COUNTRY OVERVIEW— A REPORT OF THE INTERNATIONAL EVALUATION OF THE IMMUNIZATION PROGRAMME IN INDIA

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1. Background Information

The Universal Immunization Programme (UIP) was started in India in a phased manner in 1985-86 and within 5 years, by 1989-90, all districts in the country were covered. The Immunization Programme aims at universal immunization coverage of infants with the full course of DPT, OPV, BCG and measles vaccines and of pregnant women with tetanus toxoid.

Additional inputs have been provided under UIP for strengthening the cold storage facilities and streamlining logistics for vaccines and other essential supplies. The services are organized as part of primary health care through the existing health infrastructure. In districts with high levels of immunization coverage, greater emphasis has been given to improving completeness and early reporting of cases of poliomyelitis and neonatal tetanus.

The high coverage levels recorded in an increasingly large number of districts and the significant reduction in the incidence of vaccine preventable diseases is conducive for planning strategies aimed at achieving the elimination of neonatal tetanus and eradication of poliomyelitis by the end of the decade.

The Review was undertaken in two randomly selected districts from one state in each geographical region of India: Haryana (north), Madhya Pradesh (central), Maharashtra (west), Orissa (east) and Tamil Nadu (south), to document immunization coverage levels and to assess the quality of programme implementation in three areas of critical importance for achieving the programme objectives: the organization of immunization services, cold chain for vaccines and the surveillance of vaccine-preventable diseases.

2. Methodology

Quantitative data were collected by three field surveys. These included a vaccination coverage evaluation survey, lameness survey and neonatal mortality survey. Standard WHO 30-cluster sampling methodology was employed to select the cohorts to be studied in each district. Survey cohorts included:

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(*a*) 210 children (7 per cluster) 12 to 23 months (range of birth dates from 25 August 1990 to 24 August 1991) to estimate infants' immunization coverage;

(*b*) 210 mothers (7 per cluster) of infants born during the past 12 months (range of birth dates from 25 August 1991 to 14 August 1992) to estimate women's immunization coverage for TT;

(*c*) 2,000 live births (67 per cluster) to estimate the incidence of neonatal tetanus mortality; and

(*d*) 10,000 children under 5 years of age (335 per cluster) to estimate the prevalence of lameness due to all causes, including poliomyelitis.

Standard case definitions were used for neonatal tetanus and post-poliomyelitis lameness.

Qualitative data were collected by visiting the health facilities and outreach services in the districts. Discussions were held with the concerned personnel at the district, PHC and subcentre levels and relevant records were examined. Records of major hospitals were examined in detail. Standardized forms were used for collection of data and interviews with the health staff.

The Review was designed and executed observing strict statistical criteria and may be considered to be fully representative of the current status of UIP in the district. Though the case studies give us a general idea of the status of the programme activities in the country, obviously, the ten district case studies cannot be averaged for the purposes of a single national review or permit conclusions to be drawn on that basis for an all-India picture.

3. Organization of the Review

The states of Haryana, Madhya Pradesh, Maharashtra, Orissa and Tamil Nadu were pre-selected by the Ministry of Health and Family Welfare on a regional and population basis. These states are in different stages of programme implementation. About three weeks prior to the survey, two districts each in Haryana, Madhya Pradesh and Orissa and one district in Maharashtra and Tamil Nadu were randomly selected by the WHO. Bombay and Madras were pre-selected by the WHO as cities of global interest. The names of the districts are shown in *Table I*. Thirty randomly-selected clusters in each district were communicated by the WHO to the Ministry of Health and Family Welfare just prior to the field exercise.

TABLE I–*Names of the Districts*

State	District
Haryana	Jind, Kuruskshetra
Madhya Pradesh	Hoshangabad, Shivpuri
Maharashtra	Amravati, Bombay
Orissa	Dhenkanal, Puri
Tamil Nadu	Madras, PMT

The Review was carried out by national and international experts. Each district team included 10 national and one or two international experts. The national team members were senior medical officers from states other than the state under review. They included officers from the national institutions, health and family welfare training centres, medical colleges and state and district health departments. The International experts represented WHO, UNICEF, SIDA, REACH AND ROTARY INTERNATIONAL.

Two representatives from each of the ten national teams were given additional responsibility as team coordinators. Briefing of the national team coordinators was

organized in the Ministry of Health and Family Welfare on 13 and 14 August 1992 and of the international experts on 20 August 1992 in the Ministry of Health and Family Welfare and on 21 August at WHO. Briefing of the team members and the para-medical personnel was conducted in the districts prior to the field work.

The state health authorities of the five states selected for Review arranged for accommodation, transport and other facilities required for the smooth functioning of the teams. They also deputed local health personnel as interpreters and to assist in the neonatal mortality and lameness surveys.

The Review was completed between 23 August to 3 September 1992. The major findings were presented at the district level on 3 September and at the state level on 4 September. A national level meeting was organized in New Delhi on 8 September. The inaugural session was chaired by the Union Minister of Health and Family Welfare and the valedictory session by the Secretary, Department of Family Welfare, Ministry of Health and Family Welfare.

Separate detailed district-wise reports have been drafted. However, major findings, issues of interest, common features and trends have been published in the 'Country Overview'. This paper is a summary of the report.

4. Findings

4.1 Vaccination coverage survey

4.1.1 *Access to immunization services*

The results of the Review showed that high levels of contact have been established

TABLE II–*Immunization Coverage (%)*

Vaccine	Districts *									
	HA		MP		MH		OR		TN	
	J	K	H	S	A	B	D	P	M	P
DPT1	88	100	83	75	98	96	79	81	100	100
DPT2	84	97	76	64	94	94	72	76	99	100
DPT3	81	97	69	54	91	91	69	73	99	99
OPV1	88	100	83	77	97	96	80	79	100	100
OPV2	84	97	76	68	96	94	72	74	99	99
OPV3	81	97	69	57	92	90	69	71	99	99
BCG	86	99	73	48	92	96	68	71	95	100
BCG SCAR	81	91	58	33	86	94	61	-	84	-
MEA	76	93	54	30	71	76	42	54	93	93
FI	75	92	51	21	66	76	37	50	87	93
FI < 1yr	53	81	-	-	66	57	-	-	80	86
PI	15	8	34	60	29	22	45	32	13	7
UI	10	0	15	19	5	2	18	18	0	0

* Districts have been listed by states in alphabetical order.

(FI - fully immunized; PI - partially immunized; UI - unimmunized).

with infants. This was evident from the fact that at least one dose of any vaccine had been administered to more than 95% in 5 of the 10 districts surveyed and above 80% in all but one district. The lowest rate of 77% was recorded in Shivpuri District in Madhya Pradesh (*Table II*).

4.1.2 *Immunization coverage*

Infant immunization coverage levels were evaluated by comparing survey point estimates of coverage with the third dose of OPV (OPV3) in each district. OPV3 coverage levels exceeding 90% were recorded in Madras, PMT, Kurukshetra, Amravati and Bombay. In the other 5 districts, coverage levels ranged from 57% in Shivpuri to 81% in Jind. Coverage with other vaccines is shown in *Table II*.

4.1.3 *Coverage in serial surveys*

In all districts, results of previous coverage surveys were available. The evidence suggests that UIP has been sustained or has made substantial progress in all the districts surveyed, except Shivpuri. In the more successful states, the UIP has tended to correct problems identified during the previous survey. This is particularly reflected in the reduction in drop-out rates.

4.1.4 *Drop-out rates*

Compared with the situation a few years ago, the proportion of infants who do not complete the three-dose schedule of DPT has been markedly reduced. Drop-out rates between first and third doses were less than 10% in seven out of ten districts, 10-20% in two districts and over 20% in one district (*Table III*). These findings indicated that the system can repeatedly reach infants to provide the complete immunization schedule.

The difference between the highest covered antigen (DPT1) and the lowest covered antigen (measles) ranged from 7% in Kurukshetra, Madras and PMT to 60% in Shivpuri. The low gap of around 7% in three districts between DPT1 and measles immunization, where UIP started only in 1985 or later in these districts, is encouraging. By increasing awareness and urgency for measles immunization, coverage levels in the other districts could also, no doubt, be improved.

TABLE III–*Drop-out Rates (%)*

District	DPT1-DPT3	DPT1-Measles
Jind	8.0	13.6
Kurukshetra	3.4	7.5
Hoshangabad	17.2	35.1
Shivpuri	28.1	59.9
Amravati	7.1	27.6
Bombay	5.4	21.3
Dhenkanal	13.0	46.8
Puri	9.2	33.5
Madras	1.0	7.0
PMT	1.0	7.2

4.1.5 *Age at vaccination*

Three-quarters of all infants in the ten districts who received a first dose of DPT (DPT1), received it within six months of age, including 40% of infants who received it within three months of age (*Fig. 1*). In the two districts of Tamil Nadu, over 90% of infants received DPT1 before three months of age.

The high accessibility and early initiation of the immunization schedule reflects organized services which are well accepted by the community. The high coverage levels are, therefore, likely to be sustained. This is also important as the vaccine-

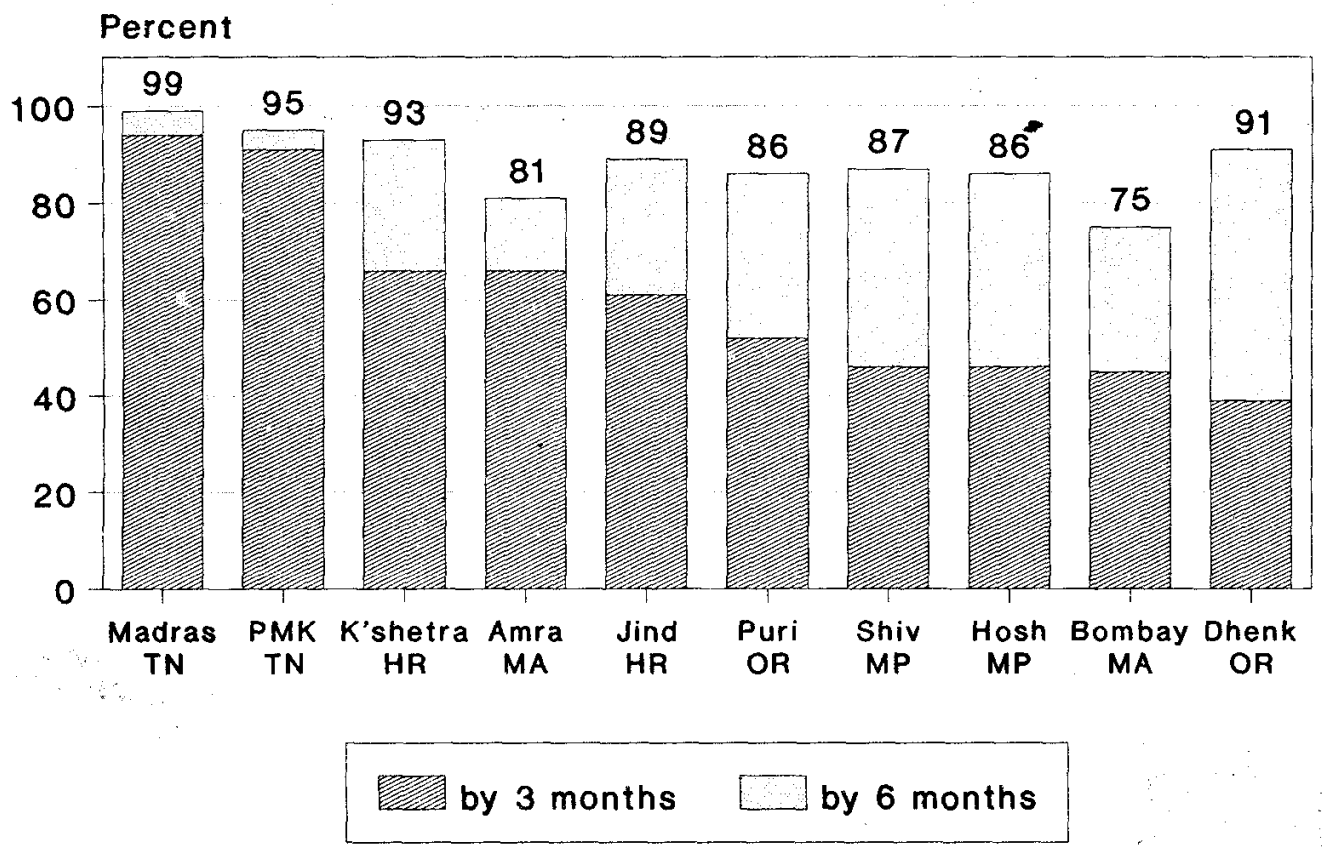


Fig. 1. Infants receiving DPT1 by 3 or 6 months of age.

preventable diseases occur in early childhood in this country.

4.1.6 *Reliability of routine reporting*

Third-dose DPT (DPT3) vaccination coverage reported by the districts was compared with coverage levels found by survey. The consistency between reported DPT3 coverage and survey results was good in six districts surveyed in Haryana, Maharashtra and Tamil Nadu, but poor in Madhya Pradesh and Orissa (*Fig. 2*). A clear tendency was evident that the lower the real coverage, the greater the difference between the reported coverage and survey results.

The comparison of reported measles vaccination coverage with survey results was more striking in this regard. In the worst cases, survey results were one-third to one half that of reported coverage (*Fig. 3*).

It is important to note that, under certain circumstances, the confidence interval associated with the standard WHO 30-cluster sampling surveys is as much as 10% on either side of the point estimate. Hence, in general, if the difference between the survey results and reported coverage is less than 10%, that difference should not be considered statistically significant.

4.1.7 *Source of vaccination*

Outreach services were the main source of immunization in the rural areas where up to 80% of infants received the first dose of DPT at outreach vaccination sessions. In the cities of Bombay and Madras, 40% of the infants were immunized in the private sector (*Fig. 4*). Hospitals also

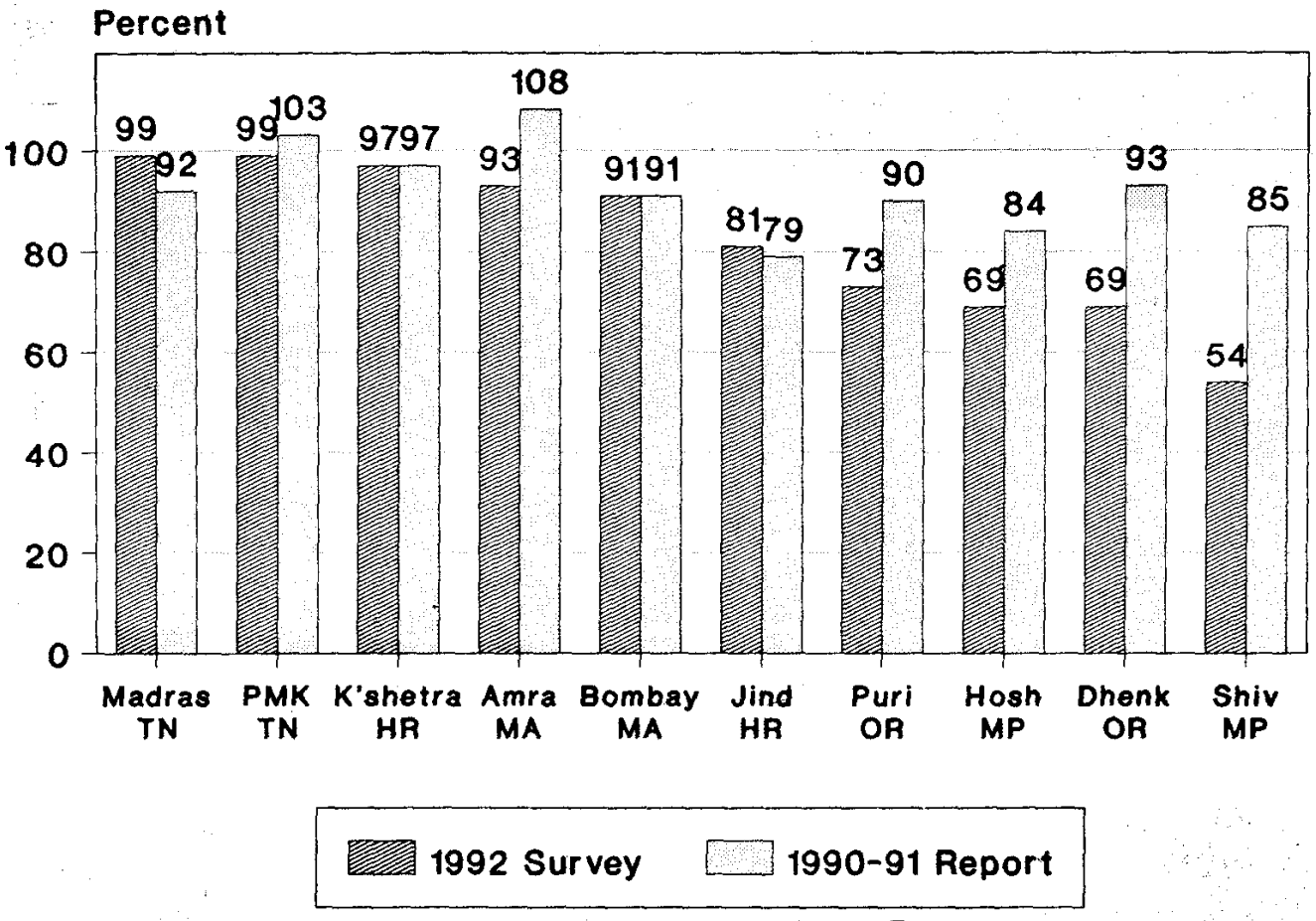


Fig. 2. DPT3 Coverage: Survey Versus Report.

played a significant role in the urban areas.

This finding indicates the active and committed efforts at the village level to sustain high immunization coverage levels through planned fixed sessions. Although, in the cities the contribution of the outreach services was much lower, it was observed that since such services reached the really deprived, high risk and low motivated population, they were significant not only in achieving overall high coverage levels but also in improving coverage levels in areas where epidemiological risk would be maximum.

4.1.8 *Community awareness*

Community awareness is crucial for the sustenance of UIP. Responses at the household level indicated a high degree of awareness for diseases like poliomyelitis, measles and tetanus, with the exception of two districts. Other vaccine preventable diseases were less well-known in the community. Other questions that were included in the survey were information on the need for three doses of DPT, TT injections and iron folic acid (IFA) tablets and clean delivery practices as well as the importance of birth spacing. Although, responses varied widely in the districts, at least half the respondents in all the districts had adequate information on the above subjects.

Between 60 to 80% of the respondents interviewed in all ten districts said they learned about UIP from health staff (*Fig. 5*). Relatives and neighbours also figured as an important source of information and it is very likely that many of them also received information originally from health workers too. Radio and television were

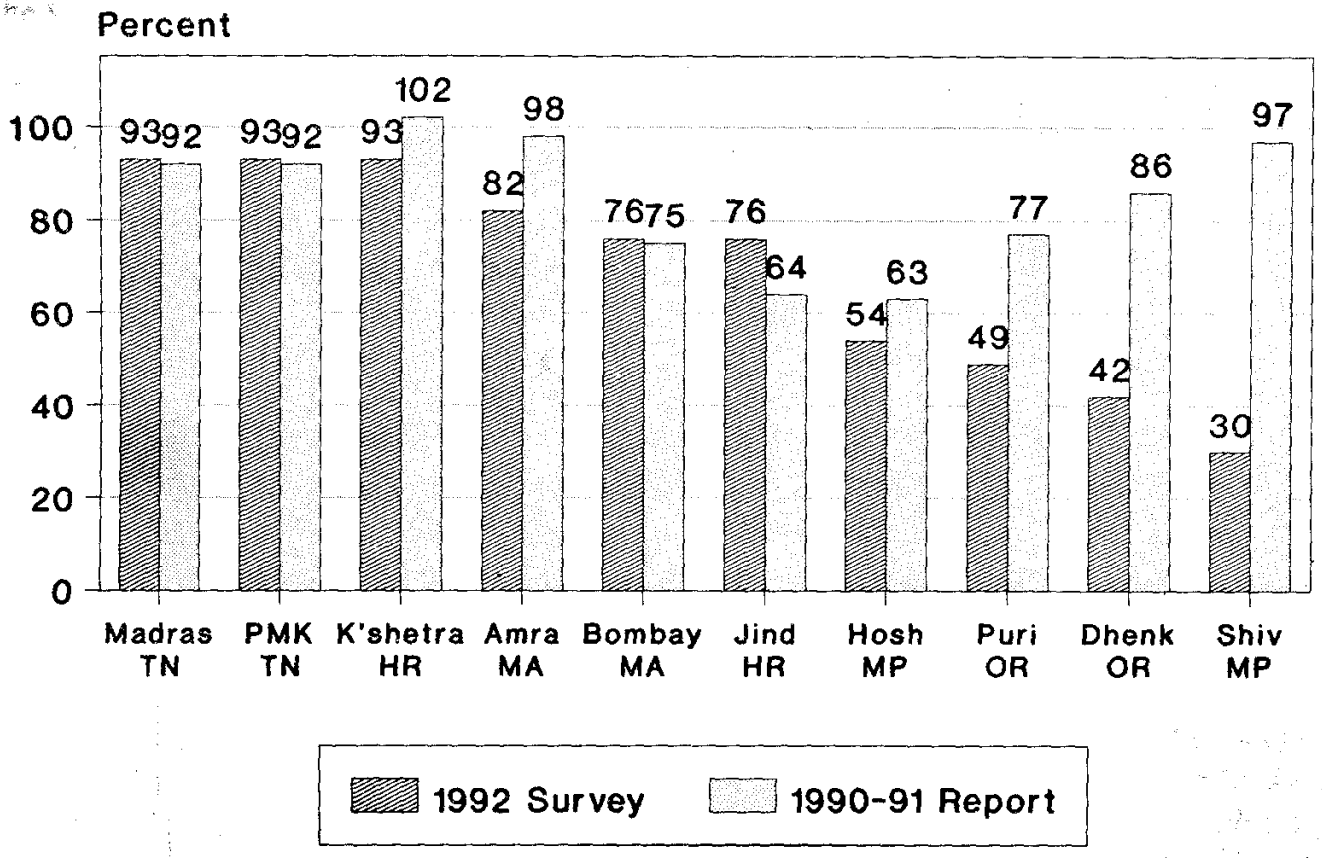


Fig. 3. Measles coverage: Survey versus Report.

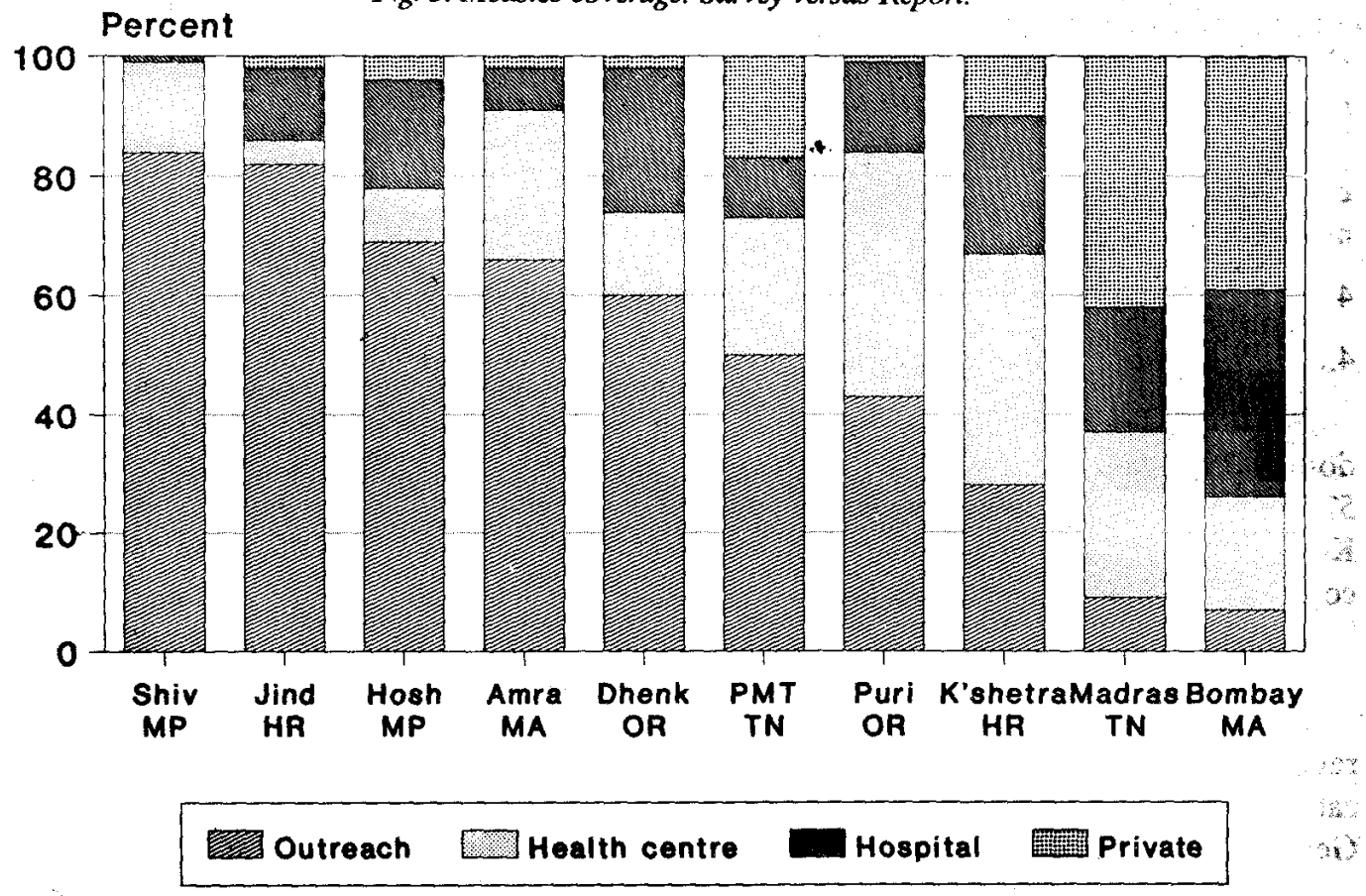


Fig. 4. Source of DPT1 vaccination.

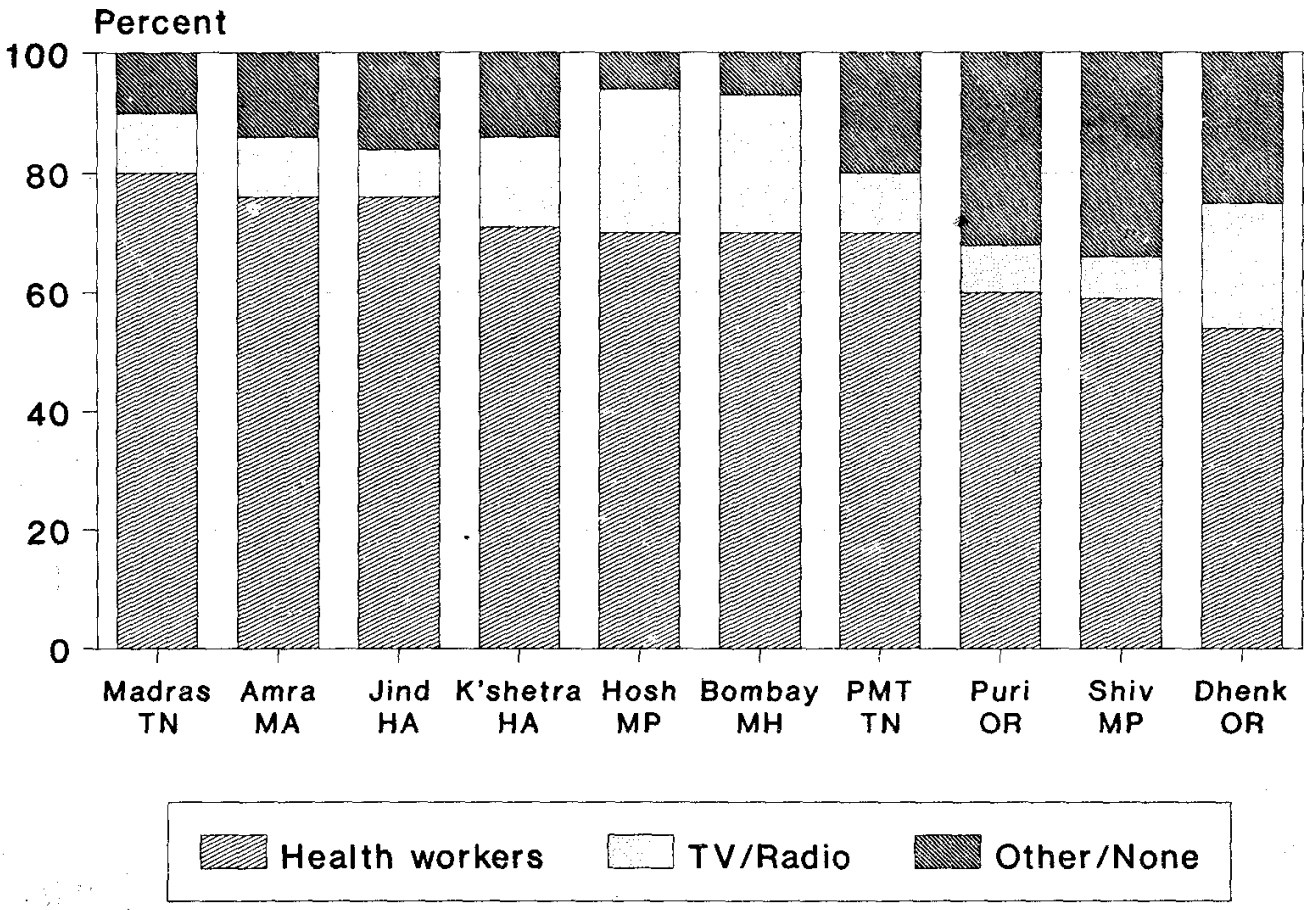


Fig. 5. Sources of community information.

cited by upto 38% of the respondents in some districts as the source of information, which demonstrated the importance of mass media for community education and motivation, especially in large urban areas.

4.2 Antenatal Care and Delivery Practices

4.2.1 *Coverage with TT2/B*

Coverage of pregnant women with two doses or a booster dose of TT ranged from 53% in Shivpuri to 97% in Madras and Kurukshetra. Four districts had achieved coverage levels of 90% or above. Coverage levels were lowest in the two districts in Madhya Pradesh (*Table IV*).

Although, high levels of coverage were recorded in a number of districts, immunization is being delayed in most districts. Generally, only about one-third of TT1 are being given by the fifth month of pregnancy. Up to the sixth month only about 25% of the women are covered with the second or a booster dose of TT. This proportion, however, increases sharply by seventh and eighth month. This reflects delay in TT coverage. Administration of

TABLE IV–*TT Immunization Coverage (%)*

District	TT-1	TT-2/B	Dropout TT1-TT2*
Jind	80	75	10.0
Kurukshetra	89	97	-
Hoshangabad	57	59	8.1
Shivpuri	56	53	10.1
Amravati	85	73	13.3
Bombay	94	91	4.0
Dhenkanal	69	73	7.2
Puri	80	83	6.5
Madras	94	97	1.0
PMT	57	96	3.3

* TT booster doses excluded from calculation.

the vaccine at the first contact during pregnancy as per the National Immunization Schedule should be strongly promoted.

Outreach services were the main source of immunization in the rural areas whereas, in large urban areas and in the cities of Bombay and Madras, hospitals and other health institutions largely contributed to the TT coverage of pregnant women. The role of the private sector was significant and, in absolute proportion, was greater than immunization coverage of infants through this sector (*Fig. 6*).

4.2.2 *Other antenatal services*

Although, a high level of antenatal contact had been established, adequate antenatal care (minimum of three visits) could not be provided to all the women for various reasons. For example, despite coverage of 98% with two doses or a booster dose of TT in Kurukshetra, only 60% contacted the health facilities for a minimum of three visits. The high proportion of contacts with pregnant women can be used to promote opportunities for qualitative improvement in antenatal care leading to a safe motherhood.

Coverage with IFA was less satisfactory than the immunization coverage. Fewer women consumed the prescribed 100 tablets with the highest coverage of 75% recorded in Amravati and the lowest of 7% in Shivpuri.

4.2.3 *Delivery practices*

A high proportion of births in the districts surveyed were attended by trained personnel, including trained TBAs. In eight out of 10 districts, over 70% of births were attended by 'safe hands' (*Fig. 7, Table V*). However, in Orissa, over half the births

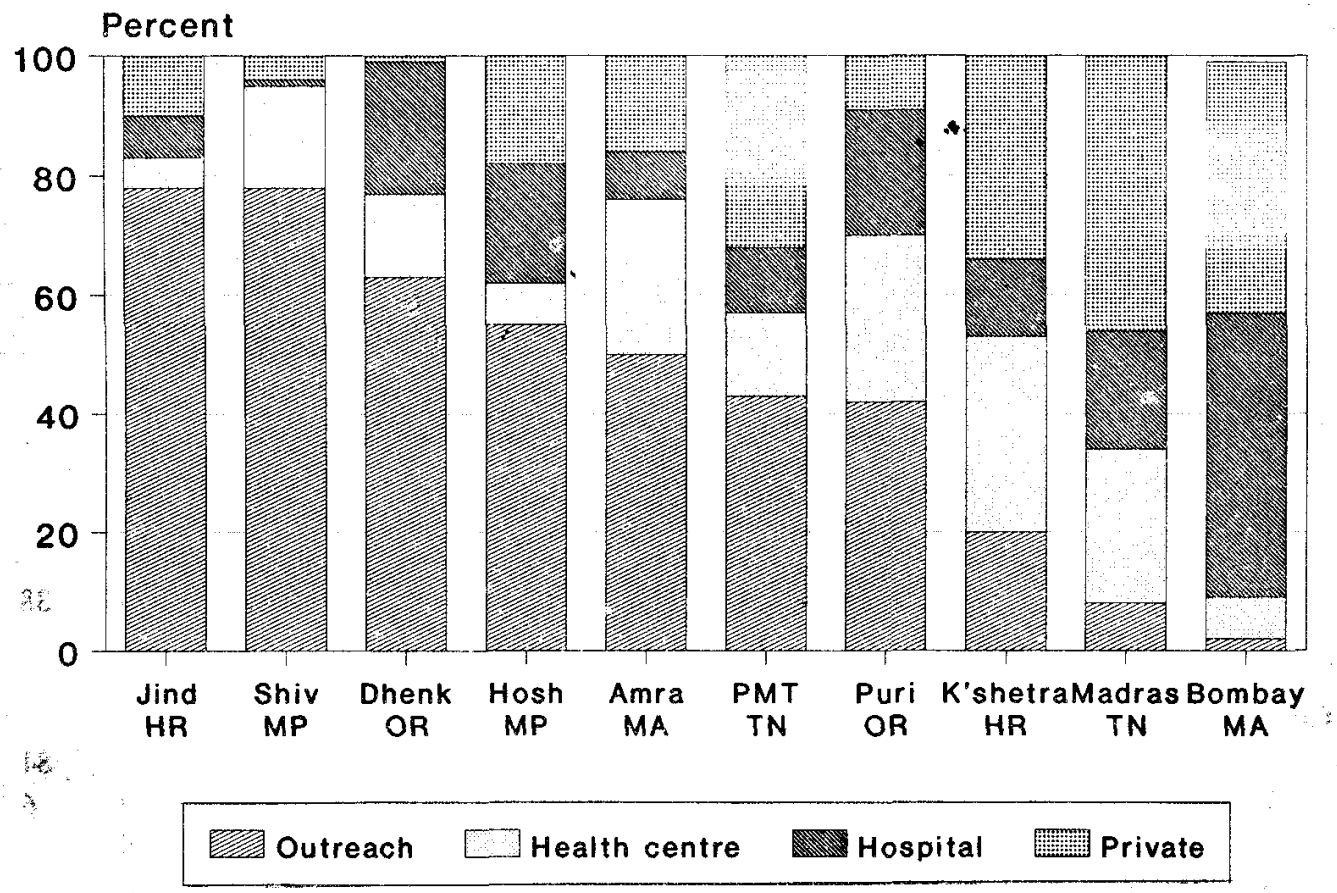


Fig. 6. Source of TT2 vaccination.

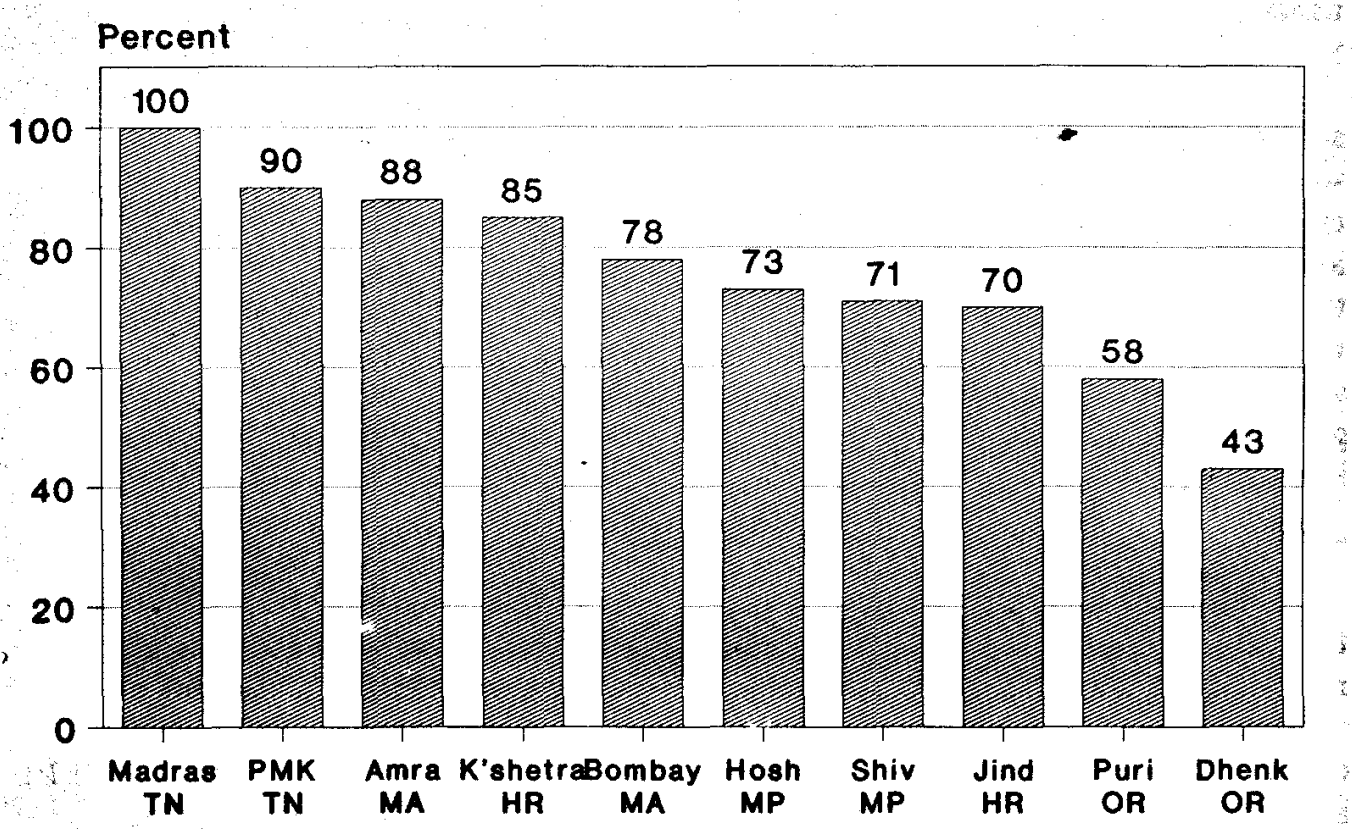


Fig. 7. Deliveries in "Safe Hands" (health staff and trained dais).

TABLE V–*Antenatal Care and Delivery Practices(%)*

Services	Districts									
	HA		MP		MH		OR		TN	
	J	K	H	S	A	B	D	P	M	PMT
Contacts (3+)	41	60	51	17	91	83	53	82	93	78
IFA (100 Tab)	31	48	33	7	75	68	51		68	11
Delivery										
Hosp/PHC	10	12	23	13	32	48		37	64	36
Pvt. Hosp		20	3	1	14	45		2	33	38
Home	90	68	74	86	64	7	79	61	3	26
Conducted by										
Health Staff	11	38	28	23	58	93	28	50	98	84
Trained Dai	58	41	45	49	30	4		8	2	6
Untrained Dai	29	18	21	10	4	2	57	21	0	5
Family Member	1	3	6	18	8	1		21	0	0
Other			0	0	0	0		0	0	5

were still attended by untrained persons.

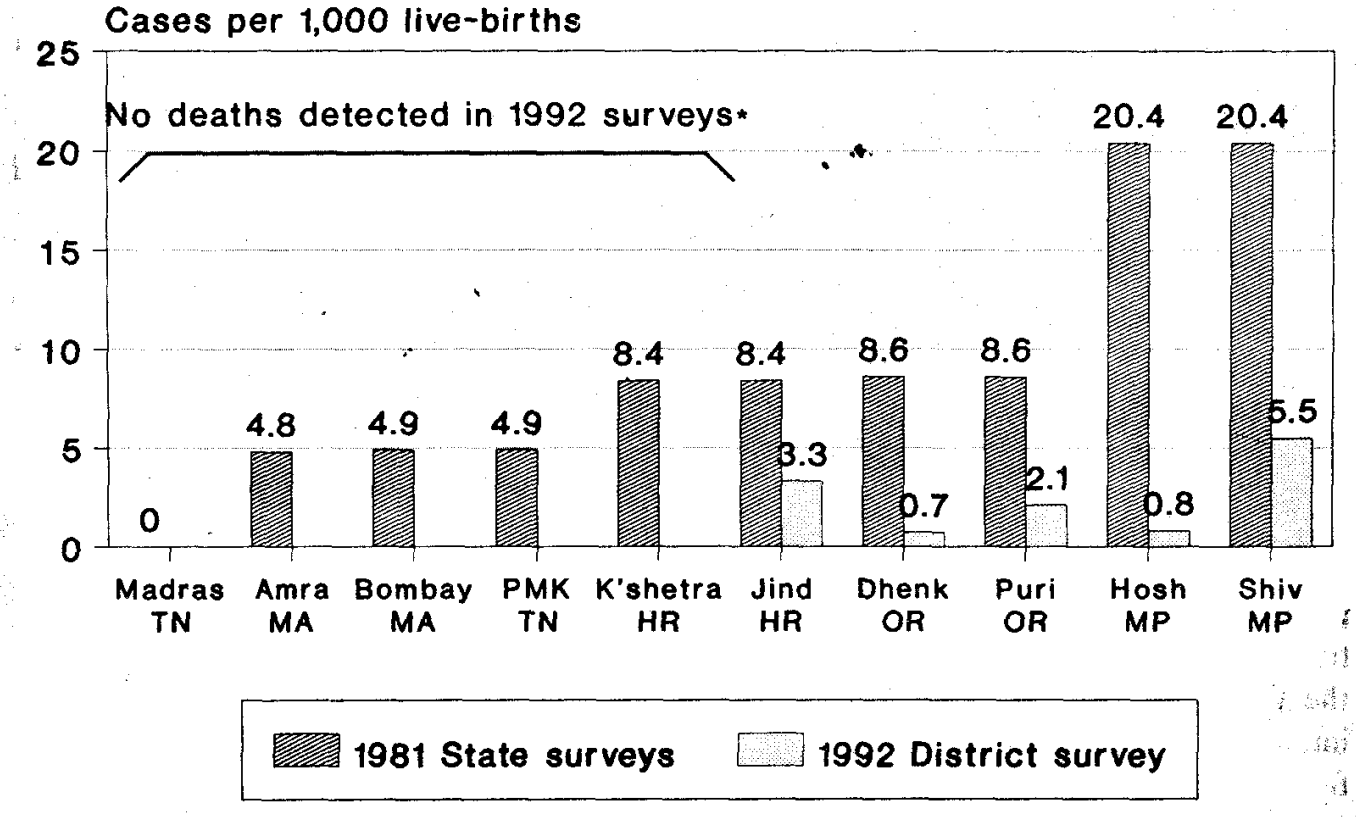
4.3 Neonatal Tetanus (NNT) Survey

The present review suggested that the combination of high levels of TT vaccination coverage and safe birth practices has produced a marked drop in the incidence of NNT (*Fig. 8, Table VI*). *No cases could be detected in Madras, Amravati, Bombay, PMT and Kurukshetra.* The survey results confirmed the hypothesis that the disease has reached negligible levels or may already have been eliminated in those parts of the country with high TT coverage levels and safe birth practices. However, NNT is still widespread in some states in the country, as evidenced by the results in Orissa and Madhya Pradesh. This calls for a strategy which focusses attention to high-risk areas.

Although, not strictly comparable, the rates determined by the present review are many-fold lower than the results of the state-wide NNT baseline surveys which were performed in 1981 in urban and rural areas. These results indicate that even in areas with comparatively high incidence rates, there has been a significant decline as compared to the baseline rates of 1981.

Analysis of other causes of neonatal deaths showed that a majority of the deaths were due to potentially preventable causes such as birth asphyxia, septicemia, low birth weight and broncho-pneumonia. This calls for the strengthening of the antenatal, natal and postnatal care in the districts as is envisaged through the Child Survival and Safe Motherhood Initiative.

One of the major objectives of the Immunization Programme is to reduce neonatal and infant mortality through the



deaths with adequate confidence.

Fig. 8. Neonatal tetanus incidence: 1981 and 1992.

TABLE VI–*Neonatal Mortality Survey*

District	Births surveyed	Neonatal deaths	NNT deaths	% cause
Jind	2446	20	8	40
Kurukshetra	2365	14	0	0
Hoshangabad	2445	23	2	9
Shivpuri	3092	50	17	34
Amravati	2324	10	0	0
Bombay	2265	0	0	0
Dhenkanal	2111	14	1	7
Puri	2443	21	5	24
Madras	2113	9	0	0
PMT	2131	15	0	0

elimination of NNT, which accounts for a large proportion of deaths in the neonatal period. The significant reduction in the level of NNT is a measure of the effectiveness of TT coverage among pregnant women, as well as the quality of practices and care during delivery and post-partum period. Since the efficacy of a full course of TT is very high (around 95%), there is a high potential for drastically reducing the incidence in India by focussing attention in the high risk areas, with a view to achieving the goal of NNT elimination nationwide by 1995.

4.4 Lameness Survey in Children Under Five Years

Lameness due to paralytic poliomyelitis is distinctive and easily identifiable. Reduction in the number of lame children over the years can serve as an indicator of the impact of OPV3 coverage. Data collected from lameness surveys supplements information through other systems of surveillance and is useful for documenting trends and for monitoring polio eradication strategies.

A substantial reduction in polio prevalence appeared to have been achieved in Haryana, Maharashtra and Tamil Nadu. However, cases of poliomyelitis were still found in all districts surveyed, and the prevalence was high especially in Madhya Pradesh (*Fig. 9, Table VII*).

Vaccine efficacy was calculated for OPV3 from survey data using a standard formula which estimates the per cent reduction in the incidence rate of poliomyelitis among vaccinated children compared to unvaccinated children. The formula used for the calculation is shown in *Annexure 1.*

OPV3 vaccine efficacy was calculated in 8 districts and was found to be in the range of 83-98% (*Fig. 10*). These results, although derived from very small number of cases found during the surveys, are consistent with studies in other countries and confirm that the vaccine efficacy of OPV3 in the country is satisfactory.

4.5 Immunization Sessions

The observation of fixed (public and private) and outreach immunization sessions in the districts surveyed, in general,

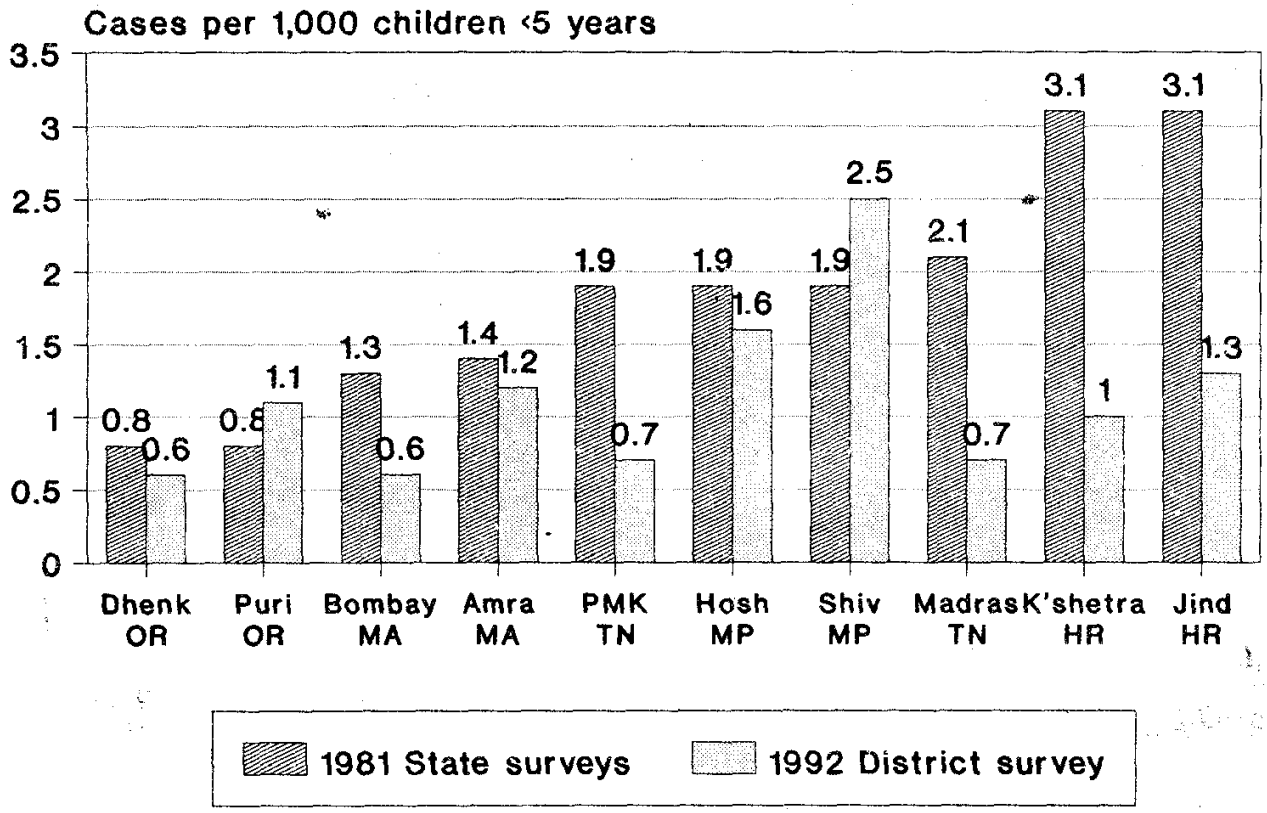


Fig. 9. Poliomylitis prevalence: 1981 and 1992.

indicate that immunization session organization, cold chain, injection and sterilization techniques and record keeping to be satisfactory. Some short-comings requiring closer supervision were pointed by district review teams where appropriate. Very few

TABLE VII–*Lameness Survey*

District	Households visited	Children < 5 years	Lame children	Polio paralysis	% cause
Jind	7979	10438	17	14	82
Kurukshetra	10471	10470	15	10	67
Hoshangabad	-	10332	24	17	71
Shivpuri	8467	11068	43	28	65
Amravati	12456	10571	13	7	54
Bombay	17979	10565	11	6	55
Dhenkanal	-	10499	11	6	55
Puri	12349	10459	15	11	73
Madras	14988	10125	19	7	37
PMT	19971	10499	16	7	44

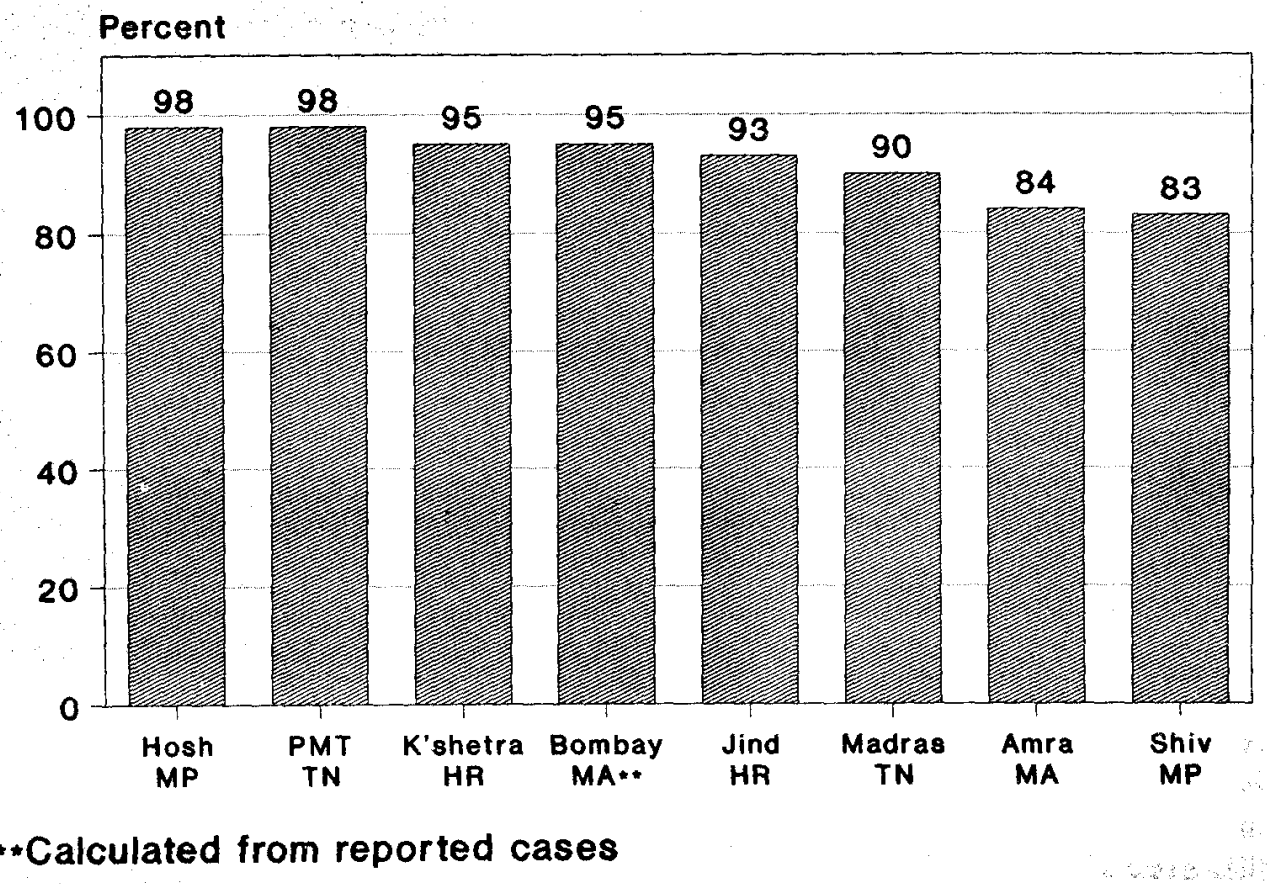


Fig. 10. OPV3 vaccine efficacy.

abscesses were reported which, in general, supported the hypothesis that health workers have mastered safe injection practices. The major challenge now facing UIP in India is to further reduce the proportion of unimmunized and partially immunized children.

4.6 Cold Chain

In the districts surveyed the vaccine cold chain and logistics systems were operating effectively. Good equipment for both vaccine storage and icepack freezing was installed in the districts and suitable arrangements existed to ensure safe vaccine distribution at delivery points. Alternative procedures for storing vaccine in the event of refrigerator failure were also well laid down. Some specific technical problems with both imported ice-lined refrigerators and certain voltage stabilizers were noted.

Vaccine storage and handling, temperature monitoring, and equipment care were generally satisfactory. Vaccine supplies were almost always sufficient and no significant shortages of syringes and needles were observed. Stock registers were in use and well maintained with necessary entries made regularly. Each of the districts had developed acceptable system of calculating vaccine utilization rates. Vaccine handling at immunization sessions is satisfactory.

Equipment repair is handled fairly promptly and effectively, at present, inspite of vacant positions of refrigerator technicians in some districts. These, however, need to be filled to provide for better maintenance services and to ensure cold chain security in the future as the equipments get older.

The satisfactory testing of randomly

selected vials of OPV in each district tended to confirm both high vaccine potency and the effectiveness of the cold chain.

In conclusion it can be said that potent vaccine can be delivered through the existing level of cold chain to the recipient.

In addition to the observations made by the survey teams, two consultants reviewed specifically the technical problems with the ice-lined refrigerators (ILRs) and freezers supplied by Vest Frost Company of Denmark. They visited the states of Tamil Nadu and Orissa and observed that many ILRs had developed the problem of 'internal leak' due to the corrosion of the steel tube evaporator used in the machines. The problem was accentuated in areas with irregular power supply and voltage fluctuations.

4.7 Surveillance of Vaccine Preventable Diseases

4.7.1 *Routine surveillance*

Routine passive surveillance of vaccine-preventable diseases, and surveillance through sentinel sites, was found to be established in all districts surveyed. In Bombay, Madras and in the states of Haryana, Maharashtra and Tamil Nadu, the surveillance was effective. The efficiency of reporting and the utilization of surveillance data were less satisfactory in Madhya Pradesh and Orissa. In general, the surveillance was efficient in places with high coverage levels, whereas in districts where acceptable coverage levels are yet to be reached, surveillance system was inadequately developed.

4.7.2 *Polio surveillance*

Polio cases are primarily reported from hospitals and other health facilities, to the District Immunization Officers (DIOs). In 1992, Ministry of Health and Family Welfare initiated active surveillance of cases of Acute Flaccid Paralysis (AFP) and NNT in a number of states including Haryana, Maharashtra and Tamil Nadu. Where AFP surveillance has been established, the substantial increase in the number of cases reported in 1992, as compared with the previous two years, was considered by the review teams mainly to represent the change in reporting criteria, although there was evidence in Amravati district in Maharashtra that a real increase in polio cases, possibly associated with cyclical trends in polio epidemiology, was occurring.

Extensive data, including line-lists and spot-maps providing full details of reported cases, were available in most of the districts surveyed. This data can be more effectively used to monitor polio eradication efforts by using standard surveillance indicators. Early computerization and use of specially designed software, especially in the large states with the potential of eradication of poliomyelitis in the next few years, would greatly enhance efficiency and ensure regular monitoring and speedier response to surveillance reports.

Since other states would also ultimately initiate more aggressive measures for polio eradication, mandatory reporting of all AFP cases in children under 15 years as well as active surveillance may be extended to all districts in the country.

4.7.3 *Monitoring of polio surveillance data*

In order to quantify surveillance and monitor achievement over a period of time, indicators of performance should be introduced progressively as more states and districts achieve prerequisite conditions for polio eradication. The following analysis of the standard indicators for monitoring AFP surveillance in Haryana serves to illustrate the procedures involved. The

recommended indicators for polio surveillance are:

(*i*) Completeness and timeliness of reports received (minimum monthly);
(*ii*) Interval between disease onset and notification;
(*iii*) Interval between notification and case investigation (at the residence);
(*iv*) Completeness of fecal specimen collection;
(*v*) Interval between notification and fecal specimen collection;
(*vi*) Completeness of appropriate containment activities;
(*vii*) Interval between notification and containment activities.

A total of 87 cases of AFP were reported in the two districts surveyed as of the end of August, 1992. At the time of the review, none of the cases had been finally classified as confirmed polio or non-polio although the clinical and laboratory data necessary to do so were available in several cases. It is possible that many of the reported AFP cases will eventually turn out to be of non-polio etiology and discarded from the records of polio cases.

In 1992, 60% of the AFP cases were reported by the staff of CHC/PHCs, health sub-centres and the private sector which demonstrates improved dissemination of the message for reporting of cases from all community sources. Nearly 50% of cases reached the attention of health workers within one week of disease onset and 70% within two weeks. Improvements in public awareness regarding polio eradication will be required to reduce this interval and hence permit more timely response to interrupt poliovirus transmission.

Nearly 70% of reported AFP cases were under two years of age (*Fig. 11*). Now

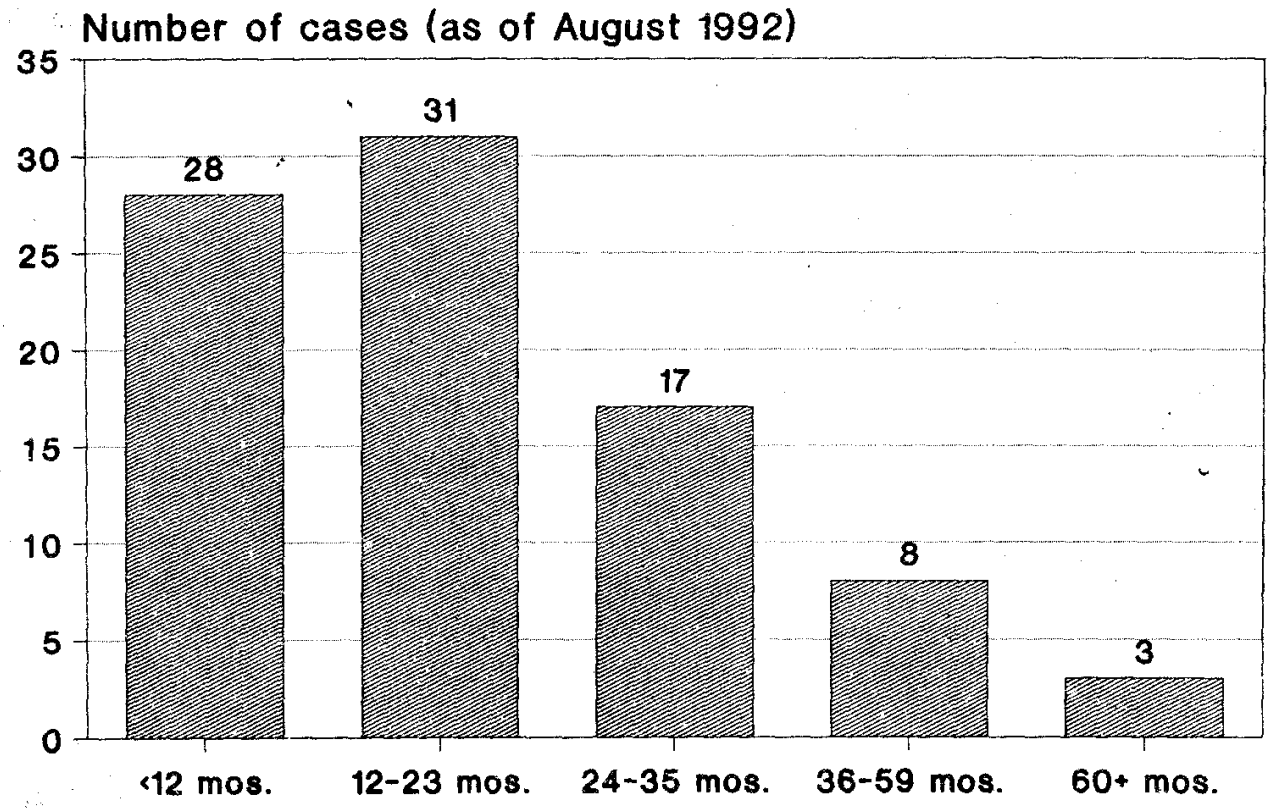


Fig. 11. Acute flaccid paralysis cases–Distribution by age.

that vaccination coverage with OPV has reached very high levels in Haryana, it is likely that fewer cases in the future will be confirmed in infants and young children. Twenty per cent of reported AFP cases occurred in fully-immunized children (*Fig. 12*), but it is possible that some cases in this group may eventually be discarded as non-polio. However, as vaccination coverage increases, the proportion of a few polio cases that occur in fully immunized children can be expected to rise.

Fecal specimens were collected within one month of onset of illness from nearly 50% of the AFP cases. Of those, two-thirds were collected within two weeks of disease onset and three-quarters were collected within 48 hours of notification, thus maximizing the possibility of isolating poliovirus. Laboratory results were received to date from 16 (41%) of fecal specimens submitted. Polio-viruses and non-polio enteroviruses were isolated from four each of those specimens, respectively.

Significantly, containment vaccination was performed promptly in all 82 reported AFP cases eligible for such control measures, of which 72% of the containment activities were initiated within 48 hours of notification, thus maximizing the possibility of interrupting the poliovirus transmission. In the majority of instances, two rounds of OPV were administered to children in 0-3 year age-group in the village or urban ward of residence of the case.

These findings demonstrate that, in Haryana, AFP surveillance and control measures are being implemented in as complete and as timely a manner as in other regions and countries, such as those of Latin America, where polio eradication may already have been achieved. With

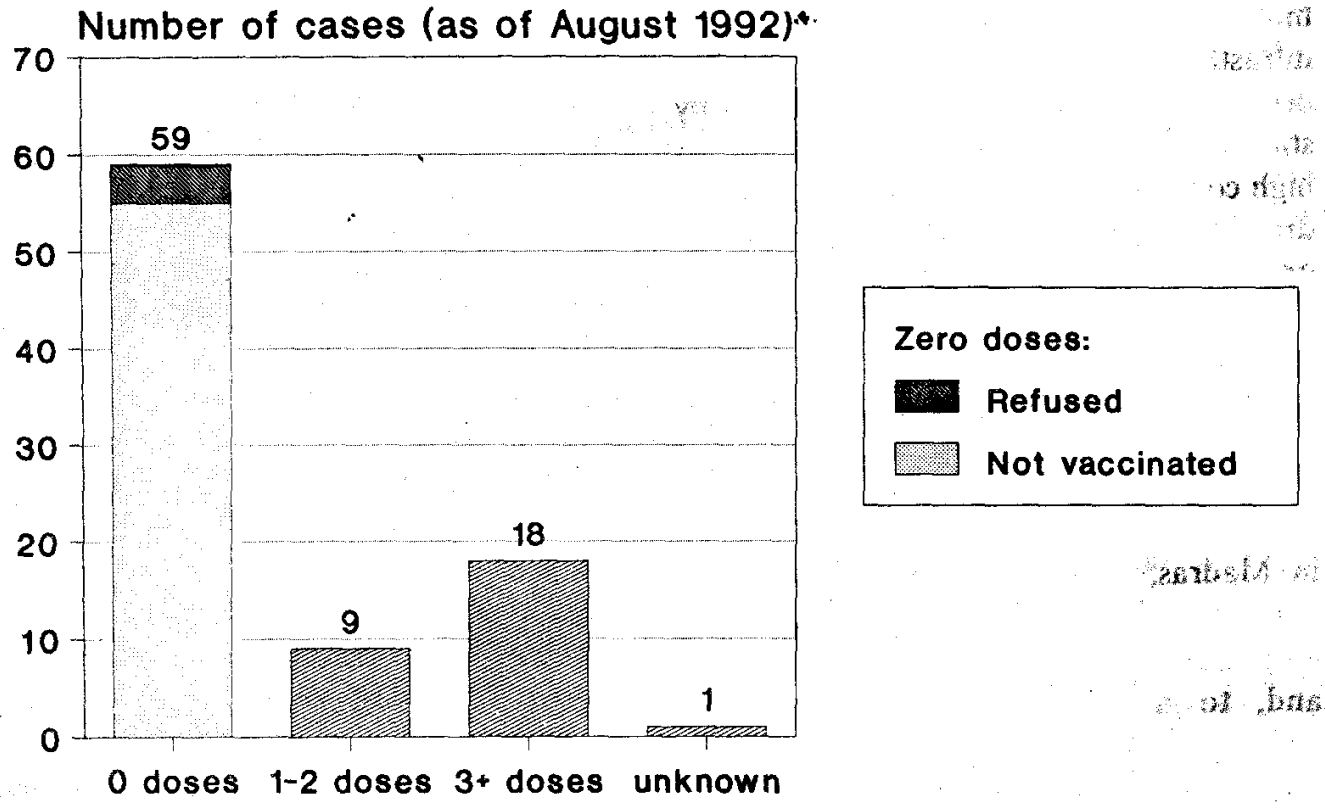


Fig. 12. Immunization status of 87 cases of acute flaccid paralysis.

closer monitoring of performance, surveillance and response strategies, in conjunction with sustaining current high levels of OPV3 vaccination coverage, should lead to the control and eventual elimination of polio transmission in Haryana by the year 1995.

Although similar data were available in Maharashtra and Tamil Nadu, where prompt action on notified cases is taken, analysis along the above lines was not yet being done.

4.8 Area Specific Observations

4.8.1 *Bombay and Madras*

The review has shown that the UIP has made outstanding progress, making full protection available to almost all women and children in these cities. Universal coverage is only held back by minor deficiencies in measles vaccination which in a small proportion was given either before the recommended age of nine months or after 12 months. The UIP has developed sound infrastructure and immunization service organization. There is active follow-up by staff at the community level, leading to high community awareness and virtually no drop-out. Additional focus is being placed on providing extra services to high-risk slum areas, although in Bombay some "grey areas" (new slums which do not fall within the boundaries of any specific government health facility) still remain.

As a result of effective disease surveillance, the team considered that, especially in Madras, probably all AFP and NNT cases were being detected, and that NNT may have been eliminated. In Bombay and, to a lesser extent, Madras, the enormous mass of carefully collected data, line-listings and maps were not fully used to monitor programme performance, especially in relation to containment measures and follow-up of cases 60 days after onset of illness. This was largely due to the manual processing of the data. There is a need to use the indicators of polio surveillance to monitor the quality of the polio eradication activities. Such monitoring would confirm that disease surveillance data and control measures are being effectively implemented.

Some pockets within both the cities, due to several highly negative epidemiological factors, will need special attention to clear the cities from remaining foci of poliovirus transmission. Moreover, since disease transmission respects no man-made boundaries, future polio eradication and measles control activities in these urban areas must be coordinated more closely between municipal, peri-urban and adjacent district services and effectively implemented across boundaries.

The proportion of institutional deliveries is very high in Bombay and Madras, following almost universal antenatal care. This facilitates the achievement of high TT2 vaccination coverage among pregnant women, clean birth practices and high rates of OPV zero dose and BCG vaccines among newborns. These factors have contributed to the apparent disappearance of NNT in Madras and Bombay.

The private sector plays a key role in vaccination services in the cities, providing 30-45% of all vaccines administered. However, these services are not monitored by government authorities or self-regulated by the practitioners. There is no comprehensive monitoring of cold chain, vaccine handling, adherence to government vaccination schedules, coverage and disease reporting.

4.8.2 *Districts in Haryana, Maharashtra and Tamil Nadu*

The results from the districts of

Haryana, Maharashtra and Tamil Nadu have demonstrated that excellent achievements can be made in rural areas too. Like the urban districts described above, very high levels of access to immunization services and high coverage rates have been achieved. Although, coverage with measles vaccine, which was introduced in the programme much later than the other vaccines, is lower, the narrowing gap between DPT1 and measles vaccine in these districts is an encouraging sign.

While initiation of vaccination in infants is later in rural areas than in the cities, approximately 75% have received DPT1 vaccine by six months of age. Drop-out rates are low and falling, and overall coverage has increased since previous surveys were conducted. Immunization is provided, for the most part, through health centres and outreach sessions, with much less participation from the private sector. Immunization services are well organized and vaccination practices appear safe and effective.

The proportion of institutional deliveries is lower than that observed in the two urban districts surveyed, but there are high rates of attendance by trained personnel.

Vaccine-preventable disease surveillance and control was well initiated but requires consolidation. The systematic use of data for monitoring and evaluation of polio eradication interventions is yet to be implemented effectively in these districts, although the potential for doing so is there. All the districts surveyed in the above states can now realistically plan and implement strategies aimed at polio eradication and NNT elimination.

4.8.3 *Districts in Madhya Pradesh and Orissa*

High levels of access to immunization have been achieved in the rural districts of Madhya Pradesh and Orissa. Approximately 80% of infants receive at least one dose of vaccine but, in one district, as few as 18% complete a vaccination schedule. Of those infants who receive vaccination, a relatively high proportion receive vaccines early in life, but the drop-out rates were high, reaching an unacceptable 28% in Shivpuri district.

Serial surveys showed that vaccination coverage had not improved significantly probably due to less active follow-up on reasons for immunization failure identified in previous surveys. Also, the discrepancy between reported coverage and survey results was highest in these districts, exceeding 30% for some vaccines in Madhya Pradesh.

Nevertheless, public awareness of immunization was relatively high. Similarly, vaccination coverage with TT2/B among pregnant women was acceptably high. Antenatal care is less well developed than in other districts surveyed, and institutional deliveries account for only 15-30% of the total. Deliveries are attended by trained personnel in 50% or less of the births in Madhya Pradesh and Orissa and it is difficult to vouch for the quality of the services.

Disease surveillance is inadequate in Madhya Pradesh and Orissa and case reporting is deficient. Specific surveys demonstrated that there is still a high incidence of NNT and a high prevalence of post-polio lameness in these two states.

A large number of vacancies and frequent transfers of staff appear to contribute to a lack of stability to new programmes such as UIP. Furthermore, the team observed lower levels of official commitment, including senior authorities in Madhya Pradesh and Orissa.

5. Recommendations

5.1 The achievements need to be sustained and the quality of immunization services maintained. Extra effort should now be made to extend high quality immunization services to all poorly covered areas.

5.2 In selected districts, not only within the states of Haryana, Maharashtra and Tamil Nadu, including the metropolis, where the present review was conducted, but also in districts of other states with high coverage levels, the eradication of poliomyelitis and the elimination of NNT are a distinct possibility in the near future. The team recommended that action plans aimed at achieving those goals be formulated and implemented in the near future. Such plans should include:

(*a*) Strong active surveillance through effective case detection at the community level;

(*b*) Careful case investigation and the use of improved clinical and laboratory criteria for diagnosis;

(*c*) Laboratory support including the development of the capacity to distinguish between wild and vaccine-like polioviruses;

(*d*) .Greater emphasis on timely final diagnosis, including discarding cases not meeting diagnostic criteria for confirmed polio;

(*e*) Prompt outbreak containment activities;

(*f*) Identification of high-risk areas and their elimination through focussed mass vaccination activities; and

(*g*) Close monitoring of surveillance through state-level computerization of data compilation and analysis, using software designed specifically for that purpose.

5.3 Disease surveillance should be strengthened. In due course, active surveillance for AFP and NNT should be started in all districts in the country so that few or no cases are missed from the surveillance data.

5.4 Where problems are delaying progress under the UIP, these need to be identified, analyzed and resolved by managerial and technical expertise available in the states.

5.5 The critical role of service organizations, NGOs and the private sector in raising public awareness about immunization and in promoting and providing immunization services should be recognized. Their participation should be promoted in planning, monitoring and evaluating immunization services and in disease surveillance. Quality of services provided by them, especially the cold chain should be monitored.

5.6 Ways of using the highly successful UIP logistics and service delivery network to assist other health promoting activities, especially those aimed at women and children to reduce infant, child and maternal mortality, need to be explored in the future.

6. Overview

India is a vast country having a heterogeneous population and diverse geographic, socio-cultural, educational and infrastructural development. Moreover, the UIP has been in operation for varying length of time in different parts of the country. This has resulted in unequal impact of the Programme in different areas. Therefore, in the context of the achievement of goals of NNT elimination and polio eradication, the targeted years need to be phased by states as has been planned under the UIP.

Some areas with high levels of development, easy access and well developed physical and managerial infrastructure are already in a position to plan additional measures aimed at polio eradication and NNT elimination. The present review identified the states of Haryana, Maharashtra and Tamil Nadu as being ready to move forward, but undoubtedly other states or districts within states are also ready for such developments.

As the active surveillance of AFP cases gains momentum in those states that are ready to pursue polio eradication, the number of reported cases will naturally increase. Since a number of etiological agents may, at least temporarily, cause flaccid paralysis, the importance of the effective use of improved clinical and laboratory criteria for confirmation of cases and discarding of non-polio cases increases in importance. Therefore, greater emphasis will be required in the future on the sensitization of the medical community, on the careful orientation of district staff, and on the extension of diagnostic laboratory facilities throughout the country.

All appropriate resources will need to be mobilized to raise public awareness concerning polio eradication and NNT elimination and to participate actively in launching such initiatives. The support of voluntary agencies and professional bodies such as Rotary International, Indian Medical Association, Indian Academy of Pediatrics, Lion's Clubs and other NGOs would greatly promote the early achievement of the important national goals.

The implementation of the programme in the less advantaged states suffer from recurrent problems of poor infrastructure, lower awareness among the people, areas of difficult physical access, considerable distances, but also less apparent motivation and commitment of the key staff members. However, where immunization services are provided, these are carried out relatively well, despite higher "wastage" from later initiation of vaccination and higher drop-out rates. These programmes lack adequate monitoring and supervision, since medical officers appear to place low priority on such activities. There is a clear need for stronger management backed up by greater commitment, focussing on problem identification, analysis and resolution.

Acknowledgements

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ANNEXURE - 1

Calculation of Vaccine Efficacy

Vaccine efficacy was calculated for OPV3 from survey data using a standard formula which estimates the per cent reduction in the incidence rate of poliomyelitis among vaccinated persons compared to unvaccinated persons:

$$VE = \frac{(PPV * PCU) - (PPU * PCV)}{(PPV * PCU)} \times 100\%,$$

where VE = vaccine efficacy
PPV = proportion of population vaccinated with OPV3
PCU = proportion of cases unvaccinated
PPU = proportion of population unvaccinated
PCV = proportion of cases vaccinated with OPV3.

Ideally, this calculation should be performed only on children 12-23 months of age, since the coverage survey has provided cover-

age data only for that age group. Similarly, the calculation should ideally be made for each year of onset using coverage data applicable to each individual year. However, since the number of cases was very small, it was necessary to make a single calculation for the five-year period.

Partially vaccinated children were not included in the calculations, as per standard statistical guidelines.

NOTES AND NEWS

THIRD COMMONWEALTH CONFERENCE ON DIARRHEA AND MALNUTRITION

The Third Commonwealth Conference on Diarrhea and Malnutrition is to be held in Shatin, New Territories, Hong Kong from *November 11th–14th, 1994*. This conference is organized jointly by the Department of Pediatrics, The Chinese University of Hong Kong and the Hong Kong Pediatric Society. Participation by over 300 delegates from throughout the Commonwealth is anticipated and, in this special meeting, we will be joined by colleagues from China.

Further details are available from:

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