



IMPACT AND COST EFFECTIVENESS STUDY OF HARDO INTERVENTION IN POLIO ERADICATION

Ahmad I. M^{1,2*}, Yunusa I², Badayi M. Sani³, Abba B¹, Abdullahi S¹, Ameen Y¹, Illo I.I¹, Hassan H. Suleiman³, Abubakar A.S¹, Abubakar Y.K¹, Ali N.R⁴, Umar M.S¹, Haladu S⁴. And Gidado Z.M⁵

¹World Health Organisation, Kano state, North West Zone, Nigeria.

²Department of Biochemistry, Kano University of Science and Technology, Wudil, Kano, Nigeria.

³Department of Economics, Faculty of Social and Management Sciences, Bayero University, Kano, Nigeria.

⁴Kano Polio Emergency Operation Center, Kano state, Nigeria.

⁵Department of Science and Laboratory Technology, Kano state polytechnic, Kano state, Nigeria.

***Corresponding Author: Ahmad I. M**

World Health Organisation, Kano state, North West Zone, Nigeria.

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ABSTRACT

The impact, Cost Effectiveness of Hardo intervention, being one of the 3 Demand Creation (DC) interventions used in polio eradication activities in Kano state, Nigeria during the year 2015, were studied from the providers (program funders) and community perspective. The cost of the intervention used was obtained from the budget line available with the program funders. During the year 2015, a total of \$ 15,829, representing only 0.5% of the total demand creation budget, were spent for the conduct of Hardo intervention in Kano state, thereby immunising 165, 157 children. It costs average of \$ 0.095 per child immunised during the 7 IPDs round in the year 2015 in Kano state, implying that, for every child immunised, the Average Cost Effectiveness Ratio (ACER) for Hardo intervention is \$ 0.095. A total of 133,777 potential cases of poliomyelitis were averted with cost-effectiveness ratio of 0.1183, implying that Hardo intervention costs \$ 0.1183 to avert one case of Polio in Kano, when compared to 'doing nothing'. A total of 571,095 DALYs were averted among the total children immunised in the year 2015, in Kano state using Hardo intervention. It costs \$ 0.0277 to avert 1 DALY in Kano state during the 7 IPDs in the year 2015 using Hardo intervention. However, it was much less cost effective to immunise a child, avert a polio case and a DALY during the month of January 2015 (\$ 0.1084, \$ 0.1338, and \$ 0.0313) and much more cost effective during the month of June, 2015(\$ 0.0884, \$ 0.1091, and \$ 0.0255). This corroborates the fact that more children were immunised during the latter month, for reason being the month when more Fulani herdsmen settle, despite using similar amount of resources. It is recommended that more resources for Hardo intervention to be allocated during such month of every year and that the intervention should be scale up and given more attention at the LGAs with high number of Fulani settlements or migrants.

KEYWORDS: Key words: Hardo, Polio, Eradication, Impact, Cost, effectiveness, DALY.

INTRODUCTION

Infectious diseases have long imposed a considerable burden on human populations around the world (McNeill, 1998; Oldstone, 2010; Harrison, 2007). Vaccine diseases such as polio, measles and pertussis continue to cause significant morbidity and mortality worldwide. While polio has been successfully eradicated from the western hemisphere, it remains endemic in three countries (Nigeria, Afghanistan, and Pakistan) (Renne, 2006). However, the only vaccine-preventable infection to have been globally eradicated to date is smallpox. Although the smallpox vaccine was available starting in the 19th century, smallpox was only eradicated in 1977 after a final, intensive 10-year push by the World Health Organization that required global coordination of control efforts (Harrison, 2007). Consistent with the WHA resolution (1988), we use the term "eradication" to mean

contemporaneous interruption of the circulation of wild polioviruses (WPV) everywhere (Barrett, 2003).

SIAs improve health outcomes in low income countries by preventing the build-up of the susceptible population and thereby preventing outbreaks (Grabowsky, 2005). Misconceptions about OPV and suspicions about motivations behind the campaign emerged, especially in the light of other visible problems (i.e. understaffed clinics, poor roads, other diseases). Misconceptions included: OPV caused illness in children, was ineffective, caused infertility and was part of a plan to curb growth of Muslims (Pipes, 2005 and Murphy, 2004). Vaccine-preventable infectious diseases such as polio, measles and pertussis continue to cause significant morbidity and mortality worldwide. While polio has been successfully eradicated from the western

hemisphere, it remains endemic in three countries (Nigeria, Afghanistan, and Pakistan) (Renne, 2006).

There was no single case of confirmed Polio virus in Kano state, and perhaps in Nigeria, during the year 2015. Kano state accounted for 83% of the WPV cases during the year 2014 and this was largely due to many socio-cultural factors and perhaps due to the residual effect of the 2003 polio vaccination controversy, that culminated into the boycott of the polio vaccination, which inarguably retarded the rate at which eradication could have been achieved in the state. Study conducted by Ahmad *et al.*, (2015), recommended the continual use of demand creation intervention to facilitate uptake of polio vaccination and overcome noncompliance cases for rapid interruption. The demand creation interventions used in Kano state include Hardo's intervention, Quranic teachers' sensitization and health camp activities. These interventions have proven to create huge demand for polio vaccination among targeted groups, of course using a heavy budget line, whose cost effectiveness is yet to be studied.

Nigerian community leaders help track mobile populations, Mainly Fulani ethnic group. Hardos, which are the Fulani leaders, are working with the PEI to help reach migrant and mobile populations in Kano and other northern parts of the country. The Fulani community leaders, or 'Hardo', among the Fulani people in Kano state are sensitised, mostly under the Myetti Allah (SWT) or Fuldan organizations to help the PEI vaccinate the hardest-to-reach Fulani children against polio, with spectacular success. The Myetti Allah (SWT) and Fuldan organizations, led by the Hardo, are devoted to the development of the Fulani people and the protection of their unique cultural heritage. The Fulani ethnic group are a traditionally nomadic people, although many have now joined static settlements. Tracking those who are on the move or who have very recently settled can be difficult for vaccination teams. This is where the knowledge of the Hardos is invaluable. Prior to implementation of each campaign, The Hardos are invited for sensitisations where they are provided with information about polio and vaccination, and also sought for information on the local situation. The meetings resulted in the mapping of common routes of travel for the nomadic people, agreement on the day of visit of the vaccination teams. Hardos are tasked to help spread the polio eradication message within their communities. Since this intervention was mounted, a substantial increase in the number of children vaccinated is already being seen by the Global Polio Eradication Initiative (GPEI, 2011).

(www.polioeradication.org, 2011).

Hardos intervention, as one of the Demand Creation (DC) interventions in Polio eradication in Kano state, is in part connected with the recent gains in Polio eradication initiatives. Children that were hitherto

chronically missed rounds over rounds due to poor identification of Fulani communities, non-involvement of their leadership (Hardos), noncompliance and 'child absent' hard to reach nature of Fulani settlements are now captured as high value kids with this interventions. With huge amount of money this intervention engulfs each round of immunisation activity in Kano state, there is need to determine its impact and assess their cost effectiveness so as to better guide the program policy makers and communities.

Methodology

The study was a cross-sectional cost-effectiveness analysis of Hardo Demand Creation intervention during Immunisation Plus Days (IPDs) for the year 2015 in Kano state of Nigeria. Data were collected retrospectively from the WHO DC intervention data base. All the 44 Local Government Areas of Kano state were considered. Data were analysed using Microsoft Excel software.

Perspective of the study

Program funders (Providers') perspective. The cost determination of the intervention took into account the cost incurred by the partners funding the intervention in the course of the service delivery. However the outcomes considered are those that matters most to funders. i.e number of children immunised with polio vaccine as a result of each intervention. However, Disability Adjusted Life Years and number of cases averted as a result of the intervention was also considered as the outcome for the determination of the cost-effectiveness.

Determination of costs

The cost of the Hardo intervention used was that obtained from the budget line available with the program funders, WHO as expended. The entire year 2015 (7 IPDs rounds) Kano state Hardo intervention budget was considered for this study.

Some costs are specific to the interventions, whereas others, which were not considered are shared cost. Examples of such costs are that of vaccines/delivery/personnel/cold chain etc. which when considered will cause under estimation of the performance of the intervention under study.

Determination of Effectiveness

Oral Polio Vaccine doses used and vaccinated children relate to productive efficiency while the number of Polio cases averted and disability adjusted life years averted refer to allocative efficiency.

i) Polio cases averted

The number of cases averted by Hardo intervention was calculated as described by Kaucley and Levy (2015) as follows

Cases averted = Number of children Immunised x vaccine efficacy

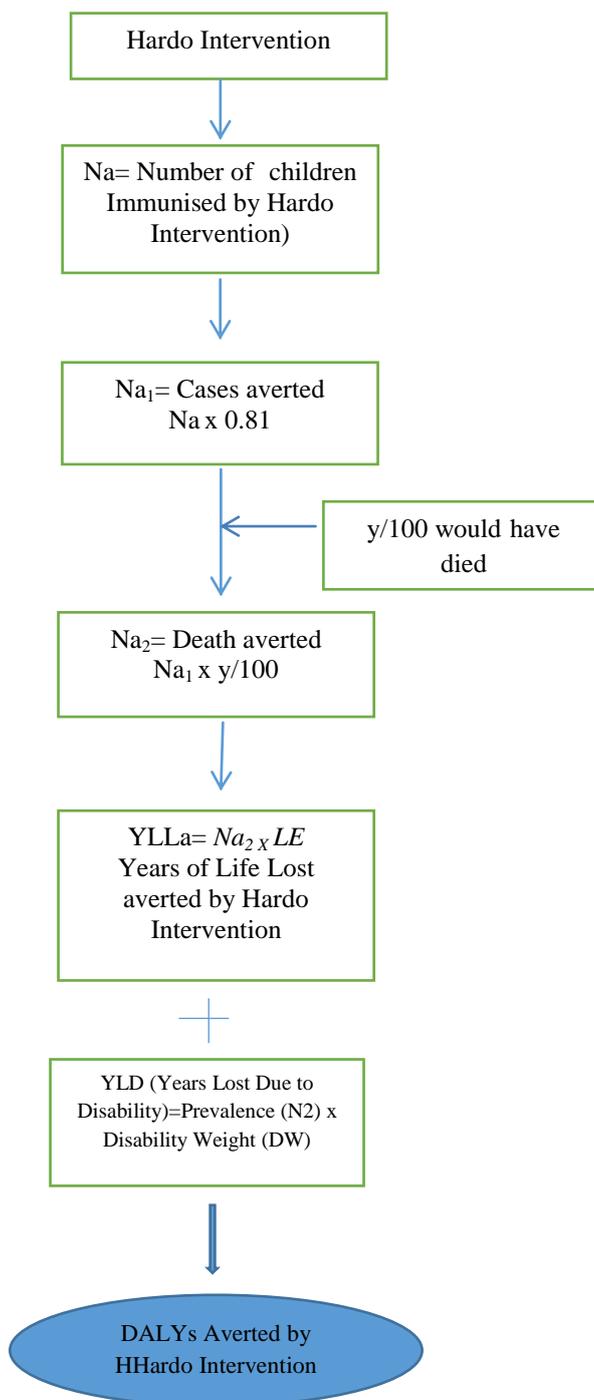
However, 81 % (95% CI) vaccine efficacy was used as reported by Deming *et al* (1992).

ii) Disability Adjusted Life Years (DALY) averted

DALY was determined using $DALY = YLL + YLD$ as reported by Murray (2002) and Murray (1994). Where the Years of Life Lost (YLL) was determined as described by WHO (2016). The life expectancy used was 52 as reported by World Bank (2016). Years Lost with

Disability (YLD) was determined as described by WHO (2016) using the Polio disability weight of 0.369 as reported by WHO (2004).

iii) Death averted: Number of Deaths averted was calculated by multiplying the number of cases averted (Effectively immunised) and number of children/100 that would have died. WHO (2015) reported that 5-10% of polio cases died after onset.



Adapted from Kaucley and Levy (2015)

Figure 1.1: Schematic design used for the estimation of Disability Adjusted Life Years (DALY)

RESULTS AND DISCUSSION

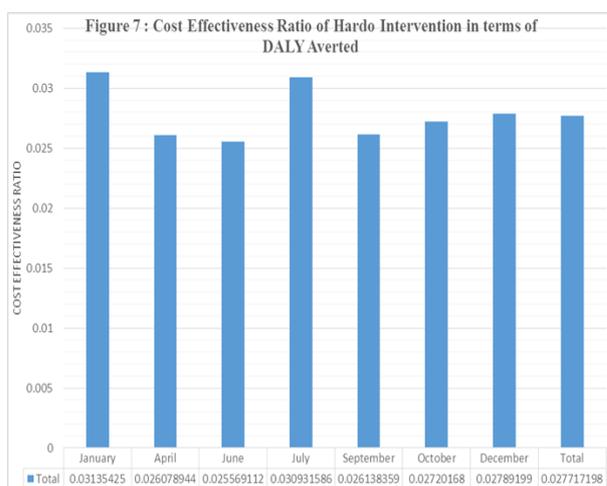
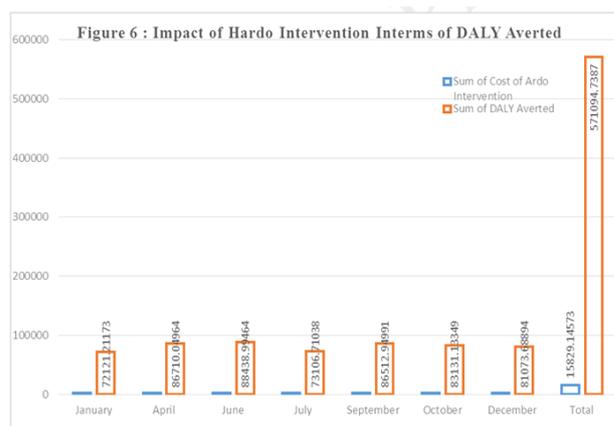
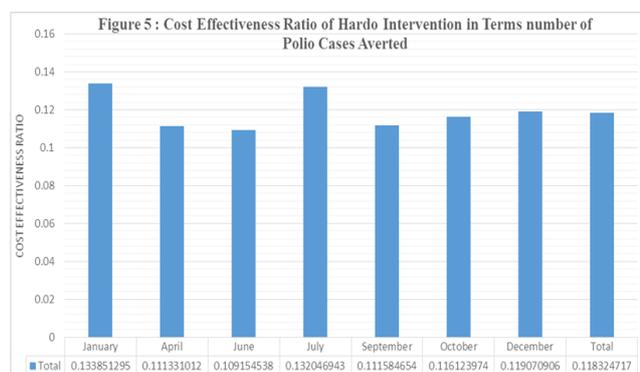
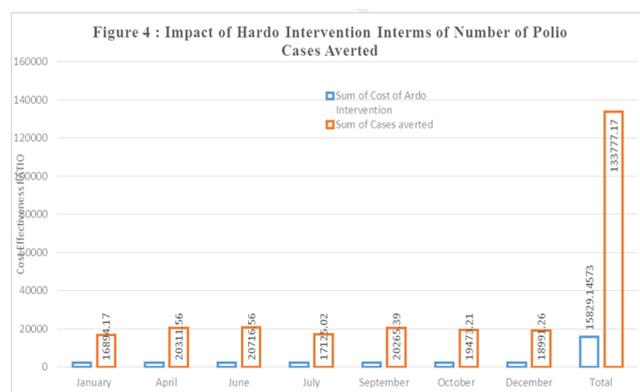
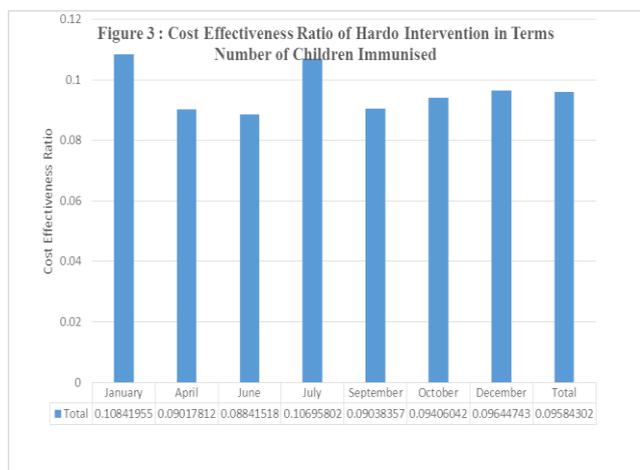
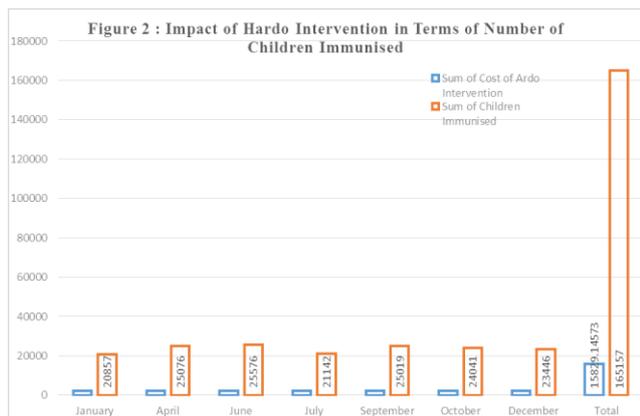


Figure 2 shows the impact of Hardo intervention on the number of children immunised by month and also cumulative. During the year 2015, a total of \$ 15,829, representing only 0.5% of the total demand creation budget, were spent for the conduct of Hardo intervention in Kano state, thereby immunising 165, 157 children. Despite the fact that the cost remained \$ 2261 per month throughout the 7 IPD rounds in the year, the number of children immunised was not uniform, arguably due to Fulani migration. The month with highest number of children immunised is June 2015 having 25,576 children immunised, arguably due the onset of rainy season and subsequent settlement of Fulani herdsmen which usually comply with the vaccination teams. The month with the least number of children immunised is the month of January 2015, for the fact that very few Fulani herdsmen settle in most of the communities.

Regarding the cost effectiveness (Figure 3) in terms of number of children immunised, Hardo intervention costs average of \$ 0.095 per child immunised during the 7 IPDs round in the year 2015 in Kano state. This implies that, for every child immunised, the Average Cost Effectiveness Ratio (ACER) for Hardo intervention is \$ 0.095. it costs \$ 0.095 to vaccinate 1 child using Hardo intervention. Among the 7 IPDs Rounds, it was much less cost effective to immunise a child during the month of January 2015 compared to every other month of IPDs

round as it has highest cost effectiveness ratio of \$ 0.1084. This corroborates the fact that less children were immunised (Figure 2) during the month, despite using similar resources. The month in which implementation in which implementation of Hardo intervention is much more cost effective was June, 2015 and this corroborates the fact that more children were immunised during the month, using similar amount of resources, arguably as a result of onset of rainy season and subsequent settlement of Fulani herdsmen in most of the Rural LGAs of Kano state.

Figure 4 shows the performance of Hardo intervention in averting polio cases, which can be regarded as an intermediate outcome. The total cost during the year is \$ 15,829 representing only 0.5% of the total demand creation interventions budget, and resulted in averting 133,777 potential cases of poliomyelitis. Despite the fact that the budget remained the same in all the 7 rounds of IPDs in the year 2015, the number of cases averted varies across the month of the year. The month with highest number of cases averted was June 2015 with 20716 cases averted due to settlement of Fulani herdsmen during the month, for the onset of rainy season. The month with least with least number of polio cases averted was January, 2015 and this was as a result of relatively low number of children immunised during the month (Figure 2). This variation is not due to any change in vaccine efficacy, but for variation in the number of children immunised.

Regarding the effectiveness in terms of number of Polio cases averted (Figure 5), Hardo intervention has cost-effectiveness of 0.1183, implying that it costs \$ 0.1183 to avert one case of polio in Kano, and that when compared to 'doing nothing', for every \$ 0.1183 saved, a case of polio may emerge. Among the 7 IPDs round, January 2015 was the less cost effective, as it has the highest cost effective ratio of \$ 0.1333 compared to every other IPDs round. This corroborates the fact that less children were immunised (Figure 2) in the month of January 2015, despite similar resources being used. The month in which implementation of Hardo intervention is much more cost effective, for having less cost effective ratio (\$ 0.10915) was June 2015; and this is justified by the fact that more children were immunised during the month (Figure 2), despite using similar resources.

Figure 6 shows the impact of Hardo intervention on DALYs averted, including death averted constitute the final goal of disease eradication program such as immunisation against polio. A total of \$ 15,829 was spent to avert 571,095 DALY among the total children immunised in the year 2015, in Kano state using Hardo intervention. This means the total number of children immunised (165,157) by Hardo intervention (Figure 2) would likely had to spend 571,095 years equivalent with disability, when compared to doing nothing. The month of June was the one with highest DALY averted (88,439), for reason being the month with highest

number of children immunised (Figure 2) which was as a result of Fulani settlement during the month. January 2015 was the month with the least DALY averted (72,121) for reason being the month with least number of children immunised (Figure 2).

Regarding cost effectiveness of in terms of DALY averted, Hardo intervention costs \$ 0.0277 to avert 1 DALY in Kano state during the 7 IPDs in the year 2015. This implies that for 1 DALY to be averted using Hardo intervention, \$ 0.0277 is expended. Among the 7 IPDs rounds, January 2015 IPDs was the one with less cost effectiveness as it has the highest cost effectiveness ratio of \$ 0.0313 compared to every other month of IPDs rounds. This corroborates the fact that less children were immunised (Figure 2) in the month of January, 2015 despite using similar resources.

CONCLUSION AND RECOMMENDATIONS

Implementation of Hardo intervention as one of the Demand Creation (DC) intervention in Polio eradication in Kano, is of paramount importance as it assists in immunising cohort of children that would otherwise remain unvaccinated, assists in averting cases of polio, death and Disability Adjusted Life Years (DALY). From the impact and cost effectiveness study, It is stood that the month of June 2015 recorded highest impact and much more cost effectiveness of Hardo intervention in terms of children immunised, cases of polio averted, DALY averted for reason being the month when more Fulani herdsmen settle and therefore more resources for Hardo intervention to be allocated during such month of every year. It is recommended that more resources for Hardo intervention to be allocated during such month of every year and that the intervention should be scale up and given more attention at the LGAs with high number of Fulani settlements or migrants.

DECLARATION OF INTEREST

WHO funds demand creation activities, including Ardo intervention. Authors have no interests to declare.

SOURCE OF FUNDING

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