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An Evaluation of Post-Event Coverage Surveys: Challenges Facing Vitamin A Distribution in Four African Countries from 2010-2013

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Abstract

An Evaluation of Post-Event Coverage Surveys: Challenges Facing Vitamin A Distribution in Four African Countries from 2010-2013

By Teresa Eklund

Introduction: Vitamin A deficiency is prevalent in sub-Saharan Africa, contributing to childhood blindness and mortality. Vitamin A supplementation (VAS) is a well-established intervention utilized to combat this problem. Countries have recently begun to transition from door-to-door VAS distribution to facility-based with outreach strategies. Multiple challenges during this transition have prevented VAS distribution programs from reaching desired levels of effectiveness. Little evidence-based research exists on the challenges associated with new VAS distribution strategies as well as the steps necessary to address them.

Objective: This study aimed to assess the challenges VAS campaigns faced from 2010-2013 in four sub-Saharan African countries that had already made the transition from door-to-door distribution to facility-based with outreach.

Methods: Twenty-four post-event coverage (PEC) surveys from four countries of interest (Kenya, Mozambique, Nigeria and Tanzania) that were administered by HKI from 2010-2013 following VAS distribution campaigns were analyzed. The analysis focused on distribution challenges and suggestions for improving future VAS campaigns.

Results: In all four countries, VAS coverage in children aged 6-59 months did not meet the 80% target set by the World Health Organization. While some of the challenges discovered were country-specific, the most prevalent challenge was the same in each country. The PECS data overwhelmingly indicated a gap in social mobilization, which prevented caretakers from hearing about the campaigns and taking their children to receive VAS.

Discussion: Low VAS coverage in these four countries utilizing facility-based distribution with outreach is linked to inadequate social mobilization strategies, among other challenges, such as living in remote areas. Mobile outreach efforts to distribute VAS to hard-to-reach children help increase coverage, but they are not able to reach all children, leaving many out of the campaigns. Challenges with newer VAS distribution strategies as well as recommendations for improvement will be shared with HKI in order that programming can be improved to reach more children with life-saving VAS.

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Chapter 1: Introduction

1.1. Introduction and Rationale

Vitamin A deficiency (VAD) is prevalent in sub-Saharan Africa, contributing to childhood blindness and mortality (Black et al., 2013). A temporary solution to this problem is the well-established practice of supplementing children's diets lacking in vitamin A-rich food sources with bi-annual, high-potency doses of vitamin A capsules, known as vitamin A supplementation (VAS) (Aguayo, Garnier, & Baker, 2007). In the past, VAS campaigns took advantage of the existing funding and logistics of immunization campaigns, especially those involved with polio eradication. These campaigns went door-to-door, ensuring nearly universal coverage of children. Thus, high rates of VAS coverage were also reached using this distribution strategy (Goodman, Dalmiya, de Benoist, & Schultink, 2000). When polio began to become eradicated in many countries, funding for door-to-door campaigns started to dry up. VAS programs began evolving from add-ons to immunization campaigns to being part of the integrated service packages distributed during Child Health Days (CHDs) (Doherty et al., 2010; Oliphant et al., 2010). The current strategy used in four African countries in which Helen Keller International (HKI) works involves VAS distribution through fixed health post campaigns, usually in health facilities, with outreach to more remote areas. As this newer distribution method required greater participation of caretakers, multiple barriers prevented them from bringing their children to receive VAS. This results in low overall VAS coverage with many children being missed (Nyhus Dhillon, Subramaniam, Mulokozi, Rambeloson, & Klemm, 2013; Nyirandutiye, Ag Iknane, Fofana, & Brown, 2011). Challenges with this newer fixed post distribution method need to be addressed to ensure that children receive this life-saving intervention.

1.2. Problem Statement

VAS distribution at fixed health posts is wry with challenges. The main problem is the large drop in coverage faced by VAS distribution campaigns after four African countries – Kenya, Tanzania, Mozambique and Nigeria – switched from door-to-door to facility-based distribution. An example from Kenya shows just how dramatic this drop in coverage was after the transition. Prior to the transition, Kenya recorded coverage of VAS at 93%. Immediately after the transition to fixed post distribution in health facilities, VAS coverage dropped dramatically to just 22% (Clohossey et al., 2014). While VAS coverage in Kenya has since risen somewhat, it is still too low there as well as in the three other African countries that made the transition – indicating that many children are missing out on receiving this intervention that could be greatly benefitting their health. More so, low coverage rates of VAS in Africa mean an increase in childhood blindness and, ultimately, increased mortality of children aged 6-59 months.

It is imperative that challenges with VAS distribution at fixed health posts be addressed with new strategies to increase coverage rates. However, scarce evidence-based research exists on both the challenges faced when transitioning to this strategy and the steps necessary to address them. This evidence would allow organizations specializing in VAS programming, like HKI, to create more effective strategies when working to optimize this newer distribution method. Ultimately, the lives of children depend on the success of these VAS distribution campaigns.

1.3. Purpose Statement

This research thesis filled the need for evidence-based research on four countries in sub-Saharan Africa that have already made the transition away from door-to-door to VAS distribution campaigns at fixed health posts. It critically analyzed the challenges these campaigns are facing so that these challenges could be addressed with better-informed VAS programming strategies to reach more children.

1.4. Research Questions

Primary research question: What challenges do countries distributing twice-yearly vitamin A supplementation face when they transition from door-to-door to fixed health post campaigns with outreach?

The following questions also needed to be asked to effectively address the primary research question:

1) What are the distribution challenges among countries that have made the transition away from door-to-door campaigns to fixed health posts with outreach campaigns (Kenya, Mozambique, Nigeria and Tanzania)?
    a) What are the characteristics of the campaigns implemented?
        i) What is VAS coverage among children 6-11 months, 12-59 months and 6-59 months?
        ii) How did caretakers hear about the VAS campaigns?
        iii) Where was VAS received?
        iv) What are the reported reasons for non-receipt of VAS by eligible children?
        v) What are caretakers' sources of health information?
    b) According to health workers and community health workers in their geographic service areas, what are some problems and solutions they have identified regarding VAS?
        i) Are there problems reported with supply?
        ii) Are there groups being left out of VAS distribution?
        iii) How can VAS distribution be improved?

1.5. Significance Statement

Many developing countries in sub-Saharan Africa face a diverse array of challenges, with one component being the lack of sufficient health resources. VAS is often said to be the most cost-effective public health program in the world to prevent blindness, reduce malnutrition and

decrease the number of children at risk of mortality. Knowledge on how to utilize new distribution strategies effectively and overcome challenges will allow VAS to remain the life-saving intervention that it was designed to be.

Definition of Terms

Community leaders: Any influential leaders within a community, such as government leaders or religious leaders

Door-to-door: Going from house to house to deliver an intervention

Fixed health post or facility-based: Both government and private health facilities serve as sites for VAS distribution

Frontline workers: Facility-based health workers and community-based health workers

Outreach, mobile or temporary posts: VAS delivery complementing fixed-post distribution. This could be in a school, religious center, door-to-door, or another common site in a community. This is utilized to reach children living in remote or hard-to-reach areas.

Post-Event Coverage (PEC) survey: A survey conducted by Helen Keller International to verify administrative data from tally sheets and to collect more information about recent VAS distribution campaigns

VAS coverage: The percentage of children aged 6-59 months receiving VAS during the latest round of distribution for their country

Chapter 2: Literature Review

2.1. Importance of Vitamin A for Child Health

2.1.1. Functions

As an essential nutrient, vitamin A is required for multiple functions in the human body. These primarily include growth, vision, epithelial cell integrity and immune function (Underwood & Arthur, 1996). Researchers initially focused on vitamin A for its role in maintaining healthy vision. However, it also became recognized for its contribution in reducing infectious disease-related mortality through its role in immunity (Bates, 1995; Green & Mellanby, 1928). Vitamin A is especially important for children under five years of age as this is a period of rapid growth and development. Young children in resource-poor settings often suffer from repeated episodes of diarrhea, which can lead to stunted growth. Vitamin A has been shown to reduce this risk by improving the immune system, thus giving children a better chance to fully reach their intended height (Villamor et al., 2002). Sufficient vitamin A has also been seen to improve the growth of young HIV positive children and those suffering from malaria (Villamor et al., 2002).

2.1.2. Dietary Sources

Vitamin A is found in two main forms: preformed vitamin A and provitamin A. Retinol found primarily in animal sources, such as meat, makes up preformed vitamin A. Provitamin A consists of beta-carotene from plants, particularly leafy greens and orange and yellow fruits and vegetables (Bates, 1995; Tang, 2010). Retinol is stored in the liver, where it is easily converted to its active form of retinal and used by the body. However, there is a much lower bioavailability of vitamin A in carotenoids in plants (Bates, 1995). For beta-carotene to be taken up, it first must be converted to retinol. This bioconversion process is inefficient, with a 12:1 ratio of beta-

carotene to retinol by weight (Tang, 2010). Therefore, one would be required to eat many times more plant-based than animal sources to receive the same quantity of vitamin A in the diet.

Intake of vitamin A through dietary sources is often seen as sustainable, with the added benefit of obtaining other necessary nutrients for the body. The reality is that, in most developing countries, vitamin A-rich animal sources are often unattainable due to high cost or low supply (de Pee, West, Muhilal, Karyadi, & Hautvast, 1995). Plant foods like green leafy vegetables are encouraged as a substitute. While their rich supply of various nutrients is important, their consumption alone does not improve levels of vitamin A in the body due to the poor absorption of beta-carotene (de Pee et al., 1995). To address these challenges, high-dose vitamin A capsules are administered in many developing countries to supplement dietary intake of vitamin A.

2.1.3. Deficiency

The lack of sufficient vitamin A is a major cause of preventable childhood blindness in developing countries, with those experiencing blindness from VAD having only a 50% chance of surviving within the year (Helen Keller International; Jamison DT, Breman JG, Measham AR, & et al, 2006; Underwood & Arthur, 1996; WHO, 2009). VAD results from inadequate vitamin A intake, and disproportionately affects young children as they require a greater amount of nutrients per kilogram of body weight compared to older children for growth during their first years of life (WHO, 2009). The prevalence of VAD in Africa is highest in the world at 41.6% in children under five years of age (Black et al., 2013). Consequently, 6% of children aged 6 to 59 months die in sub-Saharan Africa as a result of VAD alone (WHO, 2011). It is estimated that 600,000 lives per year could be saved if 190 million children at risk of death from VAD was reduced by 24% (Bhutta et al., 2008; Mayo-Wilson et al., 2011).

Xerophthalmia is a term used to describe a wide spectrum of eye problems, including night blindness and issues with the epithelium of the cornea and conjunctiva, such as Bitot spots, xerosis, and keratomalacia (World Health Organization: Vitamin and Mineral Nutrition Information System, 2014). Clinically, VAD is defined as a serum retinol concentration of 0.7 µmol/L or lower. Night blindness is often the first physical manifestation of low vitamin A levels, occurring when serum retinol concentrations fall below 1.0 µmol/L, and presenting itself with even more serious symptoms below 0.7 µmol/L. At serum retinol concentrations below 0.35 µmol/L, a child is severely vitamin A deficient and serious xerophthalmia occurs. Catching childhood VAD at the night blindness stage is beneficial in preventing more severe damage. VAD-related eye problems respond well to high doses of vitamin A, except when permanent corneal xerosis has already been caused by xerophthalmia (World Health Organization: Vitamin and Mineral Nutrition Information System, 2014). In 2013, Black et al. found that one third or 90 million children under five years of age were living with subclinical VAD across the globe. At 2.1%, night blindness is most prevalent in Africa compared to the global figure of 0.9% (Black et al., 2013).

A poorly functioning immune system often co-exists with xerophthalmia (Bates, 1995). Even back in 1928, Green claimed vitamin A an “anti-xerophthalmic” vitamin as he saw the connection of xerophthalmia with a weakened immune system. He referred to vitamin A as an “anti-infective” agent with a lack of animal products in the diet increasing the risk of infection, and deemed immunity its primary function instead of the more commonly known role of vision (Green & Mellanby, 1928). Pregnant women lacking a diet rich in vitamin A are more susceptible to infection due to experiencing increased nutritional demands of the developing fetus. When prescribed vitamin A supplements, risk of infection is reduced both during

pregnancy as well as post-partum (Semba, 2012). In young children under five years of age, sufficient levels of vitamin A help them fight infectious disease. VAD is a factor in measles infection for those not immunized. In one study of children under two years of age who were hospitalized with measles, two high-dose capsules of vitamin A (200,000 international units (IU) per dose) were shown to increase their rate of survival (Huiming, Chaomin, & Meng, 2005). In recent years, vitamin A has been proven necessary for prevention of overall child mortality (Underwood & Arthur, 1996).

2.2 Vitamin A Supplementation (VAS)

2.2.1. Overview

Although multiple VAD-reducing strategies exist in developing countries, such as dietary diversification, fortification, micronutrient powders and supplementation, the focus of this thesis is on supplementation. Supplementation entails providing children aged 6 to 59 months with bi-annual, high-dose vitamin A capsules to supplement a low intake of natural vitamin A from dietary sources (Helen Keller International). The high dosage given every six months replenishes liver stores and keeps serum retinol levels above deficiency levels until the next round of VAS distribution. So, while a healthy diet rich in sources of vitamin A is the ideal goal, this is often not attainable in many African countries due to poverty and other factors. For now, VAS acts as a first line of defense for children experiencing VAD as well as for those at risk, thus saving the lives of many children every year.

2.2.2. World Health Organization VAS Recommendations

The World Health Organization (WHO) provides recommendations on supplementation for children under five years of age, as is shown in Table 1. For infants 6-11 months of age, one 100,000 IU capsule given once during this time period is the recommended dosage. For older

children aged 12-59 months of age, twice this amount, or 200,000 IU, is recommended every 4-6 months (World Health Organization, 2013). VAS is provided as a liquid encased in a gelatin capsule, of which the end is snipped with scissors and the liquid dripped into the child's open mouth. One side effect sometimes observed is increased risk of vomiting following VAS, continuing for up to 48 hours afterward (Imdad, Herzer, Mayo-Wilson, Yakoob, & Bhutta, 2010).

Table 1: World Health Organization VAS Recommendations

Table I-5 Suggested vitamin A supplementation scheme for infants and children 6–59 months of age

Target group	Infants 6–11 months of age (including HIV+)	Children 12–59 months of age (including HIV+)
Dose	100 000 IU (30 mg RE) vitamin A	200 000 IU (60 mg RE) vitamin A
Frequency	Once	Every 4–6 months
Route of administration	Oral liquid, oil-based preparation of retinyl palmitate or retinyl acetate[a]	
Settings	Populations where the prevalence of night blindness is 1% or higher in children 24–59 months of age or where the prevalence of VAD (serum retinol 0.70 µmol/l or lower) is 20% or higher in infants and children 6–59 months of age	

IU, international units; RE, retinol equivalent.

[a] An oil-based vitamin A solution can be delivered using soft gelatin capsules, as a single-dose dispenser or a graduated spoon (76). Consensus among manufacturers to use consistent colour coding for the different doses in soft gelatin capsules, namely red for the 200 000 IU capsules and blue for the 100 000 IU capsules, has led to much improved training and operational efficiencies in the field.

Source: WHO, 2013.

2.2.3. Efficacy Studies

Since the early 1990s, there have been multiple meta-analyses of randomized controlled trials (RCTs) showing the efficacy of VAS in reducing mortality. Three of these studies took place in 1993, all showing a large reduction in childhood mortality. Beaton et al. showed a 23% reduction in mortality in children 6-59 months of age due to VAS (Beaton GH et al., 1993).

Fawzi et al. analyzed 12 RCTs from both hospital and community-based studies, specifically looking at the effect of VAS in mortality reduction when used as treatment of measles and pneumonia in the hospital-based setting, with the community-based studies looking at its role in mortality reduction in non-patients. There was shown to be a protective effect against mortality with VAS, particularly an associated 30% reduction in mortality from diarrhea. With measles, there was also a protective effect, yet it was not significant. There was no association with pneumonia-specific mortality (Fawzi, Chalmers, Herrera, & Mosteller, 1993). The third meta-analysis by Glasziou et al. confirmed this large reduction, showing a 30% reduction of all-cause mortality. The study also showed a reduction in mortality from specific causes: a 39% reduction in death from diarrhea, a 70% reduction from respiratory diseases, and a 34% reduction from other causes of death (Glasziou & Mackerras, 1993).

In more recent years, three more studies have been undertaken to confirm the previous results from the 1990s. A Cochrane systematic review of VAS effectiveness in reducing mortality in children 6-59 months of age was published in 2010, showing a 24% reduction in all-cause mortality of children in this age group when supplied with VAS bi-annually (Imdad et al., 2010). In 2011, Mayo-Wilson et al. completed another systematic review and meta-analysis to show VAS efficacy in reducing child mortality. It excluded from the meta-analysis all studies of children with known illnesses, such as measles and pneumonia, and those who received VAS as part of hospital stay or treatment. The results showed a reduced prevalence of night blindness and xerophthalmia with VAS, also confirming the 23% reduction in all-cause mortality previously shown by Beaton et al.(Mayo-Wilson et al., 2011). A large, five-year, effectiveness trial, known as Deworming and Enhanced Vitamin A Supplementation (DEVTA), studied effects of VAS in one million pre-school aged children in north India. The results gave a much more

modest reduction in child mortality of 11%, contradicting the larger 20-30% reduction shown in other studies. While there are critics of the study and its results, even an 11% reduction in mortality is relevant in public health, with the children receiving life-saving VAS every year likely agreeing with this statement (Awasthi et al., 2013).

2.3 VAS Distribution Strategies

2.3.1. Door-to-Door Campaigns

National Immunization Days (NIDs)

Door-to-door distribution of a public health intervention allows for nearly 100% coverage of the intended target population, especially for a large one dispersed over a wide area. Immunization campaigns have proven to be a good example of this distribution strategy. Beginning in the 1980s, the WHO's Expanded Programme on Immunization's (EPI) National Immunization Days (NIDs) focusing on polio have resulted in higher immunization rates with total eradication of the virus in some parts of the world. The target group for polio NIDs is children 0-59 months of age (which is conveniently inclusive of the 6-59 month target group for VAS). WHO recommendations called for polio campaigns of short duration (ideally 1-2 days) due to the difficulty in sustaining a high level of motivation of the large number of workers and volunteers needed for any extended period time as well as for maintaining public awareness of the campaigns (Birmingham, Aylward, Cochi, & Hull, 1997). A second round of polio immunizations follows the first after 4-6 weeks, adding to campaign challenges the maintenance of social mobilization during the interim (Birmingham et al., 1997).

VAS Piggy-backing on Mass Immunization Campaigns

As the WHO was dedicated to eradicating polio by 2000, funding, multi-country support and social mobilization for these campaigns was already extremely high. Utilization of these existing

resources proved to be a beneficial side effect when polio NIDs also began serving as a platform to address other child health issues, including VAD (Goodman et al., 2000). Starting in 1994, the WHO and the United Nations Children's Fund (UNICEF) created a policy to include VAS distribution side-by-side with immunization campaigns. Including VAS in immunization procedures was a marriage of convenience, as VAS was slow to be taken up with routine immunizations, but was quickly integrated into polio campaigns (Goodman et al., 2000). Polio NIDs had contact with 80% of the world's children under one year of age, a target population included in the VAS distribution strategy. In India, linking VAS distribution with NIDs resulted in nearly full coverage of VAS and coincided with a 13% decrease in xerophthalmia after just two distribution rounds (Swami, Thakur, & Bhatia, 2002).The integration of VAS campaigns with polio NIDs has been one of the most successful approaches to reaching large numbers of children at risk for VAD (Goodman et al., 2000).

Logistically, tagging along on polio campaigns proved extremely beneficial for VAS distribution. In the case that immunization coverage in a given area is already high, the integration of immunization campaigns with other services can improve the coverage of those services (Wallace, Dietz, & Cairns, 2009). This worked to the advantage of VAS programs, and many areas saw large increases in coverage. Studies of mass polio campaigns in Egypt from the 1990s showed that door-to-door distribution methods did provide nearly universal coverage (100%) as compared to 86% coverage when utilizing fixed-site delivery and house-to-house, making it the best and most cost-effective strategy (Linkins, Mansour, Wassif, Hassan, & Patriarca, 1995). Supplementary Immunization Activities (SIAs) employed in regions with low immunization coverage also assisted VAS distribution. SIAs traveled house-to-house to find children missed by polio NID campaigns, allowing VAS to find these missed children as well.

VAS also would sometimes be integrated with measles NIDs. One caveat of this was that the target group of children for measles NIDs began at nine months of age, thus leaving children aged 6-9 months unprotected from VAS for a three-month period. However, VAS piggy-backing off of NIDs improved coverage of this life-saving intervention as well as placed it into the spotlight, showing the world the importance of its contributions to child health.

2.3.2. Fixed Health Posts with Outreach

Child Health Days (CHDs)

As polio began to become eradicated in more and more countries, funding for mass door-to-door campaigns began to dry up. This did not bode well for the other services that had become integrated into those campaigns and had come to rely on the funding and organizational strategies that helped them achieve high coverage. The logistics of transporting supplies over great distances on poor or nonexistent roads was not realistic. Health infrastructure in many developing countries was still weak, especially in rural areas. Trained personnel were not available in many areas to distribute services such as VAS and deworming medications on a routine basis. These challenges gave birth to the new idea that, if caretakers could be motivated to bring their children to defined locations within a reasonable distance from their communities, multiple health services could be distributed at one time and place.

Successful integration of other child health services into NIDs led to the birth of Child Health Days (CHDs). There are many different name formulations depending on location, such as Child Health Weeks in Zambia, Child Days Plus in Uganda and Child Nutrition Weeks in Mali, among others. CHDs officially began in 1998 when VAS first became integrated into NIDs to help reach children who were not adequately receiving it through routine services (Fiedler & Chuko, 2008; Oliphant et al., 2010). These large, campaign-based events take place over a short time period,

and are implemented with the help of UNICEF and other development partners with the goal of addressing child mortality and morbidity (Fiedler & Chuko, 2008; Oliphant et al., 2010). Integration of multiple services often leads to greater community participation because more needs are being addressed at one time (Nyirandutiye et al., 2011). CHDs are now a common occurrence in sub-Saharan Africa, with 61% of CHDs worldwide taking place there (Palmer, Diaz, Noordam, & Dalmiya, 2013).

CHDs deliver an entire package of child health services within a short time period, as is determined by a country and its partners. Intervention packages differ by country and from year to year, but most contain the same core services. Oliphant et al. found a CHD package to contain at least two of the following services, regardless of its country of implementation: VAS, an immunization, deworming tablets (albendazole or mebendazole), and insecticide-treated bednets (Oliphant et al., 2010). However, if an excessive number of services are offered during a CHD, overall success may actually decrease. Practitioners claim this is because the event becomes too large to maintain the required level of organization and focus, thus sacrificing effectiveness. This "magic" number is approximately five services. However, 45% of CHDs from 2005-2010 consisted of five or more services (Palmer et al., 2013).

The designated distribution sites of a CHD vary by country and region. Health facilities are used as fixed posts, while common gathering points, such as schools and religious centers, are used as temporary outreach posts for communities within five kilometers of the fixed post. HWs distribute VAS at health facilities, while trained CHWs familiar with harder to reach communities distribute VAS at the temporary posts as part of additional outreach efforts (Helen Keller International, 2014b). The facility-based campaigns last 3-4 weeks, while another type of CHD, large-scale mobilization campaigns, last only a few days (Fiedler & Chuko, 2008). In

Tanzania, what began as the short-term mobilization campaigns has now evolved into facility-based CHDs with the final week of the campaign involving a 'mop-up' campaign. These 'mop-up' campaigns help to increase overall coverage by using mobile outreach to distribute services to those who were previously missed (Fiedler & Chuko, 2008).

CHDs have been said to have both positive and negative consequences on countries that implement them. They may divert staff away from health facilities, increase their workload and may not provide them with additional remuneration or incentives to compensate them for their extra work responsibilities (Doherty et al., 2010; Palmer et al., 2013). Sometimes CHDs conflict with other campaigns and events addressing health and well-being. Although well-intentioned, an overload of promotional services may cause caretakers not to take them as seriously (Doherty et al., 2010; Palmer et al., 2013). At the same time, implementation of frequent CHDs has been an excellent exercise for countries, allowing them to improve their skills in coordination and planning large, country-wide events – skills that can continue to be utilized in the future (Doherty et al., 2010). One of the greatest achievements of CHDs has been their ability to raise the profile of child health at multiple levels of government, from the community level all the way up to the central government (Doherty et al., 2010). Even more so, CHDs have highlighted the necessity of multiple preventative services for complete child wellness, including the significance of VAS as a part of that portfolio.

2.4 VAS Distribution Challenges with Current Strategies

2.4.1. Coverage

Overall, little research exists on VAS distribution using this newer strategy of fixed health posts with outreach. One positive review in Tanzania comparing VAS coverage during routine health care to VAS campaigns as part of CHDs showed a marked increase during the campaigns

(Masanja et al., 2006). Another reported that the integration of VAS into bi-annual CHDs improved and maintained VAS coverage, typically 30% greater than what was recorded with attempts of stand-alone VAS events (Oliphant et al., 2010). However, this again differs by country, with multiple challenges displayed at the onset of new distribution strategies. The days of nearly universal coverage from when VAS tagged along with door-to-door polio NIDs were a thing of the past in most countries, and the new VAS coverage target goal became reaching at least 80% coverage.

In one of the only published articles available on the effects of transitioning to a new VAS distribution strategy, Clohossey et al. explained a large drop in coverage as Kenya switched from distribution through an outreach-based type of system (door-to-door) to delivery through a CHD, a type of facility-based system called Malezi Bora (Clohossey et al., 2014). With the former distribution method in 2006, VAS coverage reached 93%. In 2007, this fell to 22% as the new facility-based system was introduced (Clohossey et al., 2014). In 2012, a Post-Event Coverage (PEC) Survey conducted by HKI found Kenya VAS coverage to be 31% in children 6-59 months of age (Clohossey et al., 2014). This shows the difficulty in maintaining high coverage with implementation of new VAS distribution strategies. A goal of this thesis is to provide more research highlighting these challenges in order to inform and subsequently improve distribution strategies in the future.

2.4.2. Missed Children

One of the greatest challenges from the literature regarding VAS distribution is missing children during campaigns. Dependence on routine health care for certain services can lead to children not receiving services at all, especially slightly older children who are up-to-date on their recommended immunizations. The entrance of CHDs into the picture has helped greatly with this

challenge (Palmer et al., 2013). However, many children at still being left out of even CHDs. It was found that children who did not participate in a CHD in Mali were shown to be more malnourished at follow-up than those who did participate, indicating that finding a way to reach them would be well worth the effort (Nyirandutiye et al., 2011). As sparse literature exists on connecting VAS with reasons for non-receipt, I will supplement these few studies with research available from other campaigns. The lessons learned from other types of campaigns, such as immunization and bednet campaigns, can be applied to VAS campaigns as well. I will compare reasons for children being left out of campaigns in the literature with results from my data analysis later on in the thesis.

In a review of 35 articles evaluating polio campaigns, Weiss et al. found multiple reasons for children being missed, ultimately hurting polio eradication efforts by failing to achieve the high coverage needed at that time (Weiss, Winch, & Burnham, 2009). First, more children were left unvaccinated in areas where fixed health posts had been used versus door-to-door campaigns. For the door-to-door campaigns, a problem was mistiming, defined as health workers going to a house to vaccinate the child who lived there, but finding that the parent or child was not at home and skipping the house altogether. In fixed-post campaigns, caretakers who did not know that campaigns were taking place did not bring their children to the vaccination point. These caretakers were less likely to listen to a radio, watch television or read newspapers, where they may have seen or heard advertisements about the campaign. Illiterate mothers were found to be less likely to participate in the campaigns. Distance from the fixed post was also a factor in children being left unvaccinated, especially for those living in rural areas. Some caretakers did not know the benefits of vaccinations, and some who were aware of the benefits still refused to bring their children for fear of negative side effects. Minority populations and religious groups

were sometimes skeptical and refused to bring their children as well. Other caretakers wanted to bring their children, but were too busy to follow through (Weiss et al., 2009).

Another study reporting reasons for children being left out was from a campaign in Senegal. At a bi-annual VAS and de-worming campaign, caregivers who brought their children were provided with a voucher for a free insecticide-treated net (ITN) to be given out at another location (Thwing et al., 2011). Ninety-two percent of caregivers had heard about the campaign, 34% from a community health worker (CHW), 26% from neighbor, and 22% by listening to a radio (Thwing et al., 2011). Some caretakers reported that they did not redeem their vouchers for an ITN, even though it would be at no cost to them. Those who went to the distribution point to receive an ITN said that the point was a short distance from their homes (less than a 30 minute walk) if not located within their village (Thwing et al., 2011). This example shows that both campaign awareness as well as ease of access to the distribution site clearly makes participation more likely, resulting in higher campaign coverage.

Studies specifically reporting on VAS campaigns presented similar reasons for children's non-receipt of this important intervention for child health. In Nigeria, socioeconomic status (SES) was shown as a factor for VAS uptake, with those from households with higher SES more likely to receive VAS (Aremu, Lawoko, & Dalal, 2010). In Mali, the level of a father's education, knowledge of VAS by community leaders and health workers, and more traditional methods of social mobilization (town criers, neighbors, friends) were all shown to significantly affect VAS coverage in children (Ayoya et al., 2007). The absence of caretakers during the time of the event, not being notified that the event was taking place, and lack of motivation to participate were also reported by caretakers in another Mali study as reasons for not taking their children to receive VAS (Nyirandutiye et al., 2011). In Tanzania, the most common reasons for children being

missed in VAS campaigns were caretakers being unaware of campaigns, their unavailability to take the child, the lack of supplies at health facilities, the journey being too far away, and the child being Muslim (Nyhus Dhillon et al., 2013). Caretakers who knew the benefits of vitamin A were more likely to ensure that their child received it during the campaign (Nyhus Dhillon et al., 2013).

2.5 Post-Event Coverage Surveys

2.5.1. Overview

Beginning in 2010, HKI began conducting PEC surveys in the countries where it supported VAS distribution programs. The primary purpose of a PEC survey is to verify administrative data following a VAS distribution campaign (Helen Keller International, 2014a). Secondarily, PECS are used to identify factors that affected coverage during a particular campaign. This allows for a better picture of VAS distribution campaigns in a particular country, including pinpointing strengths and weaknesses. In this way, both problems as well as lessons learned are brought into the open, where successful techniques can be applied to other campaigns and troubleshooting is undertaken to improve program effectiveness in the future.

Standard procedure calls for a PEC survey to be conducted within 4-6 weeks following a VAS distribution event. This is because PECS use the recall method and rapid follow-up provides more accurate recall from respondents. PECS are notated as either Round 1 or Round 2, as VAS distribution takes place twice per year. Round 1 distribution occurs from May-June, with November-December of the same year identified as Round 2. Before the PEC survey takes place, it is piloted in its target community to verify that the questions to be asked are easily understood, and to estimate the time burden required in order to determine the number of enumerators needed to complete the PEC survey within the 4-6 week window. A PECS team consists of a supervisor,

team leaders, enumerators, and data entry personnel. Team leaders and enumerators receive separate training detailing their specific duties along with detailed instruction on PECS administration, logistics and practice in the field. The duration of the training is 2-5 days, and depends on the number of people to be trained as well as the length and complexity of the specific questionnaire to be implemented (Helen Keller International, 2014a).

2.5.2. Overestimation of Coverage

One important issue highlighted by PECS is overestimation of coverage by administrative data and tally sheets. A recent PEC survey in Tanzania reported a 30% overestimation of VAS coverage from tally sheets (Nyhus Dhillon et al., 2013). Overestimation of coverage prevents country governments and their partner organizations from getting an accurate portrayal of the number of children receiving the services which they have deemed important to improving child health and well-being in a country. Some reasons for this described in the Tanzania study were reported to be human error while recording the children receiving VAS during a CHD, inaccurate reporting from distribution sites, possibly due to incorrect aggregation of data, and underestimation of the target population or denominator (Nyhus Dhillon et al., 2013). Some program reports may show greater figures for VAS distribution coverage if the overall age range at the CHD event is different than the age for VAS of 6-59 months (Oliphant et al., 2010). Target population estimates (the denominator) may be taken from either outdated census data, or assumptions on certain target populations may be assumed from the census data where there was no exact data (i.e. children 6-59 months) (Oliphant et al., 2010). It is possible that some overestimation of coverage may be deliberate in order to show success of an event to funders and partners. With inaccurate coverage, it is difficult to focus on poor-performing campaigns in order

to improve strategies in the future. Therefore, PECS have proven to be extremely useful tools for organizations such as HKI.

2.5.3. Country-Specific Questions

Apart from verifying coverage data, PECS collect other information about recent VAS distribution events. According to HKI's *Guide to Conducting Post-Event Coverage Surveys for Vitamin A Supplementation, Deworming and Immunization Events*, each country and specific round has its own PECS questionnaire, allowing questions to be tailored to a particular country context. Prior to the implementation of each PEC survey, HKI staff meet with stakeholders and government officials in the country where a PEC survey is proposed to take place. This allows for the best survey design possible to benefit both the country government as well as HKI programming, and the information needed also determines the location of a PECS. Country-specific questions can also depend on what information a country or region needs and the size of the available budget. Despite some event-specific questions, all questionnaires across all countries seek information on the child who received VAS (age, sex, location of receipt). In the case that a child did not receive VAS, the caretaker is asked questions on why the child was missed. Health workers (HWs) and community health workers (CHWs) who participated in a VAS distribution campaign are surveyed because their first-hand experiences with the campaigns can provide valuable information on how to improve future campaigns. These service providers are asked questions about supply problems during distribution events, their knowledge of vitamin A, and how they believe that campaigns can be improved in the future (Helen Keller International, 2014a). The responses to these survey questions are analyzed here as they are the main focus of this thesis.

2.6. Conclusion

Vitamin A is essential for playing a role in overall child health and wellness. Further, this important vitamin also reduces the risk of mortality in children 6-59 months of age. Many children in developing countries do not receive adequate dietary vitamin A, leading to high prevalence of VAD - especially in Sub-Saharan Africa. VAS acts as a first line of defense, addressing this deficiency in the interim period until more sustainable solutions to the problem can come into play. Sparse data exist on the challenges experienced with VAS-specific distribution campaigns. However, with the data that are available, both published and unpublished studies have alluded to challenges with maintaining high coverage rates during the transition from door-to-door to fixed health post campaigns with outreach. PECS data collected by HKI allows for a better understanding of these challenges. I will use these data from four countries (Kenya, Mozambique, Nigeria and Tanzania) that have already made this transition, detailing issues with coverage and reasons for children being missed during campaigns. In addition, the data will provide suggestions on how future VAS distribution campaigns can be improved.

Chapter 3: Methods

3.1. Overview

There are four steps to a PEC survey: planning, implementation, data analysis and dissemination. As I did not administer PECS myself, I reviewed the methodology used for survey implementation from HKI's *Guide to Conducting Post-Event Coverage Surveys for Vitamin A Supplementation, Deworming and Immunization Events* (Helen Keller International, 2014a). While minor deviations to the guidelines may have occurred from country to country while conducting PECS from 2010-2013, the standard procedures remained the same. The primary

purpose of my analysis is to pinpoint challenges of VAS campaigns in countries already transitioned from door-to-door distribution so that HKI can modify and subsequently improve campaign strategies in future campaigns.

3.2. Population and Sample

3.2.1. Target Population and Eligibility

PECS targeted three distinct populations - caretakers, HWs and CHWs - who possessed knowledge, experience and perspectives on the most recent VAS campaign held in their area of service. Accordingly, a unique questionnaire was used for each of these targeted groups. Following site determination for each PEC survey, selection of individuals from these populations then occurred.

The presence of a child 6-59 months of age in a household who was eligible to receive VAS during the most recent campaign in his/her area determined the eligibility of caretakers surveyed. In most instances, mothers were the caretakers surveyed; however, any adult caretaker of the child who met the criteria and consented to be surveyed was eligible. Trained enumerators administered caretaker PECS.

To gather additional information about VAS distribution campaigns, team leaders administered PECS to HWs and CHWs at the same sites that caretaker surveys were implemented. While team leaders did not use a standard method in selection of participants from these populations of HWs and CHWs, a few definitions describing these participants allowed for consistent selection. Each HW fit the criteria of being facility-based, while the CHWs who were selected based their work in communities rather than in health facilities. Also, both of these types of participants needed to be available during the PECS and consent to be surveyed. Team leaders gave priority to those who had participated in the most recent VAS distribution campaign in the area being surveyed.

3.2.2. Geographical location and site determination

HKI staff met with stakeholders and government officials from each individual country to discuss the needs and goals of each country regarding PEC data. These planning meetings determined the specific areas or regions of a country where each PEC survey occurred. For example, for a particular round of VAS distribution, did the country need national, regional or district level data? Due to changing needs over time, each PEC survey occurred in a different location within a country. The location of each PEC survey and length of the questionnaire also depended on funding available at that time.

3.2.3. Sample size and sampling method

To determine sample sizes for each PEC survey that it administered, HKI followed the WHO's Expanded Programme on Immunization (WHO-EPI) 30 x 30 cluster sampling methodology. This methodology allowed for 30 clusters with 30 households in each cluster to be sampled for a total sample size of 900 per PEC survey. The clusters were selected by using probability proportional to size sampling, which allows for the clusters to be selected at random yet the clusters with larger populations have a greater probability of being selected. Thirty caretakers were surveyed per cluster, as well as one HW and one CHW.

Selection of the clusters depended on the geographic areas determined during the planning stage. For example, if a country needed national-level data, the clusters were selected from the entire population of the country. If only a particular region was of interest, then the clusters were selected from that region alone.

All of the villages in that region (or administrative units, depending on the country) were listed along with their populations. As 30 was the standard number of clusters to be surveyed, the cumulative population was calculated and then divided by 30 to give the sampling interval,

which was rounded to a whole number. To determine the first cluster, a random number between one and the sampling interval was selected using a random number table or random number generator. The list of villages or administrative units was consulted, and the one with the cumulative population figure containing the random number became the first cluster selected to be surveyed. The random number was then added to the sampling interval to select the next cluster. Then, the random number was added to the number that was used to select the previous cluster, and so on until 30 clusters were randomly selected from the list.

3.3. Research Design

3.3.1. Instrument Design

Each questionnaire pertaining to a country's recent VAS distribution campaign may have differed by the country and round in which it was administered. During planning meetings, HKI staff and country stakeholders discussed specific information that a country wished to obtain from a PEC survey; questions pertinent to the collection of the information were added during the instrument design phase. While also considering a country's specific requests for information, each questionnaire generally gathered most of the same data regardless of the country in which it was implemented, such as characteristics of the child who received VAS during the last campaign (i.e. age, sex, location of receipt), reasons a child may not have received VAS, and how a caretakers became aware that a VAS campaign was taking place in their area of service. HWs and CHWs were asked questions pertaining to supply during campaigns, their knowledge of vitamin A, and their suggestions for improving campaigns in the future. Translation into a country's official language occurred for surveys not conducted in English.

3.3.2. Data Collection

Standard HKI protocol calls for PECS to be conducted within 4-6 weeks following a VAS distribution campaign. This is because PECS rely on the recall method to collect data, and implementation within a short timeframe after a campaign provides more accurate responses.

Before implementation of each PEC survey, HKI staff held meetings with community leaders in each cluster to explain the purpose of a PEC survey and to obtain their permission to begin implementation. After permission was obtained, community leaders were asked to inform villagers about the PECS, including when the survey would be taking place.

Before a PEC survey was implemented, it was first piloted in the community to verify the clarity of the questions as well as to estimate the time burden. Knowing the average amount of time required for each survey informed HKI staff of the number of enumerators that were necessary to hire. A PECS team consisted of a supervisor, team leaders, enumerators, and data entry personnel, with the exact numbers differing for each PECS event. Team leaders and enumerators received separate training, lasting from 2-5 days, to fully equip them with the skills necessary to carry out their responsibilities during an event.

Households within the cluster were randomly selected by drawing a simple map of the cluster and dividing it into four quadrants. In each quadrant, five starting points were selected. Subsequently, one of these starting points was randomly selected by drawing a number from one to five out of a hat, sack, etc. To randomly select the direction in which enumerators would proceed, a pen was spun on the ground to indicate the starting direction. Enumerators counted the houses in their immediate path and used a random number table between one and this number of houses to indicate the house in which to begin the survey, continuing in the same direction and surveying each household along the line. After verifying the eligibility of a caretaker in a

household and receiving informed verbal consent, the enumerator marked responses on a hard copy of the questionnaire. Eligible households were surveyed in this manner until reaching the required number of households, usually seven or eight per quadrant. If the enumerator reached the last house or a boundary without reaching their quota, the pen was spun again to indicate the direction in which they should next proceed.

3.3.3. Data Management

Team leaders rotated among enumerators throughout the day during survey implementation. They checked questionnaires at each day's end to ensure data quality. Any incomplete forms or noticeable errors were corrected before leaving the survey area.

Data entry differed by country and round. Data entry assistants entered data from paper surveys into data entry programs such as Epi Info, CSPro, or Microsoft Excel or Access. Double data entry was performed to ensure accuracy. Completed files were sent to HKI's Regional Office for Eastern, Central and Southern Africa in Nairobi for data cleaning and analysis.

Three HKI interns, supervised by both the VAS Regional Monitoring and Evaluation Officer and the VAS Program Statistician, used IBM SPSS Statistics® version 22 to clean all PECS data available from 2010-2013. During the cleaning process, all data were re-verified that they did not contain any identifiable information, formatted into SPSS templates provided by HKI, and merged into three multi-country databases (per survey type: caretaker, HW and CHW).

3.3.4. Ethical considerations

HKI received approval from the Institutional Review Board (IRB) and followed specific protocols required by each of their country partners prior to implementing each PEC survey. Emory University's IRB was consulted to inquire if this analysis of de-identified, secondary data

required IRB review. It was determined that IRB review was not required because this analysis did not meet the requirement of research with human subjects as set forth in Emory policies and procedures.

3.4. Data Analyses

All data were analyzed using IBM SPSS Statistics® version 22. In total, 24 PEC surveys from four countries of interest (Kenya, Mozambique, Nigeria and Tanzania) that were administered from 2010-2013 during eight different rounds were analyzed. All rounds per country for each type of data were combined in order to present the final results for the period of 2010-2013 as a whole. Frequencies were calculated and uncommon responses we combined or put into an 'other' category. Final frequencies were re-calculated and recorded in results tables in Microsoft Excel.

Chapter 4: Results

4.1. Characteristics of Campaigns from 2010-2013

As is displayed in Table 2, 24 PECS of three different survey types were analyzed, which were administered over four years, from 2010-2013, during eight different rounds. The availability of data differed both per country and per round.

Table 2: Data Contribution per Round for Each Country - Three Survey Types (Caretaker, CHW and HW)

Country	**R1 2010**	**R2 2010**	**R1 2011**	**R2 2011**	**R1 2012**	**R2 2012**	**R1 2013**	**R2 2013**
Kenya								
Caretaker					✓		✓	
CHW					✓		✓	
HW					✓		✓	
Mozambique								
Caretaker		✓				✓	✓	
CHW						✓		
HW						✓	✓	
Nigeria								
Caretaker								✓
CHW								
HW				✓	✓			✓
Tanzania								
Caretaker	✓				✓	✓		✓
CHW					✓			
HW					✓	✓		✓

Sample sizes for two respondent characteristics, area type and gender, are shown for each survey type in Table 3. It is clear that many more caretakers were surveyed for the period of 2010-2013 than were either HWs or CHWs. Tanzanian caretakers who were asked about their gender make up the largest sample size (n=5792) while the smallest is that of Mozambique's CHWs who were asked about both their area type and gender (n=40). These differences in sample sizes were due partly to the number of rounds with data available that were combined for the four-year period of interest. It was also due to sample size specifications required by PEC survey protocol. As for the area type of the survey participants, greater than 70% of these participants for all countries except Tanzania were from rural areas as compared to urban areas. Kenya had the highest make-up of rural caretaker survey respondents, with 87% being from rural areas. In Tanzania, only 45% of caretakers and 64% of HWs surveyed were from rural areas, yet 93% of CHWs were

from rural areas. As for the gender make-up of the survey participants, the balance of males and females was approximately 50:50, less three instances of HWs and one instance of CHWs surveyed from the four different countries. Kenyan male HWs were surveyed the least, with just 20% of participants being of that gender (n=55). In Mozambique, 65% of CHWs (n=40) were male, while Nigerian and Tanzanian HWs were 69% (n=168) and 64% (n=44) female, respectively.

Table 3: Sample Sizes by Country and by Area Type and Gender of Respondent

Country	n	Area Type		n	Gender	
		Urban	Rural		Male	Female
Kenya						
Caretaker	1776	227 (12.8)	1549 (87.2)	1776	912 (51.4)	864 (48.6)
CHW	59	8 (13.6)	51 (86.4)	60	31 (51.7)	29 (48.3)
HW	55	13 (23.6)	42 (76.4)	55	11 (20)	44 (80)
Mozambique						
Caretaker	985	213 (21.6)	772 (78.4)	3247	1631 (50.2)	1616 (49.8)
CHW	40	9 (22.5)	31 (77.5)	40	26 (65)	14 (35)
HW	57	14 (24.6)	43 (75.4)	50	23 (46)	27 (54)
Nigeria						
Caretaker	1775	431 (24.3)	1344 (75.7)	1775	969 (54.6)	806 (45.4)
CHW	[a]					
HW	195	56 (28.7)	139 (71.3)	168	52 (31)	116 (69)
Tanzania						
Caretaker	3547	1945 (54.8)	1602 (45.2)	5792	2854 (49.3)	2938 (50.7)
CHW	58	4 (6.9)	54 (93.1)	58	28 (48.3)	30 (51.7)
HW	114	41 (36)	73 (64)	44	16 (36.4)	28 (63.6)

[a] No data available

4.2. VAS Coverage from 2010-2013

VAS coverage refers to the percentage of children aged 6-59 months receiving VAS during the latest round of distribution for their country. By sample size, a greater number of children aged one year to fifty-nine months received VAS than did children from six to eleven months of age (Table 4).

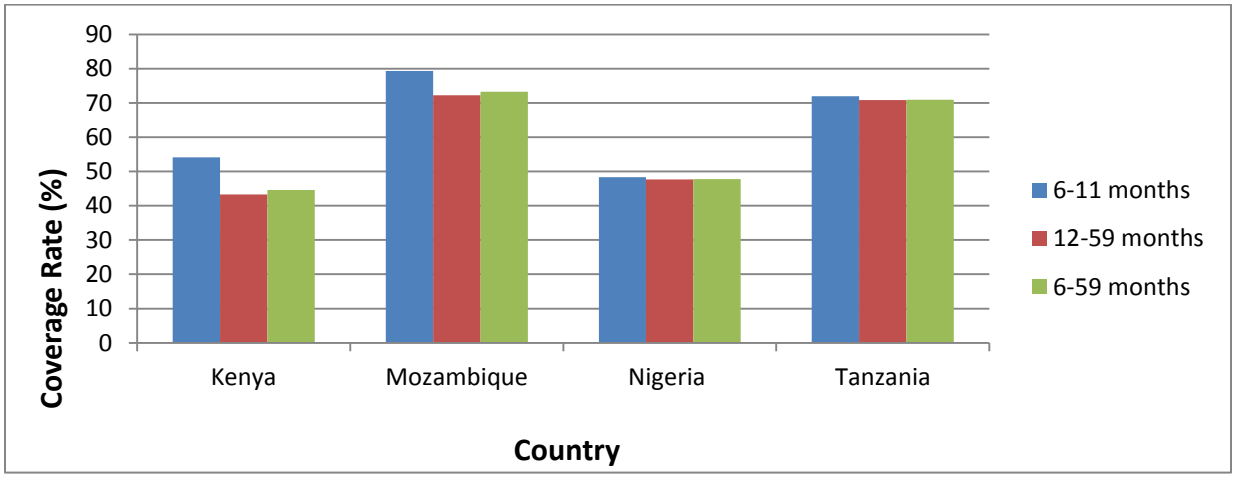
Table 4: VAS Coverage[a] by Country among Children in Three Age Groups from 2010-2013

Country	6-11 months		12-59 months		6-59 months	
	n	Coverage	n	Coverage	n	Coverage
Kenya	220	119 (54.1)	1555	673 (43.3)	1775	792 (44.6)
Mozambique	439	348 (79.3)	2735	1976 (72.2)	3174	2324 (73.2)
Nigeria	302	146 (48.3)	1473	703 (47.7)	1775	849 (47.8)
Tanzania	857	616 (71.9)	4781	3383 (70.8)	5638	3999 (70.9)

[a] VAS coverage refers to the percentage of children aged 6-59 months receiving VAS during the latest round of distribution for their country. Here, all VAS rounds with PEC data from 2010-2013 were combined for each country.

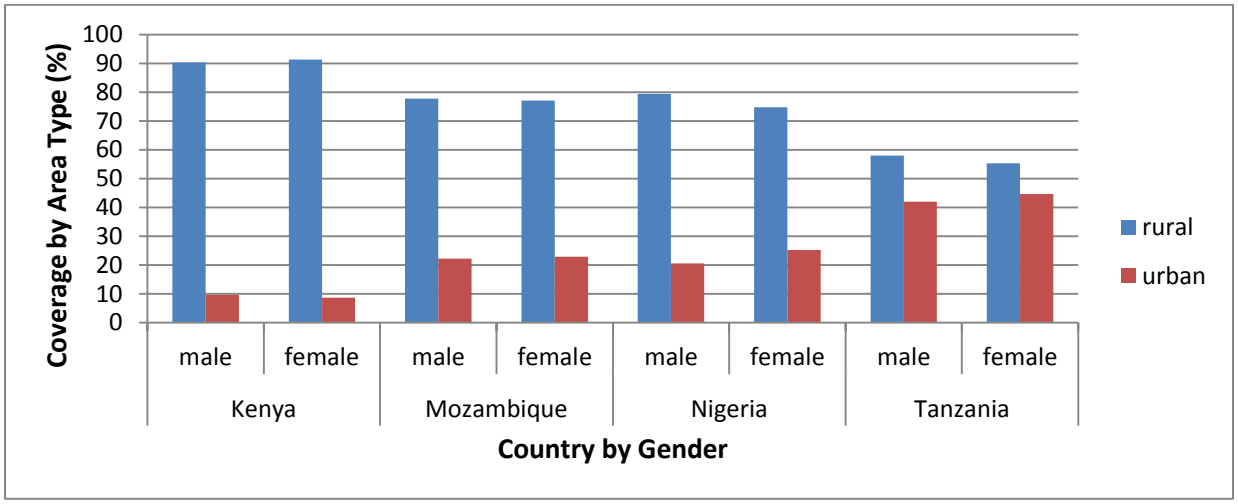
In Figure 1, a comparison of three age groups (6-11 months, 12-59 months and 6-59 months) for each country shows that VAS coverage of children in different age groups across 2010-2013 was consistent. Coverage was highest in Mozambique at 79% among children aged 6-11 months, and 72% and 73% for those 12-59 and 6-59 months, respectively. Tanzania had very similar coverage rates at just over 70% for all three age groups. However, Nigeria and Kenya had much lower coverage rates with fewer than half of children receiving VAS in the latest distribution round. Nigeria's coverage rate for all three groups is 48%, while 54% of Kenyan caretakers of children aged 6-11 months brought their children to receive VAS. Approximately 43% and 45% of Kenyan children aged 12-59 months and 6-59 months, respectively, received VAS in the latest round.

Figure 1: VAS Coverage by Country among Children in Three Age Groups from 2010-2013



When examining coverage further by area type, it can be seen in Figure 2 that the majority of children who received VAS lived in rural areas. However, one noticeable exception can be seen in Tanzania. Tanzanian children of both genders living in urban areas received VAS at relatively similar percentages to those in rural areas. For example, 58% of male children aged 6-59 months living in rural areas received VAS compared to 42% from urban areas. Even with the large differences in receipt by area type in countries such as Kenya, these differences were not found to differ significantly by gender.

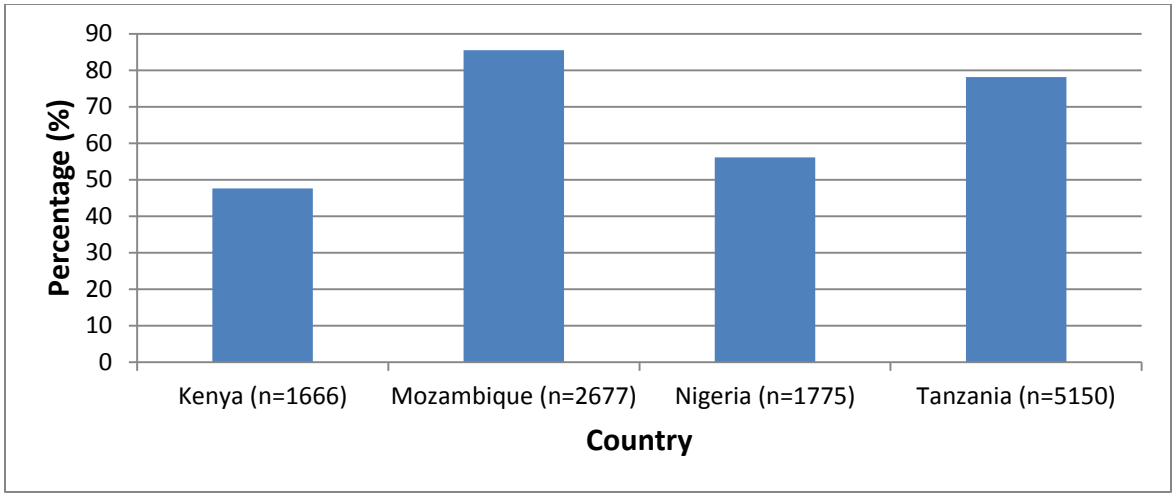
Figure 2: VAS Coverage by Area Type and Gender in Children 6-59 Months of Age



4.3. Caretakers Report Hearing about VAS Campaigns

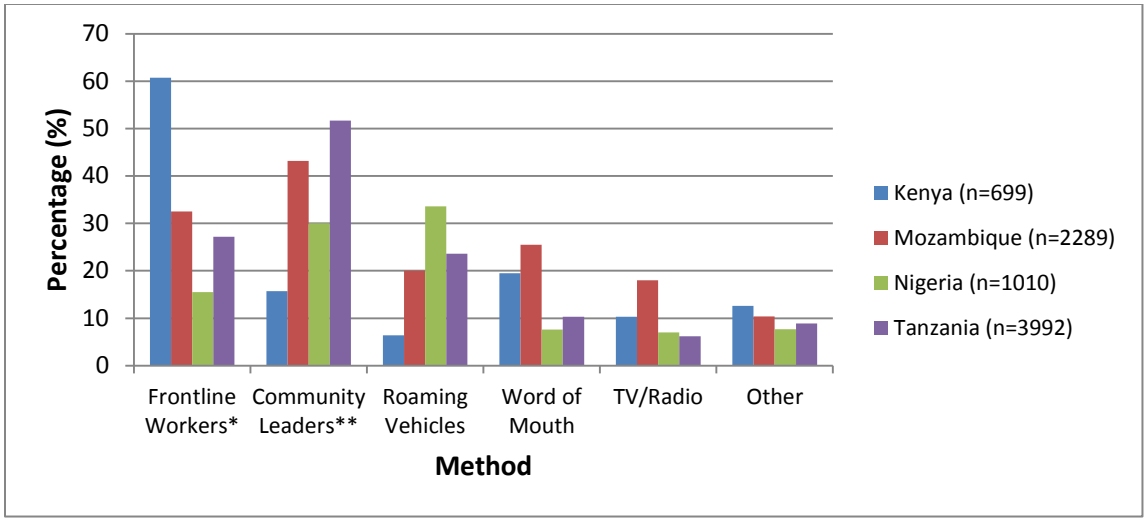
As well as being from the two countries with the highest VAS coverage, Mozambican and Tanzanian caretakers reported hearing about VAS campaigns at a greater percentage than in Nigeria or Kenya. As is shown in Figure 3, 86% of caretakers surveyed in Mozambique and 78% from Tanzania reported hearing about VAS distribution campaigns for the period of 2010-2013.

Figure 3: Caretakers who Reported Hearing about VAS Campaigns from 2010-2013



Caretakers reported hearing about VAS distribution campaigns through various methods, as are displayed in Figure 4. Through a comparison of all four countries, Kenya was shown to have the most common response. Here, frontline workers, who are defined as either HWs or CHWs, informed 61% of Kenyan caretakers about VAS distribution campaigns occurring in their area. Another common method of finding out about VAS campaigns was through community leaders, a category that also includes religious leaders. In Tanzania, community leaders played this role for 52% of caretakers, and in Mozambique 43% of caretakers reported hearing about campaigns through community leaders. Roaming vehicles equipped with megaphones were a common method used in Nigeria (34%). Twenty-six percent of Mozambican caretakers learned about campaigns through word of mouth and 18% by seeing advertisements on television and/or hearing promotions on the radio.

Figure 4: Method by which Caretakers Heard about VAS Campaigns from 2010-2013

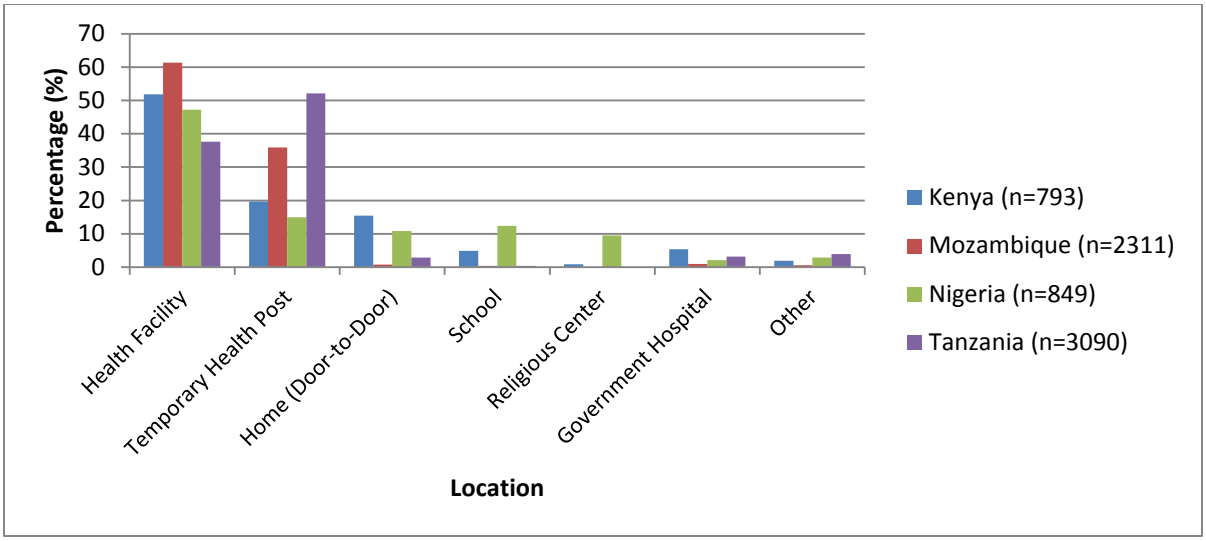


*Frontline workers includes both health workers and community health workers.
**Community leaders includes religious leaders.

4.4. Location of VAS Receipt

From 2010-2013, the most common locations where children received VAS were health facilities and temporary or mobile health posts (Figure 5). Sixty-one percent of Mozambican caretakers reported taking their children to health facilities compared to 52% of Kenyan, 47% of Nigerian, and 38% of Tanzanian caretakers. Most Tanzanians reported their child receiving VAS at temporary or mobile health posts (52%). Fifteen percent of Kenyan children were still receiving VAS at home through door-to-door campaigns for the four year time period of interest, although it cannot be stated which year as all of the rounds were combined for the analysis. Almost exclusively in Nigeria, some children also received VAS at school or at a church or mosque (12% and 10%, respectively). Very few children in any of the four countries received VAS at a government hospital.

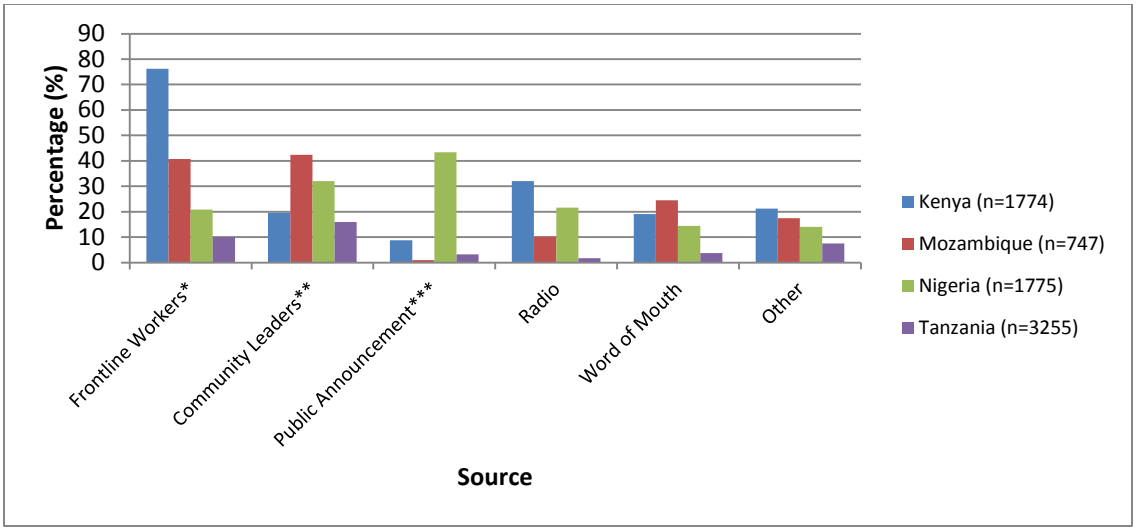
Figure 5: Location of VAS Receipt by Country from 2010-2013



4.5. Caretakers' Sources of Health Information

As is shown in Figure 6, frontline workers acted as a major source of health information for caretakers from 2010-2013. This was especially true in Kenya, where 76% of caretakers reported frontline workers as the source by which they receive health information. In Mozambique, this was the case for 41% of caretakers. However, a nearly equal source of health information for Mozambicans is through community leaders. Forty-two percent of caretakers in that country report community leaders as a source of health information, and 32% of Nigerians also reported in this manner. Despite this high rate of response, the major way of acquiring health information for Nigerians is through public announcement (43%). Public announcement includes both roaming vehicles with megaphones and public criers on foot. In two countries, Kenya and Nigeria, over 20% of caretakers reported radio as a means of health information (32% and 22%, respectively). Tanzanian caretakers' greatest source of health information was obtained through community leaders (16%). There were other various methods of health information sources reported as well.

Figure 6: Sources of Caretakers' Health Information by Country from 2010-2013

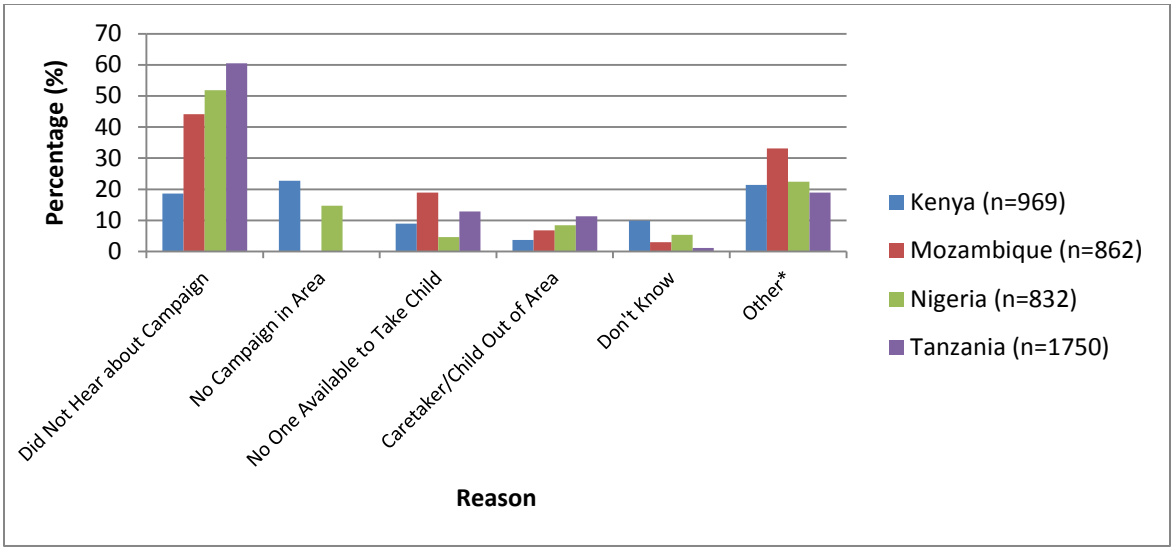


*Frontline workers includes both health workers and community health workers.
**Community leaders includes religious leaders.
***Public announcement includes roaming vehicles with megaphones and public criers on foot.

4.6. Reasons for Non-receipt of VAS

Common reasons for non-receipt of VAS were reported by caretakers and are displayed in Figure 7. The most common reason was due to caretakers not hearing about the campaign. Therefore, not knowing a campaign was occurring, they could not take their children to receive VAS. Sixty-one percent of Tanzanian caretakers stated this reason followed by 52% of Nigerians, 44% of Mozambicans and 19% of Kenyans. Only Kenyan and Nigerian caretakers mentioned the absence of campaigns in their area as a reason (23% and 15%, respectively). Mozambicans also noted adults being unavailable to take the child as a response (19%). In Tanzania, 11% of caretakers reported themselves or their children being out of the area during the VAS distribution campaign as a reason for non-receipt of VAS. Various other reasons were stated as well by caretakers from each country.

Figure 7: Common Reasons Reported by Caretakers for Non-Receipt of VAS from 2010-2013



*Includes various other reasons, such as the journey being too far, caretaker being sick, health facility running out of vitamin A capsules, and family decision-maker not allowing the child to receive VAS.

4.7. Children Left Out of VAS Campaigns

HWs and CHWs reported that groups of children were being left out of VAS campaigns from 2010-2013, as is shown in Table 5. Kenyan HWs and CHWs reported this the most, at 50% and 33%, respectively. Thirty-two percent of HWs and 22% of CHWs reported this as well. Less than 20% of both Nigerian and Tanzanian HWs reported that children were being left out of VAS campaigns. However, CHW data were not available to corroborate these results from these two countries.

Table 5: HWs and CHWs Reporting that Groups of Children were Being Left Out of VAS Campaigns

Country	**CHW**		**HW**	
	Total n	**n (%)**	**Total n**	**n (%)**
Kenya	48	16 (33.3)	52	26 (50)
Mozambique	32	7 (21.9)	50	16 (32)
Nigeria	[a]		168	31 (18.5)
Tanzania	[a]		69	10 (14.5)

[a] No data available

4.8. Problems with Supply during VAS Campaigns

In Table 6, the number of HWs and CHWs from 2010-2013 who experienced problems with supply during VAS distribution campaigns is displayed. While the number of CHWs surveyed was few for Kenya and Mozambique as well as being unavailable for the other two countries of interest, they are meant to support the HW data. Tanzanian HWs most frequently reported issues with supply at 33% of HWs. In Nigeria, 23% of HWs reported problems with supply. Seventeen percent of Kenyan HWs reported issues, which is supported by 50% of the CHWs surveyed. However, only 6% of HWs and 25% of CHWs in Mozambique reported supply problems.

Table 6: HWs and CHWs Reporting Problems with Supply during VAS Campaigns from 2010-2013

Country	**CHW**		**HW**	
	Total n	**n (%)**	**Total n**	**n (%)**
Kenya	18	9 (50)	52	9 (17.3)
Mozambique	32	8 (25)	50	3 (6.0)
Nigeria	[a]		166	38 (22.9)
Tanzania	[a]		70	23 (32.9)

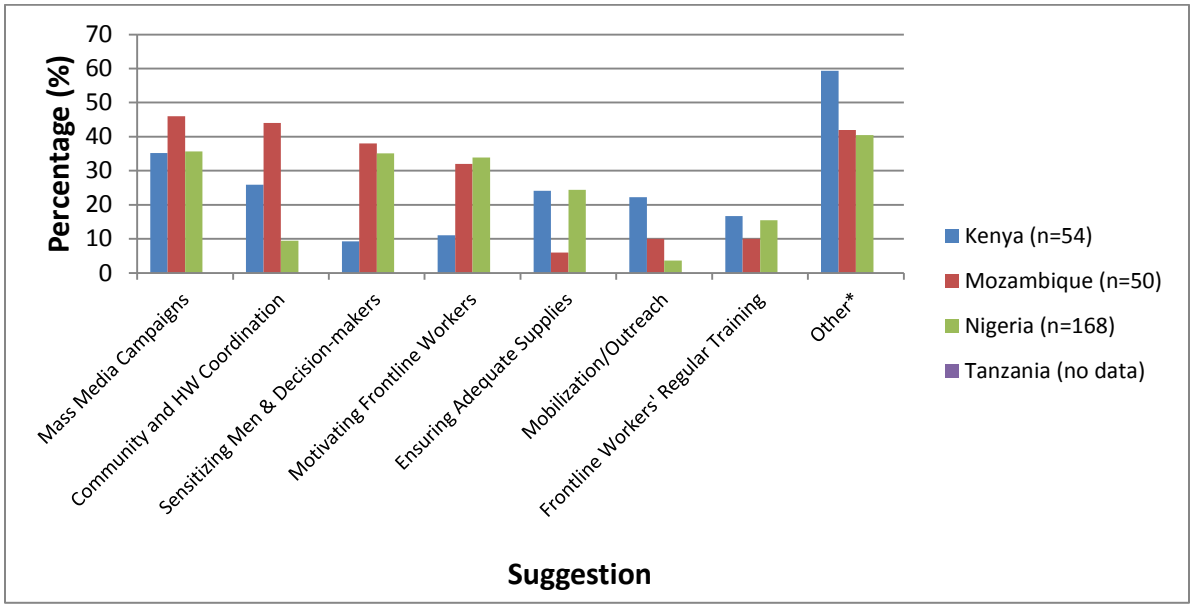
[a] No data available

4.9. Suggestions for Improvement of Future VAS Campaigns

HWs and CHWs from each country were also asked for their suggestions on how VAS campaigns could be improved in the future (Figures 8 and 9). Improving mass media campaigns was the most common suggestion for all three countries where PEC data were available. Forty-six percent of Mozambican HWs and 13% of CHWs from the same country made this suggestion. Approximately 35% of HWs and 17% of CHWs surveyed in Kenya also suggested mass media campaigns. In Nigeria, 36% of HWs made this suggestion. Another common suggestion was improving coordination between the communities and HWs during VAS campaigns. Forty-four percent of Mozambican HWs and 13% of CHWs suggested working on this task. Being more proactive on sensitizing men and decision-makers to the importance of

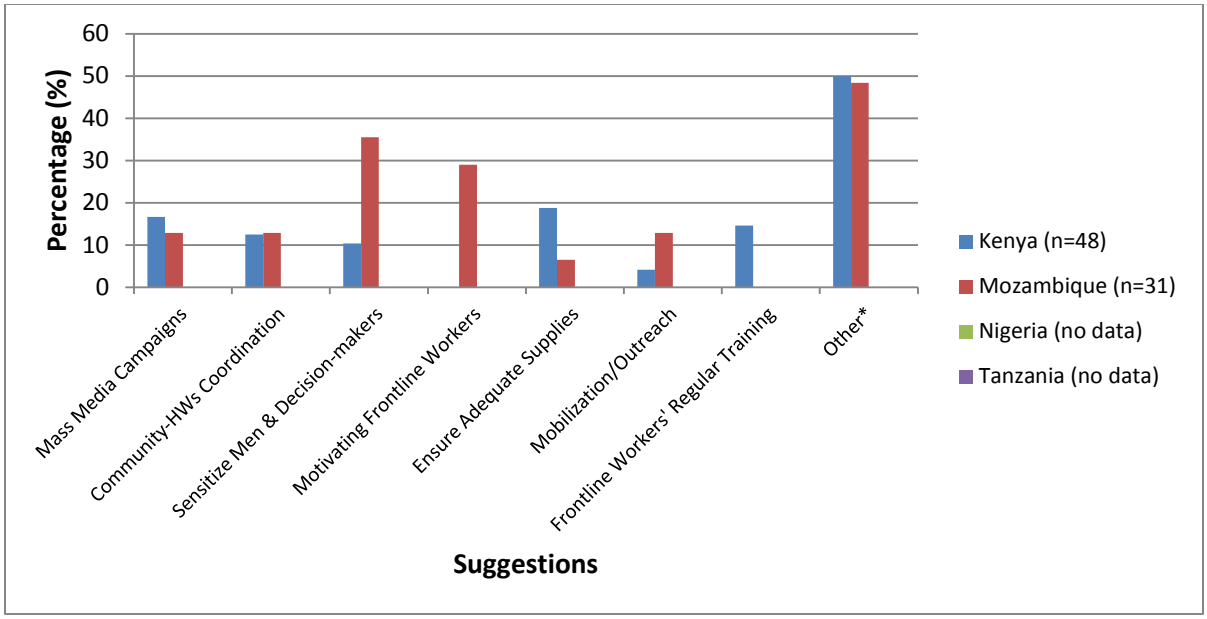
VAS for children was a suggestion commonly mentioned in Mozambique and Nigeria. Thirty-eight percent of HWs and 36% of CHWs noted this in Mozambique while 35% of Nigerian HWs made this suggestion as well. In Mozambique and Nigeria, HWs suggested trying to better motivate frontline workers participating in the campaigns (32% and 34%, respectively). Mozambican CHWs support HWs' suggestion of this as 29% of those surveyed gave the same response. Less common suggestions, such as ensuring adequate supplies, mobilization and outreach, and regular training of frontline workers were also given by HWs and CHWs.

Figure 8: HWs' Suggestions for Improving Future Campaigns by Country from 2010-2013



*Includes various other reasons, such as extending campaigns, increasing the number of distribution teams, improving logistics, and increasing the awareness of community leaders.

Figure 9: CHWs' Suggestions for Improving Future Campaigns by Country from 2010-2013



*Includes various other reasons, such as extending campaigns, increasing the number of distribution teams, improving logistics, and increasing the awareness of community leaders.

Chapter 5: Discussion, Recommendations & Conclusion

5.1. Overview

This research addressed an important knowledge gap in VAS distribution strategies. Recently published articles, although sparsely available, have shown large drops in coverage for countries transitioning their mode of VAS distribution from door-to-door to fixed post with outreach. To support this sparse research, HKI program records were also viewed to verify this decline in coverage. The purpose of this study was to examine data from VAS distribution campaigns that have already made this transition in order to draw out challenges and lessons learned to aid improvement of future campaigns. These objectives were met through the analysis of PEC survey data collected by HKI from four sub-Saharan African countries (Mozambique, Tanzania Kenya, and Nigeria), presenting challenges with this newer distribution method highlighted by caretakers, HWs and CHWs who participated in the campaigns.

5.2. Discussion

VAS coverage rates in all four sub-Saharan African countries of interest did not meet the WHO recommended target of 80% coverage. The two countries that came closest to this goal were Mozambique and Tanzania, which showed 72% and 79% coverage of children aged 6-59 months for the 2010-2013 period, respectively. Kenya and Nigeria fared worse, with less than 50% coverage for both countries during this time period. Apart from Tanzania, children received VAS in rural areas at a much higher percentage than in urban areas, regardless of gender. The greatest difference in VAS receipt by area type was in Kenya, where approximately 90% of children of either gender living in rural areas received VAS compared to just 10% of children living in urban areas. By using supporting data with factors such as reasons for non-receipt from caretakers and whether children were left out of campaigns from the perspective of HWs and CHWs, the contexts of these low coverage rates were able to be explored. Addressing these other factors can lead to recommendations for modifying certain aspects of campaigns, subsequently improving their overall success.

5.2.1. Mozambique

From 2010-2013, Mozambique, at 79% VAS coverage, was just one percentage point shy of reaching the target set by the WHO. Utilization of both frontline workers and community leaders suggests this mix was a positive factor in getting the word out to the 86% of caretakers who reported hearing about the campaigns – and ultimately obtaining high coverage. These sources of social mobilization, with the addition of radio announcements, also served as caretakers' main sources of health information. This infers the suitability of these sources in getting messages out to the general population in Mozambique. Regardless of the fact that most caretakers heard about the campaigns, HWs suggested that improved mass media campaigns could always bring

coverage even higher. Better coordination between HWs and the communities in which they distributed VAS, as well as increasing motivation of frontline workers, suggest that HWs are experiencing additional stress while participating in the campaigns. They see the opportunity for improved organization and coordination to make the sheer size and workload of VAS campaigns more manageable, thus improving their overall effectiveness.

5.2.2. Tanzania

Nearly 80% of caretakers heard about VAS campaigns, mostly through community leaders, which included religious leaders. These excellent social mobilization efforts likely account for the correspondingly high VAS coverage in Tanzania (72%) seen from 2010-2013. Well this rate is below the target set by the WHO, it indicates that progress has been made with the transition from door-to-door to fixed post distribution with outreach. Over one-third of HWs mentioned problems with VAS supply during the campaigns, possibly accounting for some of the children who did not receive VAS. Also, caretakers who did not bring their children to distribution sites stated that the primary reason was a lack of notification about campaigns. This matches another recent study completed in Tanzania on coverage and children being missed during VAS distribution (Nyhus Dhillon et al., 2013). Also, it is important to note that more children in Tanzania received VAS through temporary posts and mobile outreach than at a health facility. This indicates that there were many children living in remote areas who were difficult to reach at fixed posts, or health facilities. However, as the coverage rate is still relatively high to that of other countries, Tanzania is clearly going the extra mile to reach as many of these children as possible through the increased efforts of staff and partners.

5.2.3. Kenya

Kenya had low VAS coverage of 54% from 2010-2013, which makes sense taking into account that only 48% of caretakers heard about campaigns taking place, with caretakers citing this as the primary reason for children not receiving VAS. Half of HWs and one-third of CHWs agreed that children were not being reached during VAS campaigns. Caretakers who did hear about campaigns received the news though frontline workers, who also served as their main source of health information. This indicates that other modes of social mobilization through methods such as the use of roaming vehicles with megaphones, advertisements on television and radio, and announcements by community leaders were not being utilized. HWs' suggestions for campaign improvement called for mass media campaigns, suggesting that they also see current social mobilization strategies as a weak point of campaigns. A further indication of the campaigns' difficulty in reaching children is the fact that 15% of children still received VAS through door-to-door distribution instead of at health facilities, likely as a part of outreach or mop-up campaigns. CHWs, who distribute VAS through these outreach campaigns, reported experiencing supply shortages. Supply problems on top of trying to reach children in rural areas during mobile outreach campaigns could be a factor adding to the low coverage rate.

5.2.4. Nigeria

VAS coverage in Nigeria as part of fixed post distribution with outreach only reached 48%. The low percentage of caretakers who reported hearing about the campaigns (56%) corroborates this low coverage rate. Not hearing about the campaign was the main reason that caretakers did not take their children to receive VAS. These results suggest that the primary methods of social mobilization utilized for VAS campaigns, roaming vehicles with megaphones and community leaders (which include religious leaders), were not sufficient in spreading the word and motivating caretakers to participate in the campaign by bringing their children to receive VAS.

More than 40% of children who participated in the campaign received VAS through temporary posts and mobile outreach, such as at home through door-to-door distribution, at a school, or at a religious center. This indicates the difficulty in reaching a large portion of Nigerian children, perhaps due to many communities being located in remote areas of the country. Mass media campaigns were suggested as a method of improving social mobilization. However, with the strategies reported, it seems that multiple methods are already being used. HWs thought that sensitizing men and decision-makers could help increase coverage as well. This suggests that this group may have been a barrier to children receiving VAS. With greater sensitization, men and decision-makers could better understand the importance of VAS for child health and ensure that their children received it during the campaigns. They could also then encourage others in their communities to do the same.

5.2.5. Summary

As a whole, the results from all four countries of focus in this thesis corroborated many of the findings from previous research on distribution through fixed-post campaigns. Clohossey et al. reported on a large drop in VAS coverage in Kenya at the onset of the change in distribution strategy, and showed how coverage remained low even five years later (Clohossey et al., 2014). Other unpublished HKI program data allow for comparisons in coverage rates of the four countries that made the transition with nine other partner countries with which HKI works that still utilize mostly door-to-door distribution strategies. These data indicate high VAS coverage in the nine door-to-door countries, reaching the WHO target of 80% coverage and often being much higher (90-100%) (Helen Keller International, 2014c). This additional information helps support the thesis findings that maintaining high VAS coverage when switching from door-to-door to distribution via fixed health posts is indeed a great challenge.

Some previous research focused on campaign types different than VAS, yet the strategies used to reach children with a health-related service were the same. Weiss et al. concluded that fewer children were vaccinated during polio campaigns when fixed posts versus door-to-door had been used, and this has been shown to hold true in this study as well, as is indicated by the low coverage rates in many of the countries of study (Weiss et al., 2009). One of the factors discussed in his research – that caretakers who do not hear about campaigns are less likely to bring their children to receive VAS – also holds true in VAS campaigns. In the case of access to a distribution site, the importance of considering ease in reaching the site regarding distance from the caretakers' home parallels Thwing et al.'s conclusion from an ITN distribution study (Thwing et al., 2011). Therefore, the results from the PECS analysis supplements previous research on fixed post distribution of health interventions in Sub-Saharan Africa, particularly augmenting the evidence base of challenges faced by VAS distribution campaigns.

5.3. Recommendations

The PECS data overwhelmingly indicate a gap in social mobilization, with caretakers in each country of study citing the lack of campaign notification as the primary reason for their children's non-receipt of VAS. Greater receipt of VAS in rural areas compared to urban areas could indicate a lack of adequate social mobilization methods in urban centers, presenting an area needing extra attention. In Tanzania, as the difference in VAS receipt by area type was not as large as was found in the other countries, the mobilization strategies it currently utilizes in urban areas could be used as a model. HWs strongly suggested augmentation of mass media campaigns as an improvement to spreading the word out about campaigns. Especially for the countries with low coverage and caretakers reporting that they did not hear about campaigns, different modes of social mobilization need to be considered and implemented. This mobilization

must simultaneously be timely and considerate of the fact that, even within the same country, there exist diverse populations requiring specific modes of social mobilization. Funding restraints must also be taken into account, which proves the task of mass media campaigns as well as specializing social mobilization to certain locales a challenging feat.

In some countries, the difficulty of reaching some children is shown by the location in which they received VAS. VAS receipt in temporary posts or through mobile distribution infers that children are living in remote areas or perhaps health facilities are spaced great distances apart. Evidence from Tanzania shows that more children received VAS as part of outreach efforts than at a primary health facility, yet coverage remained high in Tanzania. This implies that Tanzania put concentrated effort into reaching children in hard-to-reach areas. Lessons learned from Tanzania's specific outreach strategies could be applied to other countries experiencing low VAS coverage in order to attempt to reach more children.

Sensitization of men and decision-makers on the importance of VAS for child health is a component of campaigns that could be ramped up in Nigeria. The data here suggested that this groups' lack of knowledge about vitamin A contributed to the country's low coverage rate. Increased education explaining the benefits of VAS for their children's health may encourage them to take their children to receive VAS. They may also then become part of the social mobilization efforts by sharing their newfound knowledge of VAS with their neighbors and extended family, thus improving overall VAS coverage.

Frontline workers experience many extra work responsibilities during VAS campaigns. By decreasing some of the additional stress associated with high-intensity distribution campaigns, both HWs and CHWs are more likely to remain motivated throughout the campaign period. This

can be accomplished in multiple different ways. One method is ensuring better coordination between HWs distributing VAS at health facilities and the communities in which they are working. This can help avoid the stress caused by any misunderstandings while ensuring the organized delivery of this life-saving intervention. Additionally, ramped-up organization efforts include confirmation of sufficient VAS supply, especially for the CHWs going the extra mile to reach children in rural areas though mobile outreach. Rewarding frontline workers with incentives for their hard work, such as monetary awards or even by offering professional training opportunities, could also help to sustain their motivation throughout the campaign.

5.4. Strengths and Limitations

This research study possessed several strengths. First, the availability of large, multi-country data sets containing multiple variables relevant to the research questions was a critical attribute. Further, some countries contained data sets from three different sources (caretakers, HWs and CHWs) that could be analyzed and used to inform one another. Caretaker data had large sample sizes. The data are recent, from 2010-2013, and therefore conclusions drawn from them can be immediately considered and applied to current VAS campaigns. Finally, enumerators consistently followed HKI's PECS Guide for data collection, increasing its reliability.

The study also has multiple weaknesses. Upon careful consideration, it became evident that comparing data across rounds was difficult for three reasons. First, data were not available for each round in each country, thus making it difficult to see trends over time or compare data for the same round across different countries. As was shown in Table 2, all three data sets (caretaker, HW and CHW) were not always available in a given year and country either, limiting the ability of the data sources to inform one another. Secondly, PECS were never conducted in the same location more than once, as a different site was identified for each PECS round. For example, in

Tanzania it would be difficult to compare Round 1 of 2012 with Round 2 of 2013 to explore any changes across time because the former consisted of 90% rural participants while the latter was composed solely of urban participants from the capital city of Dar es Salaam. A third deficiency of the study entailed small sample sizes for some of the survey responses pertaining to HWs and CHWs, particularly for questions requiring a "yes" answer to continue (i.e. "Did you have any problems with supply?"). A plethora of empty cells led to the decision to combine all rounds per country for each type of data in order to present the final results for the period of 2010-2013 as a whole. This turned out well, producing clear and reliable results. However, this method did not allow for the nuances of each VAS distribution round to be explored.

5.5. Public Health Implications

Improvements to current facility-based VAS distribution campaigns with outreach are imperative as it is likely that more countries will also be transitioning to this strategy from door-to-door in the near future. Creating more effective campaigns in these four countries will allow for increased VAS coverage now, while later these countries will be able to serve as models of success. Successful campaigns reach the WHO's target coverage rate of 80%, distributing life-saving VAS to a greater number of children. Children receiving VAS will ultimately benefit by experiencing better health overall, as well as having their risk of dying reduced by 24%. The positive effects of lower child mortality will trickle back up through the country in multiple ways. Thus, the determined efforts required to overcome the plethora of challenges currently plaguing VAS distribution through fixed health posts will be well worth it in the long run, creating a more sustainable and effective method of reaching children and saving lives.

5.6. Conclusion

This study proves that VAS distribution through fixed health posts can be effective, but the method still requires modifications to its campaign strategies in order to increase coverage and efficiency. The main finding was that caretakers did not hear about VAS campaigns, indicating a critical need for more research into which methods of social mobilization work best in certain countries, and even in specific areas of a country. HKI is currently conducting qualitative research, such as key informant interviews, to collect more specific information on campaigns being implemented bi-annually in each of these four sub-Saharan African countries. This will allow HKI and its country government partners to better understand effective strategies, as well as those strategies that have proven ineffective. When more countries start moving from door-to-door to a fixed post distribution method, more evidence and lessons learned will be available. In this way, other countries will not have to start from scratch, but will have a leg up on achieving high coverage rates from the onset. Therefore, more children will be reached with VAS in the long run - saving more young lives in the process.

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