Cincinnati health officials tell how in 1960 a program to immunize the city's children against poliomyelitis with Sabin oral vaccine was set up and operated.

Oral Poliomyelitis Vaccine Program in Cincinnati

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CINCINNATI was the first concentrated population area in the United States to undertake a communitywide poliomyelitis vaccination program using Sabin oral vaccine. During two 1-week periods in the spring of 1960, 67,634 children aged 3 months through 5 years and 111,127 school-age children received type 1 vaccine. Preschool children received also, at 4-week intervals, type 3 and type 2 vaccines, and school children received type 3 in November 1960 and type 2 in January 1961.

This paper tells in detail how the program was conceived and carried out, with particular attention to publicity methods and vaccine-dispensing procedures.

Outline of the Program

After a sharp drop in poliomyelitis incidence and mortality in 1957 in Cincinnati, cases and deaths showed a decided tendency to rise again. Believing that efforts to persuade people to be vaccinated should be stepped up, the Cincinnati Board of Health, in February 1960, requested a meeting with the Governing Council of the Cincinnati Academy of Medicine to discuss possibilities of a special vaccination program before the 1960 poliomyelitis season. Originally, the intention was to use Salk vaccine, but at the meeting it was suggested that Dr. Albert Sabin might make available enough of his oral vaccine for such a program.

Early in April 1960, Dr. Sabin did, indeed, offer to supply free enough vaccine to carry out a communitywide program. The objective was to seek the maximum acceptance of vaccine among children.

The academy and the board of health agreed to accept Dr. Sabin's offer. Permission to use the vaccine experimentally was granted by the Ohio Department of Health, and plans for the program proceeded. Speed, of course, was imperative, if the vaccine was to be effective during the expected 1960 poliomyelitis season. Certain other factors also had to be considered in planning the program.

According to Dr. Sabin, optimum results are obtained with his vaccine when the three types, each of which gives immunity to a specific type of poliomyelitis, are given separately. If given together the three types tend to interfere with each other. Dr. Sabin recommends a minimum interval of 4 weeks between doses. He considers 6 weeks optimum but says that a longer period is not detrimental.

Also important in scheduling administration of oral vaccine is its seeding effect. The vaccine

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viruses multiply in the intestinal tract and are therefore sometimes transmitted to close family contacts and playmates. In order to avoid interference of one type of virus with another, Dr. Sabin recommends that the entire community be given the same type of vaccine in the shortest possible time.

It was first decided to limit the program to preschool children, giving them type 1, type 3, and type 2, in that order, at 4-week intervals, starting April 24. This schedule allowed for all three doses before the expected poliomyelitis season. Later, a joint decision by school and health officials led to extension of the program to school children, but it was possible to schedule only one round before the close of school.

The vaccine was administered by private physicians and public and private clinics. All services in connection with administering the vaccine were supplied free, and no charge was made to any person receiving the vaccine. Publicity was donated as a community service by businessmen, newspapers, and radio and television stations. Record forms were printed by the Cincinnati Health Department, Children's Hospital, and the Cincinnati Board of Education. Lay volunteers assisted in filling out record forms and in analyzing data. The director of health education for the Cincinnati Health Department was coordinator of all phases of the program.

A total of 181,784 persons were given type 1 vaccine during the week of April 24 (the preschool program) and the week of May 16 (the school program). These included 67,634 children aged 3 months through 5 years, 111,127 school-age children (6 through 18 years), and 3,023 adults. Of the 3,023 adults, 1,268 were hospital and school personnel; the remaining 1,755 were given the vaccine by private physicians.

Persons receiving the vaccine included residents of Cincinnati and those of the three cities located within Cincinnati's boundaries—Norwood, St. Bernard, and Elmwood Place—as well as a number of persons living in nearby parts of Hamilton County. Excluding the children from Hamilton County, the following tabulation indicates what proportion of children in Cincinnati and the three small cities were given the vaccine. The population figures are official estimates supplied by the office of the mayor in each municipality, and the numbers vaccinated are derived from analysis of a sample of the preschool program records plus an actual count of the school children in each jurisdiction receiving the vaccine.

Age group	*Total population*	*Number vaccinated*	*Percent vaccinated*
3 mo.–5 yr	69, 150	50, 726	73. 4
6 mo.–18 yr	118, 500	93, 195	78. 6
Total	187, 650	143, 921	76. 7

Preschool Program

During the preschool week, 76,205 doses of type 1 vaccine were administered, 67,634 to children aged 3 months through 5 years, 5,930 to school-age children, and the remainder to adults. This age breakdown is estimated from analysis of some 48,000 records.

The program began Sunday, April 24, when many private physicians opened their offices to dispense the vaccine. That day and during the rest of the week, a total of 265 private physicians gave 44,074 doses (see table). The Cincinnati Health Department, starting Monday, April 25, gave 26,152 doses of the vaccine at its 4 regular health-center clinics, plus 20 special clinics throughout the city. The special clinics were set up at locations selected by the district nursing supervisors. Also during the week, the health departments in Norwood and St. Bernard, several local hospitals, and the Babies'

Number of persons receiving Sabin oral poliomyelitis vaccine, preschool program, Cincinnati, 1960

Agency administering vaccine	Type 1	Type 3	Type 2
Babies' Milk Fund Association	1, 913	1, 459	1, 030
Hospital clinics	2, 317	1, 666	1, 519
St. Bernard Health Department	289	265	258
Norwood Health Department	1, 460	1, 071	1, 177
Cincinnati Health Department	26, 152	22, 001	20, 222
Private physicians	44, 074	42, 781	39, 167
Total	76, 205	69, 232	63, 373

Milk Fund Association gave vaccine to an additional 5,979 persons.

The second round for preschool children started May 22. During that week, 69,232 persons received type 3 vaccine, 90.8 percent of those who had received type 1. (Only persons who had received type 1 vaccine as shown by their record cards were given types 3 and 2.) Private physicians administered 42,781 doses; the Cincinnati Health Department, 22,001 doses; and the other clinics, 4,450.

In round three, begun June 19, 63,373, or 83.16 percent, of the original 76,205 persons returned for type 2 vaccine.

School Program

The decision to extend the vaccine program to school children was reached in early May, and within 1 week's time, permit slips were printed, distributed to the children, signed by the parents, and returned to the school. Over the weekend of May 13–15, quotas by schools were established, and school clinic schedules were drawn up on the basis of the returned permit slips.

On Monday morning, May 16, teams of public health physicians, private physicians, and public health nurses began giving type 1 vaccine in the public, private, and parochial schools of Cincinnati, Norwood, and St. Bernard. By late Friday of that week, 87,341 doses had been given.

Since some of the type 1 vaccine set aside for Cincinnati proper was not used, Dr. Sabin offered it to the school systems and other health departments in Hamilton County. Another 17,856 school children received the vaccine from these sources.

Type 3 oral vaccine was given to the school children in November 1960, and type 2 in January 1961.

Publicity

The Sabin oral poliovirus vaccine program received more sustained public-service publicity in the newspapers and on television and radio than any other public health event ever to occur in Cincinnati.

As part of the preparation for the program, a volunteer educational committee was formed, consisting of three prominent local advertising men, plus the executive director of the Greater Cincinnati Hospital Council, the acting health commissioner of Cincinnati, the director of health education for the Cincinnati Health Department, and Dr. Sabin. One of its first acts was to send telegrams to all major advertisers in Cincinnati asking them to donate a segment of their paid advertising for publicity on the vaccine program. The response of these businessmen was gratifying.

Feature articles explaining the effects of the Sabin vaccine and emphasizing its safety were published frequently throughout the campaign in the 2 daily newspapers and the 24 weekly newspapers in the area. Similar information was carried on local radio and television programs. Material was supplied by the Cincinnati Health Department, the Greater Cincinnati Hospital Council, and, of primary importance, by Dr. Sabin himself.

Locations, schedules, and telephone numbers of the hospital and health department clinics were published during the preschool program by all newspapers and announced by the radio and television stations as a public service. In the week before the school program, the two daily newspapers printed copies of the permit slips, which parents could fill out, sign, and send to school so that their children could receive the vaccine.

The eye-catching gimmick used in all the announcements about the program was a picture of a spoon, emphasizing that this vaccine could be taken by mouth rather than injected. Daily counts of the number who had received the vaccine were used to show progress of the program. Movies and still pictures taken by staff photographers from the newspapers and television stations showed the clinics in operation.

The various cooperating agencies were flooded with calls for information. At Children's Hospital four extra telephones had to be installed, and workers recruited by the hospital's volunteer office manned the phones continuously from 8 a.m. until late evening. At least 5,000 or 6,000 calls were handled at this hospital alone.

During the last weekend of the preschool type 1 program, a car with a driver and an announcer was dispatched to cruise in the areas

of the city where the response to the program was lowest. At street corners and wherever people were congregated, the car stopped and the men, using a portable voice-gun, announced the program and the locations and hours of the clinics. Also in these areas, buses and cars were operated over the weekend to bring parents and their children to the clinics free of charge. The buses were equipped with loudspeakers, and some had announcers supplied by local radio stations.

A special clinic was held on three Sundays, for the administration of each type of vaccine, on one of the local television programs for children. Not only were several hundred children given the vaccine, but viewers had an opportunity to see that no "needles" were used.

Cincinnati public health nurses prepare and administer a dose of Sabin oral poliomyelitis vaccine at 1 of the 20 special clinics set up for the program.

Record Forms

Two 3″ x 5″ record forms were completed for each person receiving the vaccine, a data form and an appointment slip. Two copies were made of the data form, one for use by the coordinator of the program and the other by the physician or clinic. Only one copy was made of the appointment slip.

Of prime importance on the data card was a place for the parent's signature. No child was given the vaccine unless this card was signed by one of his parents or legal guardian. In the school program, the "data card" was the previously mentioned "permit slip."

The data card also had spaces on one side for the name of the child, his age, his street address, dates or other indication of the number of Salk vaccine inoculations he had received, and the dates of the Sabin vaccine doses. On the other side, space was provided for the age and Salk vaccination status of the father, mother, siblings, and other members of the household. This side of the card was used only in the preschool program.

An analysis of the first 4,000 record cards returned indicated that the age of the other members of the family and the Salk vaccine status of the siblings had not been clearly explained. The data on these questions were therefore of no statistical value and were no longer tabulated.

The appointment slip served two purposes. It advised the parents of the time the child was to receive the next dose of vaccine, and it was a record for the parents of the dates the Sabin vaccine was received.

Volunteer workers filled out these records in each of the clinics and in most of the private physicians' offices. Members of the PTA did this work in the schools.

Clinic Organization and Supply Lines

In the clinics set up by the Cincinnati Health Department, one series of tables was arranged so that the people would report to these tables first. Here volunteer workers filled out the record forms, or when the crowd was large, the parents filled out the forms and the workers checked them. The parents then took the forms to the public health nurses at another series of tables, where the vaccine was dispensed. Eight volunteers writing records were needed to keep one dispensing table operating efficiently.

A physician was present at each clinic as a consultant. No obviously ill child or any child who had had a tonsillectomy within 2 weeks was given the vaccine, but these were the only conditions under which the vaccine was not administered.

A dose of vaccine was given to each child by a public health nurse or a physician. A dose

consisted of two drops of diluted liquid vaccine added to a small amount of simple sugar sirup in a plastic spoon. Plastic squeeze bottles, similar to those used in restaurants for catsup and mustard, were used to put the sirup into the spoon. The spoons were laid in rows on a tray and filled with sirup, two drops of the vaccine were placed on top of the sirup, and the mixture was fed to the child.

There is no danger of an overdose of the vaccine, but accuracy in measuring the drops is important to avoid waste. Holding the medicine dropper perpendicular to the spoon allows about 15 percent more doses from a given quantity of vaccine than holding it at a near horizontal angle. At an angle, surface tension causes the drops to be unnecessarily large.

The vaccine used in the Cincinnati Health Department clinics was stored in city hall in a freezer. Each morning, the staff of the food and sanitation division transported the required amount of vaccine, sirup, and spoons to the day's scheduled clinics. To keep the vaccine cold while it was being transported, it was placed in insulated bags with a cooling agent such as frozen cans of water.

The vaccine was available to any private physician in the city in a quantity sufficient to immunize all his preschool patients. Private physicians obtained their supply directly from Children's Hospital by presenting prescriptions for the desired amounts. They returned their completed record forms to the coordinator at Children's Hospital for tabulation and retrieved them at the time they called for the next dose of vaccine. Each physician supplied his own sugar sirup, and the children brought their spoons from home.

Volunteers count, alphabetize, and tabulate records of the Cincinnati oral poliomyelitis vaccine program.

The vaccine and records for all clinics other than those of the Cincinnati Health Department were distributed similarly.

Statistical Analysis

As no money was available to pay for professional statistical analysis of the data, the work had to be done by volunteers. A sewing room at Children's Hospital was set aside for the project, and all records from the preschool program, except those of the city health department clinics, were delivered there. Volunteers were recruited by the hospital's director of volunteer services from many organizations: Children's Hospital sewing groups and other women's groups, Community Chest, National Foundation, Anti-Tuberculosis League, Withrow Hi-Y, and Girl Scouts.

When the records were received, they were first counted and then alphabetized for each physician and each clinic. The count was necessary because the second and third doses were allocated according to the number of first doses given at each location.

The project coordinator designed a raw data master sheet on which 35 cards could be tabulated by making checkmarks in appropriate squares. Data pulled were age of child receiving the Sabin vaccine, his Salk vaccine status, and the Salk vaccine status of his mother and his father. Constant attention to family name and address was required to insure that the Salk vaccine status of the parents was listed only once for each family represented by more than one child receiving the Sabin vaccine.

The first subtotal sheet consolidated data on 245 children, and the third total sheet, on 6,125 children. The grand total was arrived at on the final sheet. All totals above the first raw data were computed by the coordinator and experienced volunteer tabulators using electric adding machines, with spot verification. The coordinator was present at all work sessions.

The average volunteer could pull raw data at the rate of about 200 records an hour. Three tabulating sessions were held each day, includ-

ing Saturday and Sunday, one in the morning, one in the afternoon, and one in the evening, for 2½ weeks. More than 900 hours of work were put in by the volunteers.

Data on Salk vaccination status were taken from 45,651 of the preschool records. According to these data, 73.4 percent of the children receiving vaccine from private physicians or the hospital clinics had had three or more doses of Salk vaccine. The percentage for all clinics, except the Cincinnati Health Department clinics, was 54.4 percent; for the clinics located in the low-socioeconomic neighborhoods it was 34.4.

Parents were asked only whether or not they had ever received any Salk vaccine. Forty-six percent of 24,231 fathers and 24.5 percent of 24,545 mothers stated that they had not.

At the conclusion of the program, all records, including those from private physicians, health department clinics, hospital clinics, and the schools, are to be analyzed by census tract to determine areas that need further attention.

Evaluation

Cincinnati's oral poliomyelitis vaccine program was, we feel, remarkably successful. With 181,784 persons receiving at least type 1 vaccine, the response of the public exceeded the expectations of all concerned. The return rates for the preschool children of 91 percent for type 3 and 83 percent for type 2 vaccines also were deemed greater than might be expected.

Admittedly, this program was designed to reach the residents of Cincinnati with all the appropriate devices of persuasion and promotion. The "bandwagon" appeal was exploited to the full. The presence of Dr. Sabin in our community had a strong influence in appealing to local pride. The action of private physicians in opening their offices as a public service for the program had inestimable value in gaining public confidence and participation.

Time, however, was against us in this project. There was not sufficient time to administer the same type vaccine simultaneously in both preschool and school groups or to complete the school program before the expected poliomyelitis season. Ideally, the vaccine program should be started about November and completed before the onset of hot weather the next year.

No cause-and-effect relationship between the vaccine program and incidence of poliomyelitis in Cincinnati can be assumed, of course. Nevertheless, it is gratifying to report that no clinically diagnosed cases of the disease occurred in Cincinnati or even in Hamilton County in 1960, especially when contrasted with the 24 cases of paralytic poliomyelitis reported in greater Cincinnati during 1959.

One case of poliomyelitis was reported in the city in 1960, but onset of paralysis occurred only 13 days after the patient, a 25-year-old man, returned to this area from an extended stay in another part of the United States. He had received neither Salk vaccine nor Sabin vaccine, and he was never associated with any child who had received the Sabin vaccine. One case resembling paralytic poliomyelitis was reported in Hamilton County in September 1960, but Dr. Sabin and his staff were unable to isolate any poliovirus or to demonstrate any rise in titer of poliomyelitis antibodies. They have isolated and demonstrated infection with ECHO type 6 virus.