

**DONOR FUNDING FOR IMMUNIZATION: A LITERATURE REVIEW
ASSESSING DONOR FUNDING IN MEETING NIGERIA'S NATIONAL
IMMUNIZATION PROGRAM TARGETS**

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A thesis submitted in partial fulfilment of the requirement for the degree of Master of Public Health

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Signature:



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List of abbreviations and acronyms

BMGF	Bill and Melinda Gates Foundation
CMYP	Comprehensive Multiyear Plan
DAC	Development Assistance Committee
DHS	District Health Survey
EPI	Expanded Program on Immunization
HIV/AIDS	Human Immunodeficiency Virus / Acquired Immunodeficiency Syndrome
HSS	Health System Strengthening
IMR	Infant Mortality Rate
GAVI	The Global Vaccine Alliance
GNI	Gross National Income
HDI	Human Development Index
LGA	Local government area(s)
LMICs	Low and middle income countries
MDG	Millennium Development Goals
NDHS	Nigeria Demographic and Health Survey
NHIS	National Health Insurance Scheme
NPHCDA	National Primary Health Care Development Agency
OECD	Organization for Economic Co-operation and Development
OOP	Out of Pocket Payment
PHC	Primary Health Care
RI	Routine Immunization
SDG	Sustainable Development Goals
SIA	Supplementary Immunization Activities
SSA	Sub-Saharan Africa
U5MR	Under Five Mortality Rate
VPD	Vaccine preventable diseases
VPDMS	Vaccine preventable disease monitoring system
WHO	World Health Organization
UNICEF	United Nations Children's Fund

Working definitions

Bilateral agencies: these are organizations through which donor funding is channeled from one country to recipient countries. For example USAID, DFID, amongst others. (1)

Cost-effectiveness: amongst alternative interventions producing the same outcome, the cost effective intervention utilizes the lowest cost in producing a unit in expected outcome. (2)

Development Assistance Committee: refers to countries that formally provide the largest development assistance through donor funding to countries worldwide. (3)

Donor funding: financial resources including technical support from external sources to other countries where it supports development in one or more sectors. (4)

Expanded Program on Immunization (EPI): This is the primary program dedicated to deliver immunization services to children under-two years to prevent yellow fever, tuberculosis, measles, polio, pertussis and diphtheria. (5) These and other routinely targeted diseases by are identified in a dedicated schedule which outlines the dosage and timing of immunization. (5) The EPI is delivered through state and local government processes PHC.

Fiscal space: refers to how much of the governments' resources through budgets are allocated to a sector for example health, or a sub-sector for example immunization. This is in relation to budget allocation to other competing (sub) sectors. (6)

Full immunization coverage: the proportion of children receiving BCG, one dose of measles and three doses each of polio and Pentavalent vaccines by 12 months of age of all eligible children. (7)

GAVI supported vaccines: refers to vaccines that eligible countries procure with GAVI consisting of vaccines which are new to or poorly used in recipient countries. (8)

Multilateral agencies: these are organizations that utilize donor funding from multiple sources to finance development interventions in recipient countries. (1) These include United Nations agencies like United Nations Children's Fund, World Health Organization amongst others. (1)

Objectives: are statements describing the intended measurable results addressing a specific health need in a target population. (2)

Supplemental Immunization Activities (SIA): these are additional immunization initiatives driven by the federal government of Nigeria to accelerate the control of vaccine preventable diseases in meeting national EPI targets often identified as a global priority. (9) In the case of Nigeria, this has been mainly to eradicate polio and control measles. (10)

Sustainable development goal target 3.2: this target aims to end preventable deaths in newborns and under-five children by 2030. All countries should reduce neonatal mortality to lower than 12 deaths per 1000 live births and under-five mortality to lower than 25 deaths per 1000 live births by 2030. (11)

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Abstract

Introduction

Immunization contributes to reducing under-five mortality which is high in Nigeria. Donors financing supports immunization delivered through Nigeria's expanded program on immunization (EPI) complemented by supplementary immunization activities. Still low immunization coverage persists in Nigeria. Further, financing through The Global Vaccine Alliance ceases in 2022 after a transition period. Low evidence exists to guide effective fund utilization through this transition. Thus donor immunization funding's achievement of national targets is assessed to proffer recommendations.

Methods

A literature review assessing donor funding's achievement of Nigeria's EPI targets with comparison of the Ghana and Kenya EPI. In analysis, the Development Assistance Committee Criteria is applied as conceptual framework.

Findings

In Nigeria, donor funding reaches one in three children with immunization. By utilizing donor mechanisms in vaccine procurements pooling cost savings occur, nevertheless poor immunization data use reduces program efficiency. Private sector integration as found in Ghana and Kenya increases efficiency. Donor immunization funding effectively achieves higher immunization coverage of individual antigens through Supplementary immunization activities than full immunization coverage.

Negative effects of donor immunization was linked to unintegrated routine and supplementary immunization activities. Although targeted disease incidences have reduced, sub-national sustainability of achievements following transition is low.

Conclusions

In Nigeria, donor immunization funding is relevant, with mixed efficiency, effectiveness and impact on the immunization programs. However variable sub-national health expenditure threatens sustainability of achievements.

Recommendations

State governments should ensure minimum 15% budgetary health spending. Federal government should integrate routine and supplementary immunization activities, and private sector.

Keywords: Nigeria, donor funding, immunization

Word Count: 13, 195

Introduction

I found from my time working on a donor funded Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS) project in Nigeria that following exit of the funders some achievements were not sustained. This made me think about how Nigeria can plan for and continue with donor funded activities at their exit.

Donors have contributed to development in health amongst other sectors. (12) Donor funding for development historically followed the Second World War in Europe, and by the 1950's extended to low income countries. (13) Motivated by the millennium development goals (MDGs) global funding for health massively increased between 1990 and 2012 from \$5.7 billion to \$28.1 billion. (14) Child mortality, HIV/AIDS amongst others were targeted by these funds. (14) Correspondingly donor funding for health increased in Nigeria in the same period. (15) However since 2015, donor funding for health has declined. (16)

The under-five mortality correlating with country development levels, reveals low development in Nigeria. (17),(18) In 2018, infant and under-five mortality rates (U5MR) were high at 67 deaths per 1000 live births and 132 deaths per 1000 live births, respectively. (19) Also higher than Sub-Saharan Africa (SSA) averages of 51.8 deaths per 1000 live births and 75.9 deaths per 1000 live births, respectively. (20) Despite the established strategy of immunization in preventing under-five deaths (11), only 31.3% of Nigerian children were fully immunized in 2018 (19). By this Nigeria did not meet national immunization program targets of minimum 80% coverage of all antigens in 80% of Local Government Areas (LGA's). (17) This was even with an estimated additional \$282 million in donor funding in 2016 to support achievements of national immunization targets. (21)

With declining donor funding and persisting low development, the relevance of my concerns strengthen. At the termination of the MDGs, sustainable development goals (SDG) were adopted globally in 2015. (11) A wide gap in achieving the SDG target 3.2, of less than 25 under-five deaths per 1000 live births exists for Nigeria. (11) Therefore the Nigerian government and policy makers must assess sustainable financing for immunization through its EPI and Supplementary Immunization Activity (SIA). The extent to which these programs involved in immunization delivery has achieved national targets, following donor funding and support should be assessed. This is in view of informing improvements in national EPI and SIA policy and implementation for improved immunization coverage.

Thesis outline

This thesis is organized into eight chapters. In chapter one, Nigeria's background in relation to the problem is presented. In chapter two the problem, its justification, and objectives of this study are presented. Chapter three presents the methodology including the conceptual framework utilized in the study. In chapter four the components of immunization funding in Nigeria are explored. Chapters five and six present an assessment of the immunization programs in Nigeria compared with that in Ghana and Kenya, respectively. In chapter seven study findings are discussed in relation to the conceptual framework. Finally this provides the basis of conclusions and recommendations presented in chapter eight.

CHAPTER 1: NIGERIA'S BACKGROUND

In this chapter Nigeria's background information relevant to immunization coverage of children under-five is presented.

1.1 Geographical and administrative profile

Officially known as The Federal Republic of Nigeria (see figure 1) Nigeria, has an area of 923,768 sq. km. (22) The Atlantic ocean, Niger, Chad, Cameroon and Benin share its borders. (22) Its governance system is decentralized, (23) consisting a federal government in the federal capital territory, 36 federating states within six regions (refer figure 1) and 774 local government areas (LGA). (19)

Figure 1: Map of Nigeria showing geo-political zones (24).

1.2 Demographic profile

Nigeria's estimated 2017 population was 190.6 million. (22),(25),(26) 42.5% of whom were below 14 years. (19) Nigeria's high total fertility rate, and low (16.6%) contraceptive prevalence rate mean high cohort of anticipated births. (19),(22) Thus child survival interventions remain relevant.

1.3 Socio-economic profile

Nigeria's gross national income (GNI) per capita is \$1960 (current). (27) Thus affording her a World Bank assigned middle income status¹. (27)



Yet in 2018 two-thirds of Nigerians lived below the poverty line. (19),(28) Two-thirds of whom lived in North compared to South Nigeria, (28) where a decade of conflict in the North-East and resultant displaced people has occurred. (26) Further 34.9% of women and 21.5% of men had no education in 2018. (19) Where employed, 90% are informally employed. (29)

By the 2017 human development index (HDI), Nigeria ranked 157th of 189 countries with a low human development of 0.532. (30) This is lower than the SSA value of 0.537. (30) Nigeria also has high sub-national inequality, with a 34.7% drop in HDI greater than 30.8%, expected in SSA. (30)

Nigeria also ranked 144th of 180 countries on the 2018 corruption perception index. (31) Thus high public sector corruption is perceived. This implies high risk of misappropriated funding leading to poor public sector delivery.

1.4 Health profile

Male and female life expectancy at birth in 2017 was 55 and 56 years respectively. (32) Children under-five have a 10% probability of dying. (32) Over 3.9 million unvaccinated Nigerian children caused first ranking of 33 countries in 2017. (33) In all sexes and ages communicable diseases causes the highest mortality. (34) As for disability-adjusted life years

¹ Middle income status: Countries with a GNI per capita ranging \$996 to \$3895 (current). (27)

per 100,000 population, nutritional and communicable diseases have the highest burden in 2017. (34)

1.5 Nigeria's health system overview

The health system in Nigeria is decentralized, and based on primary health care (PHC) in the public sector. (35) This is provided by the federal, state and local governments delivering tertiary, secondary and primary levels of care respectively. (35)

The private sector with formal health providers and informal traditional health providers also deliver health services to the population. (35) The private sector which is significant in some states mainly provides secondary level care in urban areas. (9) However, the national health policy accommodates private sector primary level care provision. (35)

The federal ministry of health provides overall guidance in Nigeria's health system while coordinating international health interventions. (35) By liaising with semi-autonomous agencies for instance the National Primary Health Care Development Agency (NPHCDA) for PHC, it coordinates health delivery nationwide. (35)

Nigeria's health system ranked 187th of 191 countries in 2000. (36) Representing poor performance in its efficiency and quality of meeting the population's health needs. Further, only 30% of Nigerians were covered by PHC in 2014. (37) This is linked to insufficient health workers also concentrated in urban areas. (38) Whereas 54% of the population are rural dwellers (19), with some in scattered or nomadic settlements (9).

1.6 Nigeria's immunization program overview

The EPI introduced in 1978 primarily delivers immunization to prevent yellow fever, tuberculosis, measles, polio, pertussis and diphtheria in children under-two (see annex 1). (5) Its coordination is managed by federal and state ministers of health and development stakeholders through its Interagency Coordinating Committee.

Nationally the EPI coordinated by the NPHCDA along with its state counterpart's, delivers routine immunization (RI) as a component of PHC nationwide. (9),(39) Nationwide, the public sector delivers 85% of immunization services through PHC and outreaches. (25)

Additional immunization services is delivered through SIAs coordinated by the federal government. (9),(10) These activities provide accelerated control for select diseases, presently polio and measles (see annex 2). (9),(10)

Immunization financing is by both government and donors. The government mainly finances the EPI for RI and staff remuneration. Donors conversely mainly finance SIAs and procurement activities. (25) Its supply chain is centralized with distribution sub-nationally. (25)

1.7 Nigeria's health expenditure overview

Nigeria health expenditure is funded by taxation, donors and out of pocket (OOP) spending. In 2016, total health expenditure consisted 13% government, 10% donors, 75% OOP, and 2% other private sources. (21) The high OOP spending by households, reflect financial protection needs. However, infants receive vaccines free of charge. (35)

As a percentage of government budget, health expenditure was 4% and 5% in 2013 and 2016 respectively. (21) This was approximately \$1.8 billion in 2013. (25) Of this 3.1% equivalent to \$57.5 million was allocated to immunization through the EPI. (25) Further, 2013 government health expenditure was low, at \$8 per capita compared to the minimum recommendation of \$34. (40) While donors as important contributors, spent almost half government expenditure in 2016, of N285 billion. (41)

1.8 Nigeria's health financing function overview

In Nigeria, OOPs are the main health financing source. (21) The National Health Insurance Scheme (NHIS) pools health resources, but covers only federal workers and dependents representing 5% of the population. (41) Additionally, only two states pool health finances through the NHIS. (42) In Zamfara and Kano states in North Nigeria, basket funds specifically pool immunization funds. (43)

The Basic Health Care Provision Fund currently implemented, extends coverage to more people through payment of premiums for NHIS benefits. (44),(45),(46) Additionally it funds PHC facilities nationwide. (45)

Health services are purchased by federal and state governments in public health sector. (47) Global budgets and supplies are utilized in health purchasing based on public purchasing provider split. (48),(49) This purchasing also utilizes health management organizations who through the NHIS purchase health services for beneficiaries from both public and private sector. (44) Nigerians receive health services mainly through OOP or less so the NHIS benefit package

CHAPTER 2: PROBLEM STATEMENT, JUSTIFICATION AND OBJECTIVES.

2.1 Problem statement and Justification

Robust literature identifies immunization as a cost-effective public health intervention. (11),(50) This is because immunization prevents morbidity and mortality from vaccine preventable diseases (VPDs) in children under-five. (50),(51) Globally, an estimated two to three million annual incidents of VPDs are prevented through immunization. (52) Further by 2020, an estimated \$350 billion will be saved globally in cost of illnesses averted over the preceding 20 years by immunization. (52)

Global immunization coverage has steadily increased though not achieving global targets. Globally in 2015, 86% full immunization coverage was achieved from baseline levels of 5% in 1974. Although significantly increasing within this period, this falls below global targets to attain national immunization coverage of 90%. (52)

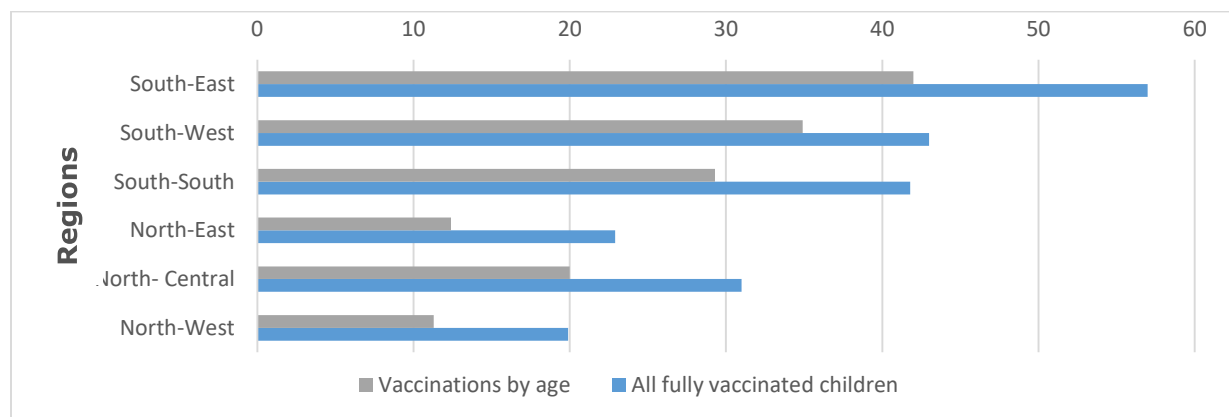
Moreover this aggregated value masks inter-country differences in immunization coverage. S.Osawa (52) argues that some countries have lagged further behind global achievements. (52) To illustrate, while some countries have nearly eliminated measles and meningitis in children under-five years, in others this achievement remains an aspiration. (53)

Nigeria's national full immunization coverage diverges from global trends, remaining low within the past 15 years. From a 21.4% baseline in 2003, full immunization coverage increased to 35.4% in 2008. (10) Then, according to the 2018 Nigeria Demographic and Health Survey (NDHS), (19) an even lower full immunization coverage of 31.3% was observed. (19)

In literature, low immunization demand is associated with child and caregivers' factors, and socio-cultural community factors. Quantitative evidence has shown that low caregiver literacy and immunization knowledge contributes to low demand. (54),(55) O.Oleribe (56) in drawing parallel conclusions also identified parental socio-economic status, occupation, education, residence, and religion amongst others as further factors influencing coverage. (56) These unevenly distributed determinants in Nigeria contribute to varying sub-national immunization coverage.

Full immunization coverage varies between regions in Nigeria. (19) Surprisingly despite insurgency in the North-East, higher immunization coverage than the North-West is noted (refer figure 2). (19) This suggests the influence of other factors particularly those on the immunization supply-side on Nigeria's regional immunization coverage.

Figure 2: 2018 regional full immunization coverage, compared with age-appropriate immunization coverage by EPI and SIA in Nigeria. (19)



Limited evidence on the influence of supply side factors on immunization in Nigeria exists. To my knowledge presently, fewer studies have evaluated the effects of supply side determinants on immunization compared to those on demand in Nigeria. (56) Previously E.Eboreime (57) in assessing supply side determinants focused on its effects on access to immunization. (57) Also P.Khaleghian and V.Gauri (58) concerning low and middle income countries (LMICs) asserted a general association between health system determinants and immunization coverage. (58) Understanding these effects in Nigeria is important to promote health system strengthening (HSS) envisioned by the 2014 national health policy. This will guide legislators in immunization policy reformulation and eventually program design to improve immunization coverage.

Immunization coverage is hindered by inadequate funding for immunization delivery through national EPI. (51),(59),(60) Low funding is linked to inadequate procurement and supply of vaccines, and poor service delivery. Further inadequate, poorly trained and maldistributed health workforce limits immunization services results.

Low immunization funding results from low domestic government budgetary health spending. Low political will and competing interests influenced total federal government health spending which was 5% in 2016. (21) This is significantly lower than the 15% budgetary allocation agreed by African governments. (45) Similarly, states and local governments failed to meet this benchmark. (42) This reflects a low priority on health, despite Nigeria's economic advancement and the National health policy guiding this benchmark for government health allocations. Still, government immunization funding increased from 40% in 2006 (10), to 70% in 2013 (25).

Generally, evidence shows that low country health spending is associated with worse health outcomes. (61) Consequently this study lines with R.Nwogu (54) arguing that increased domestic immunization spending is associated with improved immunization coverage. (54) Conversely, L.Arevahatian (62) argues that increased immunization donor funding, contributes to improving immunization coverage in Africa. (62) These contrasting views might be because the later study examines broad effects of donor funding in countries with different levels of domestic health spending. Whereas R.Nwogu's (54) study contextualizes immunization spending and its coverage in Nigeria.

Low immunization coverage persists despite Nigeria's EPI policy to eradicate VPDs and attain 80% minimum immunization coverage. Thus necessitating SIAs to accelerate VPD control and meet EPI targets. (9) Both the EPI and SIAs receive varying degrees of donor funding through The Global Vaccine Alliance (GAVI), United Nations Children's Fund (UNICEF) and World Health Organization (WHO). (41),(63)

Therefore an assessment of the EPI's performance is required to evaluate the utilization of resources and outcomes of the program. This is in view of Nigeria's transition off GAVI co-financing of GAVI supported vaccines by 2022. (41),(64) Further study should propose sustainable and effective options in immunization financing for progress. Progress entails securing sustained and adequate immunization funding and coverage because of its evidential association to reduce child mortality. (50)

Nigeria's recorded alarmingly high infant mortality rate (IMR) and U5MR in 2018, at 67 and 132 (deaths per 100 live births respectively). (19) Rates which were significantly higher than estimates in the SSA Region in that year (refer table 1).

Table 1. Nigeria's Infant and Under-five mortality rates in 2018, compared with Sub-Saharan Estimates. (20),(65)

	Under-five Mortality Rate in deaths per 1000 live births	Infant Mortality Rate in deaths per 1000 live births
Nigeria	67	132
Sub-Saharan Africa	51.8	75.9

In light of these high mortality rates, to achieve the SDGs the Nigerian Government and donors invested in immunization. (34) In the past 20 years, the Nigerian Government was supported by donors in immunization. This included immunization funding and program support by WHO and UNICEF, and GAVI assistance for vaccine procurement. (25)

Still low immunization coverage with high national IMR and U5MR persists. Additionally, a 41% immunization funding gap is projected in Nigeria's 2016 to 2020 EPI comprehensive multiyear plan (CMYP) regardless of additional funding. (25) This leads to question the effectiveness and impact of this additional funding and support on the EPI.

Besides, Nigeria faces a need for charting sustainability following exit of donors either in financing or programmatic support in its immunization program through its EPI and SIAs. This study therefore assesses the extent to which the EPI and supporting SIAs in Nigeria has achieved EPI national targets. This is following donor immunization funding within the past three planning cycles [2006 to 2010, 2011 to 2015, and 2016 to 2020] to date. Identified ineffectiveness can inform improvements in EPI and SIA policy and implementation for improved immunization coverage.

2.2 Objectives

2.2.1 General Objective

To assess donor funding on the level of achievement of Nigeria's national immunization program targets; identifying alternative financing through assessment of national immunization programs in similar middle income countries; in order to inform policy and practice recommendations for increased immunization coverage in Nigeria.

2.2.2 Specific Objectives:

1. To identify and discuss the components of immunization funding in Nigeria
2. To assess donor funding influence on the level of achievement of Nigeria's national immunization program in meeting national targets
3. To identify and compare alternate national immunization financing arrangements undertaken in similar middle income countries
4. To make recommendations to the federal, state and local government of Nigeria, Federal Ministry of Health and international stakeholders for improvements on immunization policy and implementation to improve immunization coverage.

CHAPTER 3: METHODOLOGY

The study design, search strategy, limitations and applied conceptual framework are presented in this chapter.

3.1 Study design

To attain answers to specific research objectives 1 to 3, a literature review was done. The study assessed and reviewed donor immunization financing performance in meeting Nigeria's EPI targets between 2006 and 2018 (14 years). Then performance of national immunization targets in similar countries, to identify alternate immunization financing, were compared and analyzed. Ghana and Kenya were chosen as both are decentralized low middle income countries on GAVI funding. Further since Ghana like Nigeria transitions off GAVI funding while Kenya does not, contrasting country experience to enrich recommendations is anticipated.

3.2 Search strategy

Peer-reviewed literature were retrieved from PubMed, Research Gate and Jstor databases, the Vrije Universiteit online library, and Google and Google Scholar search engines. Grey literature were retrieved from government, international and stakeholders websites including Nigeria Federal Ministry of Health, NPHCDA, WHO, UNICEF, GAVI, and World Bank.

From literature titles then abstracts and full texts, inclusion criteria were applied to narrow down to literature reviewed in the study. Additionally, snowballing of retrieved literature revealed other relevant literature, included in the study.

3.3 Inclusion and exclusion criteria

To keep findings relevant and the search non-extensive, peer-reviewed articles and literature published between 2009 and 2019 were included. However relevant older literature when found were included. For instance the 2004 Nigeria National Health Policy was included to contextualize the prevailing emphasis on immunization while examining progress thereafter.

Only literature in English was included. Data from peer-reviewed articles were included as well as some grey literature such as national and organizational policies, annual and program reports, strategy and discussion papers. Systematic reviews conducted, or out of the time-frame were included to enrich the study.

Literature failing to meet this criteria, and animal studies were excluded (refer table 2).

Table 2: Table summarizes the criteria for inclusion and exclusion of literature reviewed in the study

Inclusion	Literature written in English language Publication between 2009 and 2019 – with inclusion of relevant older articles Entire article accessible Focus on immunization – EPI or SIA for children under-two Both peer-reviewed and grey literature Systematic review
Exclusion	Article written in language other than English Publication older than 2009 Entire text inaccessible or just abstract available Literature focusing on immunization in animals, women or general population not relevant to childhood immunization

3.4 Keywords

The search utilized these keywords: donor funding, developmental assistance, aid, immunization, vaccination, national, expanded, program, Nigeria, Sub-Saharan Africa, Ghana, Kenya, effects, performance, targets, goals, objectives, (in)efficiency, (in)effective(ness), (un)impact(ful), (un)sustainable, sustainability, challenges, issues, opportunities, financing. Boolean operators AND/OR were also used. See annex 3 for details on keywords and search strategy.

3.5 Conceptual Framework

3.5.1. Introduction to the conceptual framework

The Development Assistance Committee (DAC) Evaluation Criteria (66) were used to assess donor immunization funding on the level of achievement of Nigeria's immunization program in meeting national EPI targets. Although developed to improve evaluation of development assistance through DAC countries, currently it is used in program or project evaluation studies across several countries and organizations. (66) The criteria, sustainability, relevance, effectiveness, efficiency and impact assess the value and achievement of development assistance by answering evaluative questions. Since its development in 1991, the DAC evaluation criteria are considered comprehensive to objectively assess the relative (un)importance of aid supported development work. (66) Therefore these criteria were chosen as a conceptual framework to analyze what achievements the Nigeria national immunization program has made, through supporting donor funding. Also being widely adaptable to national projects or programs at different scale of operations, it is suitable to review Nigeria's immunization program through its EPI and SIA. Finally, since it provides definitions and structured questions to each criteria, its application limits reviewer biases in selectively assessing the program.

3.5.2 The DAC Evaluation Criteria description

In utilizing the DAC evaluation criteria as the study's conceptual framework, the descriptions and suggested questions provided by the DAC of the Organization for Economic Co-operation and Development (OECD) were used. (66) These are described in table 3, including how they are interpreted in this study's context. Concerning the proposed evaluative questions on sustainability, these assess the interventions continuance following aid termination. However, as donor immunization funding extends beyond this study's timeframe, the questions are posed instead as future likelihood for continuance. By this based on current evidence, the sustainability of the immunization program at the end of GAVI's transition period in 2022, is assessed.

Table 3: Table showing the DAC Evaluation Criteria, their definitions and the questions used to apply the criteria in this study. (66)

Criteria	OECD-DAC Definition	To apply the criteria, these adapted questions (listed below) were answered in the study
Relevance	The extent of suitability of aid to priorities and policies of donors and recipients and the group targeted	How were the outputs of the immunization program consistent with overall policies, priorities and objectives of the EPI and donors? How were the outputs of the immunization program aligned with the needs of the targeted children and their caregivers? Are the objectives of the immunization program still valid?
Effectiveness	The extent to which aid attains its objectives	What was the level of achievement of the immunization program objectives expressed the CMYP
Efficiency	The extent of efficient or least costly adoption	How cost-efficient were activities on the immunization program
Impact	The direct and indirect, intended and unintended, and positive and negative changes associated with the intervention	What are the results: positive, negative, direct, indirect, intended and unintended of the immunization program How many people were affected by the immunization program
Sustainability	The possibility of continuance of the intervention following the withdrawal of aid	To what level are the benefits of the immunization program likely to continue at the cessation of donor funding

3.6 Definition of key terms in the study

Outputs: in this study are immunization program activities products or services undertaken in performing the functions of an immunization system namely (67):

1. Service delivery.
2. Logistics.
3. Surveillance.
4. Vaccine supply and quality.
5. Advocacy and communication.

Nigeria's immunization program: in this study refers mainly to EPI activities but where relevant includes SIA inputs.

3.7 Methodology limitations

1. Because of the reviewer's understanding literature other than English were excluded
2. Mainly online and publicly available donor and government immunization literature were accessed.
3. Not all full literature was retrieved despite the afore-mentioned search due to associated payments or broken online links

CHAPTER 4: NIGERIA'S IMMUNIZATION FUNDING COMPONENTS

In attaining the first specific objective, this chapter identifies and discusses Nigeria's immunization funding components.

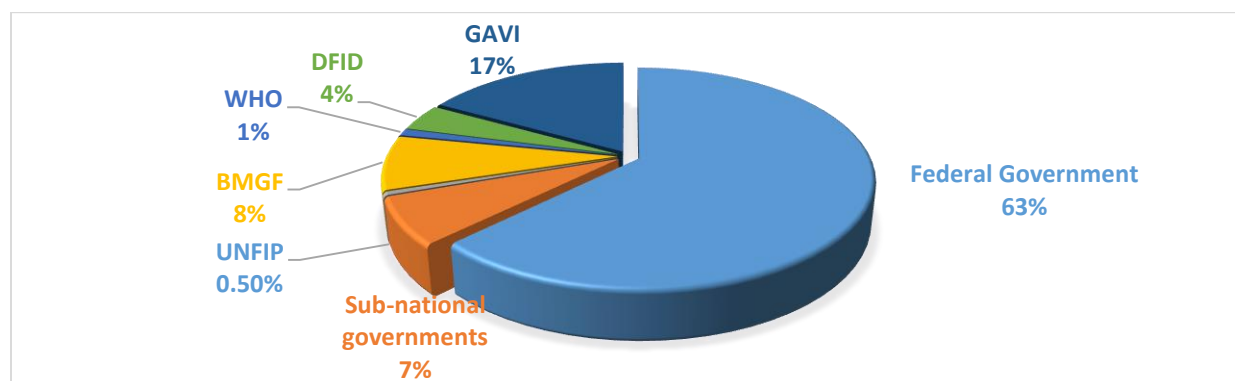
4.1 Sources of immunization funding in Nigeria

Overview of sources of immunization funding:

RI activities are currently funded by both government and donors. Significantly, the government of Nigeria financed 70% of RI activities in 2013. (25) Conversely, donors collectively finance 30% and reach 1 in 3 children with immunization (refer figure 3). (25) Also, vaccines are procured through UNICEF's procurement system² utilizing GAVI co-funding. (25) This places donors as important funders on RI services.

Despite searching widely for information on funding for SIAs, little information was found. Both government and donors fund SIAs focused on eradication of polio, and reduction of measles. (25) According to the Global Polio Eradication Initiative, WHO and UNICEF channeled global financing for polio eradication. (68),(69) The proportion of funding these sources contribute however remain obscure. (25)

Figure 3. The current sources and proportion of funding for routine immunization in Nigeria for 2016 to 2020 CMYP (25),(70)



The key sources of immunization funding are discussed below:

The government of Nigeria

The government of Nigeria finances the procurement of some vaccines. According to the comprehensive multiyear plans (CMYP), the federal government finances the purchase of traditional vaccines³ and partly finances GAVI supported vaccines⁴. (25),(71),(72) Through this financing vaccination against polio, tuberculosis, hepatitis B, measles and yellow fever are made available to children.

Further the government solely funds health worker remuneration affecting retention. The government provides salaries of health workers in immunization. (25) This function influences staff motivation, retention and immunization delivery particularly in rural communities. (10),(25)

² UNICEF (pooled) procurement is a system of public tender used by UNICEF to procure vaccines on behalf of low middle income countries. (81)

³ Traditional vaccines referred to are: Oral polio vaccine, BCG, Hepatitis-B birth-dose, Measles and Yellow Fever (includes Tetanus Toxoid for pregnant mothers). (25)

⁴ GAVI supported vaccines in Nigeria include pentavalent, IPV, pneumococcal (MCV) in 2014. (72)

Donors

Donors complement Nigeria's EPI through funding or program support. Amongst donors, GAVI funding represented 17% of total donor funding for the EPI. (25) This met vaccine procurement making up a fifth of immunization expenses in Nigeria. (10),(25) The remaining 13% was financed by multilateral and bilateral organizations, and the Bill and Melinda Gates Foundation (BMGF) (refer figure 3).

Donors finance various activities in Nigeria's EPI. Donors financed vaccine procurement, trainings and cold chain logistics as a component of strengthening the health system. (5),(10),(59),(72) Significantly their support towards strengthened advocacy and communication was noted, and will be discussed in chapter five. (69),(72)

4.2 Magnitude of Nigeria's immunization funding

Little information about the entire volume of donor funding of Nigeria's EPI was accessible. Nevertheless GAVI forecasted \$1,285,300,000.00 for funding vaccine procurement and EPI activities in Nigeria between 2001 and 2023. (73) Of this amount 75% financed vaccine procurement through UNICEF. (5),(25),(73)

This lack of transparency may make tracking of donor funds challenging by both beneficiaries and the international community. For beneficiaries, it may be linked to ineffective donor support as the outputs of the EPI are inconsistently aligned with beneficiary needs. Then for donors, it makes accountability to funding and implementing agencies difficult, as it is unclear whether the results are solely attributable to the donor activity.

Further, in spite of extensive literature search only national information was accessible; sub-national funding data was inaccessible. According to the national health accounts, in 2016 \$423 (current) million was spent financing immunization in Nigeria. (21) Of this a third originated from external sources. (21)

Low sub-national funding information makes understanding funding use difficult. Without transparency on immunization funding at sub-national levels, it is also unclear about the overall distribution and utilization of funds. This is important to ensure its equitable use by extending coverage to the most in need.

4.3 Trends in donor immunization funding

4.3.1 Trends describing the flow of donor immunization funding to Nigeria in relation to other health sub-sectors

From global sources, donor funds to support the health and population sector increased. The health and population sector funding inclusive of immunization funding, according to AIDFLOW,⁵ averaged 44.4% compared to investment in other sectors in Nigeria between 2011 and 2016. (74)

This reflects an overall strong commitment of donors to invest in improving health and demographic indices within this period. This investment backed commitments in the MDGS to tackle priority issues including child mortality. (14) Nigeria's high U5MR as mentioned in section 2.1 speaks to the justification for this increase.

Along with the generally high allocation of donor funding to health, investments to basic health care was high, but lower than that of HIV/AIDs, infectious disease control and Malaria. Reports from the OECD revealed an increase of allocations to funding basic health care in the early 2000's which includes immunization funding. (15) This increase was from a baseline of \$0.1 (current) million in 1999 to \$6.6 (current) million in 2000.

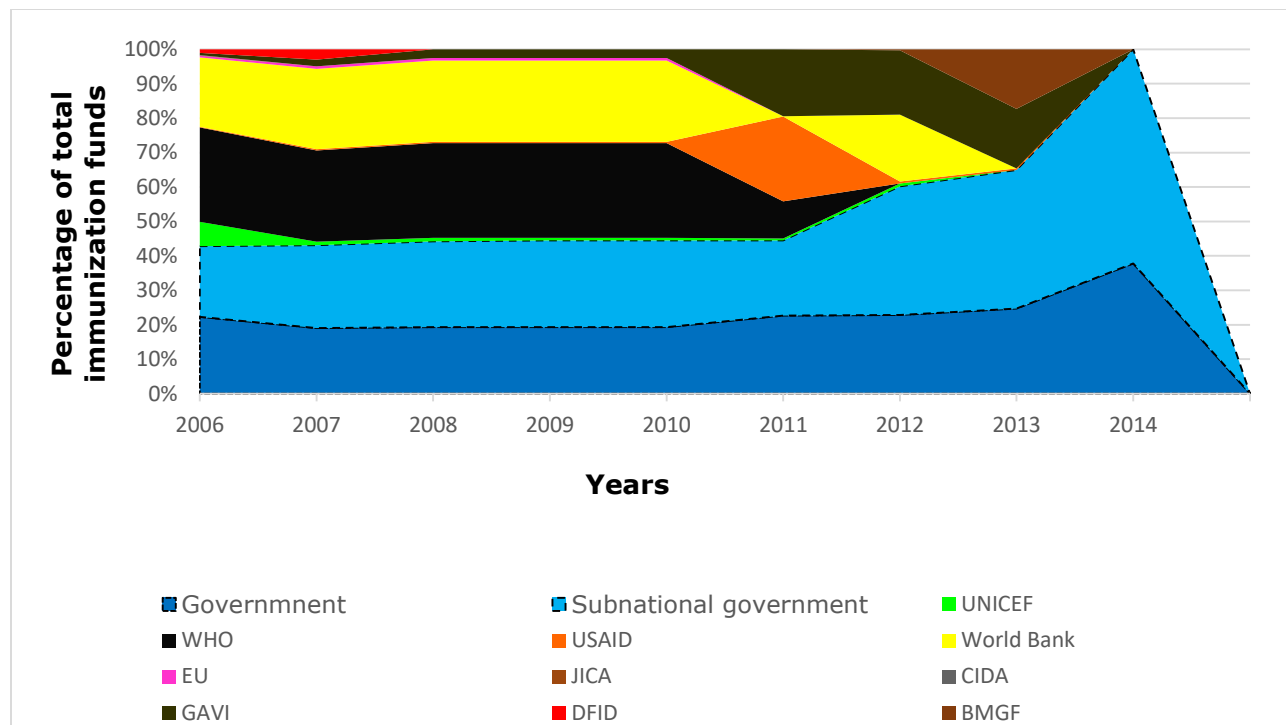
⁵ AIDFLOW is a platform created by the OECD and other partners, aims to make the flow of donor funding more transparent. (74)

Again reflecting drive of the international community to achieve MDG goals in reducing child mortality. (14),(75) In order to amplify results, by its close in 2015, peak allocations were reported by OECD in 2015 reaching \$249 (current) million. (15)

4.3.2 Trends (and proportions) of donor immunization funding utilized in Nigeria between 2006 and 2014

Donor funding for immunization according to the 2006 to 2010 and 2011 to 2015 CMYP from a baseline of about 58% in 2006, plateaued in 2011 and from then declined (refer figure 4). (10),(25) It can be seen that the World Bank and WHO played a decreasing role in funding immunization in this time. This decline was complemented by increasing contributions by GAVI along with BMGF. This shows an increasing importance of private sector in funding immunization. In line with the millennium development agenda.

Figure 4. Area chart showing the trend and proportion of funding by sources between 2006 and 2014. (10)(25)



CHAPTER 5: ASSESSMENT OF DONOR FUNDING ON THE LEVEL OF ACHIEVEMENT OF NIGERIA'S NATIONAL IMMUNIZATION PROGRAM IN MEETING NATIONAL TARGETS BETWEEN 2006 TO 2018

To attain specific objective two, the DAC criteria is used to assess donor funding on Nigeria's immunization program and its achievements in meeting Nigeria's CMYP targets between 2006 and 2019. Thus exploring the relevance, effectiveness, efficiency, impact and sustainability of donor funding on Nigeria's EPI and relevant SIAs.

5.1 Relevance

How were the outputs of Nigeria's immunization program consistent with overall policies, priorities and objectives of the EPI and donors?

The outputs Nigeria's EPI were consistent with overall national EPI policies and objectives. Overall, EPI implementation was guided by the CMYP objectives expressed in five year planning cycles (refer table 4). (9),(10),(25)

Further, the Nigerian National Routine Immunization Strategic Plan (39) defined RI strategies for implementing the 2011 to 2015 CMYP. (39) As a result, national objectives defined the products and services of the EPI.

Table 4. Table showing an overview of EPI CMYP objectives in Nigeria from 2006 till 2020. (9),(10),(25)

EPI planning cycle	Overview of EPI objectives
2006 to 2010	<ul style="list-style-type: none"> To attain in 80% local government areas 80% DTP3 coverage and other antigens by 2010 To ensure bundled vaccines are available To assess then improve the cold chain To halt wild polio transmission by 2007 To improve national HMIS By 2008, to decrease morbidity of measles by 90% and mortality by 95% To promote increased yellow fever vaccination To promote increased hepatitis B vaccination By 2009, to eliminate tetanus in mothers and children To incorporate the Hib vaccine into the EPI schedule To ensure government and other stakeholders have defined roles To ensure adequate subnational immunization resources
2011 to 2015	<ul style="list-style-type: none"> Main changes: To ensure community is aware of importance of completing immunization To create an efficient and timely reporting system
2016 to 2020	<ul style="list-style-type: none"> Main changes: To attain 95% children who are fully immunized before the first year of life in 90% local government areas To encourage integration and research To promote the adoption of Primary Health Care Under One roof⁶

To illustrate, the Nigeria EPI consistent with programme priorities targeted improvements in RI coverage. In 2006, improving RI was expressed as achieving 80% coverage of all antigens (refer table 4). (9) Accordingly, activities included health worker trainings and increasing immunization outreach service sites. (9) Subsequent improved RI coverage by 2011 was linked

⁶ Primary Health Care Under One roof is a strategy formulated in 2011 to promote the integration of all PHC services in Nigeria. (46)

to these activities and the incorporation of the Maternal Newborn and Child Health week. (10) These outputs widened EPI reach while reducing inequities in immunization coverage.

Similarly, EPI outputs were consistent with overall donor policies and objectives. EPI CMYP objectives, align with donor objectives (see annex 4) to improve the entire immunization system. Since EPI outputs derive from CMYP objectives, it follows they align also with that of donors.

For instance, GAVI, UNICEF, and WHO prioritized the elimination of inequities hindering immunization coverage in those marginalized. (76)-(78) By increasing outreach sites as earlier mentioned, more marginalized are reached to promote equitable coverage. Thus, outputs aligned with donor objectives.

How were the outputs of Nigeria's immunization program aligned with the needs of the targeted children and their caregivers?

Overall, the EPI aimed to meet all children's needs for immunization. Eligible targeted immunization beneficiaries by the EPI were the entire birth cohort. (9),(10),(25) Generally their need for protection against VPDs are met, as no child is excluded. (50),(51) Also seeking inclusion of all children, outreach and fixed sites nationwide increased. (10)

Nevertheless, indirect immunization costs excluded some children. In 2017 a study in Anambra state ([South- East Nigeria]) by Sibuedu and colleagues (79) argued transport and unofficial user fees deterred immunization. (79) Although the finding's generalizability is limited as a cross-sectional survey, it is consistent with Munoz and colleagues (80) 2015 study findings in LMICs. In general, out-of-pocket spending has been shown to reduce utilization of health services in particular by the lower earning households. (81) This is linked to lower immunization coverage most likely in the rural poor areas. (28)

Are the objectives of Nigeria's immunization program still valid?

Current EPI objectives seek improvements across immunization system components. (25) With the 2016 to 2020 CMYP focused on widening the EPI reach, children who be missed otherwise are served. (50) Additionally by promoting equity and community participation, the enhancement of community ownership to sustain immunization is expected. (25),(39) This is important for sustainability at cessation of donor funding.

To summarize findings on relevance, Nigeria's immunization program and donor objectives are consistent with programs output. Its outputs equally met the target population needs.

5.2 Efficiency

How cost-efficient were activities on Nigeria's immunization program?

In literature immunization is a recognized cost-effective strategy in controlling VPDs. (5),(11),(50) According to GAVI, for each input of \$1 in vaccination, \$18 is saved in health costs and lost productivity associated with managing VPDs. (82) In subsequent paragraphs, how efficient (or not) Nigeria's immunization program produces results from inputs is discussed.

By procurement through GAVI and UNICEF mechanisms, the best price is gotten for vaccine purchasing. According to GAVI, aggregated donor funds for large volume of purchases ensures reduction in unit vaccine costs. (83) Cost savings are also achieved through UNICEF's procurement system which Ophori and colleagues (5) note Nigeria utilizes. (5),(25),(84) Utilizing these systems, mean resources for vaccines get a fair market value. This value ensures the 20% of immunization resources facilitating vaccine procurement are efficiently used. (59) Thus reaching more children.

Additionally, learning from the program to improve efficiency, is inconstant. On one hand GAVI reportedly used program data for management improvements. (72) Consistent findings were noted on measles SIAs in 2018. (85) By learning from program implementation efficiency can improve. This by magnifying what works and modifying others. This is important because

inappropriate resource use may lower service quality ultimately linked to reduced immunization demand.

In contrast inconsistent data use in planning was noted. Limiting the opportunity for reflection and change in planning, little feedback to lower levels was found in the 2011 Landscape Analysis of Routine Immunization in Nigeria (LARI)⁷ study. (60) This suggest lower program learning on the program compared to donor level.

Overall though immunization is cost-effective, low program learning in Nigeria's immunization program was found.

5.3 Effectiveness

What was the level of achievement of Nigeria's immunization program objectives expressed Nigeria's CMYP?

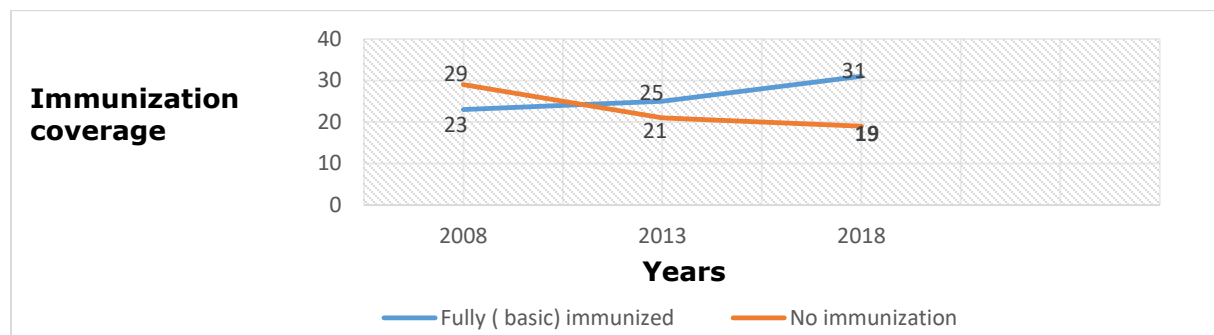
Donor immunization funding seeks improvements in Nigeria's immunization program. As seen in table four, program objectives target increased subnational immunization coverage amongst others. (9),(10),(25) Therefore in assessing donor funding effectiveness, achievement of these objectives are discussed in subsequent paragraphs.

- Immunization coverage

Only a third of eligible children were fully immunized with basic vaccines. The 2018 NDHS reports 31.3% of children fully immunized with basic vaccines in 2018. (19) Although representing a seven percent increase from 2008 immunization coverage reports, (19) it falls short of the current 95% coverage objective. (25) At this rate, achieving coverage objectives remain unlikely even in furtherance of the SDGs.

Additionally non immunized children by 23 months decreased. Children receiving no immunization decreased from 29% in 2008 to 19% in 2018. An inverse relationship to full immunization coverage is seen in figure 5. (19) These findings suggest an increase, though minor of donor funding on immunization coverage. (69),(76)

Figure 5. A graph showing both full and no immunization coverage in percentages in Nigerian infants between 12 to 23 months between 2008 and 2018. (19)



This slow achievement in achieving full immunization coverage is associated with low caregiver education and socio-economic status. (7),(86) Further, the 2018 NDHS identifies disparities in vaccination coverage of 44% and 23% in urban and rural areas respectively. (69) Meeting target population needs in reference to these factors influences full immunization coverage. As findings on relevance note insufficiently met needs, it may contribute to this gradual achievement.

On the other hand while full immunization coverage has been low, coverage by antigen has averaged above 50%. Donors mainly finance SIAs to increase specific coverage of vaccine

⁷ Landscape Analysis of Routine Immunization in Nigeria was undertaken as study in 2011 in Nigeria to perform an analysis of the routine immunization system. (60)

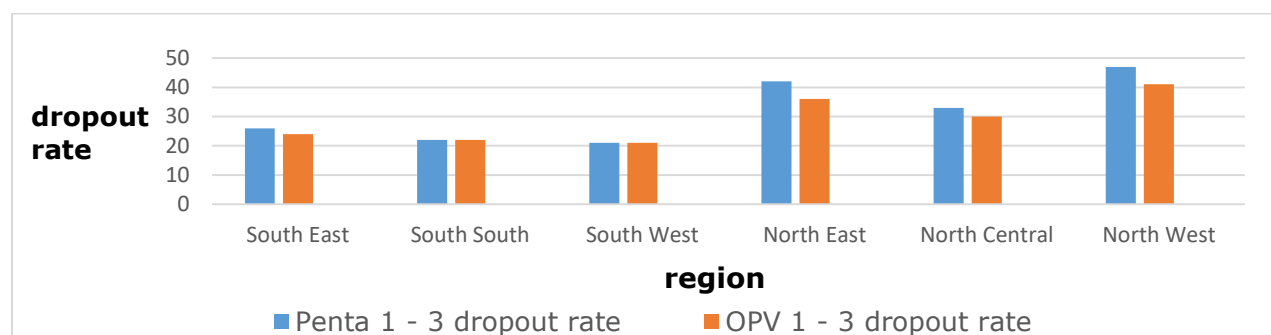
preventable diseases. (25) According to the WHO vaccine preventable disease monitoring system (VPDMS), official Nigeria immunization coverage estimates per antigen were often above 50% (refer Table 5). (87)

Table 5. Nigeria official Estimates of immunization coverage by antigen (87)

vaccine	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
BCG	67	66	60	87	69	73	58	58	53	75
DTP 1	82	84	68	67	72	76	55	55	49	72
DTP3	71	74	61	57	65	70	45	45	33	58
YFV	62	78	72	46	64	71	41	41	39	61
HEP B 3	65	66	57	84	65	70	45	45	33	58
IPV1	--	--	--	--	--	--	45	45	100	93
PCV 3	--	--	--	--	--	--	29	29	104	58
HIB 3	--	--	--	62	55	70	--	--	33	58
MCV 1	81	85	93	78	73	73	43	43	42	63

Comparing coverage per antigen to full vaccination coverage in Nigeria, shows eligible children may receive some not all immunization. Alternatively they may fail to complete the immunization doses. Findings from the 2016 multiple indicator cluster survey revealed an overall 29% drop out rate. (7) Also, disparities in dropout rate⁸ between the first and third doses of oral polio and pentavalent vaccines were noted sub-nationally (see figure 6). High dropout rates affects greater than 10% of eligible children. (7) Taking findings of high dropout rate and inequity in immunization, it follows that attaining coverage levels necessary to induce herd immunity⁹ remains an expectation. This is contrary to immunization funding's aim.

Figure 6. Figure showing the oral polio and pentavalent vaccine immunization dropout rate in (%) by regions in 2016 in Nigeria. (7)



Finally, findings of comparatively better individual antigen coverage might mean its greater effectiveness in funding SIAs. Or by funding SIAs, it hinders RI delivered through EPI. To illustrate, B.Uzochukwu (59) argues that unless polio eradication activities are integrated within RI, it negatively impacts RI service delivery in Nigeria. (59)

- Cold chain and logistics

On one hand donor upgrade of cold chain equipment, resulted in its greater functionality. GAVI (72), EU and UNICEF (10) supported cold chain equipment upgrades. This included some hard-to-reach LGAs in the North-East. (69),(84) Functional equipment eventually increased from 8% to 89% in 2010 and 2014 respectively. (25)

⁸ Dropout rate: difference between children that receive the first and those receiving the last dose in the sequence of immunization. (7)

⁹ Herd immunity is the protection afforded to unvaccinated people when a high fraction of the population are vaccinated. (50)

On the other hand, cold chain dysfunction was noted from inadequate maintenance. With the maintenance of these equipment managed sub nationally, only 41% of states reportedly embarked on equipment maintenance. (25) Findings suggest inadequacy in sub national funding for this complementary recurrent cost even though donors make the capital investment. (25)

Ultimately findings suggest long term cold chain effectiveness less dependent on donor immunization funding. Ineffective cold chain and logistics limits immunization coverage through centralized vaccine storage likely limiting retrieval supply at hard-to-reach LGAs. (60)

- Introduction of new vaccines

The introduced GAVI supported vaccines expanded the immunization schedule. IPV and PCV vaccines were introduced since 2015 (refer table 5). (25),(87) While expanding the range of immunization available, adverse effects like vaccine derived polio are eliminated. (50)

- Advocacy and communication

Weak advocacy for RI was noted. The LARI study reported low political commitment to funding immunization. (60) Further, opinion leaders who could advocate for RI instead hindered community demand. (60)

Since then, donors funding for community advocacy influenced demand positively. (69) UNICEF's engagement of opinion leaders in Ondo, Ekiti, Osun and Oyo states in community immunization awareness contributed to attaining a 95% minimum immunization coverage in these states. (69) Further, by supporting ward development committees, donors promoted increased immunization demand. (69),(72) This is as these committees voice community needs, serving as the link for responsiveness of PHC to the community. (88)

To conclude, the effectiveness of donor funding on Nigeria immunization program reveal higher immunization coverage when funding SIAs in particular. Additionally, Nigeria's health system factors contribute in long term achievements of EPI objectives.

5.4 Impact

What are the results: positive, negative, direct, indirect, intended and unintended of Nigeria's immunization program?

In subsequent paragraphs, the effects of donor funding on Nigeria immunization program on beneficiaries and stakeholders are grouped and presented.

- Direct and Intended

Generally the VPD incidence in Nigeria declined from 2009 according to the WHO VPDMS (refer table 6). (87) But incidence increases in 2018, observably coincide with prior reductions in immunization coverage in 2016 and 2017. (87)

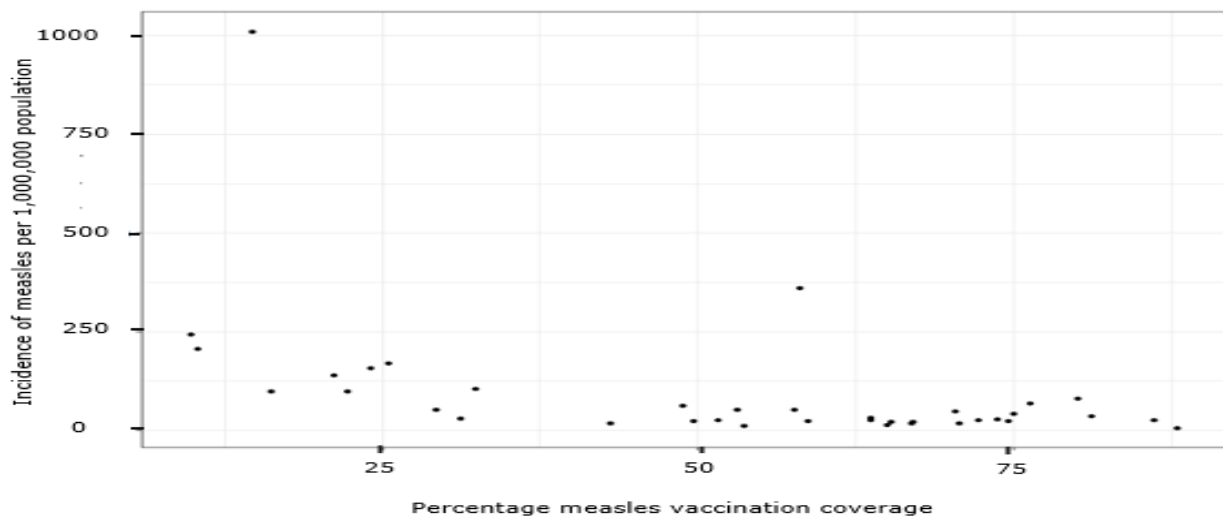
Reductions in VPD incidence are the intended positive consequences of immunization. Unsurprisingly high immunization coverage coincides with declining incidences, according to the WHO VPDMS (see tables 5 & 6). (87) This relationship was noted with yellow fever and DTP 1 and 3 vaccines but not measles. (87) However a 2018 study on measles SIAs found lower measles incidences coinciding with previously high coverage of the MCV1 vaccine (see figure 7). (85) Ultimately, donor immunization funding by increasing equitable immunization coverage was associated with this reduction.

Nevertheless, despite wide search the incidence of disease in immunized children was not accessible. VPDs resulting from vaccine failure resulting from poor cold chain for example could skew this association. In light of previous mentioned sub-national cold chain. (10),(25),(60)

Table 6. Incidence of selected vaccine preventable diseases in Nigeria from 2009 to 2018 (87) (* vaccine derived polio cases are included)

vaccine	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Diphtheria	--	--	0	--	--	--	--	--	0	1870
Yellow Fever	0	0	387	0	0	0	0	0	26	47
Measles	1272	8491	1884 3	6447	5285 2	6855	1243 3	1713 6	1119 0	7063
Polio(*)	543	48	96	130	57	36	1	5	0	34
Pertussis	1128 1	--	0	1162 8	8530	9559	6592	--	4244	7897

Figure 7. Scatter plot showing incidence of measles per 1,000,000 population and percentage measles vaccination coverage through routine immunization and measles campaigns 12 to 23 month old children in Nigeria in 2016 (85)



Except for polio, sub-national VPD incidence data was inaccessible. Five of seven states in the North-West Kaduna, Kano, Katsina, Jigawa, and Zamfara, and Bauchi in the North-East responsible for 90% of wild polio cases in 2006. (5) As well as in 2014 and 2016. (25),(68). This might be linked to the barriers of comparatively lower education and socio-economic status in both regions. (7),(86)

- Direct and Unintended

Health system improvement was not a consistent effect despite a focus on its strengthening. With mixed outcomes, several donors including Bill and Melinda Gates Foundation and Rotary International contributed to strengthening the health system. (59)

First, the donor funding as a bridge over financing gaps in the immunization program may have a negative effect. The LARI study found immunization health workers preferred polio SIA's at the expense of RI because its financial incentives. (60) Financial incentives for staff may enhance program performance. (85),(89) However, selectively applying it to parts of the immunization program may stimulate under-performance on the non-incentivized side because unaddressed remuneration needs are unmet.

Conversely, measles SIAs notably improved RI. (85) This funding unlike polio did not utilize financial incentives, and thus had low potential to demotivate non-participating staff. (85) In short, the nature of donor funding for HSS may have unforeseen effects.

Second, health worker trainings had positive effects. By targeting integrated PHC service delivery during vaccine introductions, (72) health worker training promoted enhanced integration of immunization with other child health interventions (25). Integration creates opportunities through PHC to immunize children through who have missed vaccination. (78) Overall donor funding for training strengthened PHC.

Finally, the effects on funding for improved data management were mixed. While GAVI funding for data management was associated with an increase in quality DHIS 2 reports (72), yet according to the 2016 to 2020 CMYP, wide discrepancies between administrative and WHO/UNICEF estimates exist (25).

This is linked to lower level unskilled health workers resulting from high attrition. (25) Better trained health workers are more likely to migrate to more attractive urban areas or sectors. Ultimately gaps affecting all cycles of immunization data management result.

- Indirect and Intended

U5M reduced with socio-economic and political implications. A 2017 study in Nigeria noted a 49% reduction from 213 to 161 deaths per 1000 live births in U5MR between 2003 and 2013. (17) However findings revealed a significant association between receiving tetanus injection at birth and U5MR reduction in 2003, and not in 2008 and 2013. (17) But since the entirety of immunization is not considered it remains unknown if results speak more to access to immunization health services or immunizations role in U5MR.

Known factors in this time however include donor immunization funding accessed along with reduced VPD incidence. These may be linked with observed improved child survival. (34) Further, savings from illness cost may be invested in education. Potentially contributing to improving the Nigeria's economy and reducing future aid need eventually.

- Indirect and Unintended

Despite donor funding for vaccines, they may be unavailable. Government co-financing sees funds released for vaccine procurement in the second half of the year because of the budget cycle. (39) Accordingly, vaccine provision is interrupted in the first half of the year. (60) Unavailability of vaccines despite donor funds is not intended yet it occurs because of the prevailing political process. For this reason dysfunctional administrative political processes may be masked by funding, limiting problem detection and correction, and program sustainability following donor exit.

How many people were affected by Nigeria's immunization program?

Approximately seven million children were targeted with immunization. According to the 2011 to 2015 and 2016 to 2020 CMYP, the birth cohort of about seven million children were targeted. (10),(25) With donor funding averaging 25% to 30% of immunization funds, these would potentially have reached approximately 1,750,000 to 2,100,000 of the targeted children. (10),(25) Extending also to their families in cost savings and emotional stability, as they survive. But with only approximately 30% of children reached with full immunization between 2008 and 2018, two thirds of the target were partially covered. (10),(19)

5.5 Sustainability

To what level are the benefits of Nigeria's immunization program likely to continue at the cessation of donor funding?

Since donor funding on the EPI potentially reaches 1.7 to 2.1 million children, it follows that they risk being unimmunized at its cessation. As donor immunization funding wanes with Nigeria's economic advancement (27), the program continuity is discussed subsequently.

- Continuity sub-nationally

With increasing immunization costs, state and LGA generation of health budget for immunization remains variable. Uzochukwu and colleagues (59) argue that because of the introduction of new vaccines, LGA immunization cost increased by 16% from \$167,831 to \$194,697 between 2008 and 2012. (59) Yet states have variable internal revenue generation

ranging from N1.6 billion naira in Lagos (South-West Nigeria) to N196 million naira in Yobe (North-East Nigeria). (90) Variation in public per capita health expenditure is also observed. (91) In these circumstances ensuring equitable coverage sub-nationally is unlikely and funding shortages in states with low fiscal space and or health expenditure.

Additionally, budget lines for immunization are only established federally. A 2016 study revealed absence of immunization budget line in states and LGAs. (92) This is despite federal budget lines reflecting high immunization priority. (60)

Without a budget line immunization funding is not guaranteed, as expenses are not easily identified for budgetary allocation. Thus limiting funding continuity and expansion of current regional disparity.

- Community ownership

Community participation is increasing. (59) Increased participation of community was earlier mentioned. (69) This is important as the community must own and prioritize child immunization if immunization demand must continue.

Community ownership can be linked to greater awareness of the (un) achievements of the program. Findings from the LARI study suggest that immunization data is not disseminated publicly. (60) Eventual community fatigue could result at the termination of donor funding, if people do not know the impact of their (non) participation. Given immunization boycott in 2003, community participation is pivotal in sustaining immunization achievements. (5)

CHAPTER 6: COMPARATIVE ASSESSMENT OF DONOR FUNDING ON GHANA AND KENYA IMMUNIZATION PROGRAM TO IDENTIFY ALTERNATE IMMUNIZATION FINANCING ARRANGEMENTS

To attain the third specific objective, an assessment of donor funding of Kenya and Ghana's immunization program is made. First country immunization program components are identified, then donor funding on each national immunization program's assessed using the DAC criteria.

Table 7. Table showing the immunization financing from all sources in US dollars (\$) in 2014 in Ghana and Kenya. (93),(94)

Source of funding	Amount funded in Ghana	Amount Funded in Kenya
Total government	5,335,036	6,245,400
GAVI	18,890,710	30,305,500
UNICEF	660,837	3,068,603
WHO	2,907,066	20,548,209
Rotary International	25,323	--
Church of Jesus	10,336	--
KFW	--	5,955,031
CHAI	--	475,350
Total funding for immunization	27,655,093	65,658,093

6.1 Ghana

6.1.1 Current sources of immunization funding in Ghana

On the Ghana EPI donors play a significant role as a major funder of total immunization financing. According to the 2014 GAVI Ghana annual report, donors contribute approximate 80% of all financing for immunization in Ghana (refer table 7). (93)

6.1.2 Magnitude of immunization funding

Of immunization funds, vaccines procurement receives the largest percentage. Total immunization funding in Ghana amounted to \$27,655,093 in 2014. (93) Further between 2015 and 2019, \$218.8million equivalent to 77% funds will procure vaccines. (95)

However subnational immunization funding remained unclear.

6.1.3 Assessment of donor funding on Ghana's immunization program

Donor funding on the Ghana EPI is subsequently assessed using the DAC criteria.

Relevance

How were the outputs of Ghana's immunization program consistent with overall policies, priorities and objectives of the EPI and donors?

Likewise Nigeria findings, outputs of the Ghana EPI were consistent with overall EPI policies and objectives. The CMYP equally guided EPI implementation in Ghana. (95),(96) Thereby immunization services delivered further the achievement of EPI's objectives in table 8.

Table 8. Table showing an overview of the current (2015 to 2019) objectives of the EPI in Ghana. (95)

Objectives of the GHANA EPI	
1	By 2019, reaching all targeted children with childhood immunization to achieve and sustain 95% coverage in all antigens (in pregnant women 85% coverage of Tetanus-diphtheria (Td)) by 2019
2	Improving advocacy and communication
3	Strengthening of the surveillance system
4	Improving EPI management and integration within the health system
5	Ensuring that sustainable access of the EPI to predictable funding, quality vaccine supply and new technologies

Similarly, Ghana EPI outputs were consistent with donor priorities. The 2015 to 2019 Ghana CMYP, outline EPI objectives aligned with donor immunization priorities (see annex 4). (95) Meaning in delivering EPI outputs, not only the EPI but also donor objectives were met.

For instance, donor funding supported new vaccine introductions. In 2012 Ghana reported introduction of three GAVI supported vaccines in its RI schedule. (95) Thereby facilitating expansion of immunization antigens in line with program objectives.

How were the outputs of Ghana’s immunization program aligned with the needs of the targeted children and their caregivers?

Ghana’s EPI equally targeted all eligible children as beneficiaries of immunization services. (96)(93) It follows that the need for VPD protection for all children were potentially met. Targeting all eligible children potentially ensures excluding factors are overcome in EPI implementation.

Are the objectives of Ghana’s immunization program still valid?

As seen from table 8, equity is promoted as all children are targeted EPI beneficiaries. (95) Equity should improve immunization demand in Ghana (95), thus contributing to child survival and SDG achievements. (34)

In summary, findings reveal a relevant EPI along with donor funding of its outputs in Ghana.

Efficiency

How cost-efficient were activities on Ghana’s immunization program?

By Ghana’s EPI procuring GAVI and other vaccines through UNICEF’s procurement system, competitive prices are gotten. (93),(95) Like Nigeria, this maximizes the utility of finances for vaccines. Considering over two thirds of current funding is allocated vaccine procurement and logistics. (95)

Efficiency in immunization delivery is higher in rural than urban areas. According to L.Gargasson (97) unit costs in immunization delivery were higher in urban than rural facilities. (97) Further rural facilities were less wasteful. (97)

Using cost-effective technologies, and or immunization task shifting to lower cadres may promote efficiency in rural facilities. Additionally GAVI supported civil society organizations delivering immunization services in hard-to-reach areas. By involving the private sector in this way greater efficiency may be promoted.

Effectiveness

What was the level of achievement of Ghana’s immunization program objectives expressed the CMYP?

Despite significant donor funding for vaccines in Ghana, immunization coverage targets have been unmet. First, Ghana Demographic and Health Survey, (98) reported 71% of infants were fully vaccinated in 2014. (98) Despite high donor funding, (93) this represents a negligible

change from baseline of 70% in 2008 (98). Wide regional coverage disparities (99) may explain this.

Further, achieving the main objective of 95% coverage of all antigens is unmet. As seen in table 9 three of nine antigens are below 95% coverage. In this and the plateaued full immunization, it means some children are unreached or partially covered by immunization.

On the other hand logistics has improved. According to Ghana's 2015 to 2019 CMYP, donor funding contributed to improved cold chain capacity. (95) Thus ensuring available vaccines and contributing to equitable immunization delivery.

Table 9. Table showing the official estimates from 2014 to 2018 of immunization coverage by antigen in 12 to 23 months old in Ghana. (100)

vaccine	2014	2015	2016	2017	2018
BCG	99	97	94	99	98
DTP 1	100	97	94	99	97
DTP3	98	89	93	99	97
YFV	92	88	88	86	91
HEP B 3	98	89	93	99	97
IPV1*	--	--	--	--	55
PCV 3	98	84	93	99	96
HIB 3	98	89	93	99	97
MCV 1	92	89	89	95	92

Impact

What are the results: positive, negative, direct, indirect, intended and unintended of Ghana's immunization program?

- Direct and intended

Generally, the incidence of VPDs have declined in Ghana. According to Ghana's official incidence estimate between 2014 and 2018 VPDs have declined. (95) A pattern of reduced VPDs is seen when corresponding immunization coverage is high in tables 9 and 10. This positive and sustained result is a direct and intended result of immunization.

Noting higher donor immunization funding in Ghana (93) than Nigeria (25),(70), these effects may be linked to donor funding. However the effects of government contribution cannot be disentangled.

Table 10. Table showing the incidence of selected vaccine preventable diseases reported in Ghana between 2014 and 2018.(95)

vaccine	2014	2015	2016	2017	2018
Diphtheria	0	0	0	0	0
Yellow Fever	0	0	1	0	0
Measles	124	23	32	19	34
Polio(*)	0	0	0	0	0
Pertussis	0	21	123	0	8

Further donor funding for regional data generation improved immunization planning regionally. UNICEF (99) and GAVI (93) supported regional data generation to improve regional planning. These plans are more likely responsive by prioritizing local needs likely obscure when plans are centralized.

Finally, donor immunization funding enabled predictable vaccine supply. As mentioned, the immunization schedule expanded through donor funding. (95) This along with donor supported vaccine procurement has ensured vaccine availability in Ghana.

- Indirect and intended

U5M reduced enabling achievement of SDGs in Ghana. The 2014 Ghana district health survey, noted U5MR reduction from 81 deaths per 1000 live births to 60 deaths per 100 live births. (98) Like Nigeria, donor (along with government) immunization funding likely contributed to this reduction along with other child and maternal health interventions in line with the SDGs.

How many people were affected by Ghana's immunization program?

Ghana's EPI targeted about a million children annually for immunization. (93) These represent families and communities that the EPI impacted by their survival. In 2014 since donors contributed about 80% of the immunization funding this may represent service delivered to about eight out of ten children targeted. Children at risk of non-immunization at donor exit unless funding is sustained.

Sustainability

To what level are the benefits of Ghana's immunization program likely to continue at the cessation of donor funding?

On one hand Ghana plans to adopt GAVI funding following transition off GAVI support in its EPI. Similar to the Nigeria federal government, an immunization budget line is planned. (95) The resulting clear identification of immunization expenses may secure immunization funding from encroachment by other priorities, and adequate funding. (95)

On the other hand with rising costs, the likelihood to cover funds from domestic sources poses a challenge. According to L.Gargasson (97) RI costs per child have risen from \$9.7 to \$60. (97) Accordingly a six fold increase in the immunization fiscal space is required. But reported declining government funding poses a threat (95) in domestic coverage of this gap.

6.1.4 Concluding remarks on Ghana's immunization program

Ghana's engages the private sector through civil society organizations in increasing the EPI's efficiency. Still regional disparities have resulted in negligible changes in achievement of full immunization coverage.

With donors as significant contributors to immunization funding than Nigeria and rising immunization costs, sustainability remains a challenge in Ghana at donor exit. However, Ghana's immunization budget line, increases the likelihood of continuing donor achievements.

6.2 Kenya

6.2.1 Current sources of immunization funding in Kenya

In funding Kenya's EPI, donors are significant contributors. Similar to findings in Ghana, up to 81% of financing was reportedly from donor sources in Kenya (refer table 7). (94) Further GAVI was the largest funder, playing a role in ensuring adequate vaccine supplies. (94)

6.2.2 Magnitude of immunization funding in Kenya

As seen in table 7, in Kenya total immunization funding amounted to \$65,658,093 in 2014. (94) Similar to Nigeria and Ghana, subnational funding remained unclear. This is important to identify if resources for immunization are channeled to counties most in need.

6.2.3 Assessment of donor funding on Kenya's immunization program

In accessing Kenya's EPI subsequently, the DAC criteria is also used.

Relevance

How were the outputs of Kenya's immunization program consistent with overall policies, priorities and objectives of Kenya's EPI and donors?

Kenya's EPI outputs were consistent with the objectives of its EPI. Likewise both countries, objectives in the CMYP guided program implementation. (94) This equally means in Kenya, EPI outputs were defined by these objectives (see table 11). Hence funding of these outputs were relevant.

Table 11. Table showing an overview of 2015 to 2019 multiyear planning objectives in Kenya's EPI (94)

	Summary of objectives of the Kenya EPI
1	To ensure quality of vaccines and related supplies
2	To ensure adequate and coordinated national and sub-national immunization planning and implementation
3	To ensure adequate training and availability of immunization healthcare workers at all levels
4	To increase and ensure adequate and timely immunization financing
5	To ensure DTP 3 coverage above 80% in 80% of sub counties by 2018
6	To ensure dropout rates below 10% in all counties by 2018
7	To ensure full immunization of 90% of children by 12 months
8	To introduce new vaccines and technologies in routine immunization by 2015
9	To ensure adequate and timely immunization and adverse events following immunization reports
10	To strengthen data and laboratory support management
11	To strengthen and expand the vaccine supply and cold chain capacity at national and sub-national levels
12	To strengthen community participation in at least 80% of sub-counties by 2015

These outputs were also consistent with donor priorities and objectives, as found on Nigeria's and Ghana's EPI. By donors funding the EPI and its objectives targeting the entire immunization system, it also aligned with donor objectives (see annex 4).

To illustrate, in line with donor objectives new vaccines expanded the Kenya immunization schedule. New vaccines were introduced for RI in Kenya. (94) This introduction is consistent with donor objectives to support vaccine introduction and supply. (76)-(78),(101) Thus making funding for these outputs relevant.

How were the outputs of Kenya's immunization program aligned with the needs of the targeted children and their caregivers?

Kenya EPI outputs aligned with target children and caregiver needs. Likewise Nigeria and Ghana, the entire Kenya birth cohort is targeted immunization beneficiaries. (94) Thus affording all potential protection from VPDs.

However, low immunization was associated with the level of education and location of delivery. (102),(103) By EPI objectives to strengthen community participation (see table 11), these needs may be likely addressed. This could be through addressing negative perceptions limiting immunization demand.

Are the objectives of Kenya’s immunization program still valid?

Kenya aimed for inclusion of all children similar to Nigeria and Ghana. This potentially sets EPI implementation to ameliorate identified barriers to low immunization, that lead to exclusion (94)

To summarize relevance of donor funding on Kenya’s immunization program has met the priorities policies and needs of donors, the EPI and for the target population.

Efficiency

How cost-efficient were activities on Kenya’s immunization program?

Increased efficiency on Kenya’s EPI were noted. First, just as in Ghana and Nigeria, through GAVI and UNICEF vaccines are gotten at a competitive price. (94) Like discussed this enables economy in immunization finances.

Then, the 2013 Kenya Health Sector Strategic and Investment Plan notes the Kenya government coordinated immunization partners. (104) This coordination harmonizes interventions to reduce duplication. This may be linked to better efficiency, as identified allocative inefficiencies associated with duplication of donor (and even domestic) resources are eliminated.

Finally, efficiency in Kenya’s EPI through private sector engagement is noted. Vaccine logistics between national and sub-national stores is fully contracted to the private sector. (94) This strategy may likely be employed with the assumption that the private sector is profit driven. So greater efficiency while sustaining services may be employed to drive profits. (94) However, this may be linked to reduction in quality without adequate government supervision.

Effectiveness

What was the level of achievement of Kenya’s immunization program objectives expressed the CMYP?

Generally, there has been an increase in official coverage estimates of immunization antigens (see table 12). (105) Achievement of 80% coverage of DTP 3 in particular was reduce overall RI achievement as the focus may likely remain on DTP and not other vaccines. Thus limiting full vaccination.

Table 12. Table showing the official estimates from 2014 to 2018 of immunization coverage by antigen in 12 to 23 months old in Kenya. (105)

vaccine	2014	2015	2016	2017	2018
BCG	81	74	86	76	82
DTP 1	88	81	84	76	85
DTP3	81	78	78	71	81
YFV	30	20	10	32	47
HEP B 3	81	78	78	71	81
IPV1	--	--	59	67	77
PCV 3	91	75	78	69	84
HIB 3	81	78	78	71	81
MCV 1	79	68	75	75	79

Speaking of full immunization coverage, inequity hindered its achievements. The 2014 Kenya District Health Survey noted full immunization coverage decreases from 79% in 2008 to 77%. (106) This may be explained by findings of inequity. (94),(107) By program favoring the wealthy the poor are likely excluded and remain unreached.

On the other hand, donor funding has also expanded Kenya's immunization schedule. Pentavalent, pneumococcal and rotavirus vaccines amongst others were introduced in Kenya's immunization schedule. (108) Thus similar to Nigeria and Ghana, donor immunization funding contributed to expanding VPD prevention in Kenya.

As described, donor funding has mixed achievements on Kenya's immunization program.

Impact

What are the results: positive, negative, direct, indirect, intended and unintended of Kenya's immunization program?

- Direct and intended

Funding for SIA advocacy led to increased general community immunization awareness. According to Kenya's 2015 to 2019 CMYP following polio SIA's increased community awareness on immunization importance was noted. (94) Investments for advocacy have been linked to increasing immunization demand. (107) This is a positive intended and direct effect of donor funding, likely increasing immunization coverage.

- Direct and unintended

Conversely, knowledge of RI was overshadowed by polio following SIAs. As donors largely fund polio SIAs (94) parallel SIA implementation of SIA's from RI might overshadow RI activities. The Nigeria LARI study found similar findings. (60)

Surprisingly, Kenya's coordination of donor immunization investments potentially can but appears ineffective in minimizing this disintegration. (104) Altogether the impact of donor immunization funding in Kenya both positive intended and negative unintended.

How many people were affected by Kenya's immunization program?

Kenya's EPI targeted about 1.5 million children annually. (108) With donors funding about 81% of immunization services (94), this can be said to represent the reach of 1.2 million targeted children. Likewise Ghana, this represents eight of ten children and families reached by donor funding. Children whose immunization is unlikely if funding in Kenya's EPI is not sustained at exit.

Sustainability

To what level are the benefits of Kenya's immunization program likely to continue at the cessation of donor funding?

To continue benefits attained utilizing donor funds on Kenya's EPI, Kenya developed a sustainability plan. (94) This may be linked to better adoption of funding gaps at donor exit. In any case it addresses GAVI's co-financing policy by promoting government budgetary adoption of immunization costs to sustain program achievements. (71)

Additionally, the Kenya government plans expansion of immunization's fiscal space. This J.Ojal (109) argues will support sustainability of Kenya's EPI. In deed to continue the protective benefit of the current expanded immunization schedule in Kenya, this is vital.

However, with the significant donor immunization funding, government adoption of funding gaps might be harder achieved. Considering the bulk of financing covered by GAVI, sustainability requires great government commitment. At the moment however, unlike Nigeria and Ghana transitioning is not in view for Kenya. (108) Within the intervening time until transition, sustainability plans can still be refined and implemented.

6.2.4 Concluding remarks on Kenya's immunization program

Like Ghana, Kenya engages the private sector through contracting of immunization logistics to increase EPI efficiency.

Likewise negative impacts on RI in Nigeria, polio SIAs even though increasing immunization awareness negatively overshadows awareness on routine immunization.

Still, donor immunization funding contributed to expanding the immunization schedule in Kenya. Equally in Nigeria and Ghana. However, inequities limited the Kenya's achievements of full immunization coverage.

CHAPTER 7: DISCUSSION

This review set out to assess donor funding's achievement of Nigeria's immunization program targets. By comparing similar middle income countries, alternative immunization financing was identified to inform recommendations for increased immunization coverage in Nigeria. Consequently, findings have demonstrated the components, relevance, efficiency, effectiveness, impact and sustainability of donor funding on Nigeria's EPI, including comparisons with Ghana and Kenya's EPI.

So, the discussion is presented into two sub-headings. That is Nigeria's immunization funding components, and assessment of the Nigeria immunization program targets linked to that of Ghana and Kenya.

7.1 Nigeria's immunization funding components

This review found an increasing role of Nigeria's government funding immunization. Overall, government immunization funding increased from 40% in 2006 (10) to 70% in 2013 (25). This increase is anticipated within this transition period off GAVI funding and declining donor immunization funding. Evidently, donor immunization funding reduced from 60% in 2006 (10) to 30% in 2013 (25). This corresponds to Nigeria's transition off GAVI funding with her economic advancement. Therefore, the Nigeria government at all levels must continue to increase its immunization funding to adopt immunization funding gaps at donor exit.

This implies increasing health's priority status nationally, and a correspondingly increased fiscal space especially as the minimum benchmark is unattained. In this review, the Nigeria's federal government's budgetary allocation of 5% did not meet the 15% minimum health spending agreed by African governments. (21),(45) At this budgetary level, health remains un-prioritized amongst sectors. This needs to be reversed to ensure adequate fiscal space for immunization as a component of health.

Next, the magnitude of donor immunization funding particularly for SIAs remains unclear. Despite wide search for information on the magnitude of immunization donor funding, little information was obtained.

Therefore information is limited to inform adequate government adoption of immunization funding in Nigeria. Without clarity on the magnitude of donors' funds, how can immunization funding including that of SIAs be adequately adopted? Additionally this information provides the basis for stakeholders and the community to advocate for adequate immunization funding by legislators.

Further transparency on donor immunization funding, ensures the government at all levels meanwhile can be held accountable in fund utilization to mitigate corruption. This is as donor funding at present contributes to expanding immunization's fiscal space.

7.2 Assessment of donor funding's achievement of Nigeria's immunization program and comparison with that of Ghana and Kenya

Relevance

This review showed by funding the implementation of CMYPs based on target population needs and national priorities, donor immunization funding was relevant. This was noted in Nigeria as well as Kenya and Ghana.

Evidently, donor funding's relevance depends on the quality of national multiyear planning. Decentralized planning like that in Ghana facilitate focus on sub-national priorities that better prioritize local needs in the communities and on the immunization program.

This has implications in increasing immunization coverage in Nigeria with high inequality. (30) In order to reach marginalized populations and attain prevailing 90% sub-national immunization coverage, context specific planning will contribute to eliminating sub-national immunization inequities. Including indirect costs limiting immunization access in Nigeria. (79)

Given the above, donor immunization funding for the EPI was relevant. It will however remain relevant to the extent that needs and priorities of target group and overall program are met.

Efficiency

Generally, the cost-effectiveness of immunization justified donor (and government) funding. (5),(11),(50) Additionally, current vaccine procurement pooled through both the GAVI and UNICEF mechanisms, ensures cost savings through reduced unit prices. (81) By these, economy of resources was secured in Nigeria, and similarly in Ghana and Kenya.

On the other hand, inconsistent data use to improve Nigeria's EPI management was found. Although GAVI supported learning from EPI program data, data was not always utilized in improving the EPI. Further, learning through data feedback to lower levels was low. The benefits of its facilitation of waste prevention and inappropriate resource use in Nigeria was therefore limited.

Low data use in Nigeria may be linked to the poor organization and performance of Nigeria's health system. (36) Insufficient health workers at PHC and rural levels, might mean that data is incorrectly and inconsistently generated resulting in inefficiency. This may explain wide discrepancies between administrative and UNICEF-WHO data in Nigeria. For this reason data becomes less useful in decision making.

However, private sector involvement in immunization program delivery in Ghana and Kenya increased efficiency. In Kenya efficient logistics resulted from private sector contracting. While in Ghana civil society organizations delivered immunization in rural areas. Efficient EPI delivery in rural compared to urban facilities was observed in Ghana. (97)

Whether this efficiency was linked to the private sector involvement or generally to implementation of cost-effective PHC strategies in rural areas remains unclear. Either way efficiency is expected to increase, making a case for consideration in Nigeria.

By incorporating the private sector in Nigeria's immunization program, efficiency might improve. Overall, their set up to maximize profits might result in reduced waste and inefficiencies. For this same reason, it may be argued that the private sector is not equipped to deliver a public good like immunization without reduction in quality. Ultimately, the robust private sector health delivery remains an untapped opportunity for integration in Nigeria. Particularly as the national health policy makes provision for their delivery of primary level care.

Institution of adequate regulatory and legal framework for their integration would protect the quality of services rendered. This integration can be staggered to enable learning from research into their effects where piloted, and further adaptation to the Nigeria system.

Therefore findings reveal the mixed efficiency of donor immunization funding. EPI implementation and its organization within the health system potentially affects donor immunization funding efficiency.

Effectiveness

Donor funding was more effective in increasing individual immunization antigen compared to full immunization coverage. Immunization coverage per antigen was generally higher than 50% in the review. On contrary full immunization coverage increased only slightly. As an eight percentage point increase from 2008 to 31% in 2018 was observed in Nigeria. (19)

This is likely the consequence of Nigeria's immunization program delivering RI through the EPI, and a parallel organizational and financial system delivering SIAs. Results showed this to negatively affect EPI and achievement of its objectives. (59) This presents a fragmentation in resources for immunization. Additionally, because state resources deliver immunization and SIAs depend on state employed health workers amongst other resources, it diverts attention from the EPI.

This system is contrary to the integrated nature of PHC on which the Nigeria health system is based. Ineffectiveness of donor funding's in achieving full immunization coverage is likely to continue through this system. Hence creating need for integration of both the EPI and SIA, along with further integration of immunization within PHC delivery in Nigeria. This synergizes resources for immunization particularly because the NPHCDA delivers both the EPI, PHC and measles SIAs at the moment.

In the three countries reviewed, donor funding effectively achieved vaccine and cold chain procurement objectives. Consequently supporting immunization schedule expansion through addition of new vaccines. This might be because procurements are less dependent and affected by all elements of the health system. With the low performing Nigeria health system, measuring its attainment of procurement objectives may be less challenging and encourage donor's investment.

In summary donor immunization funding effectiveness is high in meeting procurement objectives. In increasing immunization coverage, integration of the EPI and SIAs may lead to greater full immunization coverage achievement in children.

Impact

Positive direct and intended consequences of donor funding on Nigeria's immunization program were found. Donor immunization funding was associated with declining incidences of VPDs. This decline was shown to correlate with periods of high immunization coverage.

But other positive and direct effects may be unidentified. For instance in the context of crises in Northern Nigeria, RI may be piggy-backed to deliver other child health interventions and health education. In this case its delivery with PHC ensures children are reached by a comprehensive package inclusive of immunization for their survival.

On the contrary, the health system endured unintended negative consequences from donor funding of the SIAs. This was linked to the fragmentation between EPI and SIAs in Nigeria discussed earlier. Specifically, financial incentives on polio SIA's demotivated RI staff. (60)

Finally, although a reduction in under-five mortality was associated with immunization funding, the reduction attributable to immunization remains unknown. It is assumed to however have contributed to this reduction in all three countries because of immunizations identified role in reducing the burden of VPDs. (50),(51)

In short, donor immunization funding had mixed effects on Nigeria's immunization program

Sustainability

In this review the sustainability of donor funded immunization program achievements in Nigeria varies sub-nationally.

Varying sub-national health expenditures was seen. Also magnitude of sub-national immunization funding at state level was unclear. This along with 16% increase in immunization costs in Nigeria (59), mean some states are at risk of non-adoption of immunization costs.

Furthermore, sub-national budget lines are not established to guarantee immunization funding. This review demonstrated the absence of immunization line budgets at states and LGAs. Their absence makes identifying and budgeting for immunization difficult sub-nationally. Hence less protection for encroaching competing sectorial needs.

In both situations above immunization delivery is at risk. Particularly because immunization coverage is lower in the North than South Nigeria. It is important to know how much and the adequacy of immunization funding to meet needs.

Other states can learn lessons from Zamfara and Bauchi states in sustainably raising additional funding through basket funding. But could financial savings with reference to efficiency gains from private sector involvement mentioned previously lead to monetary transfer to states with greater need? Whichever happens, Nigeria's government at all levels should cue that of Kenya, committing to increasing the fiscal space for immunization as a means to guarantee immunization funding going forward.

Nigeria's government at all levels adopting immunization funding is important to continue to reach the 2.1 million children reached by donor funding in Nigeria. In particular, legislators should be especially motivated to reach Nigeria's worrying 3.9 million unvaccinated children reported in 2017. (33)

7.4 Relevance of the conceptual framework

The DAC criteria was useful in accessing donor funding for Nigeria's immunization program and that of Ghana and Kenya. The criteria description and definitions helped in operationalizing its application in this study. The conceptual framework's strength was its focus on assessing the characteristics of donor funding.

7.5 Limitations of the study

1. This review mainly assessed online literature. Although extensive search clarified some inconsistencies, accessing donor data would have further enlightened this study.
2. The CMYP provided more extensive EPI compared to SIA information in Nigeria limiting analysis.
3. Despite extensive search, the magnitude of subnational immunization funding in Nigeria was unapparent.
4. Similarly, only regional disaggregated data highlighted differences in sub-national immunization need.
5. Despite Kenya and Ghana's similarity to Nigeria, socio-culturally Nigeria is different. So their comparative assessment may still not provide enough context for complete adoption in Nigeria.

CHAPTER 8: CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

Nigeria has a large young population where child interventions will continue to be relevant with her high fertility rate. The Nigerian government has played an increasing role in funding immunization within the review period. Further, donors complement the Nigerian government in providing immunization for children under-five.

In spite of this complementary support, immunization coverage has slowly improved. Therefore an assessment for donor funding for Nigeria's immunization program was done to characterize its achievement of program objectives.

Donor funding has been relevant on Nigeria's immunization program. Outputs have been consistent with priorities of donors, the EPI and target population. Its funding remains valid in achieving program objectives.

However it has had mixed efficiency. Vaccines have been procured at competitive market prices on one hand. On the other, inconsistent learning to improve Nigeria's immunization program has decreased its efficiency.

Donor funding on Nigeria's immunization program has had mixed effectiveness. It has been highly effective in increasing individual antigen coverage following SIA's and in securing vaccine and cold chain equipment. Yet, its level of achievement has been low in promoting the full immunization coverage in the review period. Findings of SIAs implemented parallel to RI has lowered its overall effectiveness of Nigeria's immunization program.

Donor funding has had both positive and negative effects on Nigeria's immunization program. Positive effects directly resulting in the reduction in VPDs and increased community participation. Negative effects on RI was noted as an indirect unintended effect.

For its sustainability, mixed possibility in continuity of donor funded achievements were noted sub-nationally. Variable sub-national health expenditure and absence of subnational budget lines threaten the sustainability of achievements in Nigeria.

Lessons learnt from Ghana and Kenya's immunization program revealed greater private sector involvement. In Ghana this is achieved through civil society meeting service delivery in hard-to-reach areas. Whereas in Kenya, private for profit sector is employed in logistics. These increase efficiency and effectiveness potentially but require regulation in maintaining quality.

8.2 Recommendations

The following recommendations are made to address this review's findings. Presently, these should contribute to increasing the effectiveness of donor funding for Nigeria's immunization program. Eventually they are expected to contribute to sustaining immunization program achievements following donor exit. Recommendations addressing immunization program policy, implementation and research are grouped and presented:

8.2.1 For immunization program policy

1. State legislators should adopt a 15% minimum budgetary health expenditure in line with the national health policy. This ensures at the minimum adequacy of fiscal space for health while potentially expanding that for immunization. This is necessary to promote the adoption of immunization costs in furtherance of sustainability
2. State legislators should ensure the formulation and adoption of subnational budget line for immunization. This promotes the easy identification of immunization expenses. While also leading to greater security of immunization budgets from competing state interests.
3. Federal legislators should ensure transparency in the magnitude of funding utilized for SIAs. This will promote clarity funding amounts to facilitate the adoption of funding for SIAs at federal and state levels as they are integrated with RI services.

8.2.2 For immunization program implementation

To ensure effectiveness of the immunization program all stakeholders must be involved:

1. The federal government should formally integrate the private sector in immunization delivery. This can be staggered and directed at engaging private not-for-profits or civil society already providing health care in Nigeria. Additionally their community presence across the states in Nigeria engender greater community participation. But government's regulation is required to maintain quality.
2. The federal government should ensure SIA's are delivered integrated with RI services. This would require the government through the NPHCDA to provide greater oversight of immunization as a component of PHC.
3. Donors should refocus immunization funding to support RI alongside SIAs. This is to prevent the negative effects of donor funding on RI where SIA's alone are funded. This integrated approach would align with earlier recommendations to the federal government.
4. Civil society should institute advocacy to the government at all levels to scale up immunization funding. Thus contributing financial sustainability following donor exit.

8.3.3 For immunization program research

1. The federal ministry of health should commission research identifying the magnitude of Nigeria's sub-national immunization funding
2. Researchers should identify to what extent sub-national immunization funding meets sub-national needs
3. Researchers should characterize the effects of private sector involvement in Nigeria's immunization program

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ANNEX

Annex 1: The EPI schedule in Nigeria. Includes the timing, target population, and type and dose of vaccines (* immunization for child-bearing women). (25)

Vaccine name	Target population	Vaccine Classification	1st dose	2nd dose	3rd dose
Hep-B	Birth	Underused	Birth		
Oral Polio Vaccine	Birth	Traditional	Birth	6 weeks	10 weeks
BCG	Birth	Traditional	Birth		
Vitamin A	Infants surviving the birth cohort	Underused	6 months	Vitamin A	
Pentavalent Vaccine (DPT-HepB-Hib)	Infants surviving the birth cohort	Underused	6 weeks	10 weeks	14 weeks
Measles	Surviving infants	Traditional	9 months		
Yellow Fever	Infants surviving the birth cohort	Traditional	9 months		

Annex 2: Overview of accelerated disease control for polio and measles in Nigeria

Polio Eradication Initiative

This targets the eradication of polio through SIAs usually carried out 4 to six times yearly. (9) SIAs for polio largely target northern states where the burden of polio has been highest. (9)

The polio eradication initiative is implemented through a National Polio Eradication Emergency Plan. (10),(25) This governance of the initiative by the National Emergency Operation Center that coordinates national and donor SIAs in polio eradication. (10) Through its state offices the State Emergency Operation Centre, implementation of polio eradication is carried out nationwide. (10)

Thus its organization structure is parallel and separate from the organization of the EPI described in section 1.6. Its funding also is parallel to that of the EPI with expressed interests in using resources for the PEI to influence routine immunization. (9)

Measles SIA

This targets the control of measles nationwide. (9) It was instituted to reduce under-five mortality attributable to measles in Nigeria. (9) The targeted population differs from that of the EPI by targeting immunization of children between nine and 59 months. (85)

Measles SIAs have been coordinated by the federal ministry of health through the NPHCDA. (85) Its implementation utilizes polio eradication initiative structures nationwide. (85)

Measles SIAs have been staggered. First targeting 19 northern states in 2005, followed by 17 southern states in 2006. (9) Additional campaigns occurred in 2008, 2011 and 2013. (25)

Funding is by both government and donors. Federal government finances transportation and remuneration of vaccination teams, while state governments finance that of state and local

government immunization officers during measles SIAs. (85) Donors through GAVI funded measles SIA in 2013 and 2015 channeled through the federal ministry of health, but utilized UNICEF and WHO in 2017. (85)

Annex 3: Search table with keywords used for specific objectives and sources

Source	Keywords used singly or in combination along with Boolean Operator AND or OR in search strategy		
	Objective 1	Objective 2	Objective 3
Database, search engine or online library PubMed Research Gate Jstor Vrije Universiteit online library Google Google Scholar	Nigeria/Sub-Saharan Africa Immunization OR EPI OR Vaccination Funding OR Aid Targets Donor OR External OECD GAVI UNICEF Supplementary Immunization Activities Magnitude OR amount Flow	Nigeria North Nigeria South Nigeria Relevance OR Importance OR suitability Advocacy Communication Output Efficiency Cost-effectiveness Cost Cost analysis Nigeria/Sub-Saharan Africa Effectiveness OR Achievement Impact OR Effects OR Consequences Sustainability OR continuity Targets Comprehensive multiyear plans Objectives Needs Target population	Ghana Ghana regions Kenya Kenya counties Relevance OR Importance Advocacy Communication Output Efficiency Cost-effectiveness Cost Cost analysis Nigeria/Sub-Saharan Africa Effectiveness OR Achievement Impact OR Effects OR Consequences Sustainability OR continuity Immunization OR EPI OR Vaccination Funding OR Aid Targets Supplementary Immunization Activities Targets Comprehensive multiyear plans Objectives Needs Target population
Websites FMOH NPHCDA WHO UNICEF GAVI World Bank United Nations Global Polio Initiative			
Bibliography Selected literature			

Annex 4: Overview of objectives and policies of the global vaccine action plan and selected donors on the EPI. (76)-(78),(101)

Donors	Overview of objectives and policies on immunization
WHO Immunization policy and strategies	<p>To set up national technical advisory and other groups to determine in country EPI policies</p> <p>To institute Global Routine Immunization Strategies and Practices (GRISP):</p> <ul style="list-style-type: none"> Ensure capable national EPI teams Prioritize neglected communities Utilize multiyear planning Ensure appropriate funding Provide immunization with a life course approach Have a community approach <p>To institute the Reaching Every District strategy through community engagement to improve immunization demand</p> <p>To decrease Missed Opportunities for Vaccination through assessment and interventions to address the reasons for children missing vaccinations</p> <p>To address vaccine hesitancy by targeting the reasons for hesitancy</p> <p>To extend vaccination to children in the second year of life and in schools</p> <p>To reach children affected by humanitarian crisis because of their increased risk</p>
UNICEF immunization roadmap 2018	<p>To increase public demand for immunization services by addressing the determinants that lead to exclusion</p> <p>To encourage community demand by engagement of motivated community health workers</p> <p>To promote increased access of vulnerable women and children</p> <p>To ensure effective supply chains and logistics</p> <p>To promote equitable immunization services</p> <p>To ensure national policies are backed by evidence</p> <p>To ensure adequate and sustainable immunization financing</p> <p>To ensure adequate vaccine supplies</p>
GAVI	<p>To increase vaccine uptake and its coverage equitably</p> <p>To increase and strengthen the integration of immunization into the health system in order to promote increased effectiveness and efficiency</p> <p>To promote sustainable immunization programs</p> <p>To influence vaccine markets</p>
Global vaccine action plan	<p>To ensure immunization remains a priority at all government levels</p> <p>To ensure people understand that immunization is their right</p> <p>To ensure immunization is delivered equitably</p> <p>To integrate EPI as functioning within a strong primary health care system</p> <p>To ensure adequate and timely funding for immunization</p> <p>To promote collaborative research in all components of the immunization system</p>