REPORT NO. 287
JUNE 1, 1965

COMMUNICABLE DISEASE CENTER

POLIOMYELITIS

SURVEILLANCE

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U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE

PREFACE

Summarized in this report is information received from State Health Departments, university investigators, virology laboratories and other pertinent sources, domestic and foreign. Much of the information is preliminary. It is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

Contributions to the Surveillance Report are most welcome. Please address to:
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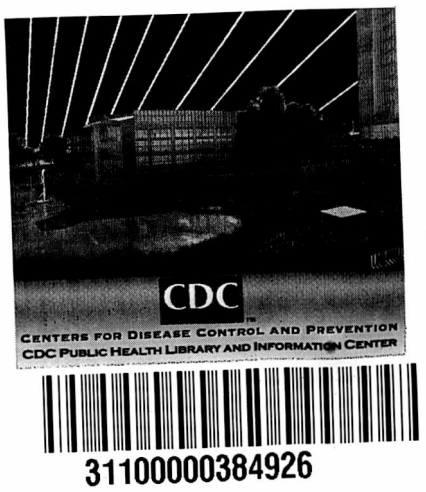

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SUMMARY

Eleven cases of poliomyelitis, 8 paralytic, have been reported to the Communicable Disease Center through the 20th week of 1965. This represents one-third the total number of cases reported during the corresponding period of 1964, the previous record low year. The only areas where more than one case have been reported are Morrill County, Nebraska and Pinal County, Arizona. Summaries of the Nebraska and Arizona outbreaks are presented in Section II.

The final report of 1964 paralytic cases reported to the PSU is presented in Section III. Sixty-day follow-up reports were received on 100 percent of the preliminary PSU forms. For 1964, the "Best Available Paralytic Case Count" was 91 paralytic cases. This total is less than one-third that recorded in 1963, previously the record low year. Of the 91 paralytic cases, only 12.5 percent were considered adequately immunized with inactivated polio vaccine (4 or more doses) and only 8.8 percent were fully immunized with oral poliomyelitis vaccine. Nineteen of the 91 paralytic cases occurred within 30 days following administration of oral poliomyelitis vaccine. There was no seasonal rise in incidence during the summer months and no epidemics were noted. There were 51 isolations of poliovirus from the 91 paralytic cases in 1964. Type III accounted for 47 percent of the total and Type I accounted for 41 percent.

An analysis of the poliomyelitis vaccination status in the United States as determined by the national immunization survey conducted annually since 1957 is presented in Section IV. While the percentage of persons receiving 3 or more doses of inactivated poliomyelitis vaccine has remained comparable to previous years, the increased utilization of oral poliomyelitis vaccine since 1962 has accounted for a general increase in the percentage of the population considered adequately immunized.

A review of poliomyelitis in Jamaica, including the epidemic of 1964-65, is presented in Section V.

The supplement to this report contains the results of the 1964 national immunization survey conducted by the Bureau of the Census in cooperation with the Communicable Disease Center. These results include the data regarding immunization status of the population against poliomyelitis, diphtheria-pertussis-tetanus, smallpox and influenza.

I. CURRENT POLIOMYELITIS MORBIDITY TRENDS

Through the 20th week of 1965 a total of 11 cases of poliomyelitis, 8 of which are paralytic, have been reported. This total compares to the 26 cases reported through the 20th week of 1964 and is 10 percent of the median number of cases reported for a similar period during the years 1960-64.

If present trends continue and no large outbreaks occur, 1965 may again be a record low year. Thus far, no cases of poliomyelitis have been reported to have occurred within 30 days of either oral or inactivated vaccine.

The only 2 counties which have reported more than a single case in 1965 are Morrill County, Nebraska where 2 paralytic cases have been recorded and Pinal County, Arizona where 4 cases, of which 2 were paralytic, (one with December 1964 onset) were recorded over a 4 month period. Special reports on the Nebraska and Arizona cases are presented in Section II. In addition, during the first 20 weeks of 1965 3 cases have been reported from 3 different counties in Texas and single cases have been reported from Minnesota, New Mexico, and California.

II. STATE REPORTS

Arizona

During a 4 month period beginning in December 1964, 4 cases of poliomyelitis including 2 paralytic cases were reported from Pinal County (population 62,673). A line listing of the cases appears below:

Case	Age	Race	Sex	Onset	Para. Status	Vacc. Status No. Doses IPV	Vacc. Status No. Doses OPV	Virus Isol.
1	2	W	F	12/27/64	P	0	0	No spec.
2	1 5/12	W	F	2/19/65	P	0	0	Type I
3	2 1/2	W	F	3/29/65	NP	0	0	Neg.
4	38	W	F	4/1/65	NP	0	3	Type I

The initial case, a 2 year old girl, became ill on December 27, 1964, with fever, anorexia and irritability. She subsequently had paralytic involvement with residual weakness of the right leg. The subsequent cases developed illness between February 19, 1965 and April 1, 1965. One of the 2 non-paralytic cases was in a 38 year old female who was the only one who had received any vaccine. She had received a full course of oral poliomyelitis vaccine in 1962. The other 3 cases were all unimmunized preschool age children. All cases occurred in white females who resided in lower socioeconomic areas. The cases were not geographically clustered within Pinal County.

In 1962 a county wide mass immunization program utilizing monovalent oral poliomyelitis vaccines had been conducted. In addition, inactivated poliomyelitis vaccine was available to the population on a continuing basis through regular poliomyelitis immunization clinics conducted by the County Health Department. A health index survey was conducted by the Communicable Disease Center in the fall of 1964 in Casa Grande (population 8,311), the largest community in Pinal County. Among children from upper socioeconomic areas, 76.3 percent had received either 3 or more doses of inactivated poliomyelitis vaccine or 3 doses of oral poliomyelitis vaccine, or both. Only 22 percent of children in the lower socioeconomic area had achieved the same level of immunization. It was primarily among this group of unimmunized children from the lower socioeconomic areas that the current outbreak occurred.

During the first week in April, a county wide vaccination program utilizing Type I oral poliomyelitis vaccine from the CDC epidemic reserve was administered by the State and County Health Departments. Since the vaccination program, no additional cases have been reported.

Nebraska

Two cases of paralytic poliomyelitis including one death have occurred in Morrill County, Nebraska. A line listing of the cases appears on the following page:

Case	Location	Age	Race	Sex	Onset	Para. Status	Vacc. Status No. Doses IPV	Vacc. Status No. Doses OPV	Virus Isol.
1	Morrill Co.	11	Sp. Am.	F	5/9/65	Died 5/13/65	1	0	*
2	Morrill Co.	11 mo.	Sp. Am.	M	5/12/65	P	0	0	Type I

* Poliovirus Type I has been recovered from the stools of 7 of 8 siblings studied.

The first case, an 11 year old girl, became ill on May 9, 1965, 5 days after returning from a visit to El Centro, California. Initial symptoms of fever and nausea were followed by stiff neck and flaccid paralysis of both lower extremities which progressed rapidly to include the upper extremities and respiratory musculature. The patient died on May 13. The second case is an 11 month old male cousin of the first case and had onset of illness on May 12. This patient has weakness of the left arm and left facial nerve. Neither case had been adequately immunized against poliomyelitis.

Stool specimens from 7 of 8 siblings of the first case have yielded Type I poliovirus at the Virology Laboratory, Department of Microbiology, University of Nebraska, and confirmed as Type I at the CDC Kansas City Field Station. Laboratory studies on specimens from the second case are in process.

A mass vaccination program utilizing Type I oral poliomyelitis vaccine from the CDC epidemic reserve, was conducted by the Nebraska Department of Health, in Morrill County (population 7,000) and adjacent Scotts Bluff County (population 34,000) on June 6.

(Reported by Dr. E. A. Rogers, Director of Health, Nebraska Department of Health.)

III. 1964 POLIOMYELITIS REPORTED TO PSU - FINAL REPORT

During 1964, the Poliomyelitis Surveillance Unit received individual surveillance case records on 115 cases of poliomyelitis. Follow-up reports, 60 days or longer after onset of illness, were received on all 115 of these cases. The diligent and persistent efforts of State and local health officials, particularly the State Epidemiologists, have made this completeness of follow-up possible.

Individual surveillance case records, consisting of a preliminary and 60-day follow-up report have been submitted to the Poliomyelitis Surveillance Unit since 1958. Follow-up reports have been received on over 90 percent of the preliminary forms for the past 5 years as shown in the table below:

Table I

Year	No. States Participating	Total Poliomyelitis Cases Reported To MMWR	Poliomyelitis Surveillance Unit Case Records: Preliminary	60-Day Follow-ups	% 60-Day Follow-ups
1958	49	5,787	6,125	4,919	80.3
1959	50	8,425	8,635	7,523	87.1
1960	51	3,190	3,304	3,095	93.7
1961	51	1,312	1,356	1,284	94.7
1962	51	910	914	898	98.2
1963	51	449	437	425	97.3
1964	51	121 (Preliminary)	115	115	100.0

Since 1958, the best continuing index of paralytic disease due to poliomyelitis has been those cases with residual paralysis at 60 days and cases reported initially as paralytic but with no 60-day follow-up report. The total thus obtained represents the "Best Available Paralytic Poliomyelitis Count." The 103 cases initially reported to the PSU as paralytic poliomyelitis in 1964 are shown in Table II by final classification. The "Best Available Paralytic Poliomyelitis Count" for 1964 includes the 91 cases with residual paralysis.

Table II

Final Classification of 103 Cases Initially Reported as Paralytic Poliomyelitis, United States, 1964

Final Classification	Paralytic
Paralytic Polio with residual paralysis	91
Paralytic Polio - no residual paralysis	11
Paralytic Disease due to other agent - unspecified	1
TOTAL	103

In 1964, the number of reported cases of paralytic poliomyelitis in the United States reached a record low level. The final case count of 91 paralytic cases for 1964 is less than one-third the total reported in 1963, the previous record low year. No county reported more than 2 cases during any month of 1964. Cases occurring within 30 days of receiving oral poliomyelitis vaccine accounted for 19 of the total of 91 paralytic cases. A line listing of these cases appears on page 8.

Unlike previous years when an increased incidence occurred during the summer and fall months, the seasonal distribution of the cases was relatively uniform. (See Figure 1) All of the 19 cases occurring within 30 days of oral poliomyelitis vaccine administration became ill during the first 6 months of the year. This coincides with the monthly distribution of monovalent oral poliomyelitis vaccine distribution in the United States as shown in Figure 2.

The 91 paralytic cases are shown by age and inactivated poliomyelitis vaccine status in Table III. There were 38 cases (42 percent) in the 0-4 year age group and 23 (25 percent) in the 5-14 year age group. In the 15 year and older age group there were 30 cases of which 15 occurred within 30 days after the administration of oral poliomyelitis vaccine. As in previous years, the majority of the 91 cases had no previous immunization with inactivated poliomyelitis vaccine. Two-thirds of the total had never received any inactivated poliomyelitis vaccine and only 12.5 percent had received 4 or more doses of inactivated poliomyelitis vaccine.

The 91 paralytic cases are shown by age and oral poliomyelitis vaccine status in Table IV. Excluding those cases which occurred within 30 days following administration of oral poliomyelitis vaccine, a total of 8 cases occurred among individuals who had previously received a full series of oral poliomyelitis vaccine (3 doses of monovalent oral poliomyelitis vaccine or 2 doses of trivalent oral poliomyelitis vaccine). A line listing of these cases appears on page 9. The 8 cases were all less than 15 years of age and 6 had received 3 or more doses of inactivated poliomyelitis

Table III

Paralytic Poliomyelitis by Age Group
And Inactivated Vaccination History
United States, 1964

Age Group	Doses of Inactivated Vaccine						Total Cases	Percent	Deaths
	0V	1V	2V	3V	4+V	Unk.			
0-4	28	1	3	4	1	1	38	41.8	3
5-9	7	1	1	1	5	1	16	17.6	1
10-14	2	0	0	2	3	0	7	7.7	1
15-19	6	0	0	1	1	0	8	8.8	0
20-29	2	1	1	0	0	0	4	4.4	0
30-39	5	0	2	0	0	0	7	7.7	0
40+	8	0	0	1	1	1	11	12.1	2
TOTAL	58	3	7	9	11	3	91	100.0	7
Percent Doses	65.9	3.4	8.0	10.2	12.5	-	100.0		

Table IV

Paralytic Poliomyelitis by Age Group
And Oral Vaccination Status
United States, 1964*

Age Group	Doses of Oral Vaccine						Total Cases
	Unvaccinated	Monovalent			Trivalent		
		1 type only	2 types	3 types	1 dose	2 doses	
0-4	29	4 (1)	1 (1)	2	2 (1)	0	38
5-9	9	1	2 (1)	2	2	0	16
10-14	3	0	0	4	0	0	7
15-19	4	3 (3)	0	1 (1)	0	0	8
20-29	3	1 (1)	0	0	0	0	4
30-39	4	0	2 (2)	0	1 (1)	0	7
40+	4	1 (1)	1 (1)	2 (2)	3 (3)	0	11
TOTAL	56	10 (6)	6 (5)	11 (3)	8 (5)	0	91 (19)

* <30 day cases are shown in parenthesis.

vaccine. Several cases showed poor antibody response to the poliomyelitis antigens as measured by complement fixation tests. From the 6 cases in which virus isolation was attempted, 2 poliovirus isolates, both Type I, were recovered.

Because of the small number of total cases, special efforts were made to obtain specimens for virus isolation and serologic study from all cases. Isolates were obtained from 51 of 77 fecal specimens examined for virus isolation. Of these, 24 (47 percent) were Type III, 21 (41 percent) Type I, and 6 (12 percent) Type II (see Table V). This contrasts with the distribution of isolates obtained during the period 1958 to 1963 during which Type I isolates accounted for 60 to 89 percent of the total each year and Type III varied from 10 to 38 percent. The proportional increase in Type III isolates reflects in part a relative increase in cases associated with the administration of Type III vaccine and an absence of the usual Type I epidemics. The 1964 poliovirus isolates are shown by State in Table VI.

Table V

Poliovirus Isolations
From Paralytic Cases, United States, 1958-64

Year	Numbers of Cases		Percent of Cases Studied	Viruses Identified				Percent of Total Specified		
	Residual Paralysis	Specimens Submitted*		Type I	II	III	Unk.	Type I	II	III
1958	3301	1479	44.8	898	29	194	10	80.1	2.6	17.3
1959	5472	2775	50.7	1881	10	228	23	88.8	0.5	10.8
1960	2218	1072	48.3	603	1	219	2	73.3	0.1	26.6
1961	829	481	58.0	231	6	145	0	60.5	1.6	37.9
1962	691	472	68.3	300	8	100	0	73.5	2.0	24.5
1963	336	242	72.0	160	6	31	0	81.2	3.0	15.7
1964	91	77	84.6	21	6	24	0	41.2	11.8	47.0

*Includes all paralytic cases on which one or more fecal specimens were examined for virus isolation. State and local health department laboratories and laboratories in academic centers reported these results through State epidemiologists to the Poliomyelitis Surveillance Unit.

Table VI

Poliovirus Isolations
by State - 1964

State	Total Para. Cases	Total Cases Lab Studied	Poliovirus Isolations I	II	III
Alabama	3	3	-	-	-
Arizona	2	0	-	-	-
Arkansas	1	0	-	-	-
California	3	2	-	-	2
Colorado	1	0	-	-	-
Connecticut	1	1	1	-	-
Florida	9	9	8	-	-
Georgia	3	2	-	-	-
Idaho	1	1	1	-	-
Illinois	5	3	-	-	2
Indiana	5	4	2	-	-
Iowa	1	0	-	-	-
Kansas	1	1	-	-	1
Louisiana	1	1	-	-	1
Maine	1	1	-	-	-
Maryland	1	1	1	-	-
Michigan	3	3	1	1	1
Minnesota	2	2	-	-	-
Mississippi	1	1	-	1	-
Missouri	2	2	-	1	-
Nebraska	1	1	-	-	-
New Hampshire	1	1	-	-	-
New Jersey	2	2	-	-	-
New York	6	6	1	1	3
North Carolina	6	5	2	1	1
North Dakota	1	0	-	-	-
Ohio	2	2	-	-	2
Oklahoma	2	2	-	-	2
Oregon	1	1	-	-	-
South Carolina	1	1	-	-	-
Tennessee	2	2	1	-	1
Texas	11	11	2	-	4
Virginia	3	3	-	-	1
West Virginia	1	1	-	-	-
Wisconsin	2	1	-	1	-
Wyoming	2	1	1	-	-
TOTAL	91	77	21	6	24

States with no paralytic cases are not shown

1964 Poliomyelitis with Residual Paralysis Occurring Within 30 Days after OPV

State	County	Age	Sex	Onset	Doses IPV	Interval (Days) OPV to Onset I	II	III	Tri.	Virus Isol.	60-Day Status**
Ala.	Escambia	18	M	1-26	0	-	-	21	-	III	3
Ala.	Escambia	28	M	3-28	0	-	-	20	-	III	2
*Colo.	Prowers	15	M	4-11	0	7mos.	6mos.	14	-	-	3
*Fla.	Dade	4mos.	F	4-29	0	-	-	-	13	I	4
Ga.	Bartow	15	M	3-5	5	25	-	-	-	Neg.	3
Ill.	Adams	3mos.	M	1-28	Unk.	-	-	11	-	III	3
Md.	Pr. Georges	15	M	5-9	0	20	-	-	-	I	4
Maine	Penobscot	41	M	3-14	Unk.	2yrs.	2yrs.	5	-	-	3
N.J.	Mercer	35	M	2-1	0	48	-	13	-	Neg.	3
N.J.	Morris	41	F	3-23	4	63	-	22	-	Neg.	2
N.Y.	Nassau	37	M	4-27	0	-	-	-	8	II	2
N.C.	Alamance	43	M	3-16	0	-	-	-	15	I	5
N.C.	Forsyth	43	M	3-9	0	-	-	-	8	II	4
N.C.	Mecklenburg	48	M	4-7	0	-	-	-	16	III	3
N.C.	Lenoir	49	M	6-14	0	84	28	56	-	-	4
Ohio	Lucas	8mos.	M	4-6	0	38	-	13	-	III	3
*Tenn.	Henderson	5	M	3-20	1	40	-	5	-	I	2
*Va.	Fairfax	59	F	5-6	0	11	-	-	-	Neg.	3
*Wis.	Dane	33	M	3-12	Unk.	60	-	18	-	-	2

* Cases reported after Surgeon General's Committee meeting of July 17-18, 1964.

** Clinical Status at 60 Days:
- 2 - Minor involvement
- 3 - Significant disability
- 4 - Severely disabled
- 5 - Death

Paralytic Poliomyelitis Occurring in Persons Receiving Full Series of OPV - 1964 (Excluding <30 Day Cases)

State	Age	Sex	Onset (1964)	IPV Status	OPV (month & yr. received) I	II	III	Tri-valent	Virus Isol.	Serology* (CF-reciprocal) Date	I	II	III	Residual Paralysis***
Arkansas	10	F	12-15	4	1-63	4-63	3-63	-	-	-	-	-	-	3
Florida	5	F	6-15	2	1-64	4-64	2-64	-	I	6-19	1:4	-	-	
										7-21	1:64	-	-	2
Georgia	3	M	9-20	3	2-64	4-64	3-64	-	Neg.	9-24	16	<8	<8	3
										10-2	<8	<8	<8	
Illinois	9	M	5-14	4	Date Unk.	Date Unk.	Date Unk.	-	-	-	-	-	-	
Nebraska	1	F	9-30	Unk.	5-63	4-63	6-63	-	Neg.	10-2	Neg.	Neg.	Neg.	3
										10-13	Neg.	Neg.	Neg.	
New York	10	M	7-19	4	4-63	5-63	5-63	-	I	7-22	1:8**	-	-	4
										8-27	1:64	-	-	
Oregon	14	F	4-14	3	9-62	9-62	7-62	-	Neg.	-	-	-	-	5
Texas	14	M	9-2	3	1963	1963	1963	-	Neg.	9-4	Neg.	Neg.	Neg.	3
										10-1	Neg.	Neg.	Neg.	

* - : No result received
Neg.: Lab report did not state titer; only that serology test was negative.

** Neutralization test

*** 2 - Minor involvement
3 - Significant disability
4 - Severely disabled
5 - Death

Figure 1

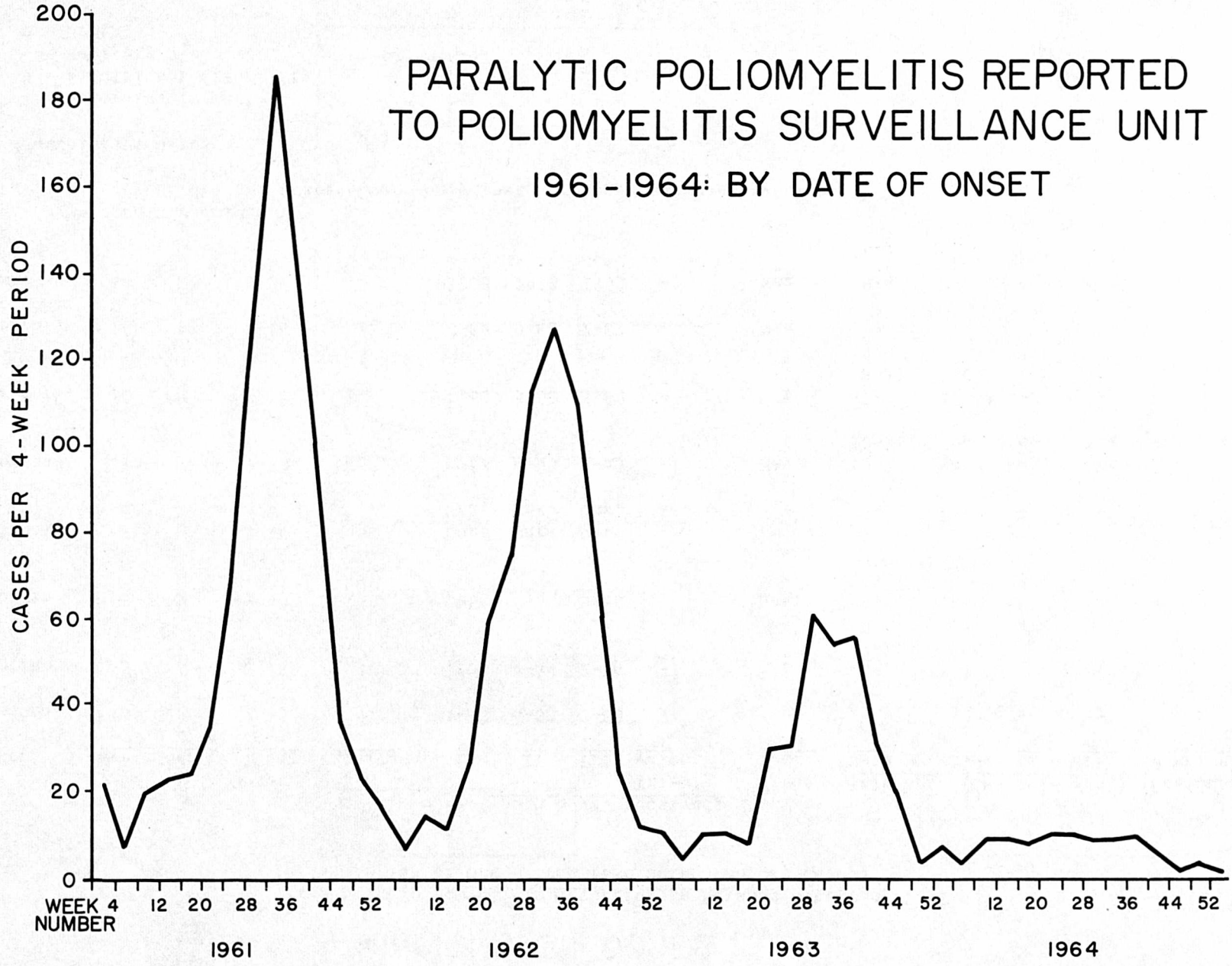
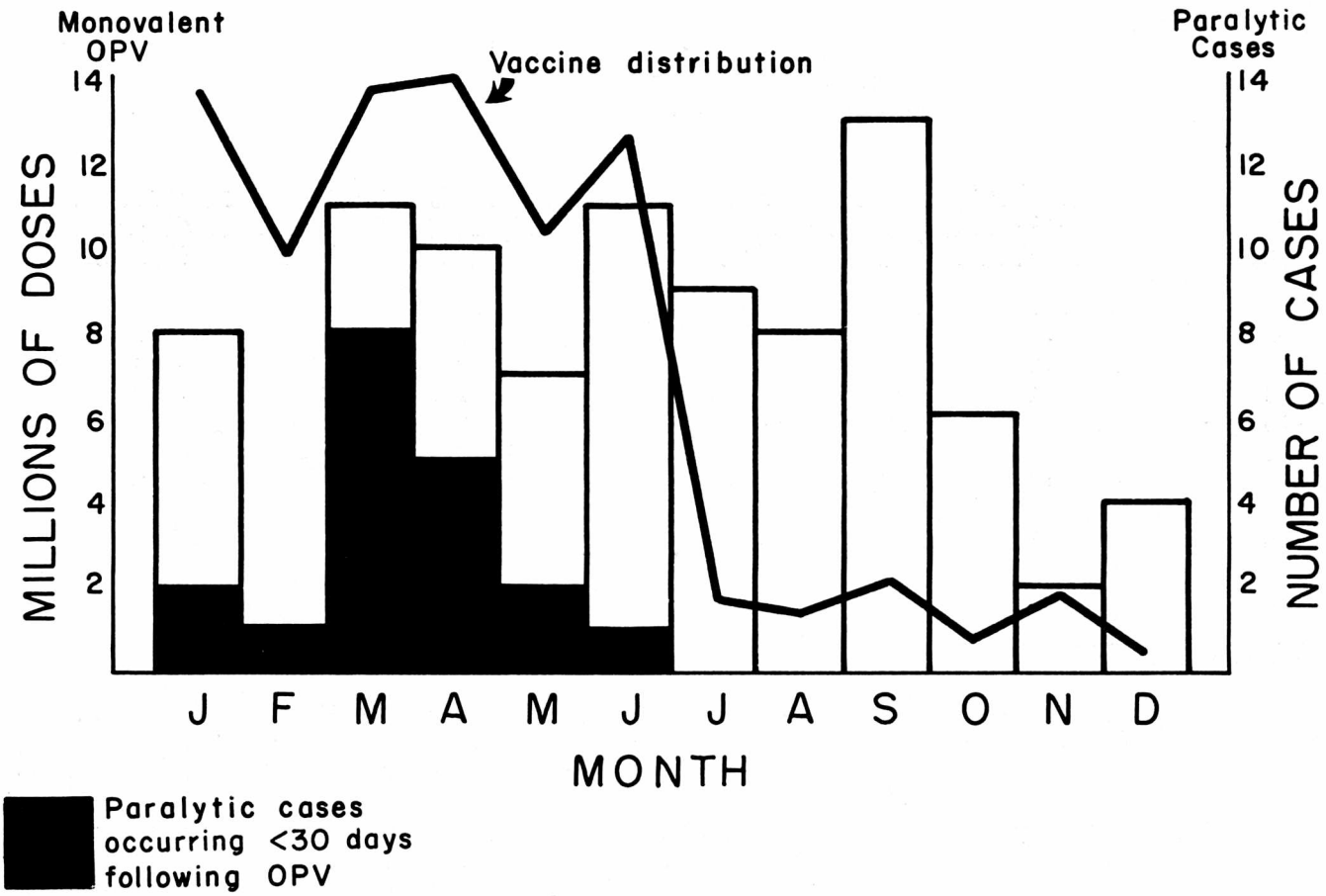

PARALYTIC POLIOMYELITIS REPORTED
TO POLIOMYELITIS SURVEILLANCE UNIT
1961-1964: BY DATE OF ONSET
CASES PER 4-WEEK PERIOD
200
180
160
140
120
100
80
60
40
20
0
WEEK NUMBER
4 12 20 28 36 44 52 12 20 28 36 44 52 12 20 28 36 44 52 12 20 28 36 44 52
1961
1962
1963
1964

Figure 2

MONTHLY DISTRIBUTION OF MONOVALENT ORAL POLIOMYELITIS VACCINE AND PARALYTIC POLIOMYELITIS BY MONTH OF ONSET 1964



IV. 1964 NATIONAL IMMUNIZATION SURVEY - POLIOMYELITIS VACCINES

As in past years, the results of the annual United States immunization survey are presented as a supplement to the Poliomyelitis Surveillance Report. The immunization status of the population has been studied annually since 1957 by means of a supplemental schedule included each September in the Current Population Survey conducted by the U.S. Bureau of the Census in cooperation with the Communicable Disease Center.* During the years, 1957-1961, information was obtained on inactivated poliomyelitis vaccine (IPV) only. In 1962, coverage was extended to include oral poliomyelitis vaccine (OPV) and diphtheria-pertussis-tetanus immunization. In 1963 and 1964, questions concerning influenza and smallpox vaccines were added to the survey questionnaire. The 1964 survey findings are presented in the supplement to this report.

The poliomyelitis vaccination status of the U.S. population, as indicated in the supplement tables, reflects the widespread use of oral poliomyelitis vaccine since its licensure in the latter part of 1961. The following table shows the increase in the oral poliomyelitis vaccination level in all age groups between the years 1962, 1963 and 1964. During this same period of time, the proportion of persons reporting 3 or more doses of inactivated poliomyelitis vaccine has remained essentially stable with some decrease in the youngest age groups.

National Immunization Survey Findings
September 1962, 1963, and 1964
Poliomyelitis Vaccination Status

Age Group	Oral Poliovaccine: Percent Reporting 3 Doses			Inactivated Poliovaccine: Percent Reporting 3 or More Doses		
	1962	1963	1964	1962	1963	1964
1-4	5.7	28.7	46.8	72.6	67.7	60.9
5-9	5.7	33.6	56.4	85.8	84.3	80.9
10-14	5.2	34.0	57.7	86.2	85.2	82.6
15-19	4.1	28.2	49.8	79.2	78.8	77.7
20-29	3.7	21.4	38.4	55.0	55.4	54.9
30-39	4.3	23.1	41.9	44.7	43.8	43.5
40-49	3.8	19.8	37.4	23.9	26.3	28.0
1-49	4.6	26.4	46.2	61.3	60.7	59.3

* Years Covered

1955-57: Sirken, M.G. and Brenner, B.: Population characteristics and participation in the poliomyelitis vaccination program. PHS Publication No. 723 (Public Health Monograph No. 61). U.S. Government Printing Office, Washington, D.C., 1960.

1957-1961:1) Sirken, M.G.: National participation trends, 1955-61, in the poliomyelitis vaccination program. Public Health Rep. 77:661-670, August 1962.

2) Morris, L.: Further analysis of national participation in the inactivated poliomyelitis program, 1955-61. Public Health Rep. 79:469-480, June 1964.

1962: Supplement to Poliomyelitis Surveillance Report No. 276, March 29, 1963.

1963: Supplement to Poliomyelitis Surveillance Report No. 284, April 20, 1964.

1964: Supplement to Poliomyelitis Surveillance Report No. 287, June 1, 1965.

With two agents available, an estimate of the population with immunization against poliomyelitis would include not only those receiving a full series of inactivated vaccine but also those who did not receive a full series of inactivated vaccine but did receive 3 doses of oral vaccine. This type of cross-classification is presented in the 1964 survey findings and appears for age groups 1-4 and 5-9 in Section D, Table 16 of the supplement.

As shown in Section A of the supplement, 32.2 percent of the population from 1 through 4 years of age have received 4 or more doses of inactivated poliomyelitis vaccine (IPV) and 60.9 percent have received 3 or more doses. The corresponding percentages for the 5 to 9 age group are 57.9 percent and 80.9 percent. Utilizing the findings of the 1964 survey, the proportion of children in these age groups protected by either inactivated or oral vaccine is shown in the following table:

Total Proportion Immunized
With Full Series of IPV or Full Series of OPV
Age Groups 1-4 and 5-9, Sept., 1964

Age Group	Percent Reporting: 4 or More Doses of IPV	Percent Reporting: 3 Doses of OPV and 4 Doses of IPV	Total Proportion Immunized
1-4 years	32.2	30.7	62.9
5-9 years	57.9	23.0	80.9

Age Group	Percent Reporting: 3 or More Doses of IPV	Percent Reporting: 3 Doses of OPV and 3 Doses of IPV	Total Proportion Immunized
1-4 years	60.9	17.8	78.7
5-9 years	80.9	9.9	90.8

V. FOREIGN REPORT

POLIOMYELITIS IN JAMAICA

This report was prepared by Dr. Donald Luck, Senior Medical Officer, Ministry of Health, Jamaica, and was presented by Dr. Luck at the Tenth Scientific Session of the Standing Advisory Committee for Medical Research for the British Caribbean, March 31, 1965, at Barbados, B.W.I.

Introduction

Poliomyelitis first appeared in epidemic form in Jamaica in 1954. Prior to that, the virus had been present on the Island, but clinical disease had been rare. The characteristics of succeeding epidemics have been somewhat modified by the effects of immunization against the disease. It is quite probable that prior to 1954 the bulk of the population had been naturally infected with the virus at an early age, thus conferring widespread natural immunity upon the population. After the Second World War, increasing standards of sanitation and hygiene undoubtedly protected many of the people on the Island from having contact with the virus at an early age, and thus a group of susceptibles was built up in the older age groups. Since the widespread use of polio vaccines, much of the population has become artificially immunized against the disease, and presumably natural spread of the virus has greatly decreased. It is interesting

that the most recent epidemic of polio in Jamaica was almost completely limited to children born since the last mass immunization campaign, thus indicating that newly born children may no longer acquire natural immunity by near-universal contact with the virus.

History of Poliomyelitis in Jamaica

Prior to 1954, notifications of polio in Jamaica were rare. It is important to note, however, that polio was apparently always present. Notifications had ranged between 0 and 13 each year since 1929, and with only one year (1950) having more than 10 cases and only one year (1943) having none. There was no pattern to the notifications, and no tendency to increase up until 1954. Additional evidence that the virus was active and indeed quite prevalent in Jamaica has been obtained by the examination of sera obtained for various reasons before 1954. Examination of such sera has revealed a high percentage of persons with antibodies to all 3 types of poliovirus. Thus, even though clinical polio was rare in Jamaica prior to 1954, there is evidence of widespread infection by polioviruses.

During the decade prior to 1954, there was a dramatic rise in the living standards in Jamaica. Safe water, sanitary conveniences, medical care, and adequate infant care were rare during the 1930's and early 1940's, but became available to increasingly large percentages of the population during the post-war period. As can be seen in Figure I, the Infant Mortality Rate declined steadily during this period, and the Per Capita Income rose concomitantly. The indices are thought to mirror the types of changes which lead to better hygiene and presumably decreased fecal-oral spread of intestinal viruses such as polio.

In 1954 a severe epidemic of 759 reported cases of poliomyelitis with 94 deaths occurred throughout the Island. Serological evidence on a small number of the cases indicated that Type I polio was the causative agent. The outbreak started in June, reached a peak in September, and had nearly ended by the first of January, 1955. The first cases were reported from Kingston (where sanitation and living conditions had long been superior to those in the rural parishes); however, cases subsequently occurred through the rest of the Island. The attack rates showed somewhat higher rates of disease in Kingston than in the rural parishes, but it is impossible to say whether this difference was due to higher natural immunity in the country areas or poorer notifications of the disease. The most interesting feature of this epidemic is that polio was observed in all age groups, although of course attack rates were somewhat higher in the preschool children than in other age groups. The numbers of cases by age and the age-specific attack rates can be seen in Table I. It should be noted (see Figure III) that 54 percent of the patients reported were in the 0-4 age group.

In 1957, a second epidemic occurred with 395 cases reported, including 11 deaths. The pattern of this somewhat smaller epidemic was similar to the 1954 outbreak, except that the disease became prevalent late in March, reached its peak in June, and had virtually disappeared by October. Once again the highest attack rates were in Kingston, but the disease was reported from all parishes. The age distribution and age-specific attack rates once again showed widespread infection of all age groups (see Table I). Fifty percent of the cases occurred in the 0-4 age group (see Figure III). Type I poliovirus was isolated from specimens from 9 cases. An attempt was made to modify it with an Island-wide campaign to offer inactivated poliomyelitis vaccine to all children in the 0-4 age group. Almost 82,000 children received at least one dose of vaccine through this program. Interestingly, only 15 cases occurred in this group (giving an attack rate of 18 per 100,000) whereas 166 cases occurred in the remaining 144,000 unprotected children (giving an attack rate of 125 per 100,000). Immunizations were routinely offered only to the 0-4 age group, and may have had the effect of lowering the attack rate in that group.

In 1960, a third epidemic occurred with 132 cases and 9 deaths. Type I poliovirus was isolated from patients with clinical illness during this outbreak. The pattern was similar to the 1957 epidemic in that it had started in March, peaked in June, and was essentially over by November. Once again, the illness had been first noted in the Kingston area, but soon spread throughout the Island. Thus it was becoming apparent that poliomyelitis was settling into an every-third-year epidemic pattern. This was perhaps due in part to the failure to routinely immunize the infants born subsequent to the previous epidemic.

Immunization with Oral Poliomyelitis Vaccine 1962-63

In late 1962, the health authorities in Jamaica felt that an epidemic similar to the ones which occurred in 1954, 1957 and 1960 might well occur in 1963. Only a small number of doses of inactivated vaccine had been given since the 1960 campaign. It was decided to conduct a mass feeding of oral vaccine to the 0-4 age group in late 1962 and early 1963. This decision was reinforced by the slow buildup of numbers of reported cases in the inter-epidemic years, suggesting that the population was becoming quite susceptible to clinical disease associated with infection by poliovirus. Accordingly, a mass vaccination program was held in which at least 432,000 doses of trivalent oral vaccine were administered throughout the Island to the 0-4 age group. Seventy-four percent received at least one dose of vaccine, and as many as 57 percent may have received two doses. The campaign was thus felt to have had considerable success. This feeling was reinforced when in 1963 only 15 cases of poliomyelitis were reported, the lowest total since 1956.

During the year and a half between the end of the mass feeding and August 1964, essentially no vaccine was given out in Jamaica. In the late summer of 1964, an extensive immunization program was initiated in the rural parishes. By the end of 1964, some 146,000 doses of trivalent oral poliomyelitis vaccine was given to children in the 0-4 age group through this program. The vaccine was not offered within the Kingston and St. Andrew Corporate area because an extensive immunization campaign with DPT antigen had just been completed, and the difficulties in mounting another mass campaign were felt to be too great.

The 1964 Epidemic

During the late months of 1964, an outbreak of poliomyelitis occurred which was sharply limited to the Kingston-St. Andrew Corporate (KSAC) area, and which was also unlike previous epidemics in that it was confined almost entirely to the 0-4 age group. The epidemic curve is shown in Figure IV. Of the 60 cases and 3 deaths found both through notification and by search of hospital records in the Kingston hospitals, only 4 were from outside of the KSAC area. The failure of the disease to reach epidemic proportions elsewhere on the Island may well be due to the vaccine distributed to preschool age children in the rural parishes during the fall of 1964. The age distribution shown in Table I and Figure III was primarily among preschool age children. Fully 91 percent of the cases occurred in children less than 5 years old, and 43 of the 60, (71 percent) were less than 2 years of age. The vast majority of these cases had received no immunizations against poliomyelitis.

Discussion

The occurrence of poliomyelitis in epidemic form in infants in Kingston during 1964 raises some grave issues for the future methods of control of this disease. Prior to this outbreak there was no reason to suspect that epidemics would occur unless some 3 years had elapsed during which newly born children remained unimmunized. Also, successful mass immunization campaigns, it was hoped, might abort such epidemics and by breaking up the cycle of naturally occurring infection actually lead to the eradication of polio from large populations. The success of the Jamaican mass oral vaccine feeding in 1962 and 1963 led authorities to feel that there was no great urgency in mounting a continuous follow-up program. Rather, the next epidemic, which might not be expected

until 1965 or 1966, might have been aborted by another mass campaign. There seemed little reason to fear that very small numbers of infants, who presumably have little close contact with each other, would be sufficient to propagate the virus in epidemic proportions. However, the 1964 outbreak makes it apparent that it is not advisable to allow even small numbers of susceptibles to be built up through failure to reach and continuously immunize newly born children. The fact that poliomeylitis became epidemic only in Kingston where no vaccine had been used for some 18 months, while the well immunized rural areas were almost completely spared, emphasizes this concept. Thus, to eradicate poliomyelitis for any more than a brief period of time, continuous vaccination of young infants must be carried out.

Prior to the widespread availability of good sanitary conditions, near-universal natural infection with wild poliovirus "controlled" the disease in the sense that it did not occur in epidemics. It is now apparent that near-universal artifical infection of the very young with live-attenuated vaccine must replace the older situation, or local epidemics such as that in Kingston in 1964 will occur. The implications of this, and the problems it raises for public health practice and administration are obvious, and grave.

Summary and Conclusion

Poliomyelitis in Jamaica before the days of good sanitation and hygiene was probably a nearly universal infection, but rarely resulted in clinical illness. Subsequent to 1954, epidemics occurred every 3 years, initially affecting all age groups, but progressively concentrating on the very young. Efforts to abort such periodic epidemics with vaccine have been successful over short periods, but there are indications that if vaccination is not vigorously pursued on a routine basis and efforts are not made to reach the very young children with vaccine, even small numbers of susceptible children may be enough to result in epidemics of severe clinical disease.

Dr. Luck acknowledges the assistance of Dr. O. F. Warner, Senior Medical Officer (Health) KSAC, who was responsible for providing the up-to-date data on the cases, Professor Louis Grant, Professor of Microbiology, University of the West Indies, who provided laboratory confirmation, and Dr. Michael Lane, an EIS Officer who assisted in the preparation of the manuscript.

ADDENDUM: Supplement to Poliomyelitis Surveillance Report No. 285 (Sept. 30, 1964) Section II, Table 1 - Additional information received indicates that during the 1963 mass oral poliomyelitis vaccine program in epidemic areas, 2,986,000 doses of Type I oral polio vaccine were fed in Metropolitan Philadelphia and 102,000 doses were fed in Cumberland and Perry Counties, Pennsylvania. Previous figures were 1,500,000 doses and 77,000 doses respectively.

TABLE I

AGE SPECIFIC POLIO ATTACK RATES

1954, 1957, 1960 and 1964

AGE	POPULATION*+	1954		1957		1960		1964		
		Cases	rate/100,000	Cases	rate/100,000	Cases	rate/100,000	Cases	rate/100,000	
0-4	267,891	413	154	190	71	93	35	54	20	83*
5-9	220,696	66	29	51	23	10	4.5	5	2.2	10*
10-14	173,923	39	22	37	21	3	1.7	0	0	0*
15-19	144,812	50	34	21	14	2	1.3	0	0	0*
20-24	124,847	92	74	38	30	1	0.8	0	0	0*
25+	677,645	99	15	58	9	20	2.9	1	0.1	0.5*
	1,609,814	759	47.1	395	24.5	134	8.3	60	3.7	

*+ Population Based on 1960 Census

* Rates Based Upon Kingston and St. Andrew Corporate - 1960 Population

FIGURE I

PER CAPITA INCOME AND INFANT MORTALITY RATE
JAMAICA – 1951-1963

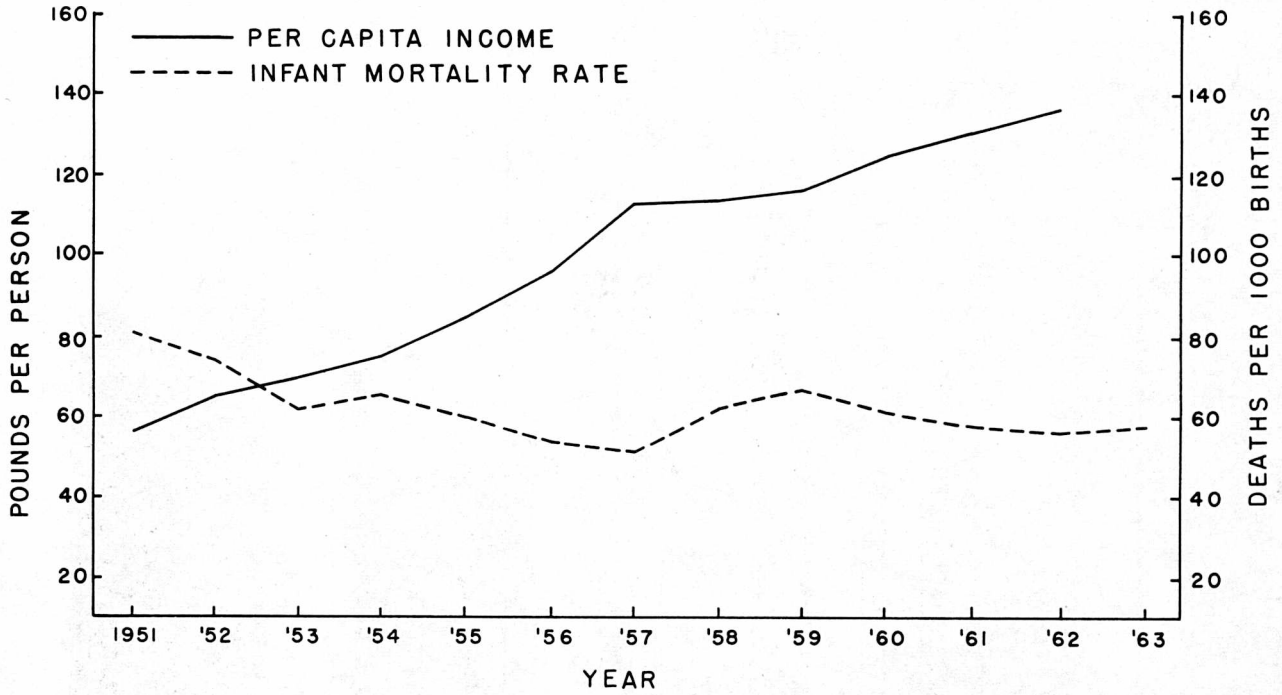


FIGURE II

POLIOMYELITIS NOTIFICATIONS
JAMAICA – 1951-1964

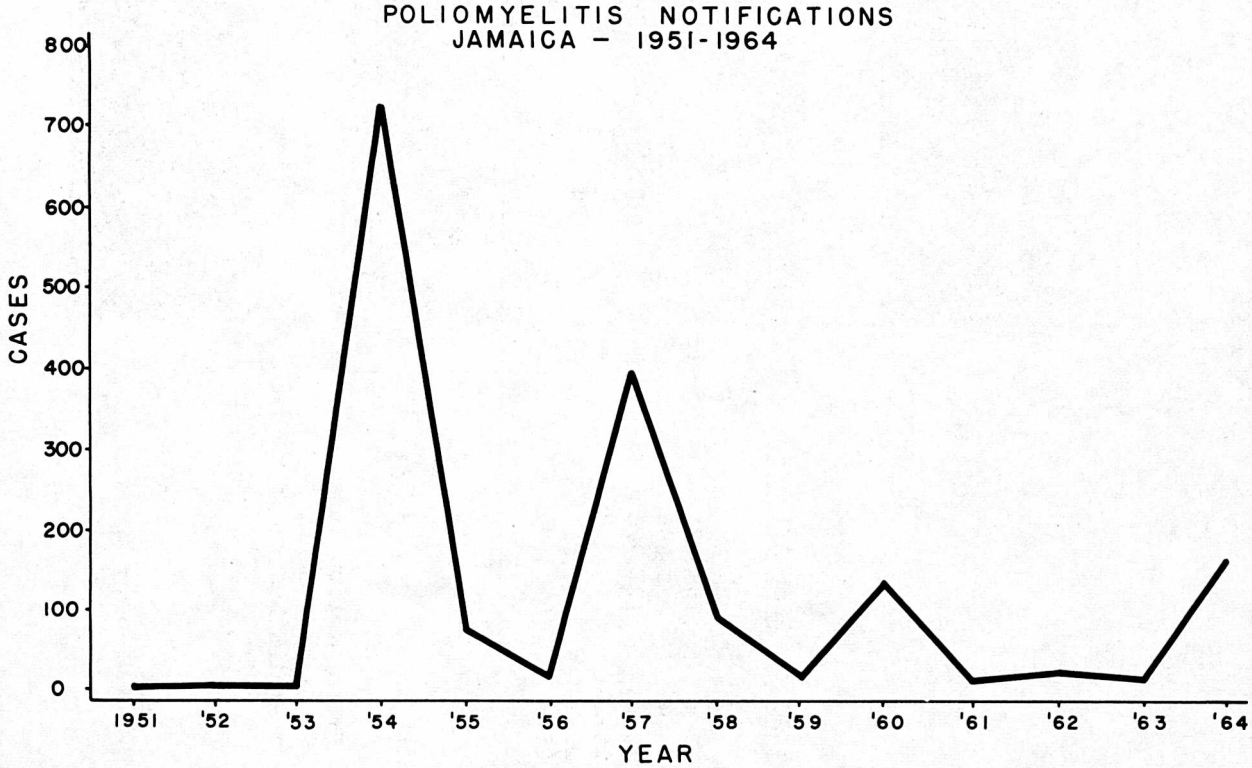


FIGURE III

POLIOMYELITIS IN JAMAICA
PERCENTAGE DISTRIBUTION BY BROAD AGE GROUPS
EPIDEMIC YEARS

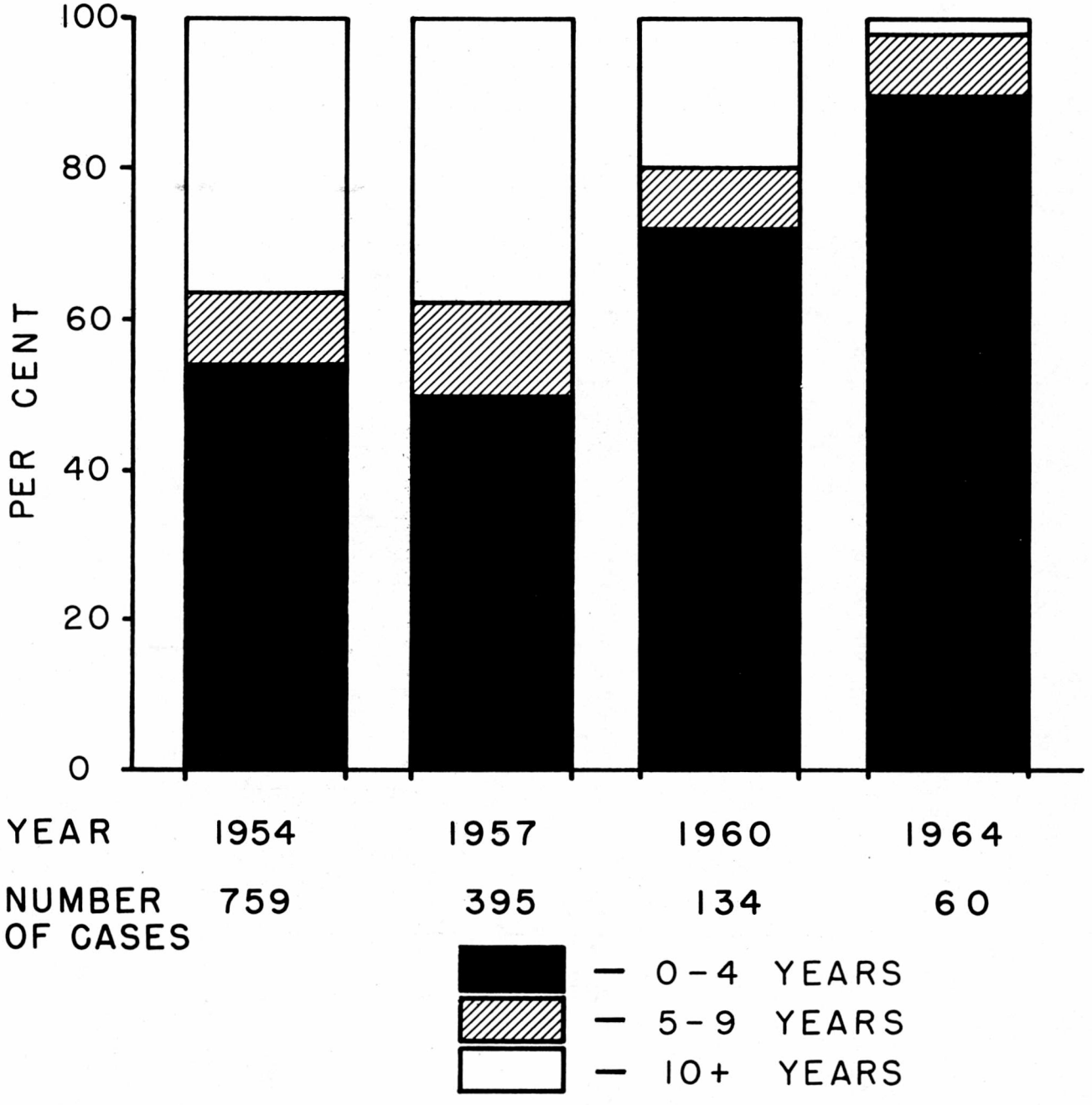
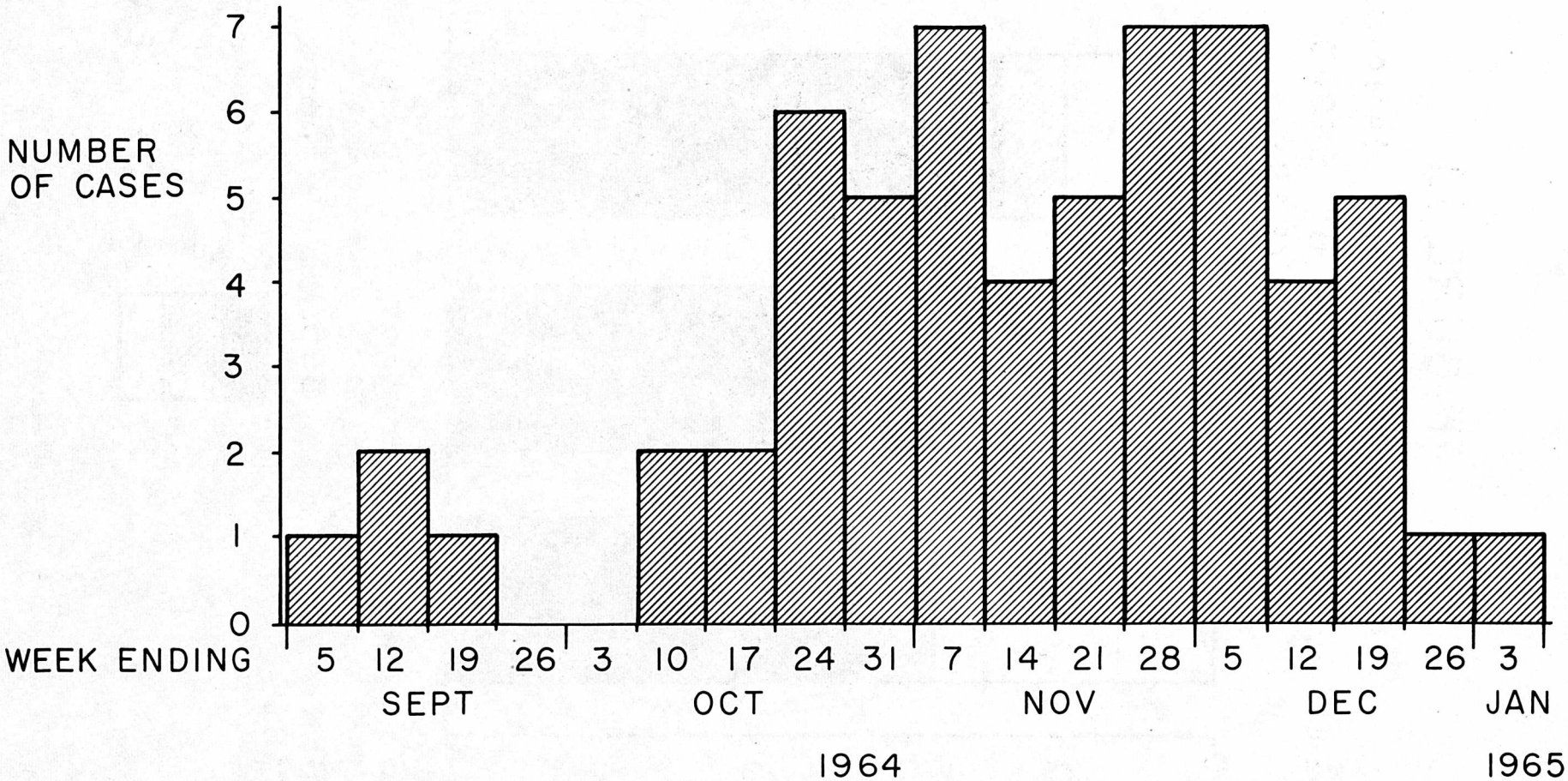


FIGURE IV

POLIOMYELITIS CASES BY WEEK OF ONSET
JAMAICA - 1964



SUPPLEMENT TO PSU #287

1965

RESULTS OF THE SEPTEMBER 1964 UNITED STATES IMMUNIZATION SURVEY

Oral Poliovaccine
Inactivated Poliovaccine
Diphtheria-Pertussis-Tetanus
Smallpox
Influenza

Prepared by

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The tables in this Supplement present the results of the September 1964 survey of the immunization status of the population of the United States conducted by the Bureau of the Census in cooperation with the Communicable Disease Center. Information was obtained on poliovaccine status, both oral and inactivated for ages under 50 years, diphtheria-pertussis-tetanus immunization for children under 15 years, smallpox vaccination for all ages, and recent receipt of influenza vaccine for ages 15 years and over.

The immunization data were collected by means of a special questionnaire included in the schedule for the Current Population Survey, a survey conducted monthly by the Bureau of the Census. The survey sample, with coverage in each of the 50 States and the District of Columbia, includes approximately 110,000 persons in 32,000 interviewed households.

Tables of data are presented in the following Sections:

Section A.	Tables 1-5.	United States by Age Groups
Section B.	Tables 6-9.	By Age by Standard Metropolitan Statistical Area Classification
Section C.	Tables 10-15.	By Age and Race for the United States
Section D.	Table 16.	Cross-classification, Inactivated Poliovaccine Status by Oral Poliovaccine Status, Ages 1-4, 5-9
Section E.	Tables 17-22.	Detailed Data for Age Group, 1-4 Years
Section F.	Tables 23-25.	Age Groups by Geographic Divisions
Section G.	Tables 26-27.	Standard Error Tables, Computed by the Bureau of the Census

Tables 1-5

Section A. United States by Age Groups

Table 1. Oral Poliovaccine Status - United States, 1964
Ages Under 50 Years

Age	Population (thousands)	No. of Doses					Percent with specified doses		
		3	1-2	0	Unknown No.	Unknown Stat.	3	1-2	0
<1	4 065	with 1 or more: 1314					with 1 or more: 32.3		
1	4 008	1 433	805	1 740	4	26	35.8	20.1	43.4
2	4 108	1 920	845	1 317	2	24	46.7	20.6	32.1
3	4 281	2 214	874	1 177	2	14	51.7	20.4	27.5
4	4 193	2 192	791	1 189	3	18	52.3	18.9	28.4
1-4	16 590	7 759	3 315	5 423	11	82	46.8	20.0	32.7
5-9	20 100	11 330	4 046	4 487	14	223	56.4	20.1	22.3
10-14	18 510	10 689	3 605	4 065	22	129	57.7	19.5	22.0
15-19	15 734	7 833	2 898	4 831	15	157	49.8	18.4	30.7
20-29	22 780	8 749	3 882	9 726	28	395	38.4	17.0	42.7
30-39	22 522	9 443	3 984	8 823	17	255	41.9	17.7	39.2
40-49	23 308	8 723	3 427	10 762	23	373	37.4	14.7	46.2
1-49	139 544	64 526	25 157	48 117	130	1614	46.2	18.0	34.5

Table 2. Inactivated Poliovaccine Status - United States, 1964
Ages Under 50 Years

Age	Population (thousands)	No. of Injections						Percent		
		≥4	3	1-2	0	Unknown No.	Unknown Stat.	≥4	≥3	0
<1	4 065	with 1 or more: 1256						with 1 or more: 30.9		
1	4 008	617	1 179	602	1 573	12	25	15.4	44.8	39.2
2	4 108	1 193	1 163	501	1 214	9	28	29.0	57.4	29.6
3	4 281	1 625	1 259	468	911	2	16	38.0	67.4	21.3
4	4 193	1 907	1 158	357	752	4	15	45.5	73.1	17.9
1-4	16 590	5 342	4 759	1 928	4 450	27	84	32.2	60.9	26.8
5-9	20 100	11 638	4 632	1 247	2 355	32	196	57.9	80.9	11.7
10-14	18 510	10 692	4 603	1 108	1 943	47	117	57.8	82.6	10.5
15-19	15 734	7 992	4 237	979	2 289	78	159	50.8	77.7	14.5
20-29	22 780	7 213	5 294	2 193	7 550	160	370	31.7	54.9	33.1
30-39	22 522	5 143	4 643	2 341	10 012	79	304	22.8	43.5	44.5
40-49	23 308	3 138	3 392	1 765	14 517	92	404	13.5	28.0	62.3
1-49	139 544	51 158	31 560	11 561	43 116	515	1634	36.7	59.3	30.9

Table 3. Diphtheria-Pertussis-Tetanus (DPT) Immunization Status - United States, 1964
Ages Under 15 Years

Age	Population (thousands)	No. of Injections						Percent		
		≥4	3	1-2	0	Unknown No.	Unknown Stat.	≥4	3	0
<1	4 065	with 1 or more: 2566						with 1 or more: 63.1		
1	4 008	805	1 965	546	586	83	23	20.1	49.0	14.6
2	4 108	1 506	1 558	439	483	90	32	36.7	37.9	11.8
3	4 281	1 885	1 487	349	472	72	16	44.0	34.7	11.0
4	4 193	2 095	1 313	345	350	75	15	50.0	31.3	8.3
1-4	16 590	6 291	6 323	1 679	1 891	320	86	37.9	38.1	11.4
5-9	20 100	13 202	3 886	1 183	1 114	470	245	65.7	19.3	5.5
10-14	18 510	12 426	3 152	848	1 100	752	232	67.1	17.0	5.9
1-14	55 200	31 919	13 361	3 710	4 105	1542	563	57.8	24.2	7.4

Table 4. Smallpox Vaccination Status - United States, 1964
All Ages

Age	Population (thousands)	Total Ever Vac.	Vaccinated Within Past 12 mo.				Vac. Stat. Unk.	Never Vac.	Percent		
			Total	1st	Revac.	Prior Stat. Unk.			Ever Vac.	Last Yr.	Never Vac.
<1	4 065	618	-	-	-	-	-	-	15.2	-	-
1	4 008	2 090	1 656	1 593	26	37	104	1 814	52.1	41.3	45.3
2	4 108	2 416	718	633	55	30	100	1 592	58.8	17.5	38.8
3	4 281	2 693	420	328	80	12	62	1 526	62.9	9.8	35.6
4	4 193	2 901	497	321	145	31	75	1 217	69.2	11.9	29.0
1-4	16 590	10 100	3 291	2 875	306	110	341	6 149	60.9	19.8	37.1
5-9	20 100	17 823	3 408	1 619	1 610	179	328	1 949	88.7	17.0	9.7
10-14	18 510	17 274	1 630	249	1 281	100	213	1 023	93.3	8.8	5.5
15-19	15 734	14 849	1 217	118	1 043	56	160	725	94.4	7.7	4.6
20-29	22 780	21 226	1 273	75	1 105	93	321	1 233	93.2	5.6	5.4
30-39	22 522	20 846	755	56	641	58	259	1 417	92.6	3.4	6.3
40-49	23 308	21 079	740	33	643	64	345	1 884	90.4	3.2	8.1
50-64	26 833	21 966	697	38	600	59	429	4 438	81.9	2.6	16.5
≥65	17 213	12 798	287	12	250	25	295	4 120	74.4	1.7	23.9
≥1	183 590	157 961	13 298	5 075	7 479	744	2691	22 938	86.0	7.2	12.5

Table 5. Influenza Vaccine Obtained Within the Past 12 Months - United States, 1964
15 Years and Over by Age and Sex

Age Group	Population (thousands)	Number Receiving Influenza Vaccine	Percent
		Total	
15-24	27 858	2 980	10.7
25-44	45 299	5 779	12.8
45-64	38 020	6 010	15.8
≥65	17 213	2 946	17.1
≥15	128 390	17 715	13.8
		Males	
15-24	13 294	1 432	10.8
25-44	21 606	3 049	14.1
45-64	18 327	2 847	15.5
≥65	7 591	1 275	16.8
≥15	60 818	8 603	14.1
		Females	
15-24	14 564	1 548	10.6
25-44	23 693	2 730	11.5
45-64	19 693	3 163	16.1
≥65	9 622	1 671	17.4
≥15	67 572	9 112	13.5

Tables 6-9

Section B. By Age by Standard Metropolitan Statistical Area Classification

Table 6. Oral Poliovaccine Status by Standard Metropolitan Statistical Area Classification - United States, 1964

Age Group	Population (thousands)	Number of Doses		Percent with	
		3	0	3	0
		Central Cities			
1-4	4 872	2 043	1 723	41.9	35.4
5-9	5 584	2 949	1 270	52.8	22.7
10-14	5 229	2 853	1 087	54.6	20.8
15-19	4 705	2 068	1 550	44.0	32.9
20-29	7 505	2 527	3 485	33.7	46.4
30-39	6 862	2 315	3 163	33.7	46.1
40-49	7 453	2 368	3 774	31.8	50.6
1-49	42 210	17 123	16 052	40.6	38.0
		Remaining SMSA Areas			
1-4	5 791	2 854	1 617	49.3	27.9
5-9	7 134	4 084	1 334	57.2	18.7
10-14	6 403	3 672	1 224	57.3	19.1
15-19	5 237	2 651	1 465	50.6	28.0
20-29	7 571	3 050	2 978	40.3	39.3
30-39	8 185	3 654	2 748	44.6	33.6
40-49	8 211	3 225	3 564	39.3	43.4
1-49	48 532	23 190	14 930	47.8	30.8
		Areas Outside SMSA			
1-4	5 927	2 860	2 082	48.3	35.1
5-9	7 382	4 297	1 883	58.2	25.5
10-14	6 878	4 164	1 755	60.5	25.5
15-19	5 792	3 113	1 816	53.7	31.4
20-29	7 704	3 173	3 262	41.2	42.3
30-39	7 475	3 472	2 912	46.4	39.0
40-49	7 644	3 130	3 424	40.9	44.8
1-49	48 802	24 209	17 134	49.6	35.1

Table 7. DPT Immunization Status by Standard Metropolitan Statistical Area Classification. Percent of Children Under 15 Years of Age with Specified Number of DPT Injections - United States, 1964

Age Group	Central Cities	Remaining SMSA Areas	Areas Outside SMSA
	3 or More Injections		
1-4	74.0	82.4	71.5
5-9	84.2	88.8	81.9
10-14	83.6	87.3	81.7
	4 or More Injections		
1-4	37.0	41.9	34.8
5-9	66.2	70.7	60.4
10-14	68.6	70.2	63.1
	3 Injections		
1-4	36.9	40.5	36.7
5-9	18.0	18.1	21.5
10-14	15.0	17.1	18.5
	0 Injections		
1-4	11.6	6.0	16.5
5-9	5.6	3.0	8.0
10-14	5.6	4.2	7.8
	With 1 or More DPT Injections		
< 1	65.1	69.4	55.7

Table 8. Smallpox Vaccination Status by Standard Metropolitan Statistical Area Classification - United States, 1964

Age Group	Population (thousands)	Percent of Persons: Total Ever Vaccinated	Received Vaccination Last Year	Vaccination Status Unk.	Never Vaccinated
		Central Cities			
< 1	1 222	20.4	-	-	-
1-4	4 872	69.4	23.8	1.9	28.8
5-9	5 584	90.9	16.6	1.8	7.3
10-14	5 229	95.4	10.0	1.3	3.3
15-19	4 705	96.4	8.5	0.9	2.8
20-29	7 505	95.0	6.4	1.4	3.6
30-39	6 862	94.3	4.2	1.5	4.2
40-49	7 453	92.7	3.9	1.9	5.4
50-64	9 247	87.4	3.7	2.1	10.5
≥ 65	6 014	82.2	2.4	2.1	15.7
≥ 1	57 471	89.6	7.9	1.7	8.7
		Remaining SMSA Areas			
< 1	1 363	14.7	-	-	-
1-4	5 791	68.8	21.2	2.0	29.2
5-9	7 134	92.9	16.1	1.4	5.7
10-14	6 403	96.0	10.3	0.7	3.3
15-19	5 237	97.1	8.9	0.7	2.3
20-29	7 571	95.1	6.3	1.7	3.2
30-39	8 185	95.4	3.6	0.7	3.8
40-49	8 211	94.8	3.6	0.9	4.2
50-64	8 080	88.6	2.7	1.2	10.3
≥ 65	4 472	84.8	1.5	1.0	14.2
≥ 1	61 084	91.0	7.9	1.1	7.9
		Areas Outside SMSA			
< 1	1 480	11.5	-	-	-
1-4	5 927	46.1	15.3	2.3	51.6
5-9	7 382	82.9	18.0	1.7	15.4
10-14	6 878	89.3	6.5	1.4	9.3
15-19	5 792	90.3	6.0	1.5	8.2
20-29	7 704	89.5	4.1	1.2	9.3
30-39	7 475	87.8	2.3	1.3	10.9
40-49	7 644	83.5	2.0	1.7	14.8
50-64	9 506	70.8	1.5	1.5	27.7
≥ 65	6 727	60.3	1.1	1.9	37.8
≥ 1	65 035	78.2	6.0	1.6	20.2

Table 9. Influenza Vaccine Obtained Within Past 12 Months - United States, 1964

Age Group	Population (thousands)	Obtained Vaccine		Percent by Sex	
		Number	Percent	Male	Female
		Central Cities			
15-24	8 700	1 017	11.7	11.4	11.9
25-44	14 191	1 919	13.5	14.7	12.4
45-64	12 881	2 119	16.5	16.5	16.4
≥ 65	6 014	996	16.6	17.6	15.8
≥ 15	41 786	6 051	14.5	14.9	14.1
		Remaining SMSA Areas			
15-24	9 176	950	10.4	10.5	10.2
25-44	16 235	2 117	13.0	14.8	11.4
45-64	11 873	1 821	15.3	15.0	15.7
≥ 65	4 472	702	15.7	15.7	15.7
≥ 15	41 756	5 590	13.4	14.0	12.8
		Areas Outside SMSA			
15-24	9 982	1 011	10.1	10.4	9.9
25-44	14 873	1 743	11.7	12.8	10.8
45-64	13 266	2 070	15.6	15.2	16.0
≥ 65	6 727	1 248	18.6	16.8	20.0
≥ 15	44 848	6 072	13.5	13.6	13.5

Tables 10-15

Section C. By Age and Race for the United States

Table 10. Oral Poliovaccine Status - United States, 1964
by Age and Race

Age Group	Population (thousands)		Percent with 3 doses		Percent with zero doses	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
1-4	14 014	2 576	47.8	41.0	32.0	36.3
5-9	17 215	2 885	57.4	50.3	22.5	21.1
10-14	15 939	2 571	57.9	56.6	22.4	19.5
15-19	13 760	1 974	49.9	49.2	31.0	28.5
20-29	20 054	2 726	39.1	33.3	42.6	43.5
30-39	19 955	2 567	43.0	33.8	38.4	45.6
40-49	20 945	2 363	37.9	33.0	45.9	48.5
1-49	121 882	17 662	46.8	42.4	34.5	34.6

Table 11. Inactivated Poliovaccine Status - United States, 1964
Percent of Persons with Specified Number of IPV Doses
by Age and Race

Age Group	Percent with ≥ 4		Percent with 3		Percent with 0	
	White	Nonwhite	White	Nonwhite	White	Nonwhite
1-4	33.7	23.8	29.7	23.3	25.2	35.6
5-9	60.8	40.7	22.9	23.6	10.3	20.0
10-14	60.4	41.5	24.0	30.2	9.5	16.5
15-19	52.4	39.7	26.9	26.9	13.5	22.0
20-29	33.1	20.9	23.7	20.2	31.7	43.5
30-39	24.1	13.2	21.4	14.6	42.7	58.2
40-49	14.0	8.6	15.1	10.0	61.4	69.7
1-49	38.1	26.9	22.8	21.2	29.9	37.8

Table 12. DPT Status - United States, 1964. Percent of Persons with Specified Number of Injections, by Age and Race, Under 15 Years of Age

Race	Age 1-4	Age 5-9	Age 10-14	Total 1-14
		Percent with 3 or More		
White	79.3	87.9	86.2	84.8
Nonwhite	58.3	68.1	71.2	65.9
		Percent with 4 or More		
White	40.0	68.8	69.7	60.6
Nonwhite	26.7	46.8	51.2	41.8
		Percent with 3		
White	39.3	19.0	16.6	24.2
Nonwhite	31.6	21.2	20.0	24.1
		Percent with Zero		
White	9.3	4.4	5.0	6.1
Nonwhite	22.9	12.3	11.9	15.6
		Age Under 1, Percent with One or More		
		White	65.8	
		Nonwhite	49.5	

Table 13. Smallpox Vaccination by Age by Race - United States, 1964

Race	Age Group	Total Ever Vac.	Total Vac. Last Year	Vaccination Last Year				Never Vac.
				1st	Revac.	Prior Status Unk.	Vac. Status Unk.	
White	<1	14.9	-	-	-	-	-	-
	1-4	62.1	19.7	17.3	1.8	0.7	2.1	35.9
	5-9	89.9	16.9	7.6	8.4	0.9	0.9	9.2
	10-14	93.7	8.7	1.1	7.1	0.5	1.0	5.3
	15-19	94.8	7.7	0.7	6.6	0.4	1.0	4.2
	20-29	93.8	5.7	0.3	5.0	0.4	1.3	4.9
	30-39	93.2	3.3	0.2	2.8	0.3	1.0	5.8
	40-49	91.1	3.2	0.1	2.8	0.3	1.4	7.5
	50-64	82.9	2.6	0.1	2.3	0.2	1.5	15.5
	≥65	75.4	1.6	0.1	1.3	0.2	1.7	23.0
Total	≥1	86.9	7.1	2.6	4.1	0.4	1.3	11.8
Nonwhite	<1	16.7	-	-	-	-	-	-
	1-4	54.5	20.4	17.7	2.1	0.5	1.8	43.6
	5-9	81.5	17.2	10.8	5.7	0.7	5.8	12.8
	10-14	91.3	9.2	3.1	5.5	0.6	2.1	6.7
	15-19	91.4	8.0	1.3	6.6	0.1	1.0	7.5
	20-29	88.6	4.6	0.6	3.8	0.3	2.2	9.2
	30-39	87.7	4.0	0.3	3.6	0.2	2.5	9.9
	40-49	84.3	3.0	0.3	2.6	0.1	2.1	13.6
	50-64	71.3	2.5	0.3	2.0	0.2	2.4	26.3
	≥65	62.5	2.6	0	2.6	0	2.0	35.5
Total	≥1	79.9	8.4	4.2	3.9	0.3	2.5	17.5

Table 14. Influenza Vaccine Obtained in Past 12 Months by Age, Race, and Sex - United States, 1964

	Males		Females	
	White	Nonwhite	White	Nonwhite
		Age 15-24		
Population	11 652	1 642	12 772	1 792
% With	10.4	13.7	10.1	14.5
		Age 25-44		
Population	19 321	2 285	20 880	2 813
% With	13.6	18.2	10.9	16.1
		Age 45-64		
Population	16 616	1 711	17 812	1 881
% With	15.4	17.0	16.0	16.4
		Age ≥65		
Population	6 979	612	8 895	727
% With	17.1	13.1	17.8	11.6
		Ages 15 and Over		
Population	54 568	6 250	60 359	7 213
% With	13.9	16.2	13.3	15.3

Table 15. Immunization Status in Central Cities of Standard Metropolitan Statistical Areas - United States, 1964 - Percent with Specified Number of Doses by Race and Age

A. Oral Poliovaccine

Age Group	White	Nonwhite
	3 doses	
1-4	43.7	37.4
5-9	54.1	49.1
10-14	55.5	51.6
15-19	44.5	42.0
20-29	34.9	28.8
30-39	35.2	28.5
40-49	32.4	29.0
1-49	41.5	37.5

B. Diphtheria-Pertussis-Tetanus Injection

Age Group	White	Nonwhite
	3 or more injections	
1-4	78.1	63.4
5-9	88.0	73.6
10-14	85.8	76.3
	4 or more injections	
1-4	40.1	29.4
5-9	70.5	54.2
10-14	71.9	57.9
	3 injections	
1-4	38.1	34.0
5-9	17.5	19.5
10-14	14.0	18.3
	0 injections	
1-4	9.4	17.3
5-9	4.2	9.3
10-14	4.4	9.5

Table 15. con't. -- Immunization Status by Race and Age in Central Cities of Standard Metropolitan Statistical Areas - United States, 1964

C. Smallpox Vaccination Status

Race	Age Group	Total Ever Vac.	Total Vac. Last Year	Vaccination Last Year		Prior Status Unk.	Vac. Status Unk.	Never Vac.
				1st	Revac.			
White	<1	18.7	-	-	-	-	-	-
	1-4	70.7	24.2	20.6	2.5	1.0	1.9	27.5
	5-9	91.8	16.8	5.8	10.2	0.7	0.9	7.2
	10-14	95.8	9.9	0.7	8.7	0.6	1.1	3.1
	15-19	96.8	9.0	0.4	8.2	0.4	0.9	2.3
	20-29	95.8	6.9	0.4	6.0	0.5	1.2	2.9
	30-39	95.3	4.1	0.2	3.8	0.1	1.1	3.7
	40-49	93.7	4.2	0.2	3.7	0.3	1.8	4.5
	50-64	89.1	3.8	0.2	3.3	0.3	1.8	9.1
	≥65	83.8	2.2	0.1	2.0	0.1	2.0	14.2
Total	≥1	90.7	7.8	2.3	5.0	0.4	1.5	7.8
Nonwhite	<1	24.8	-	-	-	-	-	-
	1-4	66.3	22.8	19.3	2.8	0.7	1.8	31.9
	5-9	88.4	16.1	9.0	6.3	0.8	4.2	7.4
	10-14	93.9	10.0	2.3	6.5	1.1	2.0	4.1
	15-19	94.8	6.4	0.4	5.8	0.2	0.6	4.7
	20-29	91.6	4.6	0.7	3.7	0.3	2.2	6.1
	30-39	90.9	4.5	0.4	4.0	0.1	2.9	6.2
	40-49	88.4	2.3	0.1	2.1	0.1	2.2	9.5
	50-64	78.0	3.1	0.3	2.5	0.3	3.5	18.5
	≥65	70.1	3.6	0	3.6	0	2.3	27.6
Total	≥1	85.3	8.4	3.9	4.1	0.4	2.5	12.2

D. Percent with Influenza Vaccine Obtained in Past 12 Months

Age Group	Male		Female	
	White	Nonwhite	White	Nonwhite
15-24	10.5	15.2	11.3	14.1
25-44	13.7	18.8	11.3	16.5
45-64	16.4	16.9	16.3	17.1
≥65	17.8	16.1	16.2	12.4
≥15	14.5	17.2	13.7	15.8

Table 16

Section D. Cross-classification, IPV Status by OPV Status, Ages 1-4, 5-9

Table 16. Number (in thousands) of Children 1-4 and 5-9 with Specified Number of Inactivated Poliovaccine Inoculations Classified by Number of Oral Poliovaccine Doses - United States, 1964

Number of IPV Inoculations	Number of OPV Doses				Unknown		Total Children
	3	2	1	0	Number	Status	
				Age 1-4			
4 or more	2 633	672	332	1 694	9	2	5 342
3	2 175	646	332	1 604	-	2	4 759
2	414	223	133	422	-	4	1 196
1	245	121	78	281	-	7	732
0	2 264	562	213	1 411	-	-	4 450
Unk. No.	11	3	-	9	2	2	27
Unk. Status	17	-	-	2	-	65	84
Total	7 759	2 227	1 088	5 423	11	82	16 590

Number of IPV Inoculations	Number of OPV Doses				Unknown		Total Children
	3	2	1	0	Number	Status	
				Age 5-9			
4 or more	6 692	1 650	582	2 699	3	12	11 638
3	2 643	774	232	965	4	14	4 632
2	396	181	87	177	-	3	844
1	146	81	55	115	-	6	403
0	1 435	276	115	525	2	2	2 355
Unk. No.	9	3	5	3	5	7	32
Unk. Status	9	5	-	3	-	179	196
Total	11 330	2 970	1 076	4 487	14	223	20 100

Tables 17-22

Section E. Detailed Data for Age Group, 1-4 Years

Table 17. Percent of Children, 1-4 Years, with Specified Number of OPV Doses, by Single Years of Life, by Race - United States, 1964

Age	Population (thousands)	Oral Poliovaccine Doses			
		3	2	1	0
			White		
1	3 416	36.9	12.5	7.1	43.5
2	3 449	47.3	13.5	6.8	32.4
3	3 622	53.0	14.4	6.0	26.6
4	3 527	53.6	13.1	5.7	27.7
			Nonwhite		
1	592	29.1	15.5	8.3	47.1
2	659	43.7	13.4	9.0	34.0
3	659	44.6	11.8	9.1	34.4
4	666	45.5	14.1	5.9	34.5

Note: In these tables children reported as having received an unknown number of doses or inoculations are included in the percentages computed for children with 1 dose;those reported with status unknown, in percentages computed for 0 doses.

Table 18. Percent of Children, 1-4 Years, with Specified Number of OPV Doses, by Single Years of Life, by Major Geographic Divisions - United States, 1964

Age	New England States				Middle Atlantic States			
	Number of OPV Doses							
	3	2	1	0	3	2	1	0
1	37.2	18.2	15.0	29.6	37.6	10.2	7.5	44.8
2	52.2	10.3	13.3	24.1	46.4	11.9	6.8	34.9
3	50.2	15.7	12.9	21.3	50.8	10.2	6.5	32.4
4	59.6	15.0	5.8	19.6	50.6	9.3	5.7	34.4
1-4	49.8	15.1	11.6	23.6	46.4	10.4	6.6	36.6

Age	East North Central				West North Central			
	Number of OPV Doses							
	3	2	1	0	3	2	1	0
1	25.5	13.8	8.5	52.2	25.5	16.5	5.6	52.5
2	30.1	20.9	6.6	42.5	37.4	14.6	6.5	41.4
3	39.0	21.1	6.9	33.1	40.1	15.2	4.1	40.6
4	34.9	19.8	8.0	37.3	36.3	19.3	4.2	40.2
1-4	32.4	18.9	7.5	41.2	35.0	16.5	5.0	43.5

Age	South Atlantic				East South Central				West South Central			
	Number of OPV Doses											
	3	2	1	0	3	2	1	0	3	2	1	0
1	41.5	16.7	5.3	36.6	54.2	11.3	2.9	31.5	38.7	8.7	7.9	44.7
2	51.3	14.7	5.6	28.5	56.9	8.4	8.4	26.3	61.9	7.5	7.2	23.3
3	55.3	16.4	5.7	22.7	68.5	8.6	2.6	20.2	61.2	12.1	9.1	17.6
4	57.1	14.6	4.5	23.8	62.4	8.2	4.2	25.2	71.5	8.9	4.5	15.2
1-4	51.4	15.6	5.3	27.8	61.2	8.9	4.6	25.3	57.9	9.3	7.1	25.7

Age	Mountain States				Pacific States			
	Number of OPV Doses							
	3	2	1	0	3	2	1	0
1	37.7	14.3	8.0	40.0	37.1	9.7	6.3	47.0
2	62.7	5.7	4.2	27.4	50.8	12.0	8.8	28.4
3	69.8	9.8	3.3	17.2	54.8	9.7	7.1	28.4
4	66.5	11.6	1.2	20.8	58.1	8.8	7.6	25.4
1-4	59.9	10.2	4.1	25.9	50.9	10.1	7.5	31.5

Table 19. Percent of Children, 1-4 Years, with Specified Number of OPV Doses, by Standard Metropolitan Statistical Area Classification United States, 1964

Age	Standard Metropolitan Statistical Areas								Areas Excluding SMSA's			
	Central Cities				Excluding Central Cities							
	Number of OPV Doses											
	3	2	1	0	3	2	1	0	3	2	1	0
1	29.0	13.5	8.7	48.7	39.3	15.3	6.3	39.1	38.2	10.2	6.9	44.6
2	41.0	14.7	8.0	36.2	48.4	16.1	7.1	28.4	49.8	9.8	6.5	33.8
3	48.9	14.3	7.1	29.7	52.4	17.7	7.3	22.6	53.1	10.0	5.2	31.6
4	48.8	16.6	5.3	29.3	56.1	13.9	5.9	24.2	51.2	9.8	5.9	33.0
1-4	41.9	14.8	7.2	36.0	49.3	15.8	6.6	28.3	48.3	10.0	6.1	35.7

Age	SMSA Central Cities, by Race							
	White				Nonwhite			
	Number of OPV Doses							
	3	2	1	0	3	2	1	0
1	31.7	11.3	8.7	48.3	21.1	20.1	8.8	50.0
2	41.2	14.6	7.7	36.5	40.7	15.0	8.9	35.4
3	51.8	14.2	6.5	27.5	41.8	14.8	8.5	34.9
4	50.8	15.3	5.2	28.7	44.0	19.7	5.7	30.6
1-4	43.7	13.8	7.0	35.5	37.4	17.3	7.9	37.4

Table 20. Percent of Children, 1-4 Years, with Specified Number of DPT Inoculations, by Single Years of Life, by Race
United States, 1964

Age	Population (thousands)	Diphtheria-Pertussis-Tetanus Number of Inoculations			
		4 or more	3	1-2	0
			White		
1	3 416	21.4	51.4	12.4	14.8
2	3 449	38.4	39.0	10.6	11.9
3	3 622	46.5	35.0	7.8	10.7
4	3 527	52.7	32.3	7.5	7.5
			Nonwhite		
1	592	12.7	35.3	20.6	31.4
2	659	27.6	32.2	11.4	28.8
3	659	30.2	33.1	11.2	25.5
4	666	35.1	26.1	12.5	26.3

Table 21. Percent of Children, 1-4 Years, with Specified Number of DPT Inoculations, by Single Years of Life, by Race, by Standard Metropolitan Statistical Area Classification - United States, 1964

Age	Standard Metropolitan Statistical Areas								Areas Excluding SMSA's			
	Central Cities				Excluding Central Cities							
	Number of DPT Inoculations											
	4+	3	1-2	0	4+	3	1-2	0	4+	3	1-2	0
1	21.5	46.9	13.3	18.3	22.0	53.5	14.0	10.6	17.0	46.7	13.4	22.8
2	34.3	37.2	11.4	17.1	41.7	40.4	10.0	7.9	33.9	36.3	10.9	19.0
3	43.8	33.8	10.5	11.8	47.1	36.7	7.7	8.5	41.2	33.5	7.1	18.2
4	48.8	30.0	9.8	11.3	54.9	32.7	6.1	6.3	46.0	31.0	9.2	13.9
1-4	37.0	36.9	11.3	14.7	41.9	40.5	9.3	8.3	34.8	36.7	10.1	18.4

SMSA Central Cities, by Race

	White				Nonwhite			
	Number of DPT Inoculations							
	4+	3	1-2	0	4+	3	1-2	0
1	23.4	49.6	11.8	15.1	15.9	38.6	17.9	27.6
2	36.2	38.5	11.1	14.2	29.8	34.0	12.0	24.2
3	48.2	31.9	9.5	10.3	32.7	38.6	13.1	15.6
4	53.5	31.7	7.9	6.8	37.4	26.0	14.3	22.3
1-4	40.1	38.1	10.1	11.7	29.4	34.0	14.3	22.3

Table 22. Percent of Children,1-4 Years, with Specified Number of DPT Inoculations,by Single Years of Life, by Major Geographic Divisions United States, 1964

Age	New England States				Middle Atlantic States			
	Number of DPT Inoculations							
	4+	3	1-2	0	4+	3	1-2	0
1	19.8	58.1	11.9	10.3	27.1	50.8	10.2	12.0
2	42.9	43.8	4.4	8.9	37.1	42.9	10.2	9.7
3	43.0	41.0	7.2	8.8	47.1	37.1	8.9	6.8
4	56.3	32.5	4.6	6.7	51.0	35.0	6.8	7.2
1-4	40.1	44.0	7.2	8.8	40.8	41.3	9.0	8.9

	East North Central				West North Central			
	Number of DPT Inoculations							
	4+	3	1-2	0	4+	3	1-2	0
1	17.6	50.9	16.2	15.2	18.3	50.3	15.5	15.8
2	32.4	46.6	9.5	11.5	34.0	44.9	10.6	10.6
3	42.6	36.9	9.8	10.7	41.3	40.8	5.4	12.4
4	48.3	33.1	9.9	8.6	46.8	36.0	7.3	10.0
1-4	35.3	41.9	11.3	11.5	35.5	42.9	9.5	12.1

	South Atlantic				East South Central				West South Central			
	Number of DPT Inoculations											
	4+	3	1-2	0	4+	3	1-2	0	4+	3	1-2	0
1	19.4	47.6	10.5	22.4	16.0	39.9	16.8	27.3	22.6	38.0	9.4	30.0
2	40.6	27.5	12.1	19.7	31.8	31.4	13.1	23.7	41.9	23.6	7.8	26.7
3	46.2	28.7	7.9	17.2	49.7	26.8	7.0	16.6	44.9	22.6	10.5	22.0
4	51.7	27.7	6.8	13.8	49.0	19.9	10.5	20.6	57.6	20.4	8.9	13.1
1-4	39.8	32.8	9.3	18.2	37.9	28.8	11.5	21.7	41.2	26.4	9.1	23.2

	Mountain States				Pacific States			
	Number of DPT Inoculations							
	4+	3	1-2	0	4+	3	1-2	0
1	15.4	52.6	17.1	14.9	17.5	52.2	18.8	11.6
2	25.0	47.2	11.3	16.5	41.2	32.3	14.5	12.0
3	41.9	34.4	10.7	13.0	39.4	40.7	6.2	13.6
4	35.8	40.5	14.5	9.2	47.8	35.3	8.1	8.8
1-4	30.1	43.6	13.2	13.1	37.4	39.3	11.8	11.5

Tables 23-25

Section F. By Age Groups by Geographic Divisions

Table 23. Percent of Persons with Specified Number of Doses by Age Group, by Geographic Division - United States, 1964

Summary Table

Age Group	New Eng.	Mid. Atl.	E.N. Cent.	W.N. Cent.	So. Atl.	E.S. Cent.	W.S. Cent.	Mtn.	Pac.
				Percent with 3 OPV					
1-4	49.8	46.4	32.4	35.0	51.4	61.2	57.9	59.9	50.9
5-9	65.4	54.0	38.6	45.3	60.1	74.8	73.5	75.8	60.4
10-14	64.0	51.6	39.8	46.0	65.8	77.5	74.1	77.3	60.8
15-19	46.2	43.8	34.6	42.5	55.2	65.5	65.6	67.3	55.5
20-29	25.3	33.3	27.2	36.4	44.0	52.1	52.7	59.6	39.9
30-39	26.6	37.4	30.5	33.8	47.3	61.2	59.4	65.2	46.4
40-49	21.1	34.5	27.0	28.6	43.1	53.2	55.3	59.9	40.8
Total 1-49	40.3	41.9	32.5	37.9	51.8	63.5	62.2	66.1	49.7
				Percent with 4 or more DPT					
1-4	40.1	40.8	35.3	35.5	39.8	37.9	41.2	30.1	37.4
5-9	69.8	61.4	68.9	63.3	65.1	63.4	68.8	55.8	68.5
10-14	73.5	59.9	70.2	67.4	63.9	66.2	66.7	65.1	73.9
Total 1-14	62.6	54.6	59.4	56.5	57.1	57.1	59.6	50.5	60.7
				Percent Ever Receiving Smallpox					
1-4	61.2	71.6	66.1	63.5	50.1	43.8	38.0	59.1	74.5
5-9	93.6	95.5	88.5	86.7	86.7	80.1	82.6	86.3	90.4
10-14	98.3	97.8	93.3	86.8	94.9	88.3	90.3	92.8	93.2
15-19	97.9	98.4	94.0	86.9	96.7	87.0	92.5	93.8	95.7
20-29	97.1	97.5	91.9	85.3	95.7	87.0	90.6	93.6	93.6
30-39	95.5	97.2	91.4	87.5	93.7	86.3	88.3	92.8	93.5
40-49	94.9	96.3	90.0	83.4	90.0	79.2	87.7	91.0	91.7
50-64	91.4	93.7	80.5	72.7	80.4	63.6	71.5	79.3	83.9
$\geq$ 65	88.5	89.9	72.7	61.9	70.7	52.3	63.5	72.8	78.0
Total $\geq$ 1	91.8	93.6	85.7	79.4	85.2	75.0	78.9	85.3	88.7

Table 24. Percent of Persons by Age Groups with Specified Number of Doses OPV, DPT, and Smallpox in each Geographic Division - United States, 1964

A. New England

Age Group	OPV				DPT					Smallpox		
	3	1-2	0		≥ 4	3	1-2	0		Ever	Never	Last Year
1-4	49.8	26.3	23.7		40.1	44.0	7.2	7.2		61.2	37.5	17.0
5-9	65.4	26.6	8.1		69.8	18.8	4.6	5.3		93.6	6.0	11.2
10-14	64.0	28.2	7.5		73.5	14.8	5.1	3.7		98.3	1.5	4.4
15-19	46.2	30.9	22.4		-	-	-	-		97.9	1.9	8.8
20-29	25.3	18.4	53.9		-	-	-	-		97.1	1.7	6.2
30-39	26.6	19.6	53.0		-	-	-	-		95.5	4.1	1.6
40-49	21.1	17.4	60.0		-	-	-	-		94.9	4.2	3.1
50-64	-	-	-		-	-	-	-		91.4	7.6	1.9
≥ 65	-	-	-		-	-	-	-		88.5	10.7	1.7
Total 1-49	40.3	23.1	35.7	Total 1-14	62.6	24.6	5.5	5.3	Total ≥ 1	91.8	7.4	5.6
	with 1 or more:				with 1 or more:					ever vaccinated:		
<1 yr.	46.6				71.4					13.5		

B. Middle Atlantic

Age Group	OPV				DPT					Smallpox		
	3	1-2	0		≥ 4	3	1-2	0		Ever	Never	Last Year
1-4	46.4	16.9	36.4		40.8	41.3	8.8	6.9		71.6	26.6	23.3
5-9	54.0	20.4	25.2		61.4	23.6	5.5	6.8		95.5	3.8	12.0
10-14	51.6	21.6	26.2		59.9	21.4	6.8	6.8		97.8	1.6	6.5
15-19	43.8	17.3	37.8		-	-	-	-		98.4	1.1	6.3
20-29	33.3	11.2	54.2		-	-	-	-		97.5	1.8	5.9
30-39	37.4	12.8	48.7		-	-	-	-		97.2	2.1	4.0
40-49	34.5	8.1	55.5		-	-	-	-		96.3	2.4	2.8
50-64	-	-	-		-	-	-	-		93.7	5.4	3.2
≥ 65	-	-	-		-	-	-	-		89.9	9.3	1.7
Total 1-49	41.9	14.7	42.3	Total 1-14	54.6	28.3	6.9	6.9	Total ≥ 1	93.6	5.4	6.5
	with 1 or more:				with 1 or more:					ever vaccinated:		
<1 yr.	31.1				66.9					19.1		

Table 24. con't. -- Percent of Persons by Age Groups with Specified Number of Doses OPV, DPT, and Smallpox in each Geographic Division - United States, 1964

C. East North Central

Age Group	OPV				DPT				Smallpox		
	3	1-2	0		≥ 4	3	1-2	0	Ever	Never	Last Year
1-4	32.4	26.3	40.6		35.3	41.9	11.3	9.9	66.1	31.7	20.0
5-9	38.6	28.1	29.7		68.9	16.2	6.0	3.5	88.5	7.6	17.0
10-14	39.8	27.9	31.1		70.2	16.5	4.6	4.4	93.3	5.0	9.2
15-19	34.6	25.3	38.7		-	-	-	-	94.0	4.8	6.9
20-29	27.2	21.3	49.4		-	-	-	-	91.9	6.4	5.5
30-39	30.5	23.1	44.9		-	-	-	-	91.4	7.4	2.6
40-49	27.0	19.4	51.6		-	-	-	-	90.0	8.4	2.8
50-64	-	-	-		-	-	-	-	80.5	18.0	1.7
≥ 65	-	-	-		-	-	-	-	72.7	25.3	2.2
Total 1-49	32.5	24.2	41.4	Total 1-14	59.4	23.9	7.1	5.7	Total ≥ 1	85.7	12.4	7.1
	with 1 or more:				with 1 or more:				ever vaccinated:			
<1 yr.	25.0				63.3				17.3			

D. West North Central

Age Group	OPV				DPT				Smallpox		
	3	1-2	0		≥ 4	3	1-2	0	Ever	Never	Last Year
1-4	35.0	21.3	42.7		35.5	42.9	9.5	10.9	63.5	33.6	18.9
5-9	45.3	21.6	31.9		63.3	22.4	7.9	3.9	86.7	11.8	18.0
10-14	46.0	19.8	32.1		67.4	20.4	3.8	5.0	86.8	10.9	7.0
15-19	42.5	15.6	39.2		-	-	-	-	86.9	9.9	8.1
20-29	36.4	13.9	47.0		-	-	-	-	85.3	12.2	4.3
30-39	33.8	20.6	43.2		-	-	-	-	87.5	10.1	2.5
40-49	28.6	15.3	53.3		-	-	-	-	83.4	14.0	1.9
50-64	-	-	-		-	-	-	-	72.7	23.8	1.1
≥ 65	-	-	-		-	-	-	-	61.9	34.5	1.4
Total 1-49	37.9	18.3	41.6	Total 1-14	56.5	27.7	7.0	6.3	Total ≥ 1	79.4	17.9	6.5
	with 1 or more:				with 1 or more:				ever vaccinated:			
<1 yr.	24.1				63.1				16.3			

Table 24. con't. -- Percent of Persons by Age Groups with Specified Number of Doses OPV, DPT, and Smallpox in each Geographic Division - United States, 1964

E. South Atlantic

Age Group	OPV 3	OPV 1-2	OPV 0		DPT ≥ 4	DPT 3	DPT 1-2	DPT 0		Smallpox Ever	Smallpox Never	Smallpox Last Year
1-4	51.4	20.8	27.4		39.8	32.8	9.3	15.2		50.1	48.2	18.2
5-9	60.1	21.0	18.5		65.1	19.2	5.8	5.5		86.7	12.5	15.9
10-14	65.8	18.8	14.9		63.9	18.1	3.7	6.9		94.9	4.3	6.6
15-19	55.2	17.7	26.6		-	-	-	-		96.7	2.8	6.2
20-29	44.0	21.2	33.5		-	-	-	-		95.7	3.7	4.5
30-39	47.3	19.3	32.6		-	-	-	-		93.7	5.6	2.5
40-49	43.1	15.5	40.6		-	-	-	-		90.0	9.2	3.1
50-64	-	-	-		-	-	-	-		80.4	18.5	2.3
≥ 65	-	-	-		-	-	-	-		70.7	28.3	1.5
Total 1-49	51.8	19.2	28.3	Total 1-14	57.1	22.9	6.1	8.9	Total ≥ 1	85.2	13.9	6.4
	with 1 or more:				with 1 or more:					ever vaccinated:		
< 1 yr.	36.7				58.5					7.7		

F. East South Central

Age Group	OPV 3	OPV 1-2	OPV 0		DPT ≥ 4	DPT 3	DPT 1-2	DPT 0		Smallpox Ever	Smallpox Never	Smallpox Last Year
1-4	61.2	13.6	24.9		37.9	28.8	11.3	19.1		43.8	54.0	12.1
5-9	74.8	10.1	14.4		63.4	18.4	4.2	9.9		80.1	18.4	15.4
10-14	77.5	8.7	13.7		66.2	15.4	2.6	9.7		88.3	11.2	6.5
15-19	65.5	10.9	23.5		-	-	-	-		87.0	12.4	4.2
20-29	52.1	12.5	33.6		-	-	-	-		87.0	11.6	4.4
30-39	61.2	9.7	28.4		-	-	-	-		86.3	12.3	2.0
40-49	53.2	10.6	35.1		-	-	-	-		79.2	19.3	2.2
50-64	-	-	-		-	-	-	-		63.6	34.0	1.4
≥ 65	-	-	-		-	-	-	-		52.3	45.5	0.6
Total 1-49	63.5	10.8	25.0	Total 1-14	57.1	20.3	5.7	12.5	Total ≥ 1	75.0	23.4	5.3
	with 1 or more:				with 1 or more:					ever vaccinated:		
<1 yr.	33.6				54.2					6.1		

Table 24. con't. -- Percent of Persons by Age Groups with Specified Number of Doses OPV, DPT, and Smallpox in each Geographic Division - United States, 1964

G. West South Central

Age Group	OPV			DPT				Smallpox		
	3	1-2	0	≥ 4	3	1-2	0	Ever	Never	Last Year
1-4	57.9	16.4	24.9	41.2	26.4	9.0	19.6	38.0	59.8	14.9
5-9	73.5	13.3	12.9	68.8	13.0	6.3	8.9	82.6	16.7	22.3
10-14	74.1	12.7	12.8	66.7	13.9	4.2	8.8	90.3	9.1	9.8
15-19	65.6	15.1	18.2	-	-	-	-	92.5	6.8	9.1
20-29	52.7	20.3	25.6	-	-	-	-	90.6	7.8	5.5
30-39	59.4	19.8	19.9	-	-	-	-	88.3	10.7	4.4
40-49	55.3	16.8	26.3	-	-	-	-	87.7	11.0	4.4
50-64	-	-	-	-	-	-	-	71.5	26.9	2.3
≥ 65	-	-	-	-	-	-	-	63.5	34.7	1.1
Total 1-49	62.2	16.5	20.3	Total 1-14 59.6	17.5	6.4	12.2	Total ≥ 1 78.9	19.8	7.7
	with 1 or more:			with 1 or more:				ever vaccinated:		
<1 yr.	29.0			51.3				5.6		

H. Mountain

Age Group	OPV			DPT				Smallpox		
	3	1-2	0	≥ 4	3	1-2	0	Ever	Never	Last Year
1-4	59.9	14.1	25.7	30.1	43.6	13.2	13.0	59.1	38.2	22.2
5-9	75.8	9.8	14.0	55.8	30.8	6.0	6.1	86.3	12.2	23.2
10-14	77.3	8.4	13.8	65.1	21.4	5.2	4.7	92.8	6.1	18.5
15-19	67.3	12.9	18.8	-	-	-	-	93.8	4.5	13.3
20-29	59.6	13.1	26.2	-	-	-	-	93.6	5.2	7.4
30-39	65.2	11.4	23.3	-	-	-	-	92.8	6.9	4.1
40-49	59.9	12.0	26.5	-	-	-	-	91.0	7.5	3.7
50-64	-	-	-	-	-	-	-	79.3	18.0	5.1
≥ 65	-	-	-	-	-	-	-	72.8	23.4	1.0
Total 1-49	66.1	11.7	21.4	Total 1-14 50.5	31.9	8.0	7.9	Total ≥ 1 85.3	13.0	11.2
	with 1 or more:			with 1 or more:				ever vaccinated:		
<1 yr.	33.1			62.1				15.9		

Table 24. con't. -- Percent of Persons by Age Groups with Specified Number of Doses OPV, DPT, and Smallpox in each Geographic Division - United States, 1964

I. Pacific

Age Group	OPV				DPT					Smallpox		
	3	1-2	0		≥ 4	3	1-2	0		Ever	Never	Last Year
1-4	50.9	17.5	31.0		37.4	39.3	11.6	7.2		74.5	24.0	25.7
5-9	60.4	14.6	24.4		68.5	18.2	6.3	3.7		90.4	8.2	21.9
10-14	60.8	14.3	23.9		73.9	11.3	4.3	3.8		93.2	5.2	14.8
15-19	55.5	13.5	30.0		-	-	-	-		95.7	3.5	11.4
20-29	39.9	16.5	40.8		-	-	-	-		93.6	4.2	7.0
30-39	46.4	16.4	35.8		-	-	-	-		93.5	4.4	5.6
40-49	40.8	15.8	41.7		-	-	-	-		91.7	6.5	4.8
50-64	-	-	-		-	-	-	-		83.9	14.3	4.9
≥ 65	-	-	-		-	-	-	-		78.0	20.2	2.4
Total 1-49	49.7	15.6	33.2	Total 1-14	60.7	22.5	7.3	4.8	Total ≥ 1	88.7	9.6	10.5
<1 yr.	with 1 or more: 40.8				with 1 or more: 74.1					ever vaccinated: 28.2		

Table 25. Percent of Persons Over 15 Years of Age Receiving Influenza Vaccine in Past 12 Months by Geographic Division and Age Groups United States, 1964

Age Group	New Eng.	Mid. Atl.	E.N. Cent.	W.N. Cent.	So. Atl.	E.S. Cent.	W.S. Cent.	Mtn.	Pac.
15-24	9.5	10.2	10.5	8.4	14.0	7.9	11.1	9.5	11.6
25-44	12.2	11.9	12.3	9.0	15.6	12.0	15.4	13.0	12.7
45-64	14.3	14.6	16.2	14.4	18.7	12.7	17.0	16.6	16.3
≥ 65	11.6	15.0	17.8	17.4	16.1	14.7	23.7	21.0	19.1
≥ 15	12.2	12.8	13.8	11.8	16.2	11.6	16.0	13.9	14.2

Tables 26-27

Section G. Standard Errors of the Estimated Percentages Computed by the Bureau of the Census

The standard errors presented in Tables 26 and 27 provide an indication of the order of magnitude of the standard errors rather than precise values for any specific item. In order to derive standard errors that would be applicable to the wide variety of items and could be prepared at moderate cost, a number of approximations were required.

Table 26. Standard Error of the Estimated Percentage

(A) Of Persons who Received Oral Poliovaccine

(68 Chances out of 100)

Estimated Percentage	Base of Percentage (000)							
	500	1,000	2,500	5,000	10,000	25,000	50,000	100,000
2 or 98	1.1	.8	.5	.3	.2	.2	.1	.1
5 or 95	1.7	1.2	.8	.5	.4	.2	.2	.1
10 or 90	2.3	1.6	1.0	.7	.5	.3	.2	.2
25 or 75	3.3	2.4	1.5	1.1	.7	.5	.3	.2
50	3.9	2.7	1.7	1.2	.9	.5	.4	.3

(B) Of Persons who Received Inactivated Poliovaccine; and of Persons who Received DPT Immunizations

(68 Chances out of 100)

Estimated Percentage	Base of Percentage (000)							
	500	1,000	2,500	5,000	10,000	25,000	50,000	100,000
2 or 98	1.4	1.0	.6	.4	.3	.2	.1	.1
5 or 95	2.1	1.5	1.0	.7	.5	.3	.2	.2
10 or 90	3.0	2.1	1.3	.9	.7	.4	.3	.2
25 or 75	4.3	3.0	1.9	1.4	1.0	.6	.4	.3
50	4.9	3.5	2.2	1.6	1.1	.7	.5	.3

(C) Of Persons who Received both Oral and Inactivated Poliovaccine

(68 Chances out of 100)

Estimated Percentage	Base of Percentage (000)						
	250	500	1,000	2,500	5,000	10,000	25,000
2 or 98	1.7	1.2	.9	.6	.4	.3	.2
5 or 95	2.7	1.9	1.4	.9	.6	.4	.3
10 or 90	3.7	2.6	1.9	1.2	.8	.6	.4
25 or 75	5.4	3.8	2.7	1.7	1.2	.9	.5
50	6.2	4.4	3.1	2.0	1.4	1.0	.6

Table 27. Standard Error of Level of Estimates of the Number of Persons Immunized by Type of Immunization

(68 Chances out of 100)

Level of Estimate (000)	Standard Error (000)			
	Oral Poliovaccine	Inactivated Poliovaccine; DPT	Inactivated Poliovaccine and OPV	Smallpox Vaccination; Influenza Vaccine
250	27	35	31	29
500	39	49	44	40
1 000	54	69	61	57
2 500	85	109	92	90
5 000	120	152	120	126
10 000	165	210	140	175
25 000	245	305		260
50 000	305	360		330

Illustrations for Use of the Tables of Standard Errors
(All numbers in thousands)

Table 1 shows that 46.8 percent (7,759/16,590) of children in the age group 1-4 had received 3 doses of OPV. Using Table 26 (A), the standard error of 46.8 percent, based on 16,590 children is found by taking 50 percent (in the first column) as approximately equal to 46.8 percent and interpolating between the standard errors, 0.9 and 0.5, given in the body of the table under bases of 10,000 and 25,000 respectively. Taking the interpolated value as 0.7 of a percentage point, the chances are 68 out of 100 that a complete census would have shown a result between 46.1 and 47.5 percent of children age 1-4 with three doses of oral poliovaccine; and 95 chances out of 100 that a census result would have been between 45.4 and 48.2 percent.

The standard error of the number of 1-4 year old children, 7,759, who had received 3 doses of oral poliovaccine can be estimated from Table 27. Referring to this table, the number 7,759 falls between 5,000 and 10,000 in the column "Level of Estimate" so that the standard error of the estimate (second column, Oral Poliovaccine) lies between 165 and 120. By linear interpolation, the standard error of the 7,759 children in the 1-4 year age group who were reported to have 3 doses of OPV is 145 (thousand). The chances are 68 out of 100 that a complete census would have differed by less than or more than 145 thousands; and 95 out of 100 that the difference would have been plus or minus 290 thousands.

Key to all disease surveillance activities are those in each State who serve the function as State epidemiologists. Responsible for the collection, intrepretation and transmission of data and epidemiological information from their individual States, the State epidemiologists perform a most vital role. Their major contributions to the evolution of this report are gratefully acknowledged.

STATE	NAME
Alabama	Dr. W. H. Y. Smith
Alaska	Dr. Thomas R. McGowan
Arizona	Dr. Philip M. Hotchkiss
Arkansas	Dr. Wm. L. Bunch, Jr.
California	Dr. Philip K. Condit
Colorado	Dr. C. S. Mollohan
Connecticut	Dr. James C. Hart
Delaware	Dr. Floyd I. Hudson
D. C.	Dr. John R. Pate
Florida	Dr. E. Charlton Prather
Georgia	Dr. W. J. Murphy
Hawaii	Dr. W. F. Lyons
Idaho	Dr. John A. Mather
Illinois	Dr. Norman J. Rose
Indiana	Dr. A. L. Marshall, Jr.
Iowa	Dr. Ralph H. Heeren
Kansas	Dr. Don E. Wilcox
Kentucky	Dr. William McBeath
Louisiana	Dr. John M. Bruce
Maine	Dr. Dean Fisher
Maryland	Dr. John H. Janney
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Michigan	Dr. George H. Agate
Minnesota	Dr. D. S. Fleming
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Missouri	Dr. E. A. Belden
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New Jersey	Dr. W. J. Dougherty
New Mexico	Dr. H. G. Doran, Jr.
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New York City	Dr. Harold T. Fuerst
North Carolina	Dr. Jacob Koomen
North Dakota	Mr. Kenneth Mosser
Ohio	Dr. Calvin B. Spencer
Oklahoma	Dr. F. R. Hassler
Oregon	Dr. Grant Skinner
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South Dakota	Dr. G. J. Van Heuvelen
Tennessee	Dr. C. B. Tucker
Texas	Dr. Van C. Tipton
Utah	Dr. Elton Newman
Vermont	Dr. Linus J. Leavens
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Washington	Dr. E. A. Ager
West Virginia	Dr. L. A. Dickerson
Wisconsin	Dr. Josef Preizler
Wyoming	Dr. Helen A. Moore