Studies of missed opportunities for immunization in developing and industrialized countries

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Missed opportunities for immunization are an obstacle to raising immunization coverage among children and women of childbearing age. To determine their global magnitude and reasons, studies reported up to July 1991 were reviewed. A standard measure for the prevalence of missed opportunities was calculated for each study. Seventy-nine studies were identified from 45 countries; 18 were population-based, 52 were health-service-based, and 9 were intervention trials. A median of 32% (range, 0–99%) of the children and women of childbearing age who were surveyed had missed opportunities during visits to the health services for immunization or other reasons. Missed opportunities were mainly due to failure to administer simultaneously all vaccines for which a child was eligible; false contraindications; health workers' practices, including not opening a multidose vaccine vial for a small number of persons to avoid vaccine wastage; and logistical problems. To eliminate missed opportunities for immunization, programmes should emphasize routine supervision and periodic in-service training of health workers which would ensure simultaneous immunizations, reinforce information about true contraindications, and improve health workers' practices.

Introduction

Based on information reported to the World Health Organization (WHO) as of September 1992, global immunization coverage for children by their first birthday was 85% for BCG (Bacille Calmette-Guérin) vaccine, 79% for three doses of diphtheria-pertussis-tetanus (DPT) vaccine, 81% for three doses of poliomyelitis vaccine, and 78% for measles vaccine. However, for pregnant women in developing countries, coverage was only 42% for two doses of tetanus toxoid. WHO estimates that in 1991 immunization prevented some 3 million deaths from measles, neonatal tetanus and pertussis, and some 530 000 cases of paralytic poliomyelitis. Additional efforts will be necessary to sustain this progress and to achieve, by the year 2000, the goal of fully immunizing 90% of the world's children by their first birthday. Perhaps the greatest challenge will be to raise the tetanus toxoid coverage of women to the same levels seen for children.

A direct approach to increasing immunization coverage is to provide immunization to all eligible persons at every opportunity. The strategy of immunizing at every opportunity has been recommended by the Global Advisory Group of the WHO Expanded Programme on Immunization (EPI) since 1983 (*1*). Immunizations should be offered at every contact point, including preventive and curative health services. Countries should review national immunization policy and remove excessive contraindications. Children suffering from malnutrition and minor illness are at particular risk for vaccine-preventable diseases and should be immunized.

An opportunity for immunization is missed when a person who is eligible for immunization and who has no contraindication to immunization visits a health service and does not receive all the needed vaccines.

Missed opportunities for immunization occur in two major settings: (1) during visits for immunization and other preventive services (e.g., growth monitoring, nutrition assessments, and oral rehydration training sessions) and (2) during visits for curative services. In both settings, eliminating missed opportunities will raise the overall immunization coverage

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in a population, particularly when the availability and use of health services are high. When the availability and use of health services are low, immunizing at every health care contact is extremely important because the risk for vaccine-preventable diseases is likely to be high in these areas.

Since 1984, EPI has been promoting the use of a standard survey for assessing missed opportunities for immunization. In 1987, when the results from several surveys in developing countries indicated that the majority of children attending curative care facilities were missing opportunities to be immunized, the Global Advisory Group called for more surveys to investigate the magnitude of the problem among children and women of childbearing age and to identify strategies to reduce missed opportunities (*2*).

This review of 79 studies on missed opportunities from 45 countries provides information on their global magnitude, the demographic differences, and the reasons for failure to immunize during visits to the health services. Strategies to reduce missed opportunities are recommended, which emphasize the usefulness of periodic systematic monitoring to evaluate the quality of immunization programme performance at the health service level as well as progress towards reducing missed opportunities.

Methods

Criteria for inclusion of studies

Only studies that assessed missed opportunities for immunization in the EPI target groups (children and women of childbearing age) were included. We reviewed studies reported in the world literature on missed opportunities for immunization or failure to vaccinate and unpublished studies reported to WHO up to July 1991. The review considered only studies that defined a missed opportunity for immunization as any contact with a health service that did not result in an eligible child or woman receiving all the needed vaccines.

Classification by study design

Studies on missed opportunities for immunization were classified in two groups: observational surveys and intervention trials. Observational surveys measure missed opportunities through review of immunization or medical records or interviews with patients, parents or health care providers.

Observational surveys measure the magnitude and the importance of reasons for missed opportunities. They were further classified by the method used to select study participants as (1) population-based surveys and (2) health-service-based surveys. Representative population-based surveys can define the potential gain in immunization coverage achievable (in the total population) through eliminating missed opportunities. In practice, however, such surveys are difficult and expensive to conduct. Health-service-based surveys are more likely to be conducted. They offer the advantage of assessing reasons for missed opportunities in the setting where they occur; thus, specific operational recommendations can be made to the participating health facility.

Intervention trials measure the change in missed opportunities or immunization coverage before and after instituting an intervention to reduce missed opportunities. Intervention trials were further classified as (1) controlled trials with a comparison group in which no intervention was introduced during the study period; and (2) trials with historical controls that compared the occurrence of missed opportunities before the intervention to the occurrence in the same group after the intervention.

Calculating the prevalence of missed opportunities

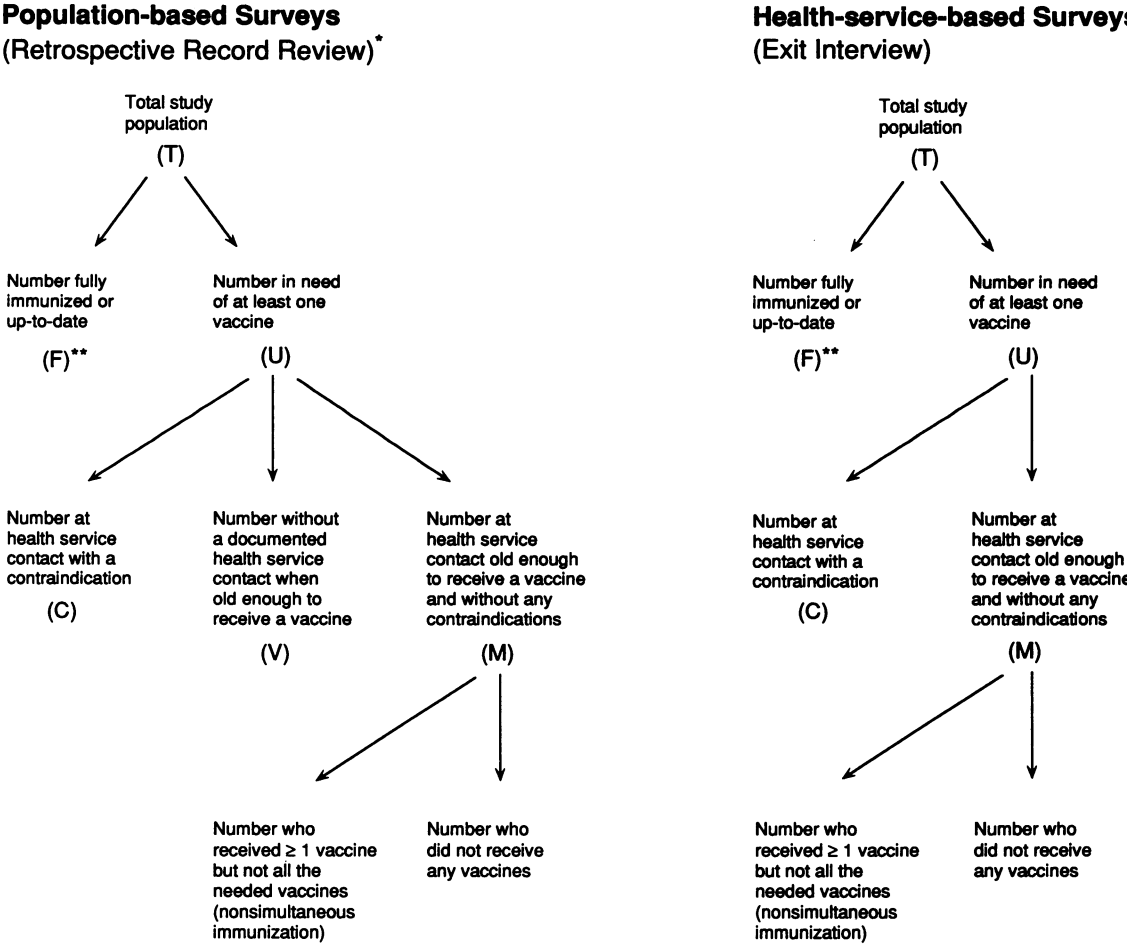
We calculated a standard summary statistic for the prevalence of missed opportunities for each study. When insufficient data were available from the study report, the authors were consulted for additional information. The prevalence of missed opportunities was calculated as the number of persons without a true contraindication to immunization who visited a health care centre and remained not fully immunized or up-to-date (for his/her age) according to the national immunization policy, divided by the total number of persons in the study population.

The method used to calculate the prevalence of missed opportunities is shown in Fig. 1. The total study population (T) was divided in two groups: those who were fully immunized or up-to-date for immunization for their age (F); and those who were not (U). These groups were based on the national immunization schedule in the country where the study was conducted. The number of children or women who missed at least one opportunity for immunization (M) was calculated by subtracting from U the number who had a true contraindication to immunization (C) and the number who were too young to be immunized (V). V was relevant only in population-based surveys or surveys where immunization cards or medical records were reviewed retrospectively.

The following equation was used to calculate the standard estimate of the prevalence of missed opportunities:

$$P1 = (U - V - C / F + U) \times 100, \text{ or}$$
$$P1 = (M / T) \times 100$$

Fig. 1. **Method for calculating missed opportunities** (see text for details).



* Includes health-service-based surveys that conducted retrospective record reviews.

** Up-to-date for age based on the immunization policy of individual countries.

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where $P1$ is the prevalence of persons in the study population who had at least one missed opportunity.

Calculating the inefficiency of health services

We also calculated the prevalence of missed opportunities for persons needing an immunization during the health visit. This statistic measures the inefficiency of the health service in immunizing eligible children and women. It is calculated by the following equation:

$$P2 = (U - V - C \,/\, U - V) \times 100, \text{ or}$$
$$P2 = (M \,/\, U - V) \times 100$$

where $P2$ is the proportion of eligible persons who had one or more missed opportunities.

Classification by reasons for missed opportunities

Reasons for missed opportunities were classified as (1) failure to administer vaccines simultaneously; (2) false contraindications to immunization; (3) negative

health worker attitudes; (4) logistical problems; and (5) refusal by the patient or family. The importance of each reason was measured as the overall prevalence of missed opportunities due to the specific reason. This information indicates the potential gain in coverage that could be achieved if that specific missed opportunity was eliminated.

Results

Types of studies

Seventy-nine studies on missed opportunities were identified from 45 countries.[a] Studies were conducted in each of the six WHO regions (Table 1). Worldwide, nearly one-quarter of all countries completed at least one study. Fifty-nine studies (75%) were conducted in developing countries and 20 (25%) in industrialized countries. Of the 79 missed opportunities studies, 52 (66%) were health-service-based studies, 18 (23%) were population-based studies, and nine (11%) were intervention trials.

Population-based observational surveys. Of the 79 studies reviewed, 18 (23%) were observational surveys that selected the study subjects by using a population-based approach. Thirteen population-based studies were conducted in 12 developing countries. Twelve of the 13 studies used EPI cluster sampling; one studied a village cohort. The EPI 30-cluster survey examines data on the home-based immunization card or child health record—specifically, the date of birth and the dates of immunization. The 30-cluster surveys in the Central African Republic,[b] Guinea (*3*), and Mozambique (*3, 4*) also assessed opportunities missed during health service visits, as the dates of these visits were recorded on the child health card. A total of more than 43 000 children and 22 000 women were studied in population-based surveys in developing countries.

Five population-based studies were conducted in two industrialized countries. Four studies used non-random samples of convenience; one used a random sample. Four studies were based on health records; one was based on parental interviews. In total, more than 1000 children were studied in industrialized countries.

Health-service-based observational surveys. Of the 79 studies that were reviewed, 52 (66%) were health-service-based observational surveys. Study subjects were selected from persons contacting health services: in 49 surveys the study subjects were outpatients, and in three surveys they were inpatients.

Forty health-service-based missed opportunity studies were conducted in 35 developing countries in all six WHO regions. The number of health facilities included in each survey differed considerably: 14 surveys (35%) included fewer than five health facilities; 15 (38%) included 5–19 facilities, and 11 (28%) assessed 20 or more health facilities. Of the 40 studies, 33 used the EPI exit interview protocol, 4 used record reviews, and 3 used hospital patient interviews. In total, more than 44 000 children and 52 000 women were studied at more than 500 health facilities in developing countries.

[a] The full list of studies and tables detailing results of each of these studies (unpublished document WHO/EPI/GEN/92.8) is available from the Expanded Programme on Immunization, World Health Organization, 1211 Geneva 27, Switzerland.

[b] **Directorate of Preventive Medicine, Ministry of Health, Central African Republic.** *Missed opportunities for vaccination: the potential impact on vaccination coverage of vaccinating at every health facility visit.* (Supplementary report for vaccine coverage survey, unpublished, May 1990).

Table 1: **Number of studies of missed opportunities for immunization in developing countries and industrialized countries, by WHO Region**

WHO Region	Developing countries		Industrialized countries		Total	
	No. of countries	No. of studies	No. of countries	No. of studies	No. of countries	No. of studies
Africa	15	19	–	–	15	19
Americas	12	15	1	14	13	29
E. Mediterranean	6	11	–	–	6	11
Europe	1	3	2	5	3	8
South-East Asia	6	10	–	–	6	10
Western Pacific	1	1	1	1	2	2
Global total	41	59	4	20	45	79

Twelve health-service-based studies were conducted in three industrialized countries located in three WHO regions. Two studies used exit interviews and 10 used record reviews. A total of more than 7000 children were studied at some 80 health facilities in industrialized countries.

Most developing countries assessed missed opportunities by using an EPI protocol. Parents and patients in the EPI target group were interviewed as they exited a health service and were queried about their child's or their own immunization history and the reason for the health visit. An interviewer determined the missed opportunity for immunization by using the reason for the health visit and the national policy on contraindications to immunization. Immunization history was obtained from immunization cards; when these were not available, information was based on parental or patient recall. Immunization cards were available for most of the children: a median of 84% (range, 48–100%) of the enrolled children had their cards. Cards were less frequently available for women, except for those attending antenatal clinics.

In countries where immunization records were kept in health care facilities, information was obtained from retrospective review of medical charts or immunization registers. The health-service-based method does not provide information on the magnitude of missed opportunities in the community unless the use of health services is high and a representative sample of all the health facilities in a community is surveyed. However, this method is useful for measuring the magnitude of missed opportunities at the health facility, identifying their causes, and designing specific recommendations to prevent future missed opportunities.

Intervention trials. Of the 79 missed opportunity studies reviewed, 9 (11%) were intervention trials. Eight trials used a health-service-based approach to select study subjects; one used a population-based approach. Only one intervention trial was a controlled trial; the others used historical controls.

Six intervention trials were conducted in developing countries; three trials were conducted in industrialized countries. The effect of an intervention was determined by measuring the change in the prevalence of missed opportunities or the change in immunization coverage before and after the intervention. Information on these outcomes was collected through interviews with the target group or health care provider, or through reviews of medical charts.

Prevalence of missed opportunities

Global. The 70 observational surveys from 44 countries were evaluated to determine the magnitude of missed opportunities for immunization. Opportunities for immunization were missed for a median of 32% (range, 0–99%) of the children and women of childbearing age who were surveyed. In 69 surveys, opportunities to immunize were missed. The only survey that failed to find missed opportunities was an exit interview survey in Zimbabwe, where the policy of vaccinating at every health contact was being successfully implemented for children at the two health facilities in the study (*5*). If opportunities to immunize had been taken in the specific populations and at the specific health services studied, immunization coverage would have increased by a median of 32%. Population-based studies suggest an increase by a median of 22% (range, 3–77%), while health-service-based studies indicate an increase by a median of 44% (range, 0–80%) among clinic attendees. Of children and women who were eligible for immunization at the health visit, a median of 67% (range, 0–100%) were not immunized. That is, a given health service contact was 67% inefficient in taking the opportunity to immunize eligible children and women.

Developing versus industrialized countries. Missed opportunities for immunizations were identified as an important problem both for developing and industrialized countries. Fifty-three observational studies were conducted among children in developing countries and 18 among children in industrialized countries. Studies included in this review showed that missed opportunities occurred more often among children in developing countries (median, 41%; range, 0–99%) than in industrialized countries (median, 15%; range, 3–55%). However, it is difficult to compare the findings from these two groups of countries since 14 (82%) of the 17 studies from industrialized countries were conducted in one country (USA), while no more than 3 studies were conducted in any one developing country. Moreover, lists of contraindications tend to be longer in industrialized countries than in developing countries. Since the formula we used to calculate missed opportunities excludes children with contraindications (based on national policy), this might lead to a lower prevalence of missed opportunities in industrialized countries.

Preventive versus curative health services. Ten surveys in 10 developing countries compared the prevalence of missed opportunities during preventive services with the prevalence during curative or other health services (Table 2). Some of these countries had national policies to immunize in curative services, others did not. Overall, opportunities for immunization were more likely to be missed in curative services than in preventive services. These

Table 2: **Prevalence of missed opportunities in preventive and curative health services in ten countries**

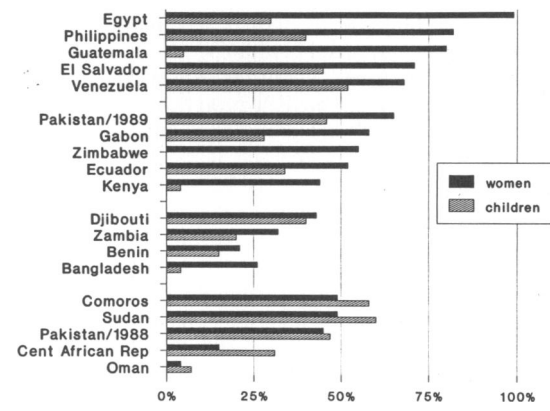
Country and reference	Study group	Prevalence of missed opportunities (%) Preventive	Curative
Cameroon (*6*)	2–35 months	40	63
Central African Republic[a]	12–23 months	25	31
Comoros (*28*)	0–23 months	33	91
	Women	42	96
Ethiopia (*29*)	0–23 months	30	44
Gabon[b]	0–23 months	20	37
	Women	54	63
Guinea (*3*)	12–23 months	5	14
Mexico[c]	0–59 months	54	40
Mozambique (*3, 4*)	12–23 months	2	6
Puerto Rico (*30*)	2–59 months	51	53
Venezuela[d]	0–23 months	48	56
	Women	71	65
All countries			
Median (range):			
Children		32 (2–54)	42 (14–91)
Women		54 (42–71)	65 (63–95)

[a] See footnote *b* on page 552.
[b] See footnote *f* below.
[c] See footnote *d* below.
[d] See footnote *e* below.

surveys showed that many persons had visited health services at times when they were eligible for immunization and could have been immunized if immunizations were offered. In two surveys, in the Central African Republic[c] and in Mexico[d], missed opportunities were reported to occur more often during immunization services than during other health services, indicating a problem with the routine immunization delivery system.

Routine screening in health facilities was found to be important in ensuring that eligible persons were immunized during visits for services other than immunization. For example, in surveys conducted in the Cameroon (*6*) and Venezuela[e], persons who attended curative services missed opportunities only when there was no routine screening to determine their immunization status. A study in Sudan demonstrated the importance of using screening at curative services (*7*). "Never immunized" children were identified at curative services but were less likely to be seen at preventive services.

Fig. 2. **Prevalence of missed opportunities among women (aged 15–44 years) and children (aged 0–23 months) in 19 surveys.**



An alternative use for a missed opportunities survey is to provide information on what improvements in immunization coverage could be expected by extending the number of days that immunizations are routinely offered. Studies were conducted for this purpose in Burundi and Gabon. In Gabon,[f] for children and women, a 2- to 3-fold increase in missed opportunities was found on the days when immunizations were not scheduled. In Burundi,[g] missed opportunities for children were lowest in facilities that immunized at every health contact (15%), compared with facilities that immunized every day but not at every contact (21%), or facilities that immunized fewer than four days per week (30%).

Women versus children. Of the 59 surveys of children in developing countries, 19 also surveyed women of childbearing age (Fig. 2). In 14 of these studies, women were found to have many times more missed opportunities than children. Only five studies found the prevalence of missed opportunities to be lower for women than for children. These data indicate that coverage of women of childbearing age with tetanus toxoid could be greatly improved by taking advantage of contact with health services to immunize women.

[c] See footnote *b*, page 552.

[d] **Romero, M.G. et al.** [*Missed opportunities for immunization of under-5-year-olds in Mexico.*] (Unpublished report, in Spanish, 1990).

[e] **Vellozi, C. et al.** *Vaccine coverage and missed opportunities of vaccination in Caracas, Venezuela.* (Unpublished report, 1989).

[f] Evaluation du Programme Elargi de Vaccination: Gabon, novembre 1989.

[g] **Tharcienne, N.** *Impact de la politique de vacciner les enfants à tout contact.* Université du Burundi, Faculté de Médecine, 1990.

Table 3: **Prevalence of missed opportunities, by vaccine**

Country and reference	Percentage of immunizations needed but not administered			
	BCG	DPT	OPV	Measles
Bolivia (*31*)	35	28	25	52
Colombia (*14*)	86	64	59	74
Ecuador (*31*)	29	30	33	58
Guatemala (*32*)	NA	48	47	20
Honduras (*31*)	68	36	31	49
Mexico[a]	83	80	74	84
Nicaragua (*33*)	65	69	54	74
Nigeria[b]	8	10	11	19
Peru (*31*)	NA	48	47	36
Puerto Rico (*30*)	NA	42	42	68
United Kingdom (*17*)	NA	27[c]	37	20
Venezuela (*31*)	8	42	32	30
Zambia[d]	18	76	84	72
All countries				
Median	35	42	42	52
(range)	(8–86)	(10–80)	(11–84)	(19–84)

[a] See footnote *d* on page 554.
[b] **Federal Ministry of Health, Nigeria.** *Nigeria national coverage survey, preliminary report, April 1991.*
[c] Includes persons with true contraindications.
[d] **Szegedi, E.** *EPI progress report, January–July 1990, Zambia.*

Vaccine-specific missed opportunities. Missed opportunities were measured for specific vaccines in 13 surveys in 13 countries; ten (77%) were from the Region of the Americas (Table 3). Although there were considerable differences among countries, surveys in seven countries demonstrated that an opportunity to immunize with measles vaccine or BCG was missed more often than an opportunity to immunize with DPT or oral poliomyelitis vaccine (OPV). This difference may relate to the fact that these vaccines are given only once. Compared with DPT and OPV, it is more likely that only one child or a few children will require immunization with BCG or measles vaccine during a single immunization session; therefore, the fear of vaccine wastage may be higher (see below, negative health worker attitudes).

Reasons for missed opportunities

In general, the broad categories of reasons why immunizations were not given during a health visit were similar for developing and industrialized countries, although the relative importance of each reason within the broad categories differed. Developing and industrialized countries reported problems with inefficient scheduling of immunization services and long waiting times (*8, 9*). Vaccine shortage was reported as a problem in some developing countries but not in industrialized countries. In developing countries, the fear among health workers about wasting vaccine if they open a multidose vaccine vial for one child was identified as an important reason for missed opportunities. In the surveys on missed opportunities that were reviewed, parental refusal to immunize children was a minor reason for missed opportunities; however, in industrialized countries, it may be more of a problem (*10*). Similarly, false contraindications may be more of a problem in industrialized countries (*10–13*).

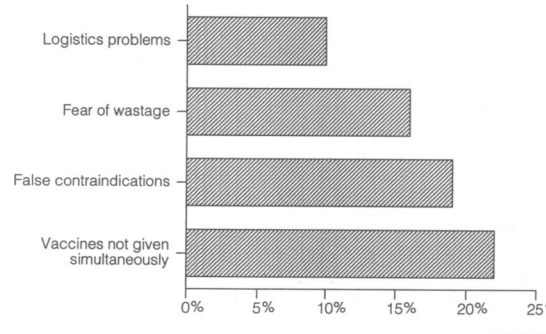
Reasons for missed opportunities were classified into five categories; details of this analysis are reported below and summarized in Fig. 3.

Failure to administer imunizations simultaneously. Failure to administer immunizations simultaneously was one of the major reasons given in eight surveys where this was specifically assessed. In these surveys, a median of 22% (range, 2–38%) of persons missed opportunities because immunizations were not administered simultaneously. This measurement may be an underestimate because many surveys classified failure to administer vaccines simultaneously as a logistical problem.

False contraindications. Twenty-seven surveys assessed the role of false contraindications for immunizations and 24 (89%) identified this as a problem. In these surveys, a median of 19% (range, 6–65%) of persons missed an opportunity because of false contraindications to immunization.

Negative health worker attitudes. Negative attitudes of health workers, including fear of wasting the vaccine, and not offering, thinking about, or screening for immunization, were assessed in 11 surveys and all found it to be one of the major reasons for missed opportunities. In these surveys, a median of 16% (range, 1–26%) of persons missed opportunities because of negative health worker attitudes.

Fig. 3. **Four major reasons why immunization opportunities were missed (expressed as percentage of median prevalence).**



Logistical problems. Logistical problems with immunization delivery (e.g., vaccine shortage, poor clinic organization, and inefficient clinic scheduling) were assessed in 11 surveys. This reason was found to be important in all 11 surveys. The median prevalence of missed opportunities for children and women due to logistical problems was 10% (range, 1–24%).

Parental refusal. In nine surveys, the refusal of immunizations by patients or their families was assessed. In general, lack of parental acceptance of immunization was not an important reason for missed opportunities. Missed opportunities due to patient or parental refusals occurred in a median of 3% (range, 2–11%) of persons.

Strategies to eliminate missed opportunities

Strategies tested in intervention trials

Nine intervention trials were conducted in eight countries. After implementation of one or more interventions, each of the nine trials demonstrated a reduction in missed opportunities or an increase in immunization coverage, although only three studies showed statistically significant changes. Of the nine trials, missed opportunities were reduced by 8–69% and immunization coverage was increased by 10–145%.

The only trial designed to determine whether the observed change in missed opportunities was due specifically to an intervention was a controlled trial conducted in Venezuela in 1989.[h] Nine clinics were included: in six clinics, letters and posters explaining the true contraindications to immunization were distributed; in three of these clinics, health records of children in need of immunizations were marked with a special stamp; in three control clinics no interventions were used. Surveys on missed opportunities conducted before and 1 month after these interventions found statistically significant declines in the prevalence of missed oportunities at *all* nine clinics. These results probably reflect the response of persons in the control clinics to an unplanned extra intervention, the distribution of immunization buttons.

A study in El Salvador[i] demonstrated significant reductions in missed opportunities for children (69%), women of childbearing age (14%), and pregnant women (44%) after the institution of multiple interventions. Specifically these were (1) providing pre-intervention survey results to health care providers whose clinics were surveyed, (2) emphasizing the issue of false contraindications during in-service training, (3) stressing the role of health workers as future health facility directors, and (4) notifying health workers about plans to conduct a repeat survey to measure the progress towards reducing missed opportunities.

A third trial that demonstrated a statistically significant reduction in missed opportunities was conducted in the State of Georgia, USA, during 1987–90 (V. Dietz, personal communication, 1992). Interventions included annual reviews of missed opportunities and immunization coverage; an award system to motivate health workers; and the provision of immunization services in federal nutrition assistance programmes serving public clinics. These interventions led to an 85% increase in immunization coverage in public clinics and an 80% decrease in the prevalence of missed opportunities.

The remaining trials implemented a variety of interventions. In Colombia, health workers and parents were notified about the need to assess immunizations at every health care visit and missed opportunities were reduced by 37% (*14*). In Djibouti[j] the interventions included offering immunizations every day, opening multidose vials of vaccine (even for one child), and screening all women and children who visited the health facility. In Nigeria, one clinic introduced an express lane for immunization services, so that children no longer had to wait to be seen by a physician before getting immunized (*8*). In Sudan, an intervention introduced at curative clinics was screening and immunizing either before or after the physician's consultation (*15*). In Fife, United Kingdom, general physicians were sent letters encouraging them to administer measles vaccine and the coverage increased by 27% (*16*). In Manchester, United Kingdom, children admitted to a hospital paediatric ward were screened for immunization status and immunized if eligible (*17*).

Zimbabwe EPI experience. In 1987, a survey of missed opportunities conducted in two clinics in Zimbabwe found no missed opportunities for children aged 3–23 months (*5*). The Zimbabwe EPI actively promotes a policy of immunizing eligible persons at every contact with a health facility. To effectively use opportunities in paediatric clinics, a

[h] **Vellozi, C. et al.** *An intervention trial for missed opportunities of vaccination in Caracas, Venezuela.* Unpublished report, 1989.

[i] **Hernandez Pimentel, J.F.** [Study of missed opportunities for immunization, Western Health Region, El Salvador.] Unpublished report, 1989 (in Spanish).

[j] **Said Salah.** *Rapport des enquêtes des occasions de vaccinations manquées.* Service d'Hygiène et Epidémiologie, Ministère de la Santé Publique et des Affaires Sociales, République de Djibouti. Document 348/SHE/89, mai 1989.

nurse screens every ill child for immunization status and vaccinates all eligible children, even before the physician's consultation. The cost of this strategy is reported as US$ 0.02–0.04 per patient per day.

Conclusions and recommendations

A number of potentially effective strategies to reduce missed opportunities have been recommended by the Global Advisory Group and tested in studies conducted in both developing and industrialized countries. Immunization programme managers should identify specific reasons for missed opportunities in their programmes, select the most appropriate strategy, and monitor the effect of the strategy in reducing missed opportunities.

Based on the reasons identified in this global review of missed opportunities, the following recommendations are relevant for immunization programmes in all countries.

(1) *Use missed opportunities surveys routinely*

Studies reported above have shown that the assessment of missed opportunities is a useful managerial tool, as well as a method suited to health services research. EPI has developed a module for EPI mid-level managers to assess the causes of missed opportunities and to determine effective strategies for their elimination. The module, entitled "Identify missed opportunities" has been prepared to serve district and provincial staff as a supervisory and evaluation tool.

Further studies at the national, district, and provincial levels may provide guidance for policy decisions. Studies may be planned to determine the specific age groups, geographic areas, and immunization services in which immunizations are most often missed. The importance of specific reasons for missed opportunities should be assessed, including gaps in health workers' knowledge, attitudes, and practice.

(2) *Screen and immunize at every contact*

This review found that missed opportunities for immunization affect both children and women of childbearing age and occur in both preventive and curative health services. Many persons eligible for immunization have contact with health services and could be immunized if vaccines were offered. Furthermore, the increased risk for children of contracting measles in health facilities has been documented in both developing and industrialized countries, underscoring the importance of protecting them through immunization at every health service contact (*18, 19*). Routine screening for immunization status should be carried out on all children and women of childbearing age who visit health services for any reason. The timing for screening in the patient-flow process should be tailored to the health service. Intervention trials indicated that screening and immunizing before or after the physician's consultation were equally effective. Ideally, eligible persons should be immunized immediately, or at least referred for immunization. National immunization policy may need to be revised or fully enforced so as to focus on screening for immunization at every health service contact.

To facilitate screening for immunization status at every health visit, immunization cards should be used for both children and women of childbearing age. Mothers should be reminded to bring their child's and their own immunization or health record whenever they have contact with a health service.

(3) *Administer vaccines simultaneously*

In this study, failure to administer immunizations simultaneously was found to be a major cause of missed opportunities. Administering vaccines simultaneously, when indicated, should be the rule. The vaccines currently used in the EPI (BCG, OPV, DPT and measles vaccine) can all be given simultaneously. These vaccines may also be given at the same visit when yellow fever vaccine and hepatitis B vaccine are administered. In-service training and periodic supervisory visits should assist in reducing this type of missed opportunity.

Whether opportunities for simultaneous immunization are being taken can be readily assessed in immunization coverage surveys that use COSAS, software available from EPI for analysis using a personal computer. WHO estimates that more than 100 coverage surveys are analysed each year with COSAS.

(4) *Emphasize true contraindications*

False contraindications to immunization were found to be a major cause of missed opportunities. To avoid this type of missed opportunity, health workers should have in-service training and be reminded periodically through posters and supervisory visits about the true contraindications to immunization. The fact that EPI vaccines have few true contraindications should be emphasized. Countries should review and, if necessary, redefine their policy on contraindications.

In general, children who have illnesses that do not require hospitalization should be immunized. Therefore, children suffering from malnutrition, low-grade fever, mild respiratory infection, diarrhoea, and other minor illnesses *should* be immunized. The immunization status of hospitalized children should be assessed and they should receive appropriate immunizations before discharge. If possible, they

should be immunized against measles on admission because of the high risk of hospital-acquired measles (*20*).

True contraindications include not giving a second or third dose of DPT vaccine to a child who had a severe adverse reaction to the previous dose. In this situation, the pertussis component should be omitted and only the diphtheria and tetanus immunizations are given.

Unimmunized persons with clinical (symptomatic) HIV infection in countries where the EPI target diseases remain serious risks should not receive BCG, but should receive the other vaccines. In general, live vaccines are not given to immunocompromised persons, but in developing countries the risk of measles and poliomyelitis in unimmunized infants is high, and the risk from these vaccines, even in the presence of symptomatic HIV infection, appears to be low (*21*).

A precaution should be taken when administering OPV to a child who has diarrhoea. OPV should be given, but to ensure full protection, a dose given to a child with diarrhoea should not be counted as part of the series. The child should be given another dose at the first available opportunity.

Immunizations are just as effective in sick children as in healthy ones, and there is no increased risk of side-effects in sick children (*20*). However, one small study recently published in the USA reported that measles seroconversion rates after a dose of measles-mumps-rubella (MMR) vaccine were 79% for children with a mild upper respiratory infection, compared with 99% for well children (*22*). This study has not had any impact on global policy to immunize sick children for the following reasons. First, the study is not consistent with previously reported studies from developing countries (*23, 24*). Second, the study findings are unusual, since a lower seroconversion rate was found only for measles and not for mumps or rubella (*25*). Finally, it should be emphasized that the measles immunity conferred by giving a single dose (79%) of measles vaccine was much higher than not giving any vaccine (0%).

Concerns about immunizing women with tetanus toxoid during early pregnancy have not been justified. There is no convincing evidence of risk to the fetus from immunizing pregnant women with tetanus toxoid (*26*).

(5) *Provide continuing education on immunization*

In-service education is essential and immunization updates should be provided at least annually to all health workers (curative and preventive). Information on immunization can readily be included in meetings of medical and nursing associations. In countries where the private sector provides immunizations, guidelines and training should be made available. Inclusion of EPI training materials in medical, paramedical, public health, and nursing school curricula may be an effective method of positively influencing the attitudes of health workers early in their training.

(6) *Reduce fear of vaccine wastage*

The EPI policy of opening a multidose vial, even for one eligible child or woman, should be emphasized again and again. The availability of smaller multidose vials may encourage health workers to follow this practice. Today most vaccines for developing countries are purchased in 20-dose vials. At the end of an immunization session, all open vaccine vials, whether used or only partly used, must be discarded. EPI training materials indicate that wastage rates of 25% are to be expected. Nevertheless, this study found that the health workers' concern about wasting vaccines if they open a multidose vial for one child or woman was an important reason for missed opportunities.

In 1991 these findings led to a series of studies of vaccine wastage in different countries (*27*), which showed markedly higher wastage rates than expected. When immunization sessions were held one or more times a week, wastage rates were as high as 40–60% for OPV and DPT, and 80–90% for BCG. In this situation, changing from a 20-dose vial to a 10-dose vial reduced vaccine wastage by as much as 20–40%.

In the absence of other information, programmes should choose to use 10-dose vials for DPT, OPV, and tetanus toxoid, and 5-dose vials for measles when immunization sessions are held more frequently than once a week. In most cases, the savings from the reduced wastage will be greater than any increase in purchase and delivery cost per dose when smaller vials are used. The availability of a smaller multidose vial may encourage health workers to open a multidose vaccine vial, even for one child.

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Résumé

Etude des occasions manquées de vaccination dans les pays en développement et dans les pays industrialisés

Bien que la couverture vaccinale ait été considérablement augmentée dans le monde entier depuis la mise en œuvre du Programme élargi de vaccination en 1974, les efforts doivent être poursuivis tant dans les pays en développement que dans les pays industrialisés pour atteindre d'ici l'an 2000 l'objectif d'une vaccination complète de 90% des enfants du monde. Pour améliorer la couverture vaccinale, une approche directe consiste à réduire les occasions manquées de vaccination dans les services de soins de santé existants.

Afin de déterminer l'ampleur et les raisons des occasions manquées de vaccination chez les enfants et les femmes en âge de procréer, les rapports publiés dans le monde entier sur cette question, ainsi que les travaux non publiés communiqués à l'OMS jusqu'en juillet 1991 ont été examinés. Les études sur les occasions manquées de vaccination ont été classées en fonction de leur conception — enquêtes d'observation au niveau de la population, enquêtes d'observation au niveau des services de santé, et essais d'intervention. Une mesure type de la prévalence des occasions manquées a été calculée pour chaque étude. Cette mesure donne des indications sur le gain potentiel en termes de couverture si ces occasions manquées étaient éliminées.

Les études sur les occasions manquées de vaccination ont fait l'objet de 79 rapports répertoriés dans 45 pays en développement et pays industrialisés; 18 de ces études portaient sur l'ensemble de la population, 52 sur les services de santé et 9 consistaient en essais d'intervention. Des études ont été faites dans chacune des six Régions de l'OMS. A l'échelle mondiale, près d'un quart de l'ensemble des pays ont réalisé au moins une étude, et les trois quarts des études ont été faites dans des pays en développement. Une médiane de 32% (intervalle 0–99%) des enfants et des femmes en âge de procréer qui avaient été enquêtés ont manqué une occasion de vaccination au cours de leurs visites dans un service de santé pour une vaccination ou pour d'autres raisons. D'après les études portant sur la population, si ces occasions manquées étaient éliminées, la couverture vaccinale pourrait être augmentée d'une médiane de 22% (intervalle 3–77%); d'après les études portant sur les services de santé, la couverture vaccinale chez les consultants des dispensaires pourrait être augmentée d'une médiane de 44% (intervalle 0–80%). Les principales raisons des occasions manquées de vaccination étaient: 1) impossibilité d'administrer simultanément tous les vaccins qu'un enfant était susceptible de recevoir (médiane 22%; intervalle 2–38%); 2) fausses contre-indications à la vaccination (médiane 19%; intervalle 6–65%); 3) pratiques des agents de santé (médiane 16%; intervalle 1–26%), notamment refus d'ouvrir un flacon multidoses de vaccin pour un petit nombre de personnes afin d'éviter de gaspiller le vaccin; 4) problèmes logistiques, par exemple manque de vaccin, mauvaise organisation du dispensaire, planification inefficace (médiane 10%; intervalle, 1–40%). Pour améliorer cette situation, les programmes devront insister sur la supervision en routine et sur la formation en cours d'emploi des agents de santé afin de faire en sorte que la vaccination simultanée soit pratiquée, de renforcer l'information sur les véritables contre-indications, et d'améliorer les pratiques des agents de santé. Il est possible d'encourager les agents de santé à ouvrir un flacon multidoses de vaccin, même pour un seul enfant ou une seule femme, en fournissant des flacons de 10 doses. Il semble que l'utilisation en routine d'un flacon de 10 doses pour le DTC et le VPO soit plus économique que celle d'un flacon de 20 doses, car il est maintenant fréquent de devoir procéder à de petites séances de vaccination portant sur moins de 10 personnes.

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