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THE AUTOMATIC CONTROL OF EXPOSURE IN PHOTO-FLUOROGRAPHY[1]

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I. INTRODUCTION

The photofluorographic examination of the chest constitutes one of the most important methods for the early recognition of pulmonary tuberculosis in large population groups. It has been of inestimable value to the armed services in the selection of inductees and promises to be equally useful in the examination of civilian groups.

The photofluorographic process, to be entirely satisfactory, requires the fulfillment of certain criteria not usually encountered in general radiography. For example, the procedure must be conducted rapidly in order to permit the examination of large numbers of subjects in a reasonable interval of time, and, in addition, it must be extremely simple in order to reduce to a minimum the operating personnel. The number of repeat examinations due to technical failure of any kind obviously must be small, and, finally, the standard of uniformity between films must be maintained at an extremely high level if the films are to yield a maximum of diagnostic information. It will be evident that the accuracy of a radiologist may be considerably impaired by the periodic appearance of technically poor films.

In the past, a satisfactory fulfillment of these criteria has been difficult, if not impossible, to achieve. However, this situation is likely to be substantially corrected before long by the application to photofluorography of a recently developed instrument called the photoelectric timing mechanism or phototimer (*1*). This device completely automatizes the photofluorographic process, so that the technician is required merely to place the subject before the X-ray machine and to close the exposure switch; time-wasting adjustments of equipment are entirely eliminated. Furthermore, the photoelectric timing

[1] The work described in this paper was done under a contract recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and the University of Chicago.

mechanism, by its inherent design, terminates X-ray exposure at the instant when a film has received the proper quantity of radiation to insure correct exposure. Excellent uniformity of radiographic quality thereby is assured, and repeat examinations due to technical failure are infrequent.

As described in previous communications, the photoelectric timing mechanism, or phototimer, consists primarily of a multiplier phototube and a condenser-thyratron-relay system. A schematic diagram of the fundamental circuit arrangement is shown in figure 1. When the exposure switch, *Sw*, of the X-ray machine is closed, the X-ray

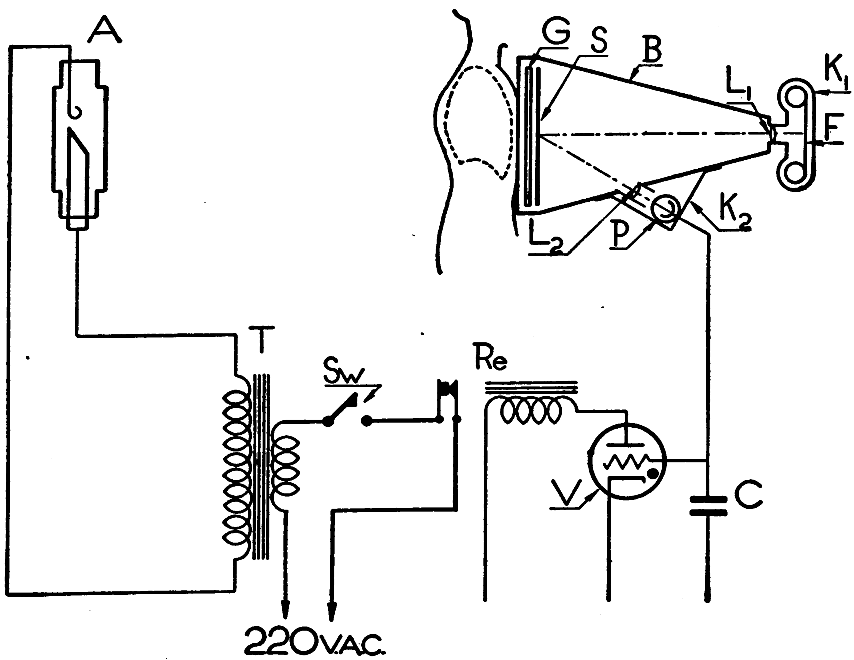

FIGURE 1. Fundamental circuit of the photoelectric timing mechanism applied to a photofluorograph. *A*, X-ray tube; *B*, pyramid of photofluorograph; *G*, grid; *S*, fluorescent screen; L_1, lens of photographic camera, K_1; *F*, photofluorographic film; L_2, lens of phototube camera, K_2; *P*, phototube; *C*, condenser; *T*, thyratron; *Re*, relay; *Sw*, exposure switch of X-ray machine; *T*, X-ray transformer.

tube, *A*, is energized through the transformer, *T*, and emits an X-ray beam which passes through the subject standing in front of the pyramid, *B*, of the photofluorograph. The radiation is filtered of undesirable scattered components by the grid, *G*, and then impinges on the fluorescent screen, *S*. Some of the resulting light from the fluorescent screen is focused by the lens, L_1, on the film, *F*, in the photographic camera, K_1; simultaneously, another part is focused by the lens, L_2, on the phototube, *P*, in the phototube camera, K_2. In response to this latter radiation the phototube conducts a small electric current whose magnitude is proportional to the radiation intensity. This current is collected by the condenser, *C*, and produces across its plates a potential which becomes progressively greater as the amount of collected charge increases. When this potential reaches a certain level the thyratron, *T*, ionizes and activates the relay, *Re*. This causes the relay's contacts to open and to break the X-ray circuit, thereby terminating the photofluorographic exposure. By properly adjusting the sensitivity of the phototube, *P*, the size of the condenser, *C*, and the potential at which the thyratron, *T*, ionizes, the phototimer can be made to terminate the X-ray exposure at exactly the instant at which optimum diagnostic quality of the film occurs.

II. THEORETICAL DISCUSSION OF THE PHOTOELECTRIC TIMING MECHANISM

It has been previously shown (*2*) that a roentgenographic film exhibits optimum diagnostic quality when the average density of the significant portions of the film has a value of 0.9. It has also been shown that the conditions under which this criterion is fulfilled are given by the equation

$$\overline{G}ts_e=1 \qquad (1)$$

where $\overline{G}$ is the average effective intensity of the radiation exposing the film,

t is the exposure time, and

s_e is the speed of the film.

It will be observed that equation (1) indicates that when the intensity of the exposing radiation is low a relatively long exposure time is required; when the intensity of the radiation is high, the exposure time must be short. Also, relatively long exposure times are required when films of slow speed are employed, whereas short exposure times are sufficient when fast films are used. This is mentioned only to illustrate that equation (1) specifies in quantitative terms what has been well known qualitatively to radiologists for many years.

The current conducted by a phototube in response to the radiation falling on its sensitive surface is proportional to the intensity of the exposing radiation. By focusing a representative portion of the fluorescent image (see fig. 3) on the sensitive surface of the phototimer's phototube, the current response of the tube will be proportional to the average intensity of the radiation emitted by the fluorescent screen, and, therefore, proportional to the average effective intensity of the radiation falling on the photofluorographic film; that is,

$$i=k\overline{G} \qquad (2)$$

where i is the phototube current, and

k is a proportionality constant whose value is a function of phototube sensitivity.

Since the spectral distribution or quality of the fluorescent radiation emitted by the screen does not change appreciably with the quality of the activating X-radiation, equation (2) is valid regardless of the thickness of the patient, the presence or absence of a stationary focused grid, and the kilovoltage and milliamperage of the X-ray machine.

The charge, Q, on the condenser, C, at the instant at which the photofluorographic exposure is terminated is given by the equation

$$Q=CV \qquad (3)$$

where C is the capacity of the condenser, and

V is the potential of the condenser produced by the collected phototube current.

The charge, Q, is also equal to the product of the phototube current, i, by the exposure time, t; that is,

$$Q=it \qquad (4)$$

When Q is eliminated from equations (3) and (4),

$$it=CV \qquad (5)$$

and when i is eliminated from equations (2) and (5)

$$\frac{\overline{G}tk}{CV}=1 \qquad (6)$$

It is evident from equation (6) that equation (1) will be satisfied, and, accordingly, the photofluorographic film correctly exposed, when

$$s_e=\frac{k}{CV} \qquad (7)$$

That is, by properly adjusting the sensitivity of the phototube, the capacity of the condenser, C, and the potential, V, at which the thyratron ionizes to correspond with the speed of the photofluorographic film being used, the phototimer will terminate X-ray exposure at the instant when sufficient radiation has been delivered to the film to insure optimum diagnostic quality.

III. DESIGN OF THE PHOTOELECTRIC TIMING MECHANISM

As developed for photofluorography, the photoelectric timing mechanism comprises three units: a phototube camera, a chassis-unit including the condenser-thyratron circuit, and a contactor or relay. A diagram of the phototube camera is shown in figure 2. The unit consists of a semirectangular box including the lens, L_2, and the phototube, P. The lens is a simple biconvex type having a focal length of 5 cm. and a diameter of 1.5 inches. The phototube is the R. C. A. 931 multiplier type. The lens and phototube are arranged in the camera in such a position that the portion of the roentgenographic image of the chest shown in dotted outline in figure 3 is projected on the sensitive surface of the tube. It was decided to scan this portion of the fluorescent screen because the upper lung fields are particularly significant from the standpoint of tuberculous pathology. Also, this portion of the lung fields excludes most of the heart shadow; therefore, variation in the size of the heart among different individuals will not cause variation in the operative characteristics of the phototimer. Furthermore, when this portion of the

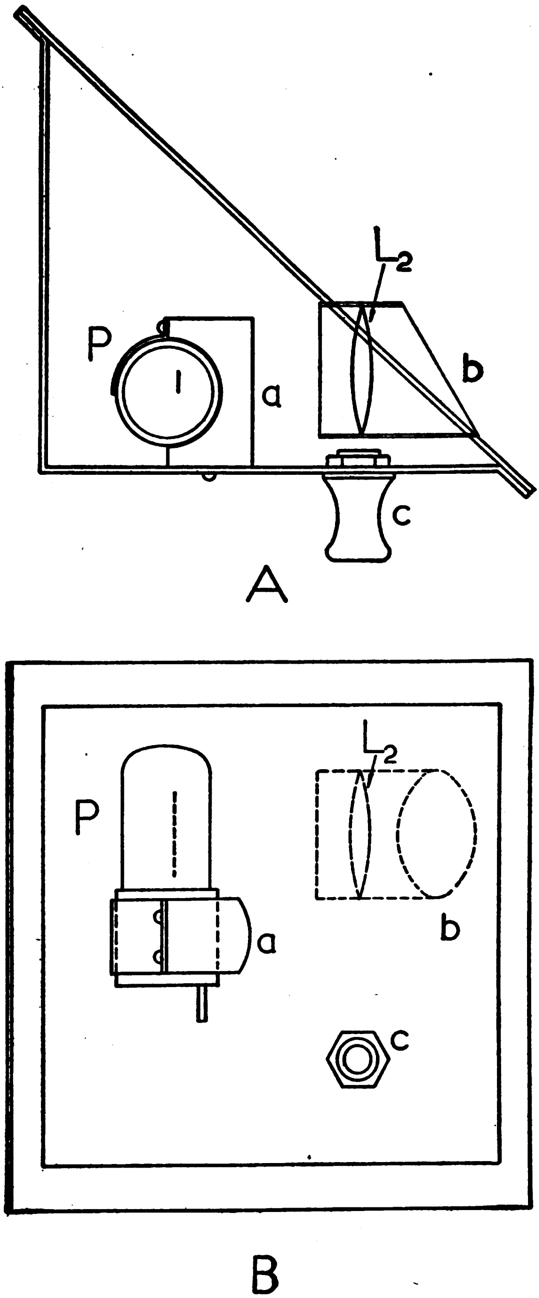

FIGURE 2. Phototube camera. *A*, side elevation; *B*, floor plan; *P*, phototube; *a*, phototube mounting, L_2, lens; *b*, lens mounting; *c*, cable receptacle.

screen is scanned, the adjacent axillae and arms make it unlikely that radiation from an uncovered portion of the screen will be focused on the phototube, should the patient be improperly centered from side to side, and, finally, quantitative measurements reveal that the intensity of the light falling on the phototube is not appreciably affected by positioning the subject a few centimeters above or below the optimum level.

A schematic diagram of the entire phototimer circuit is shown in figure 4. Potentials for the various electrodes of the multiplier phototube, P, are supplied by the step-up transformer, T_1, the rectifier tube, V_2, the condenser, C_3, the resistor network, R_1, and the variable resistor, R_4. These potentials are stabilized against fluctuations in line voltage by the gas triode, V_1, and the resistors, R_2 and R_3. The sensitivity of the phototube is controlled by the resistor, R_4. This device may be conveniently called the film speed control since its correct position depends on the speed or sensitivity of the film being used in the photofluorograph.

As in previous phototimer circuits, the ninth dynode of the phototube, P, constitutes the control electrode of the circuit. The photocurrent from this electrode is directed to a condenser-thyratron system, comprising the condensers, C_1 and C_2, and the thyratron, V_4, a cold-cathode type. The plate of the thyratron, V_4, is coupled through the resistors, R_5 and R_6, to the grids of two heavy-duty thyratrons, V_8 and V_9, whose plates in turn are in series with the two field coils of the relay, Re_1. The X-ray tube of the photofluorograph is energized by the main contacts of this relay, and accordingly these contacts must be capable of conducting 50 to 100 amperes.

Because the intensity of the radiation falling on the phototube, P, is extremely small, the photocurrent delivered to the condenser-thyratron circuit is also small (a few microamperes). To prevent loss of photocurrent through leakage, the thyratron, V_4, is of the low grid-current type. Such a tube, however, does not have the capacity to activate the field coils of the relay, Re_1, and accordingly the heavy-duty thyratrons, V_8 and V_9, are interposed in the circuit. The thyratron, V_4, could control the relay, Re_1, through a small intermediate relay rather than through these additional thyratrons, but a mechanical device of this sort introduces a considerable time lag in the operation of the phototimer, so that films of thin subjects might be as much as 50 percent overexposed. The thyratrons, V_8 and V_9, on the other hand, operate almost instantaneously; consequently the time lag of the phototimer does not exceed one-sixtieth of a second. Most of this lag is introduced by the relay, Re_1, due to its mechanical action. Such a lag, however, is of little significance since photofluorographic exposures are many times one-sixtieth of a second, and such an added exposure is of no importance. If, in the future, exposure times become

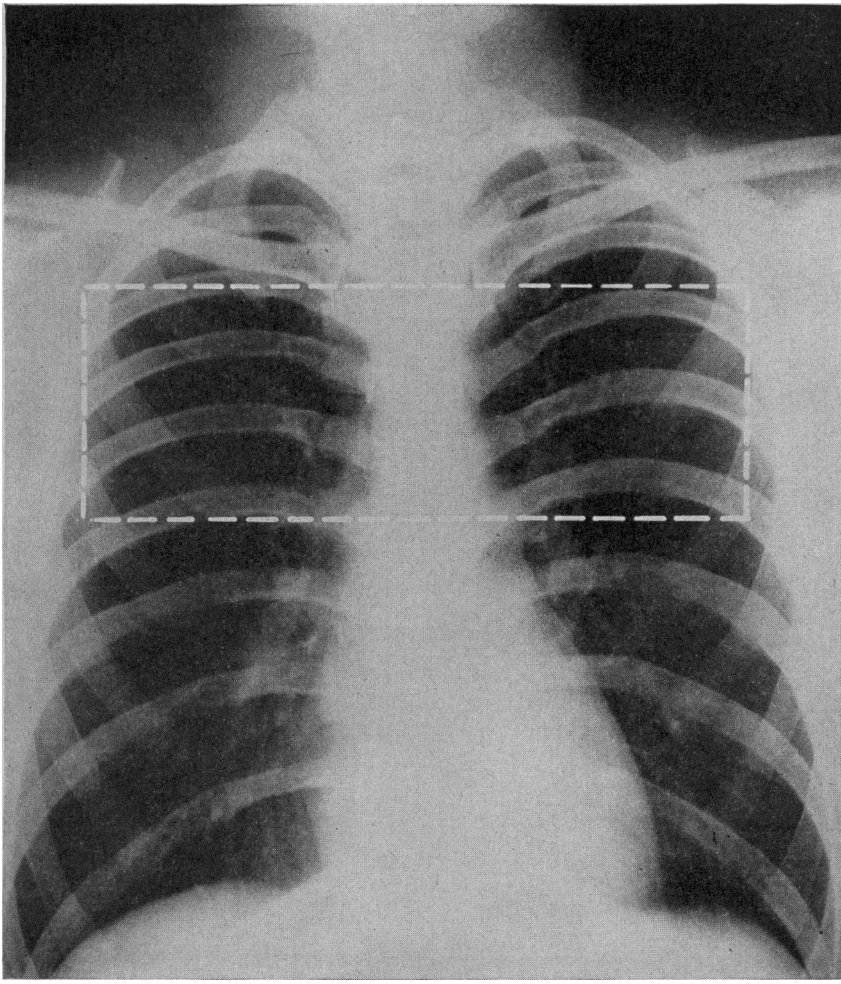

FIGURE 3.—Roentgenogram of the chest indicating in dotted outline the portion of the photofluorographic image that is projected on the light-sensitive surface of the phototube.

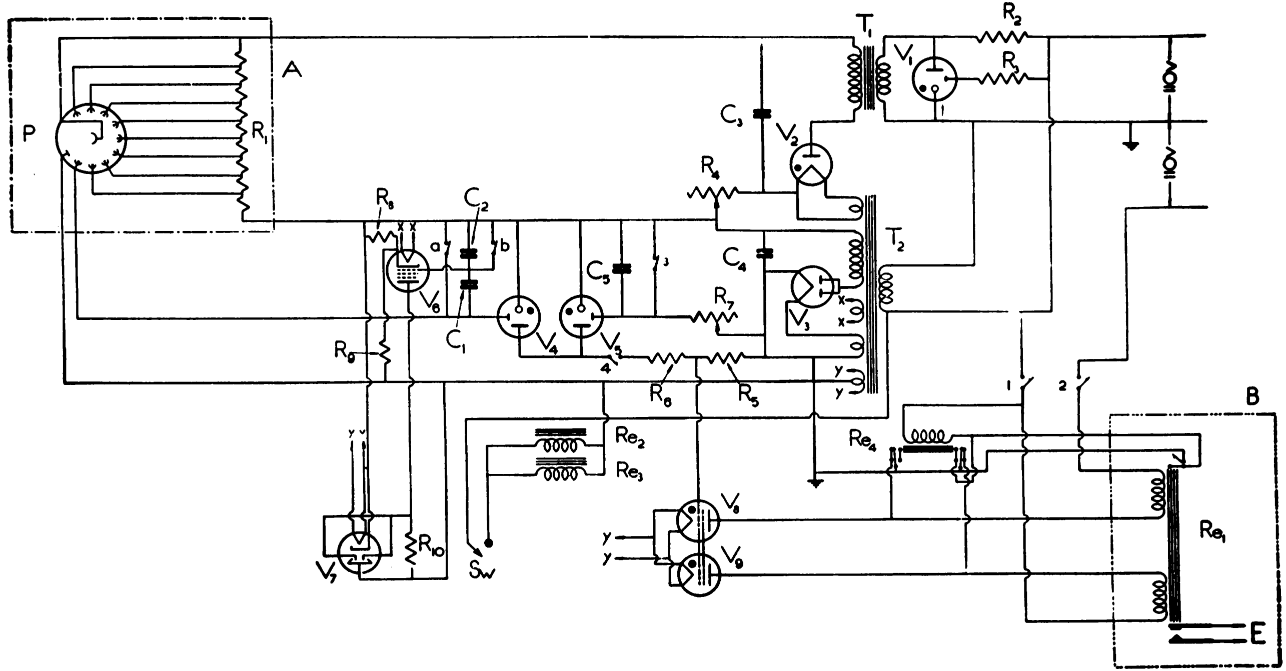

Figure 4.—Schematic diagram of complete phototimer circuit. A, phototube camera; B, contactor unit; E, leads which parallel main contactor of X-ray machine; P, 931 multiplier phototube; V_1, V_4 and V_5, OA4–G gas triodes; V_2, 2×2/879 rectifier; V_3, 5W4–GT rectifier; V_6, 6J7–GT radiotron; V_7, 6AF6–G electron indicator tube; V_8 and V_9, FG–98A thyratrons; R_1, nine 0.1 meg. resistors; R_2, 1000 ohm, 25 watt resistor; R_3, 50,000 ohm resistor; R_4, 0.5 megohm potentiometer; R_5, 10,000 ohm resistor; R_6, 20,000 ohm resistor; R_7, ten 1.0 meg. resistors; R_8, 5000 ohm resistor; R_9, 75,000 ohm resistor; R_{10}, 0.5 meg. resistor; C_1, 0.02 mfd. condenser; C_2 and C_5, 0.25 mfd. condensers; C_3, 1.0 mfd., 1500 volt condenser; C_4, 16 mfd., 250 volt condenser; T_1 and T_2, transformers; Re_1, Re_2, Re_3 and Re_4, relays.

appreciably less than at present, the lag can be considerably reduced by the replacement of the relay, Re_1, by electronic ignitron tubes.

It has been noted that the relay, Re_1, has two field coils. This deviation from standard design was necessitated by the fact that a thyratron, when operated on alternating current, conducts only during the positive phase of the cycle. If the relay were operated with a single thyratron through the customary single field coil, the coil would require a relatively large amount of energy for its activation; furthermore, the device would be noisy and would tend to introduce additional time lag. These difficulties are effectively overcome by the double field coil, energized by two thyratrons, and connected to its power supply in such a way that one coil will be energized during one half of the cycle and the other during the second half. The two coils collectively cause the relay to behave as a single-coil type operated in a conventional manner.

When the field coil of a relay is energized, the current consumed by the coil is relatively large until the contacts close. To spare the thyratrons, V_8 and V_9, of this overload, the relay, Re_4, is employed. This device short-circuits the thyratrons until the relay, Re_1, is closed and places these tubes in circuit only when the field current is at a minimum.

Parallel to the thyratron V_4 is another thyratron, V_5, in whose grid circuit is the resistor-condenser network comprising the variable resistor, R_7, and the condenser, C_5. This circuit constitutes a variable time-limiting device which terminates automatically the X-ray exposure at the maximum exposure limit of the X-ray tube, should the phototube circuit not have already done so. Occasionally, when extremely heavy patients are being filmed, an exposure time longer than the limit of the X-ray tube will be required to produce a film of optimum diagnostic quality. This safety circuit prevents X-ray tube damage in these cases.

Another safety device is the electron indicator tube, V_7. This tube provides a simple means for checking from time to time the performance of the phototimer. When the instrument is functioning satisfactorily, the angle subtended by the tube is 0° before the exposure is begun, and approximately 90° when it is completed. Variation from these readings indicates faulty operation. The indicator tube, V_7, is controlled by the phototube, P, through the condenser network, C_1 and C_2, and the amplifier tube, V_6.

The potentials for the thyratrons, V_4 and V_5, the tubes, V_6 and V_7, and the anode of the phototube, P, are obtained through a 110-volt winding of the transformer, T_2, the rectifier tube, V_3, and the condenser, C_4. The transformer, T_2, also supplies the various filament potentials of the circuit.

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The phototimer is controlled by the relay, Re_2, having the normally closed contacts, *a* and *b*, and the relay, Re_3, having the normally open contacts, 1, 2, and 4, and the normally closed contact, 3. When the exposure switch, *Sw*, is closed the relays, Re_2 and Re_3, are activated, causing contacts, 1, 2, and 4 to close, and contacts *a*, *b*, and 3 to open. At this instant the potentials of the thyratrons, V_4 and V_5, are such that these tubes are nonconducting and consequently the grids of the thyratrons, V_8 and V_9, are essentially at zero potential relative to their filaments. These latter tubes, therefore, ionize and cause the field coil of the relay, Re_1, to be energized. The contacts of the relay thereby are closed, the X-ray tube energized, and the X-ray exposure begun. The current developed by the phototube, *P*, in response to the radiation impinging on its sensitive surface, progressively charges the condensers, C_1 and C_2, during the exposure. When the sum of the potentials of these condensers reaches a predetermined level, the thyratron, V_4, ionizes, and a negative potential is developed across the resistors, R_5 and R_6. The thyratrons, V_8 and V_9, consequently become nonconductive, the relay, Re_1, is de-energized, and the X-ray exposure terminated. Should the exposure required for optimum diagnostic quality be longer than that which the X-ray tube will tolerate, the thyratron tube V_5 will ionize at the maximum time limit of the tube and terminate the exposure in a similar manner to that described for the thyratron V_4.

When the exposure switch, *Sw*, is opened, relays, Re_2 and Re_3, are de-energized, contacts 1, 2, and 4 are opened, and contacts *a*, *b*, and 3 are closed. This discharges the condensers, C_1, C_2, and C_5, and de-energizes the thyratrons, V_4 or V_5. The phototimer thereby is automatically set up for the next exposure.

IV. INSTALLATION AND OPERATION

The installation of the photoelectric timing mechanism involves three procedures: 1, the mounting of the phototube camera; 2, the wiring of the instrument to the X-ray machine; and 3, the adjustment of the controls, R_4 and R_7.

The phototube camera is mounted on the lower surface of the photofluorographic pyramid in such a position that its lens is 15 inches from the fluorescent screen. An opening in the pyramid approximately 3 inches in diameter permits light from the screen to enter the lens. The camera is focused by moving the lens within its tubular mounting. This procedure may be facilitated by substituting in the camera a dummy phototube for the real tube, the former having a lumarith window at the position of tube's sensitive surface. A 14 x 17 roentgenogram, backed by an illuminator and placed at the level of the fluorescent screen, will serve as a convenient test object.

The wiring of the phototimer to the X-ray machine presents no special problem.

The correct position of the resistor, R_7, is that at which the maximum exposure time which may be obtained corresponds to the time limit tolerated by the X-ray tube. To adjust the film speed control, R_4, it is necessary to make a series of chest films taken with the control in several different positions. When the films are developed, the film of optimum quality is chosen and the control rotated to that position at which this optimal film was exposed. Once this procedure is completed, further adjustments are necessary only when a new brand of film is employed.

The operation of a phototimer-equipped photofluorograph is extremely simple. The X-ray machine is turned on and suitable kilovolt and milliampere settings chosen (90 kv. (peak) and 200 ma. are satisfactory). To make an exposure one merely closes the exposure switch; the phototimer controls the remainder of the operation automatically. The measurement of chest thickness, the calculation of exposure factors, and the adjustment of X-ray kilovoltage, milliamperage, and exposure time are entirely eliminated. The phototimer, by providing automatic control of exposure time, supplants the customary mechanical timer in the X-ray circuit.

V. FIELD EXPERIENCE

A short time ago a phototimer similar to that described in the preceding paragraphs was installed on a photofluorograph belonging to the United States Public Health Service. The unit has been operating in the Washington area and at the time of this writing has performed approximately 15,000 examinations. It has been found that automatic timing reduces by 50 percent the personnel required to operate a photofluorograph. Furthermore, the physicians reading the photofluorographic films report a marked uniformity in film quality. This uniformity, they state, not only improves their diagnostic skill but also reduces considerably the fatigue experienced when large numbers of films are examined.

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THE SUCCESSFUL TREATMENT OF GRANULOCYTOPENIA AND LEUKOPENIA IN RATS WITH CRYSTALLINE FOLIC ACID [1]

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The production of granulocytopenia, leukopenia, and anemia in rats fed sulfonamides in purified diets and the prevention and successful treatment of these dyscrasias by liver and liver extracts have been reported previously from this laboratory (*1, 2*). These findings have been confirmed by other workers (*3, 4*). The successful treatment of sulfonamide leukopenia in rats with xanthopterin has been asserted (*5*) and denied (*4, 6*).

Very early in our work with the blood dyscrasias it became apparent that the constituent of liver concentrates, active for the rat, remained closely associated with a growth factor for *Lactobacillus casei* (*7*) and *Streptococcus lactis* (*8*) through many concentration and purification procedures. The name "folic acid" has been suggested for this factor (*8*). Within the past few months its isolation in crystalline form (*9, 10*) has been announced, and evidence has been presented (*9*) for its identity with vitamin B_c, an antianemia factor for the chick. It has also been announced (*10*) that the folic acid isolated from liver differs from the folic acid isolated from yeast.

The proof of the identity or nonidentity of folic acid and the factor active in the correction of blood dyscrasias in the rat awaited the availability for testing purposes of the pure material. We are able to announce at this time that three solutions of crystalline folic acid furnished to us from two different sources [2] have proved active in our tests. This is interpreted as evidence for the identity of folic acid and the factor responsible for the correction of the blood dyscrasia in the rat.

EXPERIMENTAL

Albino rats at weaning or shortly thereafter were placed on a purified diet containing sulfaguanidine or sulfasuxidine and were given a daily vitamin supplement. The diet used (with the exceptions noted in table 1) consists of sulfaguanidine, 1 percent; "Smaco" vitamin-free casein, 18 percent; cod-liver oil, 2 percent; cottonseed oil, 3 percent; salt mixture No. 550 (*1*), 4 percent; and glucose ("Cerelose"), 72 percent. The daily vitamin supplement consists of 100 micrograms of thiamin hydrochloride, 100 of pyridoxine hydrochloride, 200 of riboflavin, 200 of calcium pantothenate, 1 mg. of nicotinic acid, and 10 mg. of choline chloride. Crystalline biotin at a level of 0.5 or 2 micro-

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[1] From the Division of Chemotherapy, National Institute of Health.

[2] Furnished through the courtesy of Dr. A. D. Emmett, of Parke Davis & Co., and of Drs. E. L. R. Stokstad, B. L. Hutchings, and N. Bohonos, of Lederle Laboratories, Inc.

grams per rat per day was given during the latter part of the experiment.

After a variable length of time (30–122 days) on experiment, rats which showed a total leukocyte count not greater than about 4,000 cells per cubic millimeter, of which not more than about 200 were granulocytes, were selected for use in testing the activity of the folic acid solutions and of xanthopterin against granulocytopenia and leukopenia. The selected animals were given orally the amounts of the test solution indicated in table 1 daily for 4 consecutive days. At the end of the 4-day test period, recounts of the leukocytes and granulocytes were made. The techniques involved were described in an earlier communication (*1*).

Hematocrit determinations also were made. When values of about 30 volumes percent or below were found, hemoglobin determinations and erythrocyte counts were obtained. Nine of the anemic animals were used for testing solutions of crystalline folic acid for antianemia activity. The solutions were administered daily for 4 days as above. Hematocrits, red-cell counts, and hemoglobin determinations were repeated at the end of 10 days, since incomplete responses were found after shorter periods (*2*). Four of these nine animals showed granulocytopenia and leukopenia as well as anemia.

TABLE 1

Test substance	Dosage	Before treatment		After treatment		Weight gain in grams
		Total white blood cells per cubic millimeter	Percentage of polymorphonuclear granulocytes	Total white blood cells per cubic millimeter	Percentage of polymorphonuclear granulocytes	
Xanthopterin [1] [2]	40 micrograms	1,350	2	1,000	0	−1
		1,950	1	1,200	2	−1
	20 micrograms	4,200	5	4,700	1	−6
		2,500	0	1,650	3	0
		3,100	0	1,600	0	−3
		3,500	4	4,600	1	−18
Solution 38453 [3]	0.2 cc	1,600	0	17,200	52	23
		2,750	2	13,800	31	25
		3,750	2	12,200	30	16
	0.05 cc	1,150	2	5,150	56	15
		2,800	2	8,600	48	18
Solution F-6-9-5-7 [4]	0.1 cc	2,100	2	10,450	28	−1
		4,200	0	5,200	18	15
		1,600	0	2,500	19	19
		4,000	0	11,050	37	16
		4,150	5	21,400	51	16
Solution WF-6-9 [4] [5]	0.5 cc	1,600	3	10,700	55	10
		3,200	0	4,250	33	9
		2,900	0	12,300	30	3
	0.25 cc	2,450	10	6,100	37	6
		2,600	5	9,000	42	13

[1] 2 samples were tested. They were furnished through the courtesy of Dr. E. L. R. Stokstad of Lederle Laboratories and Dr. Oliver Kamm of Parke Davis & Co.

[2] 4 of these animals received 1 percent of sulfasuxidine in place of sulfaguanidine in the basal diet.

[3] 100 micrograms of vitamin B_6 per ml. Furnished through the courtesy of Dr. A. D. Emmett of Parke Davis & Co.

[4] F-6-9-5-7, 200 micrograms of folic acid per ml. WF-6-9, 42.8 micrograms of folic acid per ml. Furnished through the courtesy of Drs. E. L. R. Stokstad, B. L. Hutchings, and N. Bohonos of Lederle Laboratories. The source of this folic acid was not given but it was stated not to be identical with either of the folic acids previously described (*10*).

[5] The basal diets for these rats differed in respect to the drug. One received 0.5 percent of sulfaguanidine, two 0.5 percent of sulfasuxidine, and two 1 percent of sulfasuxidine in the purified diet described in the text.

RESULTS AND DISCUSSION

The results of our tests of xanthopterin and of crystalline folic acid solutions for activity against granulocytopenia and leukopenia are given in table 1. These data indicate that under our experimental conditions xanthopterin in doses of 20 or 40 micrograms per day for 4 days does not correct these blood dyscrasias. The average total leukocyte count at the beginning of the test was 2,750 per cu. mm., with 2 percent granulocytes. After 4 days of treatment with xanthopterin, the average total leukocyte count was 2,450 per cu. mm., with 1 percent granulocytes.

All three solutions of crystalline folic acid in the amounts tested showed definite activity by an increase both in total leukocytes and in percentage of granulocytes. For example, the administration of solution 38453 in a daily dose of 0.2 cc. (calculated as containing 20 micrograms) for 4 days was accompanied by an average increase in total leukocytes from 2,700 per cu. mm. to 14,400 per cu. mm. and an average increase in the percentage of granulocytes from 1 to 39 percent.

The effect of solutions of crystalline folic acid [3] on anemia was tested in nine rats. Seven of these animals recovered during the 10-day test period. The average hematocrit increased from 29.8 to 42.1 volumes percent, the average erythrocyte count from 5.1 to 6.9 millions per cu. mm., and the average hemoglobin from 9.7 to 12.8 gm. percent. In the other two animals the values declined. On the basis of these data, it seems probable that crystalline folic acid also has antianemia activity.

CONCLUSIONS

Three solutions of crystalline folic acid furnished to us from two different sources have shown activity in correcting leukopenia and granulocytopenia in rats induced by feeding sulfaguanidine and sulfasuxidine in purified diets.

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THE WAR AND THE DISTRIBUTION OF PHYSICIANS [1]

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What effect is the war having on the number and distribution of civilian physicians? In time of peace, medical care may be regarded as a necessity largely for humanitarian reasons; in total war it concerns us primarily because of the importance of maintaining maximum production with limited manpower. It is estimated that industry loses the equivalent of 1,000,000 employees' work every day because of illness and injury; how much food production is lost through illness among agricultural workers is not known.

It must be admitted at the outset that there is no simple relationship between the number of physicians in a community and the prevalenee of disability-producing disease in that community. It has been shown that the number of physicians' services per capita varies greatly in different States, and that even when there are relatively few physicians in a community some of them may not be working to capacity (*1*). We have no quantitative measure of the effect of physicians' services on disabling morbidity. It is generally accepted, however, that if the availability of physicians' services falls below a critical level, health, morale, and productivity suffer. It is not the purpose of this paper to define what level may be considered critical, or, indeed, how this level can be measured. The only readily applied index of such a level is the ratio of physicians to persons, or the more commonly used reciprocal, the number of persons per physician in the area under consideration. It is to be emphasized that this index is a crude one, since a high ratio of physicians to population does not guarantee a high level of services to all segments of the population. On the other hand, the total amount of service available is necessarily limited by the number of persons qualified to provide that service. The ratio

[1] From the Division of Public Health Methods, National Institute of Health.

may, therefore, be used as an index of the maximum amount of medical service potentially available to a community.

It is well known that the distribution of physicians, in terms of persons per physician, has shown great variation among the several States for many years. It is also known that this variation has a high positive correlation with State variation in per capita income and degree of urbanization, and with the ratios of dentists, nurses, and hospital beds to population.

The number of physicians in the United States, or in any of its subdivisions, is dependent on a dynamic rather than a static equilibrium. Physicians are continually being removed from practice by death and retirement and are being replaced by new additions to the profession coming out of the medical schools. It has been shown that the changes occurring in the number of physicians in the several States over a period of years have been due chiefly to the relationship existing between deaths and acquisition of new graduates by each State; the net effect of interstate migration has been very small. The trend during the past 20 years has been for the States rich in physicians to become richer and the poor, poorer, largely because of the preference of new graduates for location in the medically wealthy States (*2*).

The obvious effect of the war on our medical manpower has been the withdrawal of about one-third of our active practitioners. Other less obvious factors are also disturbing the equilibrium and are thus affecting the number and distribution of physicians. If the war should end within a year and if demobilization and resumption of peacetime medical education should be effected immediately, these factors would be of but slight importance, for their effect is cumulative. How long the war will last we do not venture to predict, but it appears evident from the present medical training program that the Army and Navy expect to require large numbers of medical officers for a considerable number of years.

What changes have already taken place in the medical manpower picture, and what further changes may we expect to take place at the National and State levels during the next few years? To help answer these questions it is possible to make estimates by applying vital statistics, announced policies of recruitment and of medical education, and knowledge of well-established trends to available pre-war data on the number and distribution of physicians. Such estimates have been prepared and are herewith presented, carried ahead to January 1, 1950. They are, of course, subject to errors inherent in all predictions. Nevertheless, it is believed that these estimates are sufficiently accurate to demonstrate certain significant trends.

THE NATIONAL PICTURE

A summary of the national picture is shown graphically in figure 1. The curves are based on calculations as of January 1, 1942, and as of dates at subsequent 2-year intervals, by a method based on data and assumptions described in the appendix. It is evident from figure 1 that the decrease in the number of physicians is extremely rapid during the present 2-year interval, falling to 85,000 by the end of this year. Nearly nine-tenths of this decrease is due to recruitment by the armed services. The rate of recruitment has,

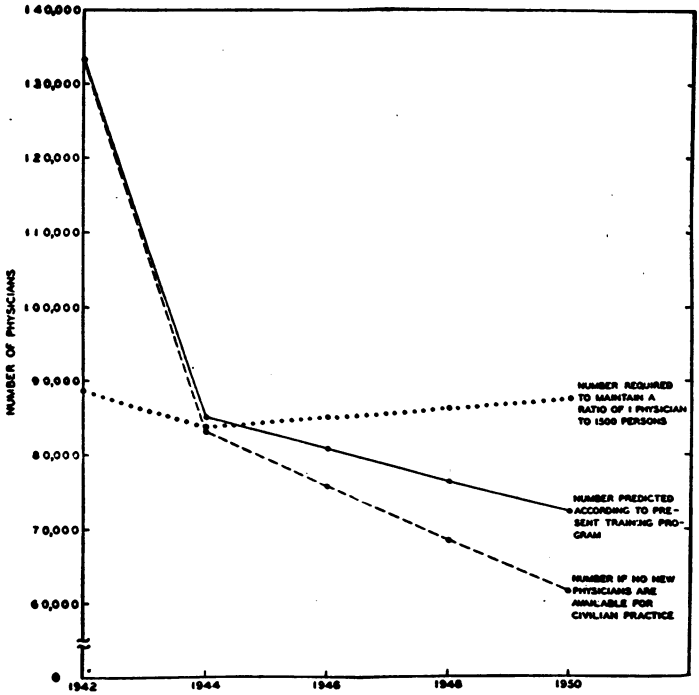

FIGURE 1.—Active private practitioners, United States, 1942–50.

of course, not been constant; the straight line merely represents the average rate for the 2-year interval. After the end of 1943, it is anticipated that recruitment of practicing physicians will virtually cease and that the armed services will obtain the additional medical officers needed from among the new physicians completing their education.

Since the services expect to take 80 percent of all medical graduates, the number entering civilian practice will no longer fully replace those who die or retire, so that a net annual loss of about 2,100 is shown by the curve after January 1, 1944. This will leave approximately 72,000 physicians in practice by January 1, 1950.

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Two hypothetical curves are also shown on figure 1 for comparison with the predicted curve. The dotted line shows the number of physicians required to provide a national average ratio of 1,500 persons per physician, a level which appears to have been generally accepted as the wartime minimum for civilian safety (*3*). This curve falls during the current period because building up the Army and Navy is reducing our civilian population, but after the end of this year, when inductions diminish in number, the civilian population will begin to increase again. It is seen that the solid and dotted curves cross early in 1944; that is, the national ratio then becomes 1,500 persons per physician and thereafter grows progressively worse. The second hypothetical curve, the broken line, shows the course of events if no new graduates were to enter civilian practice. Comparison of this curve with the solid line gives an idea of the contribution toward maintaining the 1 to 1,500 ratio which will be made by the 20 percent of the new graduates who will become civilian practitioners.

Thus, it is evident that the present military procurement objectives for medical officers, accompanied by a continuation of the previously existing and inevitable death rate, is causing a notable attrition in medical manpower which will become progressively more serious until by 1950 the country will be more than 15,000 physicians short of the number required to maintain the 1,500 persons-per-physician ratio. The crude index of the ratio actually underestimates the diminution in civilian medical services, since there is much evidence that the older physicians remaining in practice do not and cannot carry as heavy a work load as do the physicians under 45 years of age (*1*).

THE STATE PICTURE

As with the pre-war situation, the national average figures for recruitment and attrition of the medical profession conceal wide variations among the States. Any consideration of the effect of the war on the supply of physicians must give attention to data on the State and local situations. Local data must await further local studies, but at the State level sufficient data are available so that estimates may be made which are comparable to those for the country as a whole.

Figure 2 shows the change in the ratios of persons per physician in six selected States,[2] with the United States average included for comparison. To enable comparison of the rates of increase in the number of persons per physician the ratios have been charted on a logarithmic scale; the slope of each curve, therefore, represents the percentage change in the ratio during each 2-year interval. Two

[2] See appendix for method of selection.

trends are brought out by this chart. First, the initial drop, due to recruitment, is steeper in the upper curves, and second, the subsequent slower fall, due to unreplaced losses from the profession, is steeper in the lower curves. The explanation of these observations is not difficult.

Recruitment has to some extent been controlled by the quotas set for each State by the Procurement and Assignment Service in June 1942. These quotas were based on the premise that physicians could

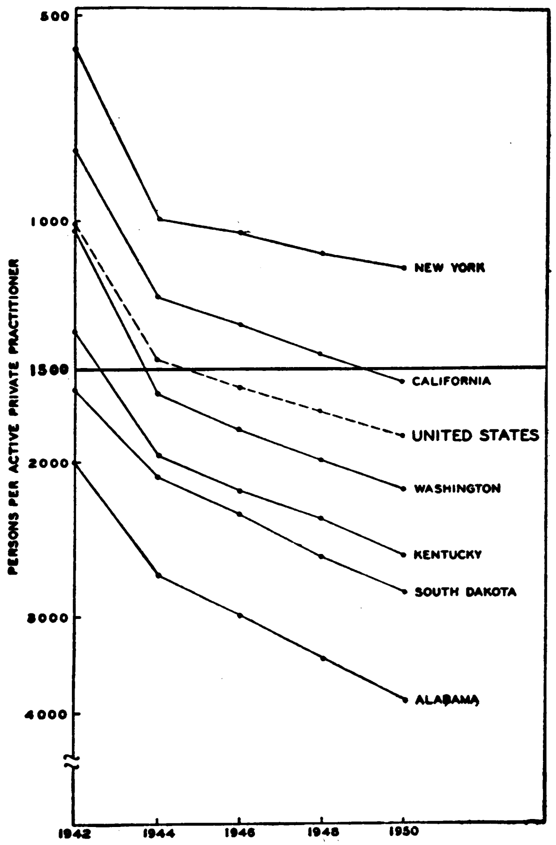

FIGURE 2.—Ratio of population to active private practitioners, United States and selected States, 1942–50.

be spared from each State in inverse proportion to the number of persons per physician existing in that State. For a number of reasons these quotas had not been exactly met up to the date of the last figures available, but their existence unquestionably slowed up recruitment in the States which were relatively poor in number of physicians.

The more rapid attrition after 1944 seen in the poorer States is accounted for by two factors. First, the bulk of young physicians entering practice has in the past gone to the wealthier States and it is assumed that the small number not going into service will continue to follow approximately the distribution which occurred in the last 2 years before Pearl Harbor. Figure 3 brings out the unevenness of settlement of new physicians: For example, New York, with about 10 percent of the country's population, gets nearly 18 percent of the new physicians, while Alabama, with over 2 percent of the population, gets only one-third of a percent of the physicians. The second reason arises from the fact that the first factor has been operating for so many years that those States which now are receiving the fewest new

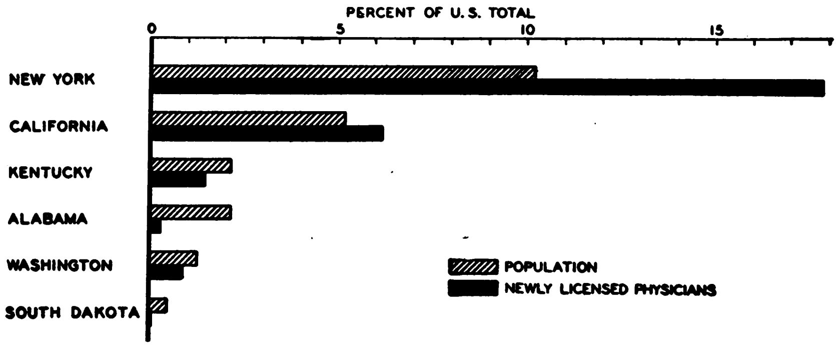

FIGURE 3.—Percent of United States total population and of newly licensed physicians in selected States, 1940 and 1941.

physicians also tend to have the highest proportion of old physicians, as is shown graphically in figure 4. The death rate among the medical profession is, therefore, highest in these same States.

It is often said that war accelerates previously existing socioeconomic trends. This would appear to be particularly true of the distribution of physicians, except where, as in the case of the State recruitment quotas, artificial controls have been established to combat existing trends. By reducing the supply of young physicians to

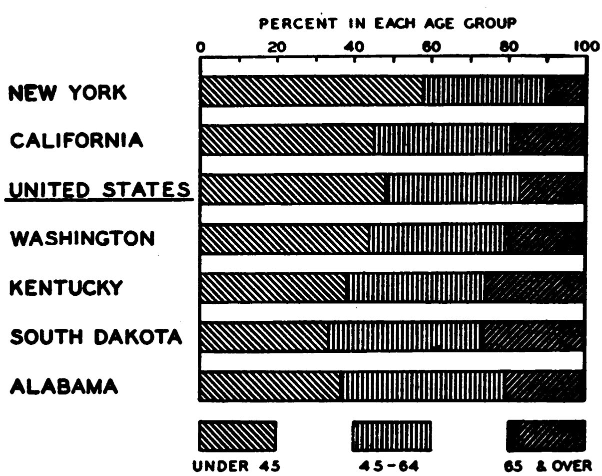

FIGURE 4.—Age distribution of physicians in the United States and selected States, 1942.

about 30 percent of its former size,[3] while leaving the death rate unchanged, the war has greatly increased the rate at which the medically poor States are becoming poorer.

Returning to figure 2, it will be noted that four of the six States start above the 1 to 1500 line and all but one fall below it by 1950. It is evident that the two most favored States will still be better off in 1950 than the two poorest States were in 1942.

Of more immediate concern is the situation which will exist by January 1, 1944. Figure 2 shows the rapid changes in the ratios for the six selected States. What the recruitment during the 2 years 1942 and 1943 means in terms of all the States is shown in figure 5.

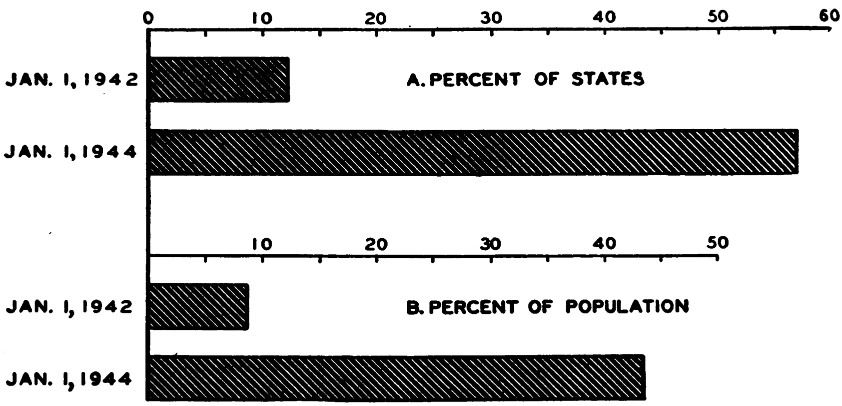

FIGURE 5.—A. Percent of States with more than 1,500 persons per active private practitioner. B. Percent of United States population in States with more than 1,500 persons per active private practitioner.

Before recruitment only six States, with 11,500,000 population, had more than 1,500 persons per physician. By January 1944, with the national ratio still slightly better than the 1,500 level, no less than 28 States, with 54,500,000 of our 125,500,000 civilians, will have more than 1,500 persons per physician. In seven of these, with 13,500,000 population, the ratio will be more than 2,000 persons per physician.

It seems probable that the statistical predictions made for State ratios underestimate the trend toward concentration of physicians in the richer States. There is reason to believe that the high consumer demand for medical services in these States will attract physicians from the poorer States to fill vacancies left by those going into military service. Since no quantitative data on this point are available, no correction has been made for this factor. Whatever uncontrolled migration of physicians occurs, however, may be expected to be in a direction which will exaggerate the tendency demonstrated.

The computed State ratios also underestimate the potential seriousness of the medical care situation for another reason which must be

[3] While the armed forces expect to take 80 percent of new graduates, the wartime increase in medical school output brings the number available for civilians up to about 30 percent of the pre-war level.

kept in mind. Just as the national ratio conceals variations among the several States, so do the State ratios conceal as wide, or even wider variations at local community levels, where medical service is actually obtained by the patient (*4*, *5*). It seems probable that the same factors which are tending to concentrate physicians in the wealthier States will also tend to cause a shift of practitioners to the urban and wealthy areas within individual States. Data are not available, however, on which to base predictions at local levels.

DISCUSSION

The purpose of presenting these estimates is to draw attention to two points which have received relatively little consideration in discussions of medical manpower: First, the very considerable annual decrease in the number of civilian physicians which will persist even after recruitment has ceased, and second, the wide and ever widening variation in State levels which is concealed by the national average ratio of population to physicians.

If the much quoted ratio of one physician per 1,500 civilians is accepted as a minimum national average, the trend demonstrated for the national level constitutes a threat to adequate medical service and, therefore, to maximum war production. An even greater threat is presented by the trend shown for State levels and implied for localities. If the output of our medical schools cannot be further increased, and as long as the requirements of the armed services remain at their present level of one medical officer per approximately 155 men, the net annual decrease in our civilian medical manpower would appear to be inevitable. On the other hand, the increasing maldistribution of physicians may be attacked through control of the initial locations and of the migration of civilian physicians. Establishment of effective measures along these lines could do much to lessen the severity of developing State and local shortages.

SUMMARY

Estimates are submitted of the number of physicians who will remain in civilian practice in the United States and in selected States as of January 1, 1942, and at 2-year intervals thereafter up to 1950.

It is shown that the national average number of persons per physician will reach 1,500 early in 1944 and will continue to rise at a considerable rate because deaths and retirements are no longer being fully replaced by new additions to the profession. It is further shown that the rate of attrition will tend to be most severe in the States which were medically poor before the war, since these States generally have a high proportion of older physicians and receive an unduly low proportion of new medical graduates. Twenty-eight

States, with a combined population of 54,500,000, are expected to have more than 1,500 persons per physician by January 1, 1944, and seven of these, with 13,500,000 population, will have more than 2,000.

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Appendix

SOURCES OF DATA

1. Census of Physicians of the Committee on Medical Preparedness of the American Medical Association, tabulated by the United States Public Health Service, for total physicians, full-time appointments, and age distribution by States.

2. Hospital Number, 1942, Journal of the American Medical Association, for interns and residents by States.

3. Educational Number, 1942, Journal of the American Medical Association, for present and anticipated number of new medical graduates.

4. State Board Numbers, 1941 and 1942, Journal of the American Medical Association, for distribution of newly licensed physicians by States.

5. Procurement and Assignment Service, War Manpower Commission, for unpublished data on recruitment of physicians by States.

6. United States Bureau of the Census estimates for population distribution by States, 1943.

7. Unpublished material, Division of Public Health Methods, National Institute of Health, United States Public Health Service, for age-specific death rates and age-specific retirement percentages for physicians.

ASSUMPTIONS

In order to make estimates of the numbers of physicians at future dates it has been assumed:

1. That the procurement objectives up to January 1, 1944, will be met from the several States in the proportion that each State had contributed up to the date of the last available data, April 30, 1943.

2. That all new medical graduates will enter the armed services on completion of their internships, except for 20 percent who will be physically disqualified.

3. That the physically disqualified new graduates will locate in the several States in proportion to the numbers of new physicians locating in each State during the 2-year period 1940–41.

4. That the numbers of interns, residents, and full-time salaried physicians remaining after recruitment on January 1, 1944, will continue to be distributed among the several States in the proportions which prevailed in 1942.

5. That no allowance can be made for physicians reentering civilian practice after discharge from the services since (*a*) their number and effectiveness cannot be predicted and (*b*) replacements for these losses may be required by the Army and Navy causing further recruitment from among civilian practitioners in 1944 and thereafter.

6. That changes in State population due to interstate migration after January 1, 1943, would be negligible, and that the population of each State would thereafter change in proportion to the increase or decrease for the country as a whole.

SUMMARY OF METHOD

(*a*) National figures: For 1942 the figure for total physicians was reduced by the sum of full-time appointments, interns, and residents to give private practitioners, and by the age specific retirement percentages to give active private practitioners. To obtain the 1944 figure the total number of physicians in 1942 was reduced by the total Army and Navy procurement objective (not including recruits from among new graduates) for the 2-year period, by deaths during the 2-year period (based on age-specific death rates), by interns, residents, and full-time appointments expected to remain after recruitment, and by the retirement correction applied to the new age distribution. Figures at the subsequent dates were derived by subtracting calculated deaths in each age group for each 2-year interval and recalculating the correction for retirements on the basis of the new age distribution.

(*b*) State figures: Computations were made for all States for 1942 and 1944, using the sources mentioned above for the data on distribution of the various categories of physicians by States, and the same method as used for the United States total. Estimates for the subsequent dates were made for only 17 States, selected by taking every third State in alphabetical order. These States were ranked by the 1942 ratio of persons per physician and 6 were selected which would demonstrate without undue crowding on figure 2 the trends shown for the 17.

FREQUENCY AND DURATION OF DISABILITIES CAUSING ABSENCE FROM WORK AMONG THE EMPLOYEES OF A PUBLIC UTILITY, 1938–42 [1]

By W. M. GAFAFER, *Principal Statistician, United States Public Health Service*

The present report is the eighth of a series (*1–7*) on disability among employees of the Boston Edison Company and is based on recorded absences due to disability lasting 1 calendar day or longer which ended during the 5 years 1938–42. The material is presented at this time principally because of the extraordinary interest in absenteeism shown by industry, war and health agencies, and others engaged in the war effort. It is believed that the analyses will be found useful in making the necessary comparisons leading to measures for the reduction and control of sickness absenteeism.

With regard to the age distribution of the employees, approximately 50 percent of the males were under 40 years of age in 1940 while the corresponding percentage for the females was 60. Possible changes

[1] From the Division of Industrial Hygiene, National Institute of Health.

in the age composition of the employees in 1941 and 1942 may be associated with changes in morbidity. Of importance also in this connection are possible changes in the occupational distribution of the employees. Should the requisite data become available, a forthcoming comprehensive study will include an examination of the factors of age and occupation.

Table 1 shows for each sex and year the number of person-years of exposure and the number of absences and days of disability according to broad cause group. Table 2 is derived from table 1 and presents three pertinent morbidity indexes by year and sex according to broad cause group.

INJURIES

It will be observed in table 2 that the average annual number of absences per 1,000 males on account of industrial injuries has increased since 1939, the rate for 1942 being well above the rate for 1941 and the average rate for the 5 years; the rate for nonindustrial injuries, on the other hand, has decreased since 1939, the rate for 1942 being slightly less than the rate for 1941 and below the mean for the 5 years. The annual industrial injury rates for the females are consistently lower than the corresponding rates for the males, as might be expected, while the nonindustrial injury rates are consistently higher.

In 1942 the average annual number of days absent per male on account of industrial injuries reached a maximum of almost 1.4 days. While the male nonindustrial injury rate is the highest since 1939, it is slightly below the mean for the 5 years. When the female experience is compared with that of the males, the rate is generally lower for industrial injuries and higher for nonindustrial injuries.

The 5-year average for the number of days per male absence on account of industrial injuries is approximately 32 days, the corresponding average for the females being 36. Nonindustrial injuries show 5-year averages of 11 and 14 days for males and females, respectively.

SICKNESS

The material covering the sickness indexes shown in table 2 is presented graphically in figure 1. Each bar in the figure for a particular year represents the value of an index for all causes of sickness and the contribution made to that value by a particular cause group; the bars representing days per absence are for particular broad cause groups since this index is not additive. The figure thus shows for two indexes and each sex the variation with time of all sickness, and each of three broad cause groups; for the third index the variation with time is shown for each of the three broad cause groups.

Number of absences per 1,000 persons.—It may be seen in table 2 that the male rate for 1942 is over 1,000 absences per 1,000 which is almost 14 percent in excess of the mean for the 5 years. The 5-year mean for females is approximately twice the corresponding rate for the males, and each of the three cause groups for each year shows the female rate to be in excess of the corresponding male rate. Noteworthy in respect of the males are the excesses of 15 and 20 percent shown by the respiratory and digestive diseases, respectively, when the rates for 1942 are compared with the corresponding 5-year means.

The figure shows graphically for each sex and year the relatively large contribution made by the respiratory diseases to the frequency of absences from all diseases. Clearly shown also is the positive correlation between the movement of the respiratory disease rate and the rate for all sickness.

TABLE 1.—*Number of absences lasting 1 calendar day or longer and the corresponding number of days of disability due to sickness and injuries, by sex; experience in a public utility, 1938–42, inclusive* [1]

Year in which absence ended	Person-years of exposure	Injury and sickness	Injury		Total sickness	Sickness		
			Industrial	Nonindustrial		Respiratory diseases	Digestive diseases	Nonrespiratory-nondigestive diseases [2]
	Males: Absences							
1938–42	13,409	12,720	337	553	11,830	7,516	2,158	2,156
1938	2,780	2,495	54	138	2,303	1,399	420	484
1939	2,738	2,808	46	141	2,621	1,716	447	458
1940	2,706	2,324	72	95	2,157	1,292	417	448
1941	2,702	2,422	73	94	2,255	1,512	395	348
1942	2,483	2,671	92	85	2,494	1,597	479	418
	Females: Absences							
1938–42	2,993	5,494	16	230	5,248	2,831	964	1,453
1938	676	1,304	5	64	1,235	638	216	381
1939	628	1,355	1	62	1,292	710	246	336
1940	584	981	3	31	947	505	168	274
1941	572	914	2	42	870	477	168	225
1942	533	940	5	31	904	501	166	237
	Males: Days of disability							
1938–42	13,409	114,463	10,730	6,174	97,559	39,843	16,530	41,186
1938	2,780	22,250	1,513	1,973	18,764	7,593	3,127	8,044
1939	2,738	22,617	1,479	991	20,147	8,843	2,908	8,396
1940	2,706	21,796	2,166	1,077	18,553	6,785	4,016	7,752
1941	2,702	23,303	2,248	1,035	20,020	8,861	2,861	8,298
1942	2,483	24,497	3,324	1,098	20,075	7,761	3,618	8,696
	Females: Days of disability							
1938–42	2,993	35,613	568	3,202	31,843	13,435	5,039	13,369
1938	676	6,235	58	533	5,644	2,564	880	2,200
1939	628	9,728	10	807	8,911	3,734	974	4,203
1940	584	6,195	17	642	5,536	2,298	780	2,458
1941	572	7,142	11	997	6,134	2,523	1,088	2,523
1942	533	6,313	472	223	5,618	2,316	1,317	1,985

[1] The number of days of disability is the number of calendar days from the date disability began to the date of return to work, or to the 372d day, inclusive.
[2] Ill-defined and unknown causes are included.

TABLE 2.—*Indexes of morbidity for different broad cause groups by sex; experience in a public utility, 1938–42, inclusive* [1]

Year in which absence ended	Injury and sickness	Injury: Industrial	Injury: Nonindustrial	Total sickness	Sickness: Respiratory diseases	Sickness: Digestive diseases	Sickness: Nonrespiratory-nondigestive diseases [2]
	Number of absences per 1,000 males						
1938–42	948.6	25.1	41.3	882.2	560.5	160.9	160.8
1938	897.5	19.4	49.7	828.4	503.2	151.1	174.1
1939	1,025.6	16.8	51.5	957.3	626.8	163.2	167.3
1940	858.8	26.6	35.1	797.1	477.4	154.1	165.6
1941	896.4	27.0	34.8	834.6	559.6	146.2	128.8
1942	1,075.7	37.1	34.2	1,004.4	643.2	192.9	168.3
	Number of absences per 1,000 females						
1938–42	1,835.6	5.3	76.9	1,753.4	945.8	322.1	485.5
1938	1,929.0	7.4	94.7	1,826.9	943.8	319.5	563.6
1939	2,157.6	1.6	98.7	2,057.3	1,130.6	391.7	535.0
1940	1,679.8	5.1	53.1	1,621.6	864.7	287.7	469.2
1941	1,597.9	3.5	73.4	1,521.0	833.9	293.7	393.4
1942	1,763.6	9.4	58.2	1,696.0	940.0	311.4	444.6
	Number of days per male						
1938–42	8.536	.800	.460	7.276	2.971	1.233	3.072
1938	8.004	.544	.710	6.750	2.731	1.125	2.894
1939	8.260	.540	.362	7.358	3.230	1.062	3.066
1940	8.055	.801	.398	6.856	2.507	1.484	2.865
1941	8.624	.832	.383	7.409	3.279	1.059	3.071
1942	9.866	1.339	.442	8.085	3.126	1.457	3.502
	Number of days per female						
1938–42	11.899	.190	1.070	10.639	4.489	1.683	4.467
1938	9.223	.086	.788	8.349	3.793	1.302	3.254
1939	15.490	.016	1.285	14.189	5.946	1.551	6.692
1940	10.608	.029	1.099	9.480	3.935	1.336	4.209
1941	12.436	.019	1.743	10.724	4.411	1.902	4.411
1942	11.844	.886	.418	10.540	4.345	2.471	3.724
	Males: Number of days per absence						
1938–42	9.00	31.84	11.16	8.25	5.30	7.66	19.10
1938	8.92	28.02	14.30	8.15	5.43	7.45	16.62
1939	8.05	32.15	7.03	7.69	5.15	6.51	18.33
1940	9.38	30.08	11.34	8.60	5.25	9.63	17.30
1941	9.62	30.79	11.01	8.88	5.86	7.24	23.84
1942	9.17	36.13	12.92	8.05	4.86	7.55	20.80
	Females: Number of days per absence						
1938–42	6.48	35.50	13.92	6.07	4.75	5.23	9.20
1938	4.78	11.60	8.33	4.57	4.02	4.07	5.77
1939	7.18	10.00	13.02	6.90	5.26	3.96	12.51
1940	6.31	5.67	20.71	5.85	4.55	4.64	8.97
1941	7.81	5.50	23.74	7.05	5.29	6.48	11.21
1942	6.72	94.40	7.19	6.21	4.62	7.93	8.38

[1] The number of days of disability is the number of calendar days from the date disability began to the date of return to work, or to the 372d day, inclusive.
[2] Ill-defined and unknown causes are included.

NOTE: Differences between the indexes for 1941 given in the PUBLIC HEALTH REPORTS for April 24, 1942 (reference *6*) and the corresponding indexes given here are accounted for by the termination of a number of absences reported subsequent to the preparation of the earlier report.

Attention is also directed in the instance of the males to the similarity of the magnitude of the contributions to all sickness made by the digestive and the nonrespiratory-nondigestive diseases, while with respect to the females the contributions made by the nonrespiratory-nondigestive diseases are larger than those made by the digestive diseases.

Days per person.—The average annual number of days absent per male on account of sickness increased to a maximum of 8 for 1942 which represents an excess of 9 and 11 percent when compared with

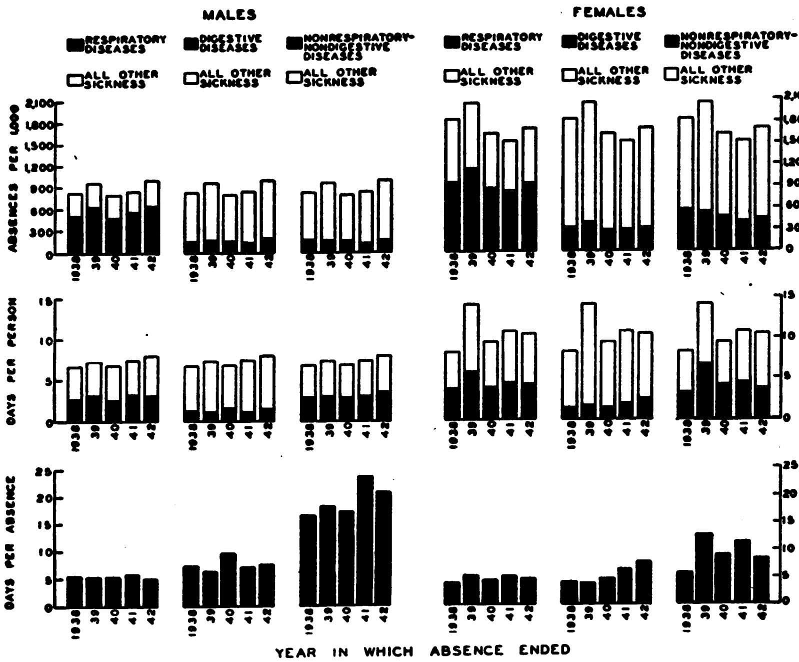

FIGURE 1.—Indexes of morbidity by sex and year based on absences due to disability lasting 1 calendar day or longer which ended during the 5 years 1938–42, experience in a public utility. (Each bar for a particular year represents the value of an index for all causes of sickness and the contribution made to that value by a particular cause group: the bars representing days per absence are for particular cause groups since this index is not additive.)

the rate for 1941 and 1938–42, respectively. This maximum is reflected only by the nonrespiratory-nondigestive diseases which show a maximum for 1942 that is 14 percent in excess of the 5-year mean. The days per female for 1942 are over 10, a rate which differs slightly from the 5-year mean but yields a decrease of 26 percent when compared with the rate for 1939. Among the females the digestive disease group is the only one presenting a maximum rate for 1942, being 47 percent in excess of the 5-year mean.

The figure shows graphically by sex the relative importance of the three disease groups with reference to the number of days absent per person. It appears that for the males as well as for the females the digestive diseases contribute least to the average annual number of days absent per person; the respiratory group and the nonrespiratory-nondigestive group, on the other hand, yield larger rates and it will be observed that for the males and females the contributions made by the two disease groups are similar in magnitude.

In this connection it is of interest to examine the percentage contribution made by each disease group to the total average annual number of days absent per male and female on account of sickness. Forty-one percent and 42 percent of the male rate for 1938–42 are accounted for by the respiratory and nonrespiratory-nondigestive diseases, respectively, while the remainder, 17 percent, is yielded by the digestive diseases. Approximately the same percentages hold for 1942, and for the females for 1938–42. The female percentage distribution for 1942, however, shows an interesting though not spectacular interchange between the digestive and nonrespiratory-nondigestive groups, the percentages for 1942 being 41, 24, and 35 for the respiratory, digestive, and nonrespiratory-nondigestive groups, respectively; for 1938–42 the corresponding percentages in order are 42, 16, and 42.

Number of days per absence.—Table 2 reveals that industrial injuries generally yield absences of longest duration. It will be observed with reference to sickness that for each sex and year the nonrespiratory-nondigestive diseases present the longest absences; for the 5-year period these durations are approximately 19 days for males and 9 days for females. This disease group is followed by the digestive diseases, 8 days for males and 5 days for females, while the respiratory group presents 5 days for males and less than 5 days for females. It is noteworthy that with only one exception all of the rates for 1942 presented by the three disease groups are not substantially different from the corresponding means for 1938–42. The exception is the digestive disease rate for females which is 52 percent in excess of the 5-year mean and has increased annually since 1939.

The lowest third of the figure presents graphically by sex and for each of the three disease groups the variation of absence duration with time. The nonrespiratory-nondigestive diseases present striking durations particularly for the males. Noteworthy increases with time are shown only by the digestive diseases for the females. While the male frequency of absences together with the days absent per male for all sickness continued to increase annually since 1940, it is of interest to observe that the absence durations specific for disease group behave otherwise. Thus from 1941 to 1942 the respiratory and nonrespiratory-nondigestive diseases decreased sensibly while the digestive diseases showed a slight increase. The females, on the other hand, show an increase from 1941 to 1942 in the frequency of all sickness together with a slight decrease in days absent per female. The duration of absence for this period shows an increase only for the digestive diseases, the respiratory and nonrespiratory-nondigestive diseases showing decreases.

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OUTBREAK OF INFANT DIARRHEA IN A MAINE HOSPITAL

Information has been received regarding a recent outbreak, with a high fatality rate, of diarrhea of the newborn in a Maine hospital. There were 26 cases in babies born in the hospital in which the outbreak occurred and 2 in infants born elsewhere but entered in that hospital for other reasons and subsequently developing diarrhea. One case was in a grandfather, who developed diarrhea about 5 days after contact with one of the babies. Of the 28 cases occurring in babies, 14 of the infants died. The first case developed in a baby born on July 27 and the last case in one born on August 29. No cases developed in infants born after the existence of the outbreak was recognized and control measures were instituted. The disease was reported to have been insidious in its onset, and the outbreak was in progress and did not come to light until several babies born in the hospital had died at other local hospitals.

An increase in mortality from diarrhea of the newborn was reported in San Francisco, California, earlier in the year. For the first four months of this year deaths from diarrhea constituted 15 percent of the total infant deaths in that city, as compared with 8 percent in infants under one year of age and 1.7 percent in those under one month for the country as a whole in 1941.

Under date of April 3, 1943, the California State Board of Public Health revised the regulations for the control of communicable diseases. In addition to requiring that epidemic diarrhea of the newborn be reported, as formerly, the condition was defined and the isolation of infant patients was required. Specific measures were set forth regarding isolation.[1]

[1] Increase in infant mortality and infant diarrhea in San Francisco, California. Pub. Health Rep. June 11, 1943, p. 917.

DEATHS DURING WEEK ENDED OCTOBER 2, 1943

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

	Week ended Oct. 2, 1943	Corresponding week, 1942
Data from 88 large cities of the United States:		
Total deaths	8,340	8,225
Average for 3 prior years	7,906	
Total deaths, first 39 weeks of year	353,227	324,730
Deaths under 1 year of age	618	635
Average for 3 prior years	556	
Deaths under 1 year of age, first 39 weeks of year	25,318	22,161
Data from industrial insurance companies:		
Policies in force	65,874,191	65,065,862
Number of death claims	11,687	11,029
Death claims per 1,000 policies in force, annual rate	9.3	8.8
Death claims per 1,000 policies, first 39 weeks of year, annual rate	9.8	9.2

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 9, 1943

Summary

The decline in the poliomyelitis incidence continued, a total of 515 cases being reported for the current week as compared with 679 for the preceding week and a 5-year median of 391 for the corresponding week. The current figure brings the cumulative total for the first 40 weeks of the year to 9,824, the largest number for the corresponding period of any other year since 1931 when 13,050 cases had been reported, which was approximately 83 percent of the total of 15,745 cases reported for that entire year.

During the current week decreases were recorded for all geographic areas except the Mountain States. Only eight States reported more than 17 cases currently, as follows (last week's figures in parentheses): *Increases*—Minnesota 22 (9), Utah 24 (18), Washington 30 (19), and Oregon 33 (29); *decreases*—Illinois 91 (118), Kansas 23 (32), and California 49 (98); *no change*—New York 52 (52).

A total of 191 cases of meningitis was reported, as compared with 192 last week and a 5-year median of 26. States reporting 6 or more cases (last week's figures in parentheses) are as follows: *Increases*—Massachusetts 14 (10), Connecticut 8 (2), New Jersey 14 (8), Illinois 17 (13), Michigan 11 (6), Virginia 7 (3), Kentucky 6 (4), and Texas 7 (0); *decreases*—New York 29 (31), Pennsylvania 11 (12), Indiana 6 (8), and California 6 (22); *no change*—Missouri 6 (6). The cumulative total for the first 40 weeks of the year is 14,714, as compared with 2,733 for the same period last year and a 5-year median of 1,618.

Current reports of influenza, measles, and scarlet fever show seasonal increases and are above the corresponding median figures, as well as those for the corresponding week of last year, while those of diphtheria, typhoid fever, and whooping cough are below the respective figures for both last year and the median. Only 5 cases of smallpox were reported.

Deaths registered for the week in 87 large cities of the United States totaled 8,044, as compared with 8,171 last week and a 3-year (1940–42) average of 7,915. The cumulative figure for the first 40 weeks of the year is 352,576, as compared with 325,568 for the same period in 1942.

Telegraphic morbidity reports from State health officers for the week ended October 9, 1943, and comparison with corresponding week of 1942 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 Oct. 9, 1943	Week ended Oct. 10, 1942	Median 1938–42	Week ended Oct. 9, 1943	Week ended Oct. 10, 1942	Median 1938–42	Week ended Oct. 9, 1943	Week ended Oct. 10, 1942	Median 1938–42	Week ended Oct. 9, 1943	Week ended Oct. 10, 1942	Median 1938–42
NEW ENGLAND												
Maine	1	0	0	1	------	------	55	6	8	5	0	0
New Hampshire	0	1	0	------	------	------	4	3	3	0	0	0
Vermont	0	0	0	------	------	------	50	20	0	0	0	0
Massachusetts	3	3	4	------	------	------	50	53	53	14	1	1
Rhode Island	0	3	0	------	------	------	1	7	2	2	1	0
Connecticut	0	0	0	5	3	1	3	10	5	8	2	1
MIDDLE ATLANTIC												
New York	9	9	10	[1] 5	[1] 15	[1] 8	92	76	48	29	16	3
New Jersey	2	1	3	4	7	6	100	29	24	14	0	0
Pennsylvania	4	6	8	------	4	------	41	60	60	11	4	1
EAST NORTH CENTRAL												
Ohio	11	18	30	1	4	4	90	18	18	5	2	2
Indiana	12	6	14	11	20	7	25	4	2	6	0	0
Illinois	10	10	17	6	4	4	37	18	18	17	5	1
Michigan [3]	6	8	8	------	10	5	182	24	30	11	2	2
Wisconsin	4	0	1	25	11	19	148	39	39	3	0	0
WEST NORTH CENTRAL												
Minnesota	9	2	2	------	------	1	182	4	4	1	1	0
Iowa	5	5	5	------	7	5	12	5	6	1	0	0
Missouri	1	4	6	------	4	2	1	11	3	6	0	0
North Dakota	2	3	2	5	8	5	102	11	6	0	0	0
South Dakota	3	3	4	------	------	------	5	3	3	0	3	0
Nebraska	6	2	1	------	2	------	1	11	10	0	0	0
Kansas	1	6	6	2	3	3	4	7	4	1	0	1
SOUTH ATLANTIC												
Delaware	0	1	1	------	------	------	1	0	0	0	0	0
Maryland [3]	2	11	7	1	2	2	7	4	5	8	5	1
District of Columbia	0	3	3	------	------	------	1	2	2	1	0	0
Virginia	15	39	39	83	107	67	46	11	11	7	4	0
West Virginia	12	10	10	------	6	7	5	1	1	1	1	1
North Carolina	48	90	99	12	2	2	20	5	15	1	2	1
South Carolina	25	48	26	189	195	139	28	7	6	1	0	0
Georgia	31	32	44	4	12	18	2	10	3	4	2	0
Florida	5	11	9	12	------	1	5	0	0	2	0	0
EAST SOUTH CENTRAL												
Kentucky	12	16	16	2	1	1	3	2	9	6	1	1
Tennessee	25	8	12	2	15	14	1	6	6	2	0	0
Alabama	29	25	32	27	15	12	5	3	5	3	0	1
Mississippi [3]	13	23	24	------	------	------	------	------	------	3	1	0
WEST SOUTH CENTRAL												
Arkansas	5	20	20	22	28	20	3	2	1	0	0	0
Louisiana	4	1	9	3	7	5	17	5	3	2	0	0
Oklahoma	8	10	14	12	31	28	3	3	3	0	0	0
Texas	34	61	53	677	458	143	14	15	15	7	0	0
MOUNTAIN												
Montana	1	2	2	2	------	2	37	6	12	0	1	0
Idaho	0	1	0	------	3	1	0	17	3	0	0	0
Wyoming	0	0	0	8	24	------	25	4	4	1	0	0
Colorado	3	18	16	15	31	11	2	8	12	1	0	0
New Mexico	1	0	3	------	------	------	2	0	4	0	0	0
Arizona	0	1	1	80	38	39	6	3	3	2	0	0
Utah [3]	0	0	0	------	------	1	7	113	5	1	0	0
Nevada	0	0	0	1	------	------	13	1	0	0	0	0
PACIFIC												
Washington	11	5	1	------	1	------	23	69	15	2	1	0
Oregon	1	3	3	24	8	6	21	49	14	1	1	0
California	13	21	12	5	17	20	41	56	77	6	6	1
Total	387	550	599	1,246	1,098	759	1,523	821	824	191	62	26
40 weeks	9,450	9,924	10,782	87,071	85,868	154,626	544,415	470,869	470,869	14,714	2,733	1,618

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended October 9, 1943, and comparison with corresponding week of 1942 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever [3]		
	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42	Week ended		Median 1938–42
	Oct. 9, 1943	Oct. 10, 1942		Oct. 9, 1943	Oct. 10, 1942		Oct. 9, 1943	Oct. 10, 1942		Oct. 9, 1943	Oct. 10, 1942	
NEW ENGLAND												
Maine	1	0	0	25	3	4	0	0	0	0	0	0
New Hampshire	0	1	1	18	7	1	0	0	0	1	0	0
Vermont	2	5	1	0	5	4	0	0	0	0	0	0
Massachusetts	10	1	2	164	112	57	0	0	0	4	3	2
Rhode Island	5	0	0	5	9	8	0	0	0	0	0	0
Connecticut	10	2	1	22	23	13	0	0	0	1	4	4
MIDDLE ATLANTIC												
New York	52	20	20	144	133	101	0	0	0	13	10	11
New Jersey	4	13	10	41	44	33	0	0	0	3	3	3
Pennsylvania	7	10	11	102	102	102	0	0	0	16	13	15
EAST NORTH CENTRAL												
Ohio	14	4	12	186	122	122	0	0	0	4	6	16
Indiana	10	1	3	56	39	44	1	0	1	3	3	3
Illinois	91	35	18	79	103	116	1	0	0	5	16	16
Michigan [2]	16	5	19	67	61	100	0	0	0	3	3	6
Wisconsin	14	7	7	129	99	69	1	0	0	1	2	2
WEST NORTH CENTRAL												
Minnesota	22	2	15	61	40	32	0	0	0	0	0	0
Iowa	17	3	3	48	26	34	1	0	0	0	2	3
Missouri	9	7	1	37	36	36	0	0	0	7	9	9
North Dakota	0	2	1	6	4	8	0	0	0	2	0	1
South Dakota	2	0	1	23	21	12	0	1	0	0	0	1
Nebraska	7	5	1	4	7	9	0	0	0	0	0	2
Kansas	23	4	4	66	55	55	0	0	0	0	0	2
SOUTH ATLANTIC												
Delaware	1	1	0	3	7	6	0	0	0	0	0	0
Maryland [2]	2	0	2	16	31	18	0	0	0	2	4	5
District of Columbia	2	1	1	13	14	8	0	0	0	0	1	1
Virginia	0	1	2	22	50	32	0	0	0	4	6	7
West Virginia	1	2	2	77	62	46	1	0	0	6	6	6
North Carolina	2	11	4	122	110	77	0	0	0	2	4	4
South Carolina	0	3	3	15	8	11	0	0	0	9	3	7
Georgia	1	1	2	31	48	29	0	0	0	7	3	7
Florida	0	2	1	4	4	4	0	0	0	1	1	1
EAST SOUTH CENTRAL												
Kentucky	3	2	6	35	26	43	0	1	0	3	10	11
Tennessee	0	3	3	36	67	67	0	1	0	4	5	7
Alabama	0	0	1	23	30	29	0	0	0	0	1	6
Mississippi [2]	1	2	1	10	15	14	0	0	0	7	3	3
WEST SOUTH CENTRAL												
Arkansas	------	3	2	10	2	11	0	0	0	3	3	13
Louisiana	2	0	0	3	3	3	0	0	0	1	6	10
Oklahoma	6	0	3	8	22	16	0	0	1	4	2	6
Texas	15	7	7	31	35	21	0	0	0	9	9	17
MOUNTAIN												
Montana	1	0	1	14	6	11	0	0	0	0	0	0
Idaho	0	0	0	28	10	4	0	0	0	2	1	1
Wyoming	3	0	0	2	0	3	0	1	0	1	0	0
Colorado	15	3	2	11	21	17	0	0	1	0	1	3
New Mexico	3	2	1	5	4	4	0	0	0	5	9	7
Arizona	4	1	0	5	6	4	0	0	0	1	5	2
Utah [2]	24	5	2	12	10	8	0	0	0	0	2	2
Nevada	1	0	0	2	0	0	0	0	0	0	1	0
PACIFIC												
Washington	30	2	2	46	17	21	0	0	0	1	0	2
Oregon	33	0	1	14	15	15	0	0	0	0	0	0
California	49	10	8	113	47	83	0	0	0	9	3	7
Total	515	189	391	1,994	1,721	1,632	5	4	16	144	163	252
40 weeks	9,824	3,024	5,290	106,353	96,437	124,297	635	644	2,036	4,496	5,513	7,693

See footnotes at end of table.

***Telegraphic morbidity reports from State health officers for the week ended October 9, 1943, and comparison with corresponding week of 1942 and 5-year median*—Contd.**

Division and State	Whooping cough: Week ended Oct. 9, 1943	Whooping cough: Week ended Oct. 10, 1942	Whooping cough: Median 1938–42	Week ended October 9, 1943: Anthrax	Dysentery: Amebic	Dysentery: Bacillary	Dysentery: Unspecified	Encephalitis, infectious	Leprosy	Rocky Mt. spotted fever	Tularemia	Typhus fever
NEW ENGLAND												
Maine	13	45	17	0	0	0	0	0	0	0	0	0
New Hampshire	0	0	2	0	0	0	0	0	0	0	0	0
Vermont	20	35	31	0	0	0	0	0	0	0	0	0
Massachusetts	80	156	117	0	0	2	0	1	0	0	0	0
Rhode Island	14	24	24	0	0	0	0	0	0	0	0	0
Connecticut	16	54	47	0	0	1	0	0	0	0	0	0
MIDDLE ATLANTIC												
New York	262	295	295	0	1	56	0	0	0	0	0	1
New Jersey	100	115	115	0	1	0	0	0	0	0	0	0
Pennsylvania	129	199	217	1	0	0	0	0	0	2	0	0
EAST NORTH CENTRAL												
Ohio	160	125	125	0	0	1	0	0	0	0	0	0
Indiana	28	23	15	0	0	0	0	2	0	0	0	0
Illinois	136	195	195	0	2	5	0	0	0	0	0	0
Michigan [2]	136	210	210	0	0	5	0	0	0	0	0	0
Wisconsin	226	151	151	0	0	0	0	0	0	0	0	0
WEST NORTH CENTRAL												
Minnesota	48	25	32	0	1	0	0	0	0	0	0	0
Iowa	7	17	17	0	0	0	0	0	0	0	0	0
Missouri	14	4	10	0	0	0	2	0	0	0	0	0
North Dakota	11	6	26	0	0	0	1	0	0	1	0	0
South Dakota	2	2	2	0	0	0	0	0	0	0	0	0
Nebraska	12	6	5	0	0	0	0	0	0	0	0	0
Kansas	27	16	16	0	1	0	0	0	0	0	0	0
SOUTH ATLANTIC												
Delaware	0	0	1	0	0	0	0	0	0	[4] 0	0	0
Maryland [2]	46	75	57	0	0	0	4	0	0	0	0	0
District of Columbia	7	16	14	0	0	0	0	0	0	0	0	0
Virginia	44	8	25	0	0	0	93	0	0	0	0	0
West Virginia	46	14	14	0	0	0	0	0	0	0	0	0
North Carolina	70	58	79	0	0	0	0	0	0	0	2	4
South Carolina	73	21	23	0	1	0	0	0	0	1	0	2
Georgia	3	10	11	0	0	6	0	0	0	0	0	85
Florida	31	7	7	0	1	0	0	0	0	0	0	8
EAST SOUTH CENTRAL												
Kentucky	54	9	58	0	0	0	0	0	0	1	0	0
Tennessee	30	18	27	0	0	0	4	0	0	0	0	2
Alabama	47	24	24	0	0	0	0	0	0	0	0	19
Mississippi [2]	---	---	---	0	0	0	0	0	0	0	0	8
WEST SOUTH CENTRAL												
Arkansas	19	10	7	0	5	23	0	0	0	0	0	0
Louisiana	0	0	3	0	4	4	0	0	0	0	0	10
Oklahoma	3	4	4	0	0	0	0	1	0	0	0	0
Texas	102	94	68	0	23	146	0	0	2	0	0	84
MOUNTAIN												
Montana	15	37	8	0	0	0	0	0	0	0	0	0
Idaho	0	0	1	0	0	0	0	0	0	0	0	0
Wyoming	14	3	2	0	0	0	0	0	0	0	2	0
Colorado	38	30	15	0	0	0	0	0	0	0	0	0
New Mexico	0	3	9	0	1	2	1	0	0	0	0	0
Arizona	15	6	9	0	0	0	17	0	0	0	0	0
Utah [2]	14	14	14	0	0	0	0	0	0	0	2	0
Nevada	0	2	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington	52	23	23	0	0	0	0	0	0	0	0	0
Oregon	28	7	10	0	0	0	0	0	0	0	0	0
California	114	154	154	0	0	2	0	5	0	0	0	0
Total	2,306	2,350	2,577	1	41	253	122	9	2	[4] 5	6	123
40 weeks	149,965	141,736	143,682	50	1,675	13,137	3,350	563	21	420	662	3,199
41 weeks, 1942				67	898	9,822	5,581	445	37	438	730	2,675

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Including paratyphoid fever cases reported separately as follows: New York, 6; New Jersey, 2; New Mexico, 1.
[4] Exclusive of delayed report (included only in cumulative total) of 1 case in Delaware for the month of June.

WEEKLY REPORTS FROM CITIES

City reports for week ended Sept. 25, 1943

This table lists the reports from 87 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								
NEW ENGLAND												
Maine:												
Portland	0	0	------	0	0	2	2	1	1	0	0	5
New Hampshire:												
Concord	0	0	------	0	0	0	0	0	0	0	0	0
Vermont:												
Barre	0	0	------	0	0	0	0	0	0	0	0	0
Massachusetts:												
Boston	3	0	------	0	3	10	11	15	26	0	1	15
Fall River	0	0	------	0	0	0	1	2	3	0	0	1
Springfield	0	0	------	0	3	0	1	0	8	0	0	5
Worcester	0	0	------	0	0	0	11	0	16	0	0	7
Rhode Island:												
Providence	0	0	------	0	16	1	1	11	1	0	0	123
Connecticut:												
Bridgeport	0	0	------	0	0	0	1	3	0	0	0	6
Hartford	0	0	------	0	0	1	1	0	0	0	0	1
New Haven	0	0	------	0	1	0	0	2	1	0	0	3
MIDDLE ATLANTIC												
New York:												
Buffalo	0	0	------	0	2	3	6	4	2	0	2	4
New York	9	0	3	0	24	8	39	39	56	0	2	93
Rochester	0	0	------	0	0	1	3	2	3	0	1	3
Syracuse	0	0	------	0	2	1	0	1	0	0	0	12
New Jersey:												
Camden	3	0	------	0	0	1	0	0	0	0	0	0
Newark	1	0	------	0	2	3	2	2	2	0	0	15
Trenton	0	0	------	0	0	0	0	0	1	0	1	0
Pennsylvania:												
Philadelphia	2	1	2	1	3	8	14	3	10	0	3	31
Pittsburgh	1	1	1	1	10	0	9	0	9	0	1	5
Reading	0	0	------	0	1	0	0	0	0	0	0	5
EAST NORTH CENTRAL												
Ohio:												
Cincinnati	2	0	------	0	1	0	0	5	11	0	0	0
Cleveland	0	0	2	1	1	2	10	1	27	0	1	12
Columbus	0	0	------	0	0	0	3	0	14	0	0	6
Indiana:												
Fort Wayne	16	0	------	0	0	1	1	0	1	0	0	0
Indianapolis	4	0	------	0	0	0	6	1	7	0	0	18
South Bend	0	0	------	0	3	0	0	0	2	0	0	1
Terre Haute	0	0	------	0	0	0	1	0	0		0	0
Illinois:												
Chicago	1	0	------	1	5	15	15	66	12	0	0	81
Springfield	0	0	------	0	2	1	5	0	1	0	0	0
Michigan:												
Detroit	4	0	------	0	6	4	8	5	18	0	2	27
Flint	0	0	------	0	4	0	0	0	0	0	0	4
Grand Rapids	0	0	------	0	0	0	0	3	0	0	0	8
Wisconsin:												
Kenosha	0	0	------	0	0	0	0	0	2	0	0	0
Milwaukee	0	0	------	0	2	1	0	7	24	0	0	42
Racine	0	0	------	0	0	0	0	2	1	0	0	6
Superior	0	0	------	0	27	0	0	0	0	0	0	4
WEST NORTH CENTRAL												
Minnesota:												
Duluth	0	0	------	0	0	0	1	0	1	0	1	5
Minneapolis	0	0	------	0	4	0	3	10	10	0	0	6
St. Paul	3	0	------	0	2	1	4	6	11	0	0	14
Missouri:												
Kansas City	0	0	------	0	1	0	1	5	7	0	0	4
St. Louis	1	0	2	0	1	1	10	1	4	0	0	5

City reports for week ended Sept. 25, 1943—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza Cases	Influenza Deaths	Measles cases	Meningitis, meningococcus, cases	Pneumonia deaths	Poliomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
WEST NORTH CENTRAL—continued												
Nebraska:												
Omaha	1	0	------	0	0	1	1	6	7	0	0	0
Kansas:												
Topeka	0	0	------	0	0	0	0	0	4	0	0	0
Wichita	0	0	------	0	0	0	1	1	1	0	0	0
SOUTH ATLANTIC												
Delaware:												
Wilmington	0	0	------	0	1	2	3	1	0	0	0	2
Maryland:												
Baltimore	1	0	------	0	3	3	8	0	7	0	0	59
Cumberland	0	0	------	0	0	0	0	0	0	0	0	0
Frederick	0	0	------	0	0	0	0	0	0	0	0	0
District of Columbia:												
Washington	0	0	------	0	0	1	8	1	5	0	2	19
Virginia:												
Lynchburg	0	0	------	0	4	0	0	0	3	0	0	15
Richmond	0	0	------	0	0	0	0	0	2	0	0	2
Roanoke	0	0	------	0	0	0	0	0	0	0	0	5
West Virginia:												
Charleston	0	0	------	0	0	0	0	0	1	0	0	0
Wheeling	0	0	------	0	0	0	2	0	0	0	0	5
North Carolina:												
Wilmington	1	0	------	0	1	0	1	0	1	0	0	0
Winston-Salem	0	0	------	0	0	0	1	0	6	0	0	7
South Carolina:												
Charleston	0	0	------	0	0	1	1	0	1	0	0	1
Georgia:												
Atlanta	2	0	10	0	0	0	1	0	2	0	0	0
Brunswick	0	0	------	0	0	0	1	0	0	0	0	0
Savannah	0	0	------	0	0	0	0	0	0	0	0	0
Florida:												
Tampa	0	0	------	0	1	0	3	0	0	0	0	1
EAST SOUTH CENTRAL												
Tennessee:												
Memphis	0	0	------	1	1	0	2	0	3	0	0	7
Nashville	0	0	------	0	0	0	2	0	4	0	0	3
Alabama:												
Birmingham	0	0	2	0	1	0	3	0	0	0	0	0
Mobile	1	0	------	0	0	0	1	0	0	0	0	0
WEST SOUTH CENTRAL												
Arkansas:												
Little Rock	0	0	------	0	0	0	1	2	0	0	0	0
Louisiana:												
New Orleans	0	0	1	1	0	1	6	2	2	0	3	2
Shreveport	1	0	------	0	0	0	1	0	0	0	0	0
Texas:												
Dallas	0	0	------	0	0	0	3	5	1	0	0	6
Galveston	0	0	------	0	0	0	1	2	0	0	0	0
Houston	1	0	------	2	2	1	3	1	1	0	0	6
San Antonio	1	0	------	0	0	0	4	0	0	0	0	2
MOUNTAIN												
Montana:												
Billings	0	0	------	0	0	0	0	0	0	0	0	1
Great Falls	0	0	------	0	7	0	0	0	0	0	0	1
Helena	0	0	------	0	0	0	0	0	2	0	0	4
Missoula	0	0	------	0	0	0	1	0	0	0	0	0
Idaho:												
Boise	0	0	------	0	0	0	0	0	2	0	1	0
Colorado:												
Denver	3	0	4	0	1	1	2	1	0	0	1	30
Pueblo	0	0	------	0	1	0	0	10	2	0	0	2
Utah:												
Salt Lake City	0	0	------	0	4	0	0	9	1	0	0	7

City reports for week ended Sept. 25, 1943—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								
PACIFIC												
Washington:												
Seattle	0	0	------	0	4	1	0	4	3	0	0	4
Spokane	2	0	1	0	6	0	1	0	3	0	0	4
Tacoma	1	0	------	1	0	0	2	2	3	0	0	8
California:												
Los Angeles	6	0	5	0	5	1	2	28	17	0	0	30
Sacramento	0	0	------	0	1	0	1	4	0	0	0	2
San Francisco	1	0	1	0	7	2	2	5	8	0	0	10
Total	72	2	34	9	176	80	239	281	384	0	22	822
Corresponding week, 1942	62	0	53	4	131	12	228	48	281	1	28	1,062
Average, 1938–42	74	------	48	[1] 10	[2] 152	------	[1] 234	------	317	1	45	1,087

Anthrax.—Cases: Philadelphia, 1.

Dysentery, amebic.—Cases: Hartford, 1; Chicago, 1; St. Louis, 2; San Francisco, 1.

Dysentery, bacillary.—Cases: New Haven, 2; Buffalo, 7; New York, 128; Rochester, 1; Syracuse, 1; Philadelphia, 1; Detroit, 6; Richmond, 2; Charleston, S. C., 4; Atlanta, 1; Nashville, 2; Los Angeles, 6.

Dysentery, unspecified.—Cases: Richmond, 4; San Antonio, 3.

Tularemia.—Cases: New York, 1; St. Louis, 1; Memphis, 1.

Typhus fever.—Cases: New York, 1; Savannah, 3; Tampa, 1; Memphis, 2; Birmingham, 2; Mobile, 2; Little Rock, 1; New Orleans, 2; Shreveport, 5; Dallas, 3.

[1] 3-year average, 1940–42.
[2] 5-year median.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1942, 34,622,000)

	Diphtheria case rates	Encephalitis, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Poliomyelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
New England	7.5	0.0	0.0	0.0	57.1	34.8	72.1	84.5	139.1	0.0	2.5	412
Middle Atlantic	7.1	0.9	2.7	0.9	19.6	11.1	32.6	22.7	37.0	0.0	4.5	75
East North Central	15.8	0.0	1.2	1.2	29.8	14.0	28.6	52.6	70.1	0.0	1.8	122
West North Central	10.1	0.0	4.1	0.0	16.2	6.1	42.6	58.8	91.3	0.0	2.0	69
South Atlantic	6.8	0.0	17.1	0.0	17.1	12.0	49.7	3.4	47.9	0.0	3.4	199
East South Central	5.9	0.0	11.9	5.9	11.9	0.0	47.5	0.0	41.6	0.0	0.0	59
West South Central	8.8	0.0	2.9	8.8	5.9	5.9	55.7	35.2	11.7	0.0	8.8	47
Mountain	24.1	0.0	32.2	0.0	104.5	8.0	24.1	160.8	56.3	0.0	16.1	362
Pacific	17.5	0.0	12.2	1.7	40.2	7.0	14.0	75.2	59.4	0.0	0.0	101
Total	10.8	0.3	5.1	1.4	26.5	12.0	36.0	42.3	57.8	0.0	3.3	124

PLAGUE INFECTION IN CALIFORNIA AND MONTANA

Plague infection has been reported proved in pools of fleas from burrows and rodents collected in California and Montana on the dates given as follows:

CALIFORNIA

Lassen County: June 2, 1942, 200 fleas from *C. beldingi* ground squirrel burrows on a ranch 3 miles south and 9 miles east of Amedee; June 25, 1942, 9 fleas from 2 ground squirrels, *C. oregonus*, found dead on a ranch on Willow Creek, 7 miles south and 4½ miles east of Susanville.

Mono County: August 12, 1943, 17 fleas from 18 golden mantled ground squirrels taken at June Lake Lodge, June Lake.

Monterey County: August 20, 1943, a pool of 97 fleas from 16 ground squirrels, *C. beecheyi*, and another pool of 89 fleas from 16 ground squirrels, same species, taken from a ranch 9 miles south and 3 miles west of King City.

MONTANA

Custer County: September 13, 1943, 176 fleas from 41 prairie dogs, *Cynomys ludovicianus*, taken 13 miles southeast of Miles City along U. S. Highway No. 212, and 13 miles south along Toung River Road.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Honolulu—Dengue fever.—A total of 325 cases of dengue fever have been reported up to October 3, 1943, in Honolulu, Hawaii Territory.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended September 11, 1943.—During the week ended September 11, 1943, 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
Chickenpox		6	7	10	17	5	8	8	20	81
Diphtheria		10	5	21		1	1	6		44
Dysentery (bacillary)							1			1
Encephalitis, infectious						1				1
German measles				1	5			2	2	10
Influenza		5			17	3			1	26
Measles	2	1		69	37	21	7	30	13	180
Meningitis, meningococcus			1	1	3				1	6
Mumps		4		18	54	9	2	10	12	109
Poliomyelitis			2	8		2		1		13
Scarlet fever		7	4	46	30	15	11	16	9	138
Tuberculosis (all forms)	5	2	1	70	55	8	14		18	173
Typhoid and paratyphoid fever		1		19	7	1		5		33
Undulant fever				4		1				5
Whooping cough		25		206	132	12	28	57	16	476

CUBA

Habana—Communicable diseases—4 weeks ended July 24, 1943.—During the 4 weeks ended July 24, 1943, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	34		Scarlet fever	5	
Dysentery	1	1	Tuberculosis	7	3
Malaria	7	1	Typhoid fever	26	
Measles	9				

FINLAND

Notifiable diseases—July 1943.—During the month of July 1943, cases of certain notifiable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Actinomycosis	1	Mumps	189
Cerebrospinal meningitis	17	Paratyphoid fever	261
Chickenpox	366	Pneumonia (all forms)	594
Conjunctivitis	35	Poliomyelitis	13
Diphtheria	477	Puerperal fever	60
Dysentery	17	Rheumatic fever	208
Gastroenteritis	4,142	Scabies	1,376
Gonorrhea	756	Scarlet fever	458
Hepatitis, epidemic	513	Syphilis	532
Influenza	314	Tetanus	1
Laryngitis	12	Typhoid fever	20
Lymphogranuloma inguinale	1	Vincent's angina	15
Malaria	1	Whooping cough	607
Measles	1,417		

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.)

Plague

French West Africa—Dakar.—For the period September 1–10, 1943, 1 case of plague with 1 death was reported in Dakar, French West Africa.

Morocco—Marrakech.—For the period August 1–10, 1943, 1 case of plague was reported in Marrakech, Morocco.

Senegal—Thies District.—For the period August 21–31, 1943, 5 fatal cases of plague were reported in Thies District, Senegal.

Smallpox

Algeria.—For the period August 21–31, 1943, 28 cases of smallpox were reported in Algeria.

Morocco.—For the first 10 days of August 1943, 24 cases of smallpox were reported in Morocco.

Sudan (French).—For the period August 21–31, 1943, 77 cases of smallpox with 7 deaths were reported in French Sudan.

Typhus Fever

Algeria.—For the period August 21–31, 1943, 23 cases of typhus fever were reported in Algeria.

Morocco.—For the period August 1–10, 1943, 132 cases of typhus fever were reported in Morocco.

Rumania.—During the week ended September 25, 1943, 25 cases of typhus fever were reported in Rumania.

Yellow Fever

Belgian Congo—Leopoldville.—For the week ended August 28, 1943, 1 case of yellow fever with 1 death was reported in Leopoldville, Belgian Congo.

Senegal—Kolda.—On September 25, 1943, 1 case of yellow fever was reported in Kolda, Senegal.

COURT DECISION ON PUBLIC HEALTH

Garbage—ordinance making collection by unauthorized person unlawful upheld.—(California District Court of Appeal, Third District; *Ex parte Sozzi*, 129 P.2d 40; decided September 2, 1942.) An ordinance and regulation of a sanitary district in California provided in part that it should be unlawful for any person, other than collectors employed by the district, to collect any garbage or waste therein. In a habeas corpus proceeding by a person convicted of a violation of this provision it was contended by the petitioner that the said provision was void and not within the power of the sanitary district to enact. The State statutes authorized sanitary districts to collect waste and garbage, to make and enforce regulations for garbage removal and all other sanitary purposes not in conflict with State laws, and to do any act necessary or proper to the complete exercise and effect of its powers or for the purposes for which formed. The statutes also made a violation of a district regulation or ordinance a misdemeanor. The petitioner conceded that the district could engage in garbage collection but contended that its right to do so was not exclusive because "a municipal corporation cannot, under grant of a power to regulate a lawful business, either create a monopoly or prohibition." But the State district court of appeal said that the gathering of garbage was not a trade, business, or occupation in any proper sense and that the sanitary district could, under its powers, reserve to itself the exclusive right, through its own agents or employees, to collect garbage within its limits. It could not be said that property rights are affected by a regulation that garbage may not be removed by other than a licensed collector or one having a permit for that purpose.

The appellate court denied the writ.