Cost of RoutineImmunization in nigeria

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1. Background

With the active collaboration of development partners and governments, there have been progressive increases in immunization coverage in Nigeria, but the challenges of sustaining these gains is yet to addressed. It is within this context that EU-PRIME[1] assisted to facilitate the establishment of an enduring and sustainable immunization financing system in Nigeria, with particular reference to the EU-PRIME focal States. At the Local Government Area level, effective resource mobilization is constrained by lack of detailed cost estimate of immunization services in Nigeria. This study was therefore, commissioned by the EU-PRIME in collaboration with the National Primary Health Care Development Agency (NPHCDA) to determine the cost of a fully immunized child in Nigeria. The outcome of the study would provide evidence on resource needs, availability and gaps; which are required for planning an appropriate and sustainable immunization financing strategy beyond the lifespan of the EU-PRIME Project. The objectives of the study are to:

a. Determine the total cost per fully immunized child in Nigeria.
b. Develop cost projections for routine immunization at federal, EU-PRIME focal states[2] and LGAs from 2007 to 2010.
c. Analyse the current and anticipated financing of routine immunization at all levels against projected costs, determining funding gaps and their implications for routine immunization at national, EU-PRIME focal states and the LGAs.

1.1. Socio-economic Context

There are 3 tiers of government, with the federal as the first and the highest level. The 36 States and the FCT constitute the 2nd tier with a total of 774 Local Governments Areas (LGAs) constituting the 3rd tier of government. There are 9555 wards which are the basic political units, to bring governance close to the people.

With a per capita GNI of $640, Nigeria is grouped among the poor countries of the World. Fifty seven percent of its population is estimated to live below $1 per day (World Bank Report, 2006). Over 64% of its population live in rural areas where poverty is more prevalent, limiting access to adequate nutrition, quality health care, education and other basic social services. Table 1 shows some basic demographic information on Nigeria.

Table 1: Basic Demographic Information on Nigeria

Total Population (2006)	**140,003,642 (Baseline)**
Annual Population Growth Rate	**3.2 %**
Under 1 year population	**4 % of Total population**
Under 5 population	**20 % of Total population**
Pregnant Women	**5% of Total Population**
Women of Child Bearing Age	**22 % of Total population**
Fertility Rate	**5.2 %**

The National Strategic Health Development Plan which was designed to address development challenges, including poverty and also to meet the Millennium Development Goals (MGD). Immunization of eligible children reduces the burden due to vaccine preventable diseases (VPDs), thus, freeing resources that would have been consumed by such diseases for more productive use. Immunization therefore is a public good and contributes to poverty reduction which by implication serves as a development strategy.

1.2. The Nigerian Health System

[1] The study was funded throug EU PRIME, Nigeria a project implemented by EPOS and National Primary Health Care Development Agency for the European Union

[2] Abia, Cross River, Gombe, Kebbi, Osun, and Plateau

The Nigerian health system is based on the three tier structure of the government (Federal, State and LGA) with autonomy and considerable authority in the allocation and utilization of resources at each level. The National Health Policy and recently, the National Health Bill ascribe roles and responsibilities to each level. Federal responsibilities include: policy formulation, setting standards, guidelines, coordination, regulating practices for the healthcare system and delivery services at tertiary care level. The States have responsibilities for secondary level care while the local governments are charged with primary level care which is the foundation of the National Health Systems. Each level of health care includes a wide range of providers namely: the public and a large and growing private sector.

Nigeria has also adopted the Ward Heath System (WHS) and the Reaching Every Ward (REW) strategy, an adaptation of the WHO-AFRO Reaching Every District (RED) approach to further bring healthcare nearer to the people. The current health status of Nigerians is shown by the indicators in Table 2

Table 2: Health Status Indicator

Infant mortality rate	**75/1000 live births***
Under 5 mortality rate	**157/1000 live births***
Maternal mortality ratio	**545/100,000 live births***
Life expectancy at birth	**49 years***

***NDHS, 2008**

The performance of the Nigeria's health system has been rated poorly. Following the assessment of the functional states of national health systems, Nigeria was ranked in the order of 187th position among the 191 member states by the World Health Organization in its 2000 report. (HSR Programme, World Health Report, 2000). The poor performance of the Nigeria's health system is manifested in the wide spread dilapidation of PHC infrastructure, near total breakdown of the system, declining morale and commitment of PHC workers and loss of confidence in the health services by the communities. This situation compounded by gross shortage of appropriate and skilled health workers in the rural areas resulted in most facilities being grossly underutilized for PHC services, including routine immunization.

The Federal Government of Nigeria, embarked on its comprehensive health sector reform programme in order to strengthen its health system and improve the health status of Nigerians. The health policy has also been revised towards making the health system more responsive to the needs of Nigerians. On immunization, the national health policy provides for free vaccines to all eligible age groups in Nigeria. It also provides for supports to states and LGAs on immunization service delivery, while establishing standards and guidelines for injection safety and waste disposal as well as cold chain and logistics management.

Dearth of qualified health manpower is a major challenge to good quality and effective service delivery. There is also inequitable distribution of the available human resource for health (HRH), especially between the urban and rural areas and also between the different geopolitical zones of the country. There are more health resources and services in the three geopolitical zones in the southern part than there are in the other three in the northern part of the country. Accordingly, the health sector is characterized by wide regional disparities in resource availability, service delivery, including RI and the general health status. The National HRH Policy has a framework to guide and direct interventions, investments and decision making in the planning, management and development of HRH at federal, State, LGA and institutional levels.

1.3. Immunization Financing

The sources of financing for immunization services whether routine or campaign, are from GoN (all administrative levels) and donor support. In the last four or five years donor support

from WHO, UNICEF and the EU have been significant in terms of direct systems related interventions and those related to campaigns. A short discussion of both donor source of financing and GoN is described below.

There is paucity of quality data on international donor funding on health and in particular immunization programmes. During the study, it was difficult to obtain accurate expenditure record on immunization from most of the development partners. In the last five years however, the following donors (Table 3) have been consistent in their financial support to immunization, including routine and campaigns. Furthermore, WHO has provided substantial financial and technical resources for surveillance activities in support of PEI and the integrated disease surveillance and response(IDSR)

Table 3: Trends in Donor Finanancing for immunization (US$)

DONOR	2002	2003	2004	2005	2006	2007
EU-PRIME (EURO)	64,500,000	-	12,900,000			20,000,000
WHO	-	22,955,536	25,403,422	28,156,956	16,360,424	40,041,079
UNICEF	4,920,933	1,690,191	12,643,869	16,516,998	102,969,766	35,289,749
GAVI	-	-	1,116,241	5,586,906	6,484,734	-

Source: Data collected from WHO, UNICEF and EU-PRIME

Nigeria enjoys substantial financial support through GAVI Immunization Services Support (ISS). GAVI ISS funds are disbursed to LGAs through their respective states except the EU-PRIME states. Having passed the Data Quality Auditing (DQA) conducted by the Global Alliance for Vaccine and Immunization (GAVI) in 2006, it is now enjoying the reward based on the additional number of children immunized. It is also receiving Injection Safety Support (INS) and Health System Support (HSS) funds from GAVI.

1.4. Government Resources

The Government of Nigeria fully funds vaccine needs through UNICEF for immunization purposes. This includes vaccines for RI and campaigns. For example, in 2008, the amount of money set aside for vaccine and equipment purchase has been in the order of US$ 23m [3].

The federal allocation for health was ₦138.17 billion for 2008, which represented a 12.57% increase over the 2007 allocation which was ₦ 120.8 billion. However, there was no information on the details with respect to immunization services. Studies conducted in 2005 and 2006 by DFID suggested the following budget availability for immunization per capita:

> "After subtracting the amounts budgeted for polio eradication in 2005 it is possible to calculate some indicative amounts budgeted for the NPI to spend on routine immunization. The amount in NPI's 2005 budget is the equivalent of USD 28.78 per

[3] cMYP 2008 Vaccine and cost projection. UNICEF

child under one. This does not include any of the funds used by States or LGAs, which are the levels where supplies are stored and distributed, and services provided"

1.5. The Nigeria's National Immunization Programme

In Nigeria, mass immunization as a cost effective intervention in the control of communicable diseases commenced in the early 1960s as part of the global campaign to eradicate small pox. The expanded programme on immunization (EPI) was launched in 1979 to widen the scope of immunization activities with intent to protecting all children against VPDs. The EPI programme was placed within the Department of Public Health and Communicable Diseases Control within the Federal Ministry of Health (FMoH). Over time, immunization coverage remained unacceptably low, compelling government to re-launch the programme in July 1997 and re-naming it as National Programme on Immunization (NPI) to reflect national commitment and ownership.

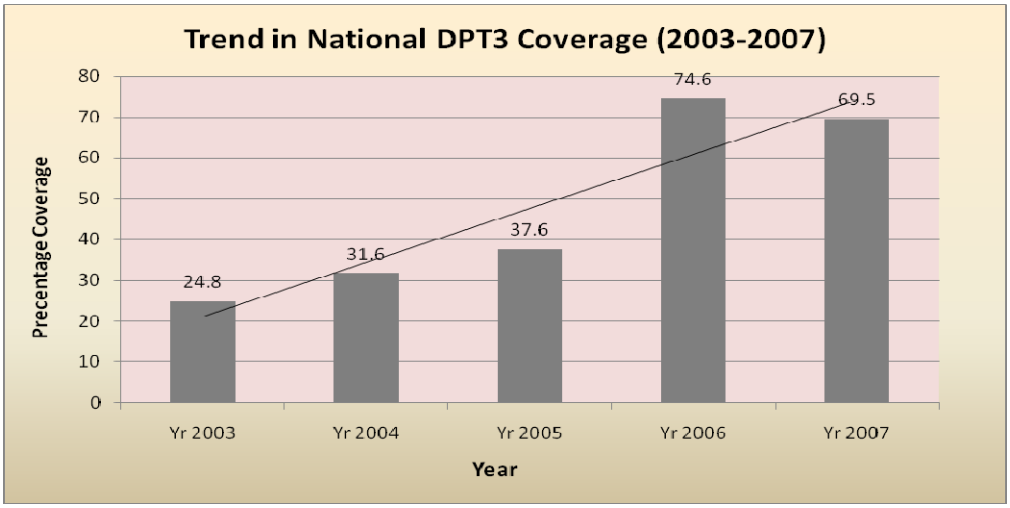
This major policy initiative coincided with the global accelerated strategy on polio eradication. NPI was therefore charged with the responsibility of effectively controlling VPDs, through the provision of vaccines and technical supports to States and LGAs. It was anticipated that higher immunization coverage would be facilitated through efficient resource allocation and collaborative efforts with development partners such as WHO, UNICEF, EU, DFID, USAID, JICA, and Rotary International as well NGOs and other private stakeholders. The Inter Agency Coordinating Committee (ICC) chaired by the Honourable Minister of Health (HMoH) was also established to ensure effective collaboration, cooperation and coordination between NPI and Partners. As part of the Health Sector Reform Programme, NPI was merged with the National Primary Healthcare Development Agency (NPHCDA) in May 2007, recognising immunization as a component of primary healthcare services.

1.6. Routine Immunization

Nigeria attained a high routine immunization coverage with a national average of 80% in the 1980s. This level of coverage could not be sustained due to a combination of factors. These included: inadequate government funding, withdrawal of donor funds, lack of ownership and the weak health system among others, leading to serious decline. The 2003 NICS which reported a DPT3 coverage of 24.8% and 12.8% for the fully immunized child was a reflection of this downward trend. In order to achieve improved coverage, Nigeria adopted the reaching every district (RED) approach in December 2004 with an operational focus at the ward level, the Reaching Every Ward (REW) strategy.

The strategies adopted to improve RI coverage with support from partner agencies and donors especially GAVI, have led to sustained improvement in the reported coverage, using DPT as the indicator. The trend in DPT3 coverage is shown in Figure 1

Figure 1: Trend in DPT_3 Coverage (2003-2007)



Source: NPHCDA, WHO Nigerian Office.

The trend in coverage shows a general improvement. The proportion of the fully immunized child (FIC) though still low, has also improved from 12.7% to 18.1% as reported in the NICS of 2003 and 2006 respectively. The FIC coverage varies considerably across the states as shown in Figure 2.

Figure 2 : Percentage of Fully Immunized Child by State (2003 vs 2006)

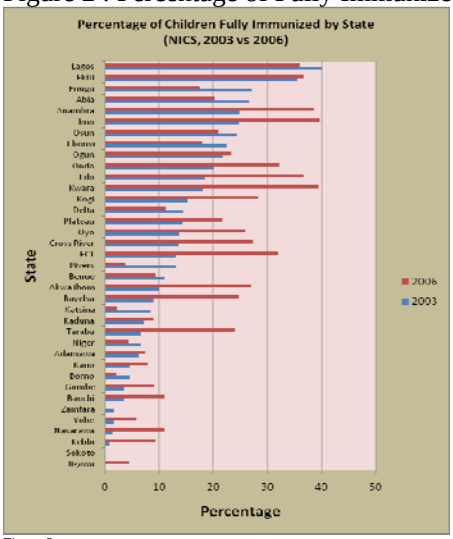


Figure 2a

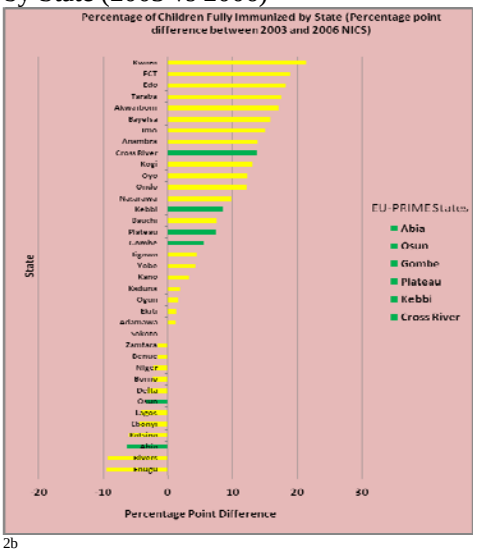


Figure 2b

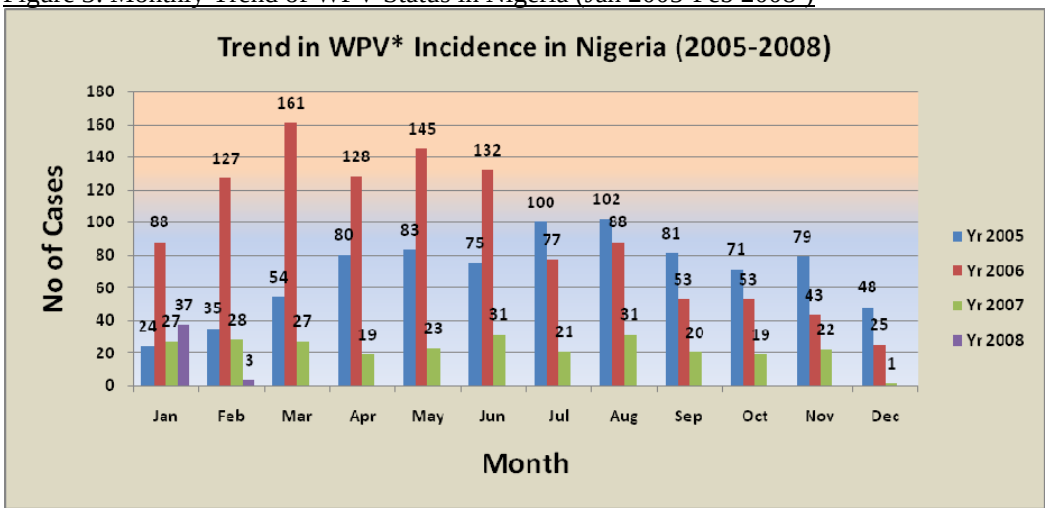
Figure 2a shows comparison between the FIC coverages in 2003 and 2006 in each state, while Figure 2b shows the percentage point differences in the FIC coverages between the period (2003-2006) for each state.

1.7. Supplemental Immunization Activities

Considerable efforts and resources have been committed into polio eradication initiative (PEI) through four main strategies which include: supplemental immunization activities (SIAs), Acute Flaccid Paralysis (AFP) Surveillance, effective routine immunization and mop up operations. The SIAs have been carried out through the National Immunization Days (NIDs) during which 2 drops of Oral Polio Vaccine (OPV) were administered to children from 0-59 months. The NIDs began in 1998 as part of the global effort to eradicate poliomyelitis. These campaigns which are largely funded by donors are major national events with intensive social mobilization at all levels of administration in the country. The NIDs have received considerable support from donors namely; WHO, UNICEF, EU-PRIME, USAID, Rotary International and JICA among others. Vitamin A as nutritional supplement was also administered to children 6-11 months (100,000 I.U) and 12-59 months (200,000 I.U) during the campaigns. The polio campaign strategy was modified to include other routine

immunization antigens such as DPT, Measles, HepB and TT as well as other child survival interventions and re-named National Immunization Plus Days (IPDs). This was to enhance OPV acceptance and also to improve RI coverage. The campaign efforts have made tremendous impact on the PEI. Figure 3 shows the monthly trend of WPV status from 2005 to February 2008.

Figure 3: Monthly Trend of WPV Status in Nigeria (Jan 2005-Feb 2008*)



*WPV Status up to Feb 2008

Source: ***WHO presentation at the national debriefing, Jos, 14 March 2008***

2. Methodology

2.1. Data Collection Process and Data Sources

Data was collected by the research team. Primary and secondary data for the analysis was collected by the research team. Primary data was collected using questionnaire surveys in six pre-selected EU PRIME and six non-EU PRIME states[4] but all located evenly in the six geo-political zones of the country. In each of the 12 States visited, data was collected from the State Ministry of Health (SMOH) and LGA offices.

Primary data on immunization costs relating to personnel, transportation and logistics, building and other equipment, programme management and administration, were collected for current immunization strategies. Expenditure data were extremely difficult to obtain at all levels. Similarly, data on planned expenditure over the next five years at Federal, State, LGA and health facility levels were generally not available. Relevant data were collected from various development partners including multilateral, bilateral and local and international NGOs such as WHO, UNICEF, Rotary International (RoI) and EU-PRIME. Key informant interviews were also conducted with authorised officers at the EC delegation, WHO, UNICEF, DFID, Immunizationbasics and PRINN. Similar interviews were conducted with authorised officers at all levels.

2.2. Costing Methodology

For the purpose of this study, household user level cost such as transportation to and from the health facility was not considered. The types of costs that were measured include cost of

[4] Enugu, Edo, Borno, Katsina, Niger, Ogun and FCT

vaccines and related items such as costs of immunization service delivery to the end-user. Accordingly, the target institutions included the Government of Nigeria (GoN), FMoH and in particular the NPHCDA, SMoHs, LGA Departments of Health and health facilities. The cost per FIC was determined by estimating the total cost to deliver routine immunization services in 2007 and dividing it by the number of chidlren that were fully immunized with the basic EPI vaccines namely: BCG, DPT, OPV and Measles. The number of children that were fully immunized was determined by applying the percentage of fully immunized (21%) to the target population of children under one year in 2007. Cost per FIC did not inlude the costs of supplemental immunizations such as the NIDs/IPDs. Data was also collected from some of the development partners on their contributions to the immunization programme in Nigeria.

2.3. Calculating Future Vaccine Needs

As part of the study the future needs of vaccines for the next five years by population-based method was calculated. This involved estimating target population numbers using official global projected figures from national and state census figures and demographic indicators such as the crude birth and infant mortality rates. Estimates of immunization wastage rates based on vials distributed and used in 2007 were undertaken, the average population of children under one was factored into the calculation.

2.4. Financing Analysis Method

For the purpose of analysing the finances undertaken, estimated (including imputed costs) costs rather than actual expenditures were used. The advantage of this approach has been that it has allowed the study to account for all programme resources, many of which were absent from expenditure reports, in particular the cost of capital goods used in the programme. Three types of costs were calculated, namely, total estimated, programme specific and current variable non-personnel costs.

Estimation of vaccine wastage was included because regular supply of good quality vaccines is the most critical component of RI services. The efficient use of vaccines has cost implications for RI. It was therefore considered appropriate to estimate the cost of vaccine wastage as the reduction in vaccine waste will also reduce the cost of RI and hence the cost per fully immunized child.

A major constraint of this study has been the paucity and limited availability of accurate and reliable health expenditure data found at all levels of government in a readily, easily usable form for estimating the cost of immunization. To this extent, the study made a number of assumptions about the estimated costs.

3. Findings

3.1. Current and Future Costs of Immunization

This Study estimated the components of the current costs of the NIP in Nigeria for the base year 2007. These costs form the basis of projections for the resource requirements of the NIP over the next five years. Estimates were provided for routine immunization (RI), campaigns and Surveillance. It was easier to provide estimates of recurrent RI than for campaigns undertaken during National Immunization Days (NIDs) or National Immunization Days *Plus* (IPDs). For campaigns the Study estimated operational costs for polio and shared personnel as well as transportation costs.

Estimated Total National Immunization Programme (NIP) Costs

The estimated total NIP costs for 2007 were US$ 219.6m. This was made up of total estimated NRIP costs of US$ 129.8m (59.1%), total campaign costs of US$ 77.0m (35.1%) and cost of surveillance US$12,828,261(5.8%) (Table 4)

Table 4: Estimated Total Costs of the NIP, 2007

Cost Component	Routine Programme Cost (US$)	Campaign Cost (US$)	Disease Surveillance	Total Program Cost (US$)	% of Total
	Recurrent Costs				
Personnel****	81,378,700	21,643,259		103,021,959	46.9
Vaccine	21,772,892	18,321,204		40,094,096	18.3
Inj Supplies	12,967,381	2,470,525.15		15,437,906	7.0
Transportation	4,257,816	9,870,110		14,127,926	6.4
Short term training	1,401,491	8,741,800		9,590,450	4.4
IEC and Social Mobilization	1,008,333	2,011,127		2,019,460	0.9
Cold Chain Maintenance & Bldg Overheads****	2,780,150	5,600,300		8,380,450	3.8
Others*		2,200,178	*12,828,261***	16,581,280	7.5
Sub Total	***125,566,763***	***70,858,503***	***12,828,261***	***210,171,202***	*95.7*
	Capital Cost				
Building****		0			
Vehicle****	200,000	0		200,000	0.1
Equipment	3,086,042	6,172,083		9,258,125	4.2
Sub-Total	*3,286,042*	*6,172,083*		*9,458,125*	*4.3*
TOTAL	***128,852,805***	***77,030,586***	***12,828,261***	**219,629,346**	**100**
Percentage of Total Cost	**59.1**	**35.1**	**5.8**	**100**	

*Others include disease surveillance, and other routine recurrent costs

**Cost of surveillance activities are mainly on personnel, transportation, specimen containers, reagents and other laboratory equipment/facilities among others.

****Shared costs

The estimated total cost of National Routine Immunization Programme (NRIP) for 2007 was US$128.9m, of which recurrent cost was US$125.6 or 97.4% (Table 4).

Cost Per Fully Immunized Child (Fic)

Table 5: Shows some of the immunization financing basic indicators and the cost per fully immunized child (FIC) as estimated in this study. The cost per FIC at national level was $22.3, while the cost per capita was $0.9 and the cost per DPT3 was $31.9 in 2007

Table 5: Cost Per Fully Immunized Child (FIC)

Total population (2007)	**144,483,759**
Population of children under 1 year	**5,779,350**
Percentage of FIC	**21%**
Number of children fully immunized	**1,213,665**
DPT3 Coverage for 2007	**70%**
Number of children immunized with DPT3	**4,045,545**
Cost per Capita	**$0.9**
Cost per DPT3	**$31.9**
Cost per fully immunized child	**$22.3**

3.2. State Level Estimates

On the average, the Study estimated a total cost of US$3.3m for RI in each state of Nigeria. Of this average, recurrent expenditure was US$ 2.5m (76.0%). The average personnel cost was estimated at US$0.5m (16.0%), representing the highest cost component. Vaccines and injection supplies were US$0.4m and US$0.2 representing 13.2% and 7.0% of total cost respectively. Total estimated capital costs for RI accounted for US$ 0.8m (24.0%) of the total estimated immunization cost. Cold chain equipment cost was US$ 0.7 (21.0%).

Relative contributions of the different components within the two cost categories (recurrent & capital) are also shown. Within the recurrent expenditure category, personnel cost accounted for (22.0%) of total recurrent cost, followed by cold chain maintenance and overhead costs 21.0%. Vaccines and injection supplies accounted for 17% and 10% respectively. Cold chain equipment accounted for 85.0% in the capital cost category, while vehicle was 15% of the total capital cost.

The estimated average total RI cost, on average, for EU-PRIME states was US$ 3.9m in contrast to US$ 2.8 in non EU-PPRIME states. There are some observed differences in the costs of various components between the two groups of the study States. In EU-PRIME states total recurrent expenditure accounted for 65% of average total RI costs while in non EU-PRIME states, the corresponding proportion was 88.0%.

3.3 Local Government Level Estimates

Table 6 shows the current average costs of the various immunization programme components as estimated in LGAs in the EU-PRIME states. The total cost was

Table 6: LOCAL GOVERNMENT LEVEL ESTIMATES (EU-PRIME LGAs)

Cost Component	US$	% of Rec./Cap	% of TAC
Recurrent Costs			
Vaccines	12,502	14	9
Injection Supplies	6,946	7.8	5
Personnel*	18,058	20.3	13
Transportation for fixed site, vaccine delivery and outreach	11,113	12.5	8
Cold chain maintenance & overhead	8,335	9.4	6
Maintenance of other capital equipt	696	0.8	0.5
Building overheads (electricity, water etc)*	1,389	1.6	1.0

Short-term Training	4,167	4.7	3.0
IEC/Social Mobilization	6,946	7.8	5.0
Programme Management	16,669	18.7	12.0
Other Routine Recurrent		0	0.0
Subtotal Recurrent	88,903	100.0	***64.0***
Capital Costs			
Building Space*			
Vehicles*	6,946	13.9	5.0
Cold Chain Equipment	43,062	86.1	31.0
Subtotal Capital	***50,008***	***100.0***	***36.0***
Total Annual Cost(TAC)	***138,910***		***100.0***

***Shared costs**

$138,910, with recurrent cost accounting for 64.0%, while capital cost category was 36.0%. Personnel which was $18,058 accounted for 13% of the total, representing the highest cost. The cost of programme management which was $16,669 was quite significant as it represents 12.0% of the total cost.

3.4 Projected Costs of National Routine Immunization

The cost projections at the national, state and LGA administrative levels were determined by applying the cost per fully immunized child in 2007 on the annual population of children under one year. The annual projected populations from 2008 to 2012 was determined, using the 2006 population of 140 million as the base and assuming the national annual growth rate of 3.2%.

Projected Costs at National Level

Details of the projected cost by programme components at the national level are presented in Table 7.

Table 7: Projected Costs by Programme Components by Year (National Level)

Year	Cost Per FIC	Proj Popn Under 1 yr	Total Projected Estimate	Personnel & Other Shared Costs	Programme Specific Costs	Vaccine & Injection Supplies	Other Progm Specific Costs
				74% of d	26% of d	75% of f	f-g
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
2008	22.3	5,964,290	132,976,095	98,402,310	34,573,785	25,930,339	8,643,446
2009	22.3	6,155,147	137,231,330	101,551,184	35,680,146	26,760,109	8,920,036
2010	22.3	6,352,112	141,622,732	104,800,822	36,821,910	27,616,433	9,205,478
2011	22.3	6,555,379	146,154,660	108,154,448	38,000,212	28,500,159	9,500,053
2012	22.3	6,765,151	150,831,609	111,615,391	39,216,218	29,412,164	9,804,055
Total			708,816,078	524,524,155	184,292,271	138,219,203	46,083,068

Projected Costs at State Level

At state level, the total projected costs in table 8 shows the projected total annual average costs for a state, the personnel and other shared costs as well as the programme specific costs.

Table 8: Projected Costs by Programme Components in the Study States (2008-2012)

Year	Estimated Average Projected Cost of RI	Personnel & Other Shared Costs	Programme Specific Component Cost
(a)	(b)	(c)	(d)
2008	5,045,197	3,733,446	1,311,751
2009	5,120,351	3,789,060	1,331,291
2010	5,198,063	3,846,567	1,351,496
2011	5,285,734	3,911,443	1,374,291
2012	5,361,027	3,967,160	1,393,867
Total	26,010,372	19,247,675	6,762,697

Projected Costs at LGA level

The projected costs as estimated at the LGA level in the EU-PRIME states are presented in Table 9. Personnel, buildings and vehicles are costs that are shared with other health programmes. For components that are specific to immunization, the annual costs that must be budgetted for are shown in column (d). With the supply of bundled vaccines by the federal government, it is these component costs that local governments need to budget for annualy to run effective and efficient immunization services.

Table 9: Projected Annual Cost of Routine Immunization Per LGA

Year	Estimated Total Average Cost	Personnel & Other Shared Costs	Programme Specific Cost (Recurrent & Capital)
(a)	**(b)**	**(c)**	**(d)**
2008	**167,831**	**32,727**	**135,104**
2009	**177,142**	**34,543**	**142,599**
2010	**182,811**	**35,648**	**147,163**
2011	**188,660**	**36,789**	**151,871**
2012	**194,697**	**37,966**	**156,731**
Total	**1,050,051**	**204,760**	**845,291**

3.5 Wastages

Two issues are addressed here. The first relates to the estimation of wastage cost in the NIP in Nigeria. This has the advantage of identifying areas e.g vaccine management where costs can be saved through reduction of wastage. Additionally, costs can be saved by ensuring that duplication in payment are reduced or even stopped completely. This is done through the estimation of shared costs, particularly in relation to personnel who are engaged in other activities and are paid per diem for their contributions to immunizatio services.

3.6 Estimating Vaccine Wastage Costs

Two types of wastages are identified, the system and service (administrative) wastages. Due to disparities in the data on vaccine supplied, used and the number of children immunized, the buffer stock and the possibility of carry over of the excess supplies to the following year could not be determined accurately. This was further complicated by the negative vaccine wastage rates reported by some states. The costs associated with vaccine wastes are shown in Tables 10 and 11. The costs associated with vaccine wastage are quite significant, amounting to US$2.6m and US$0.683m for the basic EPI vaccines and other routine vaccines respectively. These estimates provide good insights into the financial implications of vaccine wastage, which contributes negatively to the cost efficiency of the national immunization programme.

Table 10: Cost of Basic EPI Vaccine Wastage, National Immunization Programme,

(NIP) 2007

Vaccine Type	Price per Vial (US$	Cost of Vaccine Supplied (US$)	Cost of Vaccine Used (US$)	Cost of Children Vaccinated (US$)	Cost of System Wastage (US$)	Cost of Service Wastage (US$)	Total Wastage Cost (US$)
BCG	0.096	9,570,672	8,652,841	5,702,145	917,831	2,950,696	193,426
DPT	0.168	23,962,332	24,488,853	19,990,212	*	4,498,640	397,212
OPV	0.132	53,590,237	46,213,696	33,939,739	7,376,542	12,273,957	979,557
Measles	0.254	1,637,556	1,447,401	901,469	190,155	545,931	994,500
TOTAL		88,760,797	80,802,791	60,533,565	8,484,528	20,269,224	2,564,695

* There is possibility of an error in the data for vaccine supplied and used

Table 11: Cost of Other Routine Vaccine Wastage, National Immunization Programme,

(NIP) 2007

Vaccine Type	Price per Vial (US$)	Cost of Vaccine Supplied (US$)	Cost of Vaccine Used (US$)	Cost of Children Vaccinated (US$)	Cost of System Wastage (US$)	Cost of Service Wastage (US$)	Total Wastage Cost (US$)
Yellow Fever	0.82	39,581,072	38,561,115	24,353,360	1,019,957	14,207,755	152,277
Hepatitis B	0.21	25,278,504	25,955,771	22,108,573	*	3,847,198	316,993
TT	0.07	5,676,150	5,361,473	3,529,017	314,677	1,832,456	214,713
TOTAL		70,535,726	69,875,359	49,990,950	1,334,634	19,887,409	683,983

* There is possibility of an error in the data for vaccine supplied and used

4 Discussion

This study represents the first attempt to determine the cost of immunization services and the immunization financing mechanism in Nigeria, through a methodological process. The delivery of RI servises rests with the local government authorities through their health facilities, with support and supervision from the states. The NPHCDA maintains a regulatory role and technical support as well as other oversight functions, including collection of data relating to budgets, costs and expenditure for RI activities. However, such data were not easily available at all levels and represented a weakness in the level of accountability in respect of expenditure and costs incurred on immunization activities. The federal government also provides vaccines and related supplies throudgh the NPHCDA to states.

4.1 Current Cost of the National Immunization Programme

Of the total cost of the National Immunization Programme, the proportion of routine immunization (59.1%) was found to be higher than that for the campaign (35.1%) and Surveillance (5.8%). High personnel and other shared costs accounted for the higher routine cost. The cost of US$21.0 per FIC estimated in this study is comparable to similar costs in most other countries with proximate economies. Studies from Cote d'ivore (Miloud et al, May, 2000), Morroco (Miloud et al, Sep, 1999) and Bangladesh (MM Khan et al, Sep, 1998) reported cost per FIC to be US$24.29, US$20.89 and US$23.39 respectively. However, the cost per capita as estimated in this study was US$0.9, which was higher than US$0.2 and US$0.11 reported by Cote d'Ivoire and Ghana respectively (WHO, Immunization Financing database, 2008). The estimated personnel cost which is 46.9% of the total programme cost found in this study is lower than those observed in Morocco and Cote d'Ivoire with 62% and 65.1% respectively. However, it is comparable to the estimates found in Bangladesh and Ghana with personnel costs accounting for 41.32% and 40% of their immunization programmes respectively.

The estimation of shared costs revealed excess payment for personnel especially in relation to those who are engaged in other activities and are paid per diem for their contributions. A cost effective skill mix for routine immunization services would reduce the cost of personnel significantly. As indicated in the shared costs the estimates for vehicles include most of the ones assigned for immunization activities and are also used for other purposes thereby increasing transportation cost of delivering immunization services.

Of the total expenditures on IEC/Social mobilization activities at the federal level, the support for campaigns, particularly for polio eradication was disproportionately higher than that for RI. The IEC/social mobilization expenditure for RI represents 1.0% of the total recurrent non-personnel cost for RI. The relatively low level of IEC/social mobilization activities for RI could result in low demand and poor coverage with grave implication for the goal of reducing VPDs. At the state level however, expenditures on IEC/Social mobilization represented 10.4% of the recurrent non-personnel costs for RI in the EU-PRIME states, which was significantly higher than the 2.3% in the non EU-PRIME States. Several programme activities such as the Change Agent Programme (CAP) and the establishment/re-activation of the Ward/Village Development Committees (WDCs/VDCs) in support of the Ward Health System were given prominence in the EU-PRIME States. With respect to training on a national scale, funding and technical support had been from WHO with substantial contributions from the FGoN, UNICEF and the EU-PRIME. At the state and LGA levels, EU-PRIME provided more funding for training, programme management, vaccine distribution, monitoring and supervision as well as outreach services. In the Non EU-PRIME States, most of these key programme activities were funded to a lesser degree with GAVI ISS funds. Support for cold chain equipment and maintainance had been mainly from UNICEF on a national scale. Substantial capital investments have also been made by EU-PRIME with respect to cold chain equipment, particularly the provision of standard cold rooms and generators in its focal states. Cold chain equipment are very critical elements in the provision of quality RI services. EU-PRIME would therefore need to advocate to its focal states to provide budget lines for the running and maintenance of these cold chain equipment. Such advocacies should include issues on ownership for the sustainability of quality RI services. A few states are however, beginning to provide solar refrigerators, fridges and freezers in their cold stores.

4.2 Issues in Projected Costs of Routine Immunization

The cost per FIC has been used as the basis for projection. The total programme cost of RI from 2008 – 2012 is estimated to be US$1,096,997,968 of which personnel and other shared cost will be US$811,778,496 (74%) while the programme specific cost will be US$285,219,472 (26%). Of the programme specific components, the cost of vaccine and injection supplies will be US$208,210,215 (75%), leaving a balance of US$77,009,257 (25%)

for the non-vaccine components and for which funds must be sourced. It is likely that the FGoN will continue to be responsible for the procurement of vaccines and injection supplies as well as the reporting and monitoring of immunization activities. For sustainability and strategic reasons, the FGoN should also provide budget line to assume responsibility for the projected cost of surveillance of US$64,141,305 from (2008-2012) at an annual average cost of US$12,828,261. For sustainability, the non-vaccine components which are currently being supported mainly by donors will require the state and the LGAs to assume responsibility for financing, using local resources.

For the EU-PRIME States, the total projected estimate is US$26,010,372. Excluding the vaccine/injection supplies which will be provided by the federal government, other programme specific recurrent costs will be US$5,680,484 on the average from 2008-2012, for which alternative sources of funding will be required at the expiration of the EU-Project. Table 19 shows details of the annual requirements for which each state must provide budget.

At the LGA level, the projected total estimate per LGA is US$1,050,051 from 2008-2010. Of this total cost, the programme specific cost is US$845,291. The projected recurrent (excluding vaccines/injection supplies) programme specific cost is US$234,465 from 2008-2010. This represents what each local government must budget for annualy for the operationalization of the routine immunization planned activities.

Findings from this study show that the role of states in providing support, including, vaccine distribution and supportive supervision to local governments have been far from adequate in the provision of routine immunization services. Presently, the states contribute to the financing of immunization services mainly in the form of personnel and other shared costs which would have been incured with or without the immunization programme. In terms of overall financing, significant proportion of NIP funding comes from the FGoN particularly vaccines in the bundled form and personnel. Funding for the other key immunization items/activities (recurrent variable non-personnel) and other programme specific costs are donor dependent. At the LGA level, where the actual immunization activities, including other PHC services are delivered, the picture is similar. Operational costs such as vaccine distribution, outreach services, supportive supervision and cold chain maintenance as well as training and social mobilization activities are almost entirely dependent on donor supprt. Currently, subsidies for RI as provided by EU-PRIME and other key parners for example would provide immediate but short term solutions. The long term issues of ensuring that sound budgeting and timely release of money for recurrent expenditure are critical. There appears to be sufficient capital investement but a chronic absence of recurrent cost outlays. As with many other sectors, continued external financial support creates a form of dependence and lethargy particularly at lower levels of operation. Continous dependence on external support is neither desirable nor economically sensible.
For sustainability and ownership, it is strategically desirable for FGoN to also assume full resonsibility for IDSR activities which are best carried out at the national level, by providing budget line, while WHO provides technical and other oversight functions. The states are well and better positioned to take full responsibilities, including funding for:

- Training of all health workers on RI in relation to other PHC services
- Vaccine distribution from the state cold store to LGAs
- Monitoring and supportive supervision to lower administrative levels
- Social mobilization at state level
- Cold chain maintenance and overheads at state level.

The LGAs which represent the operational level are also better positioned to take responsibility, including funding for such critical activities as:

- Service delivery at fixed and outreach/mobile sites
- Linking services with the community through community mobilization, using the structures of WDCs and VDCs
- Supportive suppervision to health facilities

- Cold chain maintenance and overheads at LGA and HF levels.

The outcome of this study should be used as an advocacy tool for states and their LGAs to effectively take on these responsibilites, including funding.

As part of the sustainability plan, the local communities should be integrated through their development committees in the planning and financing of services and vaccination activities by participating effectively in the outreach immunization and other immunization related services.

4.3 Cost reduction

The cost analysis shows that the patterns of EPI expenditure vary significantly from year to year. It is therefore, necessary to examine the causes of this variability to identify the expenditure items most susceptible to high variation and find ways to even out expenditure patterns. In searching for ways to reduce costs, attention should be focused on cost items, such as vaccines and personnel and transportation. These are costs that are shared with other programmes in the health sector which tend to increase the overall cost of immunization. Effective integration of services and harmonization in the use of resources will serve as a cost saving strategy

The cost of immunization activities can also be reduced through improvements in efficiency in the delivery system by reducing vaccine wastage. The estimated service and system wastage costs are quite significant. However, the actual reasons for the current wastage rates are not well known (i.e. losses at the time of usage or from transportation and storage and would have to be investigated before it can be determined if significant reductions can be achieved without compromising standards and immunization coverage. Therefore, further study into the current policies regarding vaccine procurement, delivery system and other vaccine management practices is required to identify major points of weaknesses before any efforts to reduce vaccine wastage can be made.

4.4 Immunization Programme Performance

Increasing the coverage rates and reducing coverage disparities between the states will require better planning, monitoring and evaluation and effective coordination of immunization and other related activities. At the present time, the National Immunization Program is still functioning principally as a vertical program in which, the information, resources and evaluations are highly centralized and not effectively integrated within the primary health care setting. To ensure full integration, NPHCDA should establish dialogue with the various health programmes in the ministries of health at all levels. The joint programme of work should include: planning for procurement of commodities, issues of financing and coordination of programme activities, collection, analysis and feedback of information to States, LGAs and HFs as well as the communities. There will be need for the evaluation of objectives, resources and performances. This will not only reduce programme costs, it will also promote ownership for sustainability and enhance synergies between the different programmes in PHC, including routine immunization performance.

A major problem in all the states is the collapse of the health system which has been mentioned in chapter one. This includes the poor state of infrastructure, lack of drugs in health facilities, inadequate number of qualified health personnel and low staff morale. This invariably affects routine immunization performance. Poor immunization performance will also lead to high programme cost as expenditures will continue to be incurred on such inputs as personnel, buildings and other items. The GAVI Health System Support (HSS) fund, which has been accessed by the FGoN, is to address some of these system issues affecting routine immunization performance. This initiative, which is to be implemented in only 10% of the LGAs across the country, covers rehabilitation of PHC facilities, provision of seed stock of drugs for drug revolving, using the Bamako Initiative model. It will also cover the provision

of basic equipment and materials for delivery and other maternal and child health services, including routine immunization. Training of health workers and provision of basic structure for health management information system are also to be covered. To ensure sustainability, EU-PRIME should develop a specific plan to advocate for the provision of budget lines to replicate this initiative in its focal states. Furthermore, it should also facilitate the provision of funds through planned budgets by the LGAs to support the activities of the Ward and Village Development Committees (WDCs and VDCs) which it initiated in its focal states.

In line with the PPP policy of the health sector reform programme, the private sector should be encouraged to offer quality vaccination services and develop several initiatives to increase availability, with particular emphasis on the underserved rural areas. The potential to contract-in private service providers for vaccine collection and delivery management, as is the case in many parts of the world, is a possible option in the medium to long term and this should be explored. To achieve synergy of efforts, a clear and flexible framework should be developed in coordination with the relevant partners.

Human resource management and staff planning at all levels need attention and focus. Undertaking a human resource review with focus on RI would be a step in the right direction. EU-PRIME would be very well placed to put in place a model for optimising staff requirements and utilization to deliver quality RI service. In this context, the EU Prime should collaborate with other relevant agencies to consolidate its intensive training and skill development programme of key state and LGA immunization staff and other officers in planning, implementation, monitoring and evaluation of immunization activities. In this regard intensive training on all the five components of the REW strategy is highly desirable and therefore strongly suggested. This would guarantee ownership and complete engagement of government and communities, thus creating a sense of civic responsibility in immunization and other PHC services.

4.5 The Cold Chain System

Cost of the cold chain system was difficult to determine as there were no stanardized scales of equipment at the various levels against which to assess requirements, availability, shortfalls and future projected needs. Inventories were also generally poor, especially at LGA and health facility levels. These cost elements were critical but were lacking for determining precise estimates of the cost of cold chain needs. A standard scale of cold chain and other immunization related equipment should be produced and displayed along with inventories at all levels of the immunization system. This will allow for monitoring and tracking of equipment needs on a regular basis. It will also facilitate decisions on replacement on a systematic and regular basis.

4.6 Sustainable Immunization Financing

It seems likely that key donors and international organizations will continue to contribute to the immunization program, both through pooled and unpooled mechanisms. However, some fluctuations in funding have been observed over the last five years with the likelihood that some may be planning to phase out of the programme altogether. This includes EU Prime, which plans to end its project by 2009. Presently, EU Prime funding covers technical assistance, communication, change agent, training and workshop, equipment for immunization and support to recurrent budget. The strategies for exit should focus on alternatives for funding these areas of costs. It will therefore, be important for the key stakeholders and planners to plan how to finance the costs of the items under EU Prime when the funding ends. In this regard, there is need for the ICC to consider allowing the 6 EU-PRIME focal states to access the GAVI ISS fund. Furthermore, there may be other donors who will still continue to provide technical assistance and training to improve these critical support systems. Through a stakeholder's forum such donors can also be consulted to accommodate these areas within their budgets. These options should be considered as

short/medium term measures, while more durable mechanisms for sustainable immunization financing are being put in place.

For programme sustainability, donor funds are best used for long-term investments, such as infrastructural development, e.g cold chain; critical systems such as disease surveillance and capacity building. Gradual reduction in the use of external funds for financing operational costs can be achieved through various means including increased budget allocations by governents at all levels and mobilization of local resources such as health insurance schemes. Within this context, it is desirable to expand the insurance coverage for immunizations and increase the role of the private sector in providing immunization services. To this end, the benefits package of the National Health Insurance Scheme (NHIS) for the formal sector as well as the rapidly growing community based health insurance scheme will need to be explored to include immunization services.

With the passage of the National Health Bill into law, including the provision of National Primary Health Care Fund and further decentralization of the health sector - it is likely that the states and local governments will assume greater roles and responsibilities in providing and financing immunizations and other preventive care services.

Effective coordination of donor activities in immunization sub sector is fundamental to the achievement of higher coverage rates and reduction in disparities between states as well as overall performance. The present donor coordination mechanism for immunization services is unsatisfactory. During the study, it was difficult to obtain expenditure data on immunization activities from some of the relevant donors. It would be desirable if Sector Wide and Service Wide Approach could be applied to immunization activities such that an NIP Fund could be created that would assemble all contributions and donations (external and internal) for immunization services. The objective of the fund would be to allocate resources for immunizations in an integrated fashion according to the priorities defined by the joint health sector and national strategic immunization plans. This fund would avert short-term allocations made without consideration for the long term national immunization objectives.

4.7 Costs and Planning Issues

Cost analysis is an important element of decision making in the planning, management and improvement of programme outcomes. This study revealed poor expenditure tracking by stakeholders in the sub sector. Records on the numbers of staff, salaries and costs are not easily available. At all levels, cost and budget systems are poorly developed, documented and non-computerized. These have tendencies to affect the quality of decision making as well as increase the level of inefficiencies. In order to ensure financial sustainability, there is need for improvements in record keeping, computerisation and accounting of costs for immunization services. Furthermore, capital and recurrent expenditures need to be systematically and transparently recorded.

More importantly, the study observed that the use of costs in planning is highly limited among the policy makers at all levels. It is useful and considered an imperative for cost dimensions to be systematically introduced along with considerations for effectiveness and quality in planning of immunization programmes. It is necessary to take into account data on costs and efficiency when determining priorities and resource allocation. This is particularly critical as governments at all levels are being sensitized to take ownership and assume greater responsibilities for financing more and more of the immunization programme activities with local resources. To this end, data on costs should be collected and reported along with other routinely reported data from health facilities through appropriate channels to the highest level. It is also important to train NIP staff in basic cost analyses and management of immunization activities at all levels.This will enhance the knowledge and skill of staff to appreciate effectiveness and efficiency issues in programme planning. It will further foster transparency and accountability in the management of resources. This would facilitate systematic

collection of data on costs from existing records, particulrly for coverage, evaluation and any other immunization related studies.

National immunization coverage surveys are conducted to validate administrative coverage data that are reported routinely. It does not address effectiveness and efficiency issues which are critical for resource allocation. In addition to the collection and reporting of cost data as suggested above, periodic immunization programme evaluations are also required. Cost considerations should also form part of the monitoring check list and performance indicators.

4.8 Research to Policy

NPHCDA and EU Prime in collaboration with other key partners should consider the option of conducting operational research activities to identify more cost-effective methods of delivering EPI services to the target population in the country. Examples of such research activities include: finding ways to reduce the size of the EPI administration, achieving greater efficiency in the distribution of vaccines, using equipment more efficiently, ensuring higher attendance at fewer sites, and involving NGOs or the private sector to a greater extent in EPI activities.

Operational research or further studies are also required to investigate the high cost of personnel and other shared costs as well as the costs associated with vaccine wastage, with a view to determining the best personnel mix and effective vaccine management for optimal efficiency in the delivery of routine immunization services.

Other areas of research for EU Prime include financing a study of the current cold chain system to determine future needs and develop a detailed plan for upgrading the system.

5 Conclusion

This is the first methodological study on the cost and the financing mechanism of immunization services in Nigeria. The study has given some insights into the relative weights of the various cost elements as they contribute to the cost of immunization, making it possible to evaluate the dimensions of effectiveness and efficiency of the programme. It has also brought into fore, the immunization financing mechanism, thus, providing opportunity to explore alternatives or options for sustainable immunization financing.

The cost per FIC and per capita are comparable to similar estimates in other countries with proximate economies. These costs are characterised by high personnel and other shared costs. The high personnel cost which also accounted for the higher cost of RI compared to the cost of campaigns is particularly of concern, given the low FIC coverage. Furthermore, the cost associated with vacccine wastage is significant. These findings provide a picture of low level of efficiency in the delivery of routine immunization services.

The FGoN is at present responsible for providing vaccines and injection supplies in the bundled form. Other recurrent variable non-personnel and programme specific costs (which include some capital items such as cold chain equipment) are largely donor dependent in most of the states. Gradual reduction in the use of external funds and replacing them with local resources through increased governmemt budgetting for financing these operational costs is highly desirable. External or donor funds are best utilized for capital investments such as cold chain and other immunization related infrastrcture and equipment as well as training. A plan of action to actualize this process is strongly suggested.

Disease surveillance activities, which are currently being supported by the WHO are best carried out at the federal level. It is suggested that the FGoN provides budget line for this critical service while WHO maintains its technical oversight functions and other vital supports.

The NIP has remained a parallel programme within the PHC system. For full integration within the PHC, there is need for dialogue between NPCHDA and other programmes in the ministries of health at all levels; to establish joint programme of work and strenghten the health system, particularly at the local level. Such initiative should also effectively engage the private sector to provide good quality service and expand coverage. EU-PRIME is well placed to facilitate this process particularly in its focal states. Through collaboration with other key partners, It should also undertake a human resource review with focus on intensive training of key state and LGA staff on programme management, using the REW planning guide.

The cold chain system is critical to the success of any immunization programme. While the current performance is generally satisfactory, more effective management requires having standard scales of equipment at all levels with up to date inventories and a system of intense and regular monitoring and supervision.

This study shows the minimal use of cost information in management and decision making, as demonstrated in the poor expenditure tracking by stakeholders in the sub-sector. Cost dimensions are critical and should be systematically introduced along with considerations for effectiveness and quality in planning of immunization programmes.

Development partners and key donors would continue to contribute to the immunization programme in Nigeria for sometime. For sustainability in the short term, the current areas of support given by EU-PRIME for operational acitivities in its focal states can be replaced with GAVI ISS funds. On a medium and long term basis, the extension of the NHIS benefit package to cover immunization services should be explored. Opportunities presented with the development of community based health insurance schemes in several states should also be explored to contribute to immunization financing. Furthermore, NPHCDA should collaborate with its key partners, including the EU-PRIME and other stakeholders to facilitate the passage of the National Health Bill and the creation of the PHC Fund. This will be a major source for a sustainable immunization financing in Nigeria

With the imminent expiration of the EU-PRIME Project, a stakeholder's forum should be organized to discuss the activities, achievements, challenges, lessons learnt and the way forward for immunization programme in Nigeria, with particluar reference to its focal states. The outcome of this study should be part of the agenda for discussion at the forum.

EU Prime should consolidate its programme on empowering local community structures (WDCs and VDCs) through capacity building to promote participation, local responsibilities and ownership of health programmes, including RI. It should also consider privatising its existing network with the posibility of becoming a limited liability company to manage and deliver vaccines and equipment on a commerical basis.

6 References

1. Adedoyin Soyibo (2005). National Health Accounts of Nigeria, 1998-2002, , Project Coordinator, Nha Estimation Group; and Director Health Policy Training And Research Programme Department of Economics, University of Ibadan, Ibadan, Nigeria Final Report, Submitted to World Health Organization, Geneva. October.
2. Adeyemo D. O. (2005) Local Government and Health Care Delivery in Nigeria: A Case Study Department of Local Government Studies, Obafemi Awolowo University, Ile-Ife, Nigeria
3. Akomolafe O. Y. (2006) Improving Health Care Delivery System In Osun State: (Health Care Policy Reform And Strategies With Regard To Immunization As A

Sub- System). A, EU-Prime State Programme Manager, At The State Council On Health Meeting. 25 September.
4. Akomolafe O. Y. (2007)Health Care Financing: The Way Forward, EU Prime State Programme Manager, 2007, State Council On Health Meeting.
5. Aladelokun S. F. (2007). Report On Monitoring Of Cold Chain System/Logistics And Health Facilities For The Month Of November, Logistician, EU PRIME Project.
6. Alan Fairbank, Marty Makinen, Whitney Schott, Bryn Sakagawa, (2001): Poverty Reduction and Immunizations: Considering Immunizations in the Context of Debt Relief for Poor Countries, Prepared for: The Bill and Melinda Gates Children's Vaccine Program at PATH, January.
7. Caroline Waddington, (2004). Round Table Paper – "Does earmarked donor funding make it more or less likely that developing countries will allocate their resources towards programmes that yield the greatest health benefits?, Bulletin of World Health Organization, September 82 (9).
8. Central Bank of Nigeria: Annual Reports and Statement of Accounts, 1972–2000
9. CIA World Fact Book for Nigeria 2007
10. DFID (2005). "The State of Routine Immunization Services in Nigeria and Reasons for Current Problems" - FBA Health Systems Analysts, Revised Version
11. DFID (2005). Project Memorandum Nigeria, Reviving Routine Immunization In Northern Nigeria (PRRINN) December.
12. DFID, EC, WHO, UNICEF (2007). National Programme On Immunization - National Immunization Coverage Survey (2006), Consultants: Nics 2006 Group March Lagos, Abuja, Kaduna,
13. Edina Sinanovic1, Joses M. Kirigia and Veloshnee M. Govender, Case Study 4: Cost-Effectiveness Analysis By Health Economics Unit, University of Cape Town, Cape Town, South Africa,PDC Unit, World Health Organisation, Regional Office for Africa
14. Federal Ministry of Finance (2004). Budget of the Government of Nigeria 2004 Fiscal Year, Budget Office of the Federation,
15. Federal Ministry of Finance (2005). NIGERIA: National Expenditure on Health (Nairas), 1995-2005
16. Federal Ministry of Finance (2008). Federal Budget for 2008, Budget Office of the Federation,
17. Federal Ministry of Health Nigeria, Comprehensive Multi-Year Plan 2006-2010, The National Programme on Immunization.
18. GAVI Secretariat (2006). GAVI Alliance Strategy (2007-10) , 6 June
19. Immunization Financing Analysis - A look across 50 countries (http://www.who.int/immunization_financing/50_countries/en/)
20. John Onyeokoro (2006). Report On A Bill – For An Act To Define Limits Of Federal And State Government Responsibilities In Matters Relating To Health, , June
21. Mahmud Khan M. and Richard A. Yoder (1998). Special Initiatives Report No. 6 Expanded Program on Immunization in Bangladesh: Cost, Cost-Effectiveness, and Financing Estimates September
22. Miloud Kaddac, Patrick Lydon, Ruth Levine (2004). Financial Challenges of Immunization: a look at GAVI, , Bulletin of the World Health Organisation September: 82: 697-702
23. Miloud Kaddar, Vito L. Tanzi, Leanne Dougherty (2000). Special Initiatives Report 24 Case Study on the Costs and Financing of Immunization Services in Côte d'Ivoire May
24. Msambichaka K. A. (2005). Sustaining Immunisation Efforts Under Health Reform: Challenges For Africa
25. National Population Commission (2004). Nigeria Demographic and health Survey 2003, , Federal Republic of Nigeria, April
26. NPHCDA (2008). Nigeria Measles follow-up budget for 37 states updated 31 January , Abuja, Nigeria

27. Numerous Power Point presentations on Financial Sustainability Planning (FSP) and FSP's for Senegal, Yeman, Rwanda, Mozambique, Malawi, Madagascar, Kenya, Guyana, Ghana, Gambia, Ethiopia, Eritrea, Benin, Uganda
28. Ojo Kenneth (2003). National Health Accounts Strategic Plan For Nigeria, prepared for the Federal Ministry of Health, March.
29. Partnership for Health Reform (2000). Health Reform Tools Series: Guidelines for Performing A Country Assessment: Financing Assessment of Immunization Services, USAID Funded, April.
30. Partnerships for Health Reform (1999). Special Initiatives Report No. 21 Case Study on the Costs and Financing of Immunization Services in Bangladesh
31. Peyvand Khaleghian (2001). Special Initiatives Report No. 40 Immunization Financing and Sustainability: A Review of the Literature June, M.D. Consultant Abt Associates Inc. Partnership for Health Reform.
32. Rolf Reichert (2007) Monitoring Report, EU PRIME, EU, May
33. Rotary's contribution to date 2008, Rotary International Summary
34. Ulla K. Griffiths, Eva das Dores Pascoal, Guy Hutton, (2001). Cost-effectiveness of introducing hepatitis B vaccine into the infant immunization schedule in Mozambique
35. UN (2000). Millennium Development Goals,
36. UNICEF (2007). Provision Plan for VACCINES, SYRINGES and SAFETY BOXES for 2008, , 12 October
37. UNICEF country online statistics (www.unicef.org/infobycountry/nigeria_1463.html)
38. UNICEF, (2001). Children's and Women's Rights in Nigeria: A Wake up Call Situation Assessment and Analysis.
39. UNICEF, WHO and GAVI Alliance partners (2005). cMYP Costing and Financing Tool (Version 1.3 – December 2005),
40. Walker, N.R. Mosqueira, M.E. Penny, C.F. Lanata, A.D. Clark, C.F.B. Sanderson, and J.A. Fox-Rushby . Variation in the costs of delivering routine immunization services in Peru D. (http://www.who.int/bulletin/volumes/82/9/walker0904abstract/en/)
41. WHO (2001).Estimating the Potential Cost-Effectiveness of Using Haemophilus Influenzae Type B (Hib) Vaccine Field Test Version 1 Department of Vaccines and Biological Who/V&B/01.36,
42. WHO (2002). WHO Country Cooperation Strategy: Federal Republic of Nigeria 2002-2007, Regional office for Africa, Brazzaville.
43. WHO (2006) Geopolitical map produced.
44. WHO (2007). Routine Immunization statistical databases (numerous various excel files) collected by WHO 2006 and 2007.
45. WHO and GAVI Alliance, (2006). Immunization Costing and Financing: A Tool and User Guide for Comprehensive Multi-Year Planning (cMYP) – WHO/IVB/06.15,
46. WHO and UNICEF, March (2006). WHO-UNICEF guidelines for developing a comprehensive multi-year plan (cMYP) – WHO/IVB/06.20, March
47. Wikipedia (Online encyclopedia) on causes of deaths globally 2007.
48. Wikipedia (Online encyclopedia) on mortality rates globally 2007.