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EPI Review in Maldives

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Abbreviations

AD	auto-disable syringe
AEFI	adverse events following immunization
AFP	acute flaccid paralysis
BCG	Bacillus Calmette Guerin vaccine (for tuberculosis)
CDC	Centre for Disease Control & Prevention (USA)
CHW	Community Health Worker
DMS	Department of Medical Services
DPH	Department of Public Health
DTP	diphtheria-tetanus-pertussis vaccine
EPI	Expanded Programme on Immunization
FDA	Food and Drugs Authority
FHW	Family Health Worker
HCWM	health care waste management
HepB	hepatitis B vaccine
Hib	<i>Haemophilus influenzae</i> type b vaccine
IEC	information, education & communication
IGMH	Indira Gandhi Memorial Hospital
IVD	Immunization, Vaccine and Development
MMR	measles, mumps & rubella
NRA	National Regulatory Authority
NPSP	National Polio Surveillance Project
NT	neonatal tetanus
OPV	oral polio vaccine
ROSA	Regional Office for South Asia (UNICEF) Nepal
SIA	supplementary immunization activity
TBA	Traditional Birth Attendant
ToT	training of trainers
TT /Td	tetanus toxoid/ tetanus diphtheria
VPD	vaccine preventable diseases
VVM	vaccine vial monitor

Executive summary

The Government of Maldives has initiated several reforms in the Ministry of Health, (MoH) including transfer of some departments and units within the MoH and also to other ministries. New vaccines are becoming increasingly available in the market and are affordable for developing countries. In Maldives, measles, mumps and rubella (MMR) vaccine has been introduced in the routine immunization programme in 2007; new equipment was purchased with tsunami relief funds and new policies are being developed by the Ministry of Environment, Water and Sanitation affecting the way health care waste is managed. These changes may have an impact on the immunization programme. In this changing environment, the Ministry of Health requested WHO's assistance to conduct a national EPI review to identify problems and prepare an activity plan to implement solutions to keep up with the well-performing immunization programme in Maldives.

Teams, constituting of international EPI experts from the IVD section of the WHO Regional Office for South-East Asia (WHO SEARO/IVD), UNICEF, Centre for Disease Control and Prevention (CDC), Atlanta, USA, and Ministry of Health, Sri Lanka, along with national EPI experts, conducted the EPI review from 11 to 19 December 2006. Using questionnaires to guide the interviews, the teams collected data in six areas of the EPI programme:

- (1) Planning and management of immunization
- (2) Immunization policies and vaccination schedule
- (3) Immunization coverage, including reporting procedures
- (4) vaccine preventable diseases surveillance
- (5) Immunization safety, vaccine management and immunization waste disposal
- (6) Advocacy and communication.

The sample for data collection included four regional hospitals, six atoll hospitals, 18 health centres and several health posts which represent health facilities at each level of the health infrastructure: islands, sub-atoll, atoll, regional and central. Three teams were constituted to visit health

facilities including regional and atoll hospitals and health centres and health posts.

The findings of the review teams confirmed that Maldives has been successful in providing immunization services to the population with high coverage being maintained. In most facilities visited, the health staff was knowledgeable about planning, budgeting and safe vaccine handling and injection practices. The highest priorities to be addressed in the Maldivian immunization programme are the following:

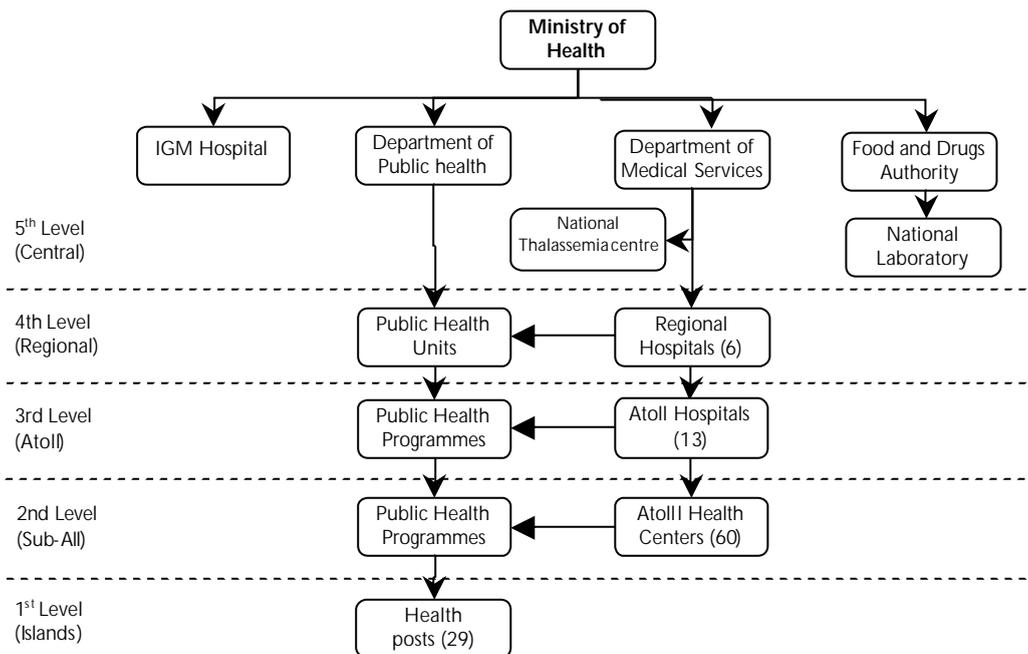
- Establish an expert group to develop national EPI guidelines that outline policies and procedures for planning and budgeting within the decentralization of health services.
- Review the current immunization schedule to:
 - Reduce number of contacts
 - Introduce fourth dose of diphtheria-containing vaccine.
 - Replace tetanus toxoid (TT) with tetanus diphtheria (Td)
- A systematic standard procedure for collection, transport and testing for suspect measles cases need to be developed along with appropriate guidelines to help health workers.
- Develop a national in-service training programme with implementation plans and budgets.
- Ensure vitamin A is administered every six months to children aged nine months to five years old.

1. Background

1.1 Health infrastructure in Maldives

The Government of Maldives gives high priority to the provision of health for all based on the primary health care approach. The geographical nature of Maldives with its innumerable isolated islands poses a major challenge to provide equitable access to health to all. To overcome this challenge the government has established a five-tier health care delivery system (Fig 1).

Figure 1: *Organization of the Health System*



In a recent reorganization of the system in 2006, all curative facilities have been brought under the newly-created Department of Medical Services, except the Indira Gandhi Memorial Hospital (IGMH), the only public sector tertiary-level health facility in the country which is directly

under the Ministry of Health. Within this change, the Department of Public Health (DPH) is administratively responsible for the health posts in the islands. Similarly, the curative services, which managed tuberculosis, malaria, filarial and leprosy programmes, have been moved from DPH to the IGMH. Also, the Maldives Water and Sanitation Authority (who looks after health care waste management), which was under the MoH, has been moved to the Ministry of Environment, Energy and Water.

At the fifth or the apex level (central level), institutions directly under MoH includes IGMH, DPH, the Department of Medical Services (DMS) and the Food and Drugs Authority (FDA). The National Thalassemia Centre, although at the central level, is under DMS and the National Laboratory is under FDA. DPH is responsible for delivering preventive public health programmes for the prevention and control of communicable diseases including vaccine-preventable diseases and the promotion of health and well-being. DMS is responsible for organizing and delivering curative services to the regions, atolls and islands. IGMH provides tertiary curative care, serving as the central referral hospital for the whole country. FDA is responsible for regulating drugs and vaccines that are all imported and to monitor their use in the country.

At the fourth level are the six regional hospitals that typically cover two to five atolls. Curative services include major specialities such as surgery, internal medicine, orthopaedics and paediatrics supported with X-ray, laboratory, ultrasound and scanning facilities. Through their public health units they also implement preventive health programmes including immunizations that are provided either in hospitals or through outreach sessions. Public health units in regional hospitals are typically staffed with a programme coordinator, community health supervisor, community health workers, family health workers and midwives. BCG, hepatitis B and polio vaccinations are provided to newborn babies before their discharge from the hospital. Regional hospitals supervise third and second level health services. The organizational chart of Thinadhoo Regional Hospital is provided in Annex 1 as an example.

At the third level are the ten (10) atoll hospitals (several health centres are planned to be upgraded to atoll hospitals in the near future). They serve the population of those atolls where no regional hospital is available. They provide general clinical services, obstetric care including labor room and operation theatre and basic laboratory services.

At the second level are the 87 atoll health centres. They provide preventive and basic curative services. They are staffed with a doctor and a registered nurse for the curative care and community health workers (CHWs) for the preventive services. Several atoll health centres have been upgraded with wards and labour rooms and now offer a wide range of secondary care.

At the first level are the 29 health posts staffed with family health workers (FHW) and traditional birth attendants (TBA). They provide simple curative and preventive services including immunization, which is often conducted during outreach sessions at the island level, with the support of the health staff from regional hospitals. Some health posts also have a doctor.

In 2005, there were 379 medical doctors with a ratio of 1:775 practising doctor per population. The number of nurses reached 974 with a ratio of 3 nurses for one doctor. The health workforce includes also 454 paramedics, 119 community health workers, 333 family health workers and 409 traditional birth attendants. To meet the rapid expansion of medical services, Maldives relies heavily on expatriate medical personnel, mostly from India and Sri Lanka (77% of practicing doctors and 92% of nurses are expatriates).

In this context the population that includes 203,746 [WHO/UNICEF joint reporting form (JRF) 2005] inhabitants has good access health care services and 5,218 children under one year of age (WHO/UNICEF JRF 2005) have good access to the primary series of vaccination.

1.2 National immunization programme

Since the official launch of the EPI programme in 1985, Maldives has achieved and maintained high immunization coverage of children less than one year of age. Routine reporting of immunization coverage is shown in Table 1. Consequently, the incidence of vaccine-preventable diseases has dramatically decreased. No indigenous polio cases have been reported since 1978. Only one imported case was found in 1994 and Maldives achieved polio-free status in 2000. Similarly, no cases of diphtheria and pertussis have been reported for decades. Four cases of neonatal tetanus (NT) were reported in 1994 and since 1995 no case has been reported.

Table 1: Immunization coverage of under one-year-old children (in %), 2000-2005, Maldives

Year	BCG	OPV3	DPT 3	HepB3	Measles	TT *
2000	99.5	98	98	96	99	97
2001	98	97	98	98	98	97
2002	98.5	97.5	97.5	97.5	96.9	94
2003	98	97	97.5	97.5	96	95
2004	98	96	96	97	97	95
2005	99	98	98	98	97	92

Source: Health Statistics 2005, Ministry of Health Male' Maldives

* Women in child-bearing age

In 2001, UNICEF and MoH conducted a multi-indicator cluster survey. The findings confirmed high coverage with 85.4% of fully immunized children under one year of age. However, it revealed some disparities, especially in the southern part of the archipelago, where only 6% of children in the sample were unimmunized. This gap in the immunization coverage is likely to have contributed to the build-up of susceptible persons to measles and measles outbreaks which have been occurring every five years, the last outbreak being in 2005 with 1395 reported cases.

In 1993, hepatitis B vaccine (HepB) was introduced in the national immunization schedule and in 2005 MR supplementary immunization activity (SIA) was conducted to prepare the introduction of MMR in 2007. The current routine immunization schedule is as shown in Table 2.

Table 2: Immunization schedule in Maldives, 2006

Vaccine	Age of administration
BCG	Birth
DTP	6 weeks, 10 weeks and 14 weeks
OPV	Birth, 8 weeks, 12 weeks and 16 weeks
Measles	9 months
TT	Women of child-bearing age (15-45) + 1 month + 6 months + 1 year, + 1 year
HepB	Birth, 4 weeks and 12 weeks

As a response to large outbreaks of measles in Maldives in 2005, MoH started to provide measles vaccines at 6 months, but after eight months it was decided to put it back at 9 months.

1.3 Justification of 2006 EPI Review

The last EPI review was conducted in Maldives 12 years ago. In the last five years MoH has undertaken a series of reforms that included the reorganization of MOH with the reallocation of some activities to other ministries. Furthermore, MoH plans to introduce MMR vaccine starting in 2007 and also is exploring the possibility to introduce combination vaccines. There are also plans to decentralize activities to the atoll level, and it is critical to assess the capacity for planning, budgeting and conducting immunization activities in the health facilities at this level.

2. EPI review

2.1 Purpose

The review was conducted to determine the level of implementation of the Expanded Programme on Immunization (EPI), its achievements in vaccine-preventable disease control and elimination, and the activities carried out during the past five years. It aimed to assess the capacity of the programme to sustain high-quality programme performance and its ability to absorb the introduction of new vaccines, such as MMR, DTP-HepB and DTP-HepB+Hib, as these become increasingly available and affordable. The review should provide information for making policy decisions. The data gathered also could be used to develop a multi-year plan of action for strengthening the programme to sustain vaccine-preventable disease control/elimination.

2.2 Specific objectives

The specific objectives of the review were:

- To describe and analyse immunization service delivery at all levels of the health care delivery system;

- To analyse the programme's managerial and administrative capacity, and immunization and surveillance at national and sub-national levels;
- To assess current vaccine procurement strategies and distribution mechanisms to point of use;
- To assess training needs for immunization managers, administrators and surveillance staff at all levels;
- To document current financing mechanisms, the setting of priorities and establishing financial sustainability for the immunization programme;
- To document the capacity of the national surveillance system, including the laboratory, to detect and respond to all vaccine-preventable diseases in a timely manner, including measles, rubella, and adverse events following immunization (AEFI);
- To validate surveillance for acute flaccid paralysis (AFP) for 2005 and 2006 up to the time of the review;
- To evaluate the cold chain throughout the way;
- To assess injection safety and the management of sharps waste and other biohazard waste;
- To review the role of the private sector as providers of routine immunization services;
- To assess communication strategies, including advocacy, partnership, social mobilization, and their implementation;
- To measure progress towards national coverage and disease reduction objectives;
- To identify and confirm EPI achievements.

2.3 Methodology

Assessor teams

The review teams consisted of seven international members including specialists in EPI, cold chain and logistics, vaccine management and injection safety, surveillance and programme management from WHO, UNICEF, CDC Atlanta/USA and the Epidemiology Unit, Colombo, Sri Lanka. Three teams were formed and they visited atolls in the north, west

and south of the archipelago. A detailed plan of field visits including institutions visited is given as Annex 2. A fourth team was constituted but it joined the other teams later on 13 December and visited health facilities in Male and nearby islands.

Sampling of health facilities visited

The sample of health facilities visited included 18 health centres and six atoll hospitals and four regional hospitals. The atolls for the review were selected based on high population density combined with distance from Male. Table 3 presents the places and health facilities visited by each team.

Table 3: Places and health facilities visited by each team from 12-16 December 2007

Visited Atolls	12 Dec	13 Dec	14 Dec	15 Dec	16 Dec
Team 1					
Seenu Atoll	RH- Hithadhoo HC- Feydhoo	HC- Hulhudhoomedhoo			
Gnaviyani Atoll		AH- Fuvahmulah			
Gaafu Dhaalu Atoll			HC- Gadhoo HC- Fares Mathoda	RH- Thinadhoo	
Gaafu Alifu Atoll				AH- Viligili HC- Kanduhulhudhoo	<i>Back to Male</i>
Team 2					
Laamu Atoll	HC- Maabaidhoo HC- Isdhoo				
Thaa Atoll		HC- Guraidhoo AH- Veymandoo	HC- Hirilandhoo		
South Alifu Atoll				HC- Mandhoo HC- Maamigili AH- Mahibadhoo	<i>Back to Male</i>
Team 3					
Haa Alifu Atoll	HC- Kelaa HC- Huvarafushi AH- Dhidhdhoo	HC Makunudhoo			
Haa Dhaalu Atoll		RH- Kulhudhuffushi			
Shaviyani Atoll		HC- Komandoo AH- Funadhoo	HC- Milandhoo		
Raa Atoll				HC- Alifushi HC- Hudhudhufaaruu	RH- Ugoofaaruu <i>Back to Male</i>
Team 4					
Male Atoll		PUCH- Hulhumale	HC- Thulusdhoo HC- Guraidhoo	Central Vaccine Storage facility in Male	PUCH- Indira Gandhi Memorial Hospital (IGMH)

RH- Regional Hospital, number visited: 4
AH- Atoll Hospital, number visited: 6
HC - Health Centre, number visited: 20

PUCH- Public Central Hospital : 2
Total visited health facilities: 32

Data collection tools

The teams used questionnaires to guide their interviews. These questionnaires were tested in October 2006 and shared with team members prior to their arrival in Maldives. A set of questions was developed for the central, atoll and island levels. For each level, questions were grouped into six areas of activities that included:

- (1) Planning and management of immunization
- (2) Immunization policies and vaccination schedule
- (3) Immunization coverage, including reporting procedures
- (4) Vaccine-preventable disease surveillance
- (5) Immunization safety, vaccine management and immunization waste disposal
- (6) Advocacy and communication.

The sets of questions for each area of activities were formulated to capture specific information available at each level:

- **At the central level**, the questions were open-ended and aimed at capturing information on the normative aspect of the programme and level of decentralization allowed by national policies.
- **At sub-national level**, questions were mostly close-ended to capture information on how national policies are translated into activities.
- **At the island or service delivery level**, questionnaires, also mostly close-ended, were intended to capture information on how the service is effectively delivered.

The teams conducted interviews with key officials of the Ministry of Health, hospital paediatricians, atoll and island EPI managers, vaccinators, vaccine store managers and other health staff in atoll/islands hospitals, health centres, and staff of other government departments.

The review was conducted from 11-19 December 2006. The questionnaire for the central level was sent in advance to the department of Public Health to be completed prior to the arrival of the teams. Data collection was conducted from 12 to 16 December and the debriefing with the Minister of Health was held on 19 December.

3. Findings

3.1 Planning and management of immunization

There is a strong commitment and support from the government to immunize children and women in Maldives. All vaccines and related immunization supplies used in the national EPI programme are funded by the government and procured through UNICEF.

In 2007, the supply of the measles-mumps-rubella (MMR) vaccine will be funded by UNICEF for initial introduction in the national EPI programme, but next year it will be funded by the government. Other non-EPI vaccines are also provided to targeted populations including quadravalent meningitis vaccine for the pilgrims going to Mecca and cholera and influenza vaccines for travellers.

The Department of Public Health is in charge of planning and budgeting for EPI at the national level. It includes budget for vaccine procurement and vaccine distribution, cold chain maintenance and transportation and allowances for the staff conducting outreach vaccination sessions. Each year, health centres, atolls and regional hospitals are requested to send budget estimates to conduct outreach sessions to central DPH, usually around March, for the next fiscal year. The DPH's finance section consolidates and finalizes budgets with EPI and sends it to the Ministry of Finance for approval. Budgets are then approved before December by the Ministry of Finance to allocate funds to DPH at the beginning of the fiscal year in January. DPH then sends the money to health centres, regional and atoll hospitals on a quarterly basis. The funds are disbursed by DPH each quarter based on expenditure reports that the health facilities provide.

Stakeholders and immunization partners meet on a regular basis at the central level and the outcomes of the meetings are documented in meeting reports. The Director-General of Health Services chairs these meetings. There is no budget for training and supervision in the DPH budget. However, with the financial support of WHO and UNICEF, trainings and supervisory visits are conducted on ad hoc basis by central level to atolls whenever possible.

In all health facilities visited, activity plans including immunization sessions were available. Immunization sessions are, in most cases, conducted once a month at a fixed date. Outreach sessions (health posts without refrigerator) are conducted once every three months. In the past many of the outreach sessions were held quarterly but, with the current trend to upgrade health posts to health centres where fixed immunization sessions are conducted, the programme will rely less on outreach sessions to immunize children in remote islands. Before the immunization sessions are conducted the family health worker (FHW) informs eligible children's parents. The number of children to be visited by FHWs is identified and a list is prepared. On a vaccination day, the list is matched with children who present for vaccination and those who are missing are followed up by FHWs. In cases of people moving between islands, the immunization is supposed to be verified over the phone; however, the system is not standard in all places, which results in inaccurate denominators and immunization coverage calculation.

There is no formal planning and coordination mechanisms in the regional and atoll hospitals to assist health centres and health posts' CHW and FHW staff to identify, prioritize, plan activities and to monitor progress toward objectives. The fact that Maldives relies on a large proportion of expatriate doctors and nurses who are subject to frequent rotation, does not facilitate establishment of standardized procedures including mechanisms to coordinate activities, especially in the absence of guidelines and written standard operating procedures. These expatriate staff should receive, upon their arrival a thorough orientation to brief them about their role and responsibilities and should be supervised more frequently by DMS, especially at the beginning of their assignment.

Planning and Management of Immunization:

Recommendations

- Include training and supervision activities and budget in the DPH workplan
- Develop standardized procedures to calculate accurate immunization coverage in the light of the mobility of the population.
- Strengthen coordination of immunization stake holders in regional and atoll hospitals and at the health centers.
- To establish periodic meetings to prepare workplan, budgets and monitor implementation.

In partnership with the Medical Institute in Male, review the agenda of orientation training provided to expatriate doctors and nurses to ensure that new staff arriving in Maldives are fully aware of their roles and responsibilities as well as understand the special and typical conditions in Maldives.

3.2 Immunization policies and vaccination schedule

A national three-year plan (2005-2007) exists that outlines the policies, procedures and budget for immunization. WHO and UNICEF provide technical and financial support to MoH to conduct studies on vaccine-preventable disease burden (Hib B) and to conduct supervisory visits and training of health staff involved in immunization. In 2005, MoH, with the technical support from WHO, conducted a training of trainers (TOT) course on vaccine management. There are no national EPI guidelines and no written procedures for planning, budgeting and monitoring of the immunization programme. The national immunization schedule differs slightly from the WHO-recommended schedule, with 9 contacts (+1 for BCG and OPV and HepB at birth) required instead of WHO-recommended 6 contacts (+1 at birth for BCG and HepB and OPV).

The current immunization schedule is not practical, especially for outreach sessions that are conducted once every three months (4 contacts + one at birth). In fact, it was observed that in most of the health posts and health centres, OPV and DTP vaccines are given simultaneously. There is a need to revise the national immunization schedule to make it more suitable to Maldives' context and also to explore the possibility to introduce a fourth

dose of DTP at 18 months or DT at school entry and to replace TT vaccine with Td for women of child-bearing age.

In Maldives, vitamin A is given to school-children and is not distributed from the immunization sites. The first dose is given at baby nursery level (3 years of age) and subsequently given in each class till standard seven. The vitamin A record (the number of children immunized class-wise) was obtained from only Thulusdhoo centre. There was no record maintained in other centres; no mobilization was done for ensuring administration of vitamin A and, more importantly vitamin A was not being administered to children between 9 months to 3 years of age.

Immunization policies and vaccination schedule:

Recommendations

- Establish an expert group to develop national EPI guidelines that outline policies and procedures, including those for planning and budgeting within the decentralized health services.
- Review the current immunization schedule with a view to:
 - Reduce number of contacts
 - Introduce fourth dose of diphtheria-containing vaccine
 - Replace TT with Td.
- Establish roles and responsibilities of DMS and DPH.
- Vitamin A distribution should be integrated into the routine immunization services with a dose of vitamin A to be administered along with measles at 9 months, again at the proposed 18 months DPT-OPV booster, and subsequently every six months so that the child receives nine doses by the age of 5 years. To facilitate this, each immunization site needs to also stock vitamin A, and necessary training should be given to all vaccinators and supervisors.

3.3 Immunization coverage, including reporting procedures

Since all children are registered at birth and are known to the island FHW and CHW, it is unlikely that many children will remain unvaccinated on most islands. However, calculating the immunization coverage in small populations is problematic, especially when the populations are mobile and children

move with their parents to Male or other islands. Consequently, many children do not receive all the series in the same place, leading to inaccurate denominator of immunization coverage estimates. Most of the coverage data which are reported are crude numbers and the coverage monitoring charts are not used to visualize progress towards the objectives. The use of monitoring chart would allow FHWs and CHWs to detect inaccurate denominator (estimated population to be vaccinated) when each month, the number of vaccinated persons constantly exceeds the monthly target.

UNICEF, Maldives, is currently working with the Ministry of Health to introduce a computerized tracking system for children who receive incomplete immunization. The system is web-based and would be tested in selected areas in 2007.

Most EPI focal points report 99-100% coverage for their respective catchment areas. This is not consistent with what is reported by the government to WHO through the SEAR Annual EPI Reporting Form. Immunization coverage is analysed and reported by the atoll/regional hospital focal persons; however, there is no mechanism for feedback. Until last year, the reports were sent every six months. The current policy is not clear whether the reporting will continue every six months or quarterly or monthly.

Immunization coverage, including reporting procedures:

Recommendations

- Introduce immunization coverage charts to monitor progress toward coverage objectives.
- Establish a system to capture children coming from outside the catchment area to make appropriate calculation of coverage.
- Explore web-based reporting of immunization coverage and related activities in collaboration with the UNICEF-supported project for tracking the un-immunized children.

3.4 Vaccine-preventable disease (VPD) surveillance

Disease reports are sent daily for 24 notifiable diseases. Immediate reporting is required for 11 diseases and next-day reporting for 13 diseases. The daily reports are forwarded by FAX from health centres to atoll/regional

hospitals and then to the central level. It is not clear why these reports are needed daily since weekly, monthly and annual reports are also generated. When a priority disease is reported, another form is also generated with more detail. This puts burden on the local health staff to compile and report the diseases or to complete a zero report daily. When diseases are reported, it is not clear what action is taken (e.g. viral fever outbreak has not been investigated on some islands).

The laboratory at the referral hospital in Male, the Indira Gandhi Memorial Hospital (IGMH), is capable of testing for measles and rubella. The number of samples is small, the laboratory tests about 2-3 samples per month exclusively from outpatients presenting at the IGMH. There is no system of sample transport from atolls if an outbreak occurs. In theory, there are test kits available in atoll hospitals but in practice, testing for measles is not done in atolls.

In 2006, there was only one laboratory-confirmed measles case and one rubella case. The laboratory reports positive results to the Department of Public Health in Male. The laboratory was conditionally accredited in September 2006. There is no local capacity for measles viral isolation and identification, and no system has as yet been set up to send samples to the regional laboratory in Chennai, India.

Feedback on reported diseases from the Centre or atoll/regional hospitals to health Centres is not routinely provided. When feedback is received, how it is handled varies from facility to facility. Some file the report, others post it on a bulletin board, but there is no routine staff meeting in the health facilities to discuss outbreaks or diseases in the country.

The teams met with the National Polio Certification Committee to review progress in detecting AFP cases and the sensitivity of the surveillance system of Notification to WHO/SEARO. One AFP case in 2006 was delayed. This case was also seen in a hospital in Kerala state in India and was not notified by the Indian National Polio Surveillance Project (NPSP). Corrective action has been taken to improve reporting of cases that seek treatment outside Maldives.

Vaccine-preventable diseases surveillance:

Recommendations

- A systematic standard procedure for collection, transport and testing for suspect measles cases need to be developed along with appropriate guidelines to help health workers.
- The laboratory at the IGMH need to implement all areas of correction identified during the last accreditation review so that the laboratory can be accredited as quickly as possible.
- Maldives should continue to attempt to improve the sensitivity of AFP surveillance, including the need to establish systematic refresher training of new medical officers posted to remote island health facilities and hospitals.
- Establish regular VPD and immunization feedback.

3.5 Immunization safety, vaccine management and immunization waste disposal

Immunization safety

Except in the IGMH that uses traditional disposable syringes for immunization injections, all hospitals, health posts and health centres visited were using auto-disable (AD) syringes. Sharp containers were also available in all facilities visited. Maldivian health staff is vaccinated against HepB but the expatriate staff is not covered unless vaccinated before leaving their country of origin. A national committee on adverse events following immunization (AEFI) has not yet been established and there is no guideline or procedures to detect, report and investigate AEFI. The Food and Drugs Administration (FDA), which acts as the national regulatory authority, is not yet functioning to oversee vaccine safety and quality.

Vaccine management

The current practices of vaccine management have several strong points. There is ample storage capacity at all levels. At the central level UNICEF has

provided a new 20 cubic metre cold room which includes 5 cubic metres of space for freezing. But the equipment is not yet operational due to lack of three-phase electricity connection. However, the authorities assured that this problem will be resolved shortly. Three other cold rooms have been provided to Seenu, Laamu and Haa Dhaal atolls. The MoH has upgraded the storage capacity to address additional space requirements that smaller vaccine vials will require. However, at the central store, the space available for the cold chain equipment including the cold room is very small and congested.

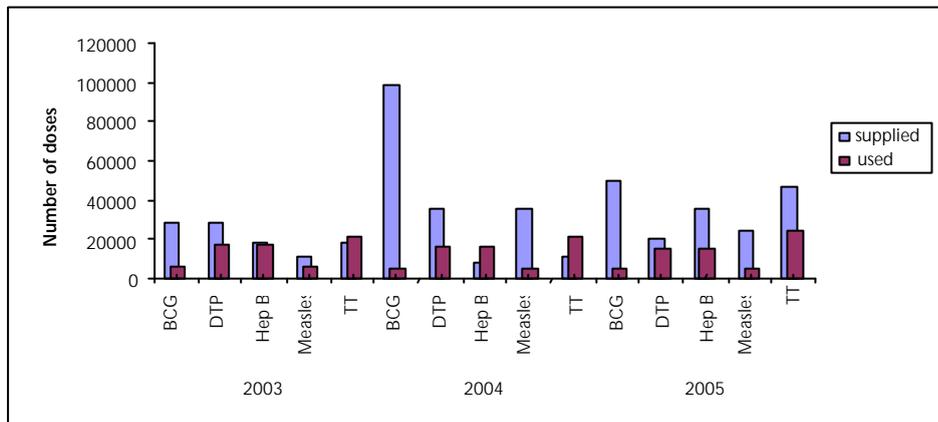
The small target population to be vaccinated in most islands does not allow maximizing the optimal use of 10-dose vial vaccines or 20-dose BCG vaccines, resulting in high vaccine wastage. A typical immunization session at a health centre or health post has, on most occasions, less than 5 children, although in urban areas and populated islands the number of children for each immunization session can go up to 20. This problem could be addressed by using smaller vial sizes. However, traditional EPI vaccines (DTP, OPV, measles and BCG) are not available from WHO pre-qualified vaccine suppliers in sizes smaller than the current 20 doses for BCG and 10 doses for other vaccines. On the other hand, new combination vaccines including DTP-HepB and DTP-HepB+ Hib are now available from WHO pre-qualified sources in 2- and 6-dose vials as well, and the government may explore the possibility to introduce combination vaccines of smaller vial sizes in the routine immunization programme to reduce the number of injections and vaccine wastage.

At the health centre level the storage of vaccine was found to be correct in most cases. In some of the health centres visited, vaccines close to discard point were in stock and being used and health workers were unaware of the significance of change of colour of vaccine vial monitors (VVM). A temperature chart was found on all EPI refrigerators; however, the temperature chart is not appropriate as the temperature-recording increments were in multiples of 5; and the temperature recording was not uniform. In almost all places where the newly provided UNICEF refrigerators are installed, the temperature adjustment was not correct - it was above 8 °C. In one case it was found that the inside temperature in a new EPI refrigerator was +20 °C and the temperature was diligently recorded on a chart every day - the staff was not explained what the correct temperature for vaccines was supposed to be.

All regional and atoll hospitals had adequate numbers of vaccine carriers. Contingency plan to deal with power outages did not exist; however, according to islanders, electricity supply was maintained continuously from island generators.

Data on vaccine wastage at the service delivery level was not collected due to time constraint, but data on the quantity of vaccine supplied and administered was collected at the central level to determine over the 2003-2005 period the proportion of vaccine used in relation to vaccine supplied. Figure 2 illustrates the trend.

Figure 2. *Vaccine supplied vs vaccine administered in Maldives, 2003–2005*



This simple trend analysis does not provide data on the vaccine wastage rates but shows that the proportion of the BCG vaccine administered over the quantity of vaccine supplied has been constantly very low in the last three years, and, to some extent, for measles vaccine for the last two years. There are risks that both vaccines reach expiry dates before these are administered and therefore, doses are unnecessarily wasted. During the field visits, BCG vaccine with expiry dates close to the discarding point was found in few health centres.

The storage and transport is safe and there has not been any vaccine wastage on record due to equipment defects or poor conditioning of

vaccines during transport. The condition of the building is also very satisfactory. Stock management is firmly established at the central level and the requisition system is commendable. In 2004, WHO supported several activities to assess the possibility of group procurement with Sri Lanka. However, the government for the time being prefers to keep the procurement through UNICEF, knowing however that the issue of vaccine procurement will come up in the next five years when UNICEF support will be phased out.

Training on vaccine management using UNICEF/WHO Global Training Network Vaccine Management training material was conducted in 2005 in 12 atolls out of 20, with financial support of UNICEF. The training has not yet been conducted in the remaining 8 atolls due to lack of funds and the CHWs and FHWs in those atolls were not always knowledgeable about vaccine vial monitor (VVM), and, in several health posts, vaccine stock was not recorded.

Sharp-waste management

The method used to dispose of syringes is either open burning at the health post and health centre or burning in incinerators at hospitals. The open burning is of poor quality and is done in very shallow pits. The teams observed unburnt and incomplete burnt waste on the sandy soil behind several hospitals. Incinerators, when available, vary in quality, but following the tsunami disaster three high-quality standard incinerators complying with European standards or equivalent have been purchased using humanitarian aid and installed in Haa Dhal, Seenu and Raa regional hospitals. In 2006, the unit in charge of Health Care Waste Management (HCWM) in the Department of Health Services in Male was moved to the Ministry of Environment and Energy. This ministry is currently working on policy formulation for industrial, domestic and health care waste management. The Department of Health Services needs to meet on a regular basis with the Ministry of Environment to ensure that waste policy can be implemented in the health care settings and appropriate procedures are in place in hospitals to collect and store infectious waste, including sharps, that comply with national policy.

Immunization safety, vaccine management and immunization waste disposal:

Recommendation

- Complete the training on vaccine management till all atolls are covered.
- Identify training partner and budget for regular training at all levels.
- Build vaccine management training into a comprehensive and integrated training package for CHWs and FHWs.
- Develop a national waste management policy.
- Conduct cost analysis and feasibility studies to introduce smaller vial size especially for the newly introduced vaccine (MMR) and combination vaccines (DTP-Hep B or DTP-HepB -Hib vaccines).
- A systematic supportive supervision plan and practice is needed, as it can complement training as the supervisors can provide more effective hands-on training at the facility level rather than attempt to regularly call all health workers for training at regional or national levels.
- Revise and standardize temperature monitoring charts for peripheral vaccine storage.

3.6 Advocacy and communication

The review team did not observe any standard training programmes or requirements for the EPI staff. Also, very few immunization posters were seen in health centres, atolls and regional hospitals. There are no regular supervisory visits conducted at any level.

Advocacy and communication:

Recommendations

- IEC materials are available but limited.
- Communication may be more of an issue in Malé.
- IEC materials are needed to promote best practices.

4. Follow-up activities

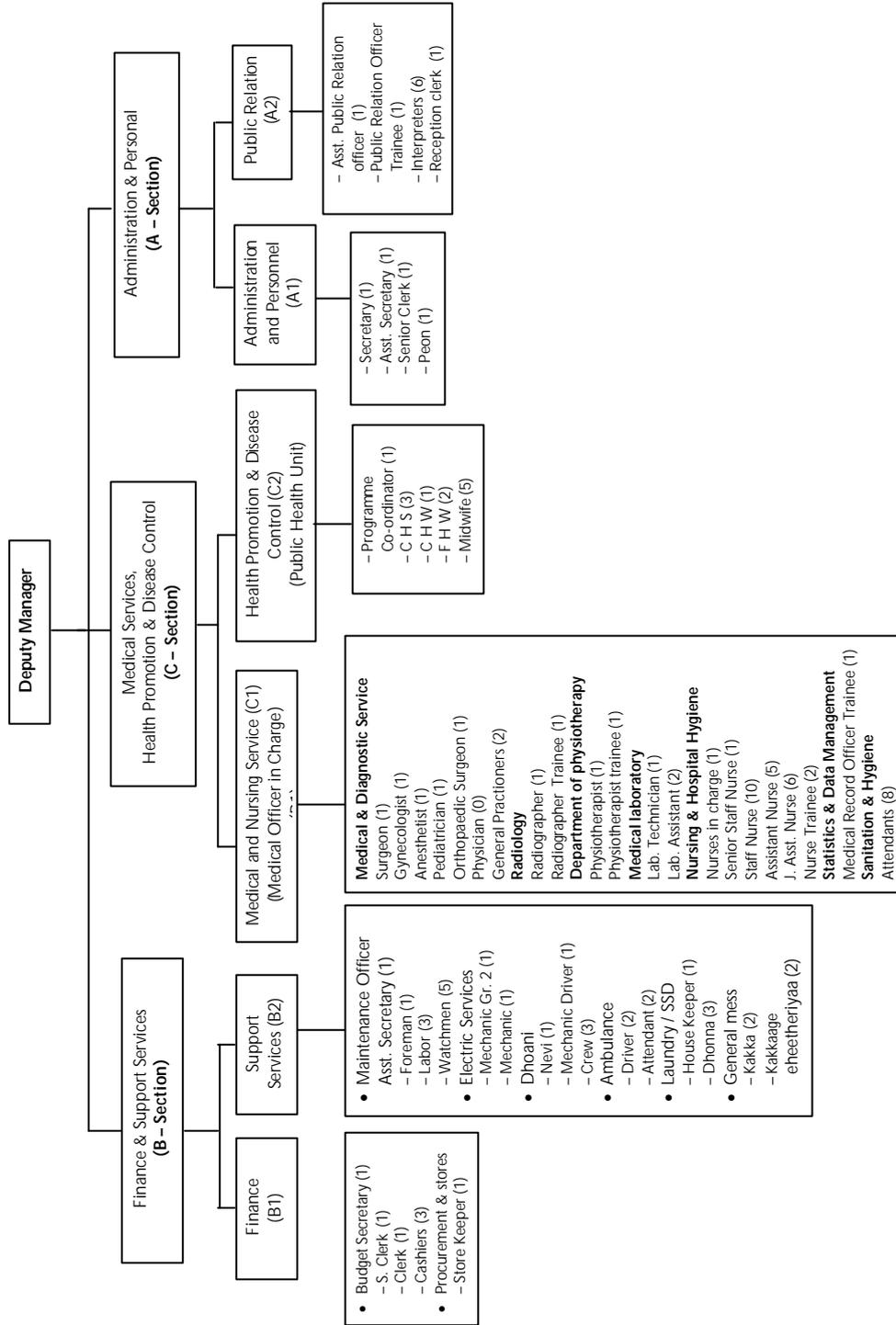
At the end of the EPI review, the teams presented their preliminary findings and main recommendations to a panel of senior MoH managers, including the Minister of Health, Deputy Minister of Health, Assistant Executive Director, DPH, Deputy Director-General, DPH, Director, Medical Services, and Assistant-Director General, DMS, and other technical staff. During the discussions the following suggestions were made by EPI review team members:

- (1) With the introduction of the MMR vaccine into the immunization schedule in 2007, there is an urgent need to review the overall existing immunization schedule. A national expert committee group that includes DPH and DMS staff, EPI programme managers and hospital paediatricians along with national regulatory authority (NRA) responsible for vaccine regulation and senior laboratory technicians should be constituted to address the introduction of MMR and the potential to introduce a fourth dose of diphtheria-containing vaccine, to replace TT vaccine with Td, and to introduce combination DTP-Hep B vaccine to use a smaller vial size and to reduce the number of vaccine injections.
- (2) The MoH should explore the possibility of revising the Vitamin A distribution system and to integrate the delivery with routine immunization services by providing a dose of vitamin A to be administered along with measles at 9 months, again at the proposed 18 months DPT-OPV booster, and subsequently every six months, so that the child receives nine doses by the age of 5 years. To facilitate this, each immunization site needs to also stock vitamin A and the necessary training should be given to all vaccinators and supervisors.
- (3) The management of and responsibilities for some public health programmes were transferred from DPH to DMS. It is important that the roles and respective responsibilities are reviewed and the terms of reference of the staff revised to avoid overlapping of functions.
- (4) The capacity to plan, implement and monitor and report immunization activities is available at regional and atoll hospitals

and health centres. However, the procedures need to be standardized through the publication and introduction of guidelines to plan, conduct, monitor and report EPI activities.

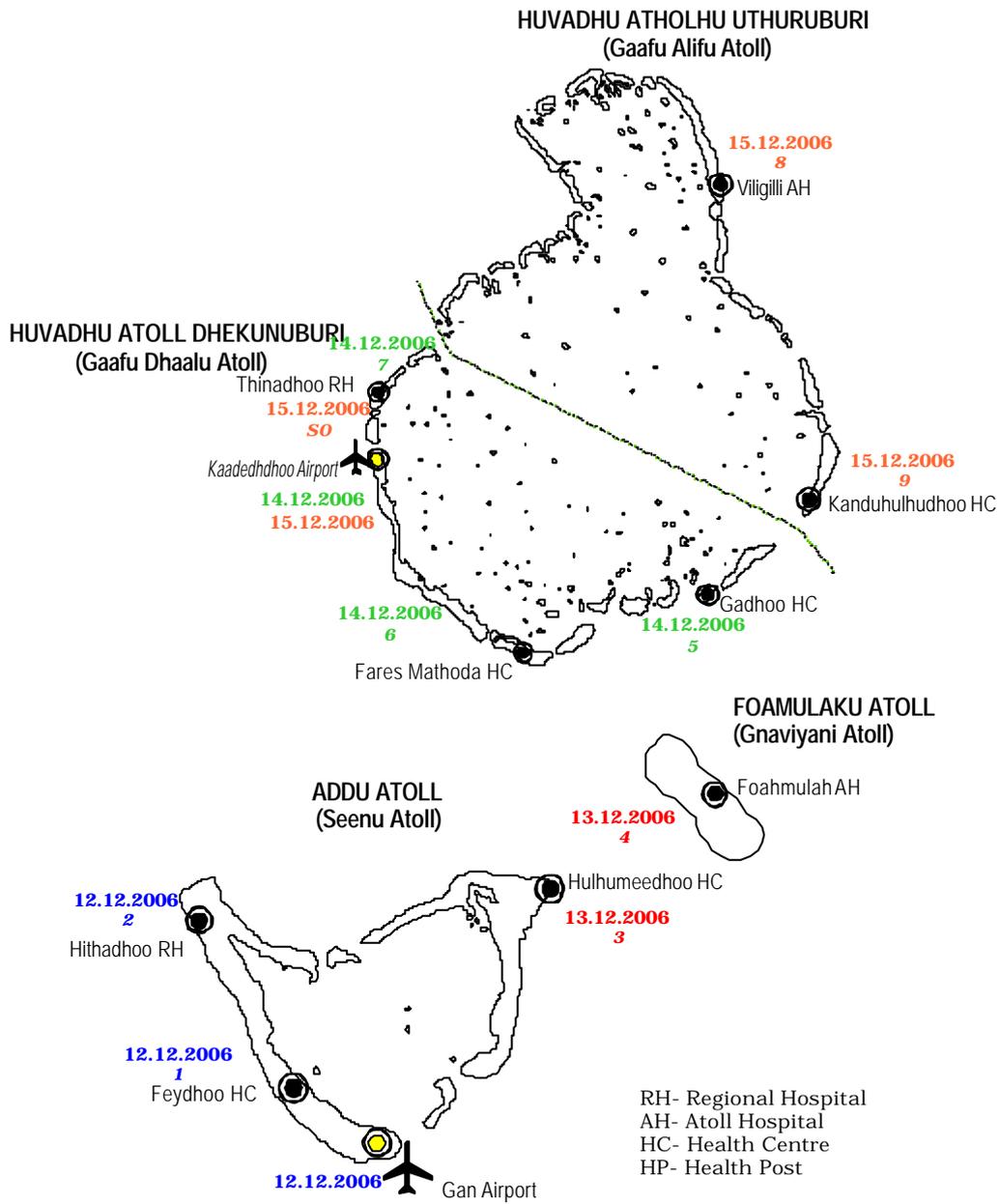
- (5) There is a need to collect more case-based data on all suspected measles cases. For all suspected measles outbreaks, at least five blood specimens should be collected and tested in the national laboratory at the IGMH in Male.
- (6) A national multi-year plan for inservice EPI training programme needs to be developed, budgeted and implemented at all levels. As a priority the training programme on vaccine management conducted in 2005-2006 needs to be completed in 2007. Lessons learned from this activity should be documented and used to develop an integrated competency-based training programme for PHC workers.

Annex 1 Thinadhoo Regional Hospital – Organization Chart



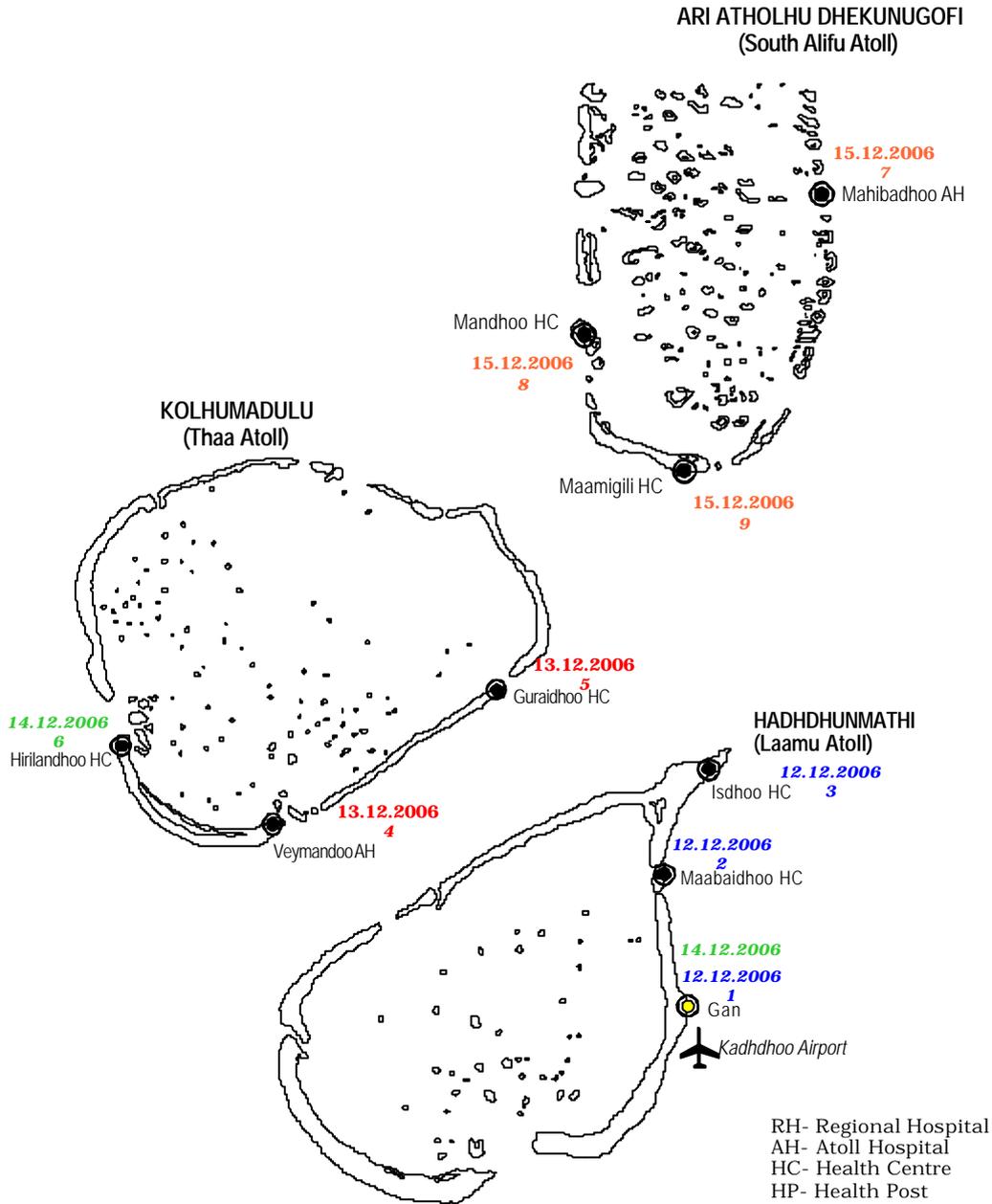
Annex 2

Travel route for team 1



Annex 3

Travel route for team 2



Annex 4

Travel route for team 3

