CDC POLIOMYELITIS SURVEILLANCE REPORT

FOR ADMINISTRATIVE USE

REPORT NO. 222 MARCH 20, 1961

Table of Contents

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
COMMUNICABLE DISEASE CENTER
Clarence A. Smith, Chief
Epidemiology Branch
Alexander D. Langmuir, Chief
Surveillance Section
E. Russell Alexander, Chief
Atlanta 22, Georgia

SPECIAL NOTE

This report is intended for the information and administrative use of those involved in the investigation and control of poliomyelitis and polio-like diseases. It presents a summary of provisional information reported to CDC from State Health Departments, the National Office of Vital Statistics, Virology Laboratories, Epidemic Intelligence Service Officers, and other pertinent sources. Since much of the information is preliminary in nature, confirmation and final interpretation should be determined in consultation with the original investigators prior to any further use of the material.

SUMMARY

The statement of Public Health Service Action in Poliomyelitis Control, 1961, is presented. This acknowledges and implements the Recommendations of the Surgeon General's Committee on Poliomyelitis Control presented in PSU Report #221.

The reporting of poliomyelitis to the Communicable Disease Center has remained at a low level during the 10th week ending March 11, 1961, with reports of 4 cases, 3 paralytic. The current total of cases with 1961 onset now stands at 30 cases, 22 paralytic. No winter epidemics have been reported.

A descriptive account of 1961 California cases, and a narrative summary of the 1960 Rhode Island epidemic are presented.

Also included is the final table of poliomyelitis cases reported to PSU in 1960 based on preliminary diagnosis.

PUBLIC HEALTH SERVICE ACTION IN POLIOMYELITIS CONTROL, 1961

(Statement by the Surgeon General in response to the Recommendations of the Committee on Poliomyelitis Control published in Poliomyelitis Surveillance Report No. 221, February 17, 1961)

The Committee on Poliomyelitis Control, at its meeting on January 23 and 24, 1961, gave voice to a sense of urgency relative to the need for intensive efforts to immunize as many people as possible before this year's polio season. It was apparent that this feeling derives, at least in part, from a fear that publicity concerning the future availability of oral vaccine will cause many people to postpone their vaccinations.

I share the Committee's concern and urge that Salk Vaccine be used intensively in order to prevent as much as possible of the crippling and death from polio that will otherwise occur this summer.

For this reason I call particular attention to the Committee's finding that the recommended schedule may be modified to permit the administration of three doses of Salk vaccine before summer. Discussions with Dr. Salk at the meeting brought out his opinion that the intervals between the first three injections may, if necessary, be reduced to one month, or even as little as two weeks, without serious loss of effectiveness.

The Communicable Disease Center at Atlanta, Ga., will have responsibility for 1961 Public Health Service activities in poliomyelitis control. Specifically, the CDC will take the following steps to implement certain recommendations of the Advisory Committee on Poliomyelitis Control.

1. Technical Information

- The collection, analysis, and dissemination of poliomyelitis data will be accelerated so as to ensure a rapid flow of current information to state and local health authorities, medical organizations, and the press.

- Clinical and laboratory surveillance services will be augmented so as to give health authorities and practicing physicians prompt information on all categories of enteroviruses identified by reference laboratories.

2. Public Information

- The Public Health Service will cooperate with the American Medical Association and the National Foundation in supporting the 1961 campaign for polio vaccination conducted by the Advertising Council.

3. Neighborhood Vaccination Program

- A community action plan to stimulate vaccinations of infants and young parents, particularly in low-income areas, will be widely distributed in the form of a brochure, "Babies and Breadwinners", to health departments, medical organizations, Parent-Teacher Associations, and other civic groups.

4. Aid to State and Local Health Departments

- All types of technical assistance will be increased to the extent of CDC's available resources, including epidemic aid, laboratory reference diagnostic services, and statistical consultation.

- Specific consultative services will be provided to help communities identify population groups that are risking polio epidemics because of their low vaccination status. For this purpose the quota sample technique or other survey methods may be used.

5. Research and Development

- Efforts will be made to establish a small reserve of live poliovirus vaccine for field studies to determine the most effective use of this immunizing agent in controlling epidemics.

- Research will be focused on the problems identified by the Committee as requiring further study of both inactivated and live virus vaccines.

- Studies will be encouraged in the behavioral sciences to determine why many families fail to obtain poliomyelitis vaccinations, as well as to devise practical measures for reducing the barriers.

In addition to the augmented CDC program, the Public Health Service will continue its work with consulting laboratory scientists and clinical investigators to determine proper dosage schedules for the use of both inactivated and live virus vaccines. We will also continue our consultation with manufacturers in an effort to speed the day when licensed oral polio vaccines will be placed on the market.

The Public Health Service has presented the Committee's recommendation on assistance to other countries to the proper authorities in the Department of State. The distribution of oral vaccine to underdeveloped countries will be discussed in detail when such a licensed product becomes available in this country for export. The wide use of parenteral vaccines is not feasible in many underdeveloped countries; however, the export of inactivated polio vaccine has been and will be expedited upon request by foreign governments.

S/Luther L. Terry
Surgeon General

1. CURRENT POLIOMYELITIS MORBIDITY TRENDS

National poliomyelitis morbidity reporting continued at a low seasonal level during the 10th week of 1961 with reports of 4 cases, 3 paralytic. This brings the yearly total to 82 cases, 46 paralytic, as shown below.

POLIO (CUMULATED WEEKLY) THROUGH THE 10th WEEK FOR PAST FIVE YEARS

	1961	1960	1959	1958	1957
Paralytic	46	131	154	105	233
Total	82	183	214	182	430

A majority of these cases are delayed reports from 1960, however, and the current total of cases with onset in 1961 stands at 30 cases, 22 paralytic.

These cases with 1961 onset have been reported from 19 states, most accounting for 1 or 2 cases each. Texas has recorded 5 cases, 2 paralytic, and California 4 cases, all paralytic (Section 2). No concentration is evident in these States or elsewhere in the nation. Three poliomyelitis fatalities have been reported, one in Ohio associated with a type I poliovirus isolation, and one each in New Jersey and Minnesota.

Virologic and serologic identifications include a type I isolation from one of the California cases; type III serologic confirmation of one Connecticut case; type I isolation from an Ohio case (fatality); and type I and type III isolations from 2 Oregon cases.

2. REPORTS

A. California

Dr. Henry A. Renteln, Chief, Bureau of Communicable Disease Control, reports occurrence to date of 4 cases of poliomyelitis in California, all with onsets between January 26 and February 27. The cases are all paralytic and have occurred in 4 scattered counties. Involved are 2 unvaccinated pre-school age children, and 2 young adolescents with 3 doses of vaccine each. Type I poliovirus isolation and serologic confirmation have been obtained in one of the pre-school children, and laboratory studies are underway in the others.

B. Rhode Island

At the request of the Providence Medical Association, Dr. Alexander D. Langmuir, Chief, Epidemiology Branch, CDC, acted as moderator at a Symposium on Poliomyelitis held in Providence on March 6, 1961. At this symposium a preliminary discussion of the 1960 Rhode Island poliomyelitis epidemic was presented by members of the Epidemiology Branch. Dr. Joseph Oren, Chief, Poliomyelitis Surveillance Unit, presented the "Report on the Providence Epidemic of 1960" and Dr. Robert E. Serfling, Chief, Statistics Section, presented an "Evaluation of the Control Program."

In the supplement to this Poliomyelitis Surveillance Report are reprinted the textual and illustrative material included in the discussion.

3. 1960 POLIOMYELITIS CASES REPORTED ON PSU FORMS

A preliminary total of 3,309 cases of poliomyelitis with onset in 1960 has been submitted to the Poliomyelitis Surveillance Unit on individual case forms. Of these cases, 2,536 are paralytic, 738 nonparalytic and only 35 unspecified as to paralytic status. This case total, which is based on preliminary diagnosis, approximately equals the 3,277 cases reported to the NOVS at the close of the year. As shown below, a great percentage of the unspecified cases reported to NOVS had paralytic poliomyelitis listed as the preliminary diagnosis on the PSU forms.

	REPORTED TO NOVS, 1960 (Preliminary Figures)	1960 PSU FORMS RECEIVED (Preliminary Diagnosis)
Paralytic	2,265	2,536
Nonparalytic	658	738
Unspecified	354	35
TOTAL	3,277	3,309

Of the 3,309 PSU forms submitted by the States, 60-day final classifications have been received on 3,093 or 93.5 percent. This represents the highest percentage of 60-day follow-up reports ever received by PSU from the State epidemiologists. A preliminary breakdown of the follow-up classifications is as follows:

1960 POLIO - FINAL CLASSIFICATION

Paralytic polio with residual paralysis	2,069
Paralytic polio, no residual paralysis	350
Nonparalytic polio	402
ECHO	12
Coxsackie	26
Aseptic Meningitis, unknown etiology	166
Not polio	68
Total with Final Classification	3,093
No Final Classification	216
TOTAL	3,309

The table on the following page representing the cases by preliminary diagnosis will be corrected on the basis of the verification of diagnosis and severity of residual paralysis (as shown in the 60-day follow-up report), and will appear in the next PSU report.

Table 3

POLIOMYELITIS CASES BY PARALYTIC STATUS, AGE GROUP AND VACCINATION HISTORY REPORTED ON PSU FORMS-- 1960 (PRELIMINARY DIAGNOSIS)

Age Group	Paralytic Doses of Vaccine 0	1	2	3	4+	Unk	Total
0-4	600	108	149	145	48	21	1071
5-9	253	44	64	154	82	10	607
10-14	62	22	18	74	38	5	219
15-19	82	12	8	28	8	5	143
20-29	205	23	17	23	11	5	284
30-39	112	9	9	10	6	2	148
40+	55	-	-	1	-	3	59
Unk.	4	-	-	-	-	1	5
Total	1373	218	265	435	193	52	2536
Percent Doses	55.3	8.8	10.7	17.5	7.8	-	100.0

Age Group	Nonparalytic Doses of Vaccine 0	1	2	3	4+	Unk	Total
0-4	88	20	13	24	21	10	176
5-9	45	16	25	59	53	12	210
10-14	16	7	5	37	31	7	103
15-19	20	4	10	26	14	-	74
20-29	44	8	6	38	15	7	118
30-39	12	3	5	7	11	5	43
40+	8	-	2	-	-	1	11
Unk.	1	-	-	-	-	2	3
Total	234	58	66	191	145	44	738
Percent Doses	33.7	8.3	9.5	27.5	20.9	-	100.0

4. ROUTINE POLIOMYELITIS SURVEILLANCE

A. Cases with Onset Within 30 Days of Vaccination

During the month of February, 8 additional 1960 cases of poliomyelitis with onset within 30 days after vaccination have been reported on Polio Surveillance Case Records. This includes 5 paralytic cases (none correlated), which are listed in Table II.

There has been a preliminary total of 160 under 30-day cases reported to the Polio Surveillance Unit with onset in 1960. Of these, 121 are paralytic (11 correlated). A complete summary of 1960 under 30-day cases will appear in a forthcoming PSU report.

Thus far in 1961, there have been no cases reported to PSU with onset within 30 days of vaccination.

B. Vaccine Distribution

The summary of current and cumulative shipments of poliomyelitis and multiple antigen vaccines is presented in Table III.

(This report was prepared by the Poliomyelitis and Polio-like Disease Surveillance Unit, Joseph Oren, M.D., Chief, Michael J. Regan, M.D. and Mr. Leo Morris, Statistician, with the assistance of Statistics Section, CDC)

Figure 1. CURRENT U.S. POLIO INCIDENCE
compared with years 1956 through 1960

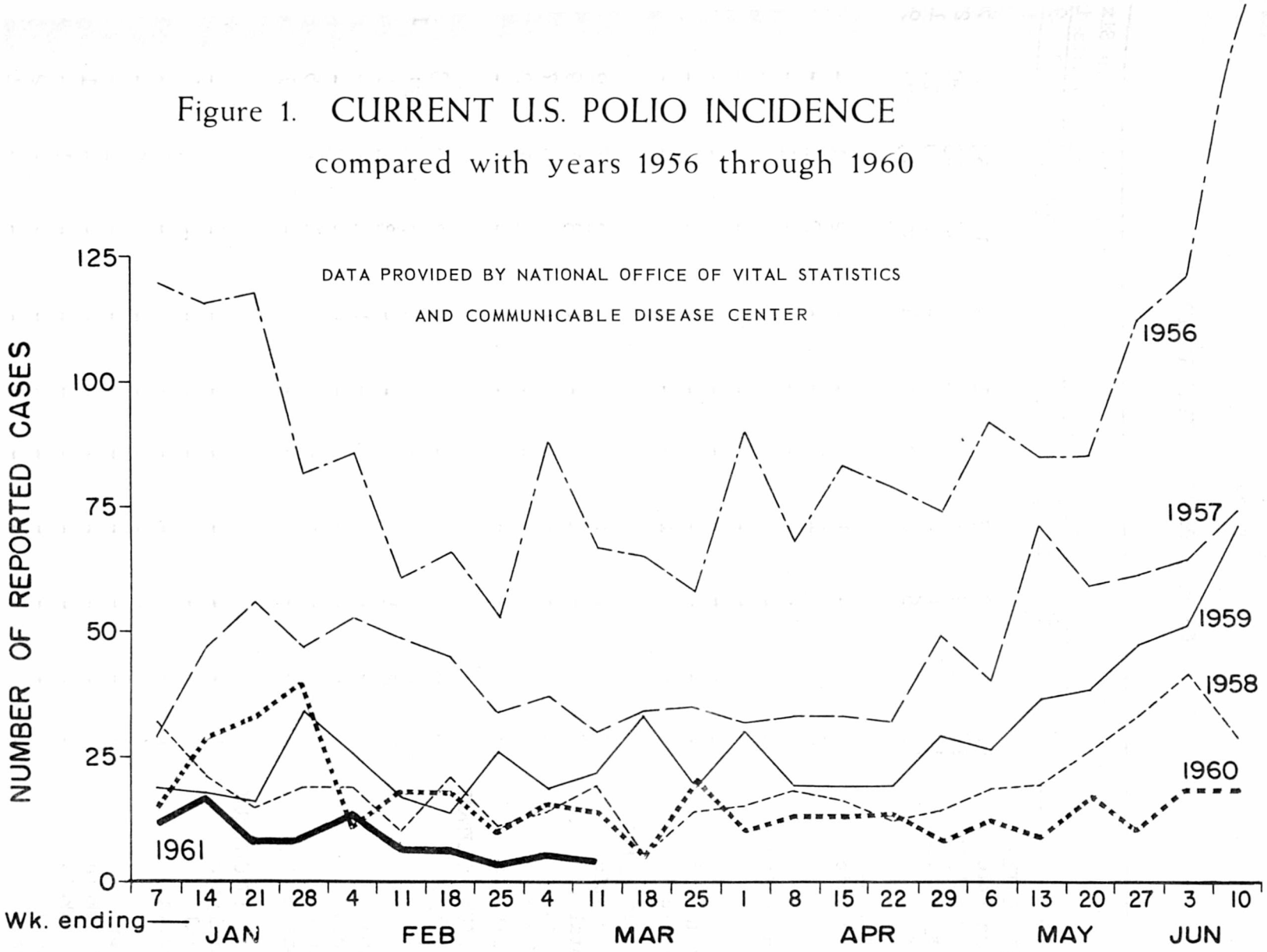


Table 1

TREND OF 1961 POLIOMYELITIS INCIDENCE

State and Region	Cumulative 1961	Cases Reported to CDC For Week Ending 2-4	2-11	2-18	2-25	3-4	3-11	Six Week Total	Comparable Six Weeks Totals in 1960	1959	1958
UNITED STATES											
Paralytic	46	6	3	3	3	1	3	19	53	88	56
Nonparalytic	18	5	2	1	-	3	1	12	13	20	27
Unspecified	18	2	1	2	-	1	-	6	9	16	11
Total	82	13	6	6	3	5	4	37	75	124	94
NEW ENGLAND											
Paralytic	2	-	-	1	1	-	-	2	1	-	-
Total	2	-	-	1	1	-	-	2	1	-	1
Maine	-	-	-	-	-	-	-	-	1	-	-
New Hampshire	-	-	-	-	-	-	-	-	-	-	-
Vermont	-	-	-	-	-	-	-	-	-	-	-
Massachusetts	1	-	-	-	-	-	-	1	-	-	1
Rhode Island	-	-	-	-	-	-	-	-	-	-	-
Connecticut	1	-	-	1	-	-	-	1	-	-	-
MIDDLE ATLANTIC											
Paralytic	7	1	-	1	-	-	1	3	8	2	1
Total	8	1	-	1	-	-	1	3	11	9	1
New York	3	1	-	-	-	-	1	2	10	7	1
New Jersey	1	-	-	1	-	-	-	1	1	2	-
Pennsylvania	4	-	-	-	-	-	-	-	-	-	-
EAST NORTH CENTRAL											
Paralytic	8	-	-	1	-	-	1	2	2	8	4
Total	13	2	1	1	-	-	1	5	11	11	11
Ohio	7	2	1	-	-	-	-	3	3	5	2
Indiana	1	-	-	-	-	-	1	1	-	-	-
Illinois	2	-	-	-	-	-	-	-	3	-	3
Michigan	1	-	-	1	-	-	-	1	4	5	5
Wisconsin	2	-	-	-	-	-	-	-	1	1	1
WEST NORTH CENTRAL											
Paralytic	1	-	-	-	-	-	-	-	4	-	3
Total	1	-	-	-	-	-	-	-	7	4	3
Minnesota	1	-	-	-	-	-	-	-	3	-	1
Iowa	-	-	-	-	-	-	-	-	2	-	1
Missouri	-	-	-	-	-	-	-	-	1	-	-
North Dakota	-	-	-	-	-	-	-	-	-	1	1
South Dakota	-	-	-	-	-	-	-	-	1	-	-
Nebraska	-	-	-	-	-	-	-	-	-	2	-
Kansas	-	-	-	-	-	-	-	-	-	1	-

Table 1 (Continued)

State and Region	Cumulative 1961	Cases Reported to CDC For Week Ending 2-4	2-11	2-18	2-25	3-4	3-11	Six Week Total	Comparable Six Weeks Totals in: 1960	1959	1958
SOUTH ATLANTIC											
Paralytic	6	1	-	-	1	-	1	3	6	21	15
Total	8	1	-	-	1	1	1	4	7	26	24
Delaware	1	-	-	-	-	-	-	-	-	1	1
Maryland	-	-	-	-	-	-	-	-	1	-	-
D.C.	-	-	-	-	-	-	-	-	-	-	-
Virginia	-	-	-	-	-	-	-	-	-	-	1
West Virginia	2	-	-	-	-	1	1	2	-	6	3
North Carolina	2	1	-	-	-	-	-	1	1	-	5
South Carolina	-	-	-	-	-	-	-	-	1	5	1
Georgia	1	-	-	-	1	-	-	1	-	1	4
Florida	2	-	-	-	-	-	-	-	4	13	9
EAST SOUTH CENTRAL											
Paralytic	-	-	-	-	-	-	-	-	5	10	5
Total	11	2	-	2	-	1	1	6	5	13	7
Kentucky	11	2	-	2	-	1	1	6	3	3	3
Tennessee	-	-	-	-	-	-	-	-	-	5	-
Alabama	-	-	-	-	-	-	-	-	1	-	3
Mississippi	-	-	-	-	-	-	-	-	1	5	1
WEST SOUTH CENTRAL											
Paralytic	4	1	1	-	-	-	-	2	3	21	10
Total	9	2	2	-	-	1	-	5	4	28	15
Arkansas	1	-	-	-	-	-	-	-	-	3	3
Louisiana	3	-	-	-	-	-	-	-	2	5	1
Oklahoma	-	-	-	-	-	-	-	-	1	1	1
Texas	5	2	2	-	-	1	-	5	1	19	10
MOUNTAIN											
Paralytic	7	1	1	-	-	-	-	2	3	1	3
Total	13	1	1	-	-	1	-	3	6	4	9
Montana	1	-	-	-	-	-	-	-	-	-	-
Idaho	2	-	-	-	-	-	-	-	4	-	-
Wyoming	-	-	-	-	-	-	-	-	-	1	1
Colorado	3	1	1	-	-	-	-	2	-	-	-
New Mexico	1	-	-	-	-	1	-	1	-	2	7
Arizona	2	-	-	-	-	-	-	-	2	1	1
Utah	4	-	-	-	-	-	-	-	-	-	-
Nevada	-	-	-	-	-	-	-	-	-	-	-
PACIFIC											
Paralytic	11	2	1	-	1	1	-	5	21	25	15
Total	17	4	2	1	1	1	-	9	23	29	23
Washington	-	-	-	-	-	-	-	-	3	3	1
Oregon	2	1	-	1	-	-	-	2	1	2	5
California	15	3	2	-	1	1	-	7	19	24	17
Alaska	-	-	-	-	-	-	-	-	-	-	-
Hawaii	-	-	-	-	-	-	-	-	-	-	-
TERRITORY											
Puerto Rico	1	1	-	-	-	-	-	1	16	2	14

Table II

PARALYTIC POLIOMYELITIS OCCURRING WITHIN 30 DAYS OF LAST VACCINE INOCULATION
(1960 Cases Reported to PSU from February 1, 1961 through March 1, 1961)

State	County	Initials	Age	Sex	Date Inoc.	Mfr.	Lot No.	Onset Interval	Site Inoc.	Site First Para.
Iowa	Clinton	S.S.	14	F.	8-22-60	Unk.	Unk.	2 days	left arm	right arm
N. J.	Passaic	A.T.	9	F.	7-27-60	Lilly	Unk.	10 days	arm	palate
S. C.	Pickens	J.F.	22	M.	7-30-60	Wyeth	Unk.	6 days	left arm	bulbar
Texas	Bexar	C.M.	3	F.	10-?-60	Unk.	Unk.	Unk.	left arm	lower extremities
Texas	Galveston	S.U.	1	M.	7-8-60	Unk.	Unk.	24 days	probably right buttock	both hips

Additional information received on Maryland Case B.K. listed in Report #221: Site of Inoculation - left deltoid, Site of First Paralysis - bulbar, Vaccine Manufacturer - Merck, Sharp & Dohme tetravax.

Table III

THE NATIONAL FOUNDATION

MONTHLY REPORT OF POLIOMYELITIS VACCINE RELEASED AND SHIPPED
(1,000cc's)

January, 1961

	SINGLE ANTIGEN		MULTIPLE ANTIGEN		TOTAL	
	This Month	To Date	This Month	To Date	This Month	To Date
CC. Released	3,524	467,082*	1,715	14,074	5,239	481,156*
CC. Shipped						
National Foundation	-	15,245	-	-	-	15,245
Public Agencies	906	164,412	57	871	963	165,283
Commercial Channels	913	165,716	628	11,132	1,541	176,848
Domestic Total	1,819	345,373	685	12,003	2,504	357,376
Export	3,483	97,012	44	506	3,527	97,518

* Includes manufacturers' adjustments of previously reported data.

CDC POLIOMYELITIS SURVEILLANCE REPORT 222 SUPPLEMENT

U.S. Department of Health, Education and Welfare

Public Health Service Bureau of State Services

COMMUNICABLE DISEASE CENTER
POLIOMYELITIS SURVEILLANCE UNIT
Atlants 22, Ga.

March 20, 1961

PRELIMINARY REPORT -

I. RHODE ISLAND POLIOMYELITIS EPIDEMIC 1960

II. EVALUATION OF VACCINE STATUS AND EFFECTIVENESS

Presented at the Poliomyelitis Seminar
The Providence Medical Association
March 6, 1961

SUPPLEMENT TO PSU REPORT 222

I. PRELIMINARY REPORT - RHODE ISLAND POLIOMYELITIS EPIDEMIC 1960

During the summer of 1960, the State of Rhode Island suffered its first poliomyelitis epidemic in 5 years. This epidemic was unusually early in starting, reached a peak early, and fell off before the epidemic season of past years. Cases tended to be relatively concentrated in the more crowded, lower socioeconomic areas, especially in several housing projects. Within these areas the disease seemed to spread rather easily, but it was quite limited in its spread to more peripheral areas.

During early June the Rhode Island State Health Department recognized that the occurrence of cases was excessive and invited the Communicable Disease Center to participate in epidemiological studies. A team of investigators was detailed to assist Dr. Raymond F. McAteer in studying the cases, their environment, and the infectious agents. This team investigation, lasting until mid-September led to the preliminary data presented at this time. There are several findings of interest which will be reported upon, and as our laboratory analyses are completed, more definitive data will be available. However, at this time it is evident that the pattern of polio as it appeared in Rhode Island during 1960 was quite different from that generally seen in the past.

Figure 1 shows the annual occurrence of poliomyelitis in Rhode Island in rates per 100,000. Periodic high incidence years are seen during the 1930's and 1940's, followed by a series of epidemic years in the early 1950's. The low years in 1956 through 1959 were followed by last summer's epidemic with a State attack rate of 12 cases per 100,000 population. Figure 2 demonstrates the weekly incidence of polio during the epidemic years of 1953 through 1955, and superimposed the comparable curve for 1960. Since these graphs show cases by week of report they can only approximate the true occurrence of cases. However, it is clear that whereas the earlier epidemics tended to rise during July and August to peaks in late August and early September, falling off gradually during the fall, the 1960 epidemic has a very different pattern. Last summer the epidemic rose rapidly during June and early July, peaking in late July, and than falling off much more rapidly than in previous years.

In Figure 3 the epidemic is more accurately described, showing cases by week of onset. A total of 121 cases were studied by the investigating team, including 86 paralytic cases and 35 with a preliminary diagnosis of nonparalytic polio. One hundred and three of these, including practically all of the paralytic cases, were reported to the State. Note the sudden decline in the occurrence of cases after the July peak, as though the epidemic had

been truncated. In the lower part of the Figure, are shown the distribution of vaccine at free clinics, the chronology of the epidemic field study, and the periods of collection of stool samples. These are arranged along the same time axis as the incidence curve. The level of vaccination within the State of Rhode Island, and within the city of Providence, was generally quite high. From 1955 through May of 1960, 1,800,000 doses of polio vaccine had been shipped into the State. During the epidemic season of 1960, from June through September, an additional 500,000 doses of vaccine were distributed. Approximately 300,000 doses were distributed at free clinics throughout the State, and another 200,000 doses by private practitioners. As indicated in the graph, the greatest part of this vaccine was distributed during July, directly prior to the sudden fall off in the epidemic. Previously the vaccine had not been uniformly used, and there were pockets of poorly vaccinated groups, who remained susceptible to disease. The massive vaccination during the epidemic weeks, which did reach the previously unvaccinated groups, was probably instrumental in aborting this epidemic.

The epidemiologic study lasted from mid-June until mid-September. Surveys of the vaccination status of the population, were carried out at the end of June and the end of August in Providence, and in several housing projects during early August. Two other studies at this time were done, however the results are not yet available. These studies include an investigation into the spread of virus within families and to family contacts, carried out by members of the Kansas City Field Station of the Public Health Service. Also, during the epidemic and continuing thereafter, specimens of sewage were collected from a number of sites in Providence and Pawtucket. These specimens were collected from the sewer mains draining from relatively homogeneous socioeconomic areas in various sections of the city and from several of the housing projects, in order to demonstrate the spread and prevalence of virus.

A breakdown of the histogram for the occurrence of cases by week of onset is shown in Figure 4. It is seen here that the epidemic in Providence had a very dramatic decline. The epidemic in Pawtucket followed a similar pattern. However, it is to be noted that the first cluster of cases in Pawtucket was entirely limited to the Prospect Heights housing project. The second cluster during August was scattered through other parts of the city and was followed by several sporadic cases during the fall. Outside of the two concentrations, cases were more widely distributed, both temporally and geographically.

The geographic distribution can be clearly seen in Figure 5 which shows the occurrence of both paralytic and nonparalytic cases in the metropolitan concentrations and in other townships throughout the State. The great majority of cases were concentrated within the greater metropolitan area, with very few occurring in the less populous regions. Relatively few cases occurred in the adjacent areas of Massachusetts. There was, however, some concentrations of cases in western Connecticut, in the Groton - New London area early in the summer and in the more rural Windham County area later in the summer.

Figure 6 indicates the socioeconomic level of the various sections of Providence, by census tract in 1960 as indicated by a detailed survey done during the epidemic. The lower socioeconomic tracts are concentrated largely within the central part of the city and in South Providence. The occurrence of cases of poliomyelitis during past epidemics and in 1960 is demonstrated in the following spot maps. In Figure 7 the distribution of cases during the 1953 and 1955 epidemics is shown. During the years preceding the introduction of Salk vaccine cases were widely and relatively uniformly scattered throughout the city without preference for any socioeconomic group. On the other hand in Figure 8 it is evident that the 1960 cases were almost entirely concentrated within the socioeconomic census tracts classified as lower and lower-middle. A concentration of cases occurred in the Chad Brown housing project in the North Central section and, a relative localization is evident in South Providence. The degree to which the upper economic areas were spared is quite remarkable. The vaccination surveys clearly demonstrated that the lower socioeconomic areas were less well vaccinated than the upper areas.

During the epidemic we had the opportunity to investigate a total of 121 cases with diagnosed or suspected poliomyelitis. Lab specimens were collected in 90 percent of the cases. History and physical findings were recorded and a visit was made to the family of each case in order to study the vaccination status, the home environment, and any possible source of infection. Furthermore, each case received a convalescent evaluation to ascertain the degree of residual paralysis. These follow-up exams were done 60 days or longer after onset in all but one patient who moved out of the State. At this preliminary stage, a strong probable diagnosis of polio can be made in 73 of the cases on the basis of residual paralysis at 60 days or longer after onset. As indicated in Table 1 almost two-thirds of these cases thus far have been further confirmed by isolation of poliovirus type I in the laboratory. In addition 27 of these cases with no residual paralysis had laboratory confirmation, thus making the preliminary total of confirmed cases 100. Of the remaining 21 cases studied, 5 have thus far been diagnosed as aseptic meningitis due to other cause, including several with evidence of Coxsackie, one ECHO, and one mumps virus infection. Finally 16 cases are still under study and have not been fully classified. It is expected that several of these cases will eventually be confirmed by laboratory evidence. However, the majority of these cases are not felt to be due to poliovirus infection. In Table 1 it can be seen that of the 86 cases diagnosed as paralytic poliomyelitis, 83 have been confirmed. This is striking evidence for the accuracy with which this disease can be diagnosed on clinical grounds alone. However as is well known, the diagnosis of nonparalytic polio is much more difficult and of 35 original diagnoses only 17 have thus far been confirmed as due to poliovirus. In the incomplete study group are included the one case without residual evaluation, who did have poliovirus isolated, and also one nonparalytic case who committed suicide on the 5th day of his illness, but who did have a post-mortem diagnosis of anterior horn cell disease. The remainder of my discussion will deal with the characteristics of the diseases in the confirmed cases. Thus each of the ensuing tables will include 100 cases, 73 paralytic and 27 nonparalytic, on the basis of final classification and completed laboratory confirmation.

As usual in polio epidemics, the disease struck males more commonly than females. However, in Rhode Island the 1960 incidence was perhaps more disproportionate than usually seen in the past, 59 percent of the cases having been in males and only 41 percent in females. Among children under 10 years of age, 50 cases were in males and only 35 in females. All major ethnic groups in the population were involved, with relatively large numbers of cases in children of French, Italian, English, and Irish descent. There were only 3 Negro cases, quite proportional to the low Negro population of Rhode Island.

It will be noted in Table 2 that there is a relative predominance of cases among young children in the pre-school age group, a more "infantile" type of disease than was seen a decade ago when the majority of cases was in the school age population. This great proportion of cases among young children is further emphasized by the fact that 85 percent of all the paralytic cases were in children under 10 years of age. Although the number of cases confirmed as having nonparalytic poliomyelitis is small, it is noteworthy that the age distribution is very similar with 85 percent of the cases under 10 years of age. It has generally been found that nonparalytic polio involves an older age population than the paralytic disease. However, when cases due to other causes of aseptic meningitis are eliminated, it is seen that the true poliomyelitis cases have essentially the same age distribution, whether paralytic or nonparalytic.

Of great importance in Table 2 also is the distribution of cases by vaccination status. More than 56 percent of the paralytic cases had had either no doses or one dose of vaccine. On the other hand 26 percent of the cases had had a full series of three or more doses. Although this might be seen as a relatively high number of vaccine failures, it is important to compare the number of cases in each group with the number of persons at risk in each of these dosage groups. Since a far greater proportion of children had had 3 or more doses of vaccine, the attack rate among these vaccinated persons was actually very low compared with the attack rate among the unvaccinated, and the level of effectiveness of vaccine protection is quite high, as will be shown in a detailed study of the cases in Providence and Prospect Heights by Dr. Serfling. It must be mentioned also that this Table is somewhat misleading in that it includes all doses of vaccine given to these patients prior to the onset of illness. Thus 6 of the 21 patients with one dose of vaccine in this Table received their vaccine less than one week prior to onset. Also 2 of the cases with 2 doses of vaccine had received their second dose within 3 days prior to onset. Thus in these 8 cases the vaccine had been received too recently to have produced a significant antibody protection against infection already present.

The original diagnosis by type of involvement is presented in Table 3. Fully 37 percent of the confirmed cases had bulbar involvement, including 24 with bulbo-spinal disease. It is evident that the more severe results in cases with cranial nerve involvement were entirely limited to those with bulbo-spinal paralysis, and included the 6 deaths. Thirteen cases had bulbar involvement alone and all had minor or no residual. Also of note, 21 cases had facial weakness, including 5 with isolated facial palsies. It has been suggested that facial paralysis is rarely due to polio, but in 3 of the 5 cases poliovirus has been recovered.

Also of note, of the confirmed cases, of 17 originally diagnosed as nonparalytic polio, 3 had minor residual paralysis. The explanation for this must be that occasionally paralysis either is not noted initially or develops insidiously during the period after preliminary diagnosis is made. The importance of convalescent evaluations in confirming the clinical diagnosis of poliomyelitis is obvious.

In Table 4 the confirmed cases are presented by residual paralysis and vaccination status. When all cases were evaluated several months after the epidemic the outcome was generally quite good. Thus 65 of the 100 confirmed cases had no significant residual paralysis. We see also that the degree of residual paralysis does not seem to bear any consistent relationship to the previous vaccination status. That is to say, there is no evidence from this table that any demonstrable protection is offered by previous vaccination once the disease is contracted and the central nervous system involved.

The spread of polio from case to case in an epidemic is usually traceable with difficulty, since probably 95 percent of polio infections are subclinical. Last summer however we were impressed by the frequency of demonstrable contacts which could be elicited by questioning cases and their families. It was found that over 50 percent of the cases had a traceable contact with another case. Furthermore over 30 percent of these contacts were direct, from patient to patient. Figure 9 is a map of the most complete train of transmission elicited, showing the spread of clinical illness, directly and indirectly, from Riverside to South Providence, than to the Chad Brown project, and from there to the East side, South Providence again, and to North Smithfield. Also of interest was the occurrence of 11 multiple case families with as many as 4 patients in one family. These 11 families accounted for a total of 26 cases. The ease of tracing contacts and the frequency of clinical illness in single families are both indicative of an unusually low level of subclinical illness in this epidemic.

In summary then, on the basis of our epidemic field study, and the laboratory results thus far available, the epidemic of poliomyelitis in Rhode Island during 1960 differed from those in the past in being highly concentrated within the Providence Metropolitan low socioeconomic areas, in being largely localized to young children and primarily among those who had had no Salk vaccine or inadequate vaccination. This epidemic began earlier than in precious years, reached an earlier peak, but seemingly was aborted prior to the usual poliomyelitis epidemic season. It is our feeling that the massive immunization of this population decreased the number of available susceptibles to a point below which the epidemic burned itself out. Clinically the epidemic was atypical in the high proportion of bulbar, especially facial, involvement and the ease with which contacts could be traced within and between families.

Joseph Oren, M.D.

II. EVALUATION OF VACCINE STATUS AND EFFECTIVENESS

In the City of Providence various surveys were made during the course of the epidemic to measure vaccine status and socioeconomic level of areas selected for sewage sampling and also for sub-populations of the entire city. These surveys were carried out under the directions of Dr. Dana Quade with support and assistance of the Rhode Island State Health Department and the City of Providence Health Department.

The present report provides a summary of findings of a probability survey conducted in early September. At this time 1960 census data by enumeration districts were available. Approximately one dwelling unit in 70 was included in the survey. Socioeconomic status was determined for each household at time of interview by use of the 2-factor index of social position developed by Dr. A.B. Hollingshead of Yale University. An average value of the index was computed for each census tract by weighting the index for each sample family by the number of family members. The census tracts were then ranked and divided into quartiles classified as upper, upper-middle, lower-middle and lower. Figure 6 presents the classification of census tracts by this method.

Table 5 shows estimates of the total number of doses of vaccine administered by age and dose order and Figure 10 illustrates vaccination levels on June 1st and September 1st by age and socioeconomic levels. For the city as a whole (Table 5) a total of 137,354 doses of vaccine were administered to the 206,352 persons in the population.

Under age 15 an average of approximately one dose per person was administered.

At ages over 15 the average number of doses per person decreased but even at ages 30-39 it amounted to approximately 4 doses to every 5 persons. Over age 40 the average number was approximately 2 doses to every 5 persons.

The intensity of the vaccination program is also evident in Figure 10 which shows that by September 1st nearly every person under 15 years of age in each socioeconomic group had received at least one dose during the current campaign or previously. However, in the lower row of Figure 10, it may be observed that the proportion of children under 5 with four or more doses still remained at lower than desirable levels, especially in the lower socioeconomic groups.

Table 6 presents vaccination status, paralytic cases and attack rates by period of the epidemics, age-group and socioeconomic status.

During the period June 16th to July 21st when attack rates were highest a distinct negative correlation between vaccination level and attack rate may be observed. The association with socioeconomic level is evident. In this epidemic no paralytic cases occurred in the upper socioeconomic quartile in which the proportion with 3 or more inoculations in children under 5 was

74 percent on June 1 and increased to 86 percent by September 1.

Estimated vaccine effectiveness is calculated in Table 7 from the data of Table 6. The overall estimate was 81 percent, a figure in close agreement with similar studies in Des Moines and Kansas City during 1959.

Table 8 presents results for a closed epidemic of high intensity in a Pawtucket, R.I. housing project. Despite the high attack rates in the unvaccinated children no cases occurred in children with 3 or more doses of vaccine. A more detailed study of this outbreak now in progress indicates an effectiveness for 3 or more doses well above the estimate of 81 percent for the City of Providence.

Robert E. Serfling, Ph.D.

Figure I — ANNUAL POLIOMYELITIS RATES, RHODE ISLAND

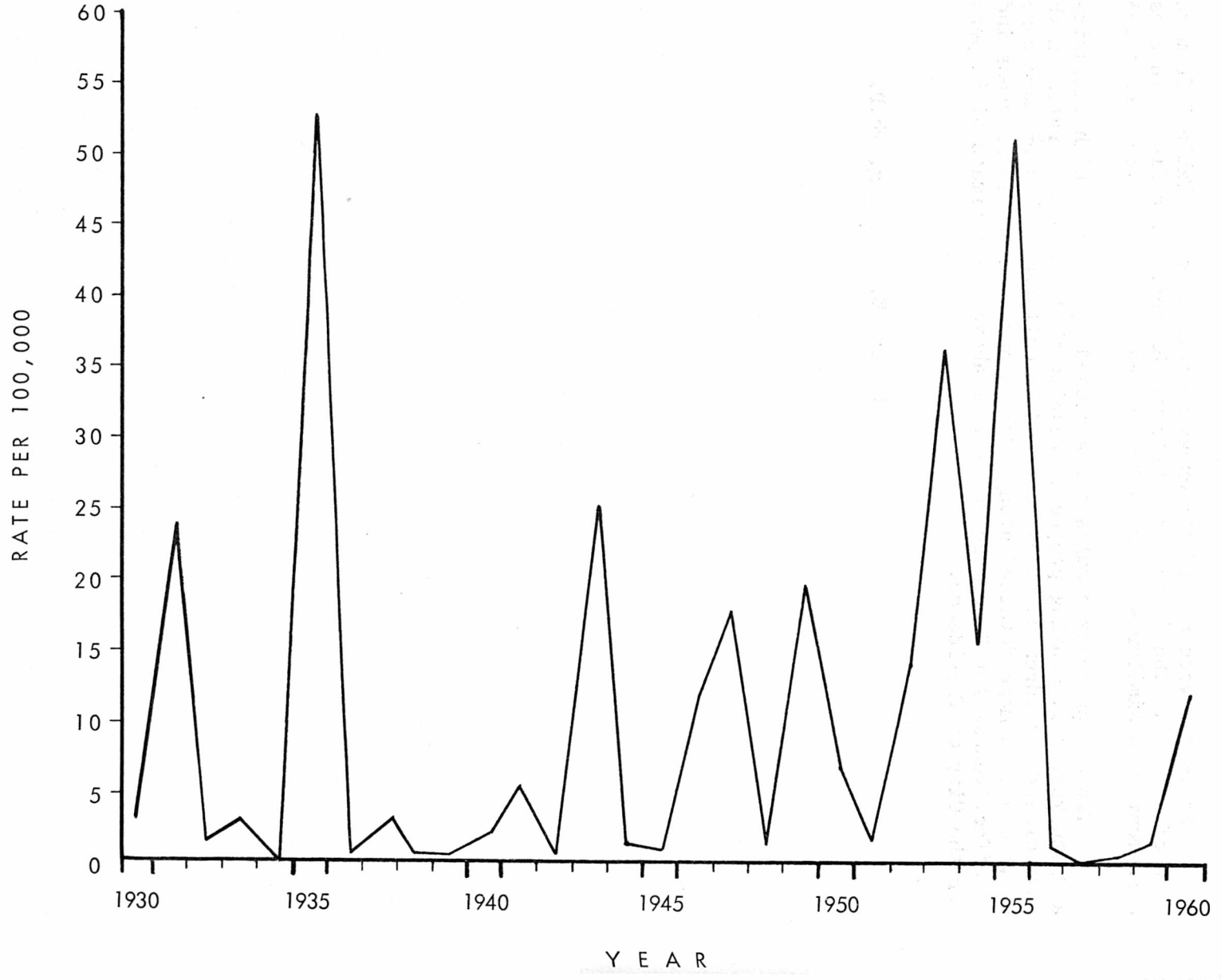


Figure 2 – POLIOMYELITIS INCIDENCE, RHODE ISLAND

(By week of report. 1953-1955, 1960)

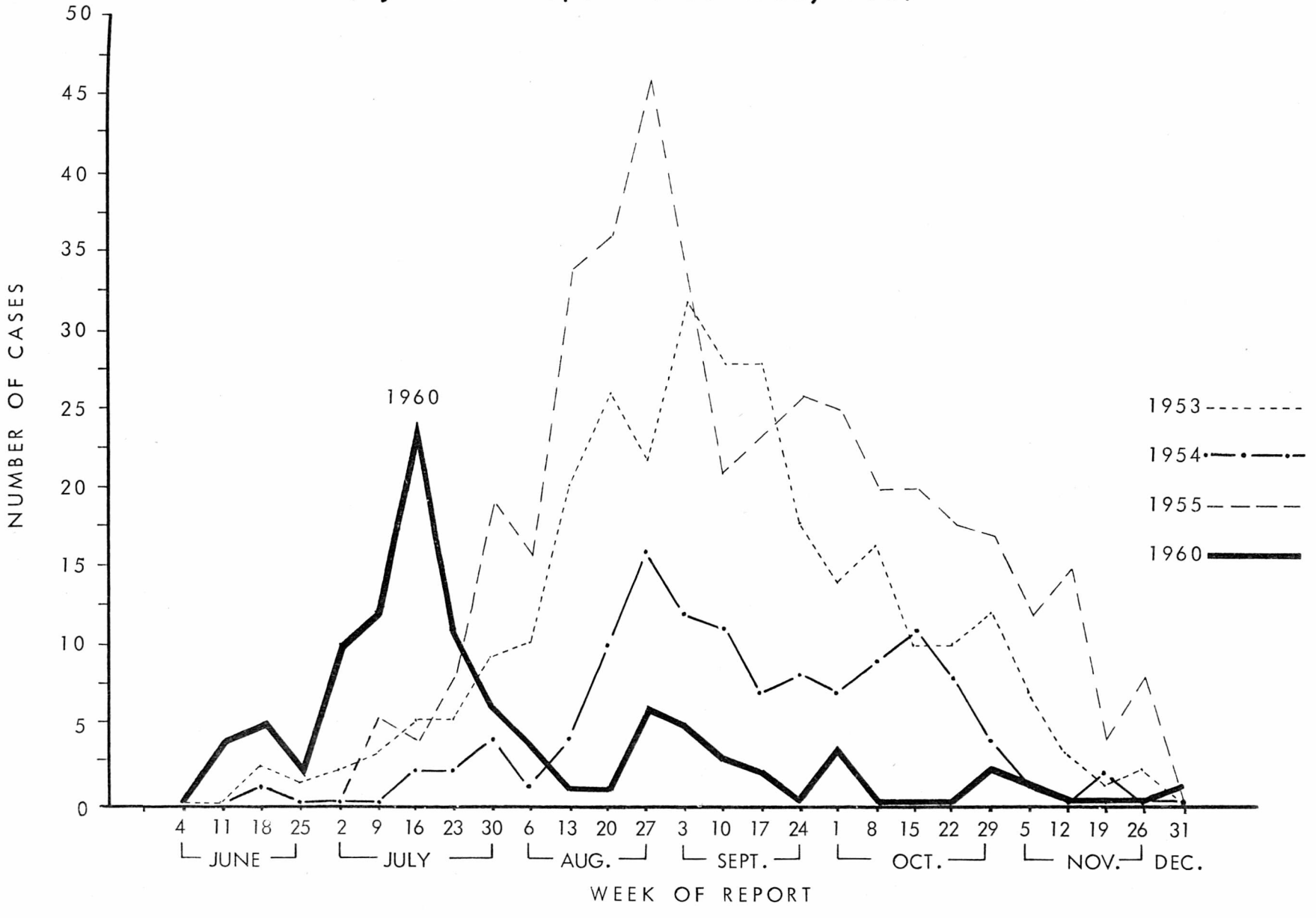
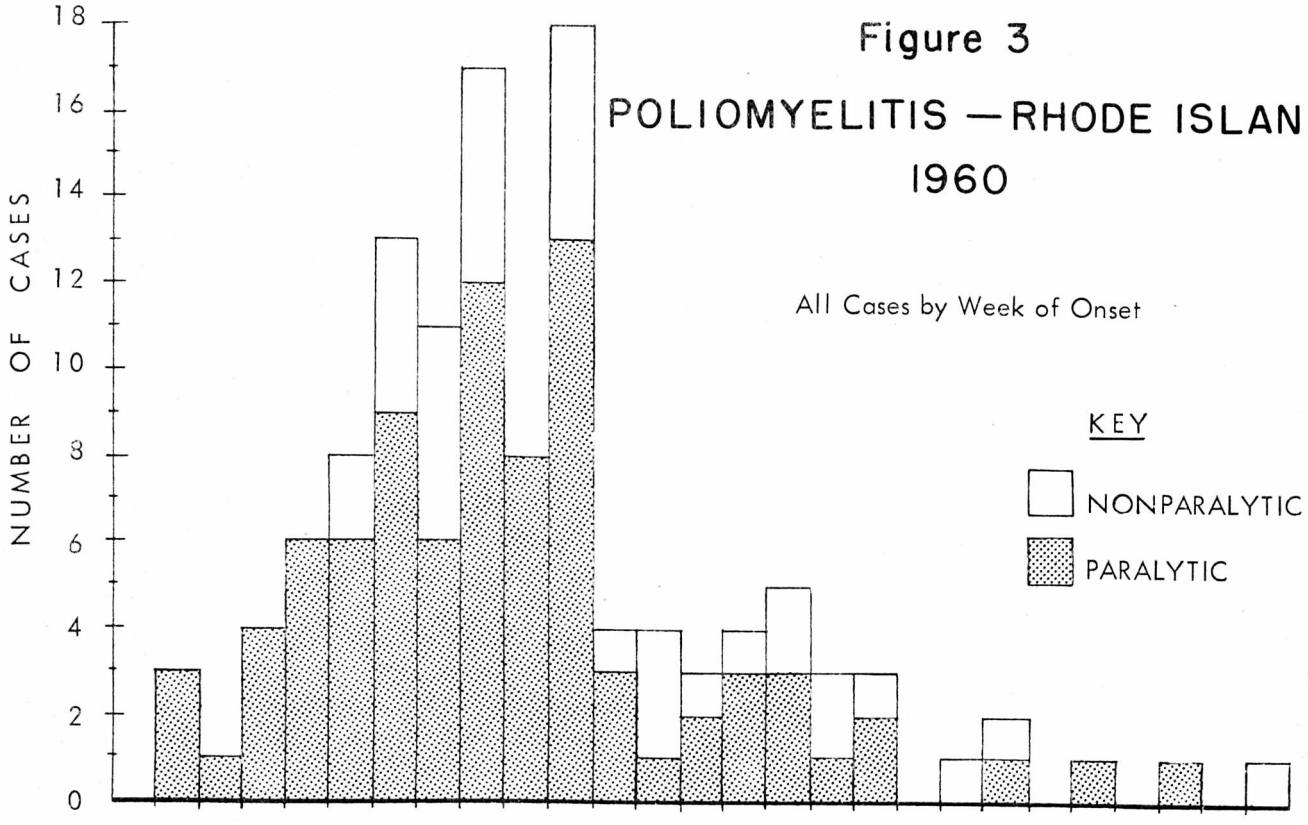
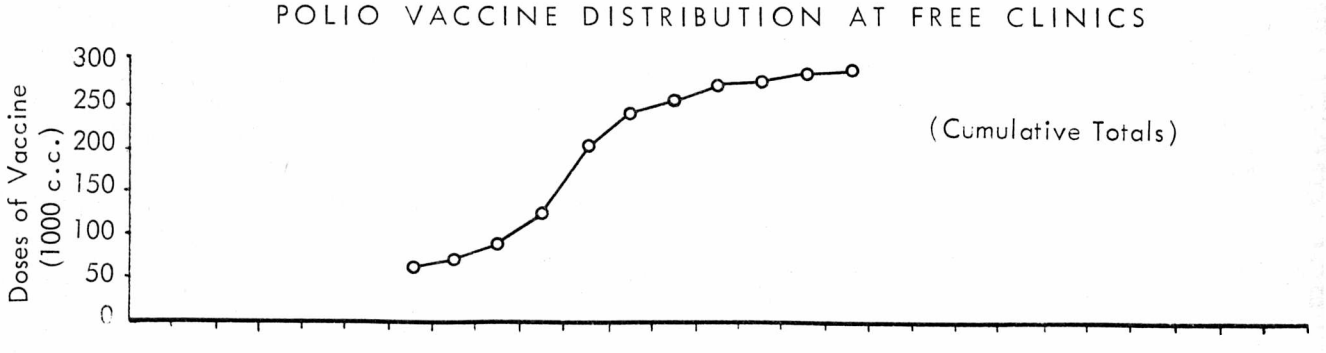
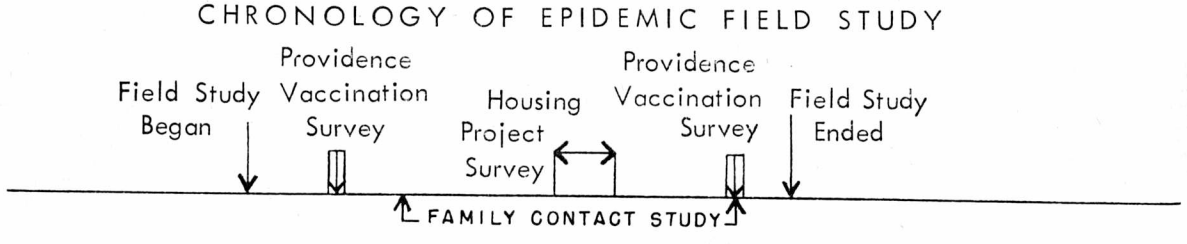


Figure 3

POLIOMYELITIS — RHODE ISLAND 1960







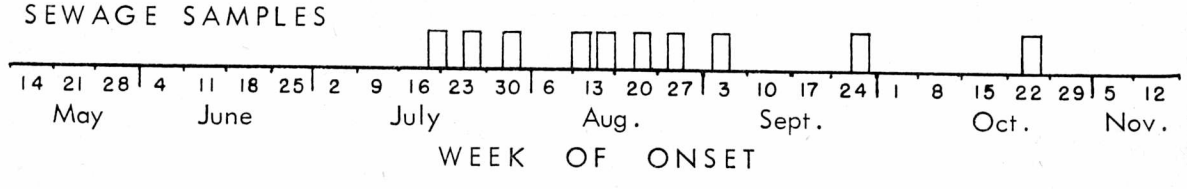


Figure 4 — POLIOMYELITIS — RHODE ISLAND—1960

METROPOLITAN CONCENTRATIONS

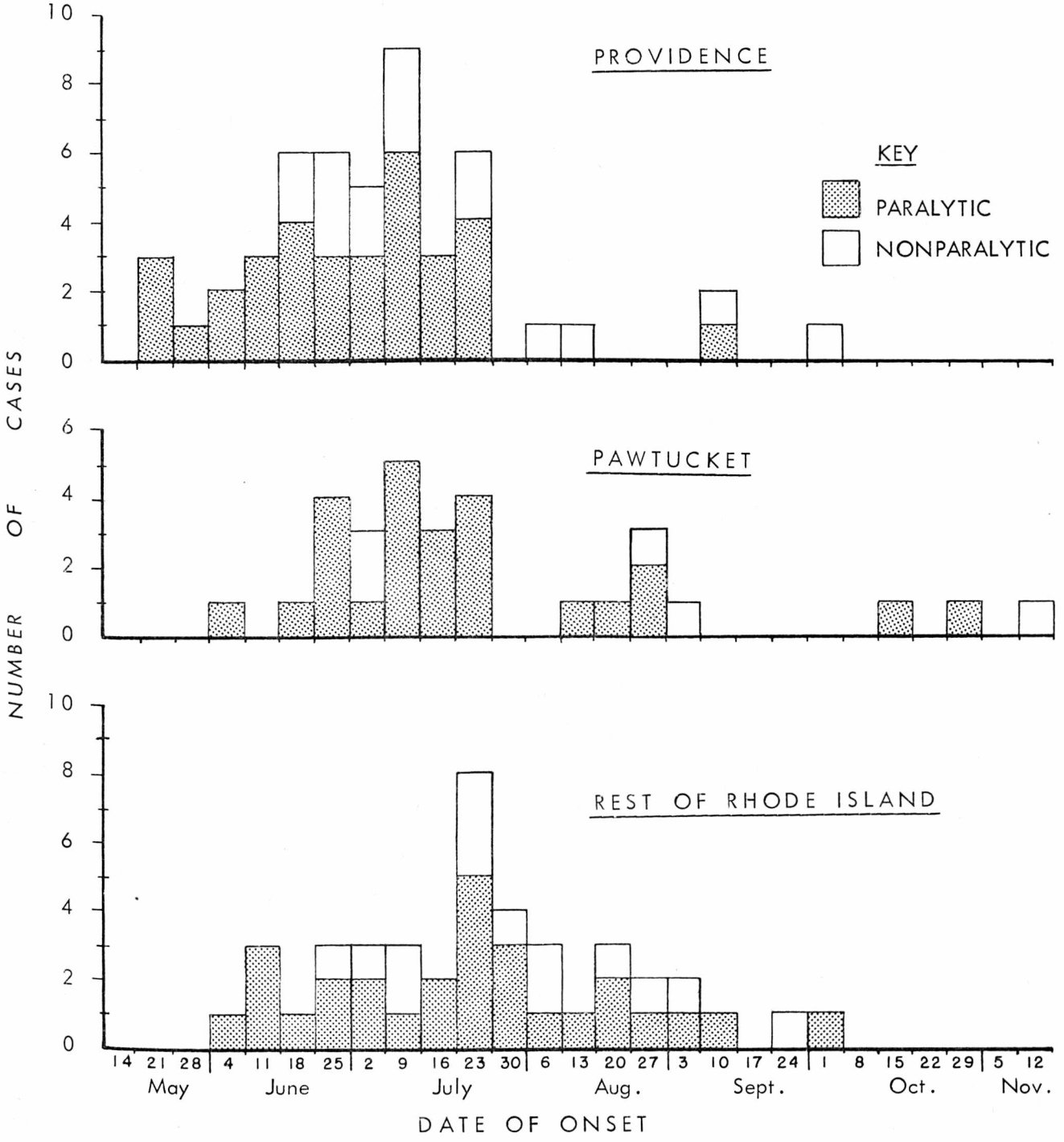


Figure 5

RHODE ISLAND – POLIOMYELITIS CASES – 1960

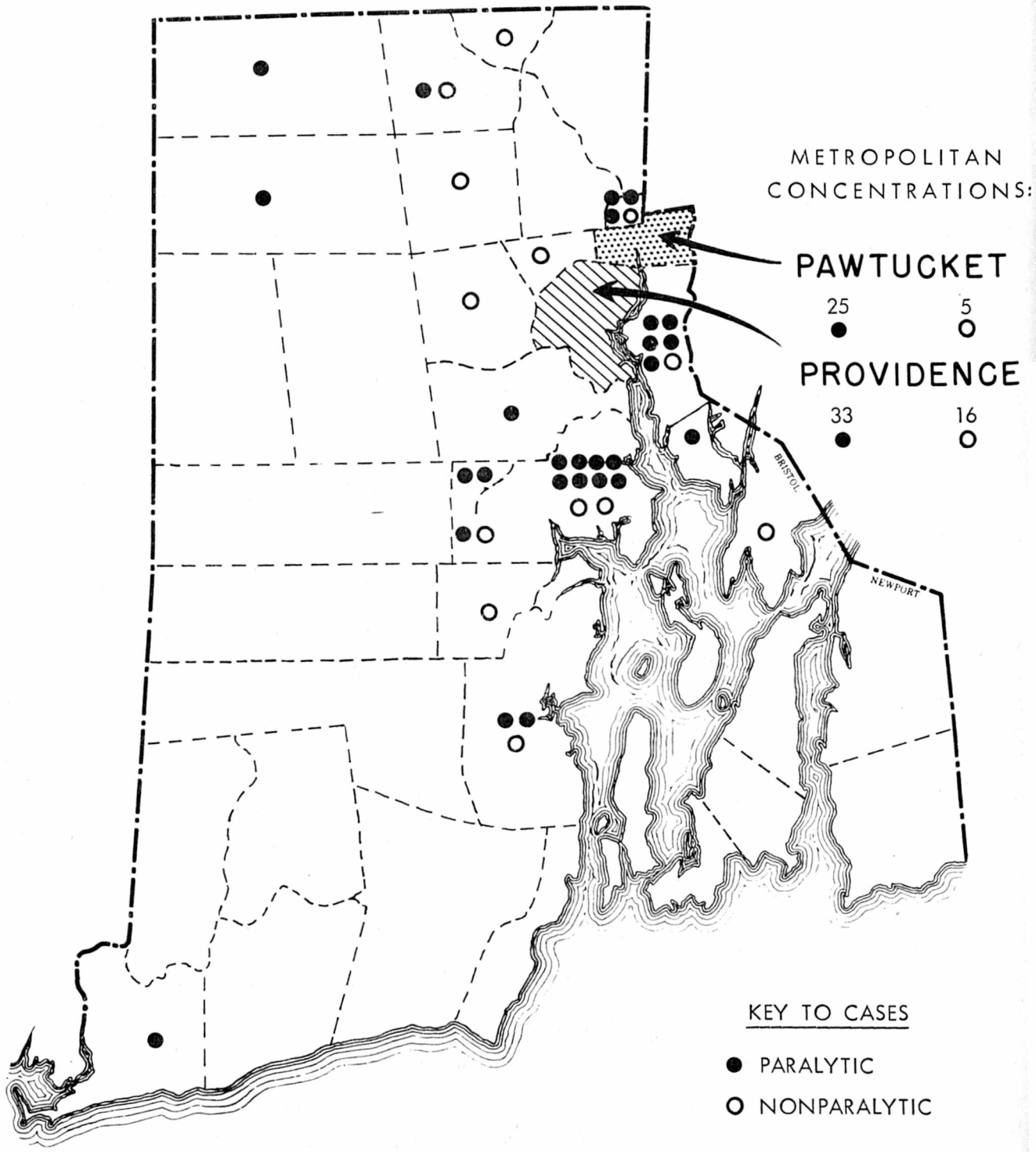
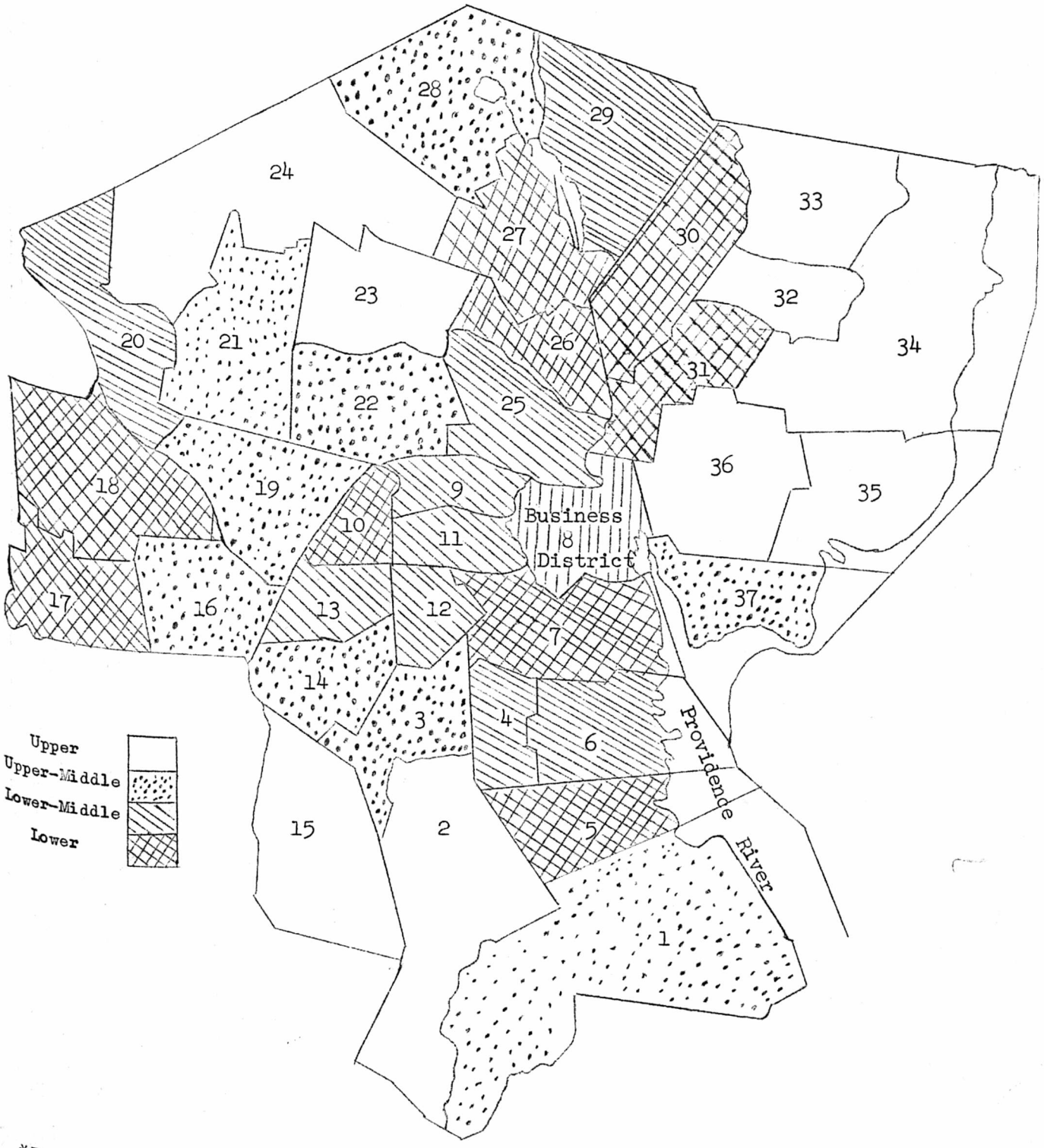


Figure 6. Classification of the Census Tracts of Providence, R.I. into Four Socioeconomic Areas, July, 1960*.



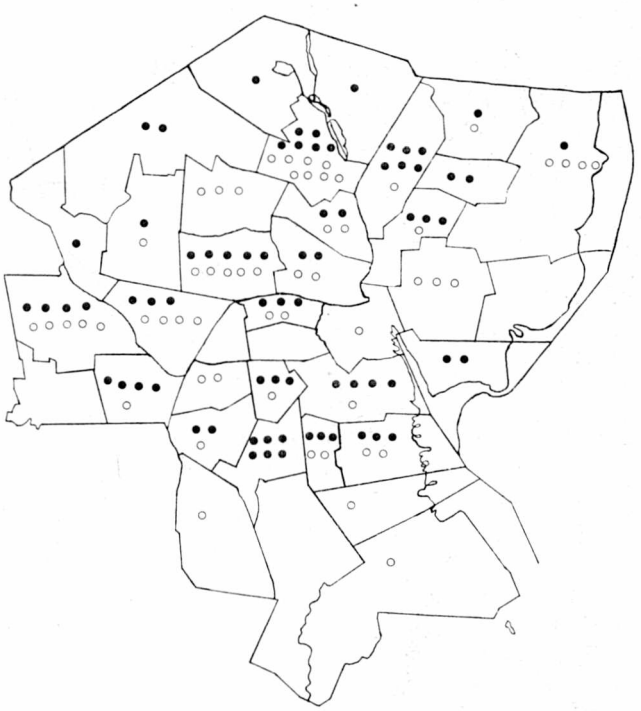
*Rankings of Census Tracts according to weighted Hollingshead index of each Census Tract computed from sample survey of September 1960.

2/27/61

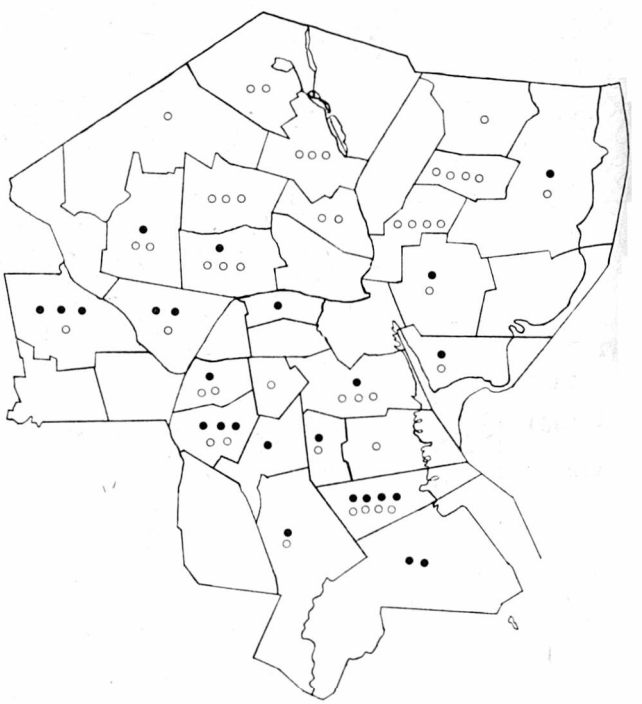
Figure 7

POLIOMYELITIS DISTRIBUTION
PROVIDENCE, RHODE ISLAND - 1953, 1955
BY CENSUS TRACT

1953



1955



KEY TO CASES

● Paralytic
○ Nonparalytic

Figure 8

POLIOMYELITIS DISTRIBUTION PROVIDENCE, RHODE ISLAND - 1960 (PRELIMINARY DIAGNOSIS) BY CENSUS TRACT

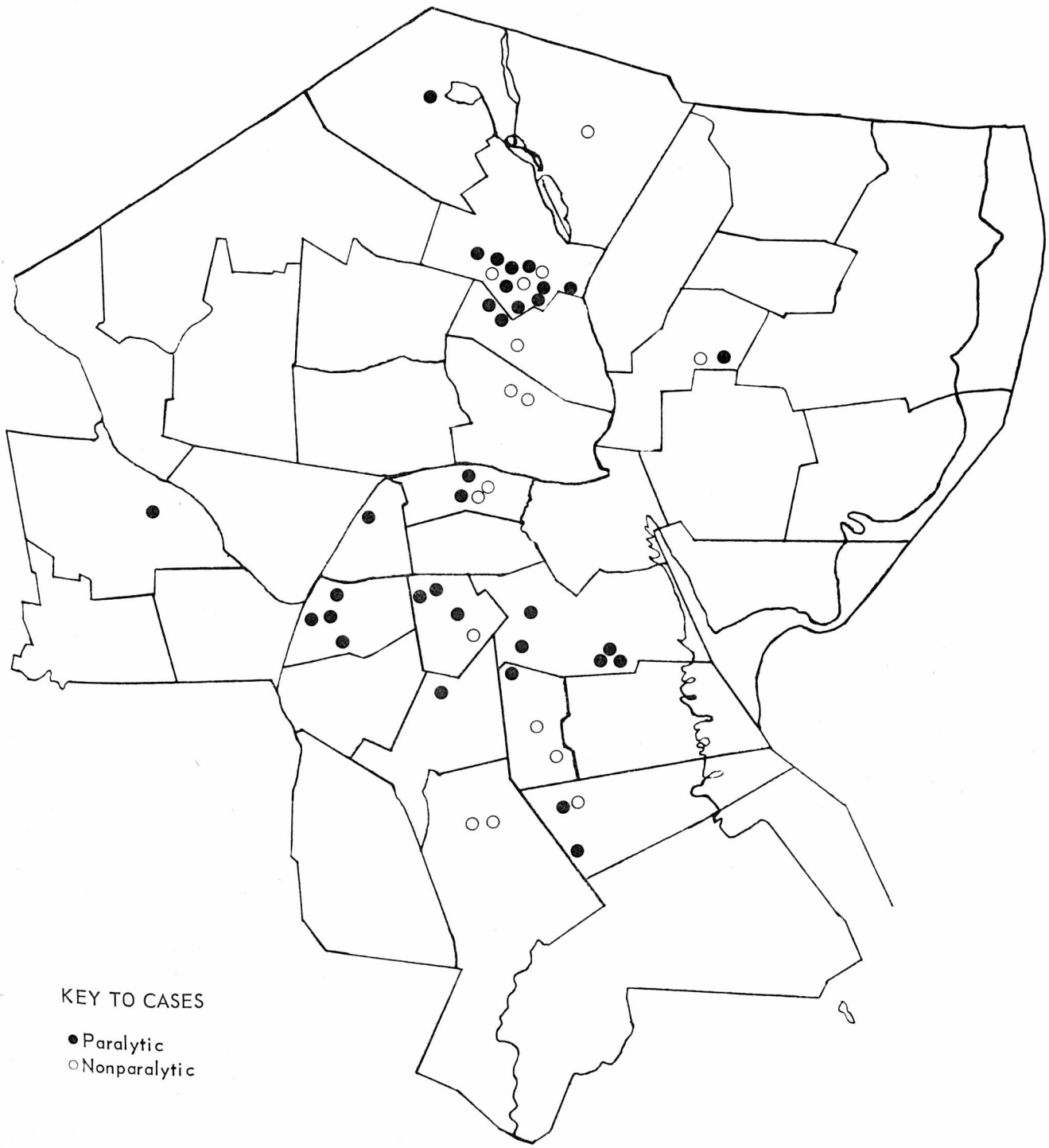


TABLE 1

POLIOMYELITIS - RHODE ISLAND - 1960
PRELIMINARY RESULTS OF CASE STUDY

Final Classification	Original Classification		TOTAL
	Paralytic	Nonparalytic	
Paralytic Poliomyelitis & residual	70	3	73[a]
Nonparalytic poliomyelitis	13	14	27[b]
TOTAL	83	17	100
Other aseptic meningitis	0	5	5
Incomplete study	3*	13**	16
TOTAL UNDER STUDY	86	35	121

* Includes one case with poliovirus isolation but no residual evaluation.
** Includes one case who committed suicide on the 5th day of illness. Diagnosis of poliomyelitis confirmed at autopsy.

a. Thus far 44 of the paralytic cases, 60%, have been confirmed by poliovirus isolation.
b. The nonparalytic cases included have all received laboratory confirmation: poliovirus isolation in 25 and high convalescent titer in 2.

TABLE 2

CONFIRMED POLIOMYELITIS - RHODE ISLAND - 1960
AGE DISTRIBUTION BY VACCINATION STATUS

PARALYTIC WITH RESIDUAL

Age Group	Doses of Vaccine 0	1	2	3	4	5	Total	Percent
0-4	12	12	7	4	3	-	38	52.1
5-9	5	7	5	5	1	1	24	32.9
10-14	-	-	1	3	1	-	5	6.8
15-19	1	-	-	-	-	-	1	1.4
20-29	2	2	-	1	-	-	5	6.8
30+	-	-	-	-	-	-	-	-
TOTAL	20	21	13	13	5	1	73	100.0
PERCENT	27.4	28.8	17.8	17.8	6.8	1.4	100.0	

NONPARALYTIC

Age Group	Doses of Vaccine 0	1	2	3	4	5	Total	Percent
0-4	4	2	3	1	1	-	11	40.7
5-9	3	2	3	4	-	-	12	44.4
10-14	-	-	-	1	2	-	3	11.1
15-19	-	-	-	-	1	-	1	3.7
20-29	-	-	-	-	-	-	-	-
30+	-	-	-	-	-	-	-	-
TOTAL	7	4	6	6	4	-	27	100.0
PERCENT	25.9	14.8	22.2	22.2	14.8	-	100.0	

CONFIRMED POLIOMYELITIS - RHODE ISLAND - 1960

TABLE 3

DEGREE OF RESIDUAL BY TYPE OF PARALYSIS

Residual Paralysis	Type of Paralysis					
	Nonparalytic	Spinal	Bulbar	Bulbospinal	Isolated facial	TOTAL
None	14	9	2	2		27
Minor	3	14	6	10	5	38
Significant		16		5		21
Severe		7		1		8
Death				6		6
TOTAL	17	46	8	24	5	100

TABLE 4

RESIDUAL PARALYSIS BY VACCINATION STATUS

Residual Paralysis	Doses of Vaccine						
	0	1	2	3	4	5	TOTAL
None	7	4	6	6	4	0	27
Minor	5	12	10	8	2	1	38
Significant	10	6	2	2	1	0	21
Severe	3	2	0	2	1	0	8
Death	2	1	1	1	1	0	6
TOTAL	27	25	19	19	9	1	100
Percent Doses	27	25	19	19	9	1	100.0

Figure 9 – CHAIN OF TRANSMISSION
POLIOVIRUS INFECTION

PROVIDENCE, RHODE ISLAND

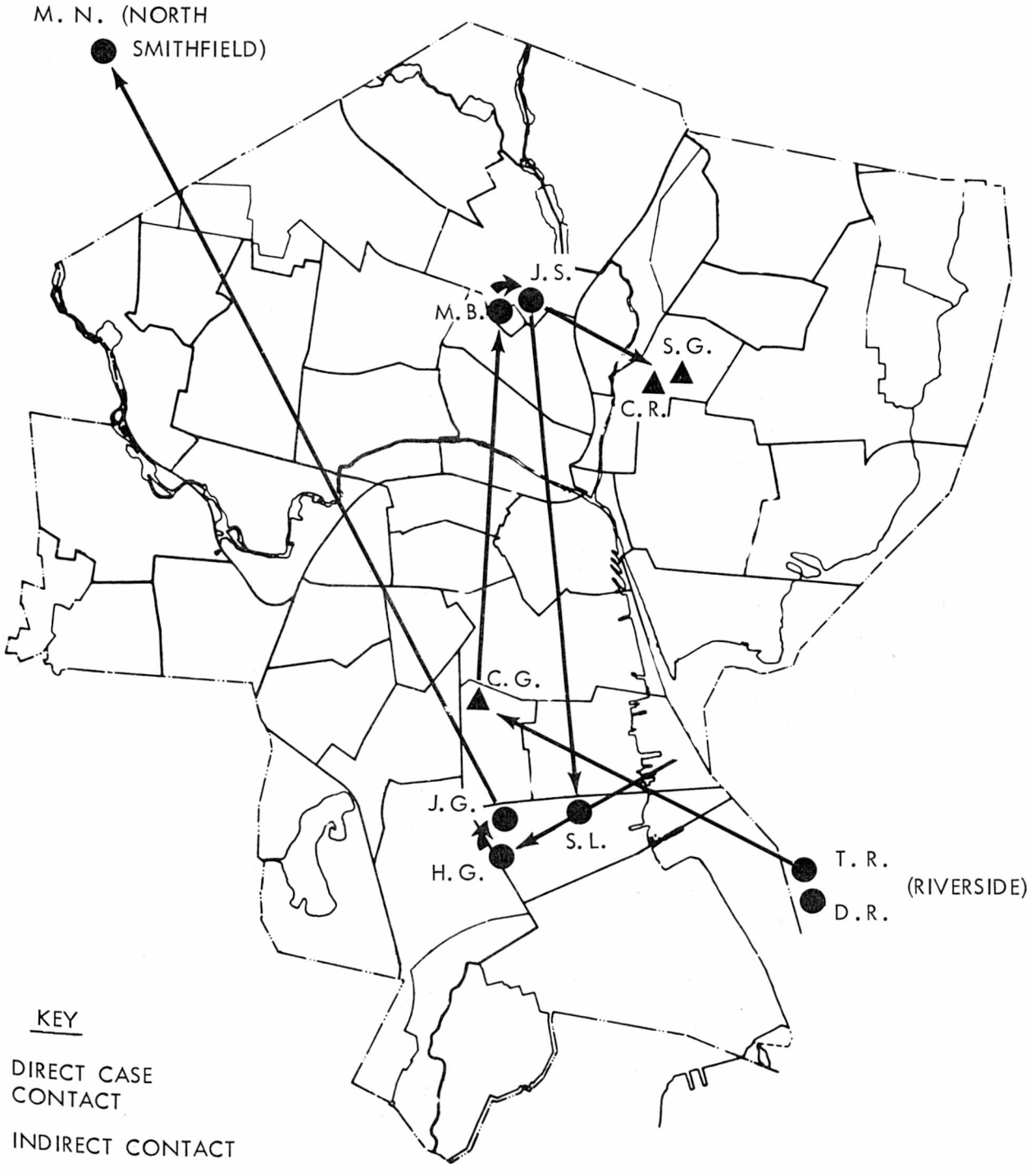
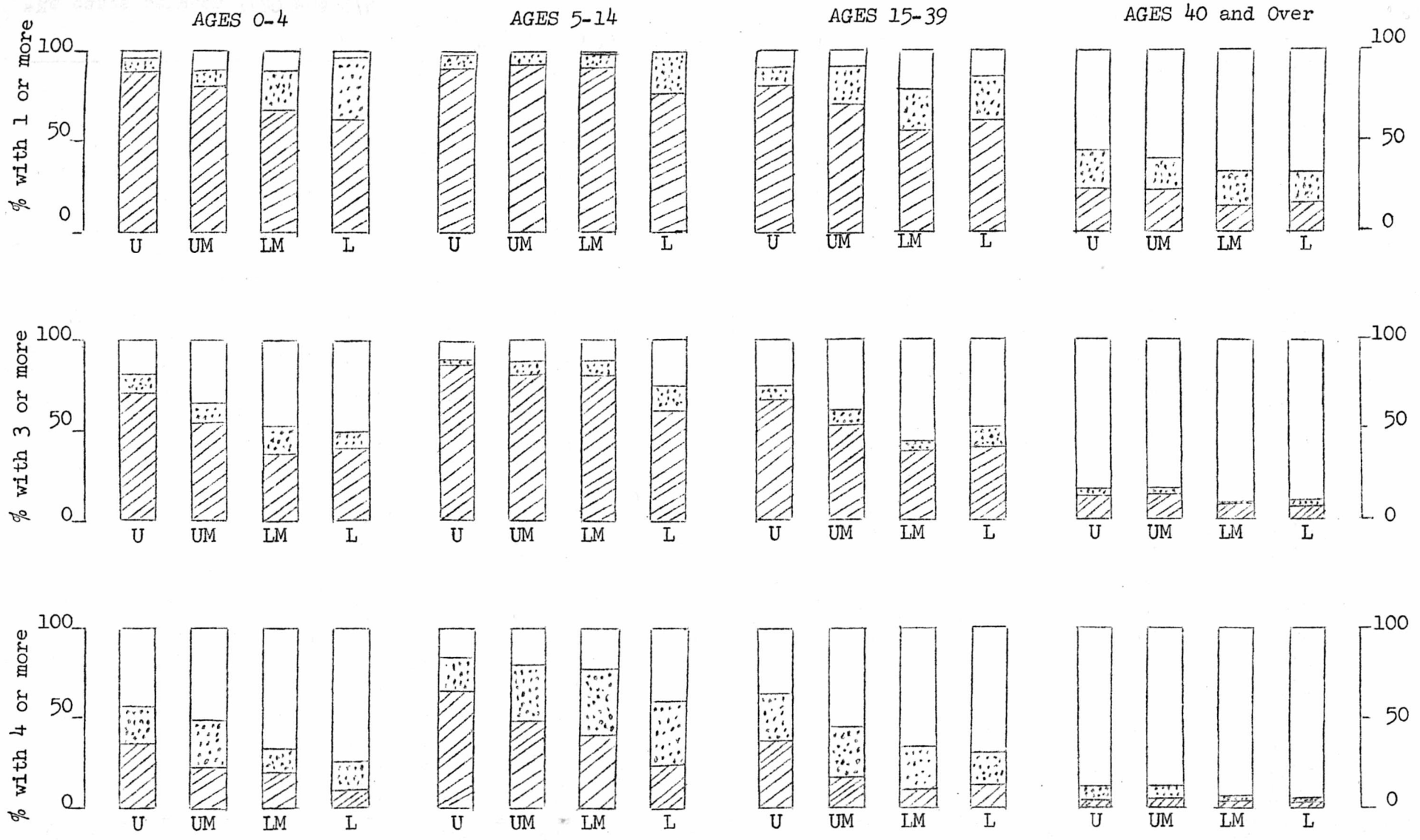


Table 5. Estimated Number of Doses of Salk Vaccine Administered to Population of Providence, R.I. during June, July and August, 1960

Population*		Number of Doses							Total Doses Obtained
Age Group	Number of Persons	First Doses	Second Doses	Third Doses	Fourth Doses	Fifth Doses	Sixth Doses	Seventh Doses	
Under 3 Months	894	71	-	-	-	-	-	-	71
3-11 Months	3298	1586	1913	180	-	-	-	-	3679
1-4 Years	15481	2088	2435	2285	3977	1887	-	-	12672
5-9 Years	17787	2259	2333	1643	5271	5475	320	-	17301
10-14 Years	19311	2116	2134	1434	5988	6031	683	233	18619
15-19 Years	16500	2552	1900	1612	5512	3452	-	79	15107
20-29 Years	21162	3896	2942	1898	4339	1568	133	-	14776
30-39 Years	24926	5155	4795	1864	5293	2517	221	-	19845
40 and Over	86710	15656	11088	2306	4266	1840	-	-	35156
Unknown	283	64	64	-	-	-	-	-	128
ALL AGES	206352	35443	29604	13222	34646	22770	1357	312	137354

*Sample estimates by age adjusted to 1960 census tract totals.

FIGURE 10. VACCINATION STATUS OF PROVIDENCE, RHODE ISLAND - JUNE AND SEPTEMBER 1960



LEGEND:

Percent having specified number of doses on June 1, 1960

Percent added between June 1 and September 1, 1960

2/27/61

Table 6. Paralytic (60-day Residual) Poliomyelitis in Providence, R.I., 1960

Period of Epidemic	Age and Socioeconomic Group		Population by Number of Doses 0	1-2	3+	Paralytic Cases by Number of Doses 0	1-2	3+	Total Population	Total Paralytic Cases	Rate per 100,000	Percent of Population with 3+ Doses
	3 Mos.	U	290	849	3 243				4 382	-	-	74.0
5/16	to	UM	1 104	1 417	3 064				5 585	-	-	54.9
	5	LM	1 137	1 169	1 494				3 800	-	-	39.3
to	Years	L	1 809	1 259	1 944	2	1	2	5 012	5	99.8	38.8
	5	U	897	323	7 550				8 770	-	-	86.1
6/16	to	UM	806	1 226	8 360				10 392	-	-	80.4
	15	LM	749	912	5 886		1	1	7 547	2	26.5	78.0
	Years	L	2 334	1 715	6 340		1		10 389	1	9.6	61.0
	3 Mos.	U	58	806	3 518				4 382	-	-	80.3
	to	UM	730	1 357	3 498	1**			5 585	1	17.9	62.6
6/16	5	LM	750	1 422	1 628	1		1	3 800	2	52.6	42.8
	Years	L	1 533	1 474	2 005	3	3		5 012	6	119.7	40.0
	5	U	517	514	7 739				8 770	-	-	88.2
	to	UM	684	1 219	8 489				10 392	-	-	81.7
to	15	LM	631	951	5 965	1	2		7 547	3	39.8	79.0
	Years	L	1 960	1 889	6 540	1	1	1	10 389	3	28.9	63.0
	15	U	3 063	2 356	11 229				16 648	-	-	67.4
	to	UM	4 730	4 394	10 132	1			19 256	1	5.2	52.6
7/21	40	LM	5 596	2 587	4 847				13 030	-	-	37.2
	Years	L	4 383	3 165	5 356				12 904	-	-	41.5
	3 Mos.	U	-	598	3 784				4 382	-	-	86.4
8/16*	to	UM	346	1 467	3 772				5 585	-	-	67.5
	5	LM	256	1 410	2 134				3 800	-	-	56.2
	Years	L	64	2 428	2 520			1***	5 012	1	20.0	50.3
to												
	15	U	1 620	2 949	12 079				16 648	-	-	72.6
9/16	to	UM	1 960	5 685	11 611				19 256	-	-	60.3
	40	LM	2 951	4 662	5 417				13 030	-	-	41.6
	Years	L	2 132	4 192	6 580	1			12 904	1	7.7	51.0
					TOTAL	11	9	6	-	26	-	-

*No cases between 7/20 and 9/4

**First inoculation 6 days before onset

*** Only case with 4 inoculations - minor residual paralysis at 60 days

2/27/61

Table 7. Estimated Vaccine Effectiveness, Providence, R.I., 1960

Period of Epidemic	Age and Socioeconomic Group		Population by Number of Doses 0	Population by Number of Doses 3+	Paralytic Cases* by Number of Doses 0	Paralytic Cases* by Number of Doses 3+	Rate per 100,000 in Unvaccinated Population	Expected Cases in Vaccinated (3+) Population
	3 Mos.	U	290	3 243			-	-
5/16	to	UM	1 104	3 064			-	-
	5	LM	1 137	1 494			-	-
to	Years	L	1 809	1 944	2	2	110.6	2.2
	5	U	897	7 550			-	-
6/16	to	UM	806	8 360			-	-
	15	LM	749	5 886		1	-	-
	Years	L	2 334	6 340			-	-
	3 Mos.	U	58	3 518			-	-
	to	UM	730	3 498	1		137.0	4.8
6/16	5	LM	750	1 628	1	1	133.3	2.2
	Years	L	1 533	2 005	3		195.7	3.9
	5	U	517	7 739			-	-
	to	UM	684	8 489			-	-
to	15	LM	631	5 965	1		158.5	9.5
	Years	L	1 960	6 540	1	1	51.0	3.3
	15	U	3 063	11 229			-	-
	to	UM	4 730	10 132	1		21.1	2.1
7/21	40	LM	5 596	4 847			-	-
	Years	L	4 383	5 356			-	-
	3 Mos.	U	-	3 784			-	-
8/16	to	UM	346	3 772			-	-
	5	LM	256	2 134			-	-
	Years	L	64	2 520		1	-	-
to								
	15	U	1 620	12 079			-	-
9/16	to	UM	1 960	11 611			-	-
	40	LM	2 951	5 417			-	-
	Years	L	2 132	6 580	1		46.9	3.1
			TOTAL		11	6	-	31.1

*With 60-day residual paralysis

$$\text{Estimated Effectiveness} = \frac{31.1-6}{31.1} = 0.81$$

2/27/61

Table 8. Paralytic (60-day Residual) Poliomyelitis in the Prospect Heights Housing Project
Pawtucket, R.I., 1960

Period of Epidemic	Age Group	Population by Number of Doses			Paralytic Cases by Number of Doses			Total Population	Total Paralytic Cases	Rate per 100,000	Percent of Population with 3+ Doses
		0	1-2	3+	0	1-2	3+				
5/16 to 6/16	3 Months to 5 Years	47	83	98	1			228	1	438.6	43.0
	5 to 15 Years	56	70	239		1		365	1	274.0	65.5
6/16 to 7/22	3 Months to 5 Years	14	101	113	5*	4		228	9	3 947.4	49.6
	5 to 15 Years	9	102	254	1	1		365	2	547.9	69.6
	15 to 40 Years	91	117	98	1			306	1	326.8	32.0
				TOTAL	8	6	0	-	14	-	-

*These five cases include one case with first dose two days prior to onset; one case with first dose three days prior to onset; one case with first dose six days prior to onset.

2/27/61