of the text, there is included a synopsis of the families, subfamilies, and genera, a guide to type localities, a bibliography of over 300 references, and an index which includes all synonyms and lists each species under each specific and generic name to which it has been referred.

In the catalog proper the 7 families and 12 subfamilies are listed in their systematic order and a rather extensive synonymy is given for each. Following this, the genera are entered alphabetically, and the species and subspecies are entered alphabetically under each genus. Under each generic name are given the genotype and the generic synonymy. Under each species are listed all references relating taxonomically to that species, with host and locality data. The reference to the original description shows whether the species was described from the male, the female, or both sexes, and gives the type host and type locality. Synonyms are given in their original terminology under the name of the species with which they are now considered synonymous. Host names are given as originally cited. All such names needing correction or interpretation are dealt with in a section on host names and synonymy following each genus.

[1] Index to the literature of Siphonaptera of North America, by Wm. L. Jellison and Newell E. Good, National Institute of Health Bulletin No. 178. Government Printing Office, Washington, 1942. Price 25 cents.