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III. FACTORS INFLUENCING THE ACCEPTANCE OF ORAL POLIOVIRUS VACCINE¶

The Oral Poliomyelitis Vaccine Program initiated in Middletown, Connecticut in the late fall of 1960,[1] undertook, among other objectives, to determine some of the factors associated with acceptance of vaccination against poliomyelitis. A number of previous studies[2-7] had indicated that information about public knowledge and attitudes is basic to an intelligent approach to the design and operation of public health programs concerned with poliomyelitis vaccination. All of these earlier studies, however, dealt with Salk-type vaccine. The present project presented a unique opportunity to study the community's knowledge of and attitudes to oral vaccine, its knowledge of, attitudes to, and previous acceptance of Salk-type vaccine, and the relationship of these factors to acceptance of oral vaccine.

A committee made up of members of the Yale Department of Epidemiology and Public Health, with representation from the divisions of health education, statistics, public health administration and psychiatry, and with the assistance of a sociologist, was formed to develop a procedure by which this information could be obtained. It was decided that interviewing a random sample of Middletown families before the initiation of the project and after its conclusion would meet the desired objective.

METHODS

Information sought in initial interview. An interview schedule was designed to provide the following data:

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(a) The age, education, and occupation of the parents and the groups (church, civic, fraternal, etc.) to which they belonged.

(b) The age and sex of the children.

(c) The Salk-type vaccine history of each member of the family, including the number of doses received, the date of the last injection, and whether vaccination had been performed by a private physician, the city health department, the school health department, or some other agency.

(d) The extent and source of the parents' information about Salk-type vaccine.

(e) The parents' attitude toward injections of Salk-type vaccine.

(f) The role of each parent in deciding whether the children should receive such injections, and the reasons, including influences outside the family, which led to the decision. The role of each parent in making decisions about obtaining general medical care for the children.

(g) The parents' beliefs about the efficacy of Salk-type vaccine in the prevention of poliomyelitis.

(h) The extent and source of parents' information about oral poliovirus vaccine. Also, the nature and sources of other health information.

(i) The parents' attitude toward giving oral poliovirus vaccine to those members of the family who had already received injections of the Salk-type vaccine, as well as to those who had not, and the reasons given for these attitudes. Also, whether the parents preferred medication by mouth or by injection for their children.

Consideration was given to limiting questions to those which would provide necessary information, to wording questions so that they could be readily understood, and to making the questionnaire as brief as possible, consistent with the purposes to be achieved.

A pilot study of the questionnaire was conducted by six public health students, each of whom interviewed ten families of different social levels in New Haven. A more extensive trial would have been desirable but could not be undertaken because of time limitations. As a result of the findings of the pilot study, the committee made a final revision of the questionnaire.

Method of sampling. A random sampling of households was drawn from a sample frame provided by the 1961 edition of the Middletown City Directory. Three random numbers were used in identifying the households to be included in the initial stage: the first number referred to the page in the directory, the second to the column on the page, and the third

to the households listed in the column. The exact number of pages in the directory and of columns on a page were known in advance, so that inapplicable numbers were not drawn in these two cases. The number of households per column was variable, however, and, to identify the household, values were drawn at random from 1 to 60, where the upper limit, 60, was an estimate of the lowest value that would not be exceeded in the count of any particular column. If, in the selection of the sample, 55 was drawn for a column which had fewer than 55 households listed, the sequence of three random numbers was rejected and the next group of three numbers was used. The use of these dummy sequences had the effect of ensuring that a household had the same chance of being included in the sample whether it belonged to a column with few entries or with many.

The city directory includes, in addition to dwelling units, places of business. These were listed as drawn, but were subsequently removed from the sample. In the case of multiple dwelling units, the various households were listed separately, and were treated on the same basis as those occupying individual units.

This method of sampling is time-consuming. It is subject to error from incomplete listing of households and it makes extensive demands on the time of the interviewers. On the other hand, it has the advantage of simplicity. Moreover, it leads to a probability sample, the members of which can be cross-classified subsequently according to any criteria on which information is available. For instance, it provides a random sample of families in each of the social classes as well as a random sample of the target population of families. So far as the children are concerned, the method leads to a cluster sample rather than a simple random one. When the standard error of statistics referring to the children was required, (for example, the per cent of children vaccinated) the fact that we were dealing with a cluster sample was taken into account.

It was the original objective of the project to administer oral vaccine to children aged 3 months to 16 years; later this was modified to include those aged 17 and 18 years. The interview sample, however, had already been selected to include only those families with children 16 and under.

By the method of sampling described, 1,700 addresses, roughly 10 per cent of those in all of Middletown, were drawn. Of these, 635 were identified as places of business, leaving 1,065 as the potential interview sample. Further investigation (by means of telephone calls) eliminated a few more as business sites, vacant residences, or homes without children in the specified age group. The remainder were all visited by interviewers who, as they proceeded, eliminated additional unsuitable addresses. Of the poten-

tial interview sample of 1,065, 24 proved to be business addresses, 70 were vacancies, and 552 families did not have children in the desired age group. This left 419 families of whom 415 were interviewed.

Preparation of interviewers. The time available for interviews was short since the administration of vaccine was scheduled to begin by the end of January in order to complete the program well before the onset of the local poliomyelitis season in late May. Therefore, it was necessary to use a large number of interviewers, despite the additional variation which this course introduced. The interviewers, a task force of 30, were all graduate students enrolled in the Department of Epidemiology and Public Health of the Yale School of Medicine.

Two days were set aside for a series of lectures and discussions to prepare students for interviewing. Poliomyelitis and its prevention, including previous experience with both Salk-type vaccine and oral vaccine, were discussed. The Director of Health in Middletown described that city, the characteristics of its population, and the organization of its public health activities. A psychiatrist and a sociologist devoted one session to a consideration of interviewing techniques. The final session interpreted the purposes of the interviews and discussed the information to be obtained, question by question. The students were also given a mimeographed statement called, "Suggestions for Interviewer—Middletown Survey," which summarized important aspects of interview procedures and clarified the meaning and significance of certain questions.

The preparatory sessions ended with the distribution to students of the names and addresses of families whom they were to interview. These had previously been arranged so that all the homes to be visited by each student were in the same area. Each student was also given a street map.

Conduct of interviews. Five days (the 12th to the 16th December 1960) were set aside for the home interviews, in the hope that information could be obtained about the original sample of selected families during that period of time. Bad weather prevented the achievement of this goal. A heavy snowstorm the first day necessitated the cancellation of all interviews. Similarly, inclement weather caused cancellations of activities on the fifth day. In the remaining three days, despite severe cold and icy roads, more than 800 homes were visited and 358 interviews of families with children were completed.

Since interviews with all families were not completed during the week of December 12 as planned, it was necessary to enlist the help of a few students in a "clean-up" program. These students returned to Middletown during subsequent weeks and visited all families in the sample from whom

information had not previously been obtained. The last interview was finally completed during the first week of January.

With few exceptions, interviewers were courteously received. They introduced themselves as representatives of the Middeltown Health Department, explained the purpose of their visit, and then obtained answers to the questions included in the interview schedule. In many instances, parents continued talking about poliomyelitis, poliomyelitis vaccine and other public health topics after the interviewer had obtained the information required.

As a result of the cooperative attitude of Middletown parents and the persistence of those involved in revisiting families not at home at the first call, information was eventually obtained from 415 of the possible 419 families; only four families refused to be interviewed.

Coding the interview data. The limited time available for the planning and conduct of the survey made it necessary to develop a code for the interview data at the same time that the students were in the field collecting information. Thus, the students were deprived of the opportunity of knowing how answers would be classified and coded and of using this knowledge to elicit and record answers which would present no ambiguity to the coder. As a result, some of the material in the interview records could not be classified in as discriminating a manner as might have been desired. Nevertheless, most of the data obtained were sharply enough defined to present no difficulty in coding or analysis.

Because some of the data gathered in the survey could conceivably be helpful in designing the program of health education planned for the two-week period immediately preceding the start of vaccination, the first 358 interview schedules were rapidly coded by a small group of faculty and students. Data were punched on IBM cards and preliminary tabulations and analyses were made. After all the interviews had been obtained the remaining data were incorporated into the tabulations and analyses.

RESULTS

I. *Analysis of interview data.*

Distribution of population sample by social class. Families in the study were divided into five social classes on the basis of a two-factor scale using education and occupation of the family head according to the method developed by Hollingshead[3] (Table 1). In the Hollingshead scale class I is the highest social class and class V, the lowest. It should be noted that almost half the families were in class IV and one-quarter in class V. The

unusual slight excess of class I over class II families may be caused by the existence of a University (Wesleyan) in this rather small city.

All tabulations of the data were made for each social class separately, but classes I and II were combined because of the small numbers in each.

TABLE 1. NUMBER AND PER CENT OF FAMILIES IN EACH SOCIAL CLASS: RANDOM SAMPLE OF MIDDLETOWN FAMILIES WITH CHILDREN UNDER 16 YEARS

Social class (Hollingshead scale)	*Number of families*	*Per cent of families*
I	25	6
II	20	5
III	76	18
IV	199	48
V	95	23
All classes	415	100

TABLE 2. INJECTIONS OF SALK-TYPE VACCINE RECEIVED BY MOTHERS, NUMBER AND PER CENT, BY SOCIAL CLASS

Number of injections	*All classes*		*Social class*							
			I & II		*III*		*IV*		*V*	
	No.	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*
1-2	58	14	4	9	6	8	36	18	12	13
3 or more	224	54	36	80	50	66	102	51	36	38
No injections	111	27	4	9	17	22	51	26	39	41
No information	22	5	1	2	3	4	10	5	8	9
Total in sample	415	100	45	100	76	100	199	100	95	100

Salk-type vaccine history. Tables 2 through 6 indicate the number of doses of Salk-type vaccine previously received by parents and children, according to social class. Of the mothers (Table 2) 54 per cent had received three or more injections of vaccine. Almost 80 per cent of those who had received any injections at all had completed the course of three doses. The percentage in this category varied with social class from 80 per cent in classes I and II to 38 per cent in class V. Private physicians had

administered the vaccine to the majority (81 per cent); this was true of a significantly smaller percentage of class V (66%) than of all other mothers.

A significantly lower number of fathers than of mothers (35% as compared with 54%) had received three or more injections of poliovirus

TABLE 3. INJECTIONS OF SALK-TYPE VACCINE RECEIVED BY FATHERS, NUMBER AND PER CENT, BY SOCIAL CLASS

			Social class							
	All classes		I & II		III		IV		V	
Number of injections	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
1-2	41	10	4	9	11	15	21	10	5	5
3 or more	145	35	32	71	35	46	63	32	15	16
No injections	186	45	4	9	29	38	96	48	57	60
No information	43	10	5	11	1	1	19	10	18	19
Total in sample	415	100	45	100	76	100	199	100	95	100

TABLE 4. INJECTIONS OF SALK-TYPE VACCINE RECEIVED BY CHILDREN, NUMBER AND PER CENT, BY SOCIAL CLASS

			Social class							
	All classes		I & II		III		IV		V	
Number of injections	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
0	48	5	3	3	4	2	20	5	21	10
1-2	74	8	3	3	10	6	34	8	27	12
3 or more	776	87	91	94	158	92	361	87	166	78
Total	898	100	97	100	172	100	415	100	214	100

vaccine (Table 3). This difference was also significant in each of the social classes except classes I and II combined.

Table 4 deals with the Salk-type vaccine history of combined school and preschool children. Eighty-seven per cent had received three or more doses; only five per cent had been given none at all. The percentage with three or more injections decreased class by class from a high of 94 per cent in classes I and II, but even in class V, 78 per cent of the children had received three or more injections of Salk-type vaccine.

A comparison was made between the Salk-type vaccine experience of preschool children (aged 0 through 4) and school children (aged 5 through 14 years). Seventy-five per cent of the preschoolers (Table 5) as compared with 93 per cent of the school-aged children (Table 6) had received three

TABLE 5. INJECTIONS OF SALK-TYPE VACCINE RECEIVED BY PRESCHOOL CHILDREN AGED 0-4, NUMBER AND PER CENT, BY SOCIAL CLASS

Number of injections	All classes		Social class I & II		III		IV		V	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
0	29	9	3	6	1	2	12	8	13	16
1-2	51	16	3	7	9	17	23	16	16	20
3 or more	245	75	41	87	44	81	109	76	51	64
Total	325	100	47	100	54	100	144	100	80	100

TABLE 6. INJECTIONS OF SALK-TYPE VACCINE RECEIVED BY CHILDREN AGED 5-14, NUMBER AND PER CENT, BY SOCIAL CLASS

Number of injections	All classes		Social class I & II		III		IV		V	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
0	17	3	0	..	3	3	6	2	8	7
1-2	21	4	0	..	1	1	11	5	9	7
3 or more	496	93	49	100	106	96	235	93	106	86
Total	534	100	49	100	110	100	252	100	123	100

or more injections of poliovirus vaccine; the observed difference is statistically significant.

Protection of preschool children with three or more injections of Salk-type vaccine varied significantly by social class in much the same fashion as it did for all children: 87 per cent of preschoolers in classes I and II as compared with 64 per cent in class V had received at least three doses. Social class differences in the percentage of school children aged 5 through 14 years vaccinated with three or more injections were smaller and not

statistically significant, although they tended to assume the pattern observed for preschool children.

Seventy-eight per cent of all children vaccinated had received their injections from private physicians and an additional five per cent from private physicians and some other source. As was to be expected, more in class I and II (94%) than in class V (59%) had been vaccinated by private physicians only. The school clinic played an important role for class V children, accounting for 20 per cent of all vaccinated in this group.

Families' source of information concerning Salk-type vaccine. It would have been desirable to determine the source of information about the Salk-type vaccine. However, it was apparent that the answers to such a question, which depended upon recall over a period of up to six years, would have very little reliability. The question was therefore limited to sources of recent information, with the realization that these findings did not necessarily hold true for previous periods. More than half of the families were aware of no recent information about the Salk-type vaccine. There was no significant difference here among the social classes. For those who had obtained recent information, newspapers or magazines were the major source and radio or television, important secondary ones. A significantly higher proportion of class V than of class I and II families obtained information from the latter media of mass communication.

Reasons for use of Salk-type vaccine. In two-thirds of the families, husband and wife jointly made the decision about vaccination for the children, while the mother alone took the responsibility in almost one-quarter of the families. The mother was the sole maker of the decision more frequently in class V than in class I and II families.

The great majority of the families interviewed (75%) gave as a reason for utilization of the Salk-type vaccine, their belief in the ability of the injections to protect against paralytic poliomyelitis. Only one per cent considered injection of the Salk-type vaccine unsafe or ineffective.

The relative importance of the private physician and the school in affecting family decisions regarding vaccination varied according to social class. The physician influenced a significantly higher per cent in classes I and II than in class V. The school, on the other hand, was of particular importance to class V families, one-fifth of whom stated that it was an influencing factor. However, 87 per cent of the class V families whose children had been vaccinated (and even higher percentages of those in other social classes) indicated that their children would have received the injections even if the school had not required them by local regulation.

Families' source of information regarding oral poliovirus vaccine. In contrast to the results given above for Salk-type vaccine, almost three-quarters of the families reported that they had recently acquired information about oral poliovirus vaccine. Again, printed mass media of communication

TABLE 7. RESPONSE TO QUERY, "SHOULD MEMBERS OF THE FAMILY WHO HAVE RECEIVED INJECTION OF SALK-TYPE VACCINE ALSO RECEIVE ORAL VACCINE?" NUMBER AND PER CENT, BY SOCIAL CLASS

			Social class							
	All classes		I & II		III		IV		V	
Response	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Unqualified yes	38		4		6		17		11	
Yes, if safe and/or effective	68		5		13		33		17	
Yes, if physician recommends	95		11		23		49		12	
Yes, for other reasons	93		12		11		41		29	
Total "Yes"	294	71	32	71	53	70	140	70	69	73
No, unsafe and/or ineffective	1		0		1		0		0	
No, no further protection needed	12		3		1		7		1	
No, for other reasons	18		2		5		6		5	
Total "No"	31	7	5	11	7	9	13	7	6	6
Not sure	90	22	8	18	16	21	46	23	20	21
Total in sample	415	100	45	100	76	100	199	100	95	100

were the most frequent source, with radio and television a rather poor second. A significantly higher proportion of upper than of lower class families had obtained recent information about oral vaccine. About half of the class V families had neither read nor heard anything about it as compared with only two per cent of the families in classes I and II. Most of this difference can be accounted for by the fact that only 29 per cent of

class V families, in contrast to 80 per cent of those in classes I and II, had read about oral vaccine in newspapers or magazines.

Attitudes toward oral vaccination for those who had already received Salk-type vaccine. Seventy-one per cent of the respondents felt that members

TABLE 8. RESPONSE TO QUERY, "SHOULD MEMBERS OF FAMILY WHO DID NOT RECEIVE SALK-TYPE VACCINE RECEIVE ORAL VACCINE," NUMBER AND PER CENT, BY SOCIAL CLASS

			Social class							
	All classes		I & II		III		IV		V	
Response	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
Unqualified yes	45		3		7		23		12	
Yes, if safe and/or effective	18		1		1		11		5	
Yes, if physician recommends	24		1		5		14		4	
Yes, other reasons	71		5		12		38		16	
Total "Yes"	158	67	10	72	25	67	86	70	37	59
No, unsafe and/or ineffective	1		0		0		0		1	
No, other reasons	39		2		8		16		13	
Total "No"	40	17	2	14	8	22	16	13	14	22
Not sure	39	16	2	14	4	11	21	17	12	19
Total response	237	100	14	100	37	100	123	100	63	100
Does not apply	121		25		27		55		14	
No response	57		6		12		21		18	
Total	415		45		76		199		95	

of the family who had received injections of the Salk-type vaccine should also receive oral vaccine, while 22 per cent were not sure (Table 7). This favorable attitude was found equally in all classes. It is worthy of note that even in class V, in which only half the families had heard or read anything about the oral form, 73 per cent were either in favor of it unqualifiedly, or ready to be convinced by their physicians or others to give it to those

members of their families who had already been vaccinated with Salk-type vaccine.

As can be seen from Table 8, almost the same percentage of families felt that members who had *not* received injections should receive oral vaccine. A comparison of this table with the preceding one, however, reveals 17 per cent of families averse to oral vaccine for family members who had not had injections as compared with seven per cent averse to it for those who *had* received Salk vaccine. This finding may indicate that the "hard core" group and therefore the most difficult to motivate to take oral poliovirus vaccination is to be found among those who failed to take Salk-type vaccine.

Preferences for oral or injected medications. The respondents in 40 per cent of the families had no preference about giving medication by mouth or by injection to their children. In the remaining 60 per cent three out of four preferred orally administered to injected medication.

Membership of families in various organizations. Finally, in order to determine the potential for using small groups in educating the public toward oral vaccination, a question was asked about group membership. One-third of all families belonged to no organizations of any kind. Class V, the class least informed about oral vaccine through mass media, was also the one with the lowest membership in groups. Forty-two per cent of class V families did not belong to any kind of organization.

II. *Results of re-interview.*

The original sample was re-interviewed by the same group of public-health students in April 1961, at the conclusion of the vaccination campaign. Of the 415 families from whom information had been obtained in December and January, 408 were visited again. Failure to reach the other seven families was most frequently due to their having moved out of the city.

The re-interview schedule was developed by the authors and the public-health students as a class exercise. The questions were designed to determine the extent of the children's participation in the oral vaccine program, as well as the factors influencing the parents' attitudes and decisions.

It should be pointed out that as part of the oral vaccination program an intensive campaign of information and education was conducted early in 1961, using primarily mass media of communication. This aspect is more fully described in another paper in this series.[8]

Acceptance of oral vaccine. The re-interviewed families had a total of 887 children who were under 16 years of age. Ninety per cent of these

TABLE 9. ORAL POLIOVIRUS VACCINE RECEIVED BY CHILDREN UNDER 16, NUMBER AND PER CENT, BY SOCIAL CLASS, AND PREVIOUS SALK-TYPE VACCINATION

Salk-type and oral vaccine status	*All classes*		*Social class*							
			I & II		*III*		*IV*		*V*	
	No.	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*
No Salk-type vaccine previously										
No oral vaccine	20	43	1	33	4	100	8	40	7	37
1 dose oral vaccine	0	..	0	..	0	..	0	..	0	..
2 doses oral vaccine	26	57	2	67	0	..	12	60	12	63
Total	46	100	3	100	4	100	20	100	19	100
1 or 2 injections Salk-type vaccine previously										
No oral vaccine	8	11	0	..	2	20	3	9	3	12
1 dose oral vaccine	0	..	0	..	0	..	0	..	0	..
2 doses oral vaccine	62	89	3	100	8	80	30	91	21	88
Total	70	100	3	100	10	100	33	100	24	100
3 or more injections Salk-type vaccine previously										
No oral vaccine	53	7	10	11	8	5	11	3	24	15
1 dose oral vaccine	6	1	2	2	1	1	1	*	2	1
2 doses oral vaccine	712	92	79	87	148	94	347	97	138	84
Total	771	100	91	100	157	100	359	100	164	100
Total sample children										
No oral vaccine	81	9	11	11	14	8	22	5	34	16
1 dose oral vaccine	6	1	2	2	1	1	1	*	2	1
2 doses oral vaccine	800	90	84	87	156	91	389	95	171	83
Total	887	100	97	100	171	100	412	100	207	100

* Less than 1 per cent.

children had received two doses of oral vaccine* and an additional one per cent had received one dose only (Table 9).

There was a significant difference in participation in the oral vaccination program among those who had not had any Salk-type vaccine previously and those who had, regardless of the number of injections. Whereas 93 per cent (780 out of 841) of those children who had had one or more injections of Salk-type vaccine participated in the oral vaccination program, only 57 per cent (26 out of 46) of those who had had no Salk-type vaccine took the oral vaccine. This was not unanticipated, since the prediction was made on the basis of the findings of the first interview that families who had not taken advantage of Salk-type vaccine might tend to constitute a "hard core" group. Only three per cent of children in classes I and II had not had any Salk-type vaccine previously, as compared with nine per cent in class V, a significant difference.

Social class differences in acceptance of oral vaccination could not be shown for the relatively small numbers who had had fewer than three injections of Salk-type vaccine. Among those who had had three or more injections, however, the extent of class V participation in the oral vaccine program was almost the same as that for classes I and II, but lower than that of classes III and IV. No ready explanation can be offered either for the similarity between the lowest and the highest social classes or for the difference between those and the two middle classes. However, one can question the practical significance of the difference between 94 per cent and 84 per cent, the rate of immunization with two doses of oral vaccine for the middle and lowest classes respectively.

Ninety-four per cent of school children aged 5 through 14 and 84 per cent of children aged 0-4 years received both doses of oral vaccine (Tables 10 and 11). Among the preschool children, immunization with two doses of oral vaccine tended to be lower in class V families than in other families. Thus, among those who had previously had three or more injections of Salk-type vaccine, 65 per cent of class V children and 90 to 93 per cent of children in the other classes were fully immunized with oral vaccine. This social-class difference did not hold for the 5 through 14 year olds, as the lowest percentage (84) with full immunization was found in classes I and II.

Regardless of social class, a high proportion of families whose children received oral vaccine gave as their reason for participation in the program the added protection that the vaccine would afford. Roughly one-third of

* The first dose contained type I and the second dose, types II and III vaccine combined.

TABLE 10. ORAL VACCINE RECEIVED BY CHILDREN AGED 0-4,* NUMBER AND PER CENT, BY SOCIAL CLASS AND PREVIOUS SALK-TYPE VACCINATION

Salk-type and oral vaccine status	*All classes*		*Social class*							
			I & II		*III*		*IV*		*V*	
	No.	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*
No Salk-type vaccine previously										
No oral vaccine	12	44	1	33	1	100	5	42	5	45
1 dose oral vaccine	0	..	0	..	0	..	0	..	0	..
2 doses oral vaccine	15	56	2	67	0	..	7	58	6	55
Total	27	100	3	100	1	100	12	100	11	100
1 or 2 injections Salk-type vaccine previously										
No oral vaccine	6	12	0	..	2	22	3	13	1	7
1 dose oral vaccine	0	..	0	..	0	..	0	..	0	..
2 doses oral vaccine	44	88	3	100	7	78	20	87	14	93
Total	50	100	3	100	9	100	23	100	15	100
3 or more injections Salk-type vaccine previously										
No oral vaccine	31	13	4	10	4	9	8	7	15	31
1 dose oral vaccine	2	1	0	..	0	..	0	..	2	4
2 doses oral vaccine	208	86	37	90	39	91	100	93	32	65
Total	241	100	41	100	43	100	108	100	49	100
Total children aged 0-4										
No oral vaccine	49	15	5	11	7	13	16	11	21	28
1 dose oral vaccine	2	1	0	..	0	..	0	..	2	3
2 doses oral vaccine	267	84	42	89	46	87	127	89	52	69
Total	318	100	47	100	53	100	143	100	75	100

* Seven children aged 0-4 in families not re-interviewed; 1 in class III; 1 in class IV; and 5 in class V.

TABLE 11. ORAL VACCINE RECEIVED BY CHILDREN AGED 5-14,* NUMBER AND PER CENT, BY SOCIAL CLASS AND PREVIOUS SALK-TYPE VACCINATION

Salk-type and oral vaccine status	All classes		Social class							
			I & II		III		IV		V	
	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent	No.	Per cent
No Salk-type vaccine previously										
No oral vaccine	7	41	0	..	3	100	2	33	2	25
1 dose oral vaccine	0	..	0	..	0	..	0	..	0	..
2 doses oral vaccine	10	59	0	..	0	..	4	67	6	75
Total	17	100	0	..	3	100	6	100	8	100
1 or 2 injections Salk-type vaccine previously										
No oral vaccine	1	6	0	..	0	..	0	..	1	14
1 dose oral vaccine	0	..	0	..	0	..	0	..	0	..
2 doses oral vaccine	17	94	0	..	1	100	10	100	6	86
Total	18	100	0	..	1	100	10	100	7	100
3 or more injections Salk-type vaccine previously										
No oral vaccine	22	4	6	12	4	4	3	1	9	8
1 dose oral vaccine	3	1	2	4	0	..	1	1	0	..
2 doses oral vaccine	470	95	41	84	102	96	230	98	97	92
Total	495	100	49	100	106	100	234	100	106	100
Total children aged 5-14										
No oral vaccine	30	5	6	12	7	6	5	2	12	10
1 dose oral vaccine	3	1	2	4	0	..	1	**	0	..
2 doses oral vaccine	497	94	41	84	103	94	244	98	109	90
Total	530	100	49	100	110	100	250	100	121	100

* There were 4 children aged 5-14 in families not re-interviewed.
** Less than 1 per cent.

TABLE 12. REASON FOR AND INFLUENCING FACTORS IN ACCEPTANCE OF ORAL VACCINE, NUMBER AND PER CENT* OF FAMILIES, BY SOCIAL CLASS

	All classes		*Social class*							
			I & II		*III*		*IV*		*V*	
	No.	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*
No. of families responding	*373*		*40*		*70*		*188*		*75*	
Reason										
None given	17	4	1	2	5	7	8	4	3	4
Added protection	324	87	38	95	58	83	165	88	63	84
Easier, to avoid injection	53	14	7	18	5	7	26	14	15	20
Other	59	16	10	25	8	11	30	16	11	15
Personal influence										
None	119	32	11	28	20	28	62	33	26	35
Physician	132	35	20	50	33	47	58	31	21	28
Interviewer	108	29	10	25	21	30	63	34	14	19
Friend or relative	71	19	9	22	9	13	36	19	17	23
Other	14	4	1	2	2	3	6	3	5	7
Other influence										
None	47	13	4	10	7	10	21	11	15	20
Newspaper	250	67	29	72	45	64	133	71	43	57
School	101	27	6	15	19	27	52	28	24	32
Radio, TV	56	15	4	10	7	10	24	13	21	28
Health Department	49	13	5	12	13	18	23	12	8	11
Publicity "flyers"	7	2	1	2	2	3	4	2	0	..
Other	30	8	5	12	7	10	15	8	3	4

* Per cents add to more than 100, since about 20 per cent of the families gave more than one answer in each category.

these families stated that a physician had influenced their decision, while slightly more than one-quarter said that their decision was influenced by the interviewer. The frequency with which the physician was mentioned decreased, and the frequency with which the school and the radio were mentioned increased, from class I to class V. Among non-personal influences, two-thirds mentioned newspapers; one-fourth, the school; and one-sixth, radio and television. (See Table 12.)

Reasons for failure to take oral vaccine. Eighty-one children in 51 families did not receive oral vaccine. Twenty-nine per cent of these families gave

illness of the child or parent as the reason for their children's failure to participate in the program; 20 per cent, misunderstanding or insufficient information about the program; 18 per cent, inconvenience, such as difficult clinic hours or lack of transportation; 12 per cent felt oral vaccination was unnecessary; and 16 per cent were afraid of it because they felt it was experimental. A number of other reasons were given with lesser frequency.

Eighty per cent of these families decided against oral vaccination without seeking advice from others, while 20 per cent apparently reached their decision after consultation with a physician. Social-class differences could not be demonstrated with the small numbers involved.

Influence of attitudes at first interview on acceptance of oral vaccine. An attempt was made to correlate the parents' attitude toward oral vaccine elicited at the first interview with participation of children in the subsequent program (Inasmuch as the six children who had one dose only of oral vaccine failed to obtain the second dose for reasons unrelated to attitudes, such as convenience, change of residence, etc., these children are included in this discussion with those who received both doses of oral vaccine.) As noted above, 91 per cent of the children received either one or two doses of oral vaccine. Categorization of their participation in the program according to the attitude of the parent (Table 13) reveals that 94 per cent of the children with parents favorable to oral vaccine, 87 per cent whose parents were indefinite, and 76 per cent whose parents expressed unfavorable attitudes, received oral vaccine. Thus only the latter attitude reduced acceptance of the oral vaccine to any extent, and that only in a limited fashion, for in spite of it 76 per cent of the children participated in the program. The rate of participation of children in families with negative attitudes did not vary significantly in classes I through IV, falling within a range of 77 to 93 per cent, but the 48 per cent participation of children in class V families with negative attitudes was significantly lower than that of the remaining classes.

DISCUSSION

A high percentage of the children of Middletown, both school age and preschool, had received three or more injections of Salk-type vaccine before the oral poliovirus vaccine program was initiated. In considering the factors responsible for such high coverage our findings lead us to agree with Glasser[4] that the physician is of key importance in any program aimed at achieving universal poliomyelitis immunization. Middletown physicians played a crucial role in the success of the oral vaccine program through

TABLE 13. ORAL VACCINATION OF CHILDREN, ACCORDING TO PRIOR OPINION OF PARENTS ON COMBINED USE OF SALK-TYPE AND ORAL VACCINE, NUMBER AND PER CENT, BY SOCIAL CLASS

Prior opinion of parent and oral vaccine received by children	*All classes*		*Social class*							
			I & II		*III*		*IV*		*V*	
	No.	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*	*No.*	*Per cent*
Parents favorable; children received:										
No oral vaccine	35	6	8	12	7	6	6	2	14	10
1 dose oral vaccine	5	1	2	3	0	..	1	*	2	1
2 doses oral vaccine	572	93	56	85	107	94	283	98	126	89
Total	612	100	66	100	114	100	290	100	142	100
Parents against; children received:										
No oral vaccine	21	24	1	7	5	23	4	14	11	52
1 dose oral vaccine	0	..	0	..	0	..	0	..	0	..
2 doses oral vaccine	66	76	14	93	17	77	25	86	10	48
Total	87	100	15	100	22	100	29	100	21	100
Parents indefinite; children received:										
No oral vaccine	25	13	2	12	2	6	12	13	9	20
1 dose oral vaccine	1	1	0	..	1	3	0	..	0	..
2 doses oral vaccine	162	86	14	88	32	91	81	87	35	80
Total	188	100	16	100	35	100	93	100	44	100
All attitudes; children received:										
No oral vaccine	81	9	11	11	14	8	22	5	34	16
1 dose oral vaccine	6	1	2	2	1	1	1	*	2	1
2 doses oral vaccine	800	90	84	87	156	91	389	95	171	83
Total	887	100	97	100	171	100	412	100	207	100

* Less than 1 per cent.

their statements in the newspapers and on radio and television as well as by personal advice given to many of their patients.

During the 1961 Middletown program 90 per cent of the children received a complete course of oral poliovirus vaccine over the short period of six weeks. This is approximately the same proportion that had received three or more doses of Salk-type vaccine during all of the preceding six years. The success of the 1961 program can probably be attributed to a number of factors: the personal readiness of the population to accept a new live virus vaccine because of experience with the inactivated type which had been new only six years earlier; the active support of the program by the medical profession of Middletown; an intensive program of information and education through mass media of communication; and the painstaking organization and conduct of the program of vaccine administration.

A direct correlation between high socio-economic status and favorable attitudes toward vaccination with Salk-type vaccine was reported by Clausen, *et al.*[5] and by Deasy[6] in studies of the 1954 field trial. Subsequently, similar observations were made by Merrill, *et al.*[7] in California in 1956, and by Glasser[4] in a national study of poliomyelitis vaccination in 1957. The present study indicates that the same correlation holds for attitudes toward both the Salk-type and the oral vaccine. Compared to the higher groups, fewer children in the lower social classes had received the recommended course of injections of Salk-type vaccine, their families were less well informed about the oral vaccine, and fewer of the preschool children participated in the oral vaccination program. This is far from a new pattern of response; public-health workers have long recognized the importance of reaching the less educated, poorer portions of the population and the difficulties involved therein. In the present study, the need has been documented once more, and the difficulties are pointed up by the findings that families in the lowest social class did not learn about poliomyelitis vaccination as effectively through the mass media of communication as did the upper social classes, nor did they seek the advice of physicians as readily. Rosenstock, *et al.*[8] reach the conclusion from a review of a number of studies of poliomyelitis vaccination and the general problems of communication, that, "The evidence to date suggests that, among the currently unvaccinated, personal readiness to obtain poliomyelitis vaccination is so weak that rather strong social supports may be needed to modify their behavior in the short run. Educating for increased personal readiness can probably be effective only in the long run. Obviously, the use of social forces in urging poliomyelitis vaccination entails working with local groups, often in face-to-face contacts." The circumstances attendant on the Middletown project precluded the organiza-

tion of a drive among small groups and on a personal basis. It is our belief, however, that such a drive is feasible and that the results would warrant the organizational efforts entailed.

In California in 1956, fear of the vaccine was the most frequent single reason given for nonvaccination of children, accounting for about two-thirds of such cases, according to Merrill and his co-workers.[7] Despite the fact that oral poliomyelitis vaccine was also a new vaccine, at least to the American people, fear was a much less significant factor in Middletown in 1961. Eighty-one children in 51 families did not receive oral vaccine. Fear of the vaccine was given as the reason by only 16 per cent of these families. (Conceivably, a number of families who gave no reason for refusing vaccine may also have been motivated by fear.) More frequent reasons given for nonvaccination were illness of parent or child, lack of understanding or misinformation, and inconvenience. Undoubtedly, many of the children who were prevented from obtaining oral vaccination for these reasons could have been vaccinated under a program more adequately geared to meet the needs of these families and their children.

While attitudes prior to the program influenced behavior with regard to oral vaccination to some extent, it is important to stress the observation that 76 per cent of the children in families whose initial attitudes were unfavorable received oral vaccine. Presumably, this unexpectedly favorable performance was the result of the formal mass education and information campaign and its informal satellite effects in the form of more personal influencing factors. Presumably, also, a planned campaign which included the personal approach would have had even more salutary effects on the families with negative attitudes and on those with positive attitudes as well. In any event, this assumption should be put to the test.

The Middletown program was limited to children, who form the main target of any poliomyelitis vaccination program, and therefore throws no light on results that might be expected in an oral immunization program involving adults. Experiences with community-wide projects in Miami, Florida,[9] and elsewhere[10,11] indicate that the responses of the age group 20-40 years have been less satisfactory than among children. However, it remains to be shown to what extent this less favorable response among adults might be nullified by extremely efficient community organization and execution of the program.

SUMMARY

In connection with the 1961 Middletown oral vaccine program a survey was conducted in an attempt to determine some of the factors which might

influence acceptance of this new form of immunization against poliomyelitis. A selected sample of the population consisting of some 415 families with children between the ages of 3 months and 16 years was interviewed before and after the community-wide program. Knowledge and attitudes toward oral vaccine and toward the Salk-type vaccine, as well as the degree of acceptance of the latter, were investigated; the relationships of these factors to acceptance of oral vaccine were evaluated.

The results indicated that the community had been well covered with Salk-type vaccine, 87 and 94 per cent of preschool and school children respectively having received three or more doses. The acceptance of this form of immunization varied directly with social class, but even in the lowest (class V) 78 per cent had been vaccinated. The physician was named as the single most important influencing factor in the parents' decision to have their children receive Salk-type vaccine. This influence, however, diminshed directly with social class.

Knowledge of oral poliovirus vaccine prior to dissemination of information and education preceding the community program was considerably greater among families in the higher social classes than in the lower. Newspapers and magazines were the main source of information, radio and television being of secondary importance. The majority (71%) of families felt that the oral vaccine should be given to their children even though they had already received three or more injections of the inactivated type.

During the oral vaccine program, 90 per cent of children in the families interviewed received two doses, and one per cent, one dose. This high degree of acceptance was based on the parents' belief that the oral vaccine offered added protection. There were no significant differences in responses by social class except for the preschool children: only 69 per cent of those in class V were vaccinated compared to 87 to 89 per cent in other social classes. Newspaper publicity was apparently the most important influence favoring acceptance; other factors were the physician, the interviewer, and the school. The frequency with which the physician was mentioned decreased from class I to V, while the reverse was true of the school as a source of influence.

Nine per cent of children in the study (81 children in 51 families) did not receive oral vaccine, the reasons given being chiefly those of illness of child or parent, misunderstanding or insufficient information, and inconvenience.

Attitudes prior to initiation of the program influenced acceptance to some extent, original unfavorable reactions having a greater inhibitory

effect in class V than in other classes. However, even in families whose initial reaction had been against oral vaccination, 76 per cent of the children received the vaccine.

Among those families whose children had previously received Salk-type vaccine, there was a greater acceptance of oral vaccine (93%), as compared to those (few in number) whose children had been given no injections of inactivated vaccine; only 57 per cent of children in the latter group received oral vaccine. Thus a "hard core" of individuals resistant to both forms was encountered, chiefly in social class V.

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