CHAPTER 4 - IMPLEMENTATION IN SOUTH AFRICA

4.1 South African Measles Elimination Goal

4.1.1 Justification for measles elimination in South Africa

Although the current EPI(SA) strategy of achieving and maintaining high routine vaccination coverage has had a very positive impact on measles epidemiology by reducing cases, its limitations have become apparent with the occurrence of a major epidemic in 1992. South Africa has enjoyed in the past 2 years the lowest level of measles activity ever recorded. This "honeymoon period" is the result of sustaining relatively high routine vaccination coverage plus the occurrence of the 1992 measles epidemic which immunised many of the susceptibles in the older age groups. Since then, as national coverage rate lies around 85% for children 1 year (12-23 months) of age, the major proportion of susceptibles is accumulating among children <5 years of age.

However, due to the suboptimal vaccine efficacy and inadequate coverage, as shown in both developed and developing countries, measles outbreaks will continue to occur, and this even where virtually 100% of children have documented vaccination. The periodicity of those outbreaks will depend primarily on the level of coverage reached in each newborn cohort and on the uniformity of coverage distribution over the country.

Hence, for South Africa a combination of mass vaccination campaigns and high routine vaccination coverage and measles surveillance with laboratory support is recommended as the most effective strategy for controlling and eventually eliminating measles.

The success of these strategies depends upon achieving very high coverage during the mass campaigns, to reduce the number of susceptibles below the threshold level, and sustaining high routine vaccination coverage between campaigns to keep the rate of accumulation of susceptibles as low as possible. Although substantial resources are

required to implement a combination measles vaccination strategy, analysis in Canada and the United Kingdom suggested that the mass campaign was a cost effective public health intervention in these countries. Additionally to maximize the impact of such a strategy, particularly if the goal is measles elimination, surveillance must be strengthened to allow an immediate clinical and laboratory investigation of all suspected cases.

In South Africa, measles will be the next disease targeted for eradication after poliomyelitis. Wild polio virus circulation has, for all practical purposes, been interrupted in South Africa, but the conditions for the international certification of polio eradication require that active surveillance for acute flaccid paralysis (AFP) cases be continued for the next few years. The measles elimination initiative, with its own comprehensive epidemiological surveillance requirements, can be utilised to sustain EPI's high profile in general and on-going polio surveillance efforts in particular.

4.1.2 Setting the goal

A measles elimination consensus meeting was held in Pretoria on 28 November 1996. Participants in this meeting were health officials from the provincial and national health departments, international and national experts and paediatric and public health academics. The following goal was proposed and with its approval this goal would become a national health goal. A similar goal has been stated by several neighbouring countries, notably Namibia and Botswana.

South African Measles Elimination Goal

To interrupt the indigenous transmission of measles virus in South Africa by the end of the year 2002.

4.2 Historical perspective & current status of measles control in South Africa

4.2.1 Changes in measles vaccination schedules from 1980 to now

Prior to 1980, measles vaccination was given to only to individuals who bought the vaccine on the private market. No public sector measles vaccination took place until it was introduced in 1983. Since then various schedules and vaccine types have been utilized as presented below. The reason to change from the high to medium titre Edmonston-Zagreb vaccine in 1992 was that higher titre measles vaccine was for a time thought to be associated with increased delayed childhood mortality.

Table 3: History of routine measles schedule in South Africa (Source: Personal communication: Dr HGV Küstner, Director: Epidemiology, DoH)

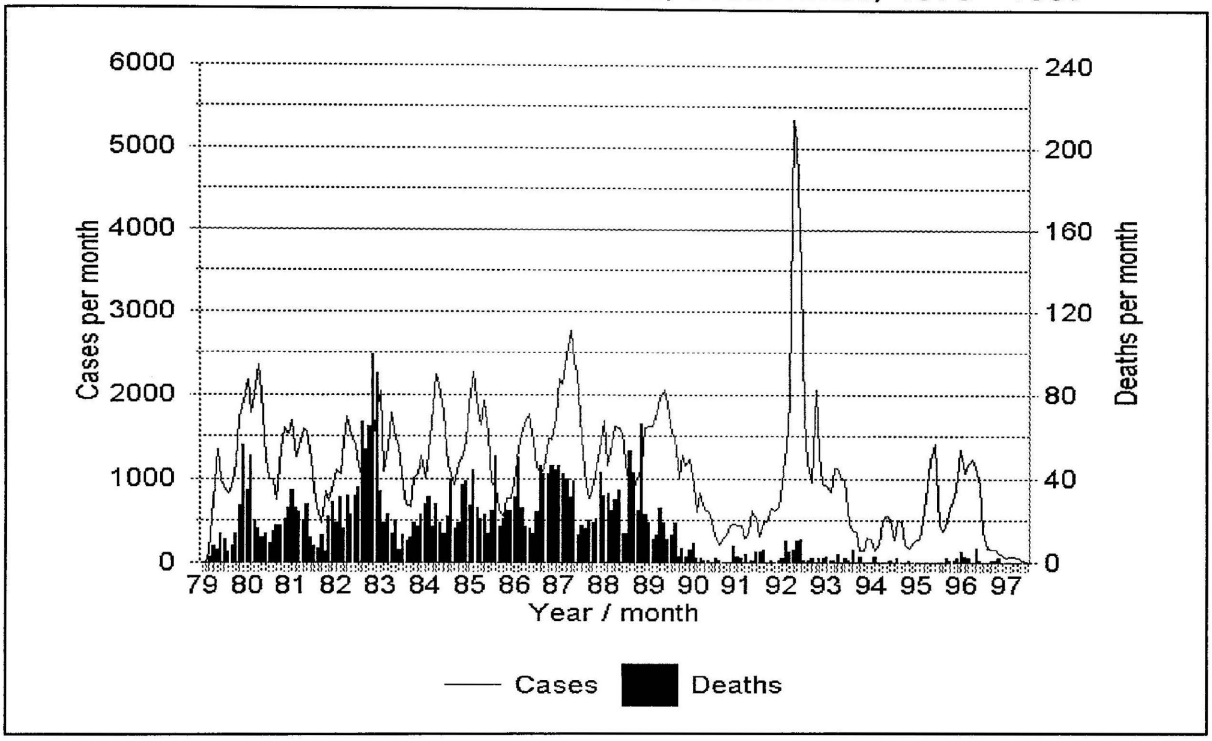
Year	Recommended Age	Vaccine strain	Minimum titre
1983-85	6m, 1st. dose 15m, 2nd dose	Schwartz	10^3 $TCDI_{50}$
1986	9-10m	Schwartz	10^3 $TCDI_{50}$
1/1991	6m	Edmonston-Zagreb	10^5 $TCDI_{50}$
3/1991	6m	Edmonston-Zagreb	$10^{4.5}$ $TCDI_{50}$
1992	6m- high risk area 9m - low risk area	Edmonston-Zagreb Schwartz	$10^{4.7}$ $TCDI_{50}$ 10^3 $TCDI_{50}$
1993	9m, 1st dose 18m, 2nd dose Additional dose at 6m in high-risk areas	Schwartz	10^3 $TCDI_{50}$
1995	9m, 1st dose 18m, 2nd dose	Schwartz	10^3 $TCDI_{50}$

4.2.2 Disease epidemiology in South Africa

Measles was made a notifiable condition in 1980. Prior to this data on disease incidence is found only in occasional reports and in some local authority annual reports.

The seasonal pattern of measles led to a primary peak in cases being experienced in September to November each year, with a secondary peak in March and April each year. In the period from 1980 to 1990, epidemics occurred every year, and case fatality

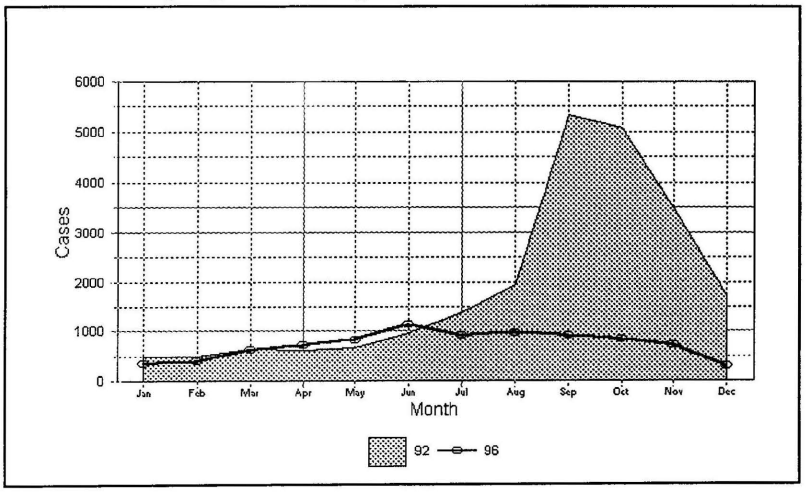
Figure 7: Notified measles cases and deaths, South Africa, 1979 - 1997



ratios of between 3% (1983) and 0.1% (1993) were experienced.

In 1990, the "Measles Strategy" (see below) was put into effect, resulting in the lowest ever annual number of cases being reported in 1991. This was followed in 1992/93 with a "post-honeymoon"

Figure 8: Aborting an epidemic: comparing notified measles cases in 1992 (epidemic year) and 1996 (mass campaigns in August)



epidemic with more cases per month in September and October 1992 than ever before. Fortuitously however, the number of deaths did not rise to the expected levels and most cases occurred in the 5 - 9 year and 10 - 15 year age groups.

Following the 1994 National Immunisation Programme Review, a national measles control goal was set, namely, that less than 4,000 reported measles cases for a period of 5 consecutive years beginning in 1996 should be observed. In fact, this goal was achieved in 1994, but the number of cases exceeded the goal in 1995 and 1996. Comparing the number of measles cases per month in the first few months of 1996 to the pre-epidemic period of 1992, an alarming trend towards another epidemic became visible, only to be curtailed by the mass immunisation campaigns in 1996/97 (Figure 8).

4.2.3 Vaccination coverage

Table 4: Measles vaccination coverage of 12 - 23 month olds by first birthday and by time of the survey

Province	By first birthday	By time of survey (95% CI)
E Cape	66,5	71,6 (62,7 - 80,5)
Free State	74,1	82,9 (76,4 - 89,4)
Gauteng	81,9	89,3 (85,1 - 93,6)
KwaZulu Natal	76,7	86,0 (80,7 - 91,3)
Mpumalanga	71,9	78,6 (71,3 - 86,0)
N Cape	71,6	88,6 (82,5 - 94,6)
N Province	80,3	91,5 (87,4 - 95,7)
North West	71,3	82,0 (75,7 - 88,2)
W Cape	89,1	95,2 (91,0 - 99,5)
SOUTH AFRICA	76,4	84,5 (82,1 - 86,9)

As part of the National EPI Review in 1994, a vaccination coverage survey of children 12-23 months of age was performed[58] (Table 4) which confirmed the quality of coverage figures reported through the routine notification system: 76% and 85% of the children were vaccinated with measles vaccine before one year and at the time of the survey, respectively. Another interesting finding of this survey is that a high

proportion of children (28%) were vaccinated before 9 months of age, that is, when vaccine efficacy is estimated around 50-60%.

Due to the restructuring of the health information units at national and provincial levels the routine collection of coverage data has been limited to individual provinces. No complete coverage picture for the country is currently available.

4.2.4 The "Measles Strategy"

In 1990, a "Measles Strategy' was launched, aiming at the improvement of immunization coverage against all 6 target diseases. From the available coverage information, this strategy resulted in a slight increase in vaccination coverage from 63% in 1989 to 71% in 1990 in the former South African and self-governing areas.

This strategy had a dramatic effect on children under 5 years, reducing their proportion in the total number of measles cases considerably. In the subsequent epidemic in 1992, most cases occurred in the older children above 5 years, and consequently only very few deaths were recorded during the epidemic. Also, the average number of reported measles cases per month before the measles strategy was 933, while after the measles strategy (including the epidemic in 1992) average reported measles cases per month dropped to 324.

4.2.5 Mass immunisation campaigns in 1996/97

Following the successful mass immunisation campaigns in 1995 against polio, another set of polio campaigns were planned for August / September 1996. However, national and provincial health managers decided to include measles mass vaccination at the same time.

Due to the structure of decision-making in the South African health system and different financial resources, different provinces decided to target different age groups of

children. It was decided that all provinces would cover the full 9 month to 14 year old age group in mass immunisation campaigns against measles either in 1996 or in 1997. The following age groups were chosen by the provinces:

Table 5: Measles mass immunisation target age groups per province , 96-97

Province	1996	1997
Eastern Cape	6 months - 9 years	9 months - 14 years
Free State	9 months - 15 years	Not done
Gauteng	9 months - 5 years	6 years - 14 years
KwaZulu-Natal	9 months - 4 years	5 years - 14 years
Mpumalanga	9 months - 14 years	Not done
Northern Cape	9 months - 14 years	Repeat selected areas only
Northern Province	9 months - 4 years (selected areas only)	9 months - 14 years (whole province)
North-West Province	9 months - 14 years	Not done
Western Cape	9 months - 4 years	5 years - 14 years

Although the classical "catch-up" campaigns described in the Americas was never conducted in two campaigns one year apart, this split was necessitated by the limited resources available in some provinces. The following levels of coverage were reached in the 96/97 measles mass immunisation campaigns:

Table 6: Coverage obtained during measles mass immunisation, 96/97

Province	96			97		
	Children targeted	Doses given	Coverage (%)	Children targeted	Doses given	Coverage (%)
E Cape	1,644,994	1,624,954	98.8	2,117,000	1,835,795	86.7
Free State	1,049,941	937,414	89.3	-	-	-
Gauteng	854,754	652,175	76.3	1,526,420	1,297,457	85.0
KwaZulu-Natal	984,727	802,778	81.5	2,117,302	1,815,960	85.8
Mpumalanga	1,044,298	1,089,324	104.3	-	-	-
N Cape	246,293	231,042	93.8	15,269	12,609	82.6

N Province	320,000	286,325	89.5	2,049,851	1,508,534	73.6
North-West	1,218,720	1,059,620	86.9	-	-	-
W Cape	334,272	331,095	99.0	778,981	704,000	90.4
South Africa	7,697,999	7,014,727	91.1	8,604,823	7,174,355	83.4

4.3 Strengthening routine immunisation

Seven diseases are targeted through vaccines given routinely in the EPI in South Africa and an eighth (Hib vaccine) is being planned. As the strengthening of the routine immunisations will encompass all these vaccines, this section deals with issues wider than just measles vaccination.

4.3.1 Physical and functional accessibility

Accessibility to routine immunisation services are generally good throughout the country. However, services are occasionally inaccessible for two reasons.

Firstly, not all communities have full access yet to health care within reasonable distance from their dwellings. This would constitute a physical barrier to accessibility. In the short term this problem should be addressed with mobile or outreach activities, delivering services to currently deprived areas.

Urgent attention should be paid by district managers to communities which remain without accessible health services, not only for the sake of immunisations but for all health care programmes. Various methods at district level could be used to identify the unreached areas. Possibly the easiest method and a good starting point would be to request all health facilities to demarcate their approximate area of service delivery on a district map based on their knowledge. These boundaries can, with time, be refined in each health facility by marking off where their patients come from. Finally, areas where no coherent health services, as well as areas of excessive overlap, will become evident through this exercise and district managers can redirect the services appropriately.

The second barrier to accessibility is probably less easy to overcome. Health care services including immunisations, are occasionally denied to clients, because the client did not come on the "right" day for the service, arrived too late at the health facility or was in other ways prevented by circumstance or staff to received full primary health care services when they arrive. This constitutes a functional barrier to accessibility and is much more covert than physical barriers.

The means to overcome these functional barriers include the redirection of primary health care staff to become client orientated much in the way a good hotel would take care of its clients. Also, thought may be given to opening the health facilities after normal working hours to allow working parents access to health facilities in their spare time. In the case of immunisations, all eligible children should be provided with the appropriate immunisation, even if it means opening a multidose vial for a single child who has come later. Adherence to the open vial policy (see inset) will also decrease the wastage for those vaccines, as they can be kept for subsequent immunisation sessions. **In the case of measles vaccine however, reconstituted measles vaccine should *always* be discarded at the end of each 6 hour session.**

Open vial policy:
Opened vials of OPV, DTP, DT, TT and Hepatitis B can be kept for subsequent vaccination sessions provided the vaccine has been kept in the cold chain, is not contaminated and has not left the health facility on an outreach activity.

4.3.2 Missed opportunities in the clinic setting

The *Integrated Management of Childhood Illnesses (IMCI)* clearly spells out the need for curative visits to the clinic to be accompanied by the checking of the Road-to-Health card and the provision of missing immunisations. This is the mainsay to ensuring that all contacts with health services are simultaneously used to provide missing immunisations.

Each clinic should be able to define the area in which the population lives that they serve. Ideally, this definition of the catchment area should be done in conjunction with other clinics in the area, as is described in section 4.3.1, page 46.

A register of children born in the area and of those that have presented themselves for previous immunisations needs to be kept. This would allow clinic staff to identify those children who have not received the subsequent immunisation doses. These children can then be traced and immunised.

Often clinics have devised their own ingenious way of finding these children, and clinic staff in some cases know their clients personally over the years, making this task easier.

4.3.3 Missed opportunities in hospitals

Due to previous health care provision legislation in some areas of South Africa, immunisations in local authority areas, even within hospitals, have often been considered a function of local authority health services. Often this would be evident through the fact that local authority staff would regularly visit the maternity and paediatric wards in hospitals in their areas and provide the necessary immunisations. However, this has led to an extraordinary number of missed opportunities[59,60]. Infants discharged during week-ends often leave unimmunised, as local authority routine would exclude the week-ends. Also, the great number of children seen daily in general and specialist paediatric outpatients are routinely either not checked for completeness of immunisation, or are told to have their missing immunisations completed at a clinic. Both practices let a golden opportunity to reach the children presenting themselves to health facilities pass unused.

All maternity and paediatric wards as well as the paediatric out-patient departments should devise mechanisms that *Road-to-Health* cards of each child are checked and that the necessary immunisations are given *there and then*, without any referral. This

can possibly even be done during the outpatient screening or admission procedures. Similarly, children's homes and "places of safety" should institute a ruling that all entrants require full vaccination including measles at entry.

In addition to this, *all paediatric admissions (even short term) of patients aged six months to four years should receive a dose of measles vaccine on admission, unless written proof of measles vaccination is provided.* This will not only protect the individual child, but prevent catastrophic nosocomial outbreaks of measles disease.

4.3.4 Missed opportunities in the private sector

As in paediatric out-patient departments, children who are present to a private practitioner or paediatrician should bring along their Road-to-Health card, and any missing immunisations should be given immediately and recorded on the Road-to-Health card. Although private health care providers have for a long time not been involved to a great extent in the immunisation programme, more and more private health care providers have now indicated their interest in providing immunisation services.

A national directive on private immunisation has been drawn up and is currently the basis of the interaction between the private sector and the public sector on immunisation. In respect of individual private health care providers, we would encourage their participation in the immunisation programme. Vaccines can be obtained free of charge from the district health authority, provided that the client is not charged for the vaccine, the number of doses given are supplied back to the district and that EPI(SA) policies are adhered to, both regarding the administration of the vaccine and the cold chain.

4.3.5 House-to-house vaccination

In certain circumstances, routine immunisations should be given by a team of

vaccinators moving from house-to-house ("raking"). Especially when it is suspected that groups of people are avoiding the authorities (eg illegal immigrants), have not been informed of health services (eg new informal settlements with high numbers of persons from other areas) or are, for any other reason, not presenting themselves to the clinics, this approach should be attempted.

Vaccinators move from door to door, requesting the residents to produce their Road-to-Health card and providing the missing doses at once. These visits should also be used to provide health promotional material, information on the local health services and other public health interventions (eg preparation of oral rehydration solutions in the case of diarrhoea).

4.4 Mass immunisation campaigns

4.4.1 "Catch-up" campaigns

By the time this policy and implementation plan was created, the "catch-up" campaigns in South Africa had been completed, placing the country squarely on the road to measles elimination. A description of the South African "catch-up" campaigns is given in section 4.2.5 on page 44.

4.4.2 "Mopping-up" activities

In South Africa, the term "mopping-up" is being used for two different activities. To place South Africa in line with international terminology regarding campaigns, we suggest the following use of terms.

Mopping-up campaign

A mass immunisation campaign following a previous campaign where areas in which low campaign coverage was achieved are reselected and redone. Similar to all campaigns, Road-to-Health cards are not checked or marked, and all

children within the target age group in the identified geographical area are reimmunised.

Raking

An activity linked to the provision of routine immunisations. In areas where low routine coverage are found, children who have no documented proof of immunisation are immunised. These immunisations form part of the routine immunisation activity and should be regularly undertaken at clinic level to boost routine coverage.

Although the second activity has often also been called mopping-up the use of the alternate term - raking - will avoid confusion.

In areas or groups where low coverage (<80%) was reached during the 96/97 mass immunisation campaigns mopping up campaigns are planned. In some cases the mopping-up was done immediately following the '97 campaign. However, where large areas or groups were missed, more extensive planning will be done to ensure good reach during the mopping-up campaigns.

Using the data on district level from the '97 campaign any district that reached less than 80% coverage will be required to do mopping-up work. In collaboration with the provincial and regional coordinators the most appropriate strategy to reach those that have been left out should be devised. This will include house-to-house vaccination, targeting creches or schools that have not reached the target. Experience in the "catch-up" campaign have shown that those schools and creches where health workers explained the need for campaigns personally to teachers and parents, a much higher coverage was obtained and refusals were minimal.

A guideline for mopping-up activities has been drawn up separately to assist the provinces in their planning.

4.4.3 "Follow-up" campaigns

The timing of "follow-up" campaigns is dependent on the coverage obtained in the routine measles vaccination programme. A "follow-up" campaign needs to be done when sufficient numbers of susceptibles have accumulated through imperfect coverage and imperfect efficacy to sustain transmission in an epidemic. This accumulation can either be estimated using the routine coverage and vaccine efficacy figures, or by doing cross-sectional serosurveillance studies. In South Africa, this decision is complicated by the current weak surveillance on the number of doses given in the routine immunisation programme and the different strategies and age groups used by the provinces in the 96/97 catch-up campaign.

Any follow-up campaign should be run uniformly across the country to enable effective social mobilisation and probably more effective disease prevention. It is proposed that the timing of the "follow-up" campaign should be calculated by doing seroprevalence studies in the age group 0 to 15 years. The seroprevalence study should be done three years after the end of the first "catch-up" activity, ie. July 1999. As indicated previously it is estimated that the current routine coverage for the first dose of measles is 76% by the first birthday and 83% in the 12 - 23 month old age group. The proposed three year limit will enable a scientific decision by the time the "follow-up" campaign is due. It is expected that "follow-up" campaigns will not be done in South Africa before July 2000.

4.5 Surveillance

4.5.1 Case definitions

Suspected Measles Case (SMC)

The category of Suspected Measles Case (SMC) is a wide catchment that is intended to provide an early alert for health workers at the health facility level that measles virus may be circulating in the area. A patient in whom a health care worker suspects the

possibility of measles virus infection is, for surveillance purposes, considered to be a SMC.

Although there is not a rigid clinical case definition used for SMCs, a health care worker should suspect measles virus infection when a patient presents with the following clinical picture:

CASE DEFINITION: SUSPECTED MEASLES CASE

- **Fever**
  AND
- **Maculopapular ('blotchy") rash**
  AND
- **Cough**
  OR
  Coryza ("runny nose")
  OR
  Conjunctivitis.

All such cases should have both a single blood specimen for laboratory analysis of measles virus infection and a urine sample for virus isolation collected and should be immediately reported to district surveillance authorities. The notification of a SMC should result in the immediate careful investigation of the case, as well as stimulate an active search for additional SMCs in the area.

Confirmed Measles Case (CMC)

There are two categories of CMCs:

- "Laboratory confirmed" and
- "Clinically confirmed".

The total number of CMCs is the sum of these categories. The definitions of these categories are outlined below:

Laboratory confirmed measles case

A Laboratory CMC is a SMC that after complete investigation satisfies at least one of the following criteria:

- Laboratory confirmation of measles virus infection
- Epidemiologic linkage to another laboratory confirmed measles case

A SMC is considered to be Laboratory Confirmed if measles specific IgM antibodies are detected in a blood specimen collected from the patient.

In an outbreak of more than 3 cases, it is not necessary to collect a blood sample from every SMC. Only the first 3 to 5 cases should have blood drawn for laboratory confirmation. All of the other SMCs can be considered to be laboratory confirmed if they are epidemiologically linked to another laboratory confirmed measles case.

Epidemiologic linkage is defined as direct contact with another Laboratory CMC whose rash onset was 7-18 days before the present case.

Clinically Confirmed Measles Case

A patient who satisfied the definition of a SMC and, for some reason, is not completely investigated is, for surveillance purposes, considered to be a Clinically CMC. Since the possibility of measles virus infection could not be excluded, it is not possible to discard these cases.

A Clinically CMC is a SMC without a complete epidemiologic investigation. Possible reasons include:

- death of the patient before an investigation is complete;
- patient can't be located or is lost to follow up;

- patient receives only a clinical diagnosis from a health care worker without laboratory investigation.

Since an epidemiologic investigation was not conducted and measles virus infection could not be confirmed nor excluded, these cases are considered to be failures of the surveillance system. In an eradication program, the goal of the measles surveillance system is to conduct a complete epidemiologic investigation on every reported suspected measles case and to have as few Clinically CMCs as possible. Of the total CMCs, at least 80% should be Laboratory CMCs.

Discarded Measles Case

A SMC that has been completely investigated, including the collection of an adequate blood specimen, and lacks serologic evidence of measles virus infection can receive the final case classification of "discarded". Moreover, if laboratory evidence of another infection that is usually associated with a rash illness was present, such as rubella, this provides ample support to discard the case.

The national EPI office should receive a copy of the case investigation form so that it can periodically review the distribution of diagnoses and evaluate the clinical basis for discarded cases.

Imported Measles Case

An imported measles case is considered a CMC in a person who travelled in another country with documented measles virus circulation during the possible exposure period (7-18 days prior to rash onset), and was in contact with a measles case in that country. For a case to be confirmed as an imported measles case, the possibility of local exposure to measles must be excluded after careful community investigation.

4.5.2 Case finding and routine reporting

Each health facility should identify one individual and one or two alternates who are responsible for keeping track of suspected measles cases and immediately reporting all new suspected measles cases. Reports should be submitted to local and/or district surveillance coordinators by the fastest means possible (telephone, e-mail, fax, etc,). All health professionals who are likely to be in contact with cases should be provided written material that describes their responsibilities and duties. Training and close ongoing supervision are important, as staff turnover may be a problem in many areas. National and provincial/state staff should visit all clinic staff to train them. Presentations on surveillance should be made to doctors, nurses, allied health personnel and record clerks. The design and use of posters and other visual materials should be encouraged illustrating responsibilities.

Key points to consider are:

- Repeated visits by the program surveillance officers will be required to establish and monitor all levels of the reporting system.

- All suspected cases should be investigated by trained staff, and an appropriate laboratory specimen should be obtained and tested promptly for the first three cases in an outbreak.

- Each suspected case should be given a unique identification number, that should be used whenever referring to the case.

- Regular reports should be made each week, even when no suspected cases of measles have been identified.

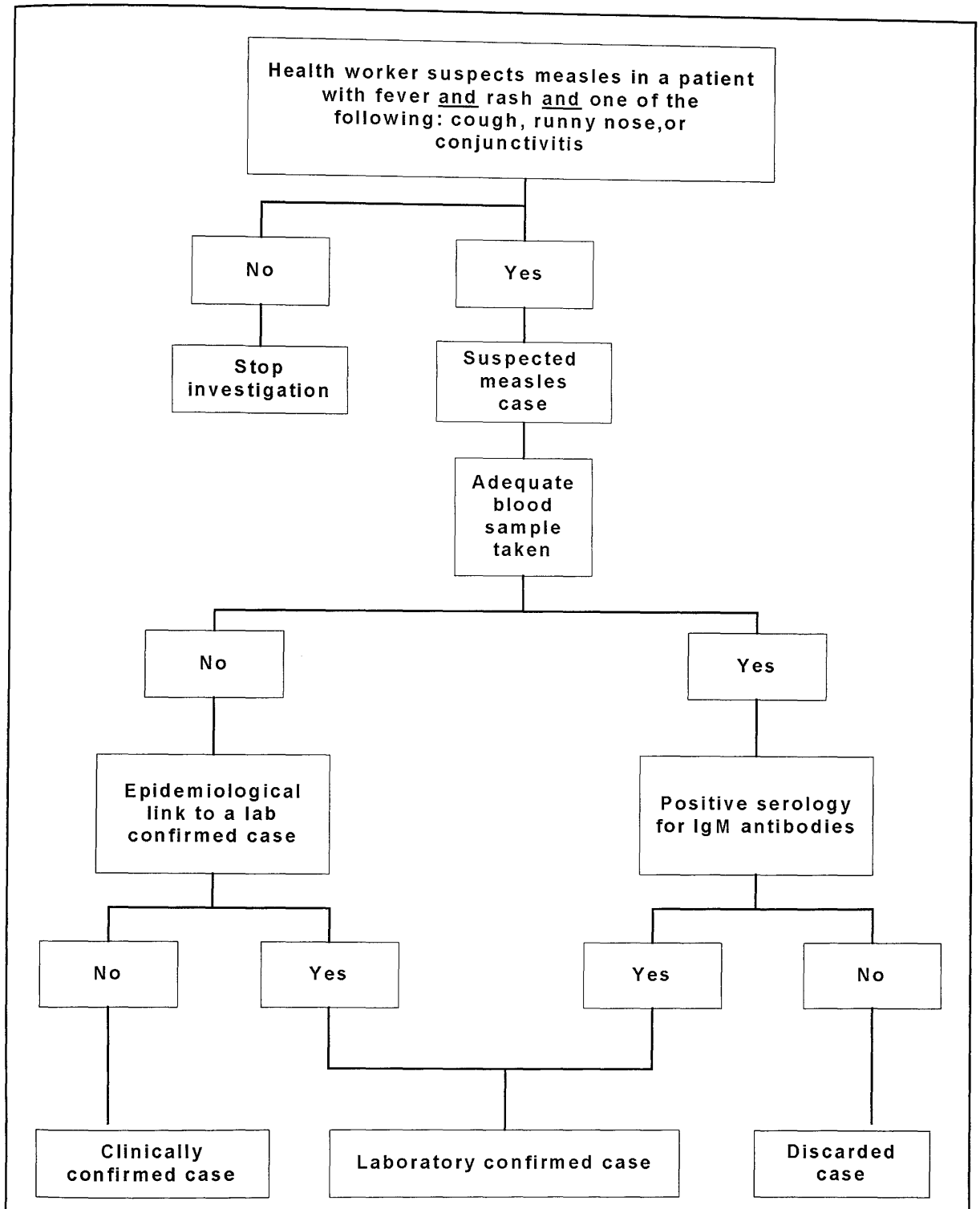
Private Practitioners: It is important that private medical practitioners be included in the surveillance system. In many areas it is likely that they will be the first to see

suspected cases. In some areas, sentinel reporting systems can be set up among a community's key pediatricians. Success of the system requires good coordination, training, frequent contact, and feedback.

Hospitals: Case-finding through the emergency department and pediatrics ward is critical to the success of a surveillance system. The infection control nurse or a deputy should be assigned at each hospital to check pediatric and infectious disease wards visually and review admission records for suspected measles cases. Reports may be submitted by telephone, E-mail, facsimile, courier service, etc.

Community sources: In addition to all health facilities, a network of community reporters need to be organized to report suspected cases. These may include pharmacists, private practitioners, private clinics, village leaders, schools, and anyone else likely to come in contact with such illnesses.

The primary purpose of measles surveillance is to detect, in a timely manner, ALL areas in which measles virus is circulating, not necessarily to detect every possible measles case. Health care workers are asked to report all patients in whom they suspect the possibility of measles virus infection. Suspected measles cases are



CLASSIFICATION OF MEASLES CASES

carefully investigated, including the collection of an adequate blood specimen for serologic analysis, and then are classified as being either Discarded or Confirmed.

As measles incidence declines, additional effort may be required to ensure that appropriate and timely diagnosis of rash illnesses and reporting of suspected cases continues. In addition, the rapid investigation and reporting of all suspected cases, and recording vaccination history and import status for all cases, will become increasingly important.

The activities listed below can further improve the detection and reporting of measles cases and improve the comprehensiveness and quality of reporting.

Searching hospital and other records. Hospital records may be searched yearly to evaluate the comprehensiveness of the reporting of hospitalized patients.

Mortality data are available through the vital records systems. Mortality data should be reviewed each year to identify deaths that may be due to measles. Any previously unreported cases identified through this review should be reported. At a minimum, mortality data should be reviewed annually.

Investigating contacts. Determining the source or chain of disease transmission, identifying all contacts (household, daycare, and other close contacts), and following-up of susceptible persons may reveal previously undiagnosed and unreported cases.

Active surveillance. Active surveillance may have a role in measles disease control; district health departments should consider making regular contact with health providers in high-risk areas (i.e., large hospital outpatient services in inner city areas) to obtain case-reports. These activities are especially important in large cities and in cities that have large numbers of international visitors. Active surveillance also may be conducted during outbreaks, when a cluster of suspected cases is reported, and when poor routine surveillance is suspected.

Special projects. Special projects such as reviewing emergency department logs to

identify rash illnesses that may have been unreported cases of measles may be used to evaluate surveillance sensitivity and reporting efficiency.

Monitoring surveillance indicators. Regular monitoring of surveillance indicators including time intervals between diagnosis and reporting, and completeness of reporting may identify specific areas of the surveillance and reporting system that need improvement.

Surveillance indicators for measles:

1. **The proportion of confirmed cases reported to the national EPI with complete information.**
2. **The median interval between rash onset and notification of a public health authority, for confirmed cases.**
3. **The proportion of confirmed cases that are laboratory confirmed.**
4. **The number of cases that meet the clinical case definition, but are not confirmed.**
5. **The number of cases that meet the clinical case definition in which measles is ruled-out by appropriate laboratory testing.**
6. **The number of chains of transmission that have an imported source.**
7. **The number of chains of transmission for which at least one clinical specimen for virus isolation was collected and submitted to the national EPI office.**

4.6 Case investigation and reporting

4.6.1 Steps in the investigation of a suspected case

All suspected cases of measles should be investigated so that the case can be classified as either discarded or confirmed. Once a case has been identified by a health worker using the case definition for a suspected measles case (SMC) the district EPI or CDC coordinator should be immediately informed by the quickest means possible (phone, fax or email). While the responsibility to investigate and follow-up the case ultimately lies with the district or regional coordinator, the health worker should be involved in the initial investigation. At the first contact with the suspected measles case, it should be confirmed that the case meets the case definition. The provincial EPI coordinator should also be informed that a case is under investigation.

An EPID number should then be assigned to each case. The EPID number consists of five elements, namely the disease code (MSL), a provincial code (eg FS for the Free State), a district code (eg BLM for Bloemfontein), the year (eg 97) and a sequential number (eg 002). The full EPID number in this example would thus read: MSL-FS-BLM-97-002.

A case investigation form (Appendix A) for measles should be used to collect all data in a systematic way. With the first contact all information in the first section needs to be collected and noted on the form. The following fields contain critical information:

- all demographic data;
- date of onset of rash;
- date of last vaccination; and
- date of serum sample taken.

A sample of venous blood should be obtained. This may be collected either by venepuncture in regular glass tubes (without any additives - red top), or using a heelprick and a capillary collection system such as Microtainer®. The sample should be sent to the nearest university virological department. If regular blood collection tubes were used, the sample should be sent on ice, while in the capillary collection tube it does not require the sample to be sent on ice. Both the sample and the laboratory request forms should be marked with the EPID number. The laboratories will conduct a measles IgM ELISA test on the sample.

In addition to the blood sample, a urine sample should be sent along with the blood sample to the virological laboratory as well. The urine sample will enable the isolation of the measles virus itself. The urine sample should accompany the original serum sample to the nearest university virological laboratory. Should the measles IgM be positive, the laboratory will send on the urine sample to the National Institute for Virology (NIV).

The investigator should enquire about other cases in the area, and if further cases are found follow the instructions in the outbreak investigation described in section 4.7 on page 69. Also, the investigator should inform other health workers in the vicinity as well as the district coordinators in adjacent districts of the occurrence of a suspected measles case so that they can be on the look-out for further cases.

The district Suspected Measles Case Line List (Annexure B) should be updated with the information of the case or cases.

Transmission is likely to have occurred from a person who had a rash-like illness or prodromal symptoms, and developed a rash illness later. Inquiries should be made to determine whether cases are occurring in places that the case visited within four weeks prior to the onset of the rash, such as a pre-school centre, school, or another town or village. If there are more than 10 suspected cases in a single outbreak area, the household visits should be cut back or eliminated depending upon available manpower. However, the district Suspected Case Line Listing should be filled out with particular attention to obtaining basic demographic data, including the age and vaccine history of the patient.

Isolation of the case and contacts

At home, a case should be limited to contact with immediate family members until 5 days after the rash appears. Communicability greatly decreases after the second day of rash. In hospitals, cases should be isolated from the onset of symptoms through the 5th day of rash. All children hospitalized or attending outpatient clinics, who cannot provide written proof of measles vaccination, should be vaccinated .

Management of close contacts

Definition of a contact:
All persons living in a household or other close quarters with the case during the infectious period (five days before to five days after the onset of the rash).

- If less than 14 days have elapsed since the case's rash began, all contacts should receive the isolation instructions whether or not they have been immunized.

- During the second week after exposure, at the first sign of possible measles (fever, runny nose, cough, or eyes bothered by light), the contact should stay at home. The child should not attend school, preschool, work, church, clubs, meetings, parties, baby-sitting groups, etc. If the illness is measles, it will become apparent in one or two days by the severity of the illness and the presence of a rash. Parents should be advised to contact the health or medical case provider immediately.

- Contacts who were susceptible at the time of a visit should be vaccinated and stay home and avoid contact with other children until two full weeks after exposure.

Searching for additional cases

In order to find additional suspected measles cases, the public should be kept well informed and community leaders should be asked to assist in case finding. Activities may include:

- Visiting blocks adjacent to the affected household;
- Sending notices to health care providers asking if they have seen or heard of

persons with fever and rash illnesses;

- Conducting visits and record reviews at the local centres, hospitals and clinics;
- Health staff in the affected areas should use every contact with patients as an opportunity to inquire about rash and fever illnesses in the neighbourhood;
- Efforts to identify additional cases should extend well beyond the neighbourhood community in which the suspected case lives.

4.6.2 Laboratory investigations

Collection and delivery of sera

While collecting sera on the first day of rash may result in some false-negative lab results, the majority of cases will be properly classified. Collecting a measles specimen soon after rash onset is clearly preferable to losing a patient to follow-up and not being able to collect any specimens.

Many patients, however, present to a health facility on or after day 2 of rash; the majority of these cases will have correct lab results and be properly classified. Moreover, if measles virus is circulating at high levels in a population, there will be more suspected measles cases and the laboratory will have other opportunities to confirm the presence of measles virus. Thus, a single serum specimen obtained at first contact with the health care system is considered to be adequate for measles surveillance.

The serum sample should be sent to the nearest academic virological department as soon as possible after collection.

SERUM COLLECTION AND SHIPMENT PROCEDURES

- Whole blood (3 ml) should be collected in a Microtainer® or normal blood collection tube. It may be kept at room temperature until there is complete retraction of the clot from the serum. Blood can be stored at 4° C for up to 24 hours before the serum is separated. Do not freeze whole blood.
- If blood is collected in a Microtainer® tube, it can be sent without refrigeration or separation of the serum.
- If normal blood collection tubes were used:
  - transfer serum aseptically to a sterile vial.
  - If available, use a centrifuge to separate the serum.
  - Store serum at 0-8° C until it is ready for shipment. Sera may be frozen;
  - Specimens should be shipped to the laboratory as soon as possible; do not wait to collect additional specimens before shipping;
  - Place specimens in zip lock or plastic bags;
  - Use Styrofoam boxes or a thermos flask;
  - Place specimen form and investigation form in plastic bag and tape to inner top of Styrofoam box.
  - Vials containing serum samples should be sealed and frozen, with the exception of whole blood, which should be stored at 0 - 8° C.
  - If using ice packs (these should be frozen) place ice packs at the bottom of the box, and along the sides, place samples in the centre, then place more ice packs on top.
- Arrange shipping date
- When arrangements are finalized inform receiver of time and manner of transport.

Meetings with public health laboratory personnel are essential to establish clear procedures, at all levels of the health system, for the receipt and transport of any specimens that are submitted for measles serology. This includes ensuring that the proper forms accompany the specimen.

Serum sent from the peripheral laboratory will be analysed for measles IgM and IgG antibodies using an indirect enzyme-linked immunoassay (ELISA) test. This test will be

standardized throughout the country and the kits will be supplied to the seven virological laboratories.

Serum found to be negative for measles IgM (ie. no current active measles disease or vaccination) will be tested for rubella, as the public health implication of a proven case of rubella is important.

Results

Patients that have a positive result with the IgM assay are considered to be laboratory confirmed measles cases. Any suspected measles case who was in control with a laboratory confirmed case will also be considered to be laboratory confirmed.

On rare occasions, a second blood specimen may be required. For example, if a blood specimen collected from a suspected measles case has a negative result and the clinician or epidemiologist strongly suspect measles infection, then it may be reasonable to collect a second blood specimen 7 to 14 days after rash onset. Similarly, if a clinician needs to make a definitive diagnosis on an individual patient with an initial negative result, a second sample may be useful.

Since both measles vaccine and natural measles infection can both stimulate an IgM response in the host, a surveillance dilemma occurs when a suspected measles case has a history of measles vaccination within 6 weeks of rash onset. Measles vaccine can cause fever and rash in about 10% of vaccinees and most vaccinees are expected to have detectable IgM after vaccination. Moreover, other medical conditions such as rubella, dengue, etc. may cause fever and rash illnesses in persons who have recently received measles vaccine. Therefore, a suspected measles case with a positive IgM result is not necessarily due to wild measles virus infection. An operational definition is needed to investigate and classify these cases.

A practical approach to this problem is as follows:

If a suspected measles case with positive IgM serology has a history of measles vaccination within 6 weeks of rash onset and an active search of the community does not find any further evidence of measles transmission, the case may be **discarded** as not being measles.

If, on the other hand, an active search finds other laboratory confirmed cases of measles in the community, the suspected measles case with history of recent vaccination should be classified as **laboratory confirmed.**

From this it is amply clear that the date of the last measles vacination is a crucial data item and it needs to be collected on all suspected measles cases.

Viral isolation

The best clinical specimens for isolating measles virus are respiratory secretions, white blood cells and urine. Specimens are best collected during the prodromal phase through the first few days of rash. Specimens (urine, nasopharyngeal aspirates, heparinized blood, or throat swabs) for virus culture should be obtained from every clinically suspected case of measles and should be shipped with the serum to the nearest university virological department. If the measles IgM is positive, the virus isolation sample will be forwarded to the National Institute for Virology. Clinical specimens for viral isolation should be collected at the same time as, and in addition to, samples taken for serologic testing. Because virus is more likely to be isolated when the specimens are collected within 3 days of rash onset, collection of specimens for virus isolation should not be delayed until laboratory confirmation is obtained. Clinical specimens should ideally be obtained within 7 days of rash onset, and should not be collected if the opportunity to collect a specimen is more than 10 days after rash onset.

Specimen collection for viral isolation

Specimens for virus isolation should be collected early in the acute phase of infection, when the virus is present in high concentration. They should be refrigerated and transported to a laboratory within 48 hours. Suitable samples for isolation of measles virus are leukocytes, serum, throat and nasopharyngeal secretions and urine.

Throat and nasopharyngeal secretions are taken either by aspiration, by lavage, or by swabbing the mucous membranes. Nasal aspirates or bronchial lavage samples yield virus more frequently than throat swabs. For isolation of the virus from urine, midstream urine should be collected into a sterile container. The urine should then be centrifuged for 30 minutes (1000 - 1500 rpm); the supernatant should be discarded and the sediment should be resuspended in 1-2 ml of viral transport media (e.g. Hanks' BSS). The resuspended sediment may be frozen and transported to the NIV.

4.6.3 Completing the case investigation

Once the results from the laboratory investigation have been received back, the case investigation form should be completed and all missing information added. The completed case investigation form should be faxed to the provincial EPI coordinator who is responsible to ensure that all the details of the case investigation forms are correct and complete.

The final case classification is made by the provincial EPI coordinator using the information on the case investigation form. The completed form with the classification should then be sent to the national EPI office where the information will be collated and reported. The national EPI office will also verify the final classification and if necessary request further information.

Feedback to the district coordinator and the health worker who detected the case is the responsibility of the provincial EPI coordinator.

4.7 Outbreak investigation and response

4.7.1 Confirm the Diagnosis

Suspected cases of measles should be investigated immediately as indicated above, and blood specimens for serologic confirmation should be collected. Also, urine samples or throat swabs for virus isolation should be taken and sent to the National Institute for Virology.

A suspected measles outbreak may be defined as 3 or more suspected measles cases in a defined geographical area within a one month period. In this context, once a single laboratory-confirmed measles occurs it is considered to be a confirmed measles outbreak.

When a measles outbreak occurs in a defined geographic area and has more than 20 cases, data gathering efforts should be limited to obtaining basic information from each case, such as name, address, age, immunization history, date of rash onset, and outcome (Appendix - Suspected Case Line Listings). At this point visits to affected households should be greatly reduced, as they are time-consuming and may divert attention from the more important control measures, such as vaccinating previously unvaccinated children.

Once the presence of measles virus circulation has been confirmed in the laboratory and appropriate specimens have been collected for viral isolation, efforts are not needed to collect blood from every suspected measles case. During an outbreak, patients in whom a health care worker has a strong suspicion of measles infection, may for surveillance purpose, considered to be confirmed via epidemiologic linkage. When the number of reported suspected cases has decreased to low levels, the collection of blood specimens may be useful in order to document the end of the outbreak. This limitation on the number of blood specimens collected will save valuable staff time, and prevent overloading the laboratories.

4.7.2 Evaluate Vaccination Coverage

Vaccination coverage data should be reviewed as soon as a measles outbreak is suspected. If immunization coverage is not high or there is not good coverage data, this presents a good opportunity to undertake a rapid vaccination program and to complete it within 1-2 weeks. The priority of the vaccination activity is to provide measles vaccination to previously unvaccinated preschool-aged and school-aged children.

4.7.3 Control actions and outbreak response

Control activities should not be delayed pending the return of laboratory results on suspected or probable cases.

The primary strategy for control of measles outbreaks is achieving a high level of immunity in the population in which the outbreak is occurring. In practice, the population affected is usually rather narrowly defined (such as one or more schools); high level immunity is obtained by achieving high coverage with 2 doses of measles vaccine in the affected population. Persons who cannot readily provide documentation of measles immunity should be vaccinated or excluded from the setting (school, hospital, etc.). Only doses of vaccine with written documentation of the date of receipt should be accepted as valid. Verbal reports of vaccination without written documentation should not be accepted. Persons who have been exempted from measles vaccination for medical, religious, or other reasons should be excluded from affected institutions in the outbreak area until 21 days after the onset of rash in the last case of measles. The recent experience in measles outbreaks in South America has been that almost all persons who are excluded from an outbreak area because they lack documentation of immunity quickly comply with vaccination requirements.

If cases are occurring among infants <12 months of age, measles vaccination of infants as young as 6 months of age may be undertaken as an outbreak control measure.

Monovalent measles vaccine is preferred. In practice, this recommendation may take several months to implement, and several months to halt once the outbreak has ended.

Health authorities at all levels should be informed and involved in all aspects of outbreak control. Health officials in nearby jurisdictions also should be notified and kept up to date as frequently as possible, so that they may begin appropriate preventive actions, as needed. If a suspected case has travelled or had close contact with individuals from other areas of the country within 15 days before the onset of the illness, the surveillance coordinator in those areas should be notified immediately. When appropriate, other countries should be notified. The public should also be informed through the media about any outbreak and control efforts that have been implemented.

The most recent information on cases, immunization activities, and villages visited should be monitored continuously during an outbreak. This information should be kept in a form that can be summarized quickly in an Outbreak Summary (see below). No new cases should be occurring four weeks after vaccination efforts are completed. Special reviews and checks should be made at this time to ensure that no new cases have occurred.

There are virtually no contraindications to receiving measles vaccine. The following recommendations serve as a general guide. Specific measures must be based on the prevailing epidemiologic situation in the outbreak area.

- Whom to vaccinate:

  The age group of the cases in an outbreak is critical to determine the target group of supplemental outbreak vaccination. In general, the measels cases indicate the group where susceptibles exist and should be targeted first.

  When fewer than 3 suspected cases are identified in an area, vaccinate all close

contacts, and the children between the ages of 9 months and 5 years in the immediate neighbourhood who documented proof of measles vaccination. When 3 or more suspected cases are identified in an area, depending on the estimated vaccination coverage in the area, a broader vaccination effort may be needed.

If many of the cases are occurring in infants under 9 months of age, vaccinate infants between 6 and 9 months of age (these infants should be revaccinated when they reach one year of age). Vaccination of older age groups should be considered, if high attack rates are observed in children 5 years of age or older, or if the coverage achieved during the "catch-up" vaccination did not reach 90% among the 9 month-14 year olds. All children without a history of vaccination after their first birthday should be targeted for vaccination.

- When to vaccinate

Start vaccination activities immediately when a measles outbreak is first suspected. Do not wait for laboratory confirmation of the suspected measles cases. If the suspected cases are eventually found to be laboratory confirmed, the vaccination intervention should help to decrease the number of susceptible children, and perhaps result in the interruption of measles virus circulation. If the initial suspected cases do not turn out to be due to measles infection, then the vaccination activity has helped to raise the level of community measles immunity and prevent measles outbreaks in the future.

- Where to vaccinate:

In both urban and rural areas the focus of vaccination efforts should be any potential pockets of susceptible children. The largest area possible should be covered. Door-to-door vaccination requires greater resources, but is likely to yield the better results. Gathering points such as schools, churches, health posts, etc., may also be chosen as mass vaccination sites.

4.7.4 Outbreaks in special circumstances:

Control of outbreaks in schools and other institutions.

During outbreaks in elementary, primary, and high school, and colleges and other institutions of higher education, as well as other institutions where young adults may have close contact (such as prisons or army camps), a program of revaccination with measles vaccine is recommended in the affected schools or institutions.

The scope of vaccination effort needed will depend on

- age-appropriate measles coverage in the community,
- population density, and
- patterns of social contacts within the community.

During an outbreak, strong consideration should be given to expanding vaccination efforts to all schools in the community, unless measles coverage is high in those other schools.

All students and their siblings, and all school personnel who cannot provide documentation that they have received two doses of measles containing vaccine or cannot provide other evidence of measles immunity (such as serologic testing), should be re-vaccinated. Persons who cannot readily provide documentation of measles immunity should be vaccinated or excluded from the school or other institution. Persons revaccinated, as well as previously unvaccinated persons receiving their first dose as part of the outbreak control program, may be immediately readmitted to school. Persons who continue to be exempted from or who refuse measles vaccination should be excluded from the school, day care, or other institution until 21 days after the onset of rash in the last case of measles.

Control of outbreaks in medical settings.

If an outbreak occurs within, or in the areas served by a hospital, clinic, or other medical or nursing facility, all personnel (including volunteers, trainees, nurses, physicians, technicians, receptionists, and other clerical and support staff) with patient contact should receive a dose of measles vaccine, regardless of their age, unless they have documentation of measles immunity or vaccination. If indicated, health-care workers who have not been immunised against measles should receive a dose of measles vaccine. Serologic screening of health care workers during an outbreak to determine measles immunity is not generally recommended, because arresting measles transmission requires the rapid vaccination of susceptible health-care workers which can be impeded by the need to screen, wait for results, and then contact and vaccinate the susceptible persons.

Susceptible (unimmunised) personnel who have been exposed to measles should be relieved from all patient contact if possible and should be excluded from the facility from the 5th to the 21st day after exposure. Personnel who become ill should be relieved from all patient contact and excluded from the facility for 7 days after they develop rash.

Further discussion on the prevention of nosocomial transmission can be found in section 4.8 on page 77

Role of community wide vaccination efforts in outbreak control.

Mass revaccination of entire communities is not of demonstrated benefit in control of measles outbreaks. Such activities may sometimes have to be undertaken because of political or other community demands for "action" and concerns about the acceptability of targeted interventions directed toward selected, high risk populations, but there is no epidemiological evidence that they are feasible or useful in controlling measles outbreaks.

Quarantine.

Quarantine is of limited usefulness in control of measles outbreaks. Imposing quarantine measures for outbreak control is usually both difficult and disruptive to schools and other institutions. Under special circumstances, such as during outbreaks in schools attended by large numbers of persons who refuse vaccination, restriction of an event or other quarantine measures might be warranted. However, such actions are not recommended as a routine measure for control of most outbreaks.

Post-exposure vaccination and use of immunoglobulin to prevent measles in exposed persons.

If given within 72 hours of exposure to measles, measles vaccine may provide some protection. In most settings, post-exposure vaccination is preferable to use of immunoglobulin. Immunoglobulin may be preferred for infants <1 year of age who are household contacts of measles patients because it is likely that they will have been exposed more than 72 hours prior to measles diagnosis in the household member, and they are at highest risk of complications from the disease.

Measles cases at port of entry.

A number of issues have been raised regarding how to handle international passengers who are suspected of being infected with measles. Below are some guidelines which may be useful in approaching such situations.

Any traveller who is a suspected of having measles should immediately be referred to local health authorities. The passenger should be informed of his/her illness and its potential for complications and spread to others. If hospitalization is not necessary, the patient with suspected measles infection should remain at a residence (hotel or other living quarters) until at least 5 days after rash onset.

A health information card should be given routinely to all travellers arriving or visiting from other countries informing them of the measles eradication program, and requesting that they assist by seeking immediate medical attention if they experience any rash illness with fever.

4.7.5 Additional surveillance strategies

Measles surveillance should be intensified to search for additional suspected cases. All reporting units should be notified of the suspected measles outbreak, and to be on the look-out for additional cases. Daily calls or visits to schools, hospital emergency rooms, and selected pediatricians may prove to be useful, especially in urban areas.

4.7.6 Outbreak monitoring

Information on suspected and confirmed measles cases, vaccination activities, and areas visited should be monitored and updated continuously during an outbreak. The Outbreak Summary form should be completed. When no new cases are reported during a 3 week period despite the presence of enhanced surveillance, the outbreak may be considered to be over.

4.7.7 Outbreak Summary

Careful investigations of measles outbreaks can provide useful information regarding factors which may have facilitated measles virus circulation. The investigation may help to identify risk factors for measles infection and provide information which may be used to refine and improve the measles eradication strategy.

Sections in an outbreak summary report:

1. Introduction,
2. Surveillance methods,
3. Description of the outbreak,
4. Analysis of the outbreak,
5. Control measures,
6. Problems,
7. Conclusions and recommendations.

In order to benefit from the investigation and

outbreak control activities it is necessary to organize and report data related to the outbreak (see adjacent box).

4.8 Minimising nosocomial measles transmission[61]

It is vital to maximize awareness among health staff that a child with measles could enter any health facility at any time. Staff must assume that there exists a continual risk of nosocomial spread of measles to non-immune persons. There needs to be a constant state of preparedness to minimize the risk of nosocomial measles transmission.

The following recommendations are made to prevent measles transmission specifically in health facilities. General recommendations such as maintaining high measles coverage in the community and avoiding missed opportunities is discussed elsewhere in this document.

4.8.1 Ensure adequate measles immunization status among hospitalized patients

The immunization status of all hospitalized patients should be rigorously checked. A dose of measles vaccine be given to all *unimmunized* infants aged six months to nine years upon admission to hospital. In cases of outbreaks or where there is a lot of measles circulating in the community, this may be extended to *all* children, even if there is documented evidence of previous measles immunization, but the precise age range may be adjusted in light of local conditions.

In addition, to guarantee that no opportunities are missed, the immunization status of patients should be checked again before discharge. Immunization of those without documentation of previous measles immunization will reduce the chances of a child returning home while incubating a nosocomially-acquired measles infection. Failure to do this could result in the infection of children in the community with measles originating in the hospital.

Exposed non-immune contacts of hospitalized measles cases, such as patients sharing the same ward and visitors, aged six months to nine years, should receive one dose of measles vaccine, where possible, within 72 hours of exposure. Hyper-immune measles gamma globulin is less effective and much more costly than measles vaccine for use with non-immunocompromised patients.

4.8.2 Isolate fever and rash cases upon arrival

Cases of fever and rash should be considered as suspected measles until proven otherwise. To reduce the chance of exposure, cases of fever and rash presenting at a health facility should ideally not enter the common waiting areas. Where available, such cases should be fitted with a mask and taken directly to a different room reserved for diseases subject to respiratory isolation. Where possible, an area should be designated in the clinic to see all cases of rash illness.

If possible, waiting and treatment areas should be well-ventilated, and care should be taken to ensure that sick and well children do not subsequently share the same room or same staff for weighing, clinical examination, immunization or other consultation, since this would clearly defeat the purpose of their initial separation by allowing the possibility of measles transmission.

If it is not normally possible to provide a special waiting area because of lack of space, at least during a measles outbreak such an area should be created, and information disseminated that children with a rash illness should not wait in the common waiting area. Where female literacy is more common, a sign may be mounted outside the health facility instructing parents/guardians bringing a child with rash to wait outside and ask another person to inform the staff that the child has arrived.

4.8.3 Inform the hospital infection control authorities

Measles is a notifiable disease in South Africa. In addition, where appropriate,

nosocomially-acquired measles cases should be reported immediately to hospital infection control authorities for immediate investigation and response.

4.8.4 Ensure adequate measles immunization status among health facility staff

To prevent nosocomial spread of measles in the hospital setting, all staff should be immune. Any staff member who cannot provide documentary proof of measles immunization or adequate measles antibody titres at the time of employment should be considered for a dose of measles vaccine. Candidates should first be screened for contra-indications such as pregnancy and immune suppression.

4.8.5 Administer gamma globulin to immuno-compromised contacts of measles cases

Due to the risk of overwhelming viraemia, live virus vaccines such as measles vaccine are contra-indicated in individuals with congenital disorders of immune function or those receiving immuno-suppressive therapy. Hence, immuno-compromised contacts of measles cases should receive hyper-immune measles gamma globulin, as soon as possible after exposure. However, persons infected with the human immuno-deficiency virus (HIV) or with suspected or confirmed acquired immuno-deficiency syndrome (AIDS) may receive live measles vaccine.