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Public Health Service Bureau of State Services
Communicable Disease Center
Poliomyelitis Surveillance Unit
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SPECIAL NOTE

The information in this report represents a factual summary of data reported to the Poliomyelitis Surveillance Unit from State Health Departments, Epidemic Intelligence Service Officers, participating Laboratories and other pertinent sources. All readers should be cautioned regarding the interpretation of these data, many of which are preliminary and provisional in nature. It is understood that the contents of these reports will not be released to the press, except by the Office of the Surgeon General, Public Health Service, U. S. Department of Health, Education and Welfare. State Health Officers, of course, are free to release any information they may wish concerning data from their state.

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I. Current Poliomyelitis Morbidity Trends

Poliomyelitis incidence by weeks for 1957, with similar data for the first five months of the five preceding years, is presented in Figure 1. National incidence has continued at a low level for the past 4 weeks. The National Office of Vital Statistics received reports of 32 cases for the week ending March 30, 33 cases for the weeks ending April 6 and April 13, and 32 cases for the week ending April 20.

Table 1 presents reported incidence for the past six weeks by states and regions, with six-week totals for the previous four years.

II. 1956 Age Distribution Analysis

Preliminary analyses of data collected in the 1956 Age Distribution Analysis have appeared in previous PSU Reports and in "A Preliminary Report on the Surveillance of Poliomyelitis in the United States in 1956" (January 25, 1957). However, a comparison of age-specific attack rates in 1956 with those in 1955 has not previously appeared, and it is felt that this comparison may be of sufficient interest to include in the Report at this time. A final more detailed report on the 1956 Age Distribution Analysis is planned for later in the spring.

In Figure 3, the age-specific attack rates for paralytic poliomyelitis in 1956 are compared with those in 1955, based on cases and populations from those states for which data were available for both years. For ages under five, the curves are quite dissimilar. The 1955 curve peaked broadly at ages 2 through 5 while the 1956 curve peaked sharply at age 1, falling off rapidly thereafter. The 1955 curve showed a marked trough at ages 7 and 8. This group included most of the children who had been vaccinated in the school clinics in the spring of 1955. Similarly, the 1956 curve shows a trough at ages 8 and 9. This trough perhaps indicates that this same group, originally inoculated in the 1955 school clinics, still included fewer non-vaccinated persons than other age groups, or that it contained more triply-vaccinated persons than other age groups, or both. It may possibly also reflect a duration of immunity for one year. The attack rates, particularly in 1956, are relatively constant for each five-year age group from 10 to 30, declining thereafter.

Thus, the outstanding feature of the 1956 paralytic age curve is the heavy concentration of paralytic cases in the one year olds, indicating a need for special attention to vaccination of infants and young children.

III. British Poliomyelitis Vaccine

"Antigenic Activity of British Poliomyelitis Vaccine", A Report to the Committee on Laboratory Investigations of Poliomyelitis of the Medical Research Council, published in the British Medical Journal, February 16, 1957, Vol. i, pp. 366-368, is a study of considerable interest. This report is produced in part as follows:

"During May and June, 1956, three batches of poliomyelitis vaccine were used for the inoculation of 200,000 children in Britain under the scheme organized by the Ministry of Health. The antigenic activity of these three batches was studied in a group of children who were shown to have no detectable antibodies to any of the three types of poliomyelitis virus before their course of inoculations. The group consisted of 196 children between the ages of 1 and 11 years, in five different areas --London, Manchester, Central Scotland, Sheffield, and Southen-on-Sea.

"Each batch of vaccine was also tested for antigenic activity in monkeys.

Vaccine

"The three batches--designated 4, 5, and 6--were prepared by the Glaxo Laboratories under the direction of Dr. W. Wood from virus strains Brunenders (type 1), MEF-1 (type 2), and Saukett (type 3) by the formalin-inactivation method introduced by Salk. The vaccine differed in its type 1 component from that produced in America, the Mahoney strain having been replaced by a partially attenuated variant of the Brunhilde strain (Enders et al., 1952; Sabin, 1955). Gear (1956) has called this the Brunenders strain.

Titration of Sera

"Serial dilutions of serum...were mixed with an equal volume ....of virus suspension.....held at 37° C. for three hours, and then added to tubes containing 6- to 8-day-old monkey kidney cell cultures; two tubes were used for each dilution.....

"All sera were titrated, using Brunenders, MEF-1, and Saukett as the test viruses. Twenty post-immunization sera were also titrated for type 1 antibody, using Mahoney as the test virus. They gave similar results to those obtained with Brunenders, the geometric mean titres being 1/90 with Brunenders and 1/70 with Mahoney.

Antigenic Activity in Children

"Of the 196 children selected for the study, the majority had their pre-immunization sera taken on the day the first dose of vaccine was given and the remainder within a month before the first dose. The sera were shown to be negative at a titre of 1/8 to all three types of poliomyelitis virus. Seventy-two of the children were injected with batch 4, 66 with batch 5, 53 with batch 6, and five with a mixture of batches. Each child received two injections,

each of 1 ml., at an interval of three to four weeks. The injections were given intramuscularly into the left deltoid; no untoward reactions were observed in any of the children. Serum was taken on the average two weeks after the second dose and titrated for antibody to each of the three types. Those sera showing no antibody at 1/8 were retested at 1/2 and 1/4.

"Table 2 gives the results of the three batches of vaccine together....in all areas combined; the combined results are also given in Figure 2. The results clearly show that almost all children responded; of the 190 whose sera were fully examined, all except two responded to all three types..... The distribution of type 1 antibody titres in Manchester.....lay well outside the general distribution curve. These high titres were probably due to infection rather than to vaccination, as an epidemic was occurring there at the time, and have been omitted in calculating the geometric mean response. Considering all areas and all batches of vaccine together, the geometric mean response was 1/72, 1/282, and 1/101 for types 1, 2, and 3 respectively.

"The results with each of the three batches of vaccine are given in Table 3, and it is evident that the antibody responses to all of them were similar.

"From Table 4 it can be seen that children under 5 years of age responded as well as those aged 5 and over.

Antigenic Activity in Monkeys

"The three batches of vaccine were tested for antigenic activity in monkeys by the method in current use in the United States of America (U. S. National Institutes of Health, 1955). A commercial batch of American vaccine, E/2769, kindly supplied by Eli Lilly and Company, was tested at the same time for comparison; this batch was prepared early in 1955, and since then had been stored in the cold without any apparent loss of antigenicity.

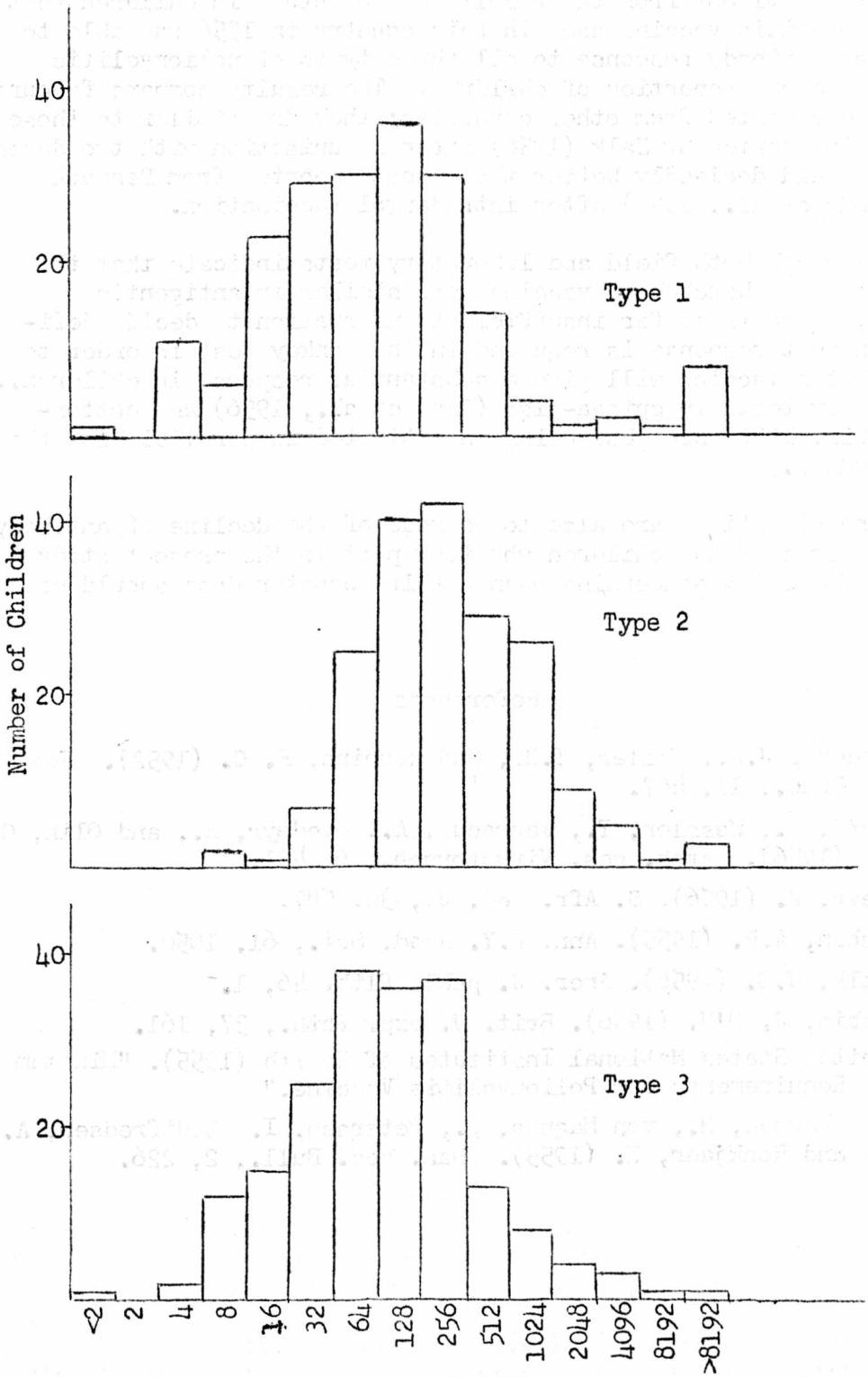
".....The results, given in the table below, show that the antigenic activity of the four batches was very similar in these animals.

Antibody Titres in Rhesus Monkeys after Immunization with Poliomyelitis Vaccine

Vaccine Batch	No. of Monkeys Injected	Geometric Mean Antibody Titre to: Type 1	Type 2	Type 3
4	12	52	108	32
5	10	67	54	39
6	11	45	47	30
E/2769	10	47	46	24

(Continued on Page 6)

Figure 2



Antibody titres in children after immunization with poliomyelitis vaccine.

Conclusions

"It is evident from the results of the study in children that the poliomyelitis vaccine used in this country in 1956 was able to produce an antibody response to all three types of poliomyelitis virus in a high proportion of children. The results compare favourably with those reported from other countries; they are similar to those obtained in America by Salk (1956) after immunization with two doses of vaccine and decidedly better than those reported from Denmark (von Magnus et al., 1955) after intradermal vaccination.

"Although both field and laboratory tests indicate that the three different batches of vaccine were similar in antigentic activity, there is so far insufficient information to decide definitely on what response is required in the monkey test in order to ensure that a vaccine will give a substantial response in children..... Antigenicity tests in guinea-pigs (Gard et al., 1956) and cotton-rate (Tobin, 1956) are also being investigated in parallel with the field studies.

"Investigations are also to be made of the decline of antibody levels in some of the children who took part in the present study to obtain information concerning when a third booster dose should be given."

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IV. Routine Poliomyelitis Surveillance

A. FINAL SUMMARY OF 1956 UNDER-30-DAY CASES

"A Study of the Correlation between Sites of Inoculation and First Paralysis in Vaccinated Poliomyelitis Cases" was distributed on December 21, 1956, as a Supplement to PSU Report No. 102. In this report data were reviewed in some detail from reports received in the Poliomyelitis Surveillance Unit through October, 1956, on cases of poliomyelitis occurring within 30 days of an inoculation with polio vaccine produced by manufacturers other than Cutter. This study included 432 occurring during 1956. Data regarding site of last vaccine inoculation, site of first paralysis, interval between inoculation and onset, and lot numbers of vaccine were examined in comparison with the group of "inoculation" polio cases which occurred within 30 days of a Cutter vaccination.

Since October, 1956, reports on additional 1956 under-30-day cases have been received and listed in subsequent PSU Reports together with 325 cases which occurred in Chicago (PSU Report No. 108) and 56 cases with incomplete data (PSU Report No. 105). Thus, an overall total of 890 under-30-day cases vaccinated in 1956 have been reported. Of these 890, a total of 73 were paralytic cases for which site of inoculation is known and in which first paralysis occurred in either the inoculated limb, the opposite uninoculated limb, or both limbs. In Table 5, these 73 cases vaccinated in 1956 are compared with the 17 similar 1955 cases and with the Cutter cases by site of inoculation, site of first paralysis, and interval between inoculation and onset of illness. It may be noted 1) that first paralysis occurred in the inoculated but not the opposite uninoculated limb in 36 cases, whereas in only 15 cases first paralysis occurred in the opposite uninoculated but not the inoculated limb, and 2) that there was a tendency for onset of these correlated cases to group in the 4-11 day interval following inoculation.

Overall data from these 73 paralytic cases vaccinated in 1956 combined with data from the 17 cases vaccinated in 1955, (90 cases in <u>all</u>), suggests no significant alteration of the conclusions outlined in the Correlation Study Reported in the Supplement to PSU Report No. 102. These conclusions may again be summarized as follows:

1. Through 1956, a total of 90 cases of poliomyelitis was reported occurring within 30 days of an inoculation of vaccine produced by manufacturers other than Cutter in which first paralysis included the inoculated and/or opposite uninoculated limb. Of these 90, 67 had first paralysis in a single limb. Of these 67 cases, 49 or 73% were "correlated" cases in which first paralysis included the inoculated but not the opposite uninoculated limb. The remaining 18 cases had first paralysis in the opposite uninoculated limb.
2. There was some tendency for day of onset of these correlated cases to group in the 4-11 day period following inoculation.
3. For the cases in which complete data are available, there was no concentration of correlated cases in association with any lot or vaccine manufacturer.
4. No additional data are available which permit further clarification of the 13 "correlated" out of 19 cases with intervals of <u>over</u> 30 days and with first paralysis in a single limb (see Supplement to PSU Report No. 102). This similar frequency of

correlation in the over-30-day cases still precludes any definite conclusion as to whether the frequency of "correlation" in the under-30-day cases suggests "inoculation" polio or "provoked" paralysis.

5. The poliomyelitis cases included in this analysis were reported in the period April 1955 through December 1956, during which time approximately 100 million doses of vaccine were distributed in this country. If it is assumed that the excess of some 26 "correlated" under-30-day cases is due to prior inoculation and that reporting of such cases to PSU is fairly complete, then the vaccine has influenced the development of less than one paralytic case per million inoculations.

B. 1957 UNDER-30-DAY CASES

Through April 24, 1957, a total of 10 under-30-day cases with onsets in 1957 was reported, five paralytic and five non-paralytic. Of the five paralytic cases, two followed inoculation with Lilly (lot number unknown for one), one with Sharpe & Dohme vaccine, and two with unknown lots of vaccine. For two of the paralytic cases the site of inoculation is unknown. For the remaining three paralytic cases, first paralysis occurred in the inoculated limb in one case, in the opposite uninoculated limb in one case, and was bulbar in the third case.

V. Vaccine Distribution

A summary of current and cumulative shipments of vaccine (in 1,000's of cc's of net bottled vaccine) appears in Table 6. Excluding export over five millionn cc's were shipped during the first two weeks of April. The vaccine inventory on April 12 totaled over six million cc's, including vaccine unshipped by manufacturers and vaccine on hand in State and Local Health Departments, Physicians Offices and in Commercial Channels.

(This report was prepared by Drs. Lauri David Thrupp, W. J. Hall, and Miss Helen Forester, with assistance from the Statistics Section, CDC.)

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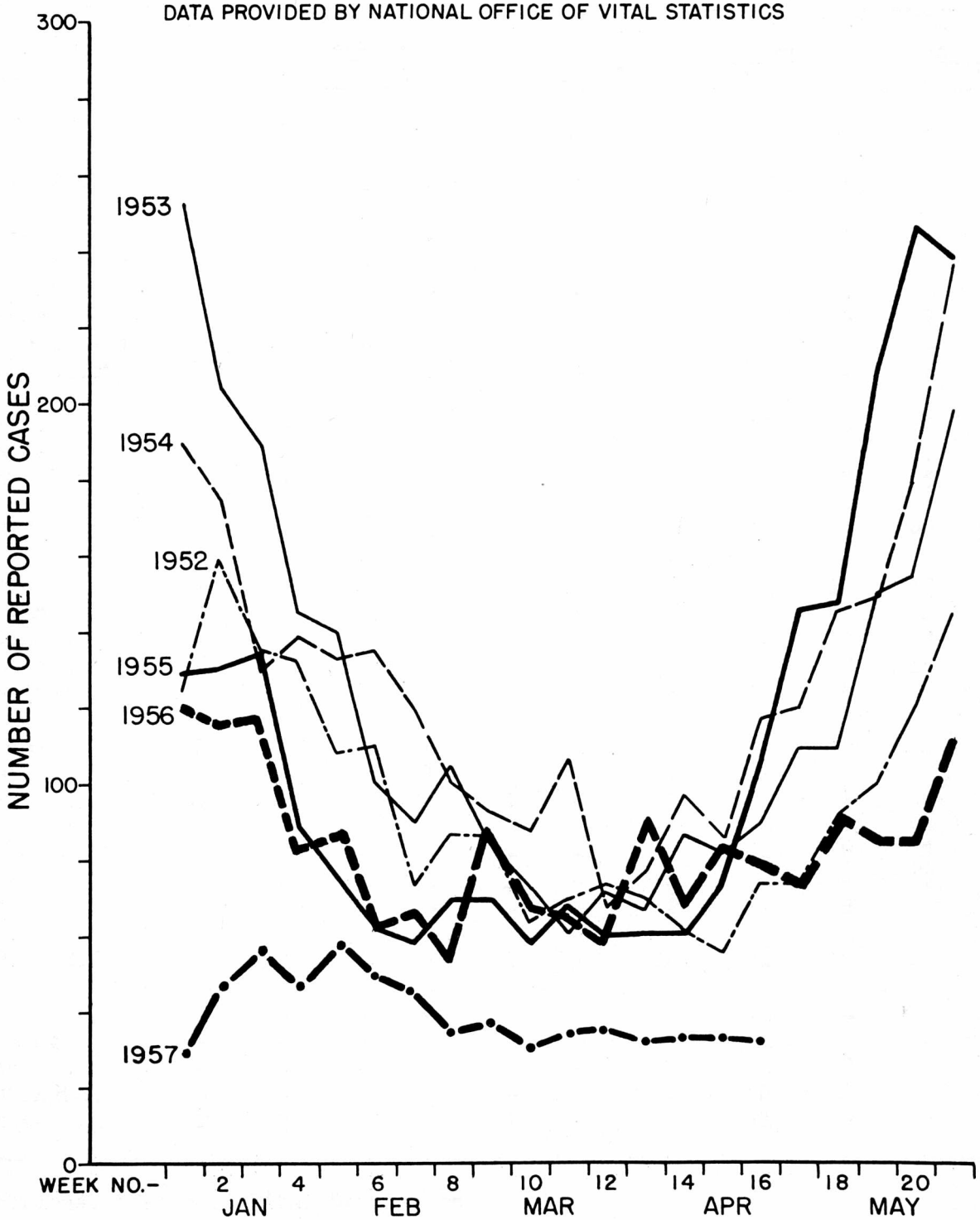
CURRENT U.S. POLIO INCIDENCE COMPARED WITH YEARS 1952-1956

DATA PROVIDED BY NATIONAL OFFICE OF VITAL STATISTICS



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ATLANTA, GA. - MAY, 1955

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Table 1

TREND OF 1957 POLIOMYELITIS INCIDENCE

State and Region	Cases Reported to NOVS* for Week Ending: 3-16	3-23	3-30	4-6	4-13	4-20	Six Week Total	Comparable Six Week Totals in: 1956	1955	1954	1953
UNITED STATES	34	35	32	33	33	32	199	443	430	556	460
NORTH EAST	2	-	1	2	1	1	7	35	55	26	41
Maine	-	-	-	-	-	-	-	2	2	-	1
New Hampshire	-	-	-	-	-	-	-	-	-	-	-
Vermont	-	-	-	-	-	-	-	2	1	-	-
Massachusetts	-	-	-	-	-	-	-	2	3	3	2
Rhode Island	-	-	-	-	-	-	-	-	-	-	-
Connecticut	-	-	-	1	-	-	1	-	-	-	3
New York	-	-	1	1	1	1	4	19	34	15	22
New Jersey	-	-	-	-	-	-	-	5	8	3	1
Pennsylvania	2	-	-	-	-	-	2	5	7	5	12
NORTH CENTRAL	6	9	5	4	10	3	37	51	80	82	100
Ohio	-	-	-	-	2	-	2	5	15	10	7
Indiana	1	3	-	-	4	1	9	1	4	4	17
Illinois	-	-	-	-	-	-	-	12	15	8	15
Michigan	2	-	-	1	2	1	6	7	7	16	9
Wisconsin	-	1	1	-	-	1	3	10	5	5	6
Minnesota	1	-	-	-	-	-	1	6	9	14	9
Iowa	-	-	-	1	-	-	1	4	5	8	6
Missouri	1	2	-	1	1	-	5	4	1	5	9
North Dakota	-	-	-	-	-	-	-	-	-	-	-
South Dakota	-	-	-	-	-	-	-	-	7	3	6
Nebraska	1	2	3	1	1	-	8	2	4	4	6
Kansas	-	1	1	-	-	-	2	-	8	5	10
NORTH WEST	2	2	1	1	1	3	10	21	15	29	27
Montana	-	-	-	-	-	-	-	1	2	10	3
Wyoming	-	-	-	-	-	-	-	1	-	-	1
Idaho	-	-	-	-	-	-	-	4	2	1	2
Washington	-	-	1	1	-	-	2	4	2	10	18
Oregon	2	2	-	-	1	3	8	11	9	8	3

* National Office of Vital Statistics

(CONTINUED ON BACK)

Table 1 (Continued)

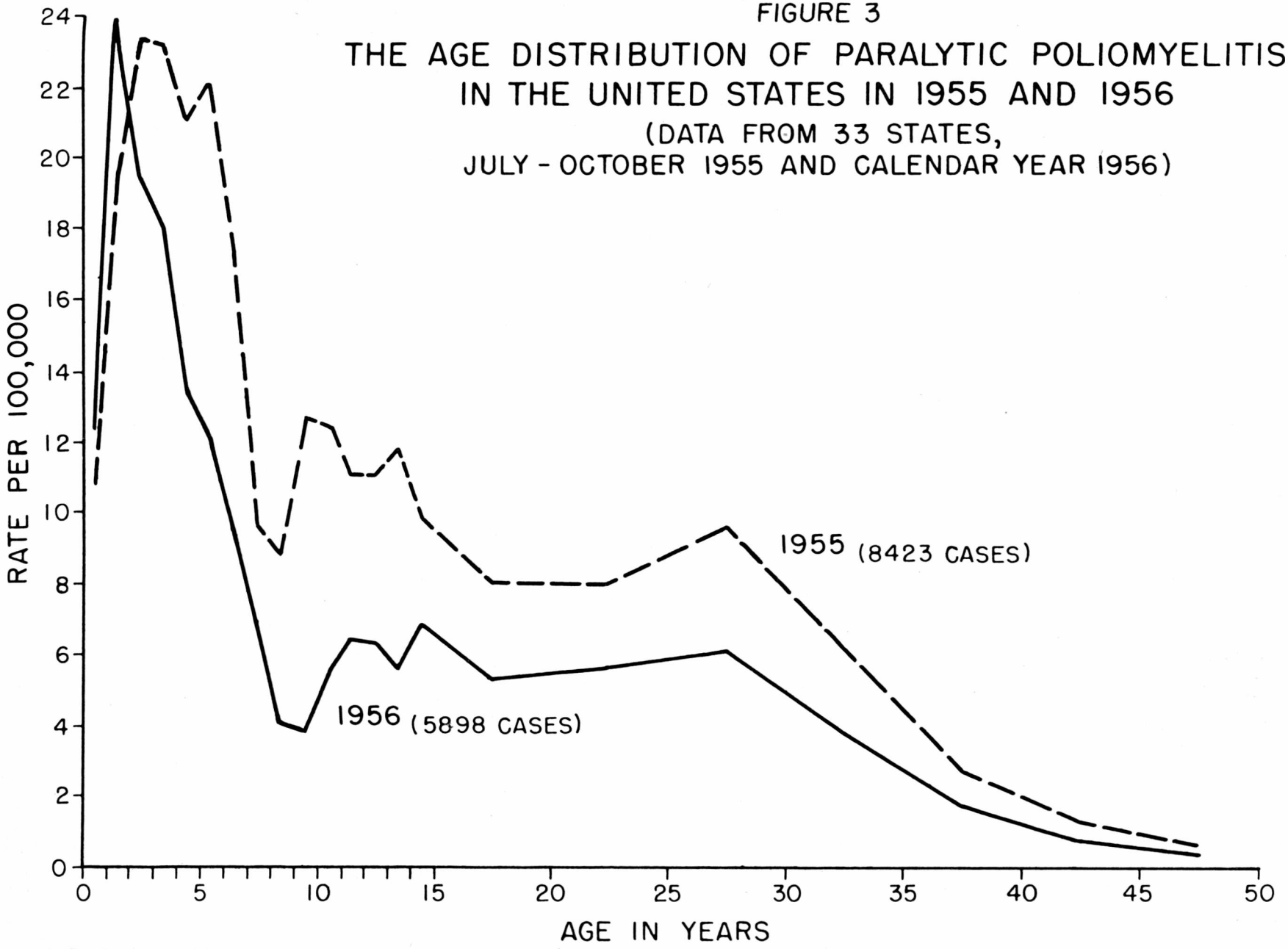
State and Region	Cases Reported to NOVS* for Week Ending: 3-16	3-23	3-30	4-6	4-13	4-20	Six Week Total	Comparable Six Week Totals in: 1956	1955	1954	1953
SOUTH EAST	10	4	6	8	7	5	40	51	89	121	67
Delaware	-	1	-	-	-	-	1	-	3	-	1
Maryland	-	-	-	-	-	-	-	-	-	1	-
D. C.	-	-	-	-	-	-	-	-	-	1	-
Virginia	1	-	3	-	1	2	7	2	3	8	4
West Virginia	-	-	-	-	-	-	-	4	3	4	4
North Carolina	1	-	-	2	-	1	4	5	3	4	3
South Carolina	-	2	-	-	-	-	2	2	5	2	3
Georgia	2	-	-	2	3	1	8	4	9	11	11
Florida	4	-	1	1	-	1	7	23	51	61	16
Kentucky	-	-	-	-	-	-	-	8	7	6	11
Tennessee	2	-	-	1	3	-	6	2	2	5	5
Alabama	-	1	2	2	-	-	5	1	3	18	9
SOUTH CENTRAL	8	10	7	9	7	8	49	130	119	150	83
Mississippi	-	1	1	2	-	1	5	5	2	9	8
Arkansas	1	-	-	-	1	1	3	2	10	16	7
Louisiana	2	2	2	1	2	1	10	22	22	18	11
Oklahoma	-	1	-	-	-	-	1	5	3	9	9
Texas	5	6	4	6	4	5	30	96	82	98	48
SOUTH WEST	6	10	12	9	7	12	56	155	72	148	142
Colorado	1	-	1	-	1	-	3	2	3	6	8
New Mexico	-	-	-	-	-	-	-	2	-	1	4
Arizona	-	3	-	-	1	2	6	10	2	7	11
Utah	1	1	-	-	-	-	2	5	7	1	6
Nevada	-	-	-	-	-	-	-	4	1	1	5
California	4	6	11	9	5	10	45	132	59	132	108
TERRITORIES											
Alaska	-	-	1	-	-	-	1	1	2	7	-
Hawaii	-	-	-	-	-	-	-	7	3	41	5
Puerto Rico	-	-	-	-	-	-	-	4	88	1	6

* National Office of Vital Statistics

FIGURE 3

THE AGE DISTRIBUTION OF PARALYTIC POLIOMYELITIS IN THE UNITED STATES IN 1955 AND 1956

(DATA FROM 33 STATES, JULY - OCTOBER 1955 AND CALENDAR YEAR 1956)



DHEW-PHS-BSS-CDC

ATLANTA, GA. MARCH, 1957

570-229

Table 2

Antibody Titres in Children after Immunization with Poliomyelitis Vaccine*

	No. of Sera	Virus Type	Number of Sera with Antibody Titre of:															Geometric Mean Titre
			< 2	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	> 8192	
All areas	196	1	1	0	11	6	23	29	30	36	30	14	4	1	2	1	8	72**
	190***	2	0	0	0	2	1	7	25	40	42	29	26	9	5	1	3	282
	196	3	1	0	2	12	15	25	38	36	37	13	8	4	3	1	1	101

Table 3

Antibody Titres in Children after Immunization with Three Different Batches of Poliomyelitis Vaccine*

Vaccine Batch	No. of Sera	Virus Type	Number of Sera with Antibody Titre Of:															Geometric Mean Titre
			< 2	2	4	8	16	32	64	128	256	512	1024	2048	4096	8192	> 8192	
	72	1	0	0	8	4	9	7	14	12	12	2	1	0	1	0	2	54**
4	71***	2	0	0	0	2	0	2	8	15	13	12	11	4	2	1	1	223
	72	3	0	0	1	6	8	10	18	10	10	3	2	1	1	1	1	81
	66	1	1	0	2	1	9	15	7	10	8	5	0	1	0	1	6	61**
5	61***	2	0	0	0	0	1	3	7	15	16	7	6	4	0	0	2	259
	66	3	1	0	0	2	5	11	11	15	12	4	1	3	1	0	0	101
	53	1	0	0	0	1	5	7	8	13	9	7	2	0	1	0	0	117
6	53	2	0	0	0	0	0	2	9	19	12	10	8	1	2	0	0	270
	53	3	0	0	1	2	2	4	9	10	14	5	5	0	1	0	0	142

*, **, ***, -- SEE TABLE 4, next page.

Table 4

Antibody Titres in Children Under 5 Years of Age and 5 Years and Over After Immunization with Poliomyelitis Vaccine*

Age Group	Vaccine Batch	No. of Children		Geometric Mean Antibody Titre to Type 1	Type 2	Type 3
Under 5 years	4	38	92	73**	291	91
	5	36				
	6	18				
5 years and over	4	35	104	71**	274	110
	5	34				
	6	35				

* Reproduced in part from "Antigenic Activity of British Poliomyelitis Vaccine", A Report to the Committee on Laboratory Investigations of Poliomyelitis of the Medical Research Council, British Medical Journal, February 16, 1957, Vol. i, pp. 366-368.

** Nine Manchester sera with high type 1 titres were excluded in calculating the geometric mean.

***In the case of six subjects there was insuffient serum to titrate type 2 antibody.

Table 5

Paralytic Poliomyelitis Cases with Site of Inoculation Known and With First Paralysis in the Inoculated or Uninoculated Limb by Interval from Inoculation to First Symptoms

Site of First Paralysis*	Interval in Days from Last Inoculation to First Symptoms					
	0-3	4-7	8-11	12-15	16-30	Total Under 30 Days
CASES ASSOCIATED WITH CUTTER VACCINE						
Inoculated Limb (and Other Sites)	1	22	9	1	-	33
Uninoculated Limb (and Other Sites)	-	1	1	-	-	2
Both Limbs (and Other Sites)	-	1	-	1	-	2
Total	1	24	10	2	-	37
1955 CASES ASSOCIATED WITH OTHER VACCINES						
Inoculated Limb (and Other Sites)	3	4	5	1	-	13
Opposite Limb (and Other Sites)	-	1	-	1	1	3
Both Limbs (and Other Sites)	-	-	-	-	1	1
Total	3	5	5	2	2	17
TOTAL 1956 CASES ASSOCIATED WITH ALL VACCINES						
Inoculated Limb (and Other Sites)	7	10	9	5	5	36
Uninoculated Limb (and Other Sites)	4	5	1	3	2	15
Both Limbs (and Other Sites)	7	3	1	2	9	22*
Total	18	18	11	10	16	73

* Including one case having two inoculations within 30 days. There was no involvement of the limb of the first inoculation.

Table 6

Poliomyelitis Vaccine Shipment Summary

(Reports from Polio Vaccine Activity, BSS, USPHS, through 4-19-57)

Vaccine Shipments (in 1000's of cc's)

Period	NFIP**** Sponsored Clinics	Public Agencies	Commercial Channels	Export *****	Total
1955	13,541	7,893	6,233***	-	27,667
1956					
First Ten Months	193	42,649	21,913	4,159	68,914
November	1	1,364	1,260	418	3,043
December	-	1,575	1,611	1,900	5,086
1956 Totals	194	45,588	24,784	6,477	77,043
1957					
January	2	4,705	4,243	2,111	11,061
February	3	9,934	6,100	544	16,581
March	3	5,297	3,140	1,456	9,896
April 1-12	-	3,824	1,345	536	5,705
Cumulative Totals	13,743	77,242	45,844	11,125	147,954

Vaccine Cleared for distribution by the National Institutes of Health but not shipped by 4-12-57; all of this vaccine has been committed.	2,593
Vaccine in State and Local Health Departments	3,176
Vaccine In Commercial Channels and Physicians Offices	560

* Totals do not add because figures are rounded to nearest 1000 cc's.

** Less than 1000 cc's.

*** Includes 562,740 cc's shipped through commercial channels prior to inauguration of the Interstate Distribution Program in August, 1955.

**** Vaccine purchased by the National Foundation for Infantile Paralysis and distributed for inoculation of first and second grade children in locally organized school clinics.

***** Regulated under Department of Commerce Export Policy.