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Maine Department of Health and Welfare

Division of Vital Statistics

Edson K. Labrack

Maine Department of Health and Welfare

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DEAN H. FISHER, M.D.
COMMISSIONER

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Department of Health and Welfare

Paralytic Poliomyelitis Case Rates By Vaccine Status Aroostook County, Maine, 1959

EDSON K. LABRACK, M.P.H.*

When an outbreak of paralytic poliomyelitis occurred in Aroostook County, Maine, in 1959 it seemed desirable to attempt a special analysis to determine what effect inoculations with Salk poliomyelitis vaccine had had on the course of the outbreak.

The Department of Health and Welfare conducted a sample survey in Aroostook County to gather data concerning the extent to which residents of the County had been inoculated with Salk vaccine. This study was described and the findings were presented in an earlier paper.¹

Data obtained in this survey made it possible to estimate poliomyelitis case rates by immunization status during the 1959 paralytic poliomyelitis outbreak in that County and to test certain hypotheses concerning the effect of this Salk vaccine in reducing the risk of contracting paralytic poliomyelitis. Case rates, or morbidity rates, were estimated from morbidity data obtained through the regular morbidity reporting channels of the Department and from estimates of the numbers of persons in the County by vaccine status survey.

MORBIDITY DATA

Since Salk vaccine is presumed to be effective only in reducing the risk of paralytic disease, morbidity data used in the estimation of case rates were limited by removing from consideration any cases with a clinical diagnosis of poliomyelitis, but in which there was no residual paralysis apparent six months or more after the onset of the disease. The age group under 40 years of age was selected for analysis. This resulted in the

elimination of one paralytic case who had received four inoculations with vaccine. Statistical tests indicate that the elimination of this case had no significant effect on study findings. It was necessary to eliminate one other paralytic case since inoculation data concerning that individual was lacking. Laboratory confirmation of diagnoses would add to the precision of case rates. However, results of laboratory tests were not available at the time of analysis. Table 1 shows morbidity data used in the computation of case rates.

TABLE 1
PARALYTIC POLIOMYELITIS CASES BY AGE AND BY
VACCINE STATUS
AROOSTOOK COUNTY, MAINE, 1959

	Number of inoculations with vaccine						
	Total	None	1	2	3 before 1958	3 in 1958 or 1959 ¹	4
Total	49	28	5	5	7	2	2
Under 1	1	—	1	—	—	—	—
1-4	10	7	—	2	1	—	—
5-9	13	7	3	1	2	—	—
10-14	8	2	—	1	3	1	1
15-19	4	1	—	1	1	1	—
20-24	2	2	—	—	—	—	—
25-29	5	4	1	—	—	—	—
30-34	4	4	—	—	—	—	—
35-39	1	1	—	—	—	—	—
40 and over	1	—	—	—	—	—	1

¹ Prior to August 1, 1959.

PARALYTIC POLIOMYELITIS CASE RATES

Paralytic poliomyelitis case rates by vaccine status in Aroostook County show differences which are substantially greater than one would expect to result from chance. Three distinct relationships are apparent: (1)

¹ Labrack, E.: Poliomyelitis immunization status in Aroostook County, Maine, 1959, *J. Maine Med. A.* 51: 169, May, 1960.

*Director, Division of Vital Statistics.

The case rate appears to be related to the number of inoculations with vaccine. (2) The case rate appears to be related to the time elapsed since the last inoculation. (3) The case rate appears to be related to age.

Tables 2 and 3 show the detail of case rate data for persons under 20 and for persons under 40 years of age.

TABLE 2
ESTIMATED POPULATION, PARALYTIC POLIOMYELITIS CASES,
PARALYTIC POLIOMYELITIS CASE RATES BY VACCINE STATUS
PERSONS UNDER 20 YEARS OF AGE
AROOSTOOK COUNTY, MAINE, 1959

Vaccine Status	Estimated Population	Paralytic Poliomyelitis Cases	Case rate per 10,000 Population
No vaccine	8,130	17	20.9
1 inoculation	2,020	4	19.8
2 inoculations	6,080	5	8.2
3 before 1958	7,170	7	9.8
3 in 1958 or 1959	19,260	2	1.0
4 inoculations	4,130	1	2.4

TABLE 3
ESTIMATED POPULATION, PARALYTIC POLIOMYELITIS CASES,
PARALYTIC POLIOMYELITIS CASE RATES BY VACCINE STATUS
PERSONS UNDER 40 YEARS OF AGE
AROOSTOOK COUNTY, MAINE, 1959

Vaccine Status	Estimated Population	Paralytic Poliomyelitis Cases	Case rate per 10,000 Population
No vaccine	18,760	28	14.9
1 inoculation	4,000	5	12.5
2 inoculations	8,650	5	5.8
3 before 1958	9,170	7	7.6
3 in 1958 or 1959	25,130	2	0.8
4 inoculations	5,190	1	2.0

There appear to be three distinct levels in the case rates. (1) The case rate for persons who had received one inoculation with vaccine is not significantly different from the case rate for persons who had received no vaccine. This would seem to indicate that one inoculation gives the recipient no significant protection.

(2) The case rate for persons who had received a series of two inoculations is significantly lower than the case rate for persons who had received no vaccine or only one inoculation. This would seem to indicate that the second inoculation gives the recipient some protection.

(3) The case rate for persons who had received a

series of three inoculations completed in 1958 or during the first seven months of 1959 was significantly lower than the case rate for persons who had received two inoculations. This would seem to indicate that a third inoculation gives significantly improved protection.

(4) The case rate for persons who had received a series of four inoculations was not significantly different from the case rate for persons who had received a third inoculation with vaccine during 1958 or during the first seven months of 1959. This would seem to indicate that the third inoculation confers optimal immunity.

(5) The case rate for persons who had received a third inoculation with vaccine in 1958 or during the first seven months of 1959 was significantly lower than the case rate for persons who had received a third inoculation before 1958. This would seem to indicate that the immunity conferred by a course of three inoculations wanes significantly after about a year and that a booster inoculation is necessary to restore immunity to an optimal level. The number of cases among persons with three inoculations with vaccine during 1958 and 1959 was small and it was not possible to determine from study data the point at which the immunity gained through a series of three inoculations had waned to a significant degree. However, the fact that the case rate was significantly higher among persons who had received a series of three inoculations completed prior to 1958 seems to indicate that immunity has waned significantly by the end of the second year after the completion of the series.

(6) The case rate for all persons under 20 years of age whose immunization level was less than optimal was approximately twice as great as the case rate in the comparable population of persons 20-39 years of age.

SUMMARY AND CONCLUSION

A study of case rates during an outbreak of paralytic poliomyelitis in Aroostook County, Maine, in 1959 confirms the effectiveness of Salk vaccine in reducing the risk of paralytic poliomyelitis. Significant findings of the study indicate that it is probably safe to conclude that persons who have received 2 inoculations from Salk vaccine have some degree of protection against poliomyelitis and that the degree of protection is increased by a third inoculation. The immunity gained by a course of 3 inoculations with Salk vaccine appears to wane after a period of time and booster inoculations are needed to restore immunity to an optimal level.