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Distribution and Salaries of Directors of Vital Statistics and Statisticians in State Health Departments as of August 1948

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The rapid expansion of public health programs has accelerated a widespread demand for more and better statistical information. Statistical data are being used increasingly as a tool in administrative planning and evaluation, as well as in research and interpretation of the health needs of the community to the public. The supply of statisticians trained in public health has not been commensurate with this growth. Foremost among the problems arising from this shortage are considerations of professional qualifications, definitions of function, and the level of compensation offered. This paper is the third in a series of descriptions and analyses of the organization and structure of statistical activities in State health departments (*1*, *2*). It analyzes the distribution of the positions of directors of vital statistics and statisticians and their salaries from data in the August 1948 pay rolls of State health departments submitted to the U. S. Public Health Service for a cooperative study sponsored by the Service, the American Public Health Association, and the State and Territorial Health Officers Association. Data on the position qualifications are from the official classification plans submitted by the States to the Public Health Service for review and approval.

Although the titles of the various statistical positions are approximately the same, wide differences among States may be noted in job descriptions, actual duties, and qualifications for these positions. The term "statistician" or "director of vital statistics" is used at times for clerical workers engaged in the routine collection or tabulation of records or reports, or their supervisors. It is also used for persons responsible for intricate statistical analyses, as well as for persons with broad administrative and technical responsibility for the collection and analysis of vital records and other health department reports.

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The classifications for directors of vital statistics and statisticians used by the Committee on Remuneration and Standards (*4*) of the Vital Statistics Section of the American Public Health Association are used in this paper, except that no distinction is made between junior and senior statisticians. These classifications are as follows:

1. Directors of vital statistics:

(*a*) Registrars—Chiefs of a statistical unit engaged primarily in the registration of births, deaths, marriages, and divorces. Responsible for policy in relation to registration matters and at times for analysis of the registration function but not engaged in analysis with regard to health department activities as a whole.

(*b*) Chief statistician-registrars—Chiefs of a combined registration and analysis unit. These combine the duties of the registrar in the registration group and the chief statistician in the statistical group.

2. Statisticians (all persons listed on pay rolls as statisticians, public health analysts, statistical aides, or biometricians):

(*a*) Chief statisticians—Workers engaged in this category are chiefs of a statistical unit engaged primarily in analytical work exclusive of registration activity. In coordination with other activities of the health department they are responsible for the development of a statistical program from the planning stages through the final analysis and presentation of results. They exercise considerable independence of action within the broad policies laid down by the health commissioner.

(*b*) Senior statistician—Under the general supervision of the registrar and/or chief statistician they are responsible for analysis of a high order of technical competence demanding a good general knowledge of public health. May consult with chiefs and other personnel of the health department with regard to planning of a study, collection of data, tabulation and analysis of results. Under general supervision only, may initiate studies and exercise considerable independence of action within broad policy lines laid down by the chief. Analytical work not confined to one particular aspect of public health.

(*c*) Junior statistician—Individuals in this class are usually under the immediate and fairly close supervision of the senior statistician. They do not confer, except on rare occasions, with chiefs of other divisions. They may supervise a small clerical or tabulating force or be responsible for some tabulating work.

Number Employed

As of August 1948, the 48 State health departments employed 47 directors of vital statistics, 39 as registrars of vital statistics and 8 as

chief statistician-registrars (table 1). The latter have broad responsibilities for statistical operations in their departments as well as for the registration of vital records. In one State (Massachusetts) the registrar of vital records is in the Department of State and not in the health department.

Table 1. ***Distribution of directors of vital statistics and statisticians employed in State health departments, by number employed per department as of August 1948***

Statisticians per department [1]	Number State health departments	Number directors of vital statistics		Number statisticians	
		Registrars	Registrar-chief statistician	Chief statistician	Statistician
Total	48	[2] 39	8	4	102
None	16	16	0	0	0
1	15	14	1	1	14
2	7	6	1	2	12
3	3	0	3	0	9
5	3	1	1	0	15
6	1	0	1	0	6
13	1	1	0	1	12
17	2	1	1	0	34

[1] Text and tables of this report exclude directors of vital statistics in considering number of statisticians per health department.
[2] The position of registrar was vacant in 1 State, and 1 State (Massachusetts) does not have the position of registrar within the State health department.

The 48 health departments had 102 statisticians and 4 chief statisticians, approximately one-third of whom were in 2 States. Five States had an additional third of the total, while 25 States accounted for the remaining third. Sixteen States had no statisticians in their health departments, although in some of these States the directors of vital statistics were qualified statisticians. At least a majority of the States appear to be without sufficient professional personnel for adequate research and statistical programs.

Established Positions

State health departments have established 94 classes [1] of statistical positions, only 53 of which were filled by the 106 statisticians that were employed in August 1948 (table 2). Ten States had not established classes of positions for statisticians other than for the director of vital statistics. Six States which did not employ any statisticians had an average of two unfilled classes of statistical positions. The remaining 32 States have an average of one unfilled class.

[1] Under civil service or merit system regulations, positions are grouped into classes on the basis of ability to subject them to common treatment with respect to compensation, selection, and other personnel actions. For example, a class may be established for senior statistician, without regard to the division or service in which the position or positions will be located. Each division or service may, if necessary, appoint a senior statistician under this class, and each incumbent will receive the same compensation and have the same general responsibilities and minimum qualifications.

Table 2. *Distribution of established [1] classes of statistical positions in State health departments, by number of statisticians employed per State as of August 1948*

Number statisticians employed per State	Number States having established positions	Number of established classes of positions		
		Total	Filled	Unfilled
Total	38	94	53	41
None	6	12	0	[2] 12
1	15	31	[2] 15	[3] 16
2	7	18	[3] 11	[2] 7
3	3	8	6	[2] 2
5	3	7	7	0
6	1	3	2	[2] 1
13	1	4	[2] 4	0
17	2	11	8	3

[1] Established in classification plan, but not necessarily in budget.
[2] Includes 1 class for chief statisticians.
[3] Includes 2 classes for chief statisticians.

Vacancies

Approximately 45 percent of the classes of statistical positions which were established in the classification plans of State health departments as of August 1948 were unfilled. If only one position per vacant class were filled, the current number of statisticians employed would be increased by approximately 30 percent.

In several of the States there may be no intention of filling the existing vacancies in statistical positions. In other States, funds are not available; the positions as established are outdated, or they are not being filled for other reasons. In addition, several States had vacancies within the classes in which some personnel are already employed. In spite of the foregoing qualifications, these data are indicative of the fact that there are many statistical positions which have been established but not filled.

Salary Scales

Data on salaries are difficult to evaluate. Theoretically, compensation is based on the levels of responsibility involved, the nature of the experience and training required to perform the duties inherent in a particular position, and the salary levels of similar positions. It is based also on supply and demand in relation to labor market and cost of living.

Actually, extreme differences appear among States and within individual health departments in content, scope, and importance of the responsibilities of the positions involved. Thus salary comparisons are useful only to describe current levels and to point up existing anomalies. Evaluation must await accurate and precise data on the functions performed and levels of responsibility involved in individual positions. In this report the comparisons are made on the basis of job titles alone.

Table 3. *Distribution of directors of vital statistics and statisticians in State health departments, by salary as of August 1948*

Position	Number positions	Salary												
		Under $2,000	$2,000–2,499	$2,500–2,999	$3,000–3,499	$3,500–3,999	$4,000–4,499	$4,500–4,999	$5,000–5,499	$5,500–5,999	$6,000–6,499	$6,500–6,999	$7,000–7,499	Over $7,500
Total	152	[1] 1	20	37	18	23	20	13	9	2	4	1	3	[2] 1
Directors of vital statistics:														
Registrars	[3] 38	0	0	5	3	3	7	8	4	2	3	0	2	1
Chief statistician-registrars	8	0	0	0	0	1	1	1	2	0	1	1	1	0
Chief statisticians	4	0	0	0	0	0	2	0	2	0	0	0	0	0
Statisticians	102	1	20	32	15	19	10	4	1	0	0	0	0	0

[1] $1,920.
[2] $8,800.
[3] Excludes the registrar of Massachusetts who is not under the department of health and the registrar of Tennessee where a vacancy exists.

Wide ranges are found in the distribution of the salaries of directors of vital statistics and statisticians employed in State health departments (table 3). Median salary intervals for the directors of vital statistics who served both as registrar and chief statistician were higher than for those serving only in the capacity of registrar, although the range of salaries was broader for the latter.

The salary ranges and medians for the groups were:

Class	*Salary range*	*Median interval*
Registrars	$2, 520–$8, 800	$4, 500–$4, 999
Chief statistician-registrars	3, 768– 7, 260	5, 000– 5, 499
Chief statisticians	4, 000– 5, 400	4, 500– 4, 999
Statisticians	1, 920– 5, 490	2, 500– 2, 999

The salaries of directors of vital statistics and statisticians, distributed according to the number of statisticians employed as of August 1948, reflect wide differences in the organization and content of statistical activities rather than any positive correlation between the number employed and their salary levels (table 4). The median salary of directors of vital statistics in health departments employing one or no statisticians lay in the interval of $4,000–$4,499, while for those in departments employing more than one statistician the median was in the $5,000–$5,499 interval. The median salary interval of statisticians in departments employing one or two statisticians was $3,000–$3,499, while in the department employing 13 it was $2,000–$2,499.[2]

[2] This department has employed a proportionately large group of junior staff members with suitable backgrounds for further training; in the two departments with only one or two statisticians emphasis has been placed on obtaining personnel already trained for higher responsibilities.

Table 4. *Distribution of directors of vital statistics and statisticians in State health departments by number of statisticians employed per department, by salary as of August 1948*

Number statisticians employed per department	Number States with designated number of positions	Total number positions	Salary											
			Under $2,000	$2,000–$2,499	$2,500–$2,999	$3,000–$3,499	$3,500–$3,999	$4,000–$4,499	$4,500–$4,999	$5,000–$5,499	$5,500–$5,999	$6,000–$6,499	$6,500–$6,999	$7,000–$7,499	$7,500 and over
Total		152	1	20	37	18	23	20	14	8	2	4	1	3	1
Directors of vital statistics [1]	47	[2] 46	0	0	5	3	4	8	9	6	2	4	1	3	1
None	16	16	0	0	3	2	2	3	2	1	2	1	0	0	0
1	15	15	0	0	2	1	2	4	3	1	0	1	0	1	0
2	7	7	0	0	0	0	0	0	3	2	0	1	0	1	0
3	3	3	0	0	0	0	0	0	0	2	0	0	0	1	0
5	2	2	0	0	0	0	0	0	1	0	0	0	1	0	0
6	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0
13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	2	2	0	0	0	0	0	0	0	0	0	1	0	0	1
Statisticians	48	106	1	20	32	15	19	12	5	2	0	0	0	0	0
None	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	15	15	0	3	3	3	3	2	1	0	0	0	0	0	0
2	7	14	0	2	4	2	2	3	1	0	0	0	0	0	0
3	3	9	0	1	4	2	1	0	1	0	0	0	0	0	0
5	3	15	0	2	6	5	2	0	0	0	0	0	0	0	0
6	1	6	0	3	3	0	0	0	0	0	0	0	0	0	0
13	1	13	1	8	2	1	0	0	0	1	0	0	0	0	0
17	2	34	0	1	10	2	11	7	2	1	0	0	0	0	0

[1] Includes registrars (or assistant registrar, where health officer is legal registrar) and chief statistician-registrars.
[2] Excludes director of vital statistics for Massachusetts and Tennessee.

The differences between the salaries of the directors of vital statistics and the directors of other selected programs are striking (table 5). In this comparison, the salaries for program directors who are required to have an M. D. degree as a major qualification have been grouped together under Medical. The salaries of directors of vital statistics are about the same as for the nursing directors, but are higher than

Table 5. *Comparison of the salaries of directors of vital statistics and other selected program directors in State health departments as of August 1948*

Percentage difference in salaries	Number of States having indicated difference in salaries between directors of vital statistics and other specified program directors				
	Medical	Sanitation	Laboratories	Nursing	Public health education
Total	48	48	48	48	48
No difference	4	3	5	4	2
Lower:					
Under 20	0	3	1	10	6
20–39	0	0	0	6	3
40–59	0	0	0	1	0
60–79					
80–99		1			
Higher:					
Under 20	9	6	13	13	4
20–39	11	14	8	6	4
40–59	8	11	7	2	0
60–79	6	5	4	1	1
80–99	5	1	3	1	0
100 and over	3	2	3	0	0
No data	3	2	4	4	28

those for the directors of public health education, and are consistently lower than those of the directors of medical programs, sanitation, and laboratories. The median salary for directors of vital statistics is 40 to 49 percent lower than that for medical directors, and 20 to 29 percent lower than the median for directors of sanitation and of laboratories. In a few States, however, the salaries for all directors are on the same administrative level.

In a study of the salaries of State public health workers which was released in October 1948 by the Public Health Service, the average annual salaries of selected health department division directors were computed for August 1948 (*3*). For the directors of vital statistics the over-all salary was $4,802—substantially lower than that for all other directors except directors of nursing which averaged $4,722. The figures are as follows:

Position	*Average salary August 1948*
Health officers	$8,247
Directors:	
Local health services	7,364
Maternal and child health	6,829
Venereal disease control activities	7,017
Tuberculosis control	7,311
Public Health dental services	6,211
Sanitary engineering	6,528
Laboratory services	6,394
Public nursing	4,722
Vital statistics	4,802

The fact that the averages are higher in general for medical, sanitation, and laboratory directors is not surprising since most of them have more responsibility in their positions than do the directors of vital statistics. In respect to these fields of activity there is more uniformity and agreement concerning job content and needed personnel qualifications, not only within their professions but by civil service agencies, legislatures, and other salary determining bodies, than there is for the directors of vital statistics. This factor may affect the level of responsibility assigned to the positions and the resultant salary levels. There is little agreement concerning the position of director of vital statistics (*4*) where functions range from the direction and routine tabular analysis of a registration program limited to births and deaths to the direction of all registration activities, including intensive statistical analysis and consultation service for the health department as a whole. There is no agreement as to what training is necessary for the position of director of vital statistics. Some State officials believe that the primary prerequisite for the position is proved administrative ability, while others think statistical training and experience are equally important.

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The study (4) cited in the foregoing paragraphs also showed that the following median salaries for professional public health personnel other than the health officers and the directors of programs fell within the following ranges:

Occupational group	*Median salary August 1948*
Medical personnel	$6,200–$6,400
Sanitary engineers	4,200– 4,400
Health educators	3,400– 3,600
Supervisory and consultant public health nurses	3,300– 3,400
Nutritionists	3,200– 3,400
Professional laboratory personnel	3,000– 3,200
Sanitation personnel	2,800– 3,000
Staff level public health nurses	2,400– 2,500
Graduate registered nurses	2,100– 2,200

The range within which the median salary fell for professional statistical workers computed from the same source as that used for the tabulation above—namely, salaries for personnel appearing on the State health department pay rolls in August 1948—was $2,800–$3,000. The median salary of statisticians was thus the lowest except for general sanitation personnel, staff-level public health nurses, and graduate registered nurses.

The salary levels for statisticians may reflect the lack of homogeniety both in the degree of responsibility assigned to them in many areas and/or in the lack of understanding of their functions by administrative and salary determining officials. In general, a doctor's, an engineer's, a bacteriologist's, or nurse's general functions can be assumed from the nature of his or her training. Such an assumption cannot be made in respect to health department statisticians without inquiry into the individual's specific background and his current duties and responsibilities.

Relation of Salaries to Total Expenditures

Another factor to be considered in analyzing the salary structure is whether salary levels are related to the size of the health department and the area it serves. An appropriate index of size is total expenditures for public health. Gross expenditures seem preferable to per capita expenditures when size of operations is the factor to be considered. In this ranking, State health departments of approximately the same size fall in close proximity, whereas a per capita ranking places States like New York, Maryland, Nevada, and Delaware on approximately the same level.

Table 6 shows this distribution when the States are ranked by quartiles according to their total expenditures for public health during the period July 1, 1947 to June 30, 1948. As would be expected, the number of statisticians increased in general as the expenditures in-

Table 6. *Distribution of statisticians and directors of vital statistics in State health departments, by salary and quartile grouping of States according to total public health expenditures in 1947* [1]

Salary interval	Number of directors of vital statistics				Number of statisticians			
	Quartile grouping				Quartile grouping			
	Uppermost [2]	Second [3]	Third [4]	Lowest [5]	Uppermost [2]	Second [3]	Third [4]	Lowest [5]
Total	11	11	12	12	58	28	15	5
Under $2,000	0	0	0	0	0	1	0	0
$2,000–$2,499	0	0	0	0	3	10	4	3
$2,500–$2,999	0	0	0	5	17	6	8	1
$3,000–$3,499	0	0	1	2	10	4	1	0
$3,500–$3,999	0	0	4	0	16	1	1	1
$4,000–$4,499	1	2	2	3	9	3	0	0
$4,500–$4,999	1	5	1	2	2	2	0	0
$5,000–$5,499	1	2	3	0	1	1	1	0
$5,500–$5,999	2	0	0	0	0	0	0	0
$6,000–$6,499	2	1	1	0	0	0	0	0
$6,500–$6,999	1	0	0	0	0	0	0	0
$7,000–$7,499	2	1	0	0	0	0	0	0
$7,500 and over	0	0	0	0	0	0	0	0
Number of States without designated personnel	1	1	0	0	2	2	5	7

[1] Excluding expenditures for general and mental hospitals, TB sanatoriums, and capital investments.
[2] California, Georgia, Illinois, Massachusetts, Maryland, Michigan, New York, North Carolina, Ohio, Pennsylvania, Texas, Virginia.
[3] Alabama, Connecticut, Florida, Kentucky, Louisiana, Mississippi, Missouri, New Jersey, South Carolina, Tennessee, Washington, Wisconsin.
[4] Arkansas, Colorado, Indiana, Iowa, Kansas, Maine, Minnesota, New Mexico, Oklahoma, Oregon, West Virginia, Utah.
[5] Arizona, Delaware, Idaho, Montana, Nebraska, Nevada, New Hampshire, North Dakota, Rhode Island, South Dakota, Vermont, Wyoming.

creased; 50 percent of all positions were in the highest quartile of States, while less than 5 percent were in the lowest quartile where 7 States had no statisticians in their health departments. The salary levels also appear to be affected by total expenditures. The median salary interval for the highest quartile of States was $1,000 above that for the lowest quartile and $500 above that for the second and third quartiles. For the directors of vital statistics there was a much greater spread of salaries between quartiles than there was for statisticians. The median salary for the highest quartile was in the interval $6,000–$6,499, while for the lowest quartile it was $3,000–$3,499; the medians for the second and third quartiles were in the $4,500–$4,999, and $4,000–$4,499 intervals, respectively.

Salaries in Relation to Type of Organization

An analysis of the distribution of the salaries of directors of vital statistics and statisticians classified as to types of statistical organization (*2*) in the 48 State health departments (table 7) indicates in general a positive relationship between salary levels and type of organization. The exceptions were in the large and/or highly organized States departments. The median salary for the directors of vital

statistics in the 17 States having only a division of vital statistics lay in the $4,000–$4,499 interval; it was in the $5,000–$5,499 interval in the 6 States having a centralized statistical division, and it was $4,500–$4,999 in those with other types of organizations.

Table 7. ***Distribution of statisticians and directors of vital statistics, by salary and type of statistical organization in State health departments, October 1947***

Salary interval	Number of statisticians					
		Type of statistical organization				
	Total	No formal statistical organization for analysis [1]	Division of VS with some centralized statistical services	Division of VS with independent central tabulating unit	Central statistical division with independent division of VS	Central statistical division
Number of persons	106	14	16	24	18	34
Under $2,000	1	0	0	0	1	0
$2,000–$2,499	20	5	0	0	8	7
$2,500–$2,999	32	4	5	9	3	11
$3,000–$3,499	15	2	7	2	2	2
$3,500–$3,999	19	2	3	4	0	10
$4,000–$4,499	12	0	1	8	2	1
$4,500–$4,999	4	1	0	1	0	2
$5,000–$5,499	3	0	0	0	2	1
$5,500–$5,999	0	0	0	0	0	0
$6,000–$6,499	0	0	0	0	0	0
$6,500–$6,999	0	0	0	0	0	0
$7,000–$7,499	0	0	0	0	0	0
$7,500 and over	0	0	0	0	0	0
Number of States without designated personnel		12	3	1	0	0

Salary interval	Number of directors of vital statistics					
		Type of statistical organization				
	Total	No formal statistical organization	Division of VS with some centralized statistical services	Division of VS with independent central tabulating unit	Central statistical division with independent division of VS	Central statistical division
Number of persons	46	17	14	6	3	6
Under $2,000	0	0	0	0	0	0
$2,000–$2,499	0	0	0	0	0	0
$2,500–$2,999	5	4	1	0	0	0
$3,000–$3,499	3	3	0	0	0	0
$3,500–$3,999	4	1	2	1	0	0
$4,000–$4,499	8	3	3	1	0	1
$4,500–$4,999	9	2	2	2	2	1
$5,000–$5,499	6	2	1	0	1	2
$5,500–$5,999	2	1	1	0	0	0
$6,000–$6,499	4	0	2	1	0	1
$6,500–$6,999	1	0	1	0	0	0
$7,000–$7,499	3	1	1	0	0	1
$7,500 and over	1	0	0	1	0	0
Number of States without designated personnel	2	1	0	0	1	0

[1] No formal statistical organization for analysis—no statistical organization having functions covering the entire health department other than the Division of Vital Statistics.

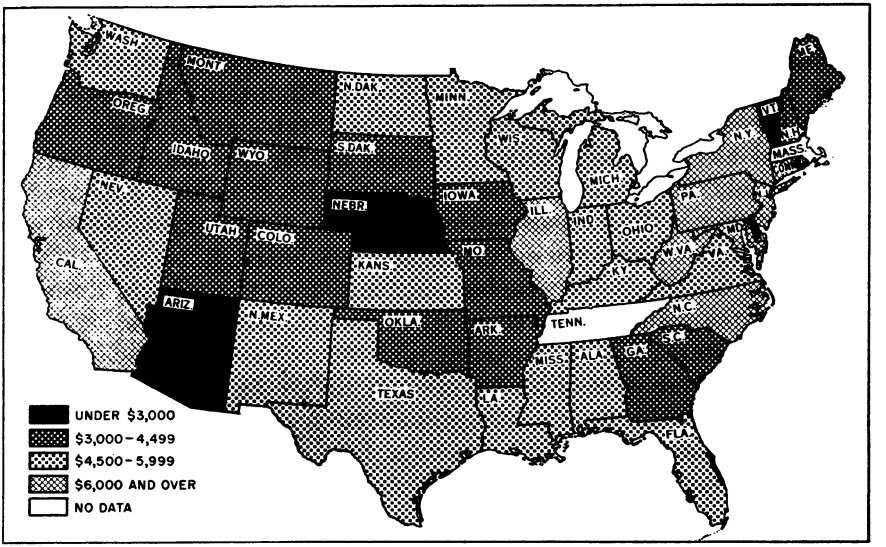

Figure 1. Salaries of directors of vital statistics in State health departments as of August 1948.

The variation was even greater in the medians for statisticians' salaries. Where there were central statistical organizations there were more statisticians; the range of salaries was broader, and the median salary was lower. The latter may be explained by the fact that more statisticians in the lower grades were employed.

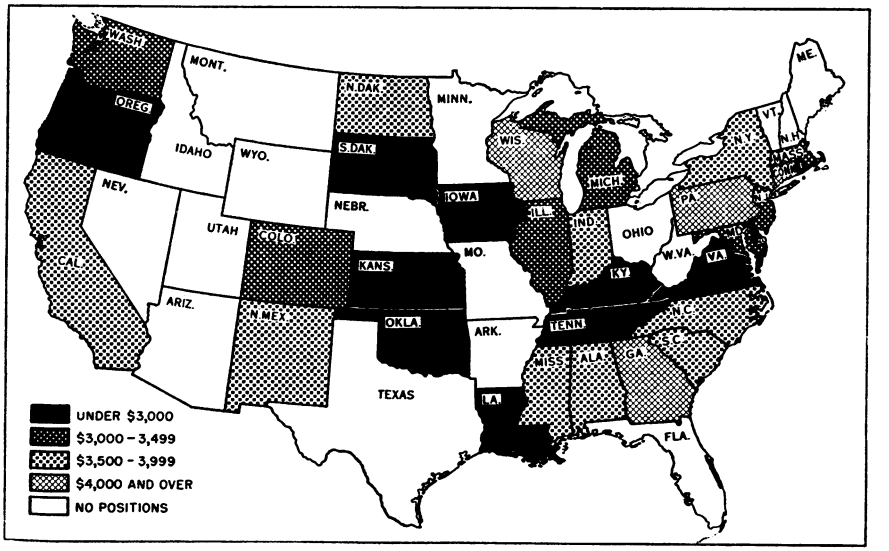

Figure 2. Median salaries of statistical positions in State health departments as of August 1948.

The geographic distribution of the salaries received by the directors of vital statistics as of August 1948 indicates no apparent patterns other than that salaries paid in the Rocky Mountain States were all in the lowest salary range (fig. 1). Those States are sparsely populated and have a low coverage of local health services. California was the only State west of the Mississippi River paying a salary of $6,000 or over. With the exception of Illinois, the other States having salaries in this range were on the Eastern seaboard.

Figure 2 shows the geographic distribution of the salaries received by the statisticians employed in State health departments. Eleven of the 16 State health departments employing statisticians as of August 1948 were west of the Mississippi River. Except in Colorado, departments in the Rocky Mountain area were void of statisticians. Only in 4 States (Connecticut, Georgia, Pennsylvania, and Wisconsin) was the median salary $4,000 or more; in 17 States it was under $3,000.

Education and Experience Required

Qualifications for appointment provide some indication of the salary level and responsibilities of the positions under consideration, and of the general level of attainment likely to exist among incumbents. Table 8 shows the median salary intervals of the directors of vital statistics and of statisticians according to the minimum educational qualifications and median years of experience that were required. The median salary interval of chief statistician-registrars was $500 higher than that for the directors who were registrars. For the 15,

Table 8. *Median salary intervals of directors of vital statistics and statisticians employed in State health departments, by minimum educational qualifications and median years' experience required for position as of August 1948*

Educational requirements and median years' experience required	Directors of vital statistics				Chief statisticians		Statisticians	
	Registrars		Chief statistician-registrars					
	Number	Median salary interval	Number	Median salary interval	Number	Median salary interval	Number	Median salary interval
Total	38	$4,500–$4,999	8	$5,000–$5,499	4	$4,500–$4,999	102	$2,500–$2,999
Less than college graduate but 3–4 years' experience	15	3,500–3,999	[1] 1	7,000–7,499	[1] 1	5,000–5,499	29	2,000–2,499
College graduation, 1–2 years' experience	7	5,000–5,499	4	4,750–5,249	1	4,000–4,499	59	3,000–3,499
1 year or more of postgraduate education plus 1–2 years' experience	15	4,500–4,999	3	5,000–5,499	2	4,500–4,999	6	2,500–2,999
Not specified or unavailable	1	6,000–6,499	0	----	0	----	8	3,000–3,499

[1] No educational requirements are set for these positions.

or approximately 40 percent, of the registrars in positions for which college graduation was not required, the median salary was in the interval $3,500–$3,999, or $1,000 below the median for all registrars. The median salary interval for the four chief statisticians was $4,500–$4,999, corresponding to that of the two in positions for which a year or more of postgraduate education was required. Of the 102 statisticians, 29 were in positions not requiring a college degree; their median salary interval was $2,000–$2,499, or $500 less than that for the 6 in positions requiring a year or more of postgraduate education. The latter interval of $2,500 to $2,999 corresponds to the median for the statisticians as a whole. The median for statistical positions requiring college graduation was higher than for those requiring a year or more of postgraduate education, probably reflecting the fact that a few departments had recruited for training purposes junior professional personnel with advanced educational preparation.

Although there is little agreement as to the content and scope of the functions of either directors of vital statistics or statisticians, most persons in the field of public health hold that basic knowledge of statistics per se is needed. Nevertheless more than one-third of the directors of vital statistics and statisticians were in positions that did not require courses and/or experience in statistics (table 9). Moreover, no direct relationship appears between such requirements and salary levels. The lowest median salary interval for the directors of

Table 9. *Median salary intervals of directors of vital statistics and statisticians employed in State health departments according to statistical content of educational and experience requirements, as of August 1948*

Statistical content of educational and experience requirements	Directors of vital statistics				Chief statisticians		Statisticians	
	Registrars		Chief statistician-registrars					
	Number	Median salary interval	Number	Median salary interval	Number	Median salary interval	Number	Median salary interval
Total	38	$4,500–$4,999	8	$5,000–$5,499	4	$4,500–$4,999	102	$2,500–$2,999
Statistics courses required with:								
Specialized experience [1]	7	4,500– 4,999	4	5,000– 5,499	2	4,500– 4,999	16	3,500– 3,999
General statistical experience	2	4,250– 4,749	1	4,500– 4,999	0		14	2,500– 2,999
Nonstatistical or no statistical experience	6	4,000– 4,499	0		1	4,000– 4,499	28	3,000– 3,499
Statistics courses not required with:								
Specialized experience [1]	9	4,000– 4,499	1	3,500– 3,999	0		0	
General statistical experience	5	5,000– 5,499	1	6,500– 6,999	1	5,000– 5,499	15	2,000– 2,499
Nonstatistical or no experience	8	4,500– 4,999	1	7,000– 7,499	0		21	3,500– 3,999
Not specified or not available	1	6,000– 6,499	0		0		8	3,000– 3,499

[1] Experience in public health or vital statistics.

vital statistics, however, was for those in positions requiring statistics courses without statistical experience or vice versa. The median salary interval for statisticians in positions requiring courses in statistics and specialized experience was $1,000 higher than for the group as a whole.

In view of the shortage of statisticians, the minimum and maximum salaries authorized for the vacant classes of positions are of interest. These data are shown in table 10. Only 20 percent of them pay starting salaries of more than $4,000. In a period of short labor supply the immediate prospects of filling such positions with trained personnel at these salaries are not promising.

Table 10. *Distribution of 41 unfilled classes* [1] *of statistical positions in State health departments, by minimum and maximum salaries as of August 1948*

Salary interval	Number of positions specifing salary as—		Salary interval	Number of positions specifing salary as—	
	Minimum	Maximum		Minimum	Maximum
Total	41	41	$4,000–$4,499	3	6
			$4,500–$4,999	2	4
Under $2,000	2	0	$5,000–$5,499	3	3
$2,000–$2,499	7	2	$5,500–$5,999	1	2
$2,500–$2,999	7	4	$6,000 and over	0	4
$3,000–$3,499	8	9	Unspecified	2	2
$3,500–$3,999	6	5			

[1] Established in classification plan but not necessarily included in budget.

Summary

As of August 1948, there were 46 directors of vital statistics and 106 statisticians employed by State health departments. The distribution of statistical positions was sparse and uneven. Approximately one-third of the statisticians were employed by two departments. Another third were employed by 5 States, and the remainder by 25 States. Sixteen States did not employ any statistician. The 106 statisticians filled 51 classes of positions established by the civil service or merit systems, while there were 41 unfilled classes. Ten States had not even established any classes of statistical positions.

Salaries for both the directors of vital statistics and statisticians in general were low, and wide variations appeared in the duties, responsibilities, and qualifications required for the positions. The salaries of the directors of vital statistics ranged from $2,520 to $8,800, while the median fell within the interval of $4,500–$4,999. The range of statisticians' salaries was from $1,920 to $5,490, and the median was in the interval, $2,500–$2,900. Over one-third of the directors and the statisticians were in positions not requiring a college degree or courses or experience in statistics.

The salaries of the directors of vital statistics were consistently lower than those of the directors of medical and sanitation programs and of laboratories. They were approximately the same as those for nursing directors and higher than those for the directors of public health education. The salaries of statisticians were lower than for other professional personnel, except for general sanitation personnel, staff-level public health nurses, and graduate registered nurses.

The distribution of statistical personnel and salaries by the total amounts expended for public health, by types of statistical organization, and by geographic location reveal no highly significant patterns. In general, the number of statisticians and the level of their salaries increased with increasing total expenditures. Until the functions, responsibilities, and requirements for statistical positions are clarified and standards for qualifications are established, the vacancies, variations, and anomalies in functions and salary will doubtless persist.

ACKNOWLEDGMENT

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Case Registers

By Marjorie T. Bellows*

The meaning of the term "register" as applied to public health recording systems is both variable and indefinite. It may refer to State or local indexes, to systems for accumulating follow-up statistics, to visible card equipment or to case reference files. The purposes of such so-called case registers are equally variable and, in practice, often undefined. As a result of this lack of definition of both terminology and function, most opinions with regard to the values or shortcomings of registers are subject to wide interpretation. Any discussion of the use of case registers must be preceded therefore, by agreement on the meaning of the term itself and common acceptance of certain basic concepts as to their characteristics and functions.

For purposes of this discussion a case register is a system of recording frequently used in the general field of public health which serves as a device for the administration of programs concerned with the long-term care, follow-up or observation of individual cases. If "recording system for program control" were not such an unwieldy substitution for the overworked term "register" it might simplify discussion. Although this definition sharply limits its application to the field of public health, the case register has general characteristics which give it a wider field of usefulness than will be discussed here.

Characteristics of Case Registers

The fact that changes in status of cases are recorded over a period of time is the single distinguishing difference between a case register and other recording systems. Reports of births and deaths, admissions to or discharges from service, reports of acute and chronic diseases, and census enumerations are all records of single events in the life of an individual and describe him at one particular time. Files of such reports, however arranged, are not case registers. On the other hand, if some single event, such as those listed above, is the starting point for a series of occurrences which is determined and recorded until some other terminating event takes place, the recording system evolved is a case register.

A registered population is a group of individuals who, for a specific reason such as going to clinic or being diagnosed in a certain way, have been selected for continuing follow-up, treatment, or observation. There are constant additions to this population of persons who have had the same things happen to them or who have done the same things.

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Follow-up continues either until it appears that such measures are no longer necessary or productive or until the person dies or moves out of range of the program. The case register is the mechanical system for keeping current information about this population which is subject to two types of changes: change of status of the individuals included, and change, by admission and withdrawals, in the population itself.

Mailing lists, membership files, personal charge accounts, and telephone registrations are similar populations. Indeed, there may be something to be learned from investigation of the mechanics developed by commercial agencies for such purposes.

Among the earliest true case registers used in health departments are those for typhoid carriers which in a few areas were established more than 30 years ago. It is important to the carrier himself and to the public that his carrier status be established beyond doubt and that it be known at all times whether or not he is still a carrier and where he lives and works. A system of recording to assure proper measures of control was obviously necessary and case registers were established.

There are many types of files or recording systems used in public health programs which are erroneously called case registers. The most frequent misuse of the term is its application to indexes of various sorts. The so-called "State crippled children's registers" are an example. These are usually indexes of cases reported on a voluntary basis by a limited group of agencies. There is rarely provision for obtaining any kind of current information for every case, for removal other than because a certain birthday has been reached or for periodic follow-up of every case. Because follow-up information may be received sporadically for a part of the population indexed, or even systematically for a special group, the file often is called a case register and sometimes is analyzed statistically as though current information were equally good for all cases listed. Certain cancer registers are built from case reports and checked only with duplicate reports or death certificates on which cancer appears as a cause of death. They are not registers because they provide neither for currency of status nor for systematic termination reports. They are merely indexes of reported cases from which certain deaths have been removed. There are some true cancer registers, nevertheless, where limited clinic or hospital populations are followed periodically until death. The index type of files may have perfectly legitimate uses but they should not be called case registers. The basic essentials of a case registration system are that continuous up-to-date records be kept for every individual in a certain population group and that the group itself, however limited, be defined and kept complete within that definition.

It should be noted that a case register need not be one special type of file in order to meet the criteria listed. The filing system, the clerical procedures to be followed, and the type of equipment used are details to be determined by the requirements and organization of the program served. Visible filing equipment has proved to be very adaptable for case register use. Its advantage is that a single visible file can replace two or three vertical files. This is because the visible edge can be used simultaneously for indexing, coding and signalling. Erroneously, some people conclude that any visible file is a case register or that all case registers should be set up on visible files. Either of these generalizations may lead to their use in specific situations where they may not be suitable; both confuse the discussion of case registers.

Function of Case Registers

The difference between good and bad case register systems depends largely on whether or not they are so organized that they serve as efficiently as possible the primary purposes for which they are intended. There are three fundamental functions of a good recording system for follow-up programs:

1. A mechanism is provided whereby continuity of service or follow-up can be maintained. Either by arrangement of records, by some system of signalling or by a special auxiliary file, a register can be made to indicate currently those individuals who require service or follow-up and what steps should be taken, and by whom, to see that they get it. In many programs initial follow-up steps, such as notices to attend clinic or requests for reports from private physicians, may be incorporated into the clerical routine of maintaining the register. In any case, referral of cases to the appropriate persons or agencies who must take some action should be a mechanical function of the register.

2. Since a continuous record is kept for each case, the register is a valuable coordinating reference file. It makes available in one place a means of locating basic information for an individual. If proper information is recorded, it permits rapid review of case histories. Since it cross-indexes by name of case all recorded services to patients it reveals duplications in service and lapses in care or supervision.

3. It is a source of administrative statistics. The appraisal of the value and efficiency of a program should be from the standpoint of the patient. In other words, statistics should answer questions such as: Does the patient get the service he needs or the service that the program aims to give him? How much service does he use? Is the service given at the time that he needs it? How rapidly in the course of the patient's life does the program achieve results? This sort of

question can be answered by an analysis of case summary records such as a register provides. Appraisal and evaluation of programs can be expressed in terms of their effect on patients rather than in terms of operations performed and service time spent by personnel.

These three functions should be carried out by some method in any well-administered service program. Any one of them requires a recording system which has all of those characteristics which are peculiar to case registers.

Program Requirements

It would seem unnecessary to point out that a program must meet certain requirements before a register will be of use, especially since these requirements appear to be essential to any good service program.

1. Administrative responsibility for the program must be clear cut. There is no point in setting up a control mechanism unless there is someone who has direct responsibility for operating the program. A register does not itself control but is a mechanism to be used by the person or agency who does.

2. Standards for care, follow-up or observation should be established. These should specify the kinds of services to be given to the various classes of persons included in the program. They should indicate also the approximate time intervals for service or follow-up and by whom such service or follow-up will be given. A register cannot guide procedures unless the procedures are clearly outlined.

3. There should be adequate facilities available for giving the service specified or doing the necessary follow-up. A register will not serve as a mechanism to see that procedures are carried out unless facilities for carrying them out are available.

All too often attempts have been made to set up a register as the first step in developing a program, in the belief that the register will somehow secure adequate and complete service. In one large city the local heart association secured several thousand dollars to be used for a rheumatic fever register. The health department, the school medical service, and a group of local pediatricians were "cooperating" in the project although none was clearly responsible for the direction of the program. There was no nursing service to take responsibility for follow-up. The register was to be set up in the office of the heart association where clerical service was available, although that organization had no function other than to stimulate public interest. A register in such circumstances would have been a complete waste of money. As a matter of fact the advisory committee, after discussion with a consultant on registers, wisely voted to give the register funds to a local children's hospital.

There are many populations being followed in public health programs for which case registers are adaptable and there will be more as public health activities are extended into the fields of chronic diseases and medical care. Clinic populations, hospitalization groups, medical care groups, chronic disease populations, school populations, all come under this general classification. Often where such populations are being followed effectively there are case register systems in effect. For example, in well-administered school health services, each child has a health record which accumulates information throughout his school life according to a fixed schedule of physical examinations and school nurse conferences. The school nurse usually has a special file of cases which require follow-up arranged according to date and type of follow-up required. Either this file or the basic health record may be signalled to show the reason why follow-up is necessary. Such a system constitutes a register of school children, despite the fact that it lacks the formalities which have become associated with case registers. The register is a tool which may be simple or complex depending on the job to be done. It is undoubtedly true that procedure and filing specialists could simplify and improve many registers now in use, but it should be recognized that they are always used in some form where there is an effective program of long term follow-up.

Case Register Maintenance

The close interdependence of the program and the register makes it difficult to separate discussion of register procedures from administrative procedures. A well-maintained register is one which serves as a constant check on the administrative conduct of a well-organized program.

A first principle in the maintenance of the register or of the program is that there be precise definition of cases to be given service, and therefore, of cases admitted to the register. Where the population covered is first identified through legal case reports, supplemental information usually must be obtained by some follow-up measures. Often it is necessary to verify the diagnosis, as is true in rheumatic fever where diagnosis is difficult and there is no specific diagnostic test. Admissions to continuing clinic services must be distinguished by definite criteria from the sporadic clinic visitants who "shop" for service, and from those patients who require several clinic visits before they can be classified as to diagnosis or other eligibility. Other classes of admissions, such as tuberculosis contacts, or crippled children, require precise definition to include persons who require service and exclude those for whom service is of little value. It is a function of the register to see that sufficient information is obtained to determine eligibility for registration and service, and to initiate, through

routine notices to the proper agencies, the necessary steps for securing additional information. While such procedures are essential for building a register for some well-defined, classifiable population, they are more essential to the program itself in assuring that time and money are not wasted in service to patients who do not need it or do not come within the scope of the program.

A second major requirement in maintaining the register and guiding the program is to select certain essential facts which describe the status of the patient and to see that information regarding them is kept current within definite time limits. The facts selected depend upon the objectives of the program. If, for example, sputum positive cases of tuberculosis require different follow-up by nurse and clinic from sputum negative cases, then sputum examination should be made at definite intervals in order to determine when the type of follow-up should change. The register should record current sputum status and indicate when the next sputum examination is due. The appropriate person can be notified when an examination is due if routine sputum report is not received. Similarly, the register, if properly set up, can initiate steps for checking on such things as the person or agency giving current medical supervision, whether or not recommendations have been carried out, or changes in diagnosis. Reporting forms and procedures can be devised so that much information required for supervision of cases and currency of information will be obtained routinely. Special measures for obtaining information will be necessary only when reports are not received. The procedures for both reporting and follow-up will vary, depending on the scope and aims of the program. While the procedures from the register clerk's standpoint maintain current information on every case, they result, practically, in getting service to the patient at the proper time. Good statistics will be available to measure effectiveness of the program in the same device that helps maintain continuity and, to some extent, quality of service to the patient.

A third basic principle is to have precise definition of cases to be terminated or withdrawn from the service and register. Services to the patient must be limited by one or more end-points such as maximum benefit to the patient, cure, age, death, withdrawal from the community or uncooperativeness of the patient. The terminating events or conditions are, of course, determined by the objectives of the program, except for such incidents as death or moving. Their definition is important in limiting service only to those patients who need, or will benefit from it. It is equally important if a register population is to be kept free from dead wood. The register is the device for noting when such end-points are reached, and notifying the proper persons or agencies. Much information, determining when

withdrawal occurs, can be obtained from routine reporting procedures, or interoffice exchanges of information, as in the case of death notification.

Administrative statistics for a register population are reliable only when admissions have been limited by clear definition, when proper intercurrent information has been accumulated systematically on every case, and when withdrawal has been accurately recorded both as to time and reason. A program has exactly the same requirements if it is to get the right services to the right people. A good program needs a well-maintained register, but a poorly conceived program cannot possibly have a good register or derive any benefit from one.

Functional Units

The functional parts of a case register are the follow-up system, case reference material, and a statistical system. These can be handled in a single file, which has been done with most systems set up on visible files, or they can be separated physically, which is often more efficient. The follow-up system may be located with a single person such as the nurse, who is responsible for follow-up, or in some instances may be as simple as a clinic appointment book kept in the clinic. In such cases it would be foolish to try to duplicate the follow-up system in the case reference file. If the follow-up file and case reference file are separated geographically, they must be compared and reconciled periodically.

The case reference material is usually most useful at some central point where the program is being administered and where clerical service is available. It is a waste of nurses' or physicians' time to burden them with keeping a register. The case reference file need not be located in the same place with detailed family or case histories, in which case provision must be made for exchange of information either by routing the detailed records through the case reference file or by some reporting system.

The statistical system in most programs is likely to be close to or incorporated in the case reference file, although there are some instances in which it may be separate. For instance, in New York City where extensive machine tabulation equipment is maintained in the central office, the tuberculosis register is split into two sections. The case reference files are kept in district offices together with special follow-up files. The statistical file, on punch cards, is kept in the central statistical office. A summary card for each case is kept up to date by means of "change" cards, the latter being punch cards on which the type of change is checked. They are sent in daily by the clerk who handles the case reference file. All changes in diagnosis, care, sputum status, address and other items are reported and the information is transferred mechanically to the summary card for the patient. The punch cards

are used as an aid in maintaining follow-up as well as for statistics. For example, machine lists of names and addresses of cases who are not under care and of active cases who have not had a sputum examination within certain periods of time are made up routinely and periodically for district offices. While this system is not at all practical for most local health departments, it illustrates the fact that there are no hard and fast rules that apply to all registers. Their functional elements must be arranged so that they will do certain specific things effectively, and as efficiently as possible.

Detailed register information is most useful to the person or agency administering the program and to those giving direct service. Its major components should be located therefore where they can be used most easily by all of the persons giving service—administrator, clinician, nurse and clerical staff. This is most often the smallest unit of organization that has responsibility for carrying out the complete program, such as the local health office, hospital or school.

A number of persons and agencies have advocated State registers. It is difficult to visualize many circumstances where the State office is close enough to service units for a register to be of any use other than as an independent source of State-wide statistics. States so small that they are the equivalent of local health districts, in that they give direct service, may be an exception. In general, the duplication of recording required for a State register, the limited amount of information that can be demanded in current reports by a State office from local health departments and the statistical inaccuracies attendant upon extensive duplication would make it highly probable that some better way of collecting statistics should be found if State-wide statistics must be had. Since local programs are rarely State-wide in coverage and are seldom alike in either objectives or methods of accomplishment, the propriety of trying to combine their respective statistics into State figures is highly questionable.

Register Statistics

Register populations are highly selected. Not only are they selected from the general population by the event or condition which brings them under observation but in addition they are some special part of the total population experiencing that event. Removals from the population are still more selected. Occasionally the selection is according to known measurable factors; more commonly it is according to unknown factors. Time changes in the population are in terms of person-years. The average administrator, requiring statistics to appraise and guide his program, feels that he needs statistical help when either selection or person-years or both, complicate his problem. The statistician, on the other hand, is intrigued with the possibilities

of follow-up data which, with some improvements, might permit exceedingly interesting studies. Perhaps with ulterior motives he has accepted responsibility for setting up the mechanical and clerical procedures involved in case registers. The administrator and statistician, although having common basic materials, are apt to have quite different ideas about the most interesting or profitable use that can be made of them. This difference in point of view has led to generalization on the part of both statisticians and administrators that case registers are over-rated, inefficient and unduly expensive. The fault lies not with the registers but with the use made of them.

The primary statistical function of registers is to provide good administrative statistics. Data for special statistical studies of chronic disease or of certain populations are merely a by-product. Whether in a given register such data are good or bad is irrelevant provided the register is serving its primary functions satisfactorily. The advisability of modifying register procedures so that they do provide certain special statistical data should be weighed carefully against the effect of such modifications on their legitimate functions. Sometimes very slight changes will do no harm, will cost little and will yield valuable research material. But situations often arise where statistical considerations may suggest changes in criteria for admission or discharge from a register which do not fit with the objectives of the program. They often result in expensive follow-up of cases in which the program has no interest. Such changes can easily decrease the usefulness of the register for its legitimate purposes, at the same time requiring nonproductive and apparently unnecessary activities on the part of the program staff. In such circumstances the result is apt to be carelessly collected and poor quality statistics.

There are few, if any, registers that can be made to show prevalence of a disease or condition. A possible exception is tuberculosis registers. In certain areas where the disease has been accurately diagnosed and reported for many years and where every reported case has been followed up regularly and frequently, the register may show something about prevalence. On the other hand, registers of rheumatic fever and rheumatic heart disease are not useful for obtaining statistics on prevalence. Diagnosis of this disease falls so far short of the ideal that even if complete registration of all cases diagnosed could be achieved, statistics on prevalence would be meaningless. But the rheumatic fever register is essential for operating a case follow-up program and its limitations in determining prevalence is beside the point. In general there are far better ways of obtaining prevalence data than by setting up or trying to use a case register.

Case register mechanics can be used in certain types of statistical studies for facilitating the accumulation of statistical information.

Such a research project as the study of chronic diseases in the Eastern Health District in Baltimore undoubtedly required a register of some sort. Individuals admitted to this study were defined as those living in or moving into certain houses. Persons who moved out of this group of houses were withdrawn from the study. Monthly follow-up reports were obtained by home visit to secure records of illnesses. Many studies of the incidence of specific chronic diseases might utilize such a register for a sample population as a tool for conducting the study, much as a service program uses them as a device for implementing the program. But it is rarely that a case register can be used simultaneously for statistical research and for administering a program without serious detriment to one or both. Service program objectives should always take precedence over statistical objectives.

Despite the fact that case registers do not necessarily produce data to the statistician's liking, there are certain obligations which the statistician should assume in increasing their efficiency for their intended purposes. The development of guides and forms, and of reporting and recording procedures, has been of great assistance to local administrators who often do not have statistical help. These guides may be a mixed blessing. They are designed for some one type of local organization, usually one that can be served by a single visible file. There is little suggestion as to how to modify procedures to meet local situations. The result is that the visible file is set up according to the guide but it may completely duplicate some other recording system which is quite adequate, or be located in a place where there is no one who needs it. The clerk who keeps the register does not know how to abstract administrative statistics and the administrator, if he knows what data could be obtained and how to get it, usually has no time to do it or to teach the clerk. Under such circumstances the register is an unduly expensive luxury.

Obviously, two things are needed: first, adaptation of general procedures to local situations, and second, guidance in administrative use of the register. Statisticians might well turn their attention to both problems. The latter requires development of methods for evaluating the effectiveness of programs. Program objectives should be studied and analyzed with and from the point of view of the persons administering the service. There are unlimited possibilities for utilizing register statistics to show whether or not services get to the persons for whom they are intended, and the effectiveness of such service in terms of the patient. After useful statistical indices are devised and tested, forms for routine periodic tabulations of data, and instructions for obtaining such tabulations from the register, may be developed. A guide for administrative use of the register is quite as necessary as the guide for clerical procedures.

Summary

A case register is an essential tool for the administration of many local public health programs, particularly those concerned with the long term observation of individuals. It is a device for assuring continuity of service or observation to every patient and a means of securing administrative statistics to guide and evaluate the program.

Registers can function only in programs where administrative responsibility is clearly designated, definite standards for service have been formulated, and adequate facilities for service are available. A good register is one in which admissions and withdrawals are clearly defined and pertinent intercurrent information is kept systemically for every case.

There are no hard and fast rules that apply to the mechanics of all registers. A register must be adapted to the local situation and it must be located where it will be of use in direct administration of the program.

The primary statistical function of case registers is for evaluation and direction of the program. A guide for administrative use of case register statistics is as necessary as a guide for mechanical procedures. Although data for special studies may be a by-product of certain registers, the collection of special statistics should never be allowed to impair the register's legitimate functions.

Spontaneous Infection of the Brown Dog Tick, *Rhipicephalus sanguineus* with *Coxiella burnetii*

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This paper reports the recovery of a strain of *Coxiella burnetii*, the rickettsia of Q fever, from a group of 18 brown dog ticks (*Rhipicephalus sanguineus*) collected early in June 1948 from a dog in Phoenix, Ariz. These ticks were tested at the Rocky Mountain Laboratory.

Test Data

The 18 ticks, all of which were alive, were soaked in merthiolate solution 1: 1000 for 1 hour and then were rinsed thoroughly in several changes of sterile distilled water. They were next triturated in 10 milliliters of saline solution. Two guinea pigs were each injected with 1 milliliter of the resultant suspension, one subcutaneously, the other intraperitoneally. The former was febrile from the fourth to the fourteenth day. Blood for the complement-fixation test was taken on the thirty-first day, and the guinea pig was challenged with Q fever rickettsiae on the thirty-second day. The animal injected intraperitoneally became febrile on the fifth day. It was sacrificed on the eighth day, and a saline suspension of spleen tissue was used to inject six first-passage guinea pigs, three subcutaneously (1 milliliter each) and three intraperitoneally (2 milliliters each). These animals became febrile from 3 to 5 days later. Two of those injected subcutaneously were sacrificed, one on the seventh and one on the ninth day, and impression smears for examination for possible rickettsiae were made from the indurated lesions at the site of injection. A saline suspension of spleen and liver tissue from one of these guinea pigs was used to inject two second-passage animals, one subcutaneously (1 milliliter) and the other intraperitoneally (2 milliliters). The third first-passage animal injected subcutaneously was sacrificed on the fifteenth day after blood was taken for the complement-fixation test. The three guinea pigs injected intraperitoneally had febrile periods of 10, 10, and 11 days, respectively. Blood for the complement-fixation test was taken from each animal on the twenty-third day, and on the next day each was challenged with Q fever rickettsiae.

Of the two second-passage guinea pigs, the one injected subcutaneously became febrile on the fourth day, was sacrificed on the seventh day, and its spleen was frozen and was stored under CO_2 refrigeration.

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The animal injected intraperitoneally was febrile from the second to the eighth day and died on the fifteenth day.

The following findings were indicative of Q fever:

1. The serum specimens from five guinea pigs (one original and four first-passage animals) were all positive by the complement-fixation test in dilution of 1:512 or greater.
2. One of the original guinea pigs and the three first-passage animals that were challenged with Q fever rickettsiae (Nine-Mile strain) remained afebrile, whereas each of six control animals reacted typically.
3. Organisms similar to *C. burnetii* were observed in the stained impression smears of the subcutaneous lesions of the two first-passage animals that were injected subcutaneously.
4. The gross pathology observed in sacrificed animals was that of Q fever.
5. Some of the surviving animals exhibited the eventual emaciation frequently observed in Q fever-infected guinea pigs.

Discussion

Although the occurrence of spontaneous infection of *R. sanguineus* with *C. burnetii* is here reported for the first time, the possibility of natural infection in this tick has been suggested by the following observations on experimentally infected material: (a) Cornelius B. Philip, of the Rocky Mountain Laboratory, has demonstrated stage-to-stage survival of *C. burnetii* and transmission by bite (1938, unpublished); (b) Blanc, Martin, and Maurice (*1*) in Morocco have also shown stage-to-stage survival of the rickettsia; and (c) Smith (*2*) in Australia has shown experimental transmission by bite and has also found that the feces are infectious (100,000,000 guinea-pig-infectious doses per gram, 65 days after collection) and will infect guinea pigs if applied to the abraded or unabraded skin.

Summary

Coxiella burnetii, the infectious agent of Q fever, has been recovered from naturally infected brown dog ticks (*Rhipicephalus sanguineus*) collected in June 1948 from a dog in Phoenix, Ariz.

REFERENCES

(*1*) Blanc, Georges, Martin, L.-A., and Maurice, A.: Le mérion (*Mériones shawi*) de la région de Goulimine est un réservoir de la virus de la Q fever marocaine. Compt. rend. Acad. d. Sc. **224**: 1673–1674 (1947).

(*2*) Smith, D. J. W.: Studies in the epidemiology of Q fever. 3. The transmission of Q fever by the tick, *Haemaphysalis humerosa*. Australian J. Exper. Biol. & M. Sc. **18**: 103–118 (1940).

INCIDENCE 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 AUGUST 20, 1949

Summary

A total of 3,420 cases of poliomyelitis was reported, an increase of only 8.4 percent (the preceding week's increase 29 percent), as compared with 3,157 last week, a 5 year (1944–48) median of 1,254, and 1,313 for the corresponding week last year (representing a 7-percent decline, but followed by increases through the succeeding 4 weeks). Currently, decreases were recorded in the South Atlantic and West South Central areas. Of the week's total, 2,672 cases (78 percent) occurred in the New England, Middle Atlantic, and North Central areas. Of 38 States reporting more than 10, 18 showed decreases of 1 to 56 cases (an aggregate decrease of 211). Current figures for 29 States reporting more than 20 cases each are as follows (last week's figures in parentheses): *Increases*—Massachusetts 189 (139), New York 601 (539), New Jersey 129 (101), Pennsylvania 69 (41), Ohio 209 (134), Illinois 348 (299), Michigan 329 (225), Iowa 114 (81), South Dakota 25 (16), Nebraska 41 (36), Kentucky 42 (33), Tennessee 41 (26), Colorado 60 (50), California 115 (106); *decreases*—Maine 40 (56), Connecticut 39 (45), Indiana 70 (126), Wisconsin 78 (84), Minnesota 136 (142), Missouri 103 (123), North Dakota 52 (58), Kansas 55 (56), Virginia 21 (26), West Virginia 29 (39), Arkansas 54 (60), Oklahoma 71 (92), Texas 104 (109), Idaho 33 (44), Washington 29 (38). The total for the year to date is 17,304, as compared with 9,743 for the same period last year and a 5-year median of 6,262.

One case of smallpox was reported during the week, in Kentucky, and a total of 132 cases of typhoid fever (last week 111, 5-year median 131), of which Texas reported 18, New York and Tennessee 12 each, and Pennsylvania 11.

Of 291 cases of typhoid and paratyphoid fever for the week ended July 30 (see graph, p. 1164), 180 were paratyphoid fever occurring in a Mexican camp in California.

Deaths recorded during the week in 94 large cities in the United States totaled 8,529 as compared with 8,813 last week, 8,115 and 8,385 for the corresponding weeks of 1948 and 1947, and a 3 year (1946–48) median of 8,115. The total to date is 307,814, same period last year 307,980.

Telegraphic case reports from State health officers for week ended August 20, 1949

(Leaders indicate that no cases were reported)

Division and State	Diphtheria	Encephalitis	Influenza	Measles	Meningitis, meningococcal	Pneumonia	Poliomyelitis	Rocky Mountain spotted fever	Scarlet fever	Smallpox	Tularemia	Typhoid and paratyphoid fever [a]	Whooping cough	Rabies in animals
NEW ENGLAND STATES														
Maine				2			40						6	
New Hampshire							15							
Vermont				2		1	[1] 16		1				14	
Massachusetts	6			26	1		189		10				111	
Rhode Island				1		1	14						8	
Connecticut			2	26		22	39		2				62	
MIDDLE ATLANTIC STATES														
New York	1		[c]	111	1	111	601		[d] 20			2	206	14
New Jersey	2	2	5	52		24	129	1	4			4	62	
Pennsylvania		1	[c]	35	9		69	1	3			11	145	1
EAST NORTH CENTRAL STATES														
Ohio	2		1	36	2	48	209		10			12	63	6
Indiana	5			13		7	70		3				26	24
Illinois		1	2	48	3	49	348		5			6	98	1
Michigan [b]	7			77	2	35	[1] 329		15			1	115	1
Wisconsin			6	50		7	78		3			1	82	
WEST NORTH CENTRAL STATES														
Minnesota				2			136		1			1		
Iowa	1			10			114						3	3
Missouri			1	2		11	103		3		2	2	3	
North Dakota		6	12	16	2		52						1	
South Dakota		1		4			25		1			3	1	
Nebraska	3		4	2		2	41		27				1	
Kansas			1	1		9	55		5				4	
SOUTH ATLANTIC STATES														
Delaware							7	1				1	8	
Maryland [b]	3			6	1	33	10	6	2		1		29	
District of Columbia	1			3		23	9					1	4	
Virginia			105	16	4	30	21	4	5		2	4	19	1
West Virginia	1		18	13		2	29	1	5			2	8	
North Carolina	6			11			14	8	9		1	1	19	
South Carolina	2		2	5		8	2				1	2	1	4
Georgia	3		6	6	2	10	5	1	2		2	7	3	5
Florida	3		4	16		12	11		1			1	2	1

EAST SOUTH CENTRAL STATES														
Kentucky	1				3	1	42		8	1		4	5	18
Tennessee	8	1	13	15	2	29	41	1	14		1	12	41	
Alabama	4		4	6	1	14	[1] 6	1	4			3	10	2
Mississippi [a]	10		1			17	18		2			3	3	
WEST SOUTH CENTRAL STATES														
Arkansas	2		13	2	1	18	54		2		2	3	23	
Louisiana			2	5	2	11	6		2			6		1
Oklahoma			3	3		7	71		2		2	5	8	2
Texas	23	2	383	33	3	189	104		6		1	18	90	7
MOUNTAIN STATES														
Montana				18			2					2		
Idaho			14	20			33		[d] 10			2	4	
Wyoming	1			1		2	14							
Colorado	1		6	9	2	9	60		6			1	6	
New Mexico	1			4		4	7		4			2	4	
Arizona	1		15	2	1	4	20						11	
Utah [a]				17		2	11	3			3		21	
Nevada														
PACIFIC STATES														
Washington	1			38			29		10				15	
Oregon			1	23		7	7		4				27	
California	5		3	66	2	22	115		[d] 16			9	106	3
Total	104	14	627	854	44	781	3,420	28	227	1	18	132	1,478	
Median, 1944-48	203	19	564	814	59		1,254	25	544	1	17	131	2,045	
Year to dates 33 weeks	4,336	379	77,540	587,334	2,342	55,724	[1] 17,304	441	58,487	41	799	2,290	38,188	
Median, 1944-48	7,088	328	191,822	549,351	4,457		6,262	398	86,839	265	629	2,519	64,543	
	(27th)		(30th)	(35th)	(37th)		(11th)		(32nd)	(35th)		(11th)	(39th)	
Seasonal low week ends	July 9		July 30	Sept. 4	Sept. 18		Mar. 19		Aug. 13	Sept. 4		Mar. 19	Oct. 2	
Since seasonal low week	568		1,673	639,727	3,186		[1] 16,388		227	51		1,830	48,221	
Median, 1943-48 [b]	1,067		1,625	584,297	5,961		5,999		544	348		2,044	91,908	

[a] Period ended earlier than Saturday.

[b] The median of the 5 preceding corresponding periods; for diphtheria, influenza, poliomyelitis, scarlet fever, and typhoid fever the corresponding periods are 1944-45 to 1948-49.

[c] New York City and Philadelphia only, respectively.

[d] Including cases reported as streptococcal infection and septic sore throat.

[e] Including paratyphoid fever: currently reported separately as follows: Ohio 2, Illinois 1, South Dakota 1, Florida 1, Tennessee 1, Texas 2, Colorado 1, California 5. Cases reported as salmonella infection, not included in the table, were as follows: New York 3.

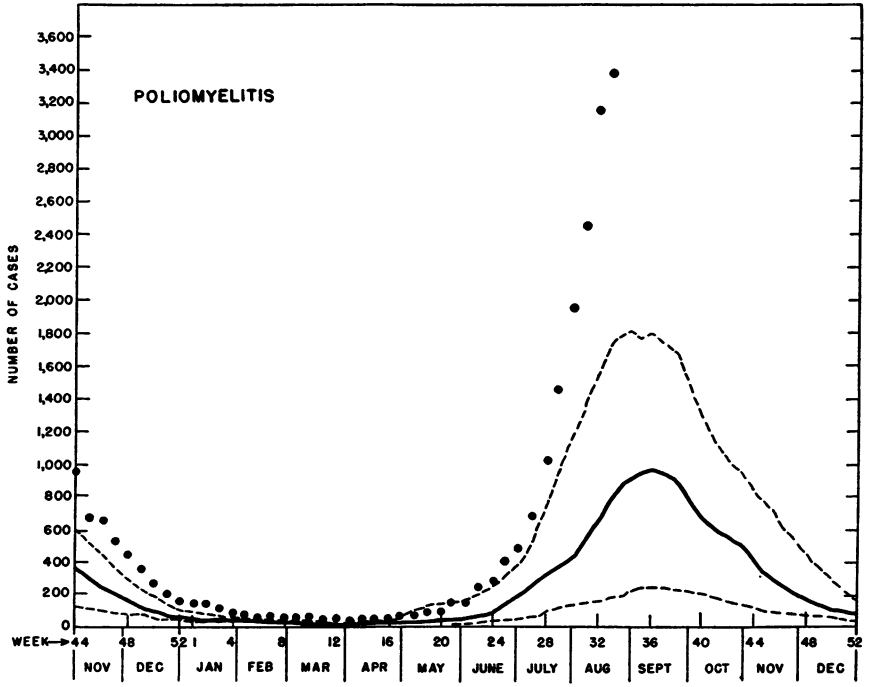
[1] Corrections, poliomyelitis, cases.—Michigan, weeks ended: *Additions*—July 2, 2; *deductions*—Jan. 8, 1; Jan. 22, 4; Jan. 29, 1; Feb. 19, 1; Apr. 16, 1; July 9, 1; July 30, 3; Aug. 6, 1. Vermont, *deductions*—July 23, 1. Alabama, *deductions*—(not allocated to specific weeks), 4.

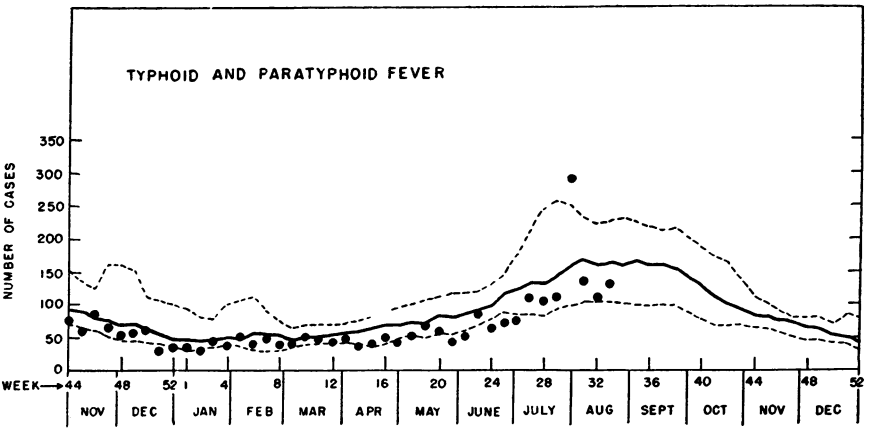
Alaska: Influenza 1, pneumonia 2, streptococcal throat 1.

Hawaii Territory: Measles 4.

Communicable Disease Charts

All reporting States, November 1948 through August 20, 1949





The upper and lower broken lines represent the highest and lowest figures recorded for the corresponding weeks in the 7 preceding years. The solid line is the median figure for the 7 preceding years. All three lines have been smoothed by a 3-week moving average. The dots represent numbers of cases reported for the weeks of 1948.

PLAGUE IN NEW MEXICO

Report on two cases of plague in New Mexico in July

The following information on the two cases of plague reported in New Mexico in July has been furnished by Mr. Justin M. Andrews, Scientist Director, Public Health Service.

One case occurred in a 10-year-old boy, living in Cerro, Taos County, with onset on July 29, a few days after he and his brother had killed a prairie dog. The patient became very ill, with a temperature of 106° F., but recovered under treatment with streptomycin and sulfadiazine.

The other case was in a 37-year-old male farmer, living in Placitas, near Bernalillo, Sandoval County, with onset on July 16. The patient had killed some gophers 2 or 3 days before being taken ill. He had a pneumonic involvement and raised considerable pus and mucus, but as no organisms were recovered and there were no contact cases, this condition may have been only an intercurrent infection. On August 11 the patient was stated to be recovering. He was treated with penicillin and aureomycin.

The diagnosis in both cases was confirmed in the State Health Laboratory. Typical organisms were reported to have been cultured from specimens from both patients.

In both cases the patient had been in contact with wild rodents, and there was no evidence of domestic rodents near the localities where the infection was acquired. Plague infection was reported in fleas from prairie dogs in Taos County in April 1949 and in Sandoval County in June, and also in the latter county the infection was found in fleas from grasshopper mice in May 1943.

PLAGUE INFECTION IN BERNALILLO COUNTY, N. MEX.

Under date of August 19, plague infection was reported proved in a pool of 2 fleas from 11 white-footed mice, *Peromyscus truei*, trapped August 4 at a location 4 miles east of Tijeras, Bernalillo County, N. Mex., on U. S. Highway 66, thence 1 mile north on old highway.

TERRITORIES AND POSSESSIONS

Hawaii Territory

Plague infection in fleas.—Under date of August 18, 1949, plague infection was reported proved on August 11, 1949, in 31 fleas collected from 76 rats (9 *Rattus alexandrinus*, 4 *Rattus norvegicus*, 26 *Rattus hawaiiensis*, and 37 *Mus musculus*), trapped July 26, in District 1A, in the Kukuihaele area of Hamakua District, Island of Hawaii, T. H.

FOREIGN REPORTS

CANADA

Provinces—Notifiable diseases—Week ended July 30, 1949.—During the week ended July 30, 1949, cases of certain notifiable diseases were reported by the Dominion Bureau of Statistics as follows:

Disease	Prince Edward Island	Nov Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		16		40	77	8	34	31	32	238
Diphtheria				5		1			1	7
Dysentery, bacillary				3	1	1				5
Encephalitis, infectious					1		1			2
German measles		3		4	4		21	27	1	60
Influenza					4	3				7
Measles		16	2	108	96	36	82	73	93	506
Meningitis, meningococcal					1					1
Mumps		12		10	70	5	3	6	13	119
Poliomyelitis		2		64	102	1	6	5	15	195
Scarlet fever		1	1	18	11	2	1	3	3	40
Tuberculosis (all forms)		5	30	96	20	23	12	4	26	216
Typhoid and paratyphoid fever			1	15	6					22
Undulant fever				1	1			1		3
Venereal diseases:										
Gonorrhea		15	11	155	51	45	10	40	64	391
Syphilis		14	2	38	32	10		6	11	113
Whooping cough		1		88	40	1	3	2	1	136

Newfoundland cases: Chickenpox 2; diphtheria 1; measles 1; tuberculosis (pulmonary) 18; gonorrhea 3; syphilis 2.

Ontario Province and Toronto City—Poliomyelitis.—Information dated August 8, 1949, states that the incidence of poliomyelitis in the Province of Ontario and the city of Toronto to that date had been almost three times that for the comparable period of 1948. From January 1 to August 8, 1949, 277 cases had been reported in the Province, as compared with 97 cases reported for the same period in 1948. In the city of Toronto 172 cases were reported during the period. Of these 69 were residents of the city, 103 nonresidents sent to Toronto for treatment. There were no deaths among the resident cases, but 12 of the nonresident cases were fatal.

JAMAICA

Notifiable diseases—5 weeks ended July 30, 1949.—For the 5 weeks ended July 30, 1949, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis		1	Puerperal sepsis		1
Chickenpox	3	11	Tuberculosis (pulmonary)	37	56
Diphtheria	4	2	Typhoid fever	5	57
Erysipelas		1	Typhus fever (murine)	4	2
Leprosy	1				

MADAGASCAR

Notifiable diseases—June 1949.—Notifiable diseases were reported in Madagascar and Comoro Islands during June 1949, as follows:

Disease	June 1949			
	Aliens		Natives	
	Cases	Deaths	Cases	Deaths
Beriberi			1	0
Bilharziasis			56	0
Cerebrospinal meningitis	1	1	6	2
Diphtheria			2	0
Dysentery:				
Amebic	3	0	182	7
Bacillary			2	0
Erysipelas			15	1
Influenza	60	0	3,632	52
Leprosy			29	1
Malaria	390	1	38,427	245
Measles	11	0	121	2
Mumps	2	0	147	0
Plague			2	1
Pneumonia, broncho	2	0	280	50
Pneumonia, pneumococcic	2	1	342	44
Puerperal infection			4	1
Tuberculosis, pulmonary	2	0	96	22
Typhoid fever	1	1	16	3
Whooping cough			305	12

NEW ZEALAND

Notifiable diseases—4 weeks ended June 25, 1949.—During the 4 weeks ended June 25, 1949, certain notifiable diseases were reported in New Zealand as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Cerebrospinal meningitis	6		Poliomyelitis	14	
Diphtheria	8		Puerperal fever	5	
Dysentery:			Scarlet fever	81	
Amebic	3		Tetanus	1	1
Bacillary	4		Tuberculosis (all forms)	149	36
Erysipelas	14		Typhoid fever	3	
Food poisoning	3		Undulant fever	2	
Malaria	1				

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

Note.—The following reports include only items of unusual incidence or of special interest and the occurrence of these diseases, except yellow fever, in localities which had not recently reported cases. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

PLAGUE

Union of South Africa—Cape Province.—Plague has been reported in Kuruman District, Cape Province, Union of South Africa, as follows: Week ended July 30, 1949, present at Tierkolf and Saltrim Farms;

week ended August 6, 1 case at Tsinen Native Reserve, and 1 case at Caledonia Farm.

SMALLPOX

Netherlands Indies—Java—Batavia and Cheribon.—During the week ended August 6, 1949, 102 cases of smallpox were reported in Cheribon, Java, and for the week ended August 13, 415 cases were reported in Batavia.

YELLOW FEVER

Gold Coast.—Yellow fever has been reported in the Oda area of the Gold Coast as follows: On July 30, 1949, 1 case at Esuboni; on August 2, 1 case at Bawdua; on August 7, 1 case at Akwatia.

The 2 suspected cases of yellow fever reported in Gold Coast on July 21, 1949 (1 case at Akwatia, 1 case at Bawdua—see PUBLIC HEALTH REPORTS for August 19, 1949, p. 1,058) are stated to have been proved positive. Also the 2 fatal suspected cases reported July 20, 1949, at Nyakrom have been confirmed pathologically. (See PUBLIC HEALTH REPORTS for August 26, 1949, p. 1096.)

DEATHS DURING WEEK ENDED AUG. 13, 1949

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Aug. 13, 1949	Corresponding week, 1948
Data for 94 large cities of the United States:		
Total deaths	8,813	7,934
Median for 3 prior years	7,934	
Total deaths, first 32 weeks of year	299,285	299,865
Deaths under 1 year of age	741	619
Median for 3 prior years	686	
Deaths under 1 year of age, first 32 weeks of year	20,910	21,507
Data from industrial insurance companies:		
Policies in force	70,253,019	70,956,591
Number of death claims	11,175	11,885
Death claims for 1,000 policies in force, annual rate	8.3	8.8
Death claims per 1,000 policies, first 32 weeks of year, annual rate	9.4	9.7