

# An Evaluation of Three Techniques For Improving Immunization Levels in Elementary Schools

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**Abstract:** Three techniques for improving immunization levels among school-age children were tested and then compared for most effective use of school nurses' time. Method A involved reviewing school immunization records, specifically inviting immunization-deficient children to a school-based clinic, with some follow-up to achieve good response. Method B involved sending out permission slips for a school-based clinic to all students without additional investment of nursing time. Method C involved a health edu-

cation program encouraging parents to have their children immunized on their own.

Using an average of 38 hours of school nurse time, Method A succeeded significantly better than Method B in immunizing more immunization-deficient children and raising immunization levels, while giving fewer unnecessary immunizations. Method C did not produce significant improvement of immunization levels. (*Am. J. Public Health* 66:457-460, 1976)

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Immunization is one of the most successful medical procedures yet, despite its availability, significant numbers of children in the United States do not receive adequate immunization protection. The lack of effective systems to deliver immunization, especially in urban areas, is compounded by complacency resulting from low disease prevalence. To rectify immunization deficiencies among schoolage children, many states utilize the "captive population" of elementary schools to conduct school-based immunization programs. Such programs may divert school nursing time from health problems more directly related to learning. The Colorado Department of Health and the Division of Health Services, Denver Public Schools, collaborated in a study to explore these issues.

## Method

Nine elementary schools in the Denver system were selected for the study, three serving high socioeconomic neighborhoods; three serving middle class; and three serving low income areas. Schools in each of the levels were matched for ethnic composition and immunization protection levels. Three different methods to improve immunization levels

were applied. One of the three methods, referred to as A, B, and C, was applied to one school in each of the three different socioeconomic levels. Method A required a complete pre-clinic review of all available school immunization records; those children recorded as immunization-deficient were given notices to take home, listing the child's immunization deficiencies, announcing an immunization clinic, and requesting parents to update the record and to provide signed permission for the needed immunizations. The nurse made up to two follow-up phone calls to those parents delinquent in returning permission slips; all time spent in record reviews and other preparations for the clinic was logged, including any time spent in training of volunteers to do record reviews or tabulations.

Method B required no significant investment of school nursing time beyond preparing for the school-based immunization clinic. Permission slips were sent home to *all* children in the schools requesting parents to specify, and to grant permission for, immunizations to be administered at the clinic. Choice was left entirely to the parents. No time was spent in follow-up of unreturned permission slips.

Method C was a health education program organized by the school nurse. In all three Method C schools, there was an initial distribution to parents of a recommended immunization schedule and a colorful pamphlet. The individual nurses involved students and parent-teacher organizations in various immunization-oriented projects. Immunizations received emphasis in science classes and in school newsletters which were taken home to parents. Method C nurses tabulated the time spent in these activities. Three months after initiation of the program (Method C), a letter was sent to each

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parent requesting a list of the immunizations received by the child through public and private means since the health education program began.

Evaluation of results from the three methods did not require additional nurse time. In Methods A and B, immunization records were updated following the clinic and were compared with pre-campaign immunization records. Method C was evaluated by surveying parents as noted above.

Methods B and C, unlike Method A, did not allow for the update of school immunization records by parents at the beginning of the study. Therefore, the pre-clinic baseline school records of Methods B and C were credited with the same percentage increment as that revealed by the parental updating of Method A for a school of the same socioeconomic level.

**Results**

The pre-clinic review of school immunization records in Method A revealed that 65 per cent of children were already adequately immunized (79 per cent, 68 per cent, and 52 per

cent in the high, middle and low socioeconomic schools, respectively). Thus, nurses working with Method A were able to concentrate efforts on a minority of the total enrollments.

Immunization results were tabulated for each school by specific antigen administered (except tetanus-diphtheria which was always administered together and tabulated as one). For each antigen the resulting numbers of immunization-deficient children immunized and the immunization levels achieved were similar when comparing methods: Method A was more successful than Method B which was more successful than Method C; high socioeconomic schools achieved better records than did middle socioeconomic schools which in turn achieved better records than did the low socioeconomic schools.\*

Because of the consistently similar results for all antigens, an average of levels achieved for all four antigens is shown in Tables 1 and 2.

\*The only exception to these generalizations was the high socioeconomic school in Method B in which pre-study immunization levels were very high.

**TABLE 1—Number and Per Cent of Immunization—Deficient Children Receiving Immunizations by Method and Socioeconomic Status (Average of Results With All Antigens)**

Socioeconomic Status	Method A			Method B			Method C		
	High	Middle	Low	High	Middle	Low	High	Middle	Low
Enrollment Number	592	546	748	770	534	418	706	689	633
Deficient Children	139	208	306	51	179	160	112	233	224
Number Immunized	93	160	178	27	37	52	6	3	1
Per cent of Deficient Receiving Immunizations	66.8	76.9	58.2	53.0	21.2	32.7	5.4	1.3	0.4
Average Per cent Immunized by Each Method	67.3			35.6			2.4		

**TABLE 2—Immunization Levels Achieved by Three Immunization Program Methods (Average of Results With All Antigens)**

Socioeconomic Status	Method A			Method B			Method C		
	High	Middle	Low	High	Middle	Low	High	Middle	Low
Level Prior To Program	76.6	61.9	59.1	93.4	66.5	61.7	84.1	66.2	64.6
Level Achieved	92.4	91.2	82.9	96.9	73.4	74.2	85.0	66.6	64.7
Increment in Level	15.8	29.3	23.8	2.5	6.9	12.5	0.9	0.4	0.1

### Number and Percent of Immunization-Deficient Children Immunized

Table 1 shows average immunization results for all three methods in reaching immunization-deficient children. In middle and low socioeconomic neighborhood schools, Method A was significantly more successful than the other techniques: 76.9 per cent of immunization-deficient middle socioeconomic school children and 58.2 per cent of immunization-deficient low socioeconomic school children were immunized as a result of Method A. This contrasted with 21.2 per cent and 32.7 per cent respectively, immunized by Method B, and 1.3 percent and 0.4 per cent respectively, immunized by Method C. Among the high socioeconomic neighborhood schools, where few children remained unprotected, results of Methods A and B were equally good; but Method C, using health education only, made very little impact on immunization-deficient children within the short three-month period of the study, at least as measured in this study.

### Immunization Levels Achieved

Immunization protection levels resulting from Method A were significantly better than those from Method B in the middle and low socioeconomic neighborhood schools (Table 2). With Method A, the average immunization level in the middle socioeconomic school was raised from 61.9 per cent to 91.2 per cent, an increment of 29.3 per cent. Method B resulted in an increment of only 6.9 per cent (66.5 per cent to 73.4 per cent) in the middle socioeconomic level. In the low socioeconomic schools, immunization levels were improved 23.8 per cent by Method A and only 12.5 per cent by Method B.

### Excessive Immunizations

In Method A permission slips were distributed only to those children who were immunization-deficient according to school records; therefore, there were no known duplicate and unnecessary immunizations given with that method. The post-clinic records for Method B indicated that at least one-fifth of all children immunized at the clinic received antigens which were already recorded in pre-clinic school records. Among the very few children in Method C who were reported to have immunizations during the study period, approximately 20 per cent received antigens which were already recorded on school records.

### Nursing Time

A prime objective of the study was the evaluation of the use of nursing time in relation to benefit for immunization-deficient children. Nurses working with Method B, not concerned with review of records or follow-up of permission slips, were assumed to be performing basic functions in clinic preparation also common to Method A. Thus, Method B nurses were not timed in their activities. Table 3 shows the time spent by Method A nurses in record reviews, training of volunteers, and communications to teachers and parents concerning unreturned or incomplete permission slips. The amount of time spent varied widely in the three schools, from 25.5 to 47 hours, with an average of 38 hours. Two of the three Method C nurses monitored time expenditures which were 16.5 hours and 9.0 hours.

The major components of the extra nurse time required in method A were: (1) reviewing school records plus preparing slips to send home (average 18.7 hours per nurse); and (2) follow-up of unreturned permission slips (average also 18.7 hours).

For the purposes of this study, the 38-hour average is taken as the time investment of Method A nurses above and beyond time expended by Method B nurses, but since the latter also had to receive phone inquiries, handle permission slips and perform other tasks in preparation of the clinic, the 38 hours likely represent an overestimate of additional time required by Method A nurses.

### Discussion

Efforts to achieve complete immunization of children with available vaccines are not proving successful. There has not been a substantial change since 1968 in the proportion of pre-school children protected against measles, and polio immunization levels in the same age group have declined by 18 per cent since 1964.<sup>1</sup> Witte has stated the problem succinctly: "The technology of delivering immunization services by public health agencies has not kept pace with the technology of developing new vaccines. Relatively few effective delivery techniques have been developed in the last decade."<sup>2</sup> One special technique which has been used, by no means a new one, is the school-based immunization clinic.

Such clinics, in themselves admissions of pre-school immunization failure, provide access to virtually all of the ele-

TABLE 3—Time Expended in Clinic Preparation By Nurses in Method A Schools

Socioeconomic Status	High	Middle	Low
Enrollment	592	546	748
Review of School Immunization Record, Preparation of Permission Slips To Be Sent Home	16 Hrs. 25 Min.	22 Hrs. 15 Min.	17 Hrs. 30 Min.
Training Volunteers	15 Min.	30 Min.	30 Min.
Handling Returned Slips; Follow-Up Calls	24 Hrs. 20 Min.	24 Hrs. 15 Min.	7 Hrs. 30 Min.
Total	41 Hrs.	47 Hrs.	25 Hrs. 30 Min.

mentary age group, but the appropriation of educational time and school personnel effort must be justified by the results achieved. School-based clinics must be shown effective not in the number of shots given but in the number of shots given specifically to children who are immunization-deficient.

Our study of three methods for promoting immunizations in elementary schools shows that school-based immunization clinics (Methods A and B) reach unprotected children, and achieve more than a health education campaign (Method C). An investment of approximately one week of a school nurse's time in record review, selected parental contact, and a moderate follow-up of permission slips (Method A) caused significantly more children to appear at the clinic than wholesale parental contact and unselected parental contact. Method A resulted in a much larger percentage of immunization-deficient children receiving protection; and it prevented the administration of excessive immunizations.

Method C was evaluated somewhat differently, and parental reporting may have been incomplete. Nevertheless, the results were unsatisfactory for a program which needs immediate correction of low immunization levels, whatever the long range beneficial results of health education may be.

A necessary prerequisite of Method A was the existence of a school immunization record. The records available in schools cooperating with this study were by no means complete and current. Most had been recorded by the school nurse as part of a required first-time school entry interview with parents as much as six years before, but they still provided a useful baseline to eliminate large numbers of children from the target population. Review of school records is prop-

erly not a nursing task, and the time so spent should be reduced to the time necessary to train volunteers and aides. In this study, each Method A nurse had the option of recruiting volunteers (clerical assistance from the school staff was not available) but all three elected to perform most of the work themselves. This was in part because of the "research" nature of the study, but was also because of concern about parent volunteers having access to confidential medical records.

There was no attempt to standardize the activities of the three nurses beyond the chart review itself and the careful measurement of time spent. Thus, the low socioeconomic school nurse, who spent the least time in follow-up, not only had other overriding priorities but also had the least opportunity to reach parents who were working or simply had no telephone.

Nevertheless, it is notable that the clinic results from her school exceeded the results from the matched school of Method B in all respects measured.

In summary, our study suggests that a school immunization record review and limited extra attention to immunization-deficient children by a school nurse will significantly enhance the results of a school-based immunization clinic. Immunization-oriented health education campaigns will not achieve the immediate results of a school-based clinic.

#### REFERENCES

1. Summary of Immunization Status for Polio, DTP, Measles and Rubella, United States. Center for Disease Control. United States Immunization Survey, 1973.
2. Witte, J. J., Recent advances in public health: immunization, Am. J. Public Health 64:939-944, 1974.

#### From an Old Book Plate

*If thou art borrowed by a friend  
Right welcome shall he be  
To read, to study and not to lend,  
But to return to me.*

*Not that imparted knowledge doth  
Diminish learning's store,  
But books I find if often lent  
Return to me no more.*

*Read slowly, pause frequently, think seriously,  
return duly with the corners of the leaves all straight.*