

## 1. Introduction and Background

This document contains the 5-year comprehensive plan for the Expanded Programme on Immunization in North Sudan. This plan has been developed in response to an extensive situation analysis. The plan is oriented to improve EPI service delivery, improve advocacy and communication for immunization, maintain vaccine supply, quality and logistics at the highest level, strengthen surveillance of vaccine preventable diseases and its indicators and further improve programme management at all levels.

### 1.1. The Republic of Sudan

Sudan is the largest country in Africa. It measures 1,500 km at its widest point east to west, and covers an area of 2.5 million square kilometres. It is characterized by a strategic geographical location, that links the Arab world to Sub Saharan Africa, and it shares its borders with 9 countries, where the Sudanese population and those of the neighbouring countries move freely across these borders. The northern part of the country is an extension of the Sahara Desert, the central part is a dry savannah area and the southern part has a typical tropical rainforest climate. Climatic factors can contribute to humanitarian emergencies related to drought and flooding, and ecological factors expose much of the population to major infectious and parasitic diseases. Difficult access to some areas, rural-urban migration, natural disasters, the longstanding civil war in the South and limited resources had a significant impact on the provision of immunization services. As a consequence there are wide variations within the country in delivery of services, vaccination coverage and disease incidence.

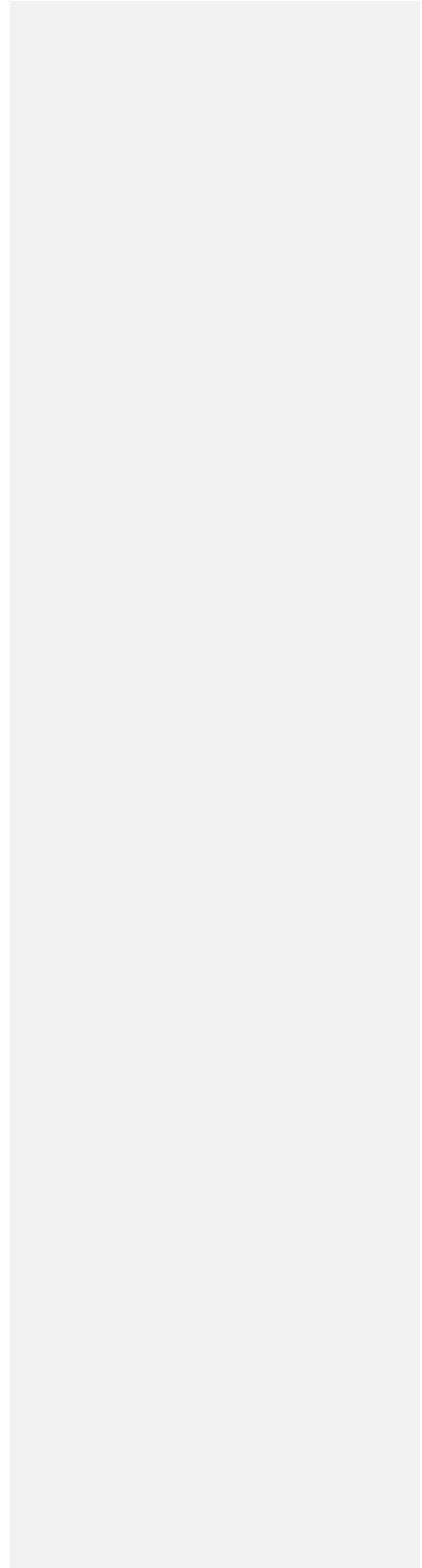
Overall, the country has scarce and inconsistent information on the health status of its population, due mainly to the fractured system and multiple actors operating. Recent surveys such as MICS2000 showed marked disparities between states for most indicators.

### Population Size and Demographic Characteristics

In 1993, a population census was conducted and the total resident population was reported to be 25.6 million. Projections from these data still form the basis for official population estimates today. The total population is estimated to be 35.4 million in 2005 with an annual growth rate of 2.6 %. The rural population represents about 65%, while nomads represent 10%. 43% of the population are less than 15 years of age. The population is unevenly distributed in the 25 States, the majority are concentrated in 6 States of the Central Region with a mean population density of 10 people per square kilometres, increasing to 50 in the agricultural areas. Natural disasters and conflict resulted in high rates of rural-urban migration reaching 15%. Life expectancy at birth, a measure of the general health condition and an indicator of the standard of living was estimated to be around 54 years.

The infant mortality rate according to 1993 census was 124 per thousand. By 2005, it is estimated to be 109 per thousand. The cohort of surviving infants in 2005 is thought to consist of 1,189 million children. An estimated 5.7 million children are under 5 years of age. Total fertility rate in 2000 was reported to be 5.9. According to the 2001 health statistical report the main

causes of death among children under five were malaria (17%), pneumonia (14%), malnutrition (13%) and diarrhoea (9%).



## **Economic Situation**

Sudan is classified as a low-income country by World Bank standards. On the UNDP Human Development Index in 2002, Sudan ranked 139 out of 173 countries. The country suffers from the aftermaths of civil strife in the South, which has led to massive population movement, coupled with drought and desertification, major floods in the northern part of the country, and severe loss of human resources (brain drain) especially in the health sector. All these factors have severely affected the health infrastructure and health status in the country.

## **Conflict and Post Conflict Context**

Sudan has suffered from civil conflict for much of the period since independence in 1956. Most of the fighting has occurred in southern Sudan, as well as areas of Southern Kordofan and Blue Nile states. Civil conflict has also flared up in other parts of northern Sudan in recent years, in particular Darfur, Kassala and Red Sea.

The health, nutrition and population effects of these conflicts have been significant, with the figure of 2 million deaths often cited. Health services in the South, not well-developed even before the war, have deteriorated over two decades of conflict so that most are now supported by international humanitarian agencies. The Operation Lifeline Sudan (OLS), formed in 1989, is a coordination mechanism which includes various UN agencies and NGOs. It provides humanitarian assistance to government and non government held war affected areas. A number of NGOs also operate in southern Sudan outside this mechanism.

After reaching the Comprehensive Peace Agreement(CPA) in January 2005, reconstruction and development are needed as well as humanitarian assistance in the health and nutrition sectors, particularly in newly accessible areas. Coordination and weak local capacity are seen as the main challenges facing the health sector development in the post conflict setting.

**Add something about current situation**

## **Administrative Division**

Decentralization was introduced in 1994 as a system of governance compatible with the needs of the multi-ethnic and multi-cultural society of Sudan. The country is divided into 25 states(16 northern) and 134 localities (districts) including the Southern areas.

The system is founded upon a multi-tier government: federal, state and local governments. The federal level is concerned with policy making, planning, supervision & co-ordination. The state governments are empowered for planning, policy making and implementation at state level. There is an uneven distribution of financial resources and manpower between states and between rural and urban areas.

The delineation of responsibilities between the Federal government and the Government of South Sudan remains unclear and there is still limited co-operation both in health service delivery and planning approaches.

## Health Services Organisation

In 2006 North Sudan has 15 State Ministries of Health (SMoH), one in each State. The Federal Ministry of Health (FMoH) is responsible for the development of national health policies, strategic plans, monitoring and evaluation of health systems activities. The SMoH are mainly responsible for policy implementation, detailed health programming and project formulation. Each state ministry of health consists of the main technical directorates namely preventive medicine, primary health care and hospital directorates. The PHC directorate has several units including the EPI. Implementation of the national health policy is undertaken through the district health system based on the primary health care concept.

Health services are provided by different partners. In addition to federal & state ministries of health these are the armed forces, universities, the private sector (both for profit and not for profit) and civil society. However, many of these are performing in isolation due to an ill defined managerial systems for coordination and guidance. The main problems of the organizational structures in the governmental health services at different levels are the rigidity of the organizational structure and poor coordination between departments.

The Federal Ministry of Health experienced marked reforms in its directorates during 2002. Even though, its system is still unable to ensure integration of programmes between different directorates. Both evidence based decision-making and better collaboration needs to be promoted. Decentralisation and bottom-up approaches have been promoted in the health sector: The execution and implementation of promotional, preventive and curative activities was shifted from the national to the state authorities.

The National Health Insurance Scheme, introduced in the mid 1990s, covers about 8% of the population, mostly government employees, but also poor families, families of martyrs and students. User fees for government health services were introduced in the mid 1990s, including exemptions for vulnerable groups and for emergency services. Government policies in recent years have encouraged the growth of the private sector. However, this sector is concentrated in urban and better off rural areas and invests mainly in clinics and hospitals. Although no data are available on household health spending, it is estimated that total out-of-pocket expenditures are as large or larger than total government health spending (1% or more of GDP). In addition, spending on health services abroad is reported to be substantial.

There is a general shortage of all categories of health personnel, and the health system suffered severe loss of human resources. Health facilities are not equally distributed, and gaps need to be reduced in order to increase access in the under-served areas and communities. The health sector infrastructure has been deeply damaged by the impact of the civil war in Southern Sudan.

In 1992, Sudan had adopted the Comprehensive National Health Strategy for 1992-2002. As a successor to this strategy and taking account of the Millenium Development Goals, the present 25 Year Strategic Plan for the Health Sector for the period 2002 to 2027 contains eight specific goals:

1. *To combat HIV/AIDS, malaria, tuberculosis and other communicable diseases;*
2. *To promote healthy life style and reduce the burden of non- communicable diseases;*
3. *To reduce child and maternal mortality;*

4. *To develop, manage, and organize health human resources to fulfil the health system requirement;*
5. *To develop an integrated model of health care provision that delivers high quality accessible services;*
6. *To build the capacity of federal and state ministries of health to be able to implement the strategy;*
7. *To develop sound financial and pro-poor policies and systems that increase the allocation of resources for health to support the delivery of the strategic plan and optimize use of resources;*
8. *To create an environment conducive to partnership building and promote the role of the private sector.*

The plan is explicit about the place of immunization in improving health outcomes. Its immunization objectives are the strengthening of the ongoing immunization programme, improved management of the cold chain and improving the coverage and accessibility of child health services.

This plan sets **three** explicit objectives for the EPI:

- To increase the proportion of children less than 1 year fully immunized against the 6 EPI diseases in all localities to 90% by the end of 2008.
- To interrupt transmission of polio by end of 2005
- To eliminate measles by 2010.

## 1.2. The Global Immunization Vision and Strategy

The new Global Immunization Vision and Strategy (GIVS) has been adopted by the World Health Assembly in May 2005. It strives for a world in 2015 where immunization is highly valued; every child, adolescent and adult will have equal access to immunization as provided for in the national schedule; more people are protected against more diseases; immunization and related interventions are sustained under conditions of diverse social values, changing demographics and economies and evolving diseases; vaccines exert the maximum impact on global health and security; and solidarity among the global community guarantees equitable access to needed vaccines for all people.

The GIVS provides broad strategic directions for national policy and programme development; commits all to unprecedented attention to reaching the "hard-to-reach"; promotes data-driven problem solving to improve programme effectiveness; takes immunization beyond infants into other age groups and beyond the current programmatic use of other settings, while maintaining the priority of early childhood vaccination; anticipates the introduction and widespread use of new and underused vaccines and technologies, all of which will require long-term financial planning; encourages a package of interventions to reduce child mortality; and contributes to global preparedness against the threat of emerging pandemics.

By 2015 all contributors to immunization and product development should aim at the following GIVS overarching goals:

*Coverage:* Every person eligible for immunization included in national programmes will be offered immunization with quality vaccines according to the established national schedule.

*Access to new vaccines:* Immunization with newly introduced vaccines will be offered to the entire population within five years of the introduction of these new vaccines in national programmes.

*Mortality and disease reduction:* Global childhood mortality and morbidity due to vaccine preventable diseases will be reduced by at least two-thirds compared to 2000 levels.

*Sustainability and systems strengthening:* All national immunization plans will be formulated and implemented in ways that link them explicitly with sector-wide human, financial and logistics plans and ensure that activities will not have to be scaled back due to shortage of human resources, funding or supplies.

### 1.3. The Expanded Programme on Immunization

The Expanded Program on Immunization (EPI) was launched in Sudan in 1976. The first five-year plan for the EPI was formulated in 1985. The programme had introduced the six classical EPI antigens (BCG, polio, DPT, measles). In 1990, vaccination coverage of children under one year of age reached 62% for DTP3 as a national figure. During the period 1990-1994, EPI coverage dropped to 51% due to lack of financial and material support from the government of Sudan and from donors. During the period 1995 to 2001 coverage was not sustained and ranged between 50 and 79%. Sudan has since strengthened its routine EPI activities with some success: increased coverage rates, successful NIDs, strengthened disease surveillance with emphasis on AFP surveillance and improvement of the cold chain capacity and quality. In early 2005, with funding from GAVI, the EPI introduced Hep B vaccine in 3 states with extension to 6 states by the end of 2005 and with a national roll out planned for 2006. Polio, measles and MNT campaigns supplement the routine programmes.

The programme is still almost completely dependent upon external aid while the government contribution is limited to salaries and a minimum share for operational costs. Due to the difficult access to some areas, rural-urban migration, natural disasters, and, above all, the long-standing civil war, there are wide variations within the country in delivery of services, vaccination coverage and disease incidence. It is estimated that only 33% of the population have access to fixed immunization services. Mobile teams conduct immunization activities in remote areas in an irregular manner, whenever transport is available. Such services cover about 27% of all immunized children. Some 38% of immunizations are delivered through outreach activities. In some remote and conflict prone areas, the population is entirely dependent on NGO services for immunization. The Federal Ministry of Health plans to provide additional health centres, dispensaries, dressing stations and PHC units for all under served areas. The private sector insignificantly participates in immunization activities only in urban areas.

#### **EPI Organization:**

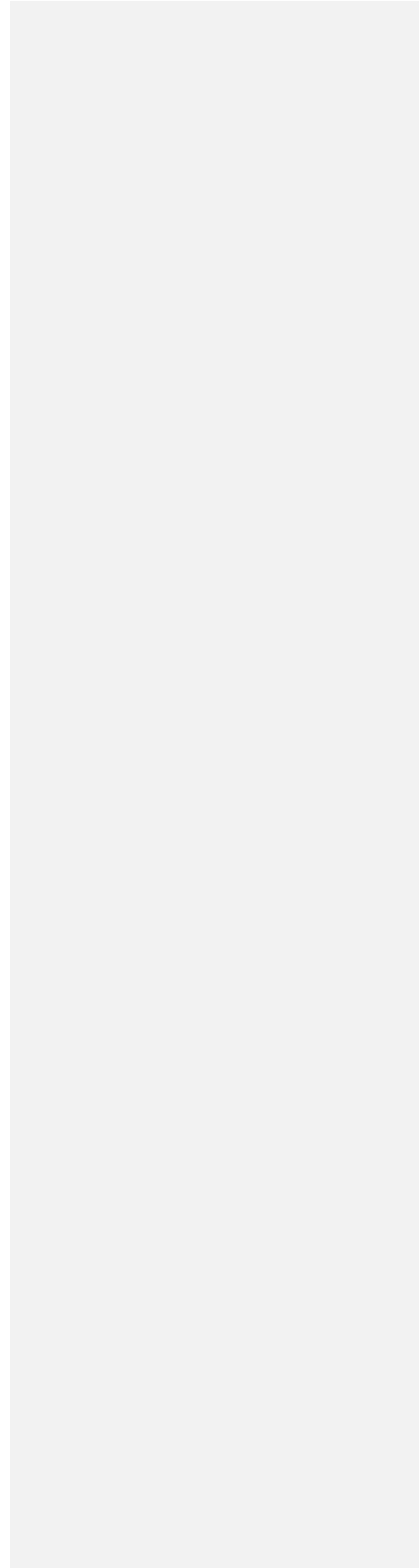
The EPI is one of the PHC departments at the FMoH. At the federal level, all policies, technical guidelines and plans are developed in collaboration with the states and then disseminated to all levels. This level is also responsible for training, technical support, supervision, monitoring and evaluation of the states service performance. The federal level is managed by the National EPI Director together with the heads of the different EPI sections: Surveillance, SIAs, Immunization Safety, Information and Research, Social Mobilization, Training, Cold Chain Management, GAVI, and Operations.

The state level is the implementing body for all EPI activities. At this level the state operation officers under the supervision of SMOH, PHC director and DG manage the programme. The state operation officer and the locality (district) operation officers are responsible for the preparation and implementation of their state and locality microplans.

Microplans are usually set up based on indicators collected at the appropriate levels, such as accessibility, utilization of human or financial resources. Microplans are prepared for each state or district.

Zonal coordinators are responsible to supervise and closely monitor all EPI activities at the state level and provide a monthly report to the Federal EPI office. National medical officers and

international STCs are stationed in all states, mainly for surveillance purposes and to assist in conductin SIAs. They also provide technical support to the local health and EPI staff.



### EPI Objectives

The table below gives an overview of the objectives of the former EPI Multi-Year Plan 2001-2005 and their achievement by the end of 2005.

Objectives of the EPI 2001-05 plan	Achievement of objectives by end of 2005
Achieve 85% immunization coverage of all children less than one year old for all antigens by the end of 2005.	DTP3 reported coverage for all states: 83%
Achieve certification of polio eradication by the year 2005.	Wild polio virus transmission possibly interrupted
Eliminate maternal and neonatal tetanus (<1 case/1000 live births) by the year 2005.	Not achieved
Reduce measles morbidity by 60% and mortality by 40% by the year 2005.	Partly achieved, repeated measles catch-up campaigns conducted
Ensure the safety of EPI injections	AD syringes and safety boxes supplied bundled with all vaccines
Improve surveillance system for the EPI targeted diseases	Partly achieved through inclusion of measles and MNT in AFP surveillance system
Integrate HepB vaccine into EPI by the year 2004	Phased introduction started in 2005
Reinforce coordination and community involvement	Partly achieved
Strengthen management	Federal and state EPI departments strengthened
Ensure sustainable financing for EPI	Partly achieved, GoS will increase contribution incrementally starting in 2006
Reinforce logistic capacities of the EPI	Done
Ensure vaccine quality and regular supply.	Improved

Given that many of the objectives of the former EPI plan have only been partly achieved, a further intensification and prioritisation of the EPI is warranted based on a thorough situation analysis.

## 2. EPI Situation Analysis 2005

### 2.1. Service Delivery and Programme Management

#### 2.1.1. Routine Immunization of Children

The EPI strives to complete vaccination of children before their first birth day according to the following schedule:

Vaccine	EPI immunization schedule (2005)				
	Birth	6 weeks	10 weeks	14 weeks	9 months
BCG	☺				
OPV		☺	☺	☺	
DPT		☺	☺	☺	
Hepatitis B		☺*	☺	☺	
Measles					☺

\*started 2005 in 6 pilot states.

#### Tetanus Vaccination for Pregnant Women

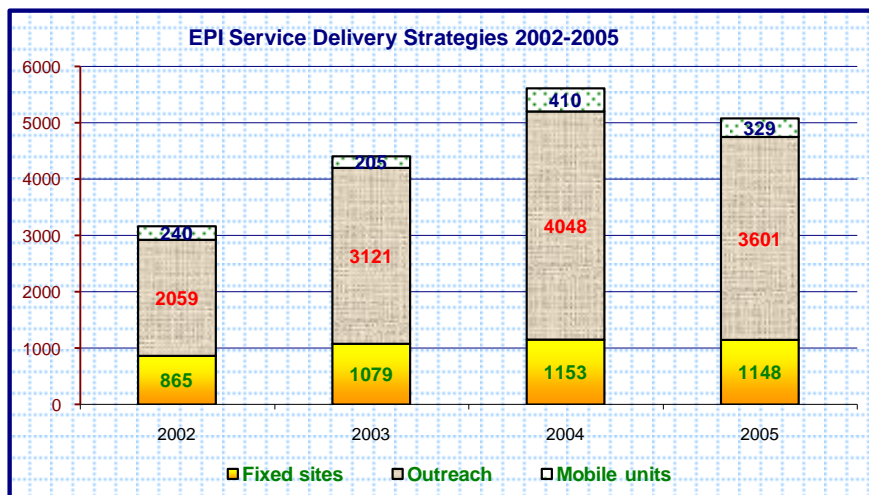
The EPI policy is to give tetanus vaccination to all pregnant women. In addition to routine vaccination conducted in the health facilities, maternal and neonatal tetanus (MNT) campaigns are conducted in high risk districts targeting all women of childbearing age (15-45 years).

Tetanus vaccination schedule (2005)			
Dose	Schedule	Dose	Schedule
TT1	At first contact	TT4	After one year
TT2	After one month	TT5	After one year
TT3	After six months		

#### EPI Service Delivery

Between 2001 and 2004, the programme completed the rehabilitation of the central cold store with introduction of advanced technologies for temperature and electricity monitoring and control. Also during 2003 and 2004, the programme started the rehabilitation of the cold chain in the states resulting in an improvement of cold chain functionality from 50% in 2001 to 80% in 2004.

There was also an expansion in the EPI delivery network. During the period 2002 to 2004 fixed EPI sites increased by 33%, the number of outreach sites doubled, and there was a 70% increase in mobile teams.



*(2005 is less than 2004 we either to justify or not to add 2005 to the graph)????????????????????*

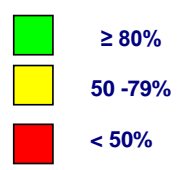
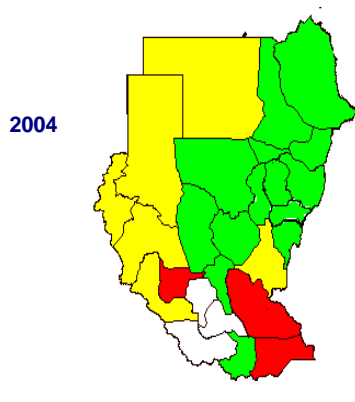
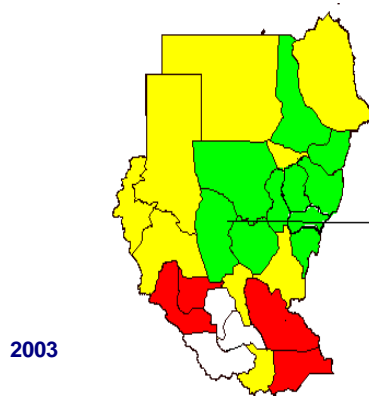
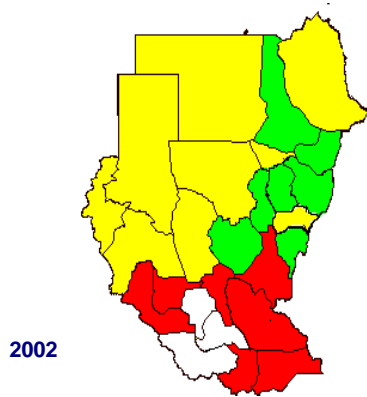
### Routine Immunization Coverage

Overall coverage increased significantly over the past 3 years as seen in the following table, thanks to a revitalisation and restructuring of all EPI services and the sustained cooperation of the EPI partners, notably of GAVI.

Coverage estimates by antigen 2003 – 2005								
	BCG	OPV1	OPV2	OPV3	DTP1	DTP2	DTP3	Measles
<b>2003</b>	73%	89%	78%	74%	89%	78%	74%	70%
<b>2004</b>	71%	88%	80%	79%	88%	80%	79%	72%
<b>2005</b>	77%	95%	85.6%	83.4%	95%	85.6%	83.4%	73%

Source: EPI Statistics Department December 2005.

The number of states achieving at least 80% DTP3 coverage increased from 7 in 2002 to 10 in 2003 and reached 14 in 2004. The maps (by states) below document this.



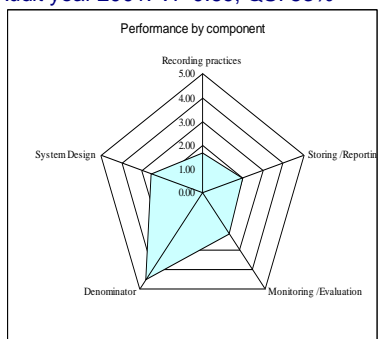
In line with achieving the WHO EMR regional objective of reaching 80% districts with  $\geq 80\%$  DTP3 coverage, the number of districts (localities) achieving this benchmark increased as shown in the following table:

Increase in DTP3 coverage in accessible localities from 2002 to 2004			
	Number of localities with coverage $\geq 80\%$	Number of localities with coverage 50-79%	Number of localities with coverage $< 50\%$
<b>2002</b>	28	29	48
<b>2003</b>	55	26	30
<b>2004</b>	65	29	13
<b>2005</b>	76	24	11

**Source:** EPI Annual report 2004 and 2005 coverage data

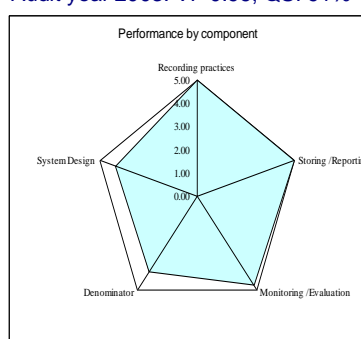
This achievement has been further supported by the improved information system for immunization data which was positively evaluated by passing the Data Quality Audit (DQA) in 2004 with a verification factor of 0.96 and a quality system index (QSI) of 91%. The following figures show the improvements of the EPI reporting and information system between 2001 and 2003:

Audit year 2001: VF 0.69, QSI 53%



Source: DQA report 2002

Audit year 2003: VF 0.96, QSI 91%



Source: DQA report 2004

A detailed overview of performance indicators of the routine EPI services in Northern Sudan is provided in the following table:

### Situational analysis of routine EPI by system components in Northern Sudan

System Components	Suggested indicators	Northern Sudan (88 Localities)		
		2003	2004	2005
Routine Coverage	DTP3 Coverage	80%	82%	86%
	% localities with DTP3 > 80%	59%	64%	77.3%
	% Localities < 50%	13%	10%	6.8%
	% health facilities that provide immunization services	42%	67%	74%
	% localities using EPI monitoring charts	83%	84%	98%
	% population covered by fixed immunization services	35%	33%	39%
	% population covered by outreach services	41%	42%	34%
	% population covered by mobile services	24%	24%	27%
	% population living in inaccessible areas	0.1%	1.6%	2%
	DPT1- DPT3 drop out rate	15%	10%	11.5%
	% localities with DPT1/DPT3 drop-out rates > 10%	66%	39%	39.8% not including localities with -ve drp out rate
	% localities with good access DTP1 > 80%	75%	73%	85%
	% implementation of the planned fixed site sessions(operation section)	79%	90%	91%
	% implementation of planned outreach sessions(operation section)	59%	78%	80%
% implementation of planned mobile sessions (operation section)	56%	73%	65%	
New Vaccines	% localities introducing Hep B	NA	NA	36%
	Hepatitis B3 coverage rate in the targeted states	NA	NA	49%
	Birth dose of Hep. B vaccine	No	No	No
	Known burden of Hib disease	No	No	No
	Intention to introduce Yellow Fever vaccine	No	No	Yes
	Intention to shift to combo vaccines	No	No	Yes
Routine Surveillance	Intention to introduce booster doses	No	No	Yes
	Existance of different surveillance systems	Yes	Yes	Yes
	Completeness of reporting	91% (states)	94% (states)	90% (loc.)
	Timeliness of reporting	67%	62%	81%

	Use of surveillance data at locality level	Yes	Yes	Yes
<b>Cold chain/Logistics</b>	Existence of renewal plan for the cold chain	No	No	No
	% localities with standard cold chain equipment	53%	53%	57%
	% localities with less than 80% cold chain functionality	34%	44%	23%
	% localities reporting stock-out	ND	25%	21%
<b>Immunization safety and Waste Management</b>	% localities that have been supplied with adequate No. of AD syringes for all routine immunization	100%	98%	98%
	Existence of an AEFI surveillance system	No	No	No
	Availability of waste management plan	No	No	Yes
	% localities implementing waste management measures ('burn and bury')	100%	98%	98%
<b>Vaccine supply</b>	% government contribution to vaccine cost	0%	0%	0%
	Any stock-out at national level during last year	No	No	No
	% localities keeping vaccine stock records	NA	65%	93%
	% localities with DPT vaccine wastage > 25%	NA	NA	14%
<b>Communication</b>	Existence of communication and social mobilization plan as an integral part of the microplans	No	No	Yes
	% funds deducted for routine communication and social mobilisation	3%	3%	5%
<b>Financial Sustainability</b>	Government contribution to total EPI costs	69%	42%	30%
<b>Management planning</b>	Are a series of locality indicators collected regularly at national level?	Yes	Yes	Yes
	% localities with microplans	100%	98%	98%
<b>Research/studies</b>	Number of vaccine-related studies conducted	4	6	3
<b>NRA</b>	Number of functions conducted	0	0	0
<b>National ICC</b>	Number of meetings held last year	3	2	2
<b>Human resources availability</b>	% health facilities with at least one vaccinator	100%	100%	100%
	health workers/vaccinators per 10,000 population	1/10,000	1/10,000	1/10,000
<b>Transport/Mobility</b>	% localities with adequate transportation (one vehicle)	80%	80%	80%
<b>Linking to other Health Interventions</b>	Immunization services systematically linked to delivery of other interventions (Malaria, Nutrition, Child health etc)	Nutrition	Nutrition	Nutrition
<b>Programme Efficiency</b>	Timeliness of disbursement of funds to localities	75%	92%	92%
	% localities with trained operation officers (MLM)	81%	81%	51%
	% localities visited at least once per year	48%	35%	45%
	Vaccine wastage monitoring at national level for all vaccines?	Yes	Yes	Yes
	% system wastage	NA	0.5	0.3
	% localities with Quality System Index > 80%	ND	ND	35%
	% localities with a Verification Factor < 0.8	ND	ND	9%

System Components	Suggested indicators	Northern Sudan (88 Localities)		
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	% localities that have been supplied with adequate No. of AD syringes for all routine immunization	100%	98%	98%
	Existence of an AEFI surveillance system	No	No	No
	Availability of waste management plan	No	No	Yes
Vaccine supply	% localities implementing waste management measures ('burn and bury')	100%	98%	98%
	% government contribution to vaccine cost	0%	0%	0%
	Any stock-out at national level during last year	No	No	No
	% localities keeping vaccine stock records	NA	65%	93%
Communication	% localities with DPT vaccine wastage > 25%	NA	NA	14%
	Existence of communication and social mobilization plan as an integral part of the microplans	No	No	Yes
	% funds deducted for routine communication and social mobilisation	3%	3%	5%
Financial	Government contribution to total EPI costs	69%	42%	30%

<b>sustainability</b>				
<b>Management planning</b>	Are a series of locality indicators collected regularly at national level?	Yes	Yes	Yes
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	health workers/vaccinators per 10,000 population	1/10,000	1/10,000	1/10,000
<b>Transport/Mobility</b>	% localities with adequate transportation (one vehicle)	80%	80%	80%
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<b>Programme Efficiency</b>	Timeliness of disbursement of funds to localities	75%	92%	92%
	% localities with trained operation officers (MLM)	81%	81%	51%
	% localities visited at least once per year	48%	35%	45%
	Vaccine wastage monitoring at national level for all vaccines?	Yes	Yes	Yes
	% system wastage	NA	0.5	0.3
	% localities with Quality System Index > 80%	ND	ND	35%
	% localities with a Verification Factor < 0.8	ND	ND	9%

### Southern Sudan

EPI data from Southern Sudan are not provided in the situation analysis tables, as data sources are limited and data quality is questionable. So far, in the South, routine EPI services are not functional. Most of the EPI services are actually carried out by NGOs, supported by WHO and UNICEF. A five-year EPI plan for Southern Sudan was developed in June 2005. It estimates present DTP1 coverage in the South to be 22%, with a DTP3 coverage of 11%. According to the planning document, there is little or no advocacy for routine EPI. Southern states face frequent stock-outs of vaccine. Supervision of routine EPI services and of vaccine management appears to be weak. The South faces wide scale measles virus transmission with large outbreaks, the last occurring in 2005. Measles coverage is estimated to be 19%, leaving large cohorts of children with increased susceptibility to measles. Mass measles campaigns were conducted in 2005 next to polio NIDs. All Southern districts are regarded as high-risk for MNT transmission. Injection safety is being addressed through the regular UNICEF provision of AD syringes and safety boxes, but there is no organised system of immunization waste management. EPI surveillance consists mainly of AFP surveillance. Vitamin A deficiency is considered an important health problem in Southern Sudan.

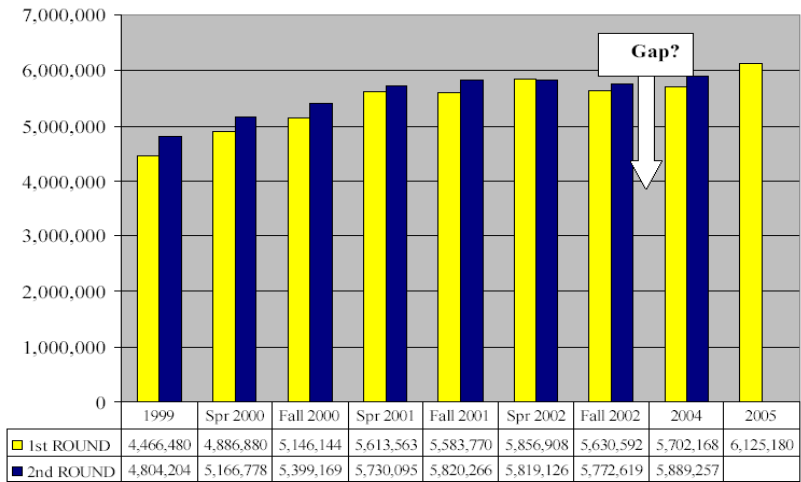
## 2.1.2. Accelerated Disease Control Initiatives

### Polio

Strategically and operationally Sudan has been one of the major priorities and successes of the polio eradication initiative. Since 1994, the EPI has implemented 13 National Immunization Days (NIDs) with two rounds each, each of them targeting around 5.8 million children of less than five years of age, plus 6 sub NIDs and one mop-up campaign. These NIDs were of a reasonable quality as stated by international observers, a matter which greatly contributed to the first interruption of the circulation of wild poliovirus in the country in 2001. This accomplishment could be preserved for three years. However, in May 2004, a new polio case was detected in a border village in West Darfur. Laboratory tests showed that the virus was of North Nigerian origin. Consequently, two immunization campaigns were implemented in Darfur States and West Kordofan State to stop circulation of the imported virus while 17 further cases appeared in other states. During October and November 2004, two rounds of NIDs were launched, but the virus nonetheless spread rapidly and there were 127 confirmed cases by the end of 2004. To stop the outbreak and to maintain the accomplished gains, NIDs were continued in 2005. Six rounds were implemented in January, February, April and May, October and November 2005. Moreover, a mopping-up campaign was implemented in Darfur states and West Kordofan in July and August of 2005, targeting more than 1 million children less than five year of age, with a coverage rate of 100% in the both the first and second round. The last NIDs targeted 6 million children, with a coverage rate of 96% in October and 99% in November. These campaigns have largely contributed to control the outbreak. In 2005, a total of 27 cases (23 in the North, 4 in the South) were reported, with the last confirmed case detected in June 2005.

The figure below shows the successive increase in the number of children reached from one campaign to the next. The graph also shows the cessation of the supplementary activities and NIDs in the period between November 2002 and 2004. This may have been the main cause for the increase in the number of children susceptible to polio infection.

### Polio eradication campaigns and children reached 1999-2005



## **Polio Laboratory**

WHO experts visited the polio laboratory to evaluate its work and performance. The laboratory subsequently received the WHO accreditation certificate for four successive years and achieved a 100% mark in the organization's quality test. All necessary materials have been provided to the laboratory so that it can play its role efficiently as one of the national laboratories recognized by the Eastern Mediterranean Region Office (EMRO).

## **Measles**

Measles is the third most important cause of infant mortality in Sudan and the most important cause of mortality from vaccine preventable diseases. Since the introduction of measles vaccine in 1985, coverage rates increased from < 20% in 1986 to an average of 70% in 2004. Prior to the introduction of vaccine the country experienced large nationwide outbreaks on a regular basis with up to 75,000 cases and 15,000-30,000 deaths annually. There has been a considerable decrease in disease incidence as vaccination coverage has increased. Approximately 40% acute disease episodes occur in children of the age group 5 to 15 years.

The proportion of susceptible children in the population is still very high enabling sustained measles transmission with epidemics moving from State to State. In addition, movement of nomads generates a permanent risk of transmission of the indigenous virus. Estimating morbidity and mortality of measles in Sudan is challenging as most of the surveillance data are derived from patients admitted to health care facilities and do not reflect disease burden at community level. Although measles is the most commonly reported vaccine-preventable disease, there is still underreporting. The number of deaths due to measles (without offering a second dose of vaccine) was estimated to be between 150,000 to 300,000 based on 2003 birth cohort data.

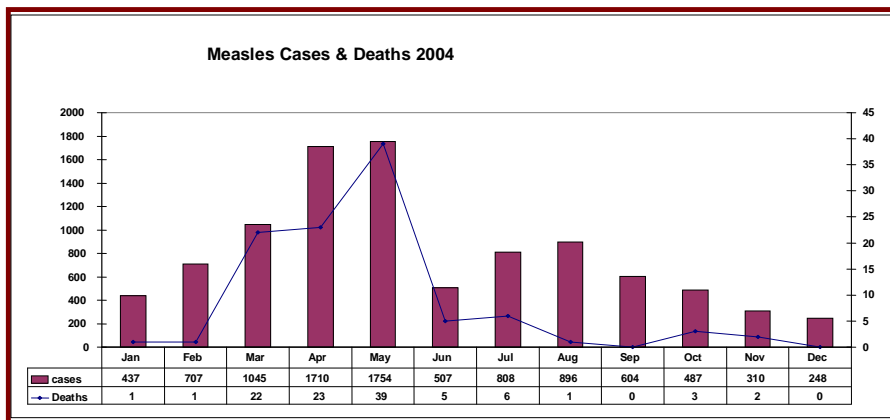
The Regional Committee for the Eastern Mediterranean Region resolved in 1997 to eliminate measles from the region by 2010. EMR countries were divided into a measles control and a measles elimination group according to their measles epidemiology and control status, with Sudan placed in the control group.

The Sudanese ICC had approved the five-year national EPI plan of action 2001-2005 for measles mortality reduction in October 2002. This plan was revised and updated in October 2003 and is implemented in phases. It includes strengthening of routine infant immunization coverage, supplemental immunization activities, a one time catch-up campaign targeted to children 9 months to 14 years of age with follow-up campaigns every 4 to 5 years for cohorts born after the initial catch-up campaign, strengthening of measles surveillance, ensuring appropriate case management and Vitamin A administration, and the improved management of children with acute measles.

The first phase of the neonatal measles mortality reduction plan was conducted in 4 selected states (Red Sea, Kassala, River Nile, Northern) in June 2004 reaching an average measles coverage of 99%. In response to the conflict situation in Darfur and the increased number of measles cases and deaths among IDPs and host communities, the Sudanese MoH and NGOs conducted vaccination campaigns against measles and polio together with Vitamin A distribution to all children under five years in all IDP camps. Unfortunately these efforts had minimal impact on the circulation of the measles virus and it is now felt that fragmented immunization activities in the IDPs camps will not stop measles virus transmission in the region. As a consequence a mass

measles vaccination campaign in the three Darfur states and Al Gadarif to close the Eastern zone was implemented in June 2004 reaching 93% coverage and was considered the second phase of the national measles mortality reduction plan. The third phase of the programme was implemented in six states (Gazira, Blue Nile, Sinnar, South Kordofan, North Kordofan, and West Kordofan) targeting more than 4 million children in December 2004. Coverage here reached 100%.

These campaigns have had a substantial impact on the reduction of measles morbidity and mortality in the above mentioned states as illustrated in the figure below.



Source: EPI Annual Report 2004

### Maternal and Neonatal Tetanus

Neonatal tetanus has remained a major public health problem in Sudan and its elimination a dire challenge. Despite previous attempts at accelerated campaigns in the late 1990s, very little impact was achieved. The current MNT elimination initiative was adopted in 2000 as part of a five year plan of action. The intervention began with a pilot phase and sought to vaccinate about 2.2 million women of child-bearing age in 47 localities with three well-spaced doses of TT irrespective of previous vaccination status. Cumulatively, some 720,000 women were reached in 28 localities with some 320,000 (15%) receiving three doses. Implementation of the clean delivery component is still weak. More than 84% of women deliver at home with less than 75% attended by trained health personnel. A complimentary strategy of following up defaulters through routine immunization services was therefore introduced. With the GAVI approval and additional funding support, specific plans to improve access and utilization have been developed for all accessible localities (111) and priority actions in 24 of these. The current increase in routine DTP3 coverage gives confidence that more unreached children and women can be accessed, although routine TT immunization coverage is still only at around 41%. A deliberate phased approach based on revised high-risk selection criteria helped identify and offer protection to the most vulnerable women and locations.

### Vitamin A Supplementation

Vitamin A supplementation has been introduced as part of the polio campaigns in collaboration between the PHC Nutrition Department and the EPI and with support from UNICEF. Supplementation first took place during the 8th round of polio NIDs in 2001 targeting children of 6 months to 5 years of age. During later measles catch-up campaigns Vitamin A was provided to children aged 9 months to 15 years in 8 northern states. In a further 8 northern states it is being offered to children aged 9 month to 5 years. Vitamin A supplementation is not yet implemented as part of the routine EPI services.

The following tables provide an overview of the present situation of accelerated disease control initiatives in Northern Sudan, based on 2003-2005 data.

### Situational analysis by accelerated disease control initiatives in Northern Sudan

System Components	Indicators	Northern Sudan (88 Localities)		
		2003	2004	2005
Polio	Non-polio AFP rate	2.4	2.8	2.7
	NIDs: # Rounds Coverage:	2 96-99%	4 77-98%	5 96-103%
	SNIDs: # Rounds Coverage	0	2 100-103%	3 98 -100%
MNT	TT2+ coverage	38%	38%	41%
	% localities reporting > 1 case of neonatal tetanus per 1000 live births	NA	NA	11%
	SIAs in high-risk areas	Yes	No	No
Measles	Measles coverage	69%	71%	72%
	Number of outbreaks reported	0	10	1
	Catch- up campaign: Coverage Age group	Yes -	Yes 97% 9m-15yrs	Yes 94% 9m-15yrs
Vitamin A	Vitamin A coverage	ND	ND	ND
	% of night blindness	NA	NA	23% <sup>1</sup>
Yellow Fever	YF coverage	0	0	0
	Preventive campaign conducted	No	No	Yes

<sup>1</sup> Data from survey conducted in White Nile state in 2005

### 2.1.3. Other EPI Activities and Components

#### New Vaccines

Within the present 5-year plan, the routine use of hepatitis B vaccine will be further expanded to cover all states and to reach DTP3 coverage levels by the end of 2008. The use of DTP-

HepB,Hib combination vaccine is intended, Relevant decisions is taken during the preparation of the MOH strategic plan. Recent yellow fever outbreaks have shown the need for appropriate vaccine protection. Introduction of the YF vaccine in the affected areas is planned for the year 2007 with GAVI support. In anticipation of further potential vaccines to be included in the EPI and in line with the regional WHO EMR immunization goals, burden of disease estimates related to congenital rubella syndrome, diarrhoea caused by rotavirus, and pneumonia and meningitis caused by Streptococcus pneumoniae and Neisseria meningitidis (including cases caused by Hib) will be carried out in the next years.

### **Immunization Safety**

Over the past years the Federal Ministry of Health has introduced AD syringes for immunization purposes as well as safety boxes for the collection and disposal of used injection equipment with UNICEF and GAVI support. AD syringes and safety boxes are distributed budled with the vaccines to the states, and are available and used in almost all centers. All health centers burn safety boxes either in the general waste disposal area or in drums and bury the remains. All health service staff is guided to follow this burn & bury procedure for health care waste disposal.

A new department was established at the EPI directorate in 2004, concerned mainly with safety of immunization and surveillance of adverse events following immunization (AEFI) and a coordinator has been appointed. A system to routinely report adverse events following immunizations (AEFI) has not yet been established in the country. AEFI are reported only during campaigns. The present EPI manual contains information for vaccinators on the AEFI for all routine vaccines and the appropriate procedures to follow in case of their potential occurrence.

With assistance from the WHO Focus Project for Immunization Safety, the EPI worked out an immunization safety action plan, being implemented in three states (Khartoum, Gazira and Blue Nile) in 2005. The plan provides for the construction of large incinerators in the said states as a guiding experience. General directives for the proper use of syringes were issued and distributed.

### **Training and Capacity Building**

In order to raise the technical capacity of EPI staff, training guidelines were prepared manuals and guidelines and a series of training courses conducted in the years 2003-2005. Overall almost 4000 basic refresher courses for vaccinators were held in 21 states, as well as almost 500 vaccine management courses targeting supply and operation officers. With the introduction of hepatitis B vaccine, about 100 courses for cold chain technicians were held and 78 training opportunities were offered to service providers (nurses, vaccinators, midwives and nutritionists). These sessions also included immunization safety and vaccine management issues. Seventeen training of trainers (TOT) sessions for vaccinator training courses were held in the northern states as well as 31 TOT courses for mid-level managers trainings in 23 states.

### **Microplanning**

In adoption of the strategy of bottom-up planning, the microplans of all accessible localities had been prepared in 2003 and annually updated by the locality operation officers.

## Human Resources Management

The EPI is currently financing a scheme for the motivation of EPI staff at different levels of the EPI structure. A major issue in human resources management are insufficient salary levels and incentives, causing a high turnover and brain drain to other more financially rewarding posts. To reduce the negative impact, the EPI has come up with a tiered system of incentives:

- *At federal level, the EPI has incorporated as part of its benefits structure subsidization of training (university programmes and as well as short term courses) to retain MDs and public health officers.*
- *At the states level, the scheme is financed through GAVI and provides small monthly incentives to state EPI Operation officers based on agreed performance in achieving certain targets. For localities, the incentive consists of training for mid-level management in the areas of vaccine management, and planning issues.*

## Costing and Financing

Main partners of the EPI are WHO, UNICEF and some major NGOs. These partners provide technical and financial support to the programme for routine services as well as for the supplementary immunization activities. WHO's support includes placement of international and national officers and co-coordinators at both federal and state levels. WHO further supports the AFP surveillance network, NIDs for polio eradication, supportive training, social mobilization and other routine and supplementary activities. UNICEF provides vaccines bundled with AD syringes and safety boxes for routine and campaign use. The Fund further supports polio NIDs, as well as MNT and other routine EPI activities.

The EPI receives a five-year GAVI support since 2002. GAVI provides immunization services support for routine activities and supports the phased introduction of new hepatitis B vaccine starting in 2005. The Government is mainly responsible for payment of the permanent EPI staff at all levels (federal, state, locality, health unit), and supporting the programme with transportation and other logistical issues. SO far there is no GOS budget line to cover costs of vaccines.

## 2.2. Advocacy and Communication

The EPI Educational and Social Mobilisation Section is active primarily during the accelerated disease control campaigns. Both at the federal, state and localities level, the section plays a major role in communication and attracting the community towards immunization days. In routine EPI services, communication activities are geared towards reducing drop-out rates and missed opportunities in immunization.

Basic information on all vaccines, posters, pamphlets, leaflets, etc. are widely distributed in the country. Special information targeted to health care providers as well as to mothers are also available. During campaigns, mass media, such as radio and TV, newspapers and other means of information transfer (such as mobile loudspeakers) are put to use. Social mobilisation plans are available at most state levels, but their implementation is patchy and not adequately monitored. Overall, not enough funds are allocated for EPI communication activities for routine services. These costs usually have to be deferred from the campaign budgets.

In October 2005, a workshop on EPI training on Health Communication was held with participation of federal and state immunization and social mobilisation health workers. The workshop recommended installing a technical committee on EPI health communication, to further

evaluate the reasons that prevent mothers from coming to the vaccination centres through appropriate KAP studies and to work out communication plans for each state according to its social fabric, utilising the directives of an overall communication plan. A “Friends of Immunization Association” has been established in some states in an attempt to target NGOs, religious leaders, parents and the private sector. A quarterly EPI newsletter is produced by the section informing health professionals about the main achievements and activities of the EPI.

### **2.3. Surveillance**

At present, information on health and disease indicators, including VPDs, is collected by several different systems without clear coordination or integration.

The Directorate of Epidemiology is responsible for the collection, tabulation, analysis and distribution of epidemiological information on all diseases. This directorate identified lists of communicable diseases to be reported and all health professionals are required to report cases of these diseases. Diagnoses are based solely on clinical criteria. The system is considered weak. Under-reporting occurs in the whole country, there are problems of timely delivery of reports, poor local utilization of collected data, and lack of a proper feedback system. The basic and continuing training for statistics clerks is deemed inadequate.

The Directorate of Health Statistics runs a separate health information system to collect data on communicable and non-communicable diseases through monthly reports which are sent from health care facilities to the Federal Ministry of Health. There are wide discrepancies between figures on reportable diseases from the Statistics and Epidemiology Directorates and neither system is considered reliable.

The AFP surveillance system, established by the PEI in 2001, on the other hand, has maintained a distinguished performance, with all indicators meeting international certification standards. The annualized AFP rate is 3.1 per 100,000 while the national adequate samples collection rate is 86% (89% in the North and 74% in the South). More than 11,000 active surveillance visits have been made to the different monitoring sites in all states of the country in 2005, representing about 95% of the visits planned. These visits have greatly contributed to upgrading the performance and following up the indicators at the different levels. The system enabled the early detection of imported viruses in 2004. AFP sentinel sites are used for additional VPD reporting under responsibility of the Federal EPI. Measles and neonatal tetanus reporting is integrated into this system with weekly and zero reporting. Information on other VPDs is provided monthly from the localities to the state and federal levels. So far, only cases seen in public health facilities are included in this surveillance system. It is expected that AFP surveillance coordinators will have a role in strengthening communicable disease surveillance in general and EPI diseases in particular.

### **2.4. Supplies, Cold Chain and Logistics**

#### **Cold Chain**

The cold chain operates in all states with cold chain stores at various levels. The central vaccine store in Khartoum comprises a total of 12 walk-in cold chambers, 10 of which operate at +4°C (160 cubic meters), and 2 operate at -20°C (37 cubic meters), giving a combined installed capacity of some 200 cubic meters. The central store thus provides adequate storage space for

present and future needs, including Hepatitis B or combination vaccines for all infants as well as for potential booster doses. It is estimated that the capacity will be adequate for all supplementary immunization activities for the next 10 years. During the past few years, 28 cold rooms have been installed in most states. All state level cold chambers are of a standard design, and have a storage capacity of some 12 cubic meters each.

### **Vaccine Wastage**

Wastage rates indicators are regularly monitored at all levels. Health facility monthly reports contain basic information to calculate this indicator. Supervisors check for wastage during their visits and, the importance of reducing wastage rates is emphasised in programme planning at all EPI levels. The open vial policy is known and in use for DTP, Tetanus and Hepatitis B. As a general rule, all health facilities provide BCG and Measles vaccines on fixed days in order to reduce wastage.

### 3. The Comprehensive Multi-Year National Immunization Plan 2006-2010

Based on the in-depth situation analysis, the new comprehensive multi year national immunization plan was established in discussions and deliberations of senior EPI staff. Priorities and major objectives were set during a workshop held in Khartoum in December 2005 with participation of representatives of federal and state ministries from North and South Sudan as well as of the immunization partners such as WHO and UNICEF. Outline and structure of the plan follow the Global Immunization Vision and Strategy (GIVS) 2006-2015. The plan takes the EPI Five-Year Plan 2001-2005 forward. Some of the observations and conclusions of the former multi-year plan, which are still valid today, were carried over into the new plan.

The plan's budget tables are based on the EPI Financial Sustainability Plan (FSP) established in June 2005. Annual work-plans with integrated and consolidated activities will be developed on the basis of this MYP for each of the years 2006 through 2010. The MYP is to be regarded as "work in progress" which needs to be revised on an annual basis in light of new developments in the field and/or possible changes in financial contributions from both the Government of Sudan and international donors.

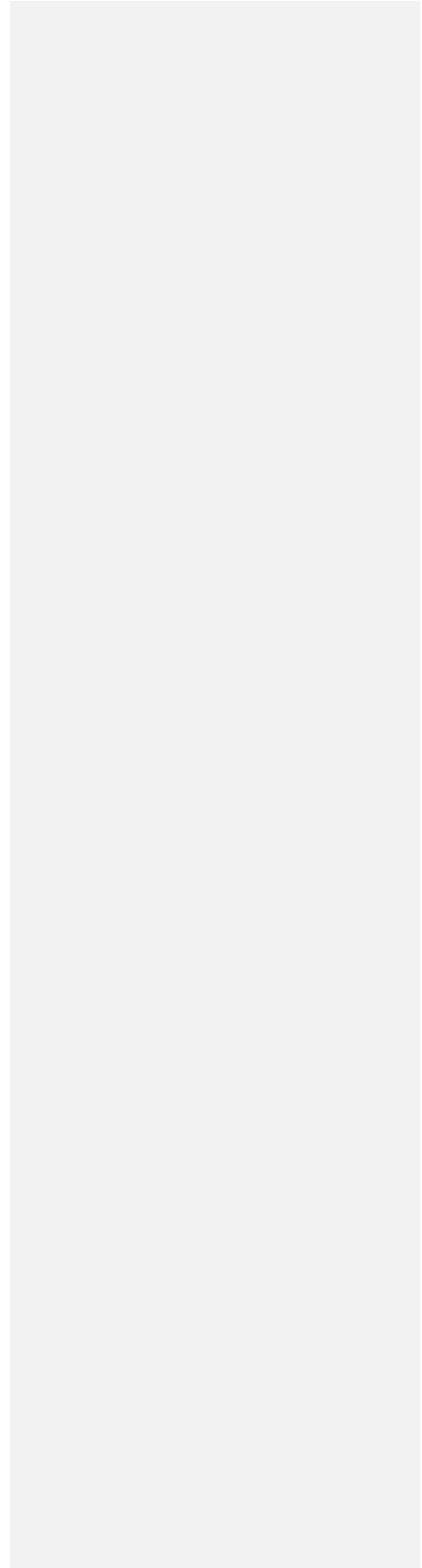
#### 3.1. National Objectives 2006-2010

1. **Routine Coverage:** By the end of 2010 Sudan will have a national DTP3 coverage of 90% with at least 80% coverage in each district.
2. **Polio:** By the end of 2008 Sudan will be certified polio-free.
3. **Measles:** By the end of 2010 measles elimination will have been achieved.
4. **MNT:** By the end of 2010 neonatal tetanus elimination (<1 case per 1,000 live births) will have been achieved.
5. **Hepatitis B:** By the end of ~~2008~~2007, HepB vaccine will have been introduced in all states. By the end of 2010 HepB3 coverage will be equal to DTP3 coverage.
6. **New Vaccines:**
  - Hib:* By the end of 2010 a 50% reduction in Hib disease burden will have been achieved.
  - Yellow Fever:* By 2010 yellow fever vaccine will be introduced into the high risk areas immunization services
  - Rubella:* By the end of 2010 the incidence of congenital rubella syndrome will be documented.
  - Rotavirus, Strep.pneumoniae, N. meningitidis:* By the end of 2010 burden of disease estimates for these pathogens will have been established.
7. **Vitamin A:** By the end of 2010, Vitamin A supplementation coverage will be same as MCV Nationaly.
8. **Immunization Safety:** By the end of 2010, AEFI surveillance system will be implemented in all states

These 8 objectives will be achieved through the pursuit of strategies and relevant activities in the following four major strategic reas:

1. Service delivery and programme management,
2. Advocacy and communications,
3. Surveillance and data for decision-making and

#### 4. Vaccine supply, quality and logistics.



An overview of the national EPI objectives and milestones for the next 5 years is provided in the following table:

### National EPI Objectives and Milestones 2006-2010

National priorities	EPI Objectives	EPI Milestones 2006 - 2010
<b>Routine Coverage</b>	By the end of 2010 North Sudan will have DTP3 coverage of 90% with at least 80% coverage in each district.	2006: 70% localities with 80% DTP3 coverage and 86% DTP3 coverage for north Sudan 2007: 75% localities with 80% DTP3 coverage and 87% DTP3 coverage for north Sudan 2008: 80% localities with 80% DTP3 coverage and 88% coverage for north Sudan 2009: 90% localities with 80% DTP3 coverage and 89% coverage for north Sudan 2010: 100% localities with 80% DTP3 coverage and 90% coverage for north Sudan
<b>Polio</b>	By the end of 2008 Sudan will be certified polio-free.	2006: Sustained absence of wild virus transmission 2007: Containment of laboratory virus 2008: Polio-free certification documents submitted
<b>Measles</b>	By the end of 2010 measles elimination will have been achieved.	2006: Measles incidence will be reduced by 60% compared to 2004 levels 2007: Measles incidence will be reduced by 80% compared to 2004 levels 2008: 90% of children under 5 years of age will have had a second opportunity to receive MCV 2009: Indigenous virus transmission stopped 2010: Measles eliminated
<b>MNT</b>	By the end of 2010 neonatal tetanus elimination (<1 case per 1000 live births) will have been achieved.	2006: All localities at high risk of tetanus identified 2007: Less than 25% of localities are at high risk of tetanus 2008: PAB system established 2009: 80% of newborns are protected at birth 2010: Neonatal tetanus eliminated in every locality
<b>Hepatitis B</b>	By the end of 2006, HepB vaccine will have been introduced in all states. By the end of 2010 HepB3 coverage will be equal to DTP3 coverage.	2006: HepB vaccine introduced in 15 <del>northern</del> northern states 2007: <a href="#">HepB vaccine introduced in all states with 87% HepB3 national coverage (equal to DTP3 coverage)</a> <del>HepB vaccine introduced in 20 states</del> 2008: HepB vaccine introduced in all states with 88% HepB3 national coverage (equal to DTP3 coverage) 2009: 89% HepB3 national coverage (equal to DTP3 coverage) 2010: 90% HepB3 national coverage (equal to DTP3 coverage)
<b>Haemophilus influenzae b</b>	By the end of 2010 a 50% reduction in Hib disease burden will have been achieved.	2006: Hib sentinel surveillance established 2007: BoD determined 2008: Hib vaccine introduced as combination vaccine in phased manner 2009: 89% Hib national coverage (equal to DTP3 coverage) 2010: 90% Hib national coverage (equal to DTP3 coverage)
<b>Yellow Fever</b>	After 2010 there will be no more yellow fever outbreaks.	2006: Identify Yellow fever high risk zone 2007: proposal raising and mobilization of funds 2008: Mass vaccination campaigns in the affected areas

National priorities	EPI Objectives	EPI Milestones 2006 - 2010
		2009: 70% YF coverage in affected areas 2010: 80% YF coverage in affected areas
<b>Rotavirus, Streptococcus pneumoniae, Neisseria meningitides</b>	By the end of 2010 burden of disease estimates for these pathogens will have been established.	2007: BoD studies on rotavirus, Streptococcus pneumoniae and N. meningitidis initiated 2010: BoD studies completed and results used for decisions about introduction of vaccines
<b>Rubella</b>	By the end of 2010 the incidence of congenital rubella syndrome will have been documented.	2006: Rubella cases detected 2008: Congenital rubella studies initiated 2010: Congenital rubella studies completed and results used for decisions about introduction of rubella vaccine
<b>Vitamin A</b>	By the end of 2010 90% of children below five years of age will have received Vitamin A supplementation.	2006: 90% of children under 5 years of age will have received at least one dose of Vit A through SIA 2007: Vit A provided to target group routinely together with MCV in selected areas of local health system implementation 2008: 90% of all children under 5 years of age will have received at least one dose of Vit A
<b>Immunization Safety</b>	By the end of 2010, AEFI surveillance system will be implemented in all states	2006: AEFI surveillance system established 2007: Waste disposal; incinerators built at least one in one locality in each state 2010: AEFI surveillance system implemented in all states

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### 3.2. National Strategies and Key Activities 2006-2010

Based on the current status of the programme with respect to these objectives, a brief review of the major issues involved is given for each major area, followed by a list of the proposed strategies and key activities. A timeline for their implementation over the next five years is being developed annually. Strategies and activities are listed in the sequence of the eight national objectives given above – not all objectives, however, are relevant in each of the four major strategic areas.

#### 3.2.1. Service Delivery and Programme Management

- All existing health facilities will need to provide full EPI services, as presently 26% of their catchment population is not being offered immunizations. This is thought to be the most cost-effective way to increase immunization coverage.
- With only 33% of target population served by fixed EPI sites, the vast majority of EPI services are delivered through outreach and mobile services. This makes it imperative that all planned outreach and mobile sessions are actually fully implemented. Presently as much as 35% of mobile and 20% of outreach sessions are not conducted. Construction of new fixed sites should be initiated once the above has been achieved.
- The introduction of Hepatitis B vaccine will need to be accelerated in order to reach the targeted national DTP3 levels (80.88%) by the end of 2008.
- The introduction of DTP-HepB-Hib combination vaccines is strongly encouraged.
- Yellow fever vaccine is to be introduced in the areas affected by outbreaks. A GAVI application is to be filed in 2007 so that vaccine introduction can start in 2008.
- Booster doses for diphtheria, tetanus (DT) and measles are to be introduced at school entry (6 years of age).
- Vaccine wastage is to be reduced (14% of localities report more than 25% DTP wastage).

- *Waste management at present still consists of open burning and burying of sharps waste; in view of the hazards of open burning, waste management guidelines will need to be reviewed and adapted.*
- *The GoS will need to steadily increase its annual contribution to the overall EPI costs in order to achieve sustainability of programme implementation.*
- *Links between the EPI and other programmes such as malaria, reproductive health, IMCI, tuberculosis, nutrition, health education, HIV/AIDS need to be established and further strengthened.*
- *The supervision of EPI staff at the locality level needs to be improved as presently 55% of localities do not receive at least one visit per year.*
- *The system of using DQA quality management methods in the evaluation of EPI services in the localities should be maintained and further expanded.*

**Service Delivery and Programme Management: Objectives, Strategies and Key Activities**

National Objective	Strategies	Key Activities
<p><b>Routine Coverage:</b> By the end of 2010 Sudan will have a DTP3 coverage of 90% with at least 80% coverage in each district.</p>	<p>Increase access to quality immunization services especially for the hard-to-reach populations</p>	<p>Expand the immunization network and re-establish immunization services for hard-to-reach and war affected areas. Ensure immunization services are offered in all existing health facilities Identify new sites and settings according to the priority list. Establish 2 – 4 outreach posts for each new fixed site.</p>
	<p>Implement RED strategy in localities with &lt; 80% DPT3 coverage</p>	<p>Develop and update microplans in remaining localities Ensure that 100% of planned outreach and mobile sessions are actually conducted Focus on hard-to reach populations</p>
	<p>Improve monitoring of microplans at all levels</p>	<p>Establish a computerized monitoring system for follow up on implementation of the micro-plans</p>
	<p>Conduct 3 to 4 pulse immunization campaigns per year in hard to reach and newly accessible areas</p>	<p>Identify the areas and target populations Develop campaign plans and nominate field coordinators Ensure and avail budgets and adequate logistics Implement and report coverage rates</p>
	<p>Reduce dropout rate</p>	<p>Update, print and distribute defaulter tracing guidelines to all localities Reduce missed opportunities in immunization (see table 2) Prepare monthly lists of defaulters in all health facilities Monitor and follow-up on defaulter retrieving</p>
	<p>Introduce booster doses</p>	<p>Provide DT booster at school entry</p>
	<p>Establish working links with other health departments (IMCI, reproductive health, nutrition, malaria, tuberculosis, HIV/AIDS, health education etc.)</p>	<p>Improve joint communication on disease control and prevention Develop plans with other health departments for the joint provision of targeted interventions Streamline health education messages between departments Distribute impregnated bednets to children below five years of age and pregnant women during routine and supplementary immunization activities in pilot areas Monitor and evaluate impact of combined interventions Explore possibilities for expansion Use other programmes for defaulter retrieving (IMCI, BDN,CFCI, MCH....etc)</p>
	<p>Ensure coordination of the EPI at federal and state levels</p>	<p>Conduct 4 meetings of the ICC per year</p>
	<p>Strengthen and improve governance and ensure proper use of information at all levels</p>	<p>Draft and endorse the national multi-year immunization plan 2006-2010 Update the EPI profile and database Prepare, print and distribute reference manuals/guidelines on vaccine management, cold chain equipment maintenance and repair, AEFI, integrated EPI disease surveillance, and supervision.</p>

National Objective	Strategies	Key Activities
<p><b>Polio:</b> By the end of 2008</p>	Strengthen supportive supervision and transfer skills and competencies to lower levels	Update, print and distribute manual/guidelines on EPI data operations and microplanning
		Conduct two review meetings per year with the state operations officers.
		Conduct joint supervision visits with the state operation officers
		Conduct regular feedback & feed-forward updates
		Adopt DQS as supervisory tool at state and locality level
		Attend, monitor and guide the state monthly meetings
		Conduct two zonal evaluation meetings annually
	Reduce vaccine wastage	Identify, analyse and monitor vaccine wastage rates at different levels
	Maintain acceptable levels of vaccine wastage vs. coverage targets	Acknowledge and reward operation officers and vaccinators for perfect performance.
	Secure availability of sufficient, adequately paid and qualified staff at all levels	Recruit 250 qualified vaccinators in 134 localities.
	Train locality operations officers and vaccinators	Recruit 3 National officers and 6 Zonal coordinators
	Assign and train 16 federal master trainers.	Conduct refresher training for 3871 vaccinators in all states
	Conduct ongoing in-service MLM training for 143 state and locality operations officers	Train 29 federal and state operations officers in vaccine management
	Train 35 cold chain technicians at state and federal levels by an international expert.	Assign and train 25 state information focal persons in all states.
	Train 27 federal staff (computer skills and English language)	Conduct post training evaluation
	Achieve financial sustainability	Initiate government incremental share in programme costs
	Fix a budget line for injection safety equipment in the national fiscal budget starting in 2006	Ensure incremental annual share of GoS of 10% of vaccine costs starting in 2007
	Conduct follow-up meetings with concerned financial departments in FMoH and FMoF	Mobilise and involve new national and international donors
	Conduct national resource mobilisation workshop	Prepare and submit appropriate funding proposals
	Continue and improve internal auditing process at federal level	Develop a document for EPI standards at all levels
	Revise the existing internal auditing system	Prepare and use performance indicators
Conduct regular internal auditing for federal EPI	Decrease dependency on mobile teams	
Achieve and sustain programme efficiency	Expand fixed sites incl. outreach services as scheduled	
Maintain high population immunity among children below 5 years of age	Boost routine immunization in large population settings	
Conduct two campaigns of synchronized NIDs		

National Objective	Strategies	Key Activities
Sudan will be certified polio-free.		nationwide Conduct SNIDs in border and high risk areas respecting tranquility widows Conduct SIAs according to the AFP data Conduct mopping up whenever need arises
	Maintain a high level of cross-border coordination	Conduct inter-state cross-border meetings once per year Participate in external cross-border coordination meetings
<b>Measles:</b> By the end of 2010 measles elimination will be achieved.	Conduct catch up and follow up campaigns	Review and update microplans Secure budget, vaccine and equipment Implement and monitor campaigns
	Provide second opportunity	Develop and update microplans Implement and monitor introduction in routine EPI
	Introduce booster dose	offer booster to children at school entry (6 years of age)
<b>MNT:</b> By the end of 2010 neonatal tetanus elimination (<1 case per 1000 live births) will be achieved.	Resume elimination programme	Update the national MNT elimination plan Identify and assign four national MNT consultants Update list of high-risk localities using the proper algorithm Revise MNT elimination guidelines
	Conduct SIAs in identified high-risk localities.	Revise and update state microplans Secure budget, vaccine and equipment Implement and monitor three well-spaced campaign rounds
	Promote clean delivery practices in selected localities	Coordinate activities with reproductive health directorate Train and re-train midwives Secure budget, equipment and supplies
<b>Hepatitis B:</b> By the end of 2007 HepB vaccine will be introduced in all states. By the end of 2010, HepB3 coverage will be equal to DTP3 coverage.	Introduce HepB vaccine in the remaining 49-7 states	Conduct pre-introduction assessment in the targeted states in two phases Develop and update microplans in the targeted states Train health service providers in the targeted states Hold advocacy meetings for the new vaccine Conduct regular monitoring and supervision
	Evaluate HepB introduction	Perform external assessment of introduction of HepB vaccine Implement recommendations and draw lessons for the introduction of further vaccines
	Introduce combination vaccine (DTP-HepB-Hib)	Assess the need for combo vaccine Conduct meetings with concerned FMOH officers to decide on introduction plan
	Link with other health programmes	Update guidelines of other health programmes with respect to new vaccines
<b>Hib:</b> By the end of 2010 a 50% reduction in Hib disease burden will be achieved.	Introduce Hib vaccine as a combination vaccine (DTP-HepB-Hib)	Conduct pre-introduction assessments Develop and update microplans Train health service providers Hold advocacy meetings for the new vaccine Conduct regular monitoring and supervision
<b>Yellow Fever:</b> After 2006 there will be no more yellow fever outbreaks.	Introduce YF vaccine in routine EPI in affected areas	Prepare and submit proposal for GAVI funding (in 2007) Obtain FMOH commitment for vaccine introduction Conduct pre-introduction assessments Develop and update microplans

National Objective	Strategies	Key Activities
		Train health service providers Hold advocacy meetings for the new vaccine Introduce vaccine in affected areas (in 2008) Conduct regular monitoring and supervision
<b>Rotavirus, Strep. pneumoniae; N. meningitidis</b> By the end of 2010 burden of disease estimates for these antigens will have been established.	Conduct burden of disease assessments  Determine the need for the introduction of new vaccines	Submit call for research proposals, select and implement appropriate survey  Use evidence provided by assessment in meetings with concerned FMOH officers to decide on the introduction of vaccines against these pathogens
<b>Rubella:</b> By the end of 2010 congenital rubella incidence will have been documented.	Conduct assessments of incidence of congenital rubella syndrome  Determine the need for the introduction of rubella vaccine	Submit call for research proposals, select and implement appropriate survey  Use evidence provided by assessment in meetings with concerned FMOH officers to decide on the introduction of the vaccine
<b>Vitamin A</b> By the end of 2010 90% of children below five years of age will have received Vitamin A	Provide Vit A during SIAs to target population  Integrate Vit A supplementation in routine EPI services	Distribute Vit A during measles campaign in southern states Conduct follow up campaigns to reach all children below the age 5 years Develop and update microplans Train health service providers Provide Vit A together with routine measles vaccination Conduct regular monitoring and supervision
<b>Immunization Safety:</b> By the end of 2010, AEFI surveillance system will be implemented in all states	Expand the implementation of the "Focus Project" in 14 states  Ensure safe injections  Ensure safe waste disposal  Establish a monitoring system for AEFI  Strengthen and resume the role of the National Regulatory Authority	Design, print and distribute posters, brochures and training manuals on injection safety practices Ensure that injection safety is a cross-cutting issue in all EPI training activities Secure funds for the construction of 14 incinerators in 14 states Monitor progress of injections safety and waste management practices Provide AD syringes and safety boxes for all EPI injections. Purchase injection safety equipment from reputable sources in collaboration with UNICEF Development of IEC material (refer to communication plan) Establish incinerators one in each locality at least Discourage open burning and encourage incineration and safe burying Provide waste management guidelines for all health facilities Identify sentinel sites for monitoring of AEFI in each locality Assign focal persons Train focal persons using the developed manuals for safety of injections Regular monitoring at all levels Revise and update the NRA members list Prepare NRA workplan Conduct two NRA meetings annually

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### 3.2.2. Advocacy and Communications

EPI communication strategies for routine immunizations will need to be improved. This will be a crucial component of a strategy to reduce drop-out in infant vaccination. DTP3-DTP1 drop out is presently estimated at 14% and more than half the localities (56%) have drop-out rates higher than 10%. New and improved communication strategies are warranted in order to convince mothers to complete the full immunization schedule for their children. At the same time, an intensified communication effort must be made to support an increased uptake of TT vaccination in women of child-bearing age. The introduction of new vaccines will need to be accompanied by a comprehensive communication campaign.

#### Advocacy and Communications

National Objective	Strategies	Key Activities
<b>Routine Coverage:</b> By the end of 2010 Sudan will have a DTP3 coverage of 90% with at least 80% coverage in each district.	Increase demand for immunization services observing population diversity	Ensure integration of immunization topics in all important meetings (e.g. Paediatric Association etc.)
		Assess the existing communication gap in reaching all communities
		Conduct a national KAP studies on childhood immunization
		Analyze the existing data to identify where major gaps in immunization coverage, high dropout rate, refusal and rumors about EPI activities exist in the community (routine, polio, measles).
		Establish a technical advisory committee to consult the EPI on social mobilisation
		Determine and deliver appropriate social mobilisation messages
		Establish communication and social mobilization as integral part of all EPI microplans
		Conduct annual advocacy meetings with the Sudanese Paediatric Association (Child Forum)
		Establish "Friends of EPI" societies in all states (8 existing) targeting NGOs, religious leaders, parents and the private sector
		Celebrate an annual National Immunization Day
	Organise an annual workshop on social mobilisation for immunization (either national or regional)	
	Implement COMBI	Identify pilot localities according to utilisation indicators
		Conduct situation analysis, identify focal points and task force
Implement the intervention plan.		
Monitor and evaluate the intervention. Expand to further localities based on lessons learnt		
Decrease dropout rate	Continue implementation of defaulters tracing programme in all localities (see table 1)	
Implement intervention to reduce missed	Identify 32 pilot localities	
	Develop, print and distribute guidelines for	

	opportunities for immunization	reducing missed opportunities to selected localities Prepare microplan for the intervention Monitor and evaluate the implementation Expand to further localities based on lessons learnt
	Train service providers in social mobilisation	Train and equip all vaccinators and other health care providers to deliver the essential social mobilization messages for caretakers. Develop and distribute guidelines and manuals for social mobilization essential messages.
	Produce educational and information materials	Design, print, and distribute registration and social mobilisation materials for routine immunization and SIAs. Produce <del>EPI</del> quarterly EPI newsletter and ensure dissemination to all levels of the health system
<b>Polio:</b> By the end of 2008 Sudan will be certified polio-free.	Continue raising community awareness	Intensify social mobilization activities during SIAs and routine vaccination
	Document social mobilisation experience	Produce booklet on social mobilization experience in PEI in Sudan
<b>Measles:</b> By the end of 2010 measles elimination will be achieved.	Increase social mobilisation	Mobilise the community including religious and other key leaders, parents, business people, school managers, teachers, youth and children and relevant organizations
	Improve advocacy	Conduct launching or opening ceremonies in the presence of the President of the Republic or other VIPs
	Disseminate information	Produce and distribute adequate information and education materials
<b>MNT:</b> By the end of 2010 neonatal tetanus elimination (<1 case per 1000 live births) will be achieved.	Improve interpersonal communication	Address rumours and misconceptions about MNT vaccination Produce simple teaching materials (pamphlets and posters)
	Increase community awareness	
<b>Hepatitis B:</b> By the end of 2007, HepB vaccine will be introduced in all states. By the end of 2010 HepB3 coverage will be equal to DTP3 coverage.	Intensify advocacy	Hold news forums and workshops with community leaders
	Improve interpersonal communication	Meet with decision-makers, key stakeholders, etc. Produce educational materials
	Disseminate information	Use mass media
<b>Hib:</b> By the end of 2010 a 50% reduction in Hib disease burden will be achieved.	Intensify advocacy	Hold news forums and workshops with community leaders
	Increase community awareness	Meet with decision-makers, key stakeholders, etc.
	Disseminate information	Meet with all the concerned population stakeholders,
<b>Yellow Fever:</b> After 2006 there will be no more yellow	Improve interpersonal communication	Produce and distribute adequate information and education materials Hold news forums and workshops with community

fever outbreaks.		leaders
		Meet with all the concerned population stakeholders,
<b>Rotavirus, Strep. Pneumoniae; N. meningitidis</b>		Meet with decision-makers, key stakeholders, etc.
By the end of 2010 burden of disease estimates for these antigens will have been established.	Disseminate information	Produce educational materials
		Use mass media
<b>Rubella:</b>	Increase community awareness	Produce and disseminate health educational materials.
By the end of 2010 congenital rubella incidence will have been documented.	Disseminate information	Use mass media
		Hold news forums and workshops with community leaders
<b>Vitamin A:</b>		
By the end of 2010 90% of children below five years of age will have received Vitamin A supplementation.	Raise awareness of mothers and caretakers.	Handout materials, messages,
<b>Immunization Safety:</b>	Raise awareness of service providers	Produce and disseminate health educational materials.
By the end of 2010, AEFI surveillance system will be implemented in all states	Raise awareness of mothers towards AEFI	

### 3.2.3. Surveillance and Data for Decision-Making

- EPI surveillance and monitoring data is to be critically analysed and used at all levels in order to derive appropriate evidence-based decisions related to the improvement of the EPI services.
- The parallel surveillance systems (PEI/AFP, EPI, Epidemiology, Statistics) need to be better coordinated. In EPI, the existing high-quality AFP surveillance system could be the basis of such a system, which is being expanded to include measles and MNT. Such expansion necessitates a new case finding approach outside of the public health services and including the private sector. An improved EPI surveillance system will also need to monitor service delivery indicators such as coverage, access, efficiency etc.
- In MNT elimination the identification of high-risk areas needs to be made by using the WHO/UNICEF algorithm. Sole use of reported cases for this purpose is to be discouraged as areas with reporting problems will not be identified.
- The initial burden of Hib disease needs to be investigated in order to produce baseline data for a later evaluation of a reduction in disease burden after the expected introduction of the vaccine in 2008.
- Improvement of immunization safety depends on the availability of reliable data on adverse events following immunizations (AEFI). Appropriate indicators need to be included in such a new and comprehensive EPI surveillance system.

## Surveillance: Objectives, Strategies and Key Activities

National Objective	Strategies	Key Activities
<b>Polio:</b> By the end of 2008 Sudan will be certified polio-free.	Ensure certification standard of the AFP surveillance system	Conduct quarterly expert review of AFP surveillance system
		Regularly update reporting sites
		Increase supportive supervisory visits
		Further strengthen the surveillance system in high risk areas
	Establish community based AFP surveillance	Prepare for containment of wild polio virus in all laboratory settings
		Update protocol
		Develop, print and distribute guidelines
		Strengthen active search for AFP cases
	Timely submission of certification documents	Conduct orientation meetings with health staff of public and private health sector, community leaders and community organizations
		Present all necessary surveillance and laboratory data to National Certification Committee
<b>Measles:</b> By the end of 2010 measles elimination will be achieved.	Establish case base surveillance in states which conducted catch up campaigns	Submit certification document to Regional Commission
		Integrate measles surveillance into the AFP surveillance system
		Conduct active search for measles cases in and outside of the public health services
		Expand existing polio laboratory infrastructure to include measles laboratory investigations
		Prepare, produce and distribute measles surveillance guidelines, manuals and materials
		Update and train health service providers in measles surveillance
		Conduct orientation meetings with health staff of public and private health sector, community leaders and community organizations
		Revise and update performance indicators for surveillance system
		Continuously monitor surveillance quality indicators
		Strengthen co-ordination with epidemiology and statistics departments
	Publish surveillance data in the periodic EPI bulletin	
	Established adequate measles surveillance in states which did not yet conduct campaigns	Document measles disease burden in Southern states
	Integrate measles laboratory with polio laboratory	Revise polio laboratory performance indicators to include measles
		Recruit and train enough skilled laboratory technicians
Establish measles case-based laboratory surveillance		
<b>MNT:</b> By the end of 2010 neonatal tetanus elimination (<1 case per 1000 live births) will be achieved.	Risk assessment	Updating the high risk localities according to standard criteria (WHO/UNICEF algorithm)
	Integration MNT with AFP surveillance	Conduct community surveys for disease incidence and protection at birth
		Improvement of weekly zero report
By the end of 2010 other VPDs (Hepatitis B, Hib, Yellow Fever, Rotavirus, Strep.	Update and strengthen the EPI surveillance network	Strengthening the coordination with RH particularly in the area of safe delivery
		Updating, producing and distributing guidelines
		Retraining and orientation of health workers particularly midwives
		Update all EPI disease surveillance reporting sites
		Producing and distributing guidelines and working tools
Train EPI staff and other health careworkers		
Prepare and implement plan for integrated EPI disease		

Pneumoniae, N. meningitides, congenital rubella: syndrome) will be integrated into a comprehensive EPI surveillance system		surveillance
		Conduct 50 supportive supervisory visits
		Establish community-based integrated EPI disease surveillance system in high-risk areas
		Closely monitor implementation of the new EPI surveillance system
	Prepare for outbreak investigation and response	Use established susceptibility profiles for monitoring susceptible populations in order to predict outbreaks of any VPD
		Establish federal and state technical outbreak response teams
		Revise and update early preparedness and epidemic response plan to include all EPI diseases
		Conduct training on outbreak investigation and response for all surveillance officers
	Conduct operational EPI research	Conduct operational studies according to need
<b>Immunization Safety:</b> By the end of 2010, AEFI surveillance system will be implemented in all states	Establish a functioning AEFI surveillance system	Update AEFI surveillance plan to include the private sector
		Start AEFI surveillance as pilot project in selected areas
		Conduct intensive training of health worker on AEFI
		Formulate a technical committee for AEFI investigation and response
		Monitor pilot AEFI surveillance system
		Establish AEFI surveillance as an integral part of the comprehensive EPI surveillance system

### 3.2.4. Vaccine Supply, Quality and Logistics

- The vaccine supply system is to be carefully reviewed in order to prevent stock-outs, presently still occurring in 21% of localities.
- The National Regulatory Authority has not yet taken up all of its functions and will need to be strengthened in light of the planned introduction of new vaccines.

#### Vaccine Supply, Quality and Logistics: Strategies and Key Activities

National Objective	Strategies	Key Activities
<b>Routine Coverage:</b> By the end of 2010 Sudan will have a DTP3 coverage of 90% with at least 80% coverage in each district.	Ensure availability of adequate supplies (cold chain equipment, vaccine, injection equipment, safety boxes, registration and documentation materials) and logistics	Secure sufficient quantities of vaccines (including booster doses) and injection safety supplies
		Secure provision of updated and adequate registration and documentation materials at all levels
		Ensure availability of adequate transport and communication means including refrigerated vehicles
		Improve forecasting of vaccine requirements
	Maintain Cold chain functionality	Conduct regular rehabilitation and maintenance of store buildings
		Ensure compliance with national insurance policy for all stock
		Develop and update cold chain renewal plan to replace 10% of equipment annually
		Procure adequate quantities of cold chain equipment and spare parts from WHO pre-qualified suppliers
		Conduct preventive maintenance once per year in each state
		Maintain at least 80% functionality of all EPI equipment
		Establish three regional maintenance workshops for cold chain equipment repair and maintenance in Alobeid, Juba and Kassala

National Objective	Strategies	Key Activities
	Ensure proper vaccine and supplies management at all levels	Train EPI staff in vaccine management and cold chain equipment maintenance Ensure regular monitoring of vaccine supply from state to lower level (stock out, wastage) Conduct quarterly vaccines inventory updates Computerize supplies inventory at federal ware house Computerize vaccine stock inventories at state level Update and maintain documentation of vaccine stock at health facility level on a monthly basis Conduct regular supportive supervisory visits at all levels (cold chain, management of vaccine) Finalise, print and distribute vaccine management manual/guidelines to all levels Release regular reports on the status of vaccine management performance indicators at all levels
	Ensure effectiveness, quality, and safety of vaccines	Update NRA member list and conduct regular NRA meetings Attain prerequisites for primary cold store accreditation Use temperature monitors at all levels
<b>Polio:</b> By the end of 2008 Sudan will be certified polio-free.	Ensure availability of adequate vaccine, supplies and logistics for NIDs	Maintain proper forecasting of vaccine requirements Procure required quantity of vaccine and supplies (cold chain equipment, documentation materials etc.) Ensure safe and proper distribution of vaccines
<b>Measles:</b> By the end of 2010 measles elimination will be achieved.	Ensure availability of adequate vaccine, supplies and logistics for campaigns	Maintain proper forecasting of vaccine requirements Procure the required quantity of vaccine Distribute vaccine in proper condition to lower level
<b>MNT:</b> By the end of 2010 neonatal tetanus elimination (<1 case per 1000 live births) will be achieved.	Ensure availability of adequate vaccine, supplies and logistics for campaigns	Improve forecasting of vaccine requirements Procure the required quantity of vaccine Ensure safe and proper distribution of vaccines
<b>Hepatitis B:</b> By the end of 2007, HepB vaccine will be introduced in all states. By the end of 2010 HepB3 coverage will be equal to DTP3 coverage.	Ensure availability of adequate vaccine, supplies and logistics in the selected states	Establish proper forecasting of vaccine requirements Ensure adequate and sustainable finances for vaccine Procure the required quantity of vaccine (preferably combination vaccine DTP-HepB-Hib) Review and increase storage capacity for vaccines and supplies at all levels Train all EPI staff on management of new combination vaccine Update documents to accommodate new combination vaccine (vaccination registers, reporting tools, monthly reports, stock registers) Ensure safe and proper distribution of vaccines
<b>Hib:</b> By the end of 2010 a 50% reduction in Hib disease burden will be achieved.	Ensure availability of adequate supplies (cold chain equipment, vaccine, documentation) and logistics	Establish proper forecasting of vaccine requirements Ensure adequate and sustainable finances for vaccine Procure the required quantity of vaccine (preferably combination vaccine DTP-HepB-Hib) Review and increase storage capacity for vaccines and supplies at all levels Train all EPI staff on management of new combination vaccine Update documents to accommodate new combination vaccine (vaccination registers, reporting tools, monthly reports, stock registers) Ensure safe and proper distribution of vaccines

National Objective	Strategies	Key Activities
<b>Yellow Fever:</b> After 2006 there will be no more yellow fever outbreaks.	Ensure availability of adequate supplies (cold chain equipment, vaccine, documentation) and logistics	<ul style="list-style-type: none"> <li>Establish proper forecasting of vaccine requirements</li> <li>Ensure adequate and sustainable finances for vaccine</li> <li>Review and increase storage capacity for vaccines and supplies at all levels</li> <li>Ensure safe and proper distribution of vaccines</li> <li>Train all EPI staff on management of new combination vaccine</li> <li>Update documents to accommodate new vaccine (vaccination registers, reporting tools, monthly reports, stock registers)</li> </ul>
<b>Rotavirus, Strep. Pneumoniae; N. meningitidis</b> By the end of 2010 burden of disease estimates for these antigens will have been established.		
<b>Rubella:</b> By the end of 2010 congenital rubella incidence will have been documented.		
<b>Vitamin A:</b> By the end of 2010 90% of children below five years of age will have received Vitamin A supplementation.	Ensure availability of adequate supplies for vitamin A supplementation	<ul style="list-style-type: none"> <li>Establish proper forecasting of Vitamin A requirements</li> <li>Ensure proper distribution of Vitamin A</li> <li>Provide refresher training to EPI staff on Vitamin A supplementation</li> <li>Update documents to accommodate vitamin A (registers, reporting tools, monthly reports, stocks registers)</li> </ul>
<b>Immunization Safety:</b> By the end of 2010, AEFI surveillance system will be implemented in all states	<ul style="list-style-type: none"> <li>Ensure availability of immunization safety equipments</li> <li>Improve injection safety and waste management practices</li> </ul>	<ul style="list-style-type: none"> <li>Ensure government funding</li> <li>Procure and provide immunization safety equipment (AD syringes, safety boxes)</li> <li>Ensure that immunization safety is a cross cutting subject in all EPI training activities</li> <li>Ensure bundled distribution of vaccines and injection safety supplies at all levels</li> <li>Construct at least one incinerator in each state</li> </ul>

### 3.3. Analysis of c MYP costing

In order to achieve these objectives, major investment should be done in all programme components as detailed below:

#### I-Service delivery and programme management

1- Expansion of fixed immunization network to cover all health facilities( currently immunization services cover 74% of the health facilities, this necessitates purchase of :

- 117 icelinning refrigerators
- 274 solar refrigerators
- 391 cold boxes, 782 vaccine carriers, 391 thermal temperature monitors and 391 freeze tags.

- Recruitment of 782 vaccinators
- 2- printing of formats, registers and guidelines. costs 144,960 US\$
- 3- training activities (refresher, midlevel, vaccine management...etc) which require 137,706 US\$
- 4- Monitoring and supervision activities 1,778,060 US\$ are needed to cover this item throughout the five years.

#### II- Vaccine supply, quality and logistics

Renewal of cold chain equipments and vehicles(10,229,289 US\$).

#### III- surveillance and data for action

- 1- Active search (116,476 US\$)
- 2- Training activities(136,065 US\$)
- 3- Supervision (68,476 US\$)
- 4- Specimen transport to federal lab (950,277 US\$)
- 5- Building 18 incinerators (54,000 US\$)

#### IV- Advocacy and communication

-Mass Media, News letters (744,473 US\$)

#### Baseline Year (2005)

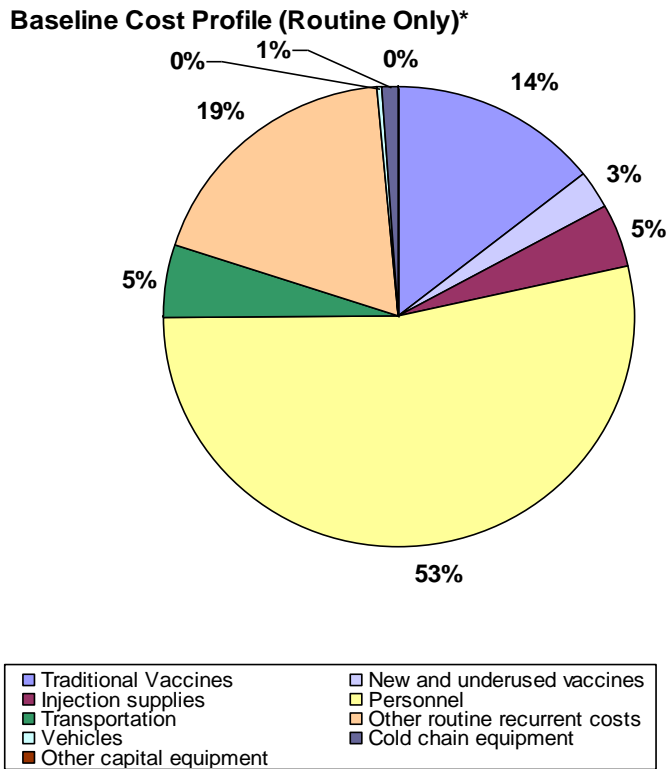
In 2005 the total expenditure on immunization services was 38.3 million US\$. 38% of spending was on routine immunization while 62% was on Supplementary Immunization activities.

Provision of routine immunization services costs 13.3 US\$ per DTP3 child and 0.4 US\$ per capita.

Baseline Indicators	2005
<b>Total Immunization Expenditures</b>	<b>\$36,124,455</b>
Campaigns	\$23,910,458
Routine Immunization only	\$12,213,997
• <i>per capita</i>	\$0.4
• <i>per DTP3 child</i>	\$13.3
• <i>% Vaccines and supplies</i>	21.7%
• <i>% National funding</i>	2.4%
• <i>% Total health expenditures</i>	12.4%
• <i>% Gov. health expenditures</i>	22.1%
• <i>% GDP</i>	0.07%
<b>Total Shared Costs</b>	<b>\$2,196,467</b>
% Shared health systems cost	6%
<b>TOTAL</b>	<b>\$38,320,923</b>

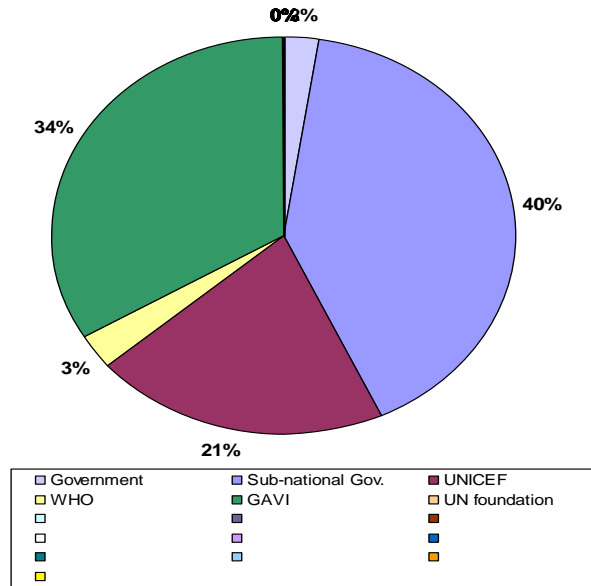
As shown in the above, total expenditure on routine immunization represents 12.4% of total health expenditure, this account for only 0.07% of the GDP

The major cost driver of routine immunization expenditure was personnel salary amounting for 53% (5, 5 million US\$) and other routine recurrent costs 19% (2,270,357 US\$) as. Vaccines and injection supplies cost contributed by 21.7% (2,649,879 US\$) to the total routine expenditure.



The contribution of other components of routine immunization is shown in the above figure.

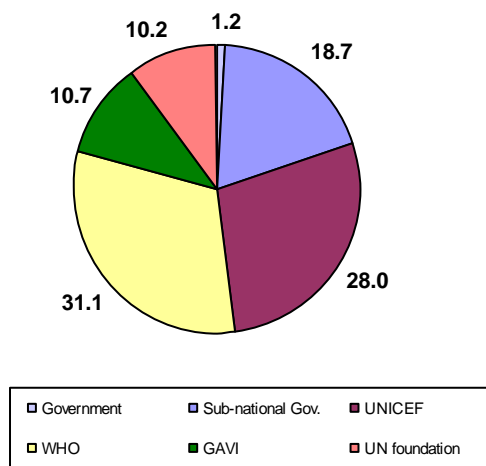
**Baseline Financing Profile (Routine Only)\***



As shown in the above figure, in 2005 the funding profile for routine activities was national and sub-national government contributed by 42% to cover personnel salaries only, GAVI (34%) covering out reach cost , supervision and programme management UNICEF (21%) for traditional vaccine cost, injection supplies and some capital cost lastly WHO (3%) for disease surveillance and short term training.

This picture will change if we included supplemental immunization activities as seen in the below figure.

**Financing profile 2005 (routine and campaigns)**



WHO (31%) mainly for operational cost Polio campaigns and disease surveillance, UNICEF (28%) covering the cost of traditional vaccines and injection supplies for routine immunization and supplementary immunization activities. The national and sub-national government contributed by 19.9% of total funding (the same cost categories mentioned above). GAVI fund covered 10.7% and UN-Foundation covered 10.2% (Cost of measles campaigns).

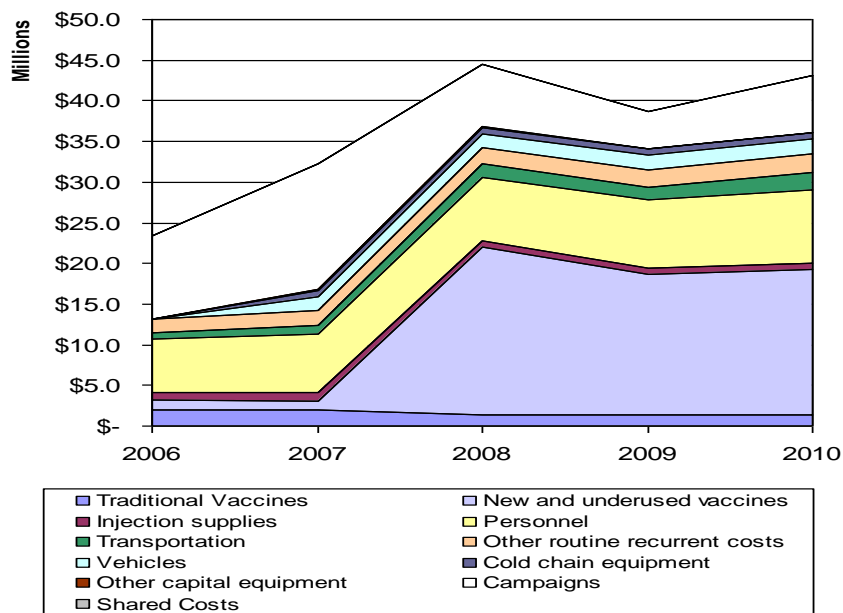
**Future resource requirements and projected financing 2006-2010**

Based on the objectives of the comprehensive multi year plan, the required resources are expected to rise mainly due to the introduction of **DTP-HepB-Hib** vaccine in 2008 which adds on average 18 Million US\$ annually as shown in the table below

Expenditure	Future resource requirements					
	2005	2006	2007	2008	2009	2010
Cost of new and under used vaccines	803,319	1,322,225	1,105,218	20,633,948	17,234,068	17,831,904

EPI is also planning to introduce Yellow fever vaccine in the routine schedule in high risk areas, this contributes to the increased cost by only 500,000 US\$ Annually.

### Projection of Future Resource Requirements



As seen in the above figure, over the whole period 2006-2010 181,834,555 US\$ is needed to cover the entire Programme needs noting that:

- 24.7% (44.9 million US\$) covers Supplemental immunization activities.
- For routine immunization, it amounts to 29.4 million US\$ per year.
- The cost per DTP3 child will rise by 13.5 US\$ from baseline year (from \$ 13.1 in 2005 to \$26.8), and by \$ 0.4 per capita (from \$ 0.4 in 2005 to 0.8)
- 51% of this cost is needed to cover the vaccines and supplies.
- Out reach activity represents 50% of routine service delivery strategies.

Financing was projected over the cMYP period including secure and probable funding.

In the secure funding government contribution will rise from 291,746 US in 2005 to about \$ 2.7 million US annually due to increased federal government commitment to include the cost of injection supplies, 4% of new and under used vaccines and part of out reach cost.

Sub-national government contribution will stay constant at 4.7 million US that mainly cover the salaries of full time workers.

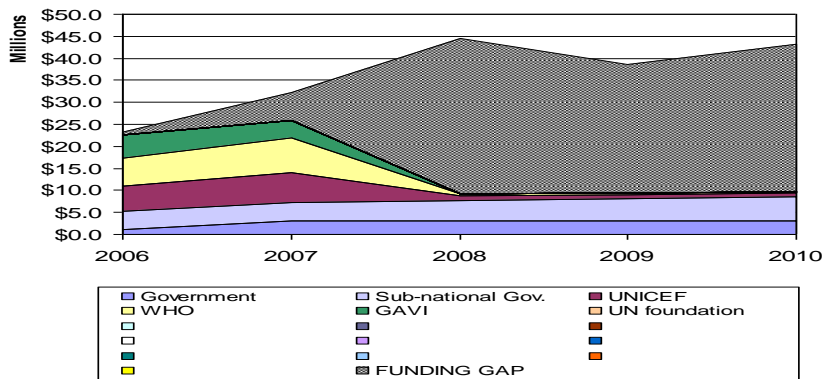
UNICEF secured funding covers the cost of traditional vaccines and vaccines of campaigns (specifically Polio campaigns), this amounts to \$15.6 million during the next five year, but varying between 0.84 and 6.8 million US according to the planned SIAs during the year.

WHO financing is secured for disease surveillance (\$ 330,000 per year) and most of the operational cost of polio campaigns

GAVI secured funding (*Phase 1*) will end in 2006, it covers out reach cost and supervision

### Gap analysis

**Future Secure Financing and Gaps**



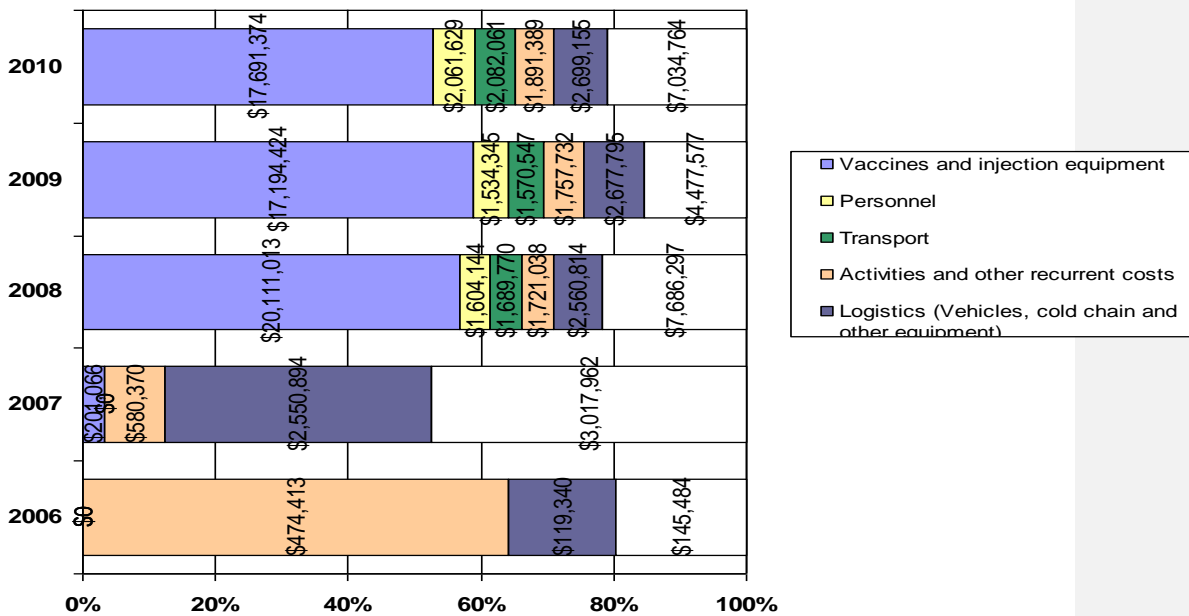
The above figure shows the evolution of the funding gap(considering secure funding only) with years, it represents an average of 68% of the total cost needed during the 5 years. This gap is mainly due to:

- ending of GAVI fund Phase 1 in 2007.
- Introduction of **DTP-HepB-Hib** will almost double the Programme cost, and its fund is dependant on the approval of GAVI phase 2 application
- Sub-national secured contribution is only for salaries.
- Supplemental immunization activities (except Polio campaigns) have a probable finance

The cost categories that have no funding source are described in the below table and figure (considering secure funds only).

Composition of the funding gap	2006	2007	2008	2009	2010	2006- 2010
Vaccines	\$0	\$201,066	\$20,111,013	\$17,194,424	\$17,691,374	\$55,197,877
Personnel	\$0	\$0	\$1,604,144	\$1,534,345	\$2,061,629	\$5,200,119
Transport	\$0	\$0	\$1,689,770	\$1,570,547	\$2,082,061	\$5,342,378
Activities and other recurrent costs	\$474,413	\$580,370	\$1,714,565	\$1,748,699	\$1,879,325	\$6,397,372
Logistics (Vehicles, cold chain and other equipment)	\$119,340	\$2,550,894	\$2,560,814	\$2,677,795	\$2,699,155	\$10,607,998
Campaigns	\$145,484	\$3,017,962	\$7,686,297	\$4,477,577	\$7,034,764	\$22,362,084
<b>Total Funding Gap</b>	<b>\$739,237</b>	<b>\$6,350,292</b>	<b>\$35,373,075</b>	<b>\$29,212,421</b>	<b>\$33,460,372</b>	<b>\$105,135,398</b>

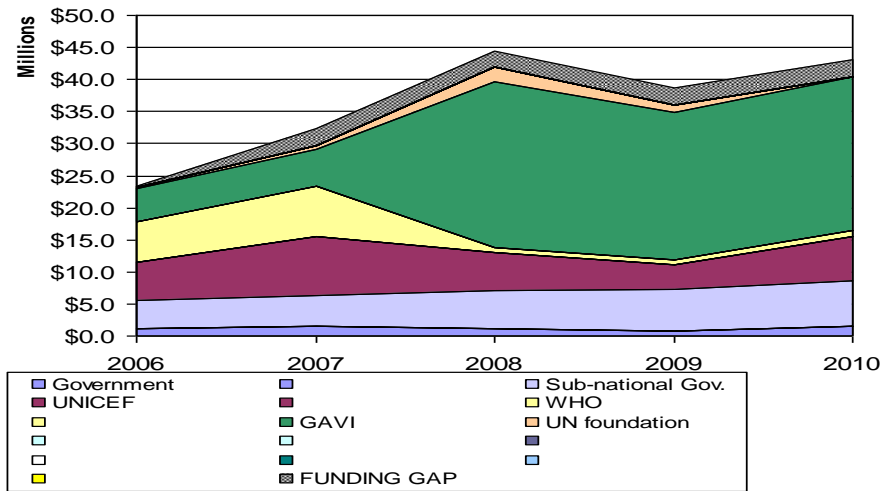
Composition of the Funding Gap\*



\* Immunization specific fundina aap. Shared costs are not included.

If we considered secure and probable funding the gap will decrease dramatically as shown in the above figure leaving only the cost for purchase of capital equipments as cold chain and vehicles unfunded, amounting to only 4% of the total EPI Programme cost in the five years.

**Future Secure + Probable Financing and Gaps**



**Strategies towards Sustainability**

The optimistic prognoses concerning economic development and allocation of more public resources to health sector will not contribute to secure enough financing from the local sources, considering other competing priorities in health care such as tertiary care and health infrastructure rehabilitation.

To achieve the best results based on the program strengths and underlying opportunities as well as over coming any forthcoming risks, this plan includes a set of strategies based on the local context and program vision. Addressing the financial gap is a matter of primary importance.

The program strategies would be articulate upon the following:

**1 Strategies to increase resource allocations**

- Discussion with FMOH, FMOF and other stakeholders to introduce EPI/vaccine line item in the federal budget.

- Secure federal government funding for gradual phase over of key elements of the EPI program such as traditional antigens starting in 2007 (10% of total costs) , increasing the financing share by 20% in 2008, to 30% in 2009 and 40% in 2010. The purpose of this gradual financing is for the GoS to fund 100% of traditional antigens to 100% in 2018. For injection supplies, the EPI program will be advocating the same increased financing share by the GoS but starting sooner than for traditional antigens, in 2006.
- This strategy is closely linked to a strategy discussed in “increasing resources reliability”. Discuss with locality levels the gradual phase over of the funding of the following (25% of total costs) starting in 2006 for the following line items:
  - Outreach mobile activities, including per diems.
  - Transportation costs (100% of costs for routine vaccines transport/delivery)
  - IEC and social mobilization
- Obtain commitment from new and traditional donors to continue their support specially in the following areas:
  - Capital items purchases and rehabilitations (specially the cold chain expansion as donors have easier and faster procurement systems.
  - Short term training.
  - The remainder of the vaccine costs
  - Supervision, Monitoring and Disease surveillance, specially for the AFP disease surveillance that WHO has traditionally been funding.
- Negotiate with GAVI:
  - The support for the introduction of the combined DPT-Hep B-Hib vaccine up by 2007-2008 and the government will take over of the vaccine cost by annual increasing 10% of its share from 2010.
  - The extension of the current commitment which ends in 2007 to 2010 and renegotiating line items.
  - An additional US\$ 2 million to finance GAVI specific activities. This funding could be either part of the transitional funding into GAVI II or a funding extension from current levels.
- Using the FSP to advocating more/new donor support (World Bank, EC, USAID, private sector, etc) to ensure better commitment and support.
- Using the FSP to advocate to new donors in the rich Gulf states.

## **2 Strategies to improve efficiency/effectiveness of current EPI program**

- Improve EPI service deliveries at fixed sites with the intent of reducing a non sustainable outreach strategy.
- Raise funding and use a social mobilization/IEC approach to direct families to fixed sites.
- Transfer of skills at the locality levels thru more training and increase technical capacities of Localities Operations Officers (LOOs) in vaccine management.

- Improve wastage rates for Hep B vaccines and ensure adequate training for LOOs for introduction of the combined DPT/Hep B/ Hib vaccines.
- To carry out major capital items replacement by the end of 2006 and to carry out regular maintenance.

### 3. Strategies to improve resources reliability

- To advocate and sensitize Localities on prioritization of EPI activities and use of local revenues in such efforts. Specific line items of the EPI program for Localities to finance have been identified in section 5.3.1.
- Enlist the participation of higher level officials of the FMOF (Finances) and other Federal agencies in the ICC.

#### Assessment of strategies proposed

The preliminary strategy elements were assessed and prioritized against criteria in accordance with the FSP preparation guidelines.

Strategy Element	Financial Importance	Programmatic importance	Implementation costs	Feasibility
<b>Resource Allocation</b>				
1. EPI line item in budget	High	High	Low	Low
2. FMOF to start purchasing traditional vaccines and injection materials	High	Medium	Low	Medium
3. Discussions with States/Localities Government	High	High	Medium	Medium
4. Advocacy with traditional donors	High	High	Low	High
5. Discussion with GAVI	High	Medium	Low	High
6. Advocacy with new donors	High	High	Low	High
<b>2.1.1.1.1 Efficiency of resources</b>				
7. Expand fixed sites delivery	High	Medium	High	High/medium
8. Launch IEC/social mobilization	Medium	Medium	Medium	High
9. Expand capital stock	Medium	Medium	Medium	High: with non traditional/new donor

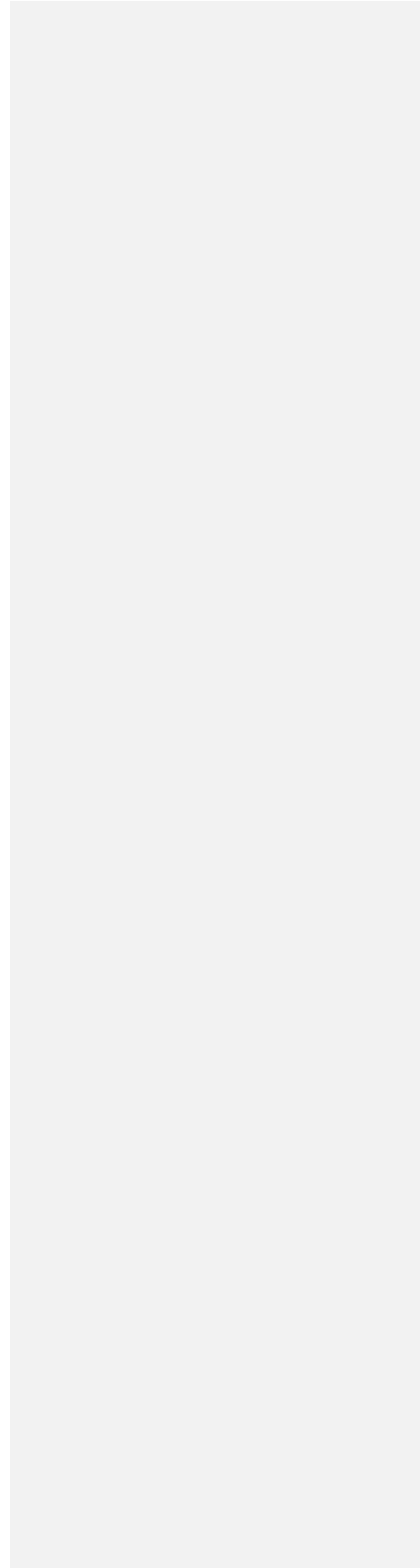
				funding for Sudan
10. Technical skills transfers to Localities levels	High	High	Medium	High: traditional donors will be amenable to funding this activity
11. Reduce wastage rate for HepB vaccine	Low	Medium	Medium	High: vaccines are effective and the roll out to other states should be accompanied by measure to improve wastage rates.
<b>2.1.1.1.2 Reliability of resources</b>				
12. Advocacy to localities for funding	High	High	High	Medium: this activity will only be productive in the medium term.
13. Enlist/recruit higher levels of stakeholders for ICC	High	High	Low	High: this is important as it will ensure that all the discussions for increasing resources are being followed.

Strategies #2, #3 and #4 have the highest impact on financing and on increasing the financial sustainability of the EPI programs. None of them are too costly to be rejected because of the inputs required. The strategy elements # 12 and # 13 are top priorities considering high probability of success, specially # 13. The ICC is already in place and the EPI views the increase of its profile of its members as extremely beneficial to ensure reliability of resources allocated under # 2 and # 3. Strategy # 7 may not improve resource efficiency in the short term but will have a sustainable long term sustainable financing impact but needs to be accompanied by a strong IEC/social mobilization to seek immunization services at fixed sites. It is very likely that sound financial arguments convince legislators to amend the legislation on state procurements allowing vaccines to be purchased directly from the UNICEF.

The success of the strategy element # 2 doesn't compromise the importance of the Strategy # 4 and 6, securing from (traditional and new) donors' funding. Using the FSP will be instrumental to justify the resource requirements of the EPI. Strategies # 4 and 6 will make it easier for donors to plan their own commitments.

The strategies described below (2, 3, 4, 7, 12 and 13) above are the backbones of the financial sustainability strategy and if implemented successfully are enough to ensure that funding will be adequate to cover future immunization needs. However, the second tier of the proposed strategies can further enhance the financial sustainability in long run through efficiency and effectiveness gains. Most of the strategy elements of the 2nd tier (except of the last one) have high programmatic importance and will help maintain the gains achieved in the short term.

Third to increase the reliability of resource, the prospect for # 12 is more medium term and long term than short term. It will take awhile for localities to be convinced to take up their health care financing responsibilities as they are facing competing demands, not just from health and social sectors but also from other economic sectors, one example of which is infrastructure in general.



## Action Plan

STRATEGIES FOR INCREASING RESOURCE MOBILIZATION			
Main Strategies	Progress Indicators	Actions, When, Implementation	Responsibility
Securing an EPI line item in budget <b>by 2007</b>	Proportion of budget that is reserved for EPI.	<ul style="list-style-type: none"> <li>- To present findings of FSP to policy makers at the FMOH, FMOF and other stakeholders to raise their knowledge about the EPI financing issues and achieve consensus</li> <li>- To hold regular working meetings with the policy makers and technical decision makers</li> <li>- FMOH to present to FMOH/DG, FMOH/SG a budget for EPI program</li> <li>- FMOH/Finances department to present to FMOF EPI budget</li> </ul> <p><b>This activity will start immediately</b></p>	MOH / FMOF
FMOF to start purchasing traditional vaccines by 2008	FMOH purchases 10% of traditional vaccines starting in 2008 close to UNICEF prices	<ul style="list-style-type: none"> <li>- Submission to FMOF of the costs of traditional vaccines starting in 2008 (presentation of budget/costs during budget preparation cycle of 2007)</li> <li>- Procurement by FMOH of the vaccines at prices close to UNICEF prices</li> <li>- Work with UNICEF on procurement systems for vaccines</li> </ul> <p><b>Discussions will start immediately, starting with advocacy during ICC meetings</b></p>	FMOH/FMOF
Discussion of funding by localities	% of total EPI costs financed by localities	<ul style="list-style-type: none"> <li>- Advocacy sessions to localities</li> <li>- EPI to help Localities during the preparation of their budgets</li> </ul> <p><b>This activity will start before the end of 2005</b></p>	FMOH, state and localities
Discussion with GAVI on extending its funding	GAVI funding continued to 2010	<ul style="list-style-type: none"> <li>- Continuous discussions between EPI and GAVI</li> <li>- New line item budgeting of the remaining GAVI fund.</li> <li>- Formal request to GAVI to extend its funding</li> </ul> <p><b>Discussions will start immediately.</b></p>	EPI/GAVI
Advocacy with new donors	# of new donors financing EPI	<ul style="list-style-type: none"> <li>- Presentation of funding requirements using FSP document</li> <li>- Discussions of where new donor funding needs to be targeted</li> </ul> <p><b>TBD/depending on when new donors start in Sudan</b></p>	ICC/EPI/ new donors
STRATEGIES FOR INCREASING EFFICIENCY OF RESOURCES			
Expand fixed site strategy	- Number of children immunized from fixed sites compared to outreach services.	<ul style="list-style-type: none"> <li>- Equip fixed sites with cold chain equipment</li> <li>- Train LOOs in immunization management</li> </ul> <p><b>Activity will start in mid 2006</b></p>	FMOH
Expand in cold chain and transportation fleet	- Number of purchases of different cold chain equipment and transportation/vehicle fleet	<ul style="list-style-type: none"> <li>- Prepare inventory of current cold chain equipment/age/status</li> <li>- Prepare and budget cold chain requirements</li> <li>- Submit list and budget to donors</li> </ul>	FMOH / EPI

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IEC/social mobilization	- Number of IEC/social mobilization sessions conducted - Number # of IEC pamphlets distributed.	- Review IEC materials to ensure their efficacy - Design and procure new IEC materials - Provide/distribute IEC materials in areas where fixed sites have current low coverage but potentially high coverage - Evaluate coverage increase from EPI Health Information Services report <b>Activity to start at the beginning of 2007</b>	FMOH
EPI skills transfers to locality levels	- Number of training courses offered - Number of training sessions for the LOOs	- To conduct a TOT training course on EPI for localities - To conduct vaccine store management and immunization safety training course in XX localities. <b>Activity to start at the beginning of 2007</b>	FMOH / EPI
Reduce wastage rate for HepB vaccine	- Wastage rates are reduced from current levels	- Monitoring and evaluating of the wastage rate at different levels in 2005-2006. - Inform LOOs of wastage rate experiences <b>Activity to start at the beginning of 2007</b>	FMOH/EPI
<b>STRATEGIES FOR INCREASING RESOURCE RELIABILITY</b>			
Advocacy to localities for funding	-Increasing financing from localities to EPI financing <sup>1</sup>	- Sensitization session for local authorities. - Creation of the EPI committee at localities levels <b>Activity will start in mid 2007</b>	FMOH/FMOF
Enlist and or recruit higher levels of stakeholders for ICC	- Increase in the number of new ICC members at DG or similar ranks	- Discussion with FMOF, FMOH, other policy/budget stakeholders about raising the profile of ICC members. - <b>Activity to start immediately</b>	FMOH/FMOF

<sup>1</sup> See Section 5.3.1 for specific areas where localities funding are expected.

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## WHO EMR EPI Regional Goals

Priority Area	EMR Regional Goal
<b>Routine Coverage</b>	By 2010 all countries will have routine immunization coverage of 90% nationally with at least 80% coverage in every district.
<b>Polio</b>	By the end of 2005, polio-transmission will be interrupted.
<b>Measles</b>	By the end of 2010, measles will be eliminated (no indigenous case detected).
<b>MNT</b>	Elimination in every district by the end of 2007.
<b>Hepatitis B</b>	By 2007 all countries will have introduced HepB vaccine.
<b>Haemophilus influenzae b</b>	By 2007, 75% of the countries with high disease burdens will have introduced Hib vaccine.
<b>Yellow Fever</b>	
<b>Rotavirus, Strep. pneumoniae, N. meningitidis</b>	
<b>Rubella</b>	By the end of 2010 there will be less than 1 congenital rubella case per 100,000 live births (elimination target)
<b>Vitamin A Supplementation</b>	
<b>Immunization Safety</b>	By the end of 2008, all immunization injections are administered safely.

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