CONTRIBUTIONS OF COMMUNITY VACCINATORS TO THE DELIVERY AND DISTRIBUTION OF NEWCASTLE DISEASE VACCINES IN MAKUENI COUNTY

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A THESIS SUBMITTED TO THE DEPARTMENT OF ANTHROPOLOGY GENDER AND AFRICAN STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF DEGREE OF MASTERS OF ARTS IN MEDICAL ANTHROPOLOGY OF THE UNIVERSITY OF NAIROBI.

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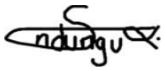
DECLARATION

This Thesis is my original work and has not been presented for examination in any other institution or university:



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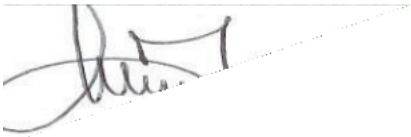

Signature……Date… ..... August 11th, 2023

Prof. Charles O. Olungah

DEDICATION

To my dearest mother who has challenged me to be the best version of myself in all aspects of life.

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ABSTRACT

This was a cross-sectional descriptive study aimed at investigating the contributions of community vaccinators in the delivery and distribution of Newcastle disease (NCD) vaccines in Kibwezi West Sub-County, Makueni County. The study sought to establish the roles of community vaccinators in relation to vaccine delivery and distribution, the strategies vaccinators use to increase awareness and uptake of vaccines, the challenges faced by community vaccinators, and how their involvement can contribute to the One Health approach. The study was guided by actor-network theory, and data were obtained through in-depth interviews, key informant interviews, and focus group discussions. Data was analyzed thematically, and the results contain verbatim quotes that amplify the voices of the informants. The findings indicate that community vaccinators provide critical services beyond vaccination, such as mobilization of farmers, awareness raising, and vaccine supply, which consequently increases vaccine reach. Other supplemental roles of the vaccinators include disease identification and surveillance, teaching and advising farmers, as well as deworming. They use strategies such as proximity, community networks, and cost effectiveness, to enhance the reach of vaccination services and the supplemental roles. Despite their crucial contributions, community vaccinators face numerous challenges, such as distance and transport issues, lack of cold chain equipment, inadequate training, and a lack of refresher courses, which undermine the sustainability of their work. The study concludes that community vaccinators provide effective links for NCD vaccine delivery and distribution; however, numerous challenges threaten the effective implementation of their services. Therefore, the study recommends that policymakers and veterinary statutory boards recognize and formalize community vaccinators as para-veterinary professionals to facilitate their access to County storage facilities and capacity building events given their role in animal healthcare. The study also highlights the need for an interdisciplinary and One Health approach, which recognizes the interconnectedness of human, animal, and environmental health, and underscores the importance of community vaccinators in enhancing animal health services and promoting public health outcomes.

LIST OF ABBREVIATIONS AND ACRONYMS

ANT	Actor Network Theory
AU-IBAR	African Union Inter African Bureau for Animal Resources
CAHWs	Community Animal Health Worker
CV	Community Vaccinators
EAFF	East Africa Farmers Federation
EAFF	East Africa Farmers Federation
FAO:	Food and Agricultural Organization
FIPS-USAID	Farms Input Promotion Africa (USAID)
GDP	Gross Domestic Product
IMF	International Monetary Fund
ITDG	Intermediate Technology Development Group
KEVEVAPI	Kenya Veterinary Vaccines Production Institute
KVB	Kenya Veterinary Board
KVP	Kenya Veterinary Policy
LMICs	Low and Middle Income Countries
NCD	Newcastle Disease
NGOs	Non-governmental Organizations
OIE	World Animal Health Organization
OPP	Obligatory Point of Passage
PAVES	Pastoral Veterinary Services
PPR	Peste des Petits Ruminants
RIGA	Rural Income Generating Activities

SDGs	Sustainable Development Goals
SPs	Service Providers
UN	United Nations
UNDP	United Nations Development Program
VAHWs	Village Animal Health Workers
VBSP	Village- Based Service Providers
VSF	Veterinary sans Frontiers
VSVP	Veterinary Surgeons and Para-veterinary Professionals

CHAPTER ONE: BACKGROUND TO THE STUDY

1.1 Introduction

In developing countries, many livestock farmers living in rural areas do not have adequate access to veterinary services (VSF, 2018). The animal health system in the global south has undergone a lot of changes (VSF, 2018) some of which have brought about the privatization of animal health services (Mockshell et al., 2014). In the past, veterinary services were being offered in a top-down approach, whereby state-appointed colonial agents would link herders to free animal health services (VSF, 2018). This system collapsed soon after the newly independent states adopted it, due to lacking a self-funding mechanism (VSF, 2016). Shortly after, between the 1980s and 1990s, international organizations like the World Bank and the International Monetary Fund (IMF) also pulled out from providing animal health services, leaving a gaping void that was soon to be occupied by individuals in the private sector, who were only keen on maximizing their profits (VSF, 2018).

This action was to be followed by numerous unintended consequences, the major one rendering animal health services inaccessible both economically and physically (Leyland et al., 2014), to impoverished farmers and those living in conflict areas. To mitigate some of these outcomes, participatory approaches were adopted in the delivery of veterinary health services in the global south. In East Africa, only a few animal health projects adopted community participation, and such projects documented positive results in their interventions (Catley & Leyland, 2001). Their success eventually drew the attention of many Non-Governmental Organizations (NGOs) and that of some government officials. From the 1990s, the use of Community-Based Animal Health Workers

(CAHWs) became more popular, particularly in addressing the animal-health needs of those disadvantaged in the community, and whose livelihoods heavily depend on livestock. (VSF, 2018).

Across the world, CAHWs have been mainly instrumental in augmenting overburdened animal health delivery services (Bessell et al., 2017). In Cambodia, for example, a cross-sectional survey detailing the practices of Village Animal Health Workers (VAHWs) found that they are actively involved in animal health services (Stratton et al., 2019). Furthermore, the findings suggested that they play a significant role in linking smallholder farmers to public veterinary services (Stratton et al., 2019). CAHWs in Bolivia are highly respected and liked by the community members, and they equally perform most of the community's animal health care services (Stewart, 2002). CAHWs activities have also been documented in the South Asian regions, where studies conducted in Nepal indicate that VAHWs are critical in linking impoverished farmers with curative and preventive animal health services when public veterinary services are inaccessible (Stoufer et al., 2002). Across the continent, studies on CAHWs activities have similarly been highlighted in Mozambique and Ghana (Oakley, 1998 as cited by Leyland et al, 2014). Research findings from both countries concluded that CAHWs provide the most efficient means of passing along the information to farmers on the proper usage of drugs (Oakley, 1998 as cited by Leyland et al., 2014).

As part of any participatory approach, Community Animal Health Workers are selected from the communities in which they reside, and taken through short training courses on basic animal health techniques (VSF, 2016). They usually comprise herders and pastoralists chosen because of their rich background knowledge in local animal husbandry practices and animal diseases (VSF, 2018). The pieces of training they go through are supposed to equip them with skills that enable them to carry out essential veterinary services at minimum cost to the community (VSF, 2016), which may be in cash or kind. CAHWs are responsible for disseminating relevant animal health information

to livestock farmers, and they are also tasked with providing them with good advice on the best animal husbandry practices (VSF, 2018). Apart from advocacies, findings from Bugeza et al., (2017) showed that CAHWs additionally engaged in disease identification, surveillance and reporting, curative and preventive health services, community mobilization, and record keeping.

CAHWs have performed exceptionally well in many of these roles, and they far exceeded expectations in their efforts towards disease prevention and control. Animal vaccination serves multiple purposes, including controlling animal infections and infestations, improving animal health and welfare, and safeguarding public health by controlling anthropozoonoses (diseases transmitted from animals to humans) (Paul-Pierre, 2009). According to Catley and Leyland (2001), attempts to control the rinderpest epidemic in the Afar region of Ethiopia in 1994 only became fruitful after the involvement of CAHWs in the vaccination campaigns. Studies conducted on CAHWs concerning the livestock distribution chain indicate that they are substantially crucial in the distribution of free and subsidized vaccines during government vaccination programs (Leyland et al., 2014). They act as middlemen, linking community members to both government-sponsored and locally procured vaccines. It is usually not unlikely to find them facilitating the distribution of vaccines through various stakeholders at a time. In countries like Tanzania, Nepal, and India, CAHWs join the vaccine distribution chain as independent businesses, selling vaccines purchased from local agro-vet stores to the farmers (Bessell et al., 2017). In such cases, the authors indicate that CAHWs are placed under the titles of Village or Community Vaccinators (CVs), where they are ‘primarily responsible for selling vaccines’ (Bessell et al., 2017:111).

Apart from distribution, they also engage in raising awareness about these vaccines (Bugeza et al., 2017). A study conducted in the Karamoja region of Uganda, for example, evaluated their effectiveness in the delivery of animal health care service, and the authors indicated that 77%

(167/215) of the farmers reported having known about the advantages of using vaccines through Community Vaccinators (Bugeza et al., 2017). Increasing awareness on vaccines includes addressing myths and misconceptions about vaccines in the community and answering questions about which diseases can be vaccinated against, how often to vaccinate, and detecting diseases early (Situnayake, 2018). Through previous studies, CVs have been known to employ strategies such as using their social networks to help carry out most of their roles and responsibilities successfully. Campbell et al., (2018), for instance, credits the use of social networks for spreading information about vaccines. In his study, he comments that farmers are more likely to adopt the use of vaccines if the information was coming from their peers (Campbell et al., (2018). Community Vaccinators are instrumental in the vaccine market because of their ability to reduce the barriers to vaccine access in households with small stocks (Campbell et al., 2018). The authors indicate an example in which CVs can help create a sharing scheme in instances where vaccines are sold in large batches of at least 100 doses (Campbell et al., 2018). This way, they help to reduce wastage and increase access to vaccines for farmers (Campbell et al., 2018).

Free-ranging backyard chickens are usually the most preferred and the most common livestock kept by impoverished farmers, as they require little input (Bugeza et al., 2017). This production chain is however threatened by the seasonal outbreak of Newcastle Disease (NCD), a viral and highly infectious disease that is very common and the most important among poultry (Terfa et al., 2018). NCD is endemic in many parts of Africa, and vaccination has proven to be effective and successful as a control measure (Campbell et al., 2018; Terfa et al., 2018). Smallholder farmers with small stock sizes often overlook the need for vaccinating poultry due to lack of information, perception, and experience regarding vaccine effectiveness, as re-entry into ownership after a loss is relatively easier compared to high-value livestock such as goat, sheep and cattle (Campbell et

al., 2019). Therefore, increasing farmers' awareness of the benefits and advantages of vaccination is crucial as it significantly enhances adoption (Campbell et al., 2018). This is particularly important as increasing vaccine usage can have significant implications such as reducing the risk of zoonotic transmission of NCD to humans, which can cause flu-like symptoms, conjunctivitis (pink eye), and laryngitis characterized by irritation and swelling of the voice box and surrounding area (MacLachlan and Dubovi, 2017).

In light of the above circumstances, this study, therefore, sought to investigate the contributions of CVs in the delivery and distribution of vaccines for smallholder chicken farmers in Kibwezi West Sub-County of Makueni County. This study primarily focused on the distribution of vaccines for chicken reared on a small-scale basis because they are usually the group that utilizes the services of CVs more. This topic begs to be addressed, given the lack of effort focused towards the delivery of animal health services to farmers in grassroots and rural areas by public and private investors in the animal health sector. Additionally, it examined how CVs operate in their day-to-day activities, and how they manage to keep their business afloat and addressed the techniques CVs use to sell and dispense the vaccines and the training that make them competent at their work. The current study further speaks to the challenges faced by CVs, their contribution to increasing vaccine awareness and adoption, and, generally, the effectiveness and sustainability of CVs programs.

1.2 Problem Statement

Livestock disease and outbreaks have been cited to be the second most difficult challenges facing livestock farmers today (EAFF, 2012). Furthermore, Kedebe et al., (2014) note that impoverished livestock health services continue to be one of the biggest issues plaguing the developing world.

Given that animal health-related challenges are expected to rise exponentially due to climate change, it warrants this issue to be addressed (Mutambara, 2013). As the animal health care services continue to be grossly under-invested and the health needs of livestock continue to rise, eventually, optimal animal health care will not be attained due to low geographic coverage and scarce resources (Mutambara, 2013).

CVs play an important role in supplementing this gap through providing basic health care services to farmers living in remote and conflict areas where animal health services are inaccessible both financially and physically (VSF, 2016). Even though CVs have shown favorable results in their involvement in the distribution and delivery chain (Acosta, 2019), policies and guidelines around their establishment remain in abeyance. This has left CV programs largely neglected, presenting a significant threat both on a medical and financial front (Campbell et al., 2018). The zoonotic potential of livestock diseases, including Newcastle disease, emphasizes the necessity of adopting a One Health approach that encompasses both animal and human health (MacLachlan and Dubovi, 2017). This underscores the significance of collaborative efforts among veterinarians, public health officials, and environmental health experts to prevent and control the disease in both animal and human populations.

Previous studies (Mockshell et al., 2014; Irungu et al., 2006 and Mutambara et al., 2013) have analyzed the use of community-based health care providers as an alternative to the delivery of basic animal health services. These studies, however, failed to narrow in on the roles the CVs play and particularly their role in preventive health services like vaccination. Discussions addressing the role CVs play in the delivery of vaccines and vaccination services have more or less been focused on their overall contributions to the animal health care sector (Bugeza et al., 2017; Leyland et al., 2014), whereas others have only looked at their involvement in the delivery and distribution

of PPR vaccine. These studies only offer an overall and comparative view of the operations of CVs without really interrogating how their involvement in the vaccine delivery and distribution chain facilitates increased awareness and adoption. In addition, discussions around this topic have largely been centered on their effectiveness, and less on the challenges that threaten the sustainability of CV programs.

According to VSF (2018), non-profit agencies and veterinary public services have long recognized the roles of CVs as vital actors in grassroots animal health services. Few studies, however, have focused on their role in vaccination campaigns, and even fewer on their role in the distribution and delivery of poultry vaccines, especially Newcastle disease. Furthermore, there is an even bigger gap in knowledge on how CVs navigate through socio-economic and gender dynamics to promote awareness and use of Newcastle disease vaccines. Ultimately, this study explored the contributions of community vaccinators to the distribution and delivery of Newcastle disease vaccines in Kibwezi West Sub-County of Makueni County. Hence, the inquiry was guided by the following research questions:

1. What role do CVs play in the distribution and delivery of NCD vaccines?
2. What are the strategies utilized by CVs to increase awareness and uptake of NCD vaccines?
3. What are the challenges faced by CVs in the distribution and delivery of NCD vaccines?

1.3 Objectives of the study

1.3.1 Overall objective

To explore the contributions of Community Vaccinators to the delivery and distribution of NCD vaccines in Kibwezi West Sub-County, Makueni County.

1.3.2 Specific Objectives

1. To assess the role of CVs in the distribution and delivery of NCD vaccines.
2. To describe the strategies used by CVs to increase awareness and uptake of NCD vaccines.
3. To identify the challenges faced by CVs in the distribution and delivery of NCD vaccines.

1.4 Assumptions of the study

1. CVs are involved in the distribution and delivery of NCD vaccines.
2. CVs use strategies such as social ties and cost effectiveness which lead to increased awareness and uptake of NCD vaccines.
3. CVs are faced with challenges such as inadequate training and transport issues when distributing and delivering NCD vaccines.

1.5 Justifications of the Study

This study offers insight into the roles and activities undertaken by CVs while carrying out vaccinations on poultry. The findings from this study assess the importance of CVs in the delivery of preventive health measures to livestock farmers. It pays particular attention to the arising issues that engulf CV programs, and ultimately how they navigate the challenging vaccine markets. This study could be beneficial in informing future projects planning, specifically, to incorporate CVs into their vaccination campaigns based on procedures that might guarantee effective, efficient and reliable vaccination bids. By highlighting the crucial role of CVs and their potential to drive meaningful progress in livestock health, this study sets the stage for substantial advancements in NCD vaccination efforts. The study holds rich academic discourse and immense practical

implications. The findings of this study provide a strong foundation for the integration of community vaccinators (CVs) as essential stakeholders in the livestock healthcare system. This study holds immense promise and serves as a catalyst for inspiring policymakers, practitioners, and researchers to recognize and unlock the untapped potential of CVs for future approaches that can ease the burden of the animal health care system.

The study also shows the need to consolidate community vaccinator projects into a single unit and paying particular attention to the mode of selection, training, and supervision of community vaccinators, and how this affects acceptance for community vaccinators and the sustainability of community vaccinator projects. The debates in the findings propose the harmonization of community vaccinator projects into one entity. To this extent, the study calls for legal reforms to the Veterinary Surgeons and Veterinary Para-professionals Act, 2011, s 17, which stipulates the guidelines for qualification and registration of veterinary para-professionals in Kenya. Currently, to qualify for registration as a veterinary para-professional in Kenya one needs to have completed not less than one year of post-secondary training course at an institution approved by the Board as well as having served more than twelve months of internship supervised by a registered veterinary surgeon. This has created an unfavorable legal environment surrounding community vaccinator projects and these reforms will seek to address the lack of recognition among community vaccinators which has resulted in lack of a proper identification for the vaccinators, compounded by sensitizing for impoverished farmers on who community vaccinators are.

Additionally, the Kenya Veterinary Policy (KVP) (2015) guidelines aim at increasing vaccination coverage and supporting animal health service providers in the private sectors. These guidelines however ignore how community vaccinators could be used as last mile delivery especially in rural and remote areas, thus ensuring extensive reach to marginalized groups who may have not been

accessed otherwise. The findings remain important in highlighting the need to integrate community vaccinators in the animal health system to supplement the shortage in animal healthcare providers, thereby increasing access to basic animal healthcare services.

Additionally, the results from the study could make great contributions to the 2030 Sustainable Development Goals (SDG) framework of 'leave no one behind' (UNDP, 2018). The practice behind community vaccinators has been linked with SDG 1 and 3, which call for an end to poverty and the promotion of the well-being for all respectively. Indigenous chicken acts as a source of food, and it also provides a source of income, employment and savings to many farmers in rural areas, and this links the practice to SDG 1. Community vaccinators create awareness on the prevention and control of Newcastle disease, in addition to providing services aimed at controlling the spread through vaccination. By addressing diseases that plague the public health sector, the practice of community vaccinators links to SDG 3, which calls for better health outcomes for all. In terms of academia, this study could provide an abundance of data to scholars interested in studying delivery of animal health services, especially NCD vaccination services using community-based workers through an actor-network lens within a rural setting.

1.6 Scope and Limitations of the study

This study was carried out in Kibwezi West Sub-County of Makueni County, and it specifically focuses on the role that CVs play in the distribution and delivery of NCD vaccines. The study explored the contributions of CVs in increasing awareness of these vaccines, the strategies they employ to increase its adoption, and the challenges they face while distributing and delivering them. The study was limited to CVs; thus, it did not delve into the challenges faced by other animal health services providers. As much as the study was restricted to a small geographical area of

Makueni Sub-County, the findings can be used to inform on similar arid and semi-arid areas in Kenya where CVs programs are in place.

The study relied heavily on qualitative methods of data collection, and it entailed the use of in-depth interviews, key informant interviews, and focus group discussions. This deliberate choice to utilize qualitative methods was driven by the unique strengths and advantages they offer in exploring complex phenomena, which was particularly relevant in the context of this study. Triangulation was used to cross-validate data and capture different dimensions of the same phenomena. Using more than one data collection method was instrumental in expelling biases and cross-referencing data. At the same time, this study was guided by the actor-network theory. The theory was sufficient in contextualizing community vaccinator projects as actor-networks which grow over bigger and larger time through consistent enrolment.

1.7 Definition of key terms

Community vaccinators: Individuals who have been picked from their community and trained on basic animal health including vaccination regimen.

Service Providers: Community-level reference to community vaccinators.

Poultry: Free-range and backyard chicken kept for subsistence purposes.

Vaccine: medication that is given to animals to boost their immunity against infection by certain diseases. In the current study, Newcastle Disease Vaccine.

Vaccination: In this study, it refers to the use of vaccines to make the animals immune to certain diseases.

Vaccine delivery: Transportation of vaccines from supplier to consumer.

Vaccine distribution: Dispensing the vaccines to the poultry farmers.

Awareness: Knowledge about NCD vaccines in general.

Adoption: Take up and utilization of NCD vaccines.

Challenges: In this study, these refer to the troubles/obstacles that CVs go through while undertaking their roles in vaccine delivery and distribution.

Supply chain: Storage, handling and management of vaccine stocks.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the literature significant to the research question and objectives. The literature is discussed under the following headings; Livestock keeping, animal health services, Community-based approaches to animal health delivery, an overview of CVs selection and training plus CVs roles and activities. Additionally, the chapter looks at the vaccine delivery and distribution chain, increased awareness and uptake, and its challenges. At the end of the chapter, the actor-network theory and its relevance to the study has been discussed.

2.2 Livestock keeping in the developing world

Livestock keeping plays an important role in the lives of many individuals living in the developing world. According to Mockshell et al. (2013 as cited in FAO, 2011), about 70% of people living in the third world are dependent on livestock for financial, human and social capital needs. The author continues to explain that livestock provides direct income to facilitate farming activities, education, health services, finance, and a social safety net (Mockshell et al., 2013 as cited in FAO, 2011). Livestock production industry is increasing rapidly, and in the first world, it accounts for half of the total gross value of agricultural production. In Africa, this figure is slightly lower at a third of the total gross value of agricultural production (FAO, 2016).

In the next 10 years, the demand for animal products such as eggs, milk and meat are set to double (FAO, 2016). This increase is predicted at a 6 to 8 percent rate annually, and this means that a large number of smallholder farmers can potentially improve their lives through the newly created opportunities (Paudyal et al., 2014). Livestock keeping is essential because it contributes to human capital, and this gives the community members the power to buy and produce food, it can also be

used to pay for education and medical bills (FAO, 2011). Additionally, livestock acts as a source of social capital. It can sustain its owners during times when food is scarce as well as using them as collateral, as gifts or even as a form of dowry (FAO, 2011).

Livestock provides income and employment to numerous men and women. Findings from FAO (2016) confirms that farmers, contract herders, traders, animal handlers, slaughter house owners and workers and also market operators all depend on the livestock sector to make a living and sustain their livelihoods. Livestock makes a significant contribution to the incomes of those living in rural areas. In fact, in 14 countries the Rural Income Generating Activities (RIGA) database concluded that as many as 50 percent of the households keep livestock and in some other cases, this figure was almost at 90 percent (FAO, 2011).

Although livestock contributes to 40 percent of agricultural GDP in the developing world, only 4.5 percent of developmental funding goes toward livestock (OIE & FAO, 2015). This report underscores the level of underinvestment in the agricultural sector, particularly in animal health and welfare (OIE & FAO, 2015). Animal diseases place a great deal of burden on individuals whose livelihoods depend on livestock, given that diseases account for 18 percent of the total animal deaths (OIE, 2013). The animal health sector has been severely neglected in terms of public and international developmental investment, compared to other sectors such as infrastructure, and the situation still prevails despite 80% of the population holding employment in the agricultural sector (OIE, 2013).

Animal health comprises more than just curative and preventive health among livestock. It also entails addressing the issues that may lead to poor health, which may ultimately result in low outputs (FAO, 2016). It is a crucial part in protecting the well-being of animals. Veterinary

departments are often charged with the responsibilities of providing these animal health care services, which are aimed towards disease surveillance and control. In many LMIC however, the livestock and veterinary services are severely 'under-resourced against all comparable measures within agriculture.' (OIE & FAO, 2015:7). Some of the issues plaguing the animal health sector include poor financial resources, insufficient staff, and ineffective organization, which often translate to high losses in livestock in areas where the epidemic is largely uncontrolled (OIE, 2013).

Underinvestment in veterinary services seems to be the main challenge facing animal health services in the world (OIE & FAO, 2015). Having limited financial resources may result in difficulty recruiting more staff and may slow down provision of animal health services. Findings from multiple studies have found that the removal of public animal health networks without replacing it with a functional and sustainable private animal health care system, often leaves farmers without any access to animal health services (OIE & FAO, 2015; VSF 2018; Catley & Leyland, 2001). As a result of this scaling down, there are huge deficits in terms of budget, staff, transport and infrastructure (Leyland et al., 2014). With limited staff and budget, veterinarians often find it difficult physically accessing communities living in remote areas (Catley et al., 2004). Consequently, a pressing need arises to bridge the gap left in the delivery of animal health care services. This gap necessitates innovative community-led solutions to ensure that farmers, particularly those in remote regions, have access to vital veterinary care. Addressing this issue is imperative to safeguard animal health, preserve livestock-based livelihoods, and ultimately promote overall public health.

2.2.1 Anthropology, globalization and One Health

One Health is a comprehensive approach that aims to understand and promote the interconnectedness between human, animal, and environmental health, considering the interactions between microbes, humans, animals, and their environment within a globalized network of processes (Rock et al., 2009). Anthropologists, although not explicitly using the term One Health, have long been studying these complex relationships since the inception of the discipline (Steffens & Finnis, 2022). The modern relationship between humans and animals is complex and deep, and includes many different aspects, ranging from using livestock for food to treating animals as companions, to live markets and the international trade of animal species (Zinstag et al., 2012.)

For example, Lowe (2010) in her multi-species ethnographic study of Influenza A virus (H5N1) in Indonesia, anthropologist examined the interconnectedness and mutual influence of humans, animals, and microbes. She raised concerns about how the H5N1 epidemic was portrayed as a global crisis, shifting the responsibility from Indonesian public health to international interventions, resulting in blame to the Indonesian population and implementing extensive culling of poultry keeping (Lowe, 2010). Lowe's study underscores the importance of questioning the framing and narratives surrounding zoonotic diseases.

Medical anthropological research on global disease ecologies offers valuable insights into the intricate dynamics and social ramifications of outbreaks, and goes beyond the biomedical perspective by considering the cultural, social, and political factors that shape disease emergence, transmission, and control (Wolf, 2015). By examining the interactions between humans, animals, and microbes within specific contexts, anthropologists can shed light on the complexities of

disease spread and the social implications that arise from interventions and responses, and how best we can respond (Wallace, 2009).

2.2.2 Community-based approaches to animal health delivery

Community-based, according to Van Bibber (1997), is a philosophical approach through which communities actively play a role and participate in bringing up and evaluating the issues that are most important to them. It allows the communities to collectively decide what problems need to be addressed, how to address them and being actively involved in the delivery of intervention strategies. A community, according to the author, in a geographic sense refers to a village, town or neighborhood, and is often composed of a group of individuals, in formal or informal organizations, who have particular common interests and share common norms, values and identity (Van Bibber, 1997).

Community-based animal health delivery programs began as and still are deeply rooted in participatory approaches. Community participation was made popular by the United Nations (UN) in the 1950s to 1960s, and according to Catley & Leyland (2001), this idea originated from Theodore's Roosevelt Country Life Commission, which was aimed at helping Americans living in rural areas develop capacity and be self-sufficient. This approach was replaced by ‘people's participation’ in the late 1960s due to flaws identified in the preceding approach (Catley & Leyland, 2001).

‘People’s participation’ or ‘popular participation’ approach began to appear in the 1970s as international organizations such as the World Bank advocated for this approach to be a feature in developmental strategies (Catley & Leyland, 2001). This approach, the authors continue, called for participation to be used for community empowerment, where community members are

equipped with new skills and capabilities to start and maintain their projects that are funded by donors and governments (Catley & Leyland, 2001). By the late 1980s and early 1990s, numerous NGOs began taking a keen interest in community participatory approaches designed for the delivery of animal health services. By the mid-1990s, the experiences of community-based animal health workers began to take shape, and they slowly started to gain acceptance of African governments and regional organizations (Leyland et al., 2014). This change in attitude was attributed to the significant role community-based animal health workers played in the eradication of rinderpest disease both in Ethiopia and South Sudan, in which they were key in penetrating conflict-inflicted areas where government vaccination had proved to have failed.

The idea was quickly taken up by projects that involved the locals in various steps of the implementation, and this approach was warranted on both practical and ideological fronts (Catley & Leyland 2001). On a practical stand, the animal health service workers were aware of the vast knowledge that pastoralists, herders and farmers possessed (Catley, 2004), and ideologically, participatory approaches emphasized the need for 'learning from indigenous knowledge and systems' (Leyland et al., 2014:7). The implementation of these projects however proved problematic, as they were operating under very unclear policies and legislations. In 2000, the Organization of African Unity/Inter African Bureau for Animal Resources (OAU/IBAR) created the Community-based Animal Health and Participatory Epidemiology (CAPE) Unit to oversee the establishment of supportive guidelines (Catley, 2004). At a conference organized by CAPE in 2003, different stakeholders in the animal health sector, both international and across Africa, convened and agreed to accept CAHWs as a working idea (Catley, 2004).

The first community participation approaches began in East Africa by NGOs such as Intermediate Technology Development Group (ITDG), Oxfam. Heifer Project International and Farm Africa

(Leyland et al., 2014). These NGOs set out to work with the local communities, and they trained the very first Community Animal Health Workers. During that period, they went by different names, and in Kenya, they were popularly referred to as 'Vet Scouts' (Young et al., 2003 as cited by Leyland et al., 2014), and also as 'Community Based Animal Health Workers'. In Tanzania, they were categorized under the title of 'Village Vaccinators' (Campbell et al., 2018), and in Somalia, they were being referred to as 'Nomadic Animal Health Auxiliaries' (Baumann, 1990 as cited by Leyland et al., 2014). Some people refer to them as "Community Based Veterinary Workers" (Catley et al., 2004), while in Cambodia, they are referred to as "Village Animal Health Worker" (Stratton et al., 2017). Other titles include "Community Livestock Worker" (Catley & Leyland, 2001), and "Voluntary Village Vaccinators" (VSF, 2018).

As illustrated above, there exist many different types of CBAHWs who perform different roles and functions. Community-based animal health service providers work on part-time basis, and they also make a living through livestock farming among other things (Leyland et al., 2014). They have been considered a revolutionary move towards empowering communities on an animal health front through provision of accessible and cost-effective services (Catley et al. (2002, as cited by Mutambara et al., 2013). A study by Leyland and Akabwai (1998), had similar findings, and concluded that CBAHWs showed high impacts in their work and generally improved livelihoods in relation to animal health care, for communities living in rural areas.

2.2.3 Roles filled by community livestock workers

The training dispensed to them usually dictates their roles as well as their limited scope of practice. Some are specialized in curative treatment of animals, others are vaccinators, there are those who perform surveillance and extension work, and then there are those who are specialized in disease-

specific control such as rabies, tsetse fly (Catley et al., 2004) or NCD. The two major roles that CBAHWs undertake in relation to animal health care, are surveillance and control. In terms of surveillance, VSF (2018) indicates that the CBAHWs act as relay agents disseminating information on disease outbreaks to the relevant officials. Similarly, Onono (2013) argued that in fact, the main role of CBAHWs initially, was to report disease outbreaks to the local animal health authorities. Since they live in the community and interact with community members regularly, they prove to be quite significant in improving the sensitivity of surveillance systems Leyland et al., (2014). Through surveillance, CBAHWs are able to report back on vaccination activities as well as issues to do with public health (VSF, 2018).

CBAHWs have for a very long time been involved in disease control and prevention interventions. Disease control programs aim at preventing and mitigating an infectious disease from spreading to other humans or animals, and is often viewed as a public good (Onono et al., 2013). Vaccines provide one of the most cost-effective, and sometimes even the only means of providing protection to livestock animals against harmful disease (Donadeu et al., 2019). The involvement of CBAHWs in vaccination activities has been documented in many regions including Cambodia (Stratton et al., 2017), India, Nepal, Tanzania (Bessel et al., 2017), Uganda (Bugeza et al., 2017), Mozambique, Ghana (Oakley, 1998 as cited by Leyland et al, 2014), Kenya, Ethiopia and South Sudan (Leyland et al., 2014). Those CBAHWs who only perform vaccinations are specifically referred to as community-based vaccinators (CVs).

2.3 Definition and Characteristics

CBAHWs are mainly livestock keepers who have been selected from the communities from which they belong and reside in, and are usually taken through some form of training to acquire basic

skills in animal health care and delivery (VSF, 2018). They are individuals with the ability to either read or write, chosen by their community to handle their animal health needs (FAO, 1994, as cited by Mutambara et al., 2013). Stratton et al. (2017) indicates that they are farmers who have gone through at least one month of training in animal health and offer their services to smallholder farmers in their community on a fee-basis. FAO (2016) and Situnayake (2018) define them as:

> "A paraprofessional who is authorized to carry out certain veterinary tasks with authorization from a Veterinary Statutory Board, under the responsibility and direction of a registered or licensed veterinarian." (FAO, 2016:6).

> "These CAHWs are entrepreneurs providing public animal healthcare services to their community members. They determine their own work hours and charges for their services. After they were trained as a CAHW, they received an initial package of veterinary drugs (for free) to jump start their career. After which, it is their duty to provide services to their community in exchange for cash or kind." (Situnayake, 2018:6).

In the present study, we adopt a comprehensive definition of Community Vaccinators by integrating the perspectives presented by FAO (2016) and Situnayake (2018). According to our definition, CVs are entrepreneurial practising farmers who operate under the guidance of veterinary officers. Their primary objective is to provide essential animal healthcare services, which include vaccination, to members of their community. They undergo a selection process and receive specialized training to fulfil their roles effectively, with one notable characteristic being their flexibility in terms of working hours and modes of payment.

This definition encompasses the fundamental elements that characterize CVs. It acknowledges the careful selection process and comprehensive training these individuals undergo, emphasizing the

importance of their specialized knowledge and skills (indigenous and trained). Additionally, the definition underscores the significant role played by CVs in delivering preventive animal healthcare services, within their communities. Furthermore, it recognizes the interconnectedness of CVs with their local communities and highlights their flexible approaches to accommodate the specific needs of their clients.

2.3.1 Selection Process

As with any participatory approach, there must be unbiased involvement of the community in the relevant steps of implementation. The selection of the CBAHWs, in the same way, must involve members of the community in question. Situnayake (2018) states that the wisdom of the community may even be more authoritative when selecting those individuals who possessed the desired qualities. This alludes to the fact that the community members may actually have a better insight as to who can best represent their interest. Community involvement is crucial in the selection process of CBAHWs because findings have confirmed that it promotes local acceptance and support which in turn leads to sustainability (Cinnamond & Eragae, 2003). FAO (2016) confirmed these findings, and the report indicates that it is important that the individuals who utilize and purchase these services have a say in who ought to provide them.

The process of selection begins when a potential "candidate is selected through a group discussion with the community together..." or when "each of these communities also provides a list of candidates that are not selected through participatory selection" (Situnayake, p.6, 2018). Some of the qualities that are necessary for selection include; trustworthiness, knowledge of the area, culture and language, literate/trainable, commitment, social person, availability, community support/acceptance, responsible, and hardworking (Cinnamond & Eragae, 2003; Leyland et al.,

2014; Catley & Leyland, 2001). After selection, those chosen often feel a great degree of accountability and responsibility because they were elected by their community (Situnayake, 2018).

2.3.2 Training

One other key characteristic shared among all CBAHWs is that they receive training on basic animal health services. These trainings are not standardized, and therefore it means that the scope of practices, as well as the activities, and guidelines surrounding their work are often varied (VSF, 2018) across the country, continent and globe. In many cases, government institutions and NGOs are usually the regulatory bodies in charge of overseeing these programs. They are tasked with formulating policies that speak to the recruitment process, training content and duration as well as their roles and work conditions. Leyland et al., (2014) maintained that without government or NGO support, many community-based animal health workers projects would continue to be unsustainable.

Generally, the training curriculum covered lessons on deworming, vaccination, identification of early signs and symptoms for various diseases and drug administration (Situnayake, 2018; Leyland et al., 2014; Onono, 2013). The training doesn't dwell much on animal husbandry due to the fact that the CBAHWs are practicing farmers with a vast knowledge and skills in animal management (Leyland et al., 2014). The training is particularly important for CBAHWs projects, and is meant to equip them with the technical capacity necessary to serve their communities effectively. Acosta et al., (2019) found that primary and secondary level of education were not a requirement for effective training of individuals, especially on services such as vaccination. After undergoing

training, the CBAHWs are given the mandate to provide animal health services in both the private and public sectors under the strict supervision of a veterinarian (FAO, 2016).

2.4 CVs involvement in vaccine delivery and distribution chain

A few studies have looked into how community-based vaccinators are involved in the vaccine supply chain in various ways. The first instance represents the independent model, where CVs act as middlemen in the vaccine supply chain (Leyland et al., 2014). Here, CVs operate a business-like model by reselling vaccines procured from a veterinary drugstore. In India, Nepal, and Tanzania, community vaccinators operate as independent businesses selling vaccines at a small profit margin (Bessell et al., 2017) In Bolivia farmers were recruited and trained to act as trusted middlemen who would link other farmers to veterinary services, including vaccines. They would work part-time in teams, and were paid staff of the local organizations, and assisted in vaccination campaigns (Catley and Leyland, 2001).

Mockshell et al., (2014) describes CVs involvement in the vaccine value chain in Ghana, and indicates that they usually purchase drugs and vaccines from the nearest towns for the farmers and transport them back to the villages at a cost, which is often combined with the cost of the service, and transportation. In Uganda, Acosta et al., (2019) found that CVs play important roles in the vaccine value chain of PPR, and they usually provide the last mile delivery in the supply chain. In South Sudan, CVs were found to be the most affordable animal health service providers who stocked a wide variety of drugs and vaccines (Leyland et al., 2014 as cited by Acosta et al., 2019).

Leyland et al., (2014) gives an example of 'Pastoral Veterinary Services' (PAVES), a model created to link private veterinarians to CVs, and here veterinarians would be responsible for their training, supervision and supplying drugs like vaccines to them. Additionally, CVs are also

sometimes recruited by the government to assist in vaccination campaigns when there is a short supply of staff. In this instance, Leyland et al., (2014) state that CVs may be called upon to help in carrying out vaccinations provided they were supervised. An assessment study carried out by the authors in Kenya, Ethiopia, and South Sudan reported that CVs were utilized in government vaccination activities (mobilization of herders, handling the animals and actual vaccination) in all the three areas they visited (Leyland et al., 2014).

2.5 Increased vaccine awareness and adoption

The use of community-based vaccinators in the delivery and distribution of NCD vaccines has been reckoned to be the most sustainable model for controlling the disease in rural areas (Campbell et al., 2019). CVs possess unique characteristics and qualities, different from all the other stakeholders involved in the vaccine supply chain like animal health assistants and veterinarians. They use these qualities to advocate vaccines to farmers, in hope that they will adopt the use of them. CVs have been found to use particular strategies to achieve this. Donadeu et al., (2019) suggests that for vaccines to be successfully adopted, they first must be available and accessible to farmers, which will trigger the demand, and subsequently lead to increased adoption. CVs are particularly effective towards providing vaccine availability and access at the same time, increasing vaccine demand and adoption among smallholder farmers. The distinction between availability and accessibility of vaccines are however quite vague (Donadeu & Dungu, 2013).

The issue of vaccine availability and access are intertwined, and proves impossible to talk about one, without mentioning the other. Key interest lies in ways which they make vaccines easily obtainable, and are always at the farmer's disposal at any given time to offer their services. This is because they are in close proximity to the community members, thus CVs are conveniently

placed to provide quick access to services, as well as advice to their clients (Leyland et al., 2014). These findings are replicated by Donadeu et al., (2019), who recommend creating a supply chain and access point "linking wholesalers to rural retailers and rural retailers with animal vaccinators (veterinarians, community animal health workers…" in an effort to increase vaccine availability. Bessell et al., (2017) found that farmers were quick to buy if the vaccines were sold directly to the farmers in the village by community-based vaccinators. CVs are instrumental in such activities due to their ability to easily identify who owns livestock in their community, and may require vaccines and vaccine services.

CVs are considered the most cost-effective delivery system, making them affordable and thus accessible to rural farmers. Even if the vaccines are easily available in nearby agro-vet shops, if they are expensive, they may be accessible to farmers (Donadeu & Dungu, 2013). Vaccine manufacturers package vaccines in vials ranging from 100 to 500 doses. Farmers with less than 100 chicken may not find it cost-effective purchasing the entire vial. The strategy utilized by CVs here involves purchasing the entire vial and reselling the vaccines in doses, therefore giving the farmer with few birds the opportunity to afford them. This facilitation role taken up by CVs has been key in providing vaccines packaged in smaller doses and also maintaining a cold chain for the vaccines (Donadeu et al., 2019). The use of cool-boxes during transportation of vaccines by community-based vaccinators helps to maintain the quality. CVs are able to increase demand this way, because farmers see the value in and benefits of vaccines if they work well. If the vaccines are effective, there are high chances the farmers will purchase again and even refer their friends and neighbors.

CVs are additionally instrumental towards increasing the demand for vaccines. Demand in this case denotes farmers having information on vaccines, appreciating, and wanting to utilize it

(Donadeu et al., 2019). The authors postulate that awareness is key in sensitizing farmers on disease control mechanisms such as the existence of vaccines, its usage and functions (Donadeu et al., 2019) Previous studies have concluded that CVs are very valuable in raising awareness during vaccination campaigns (Leyland et al., 2014). Through community mobilization, CVs have the ability to tap into their connections and access individuals who are targeted for these vaccination exercises. CVs have additionally demonstrated they are able to utilize their social networks to increase awareness of vaccines to the farmers. Catley et al. (2004), indicate that in South Sudan, the CVs utilized their power in numbers and network to help deliver vaccination services in the field. Spreading awareness is key in vaccine adoption, and it is through this way that rinderpest was eliminated in Uganda by CVs who delivered bulk vaccinations to the Karamoja region (Catley et al., 2004).

2.6 Challenges

The livestock vaccine value chain faces a number of problems ranging from inadequate information, lacking cold-chain capacity, poor infrastructure, and inadequate funds (Acosta & Hendrix, 2019). Community vaccinators make part of the vaccine value chain, and are equally affected by these challenges, creating a wave of new plus other existing challenges they have to overcome. VSF (2018) mentions four major challenges affecting CVs, and they are listed as; lack of standardized training, lack of a common nomenclature, supervision, and formalization of their status.

2.6.1 Policy and legislation

The provision of quality and self-sustainable services from CVs has been heavily questioned, and this largely stems from a lack of involvement from the private sector, and ill-suited policy and

legal frameworks (Catley et al., 2004). In many countries, the legal framework surrounding the practices of CVs, have been marred by issues relating to their legality. In the global south for example, there have been major concerns regarding the long-term success of the CVs program as a result of such weak institutionalization (Catley & Leyland, 2001). Lack of legal recognition has been argued to favor the various different types of CV programs, training, names, and supervision resulting in varying skills, knowledge as well as roles and provision of quality services (VSF, 2018). Other authors have also argued that a lot of the challenges facing CVs programs emerge from "...veterinary level governance and capacities of government veterinary departments to train, regulate and supervise" (Leyland et al., 2014:2).

To ensure the sustainability and effectiveness of CVs, policies and regulations surrounding the program needs to be reevaluated. In Kenya for example, Leyland et al., (2014) indicates that the policy process involving the CVS program has undergone turbulent debates that resulted in inconsistent positions by the Kenya Veterinary Board (KVB). Under the new constitution however, county administrations are now in charge of animal health service delivery, while the national government is meant to regulate the veterinary profession (Leyland et al., 2014). KVB proposed the use of interns to provide animal health delivery services to farmers in marginalized areas, but their plans currently remain unfunded, and with continued government cuts, there are no clear signs of funding in the future (KVB, 2015).

2.6.2 Inadequate training and lack of refresher courses

Inadequate training has been flagged as one of the main issues plaguing the CVs program. A study by Acosta & Hendrix (2019) identified the need for more training for existing CVs in Niger. Other challenges that come up in relation to training include: the duration of the training, the

effectiveness of the training, and lack of standardization. Effective training is a key requirement for successful (Leyland et al., 2014) and sustainable CVs programs. Having a standardized training manual is essential for maintaining a homogeneous set of knowledge within the programs (Cinnamond & Eragae, 2003). Additionally, CVs need to undergo additional refresher courses to ensure that they receive higher-level knowledge and remain valuable and active in the community they serve (Mockshell et al., 2014). VSF (2018) indicates that:

> "There is no standardized training (content, duration, objectives and pedagogical requirements, persons qualified to train, evaluation) for CAHWs, resulting in important variations in terms of training content and duration from country to country. As a result, significant differences exist in terms of CAHWs' capacities between countries, and in some cases even within a single country." (VSF, 2018:10).

The training CVs receive can therefore, be argued to be short and shallow. Mockshell et al., (2014) argue that the findings from their studies indicate that the CVs system is inadequate for providing quality animal health services because of the lack of standardization. Furthermore, other issues such as unqualified trainers also provide reason for concern. Findings from Leyland et al. (2014), suggest that in South Sudan and Ethiopia, certification of the trainers was a source of concern, where unqualified trainers were training and retraining the CVs. The situation translated to CVs in Ethiopia having poor technical skills (Leyland et al., 2014). To ensure success, veterinarians in charge of training CVs must themselves undergo training in participatory training techniques (Catley et al., 2004).

2.6.3 Minimal supervision

Proper supervision is an essential requirement for the success of any CVs program. In accordance with World Organization for Animal Health (OIE) standards for quality veterinary services, having a defined supervision is a requirement (Leyland et al., 2014). OIE stipulates that veterinary paraprofessional ought to work under the direct supervision of a veterinary surgeon (Leyland et al., 2014). It is imperative to remember CVs are farmers (first and foremost) who have received training that are usually short with minimal content and little to no refresher courses. With no supervision therefore, it means that veterinary may potentially be administered in the wrong way, or may be abused (VSF, 2018). Supervision, according to Riviere-Cinnamond (2013), guarantees that CVs provide quality services in terms of technical skills.

Statutory bodies' in-charge of the CVs program should be able to provide defined systems for their supervision and duties (Catley & Leyland, 2001). Supervision greatly varies across the globe, and lack of standardization is still a challenge for many countries still using CVs actively (VSF, 2018). In Uganda there was inadequate supervision of CVs during pesticide application, due to the lack of a statutory requirement and a severe lack of aid (Bugeza et al., 2017). Minimal supervision not only affects the quality of services rendered by the CVs, but it also affects the viability of the program.

Catley & Leyland (2001) highlights two types of statutory supervision, and lists them as post-training supervision, and routine supervision. Findings from previous studies have documented that a majority of technical and communication issues surrounding CVs have occurred after training, and within three months of work (Catley et al., 2004). Post-training supervision, in this case, behaves more like a performance assessment for CVs than supervision (Catley et al., 2004). Routine supervision on the other hand involves regular monitoring of the CVs activities by

veterinary personnel, and the authors recommend a standardized system for routine supervision of CVs (Catley et al., 2004).

2.6.4 Inadequate operational resources

The delivery of animal health services to marginalized areas is hindered by both the remoteness of the area, and also by the lack of infrastructure (Riviere-Cinnamond, 2013) to penetrate these areas. In addition to poor roads and communication networks, CVs face a major challenge in terms of lack of transport allowance and cold-chain facilities. Vaccines are easily perishable goods and therefore require quick transportation and storage in a cold-chain facility to avoid deterioration. To ensure effective transfer of vaccines, the establishment of a reliable cold-chain to store and transport vaccines (Rathod et al., 2016). It is therefore imperative to provide access to some form of financial mechanism to vaccine retailers such as CVs, which may be required to help them secure a cold chain facility (Donadeu et al., 2019).

2.7 Theoretical Framework

This study was guided by the Actor-Network Theory (ANT), an analytical tool which flourished in the mid-80's and was predominantly associated with three authors, namely, Bruno Latour, Michel Callon, and John Law. This analytical approach has been referred to as both a method and a theory. Law (2007), argues that, ``actor-network is not a theory, but rather an approach". Theories according to Law (2007:2), usually try to explain why something happens, but actor-network theory is descriptive rather than foundational in explanatory terms". The basic premise of this theory holds that we need to treat humans and other non-human actors as equals, because it is difficult to separate the two entities (Law, 1992). Proponents of ANT suggest that the social is nothing more than just a patterning of heterogeneous materials (Law, 1992). It essentially erases

the analytical divide between agency and structure, and macro and micro social. Law (1992:2), explained that, "society, organizations, agents and machines are all effects generated in patterned networks of diverse (not simply human) materials".

The semiotic definition of an 'actor' indicates something that acts, or produces action. Networks on the other hand, are composed of actors who can be both human and non-human, and whose identities are acquired through their association with other actors. Actor-network theory relies heavily on associations, and it studies how they come to be bigger and dominant over others, where they obtain this power, and how they make these associations last longer. This anti-essentialist view backs up the notion of relational materialism, which holds that all entities attain significance, in relation to other entities. In this sense, "we are not primarily concerned with mapping interactions between individuals…we are concerned to map the way in which they [actors] define and distribute roles, and mobilize or invent others to play these roles" (Law & Callon, 1988:285). Both humans and non-human entities equally play an important part in shaping reality (Law, 1992). The concept of agency in actor-network does not imply intentions. In ANT, agency is found in these heterogeneous networks and associations, rather than in humans or non-humans. Instead of paying attention to the causes, we should rather focus on the interactions and the effects they have, if we hope to understand these networks (Latour, 1986).

An important factor in actor-network theory is punctualization or black-boxing. This phenomenon takes place when network patterns have been widely performed to the extent of converting them into a single point or node in another network (Callon, 1991). Law (1992) emphasizes that all phenomena are only just effects of these heterogeneous networks, and that much of the time we cannot be able to detect these complex networks. This happens when a network acts as a single unit or block, thereby disappearing and it is replaced by the action itself, or by the simple author

of that particular action (Law, 1992). The network patterns that often run wide and deep, are those that tend to be widely performed. This process is also known as network ordering, and it is a process where these networks overcome resistance, and thereby become durable over time. These 'patterning generates institutional and organizational effects, including power and hierarchy' (Law, 1992).

Actor-network theory assumes that these activities that take place in a network, or during the formation of one happens through a process of translation (Boudewijns, 2016). Callon et al., (1983) offered that translation involves the strategies in which actors identify and arrange themselves in relation to each other. This theory maintains that interests vary greatly among people, and therefore the interests of the individuals need to align in order for the artifact to be constructed. Translation therefore explains how material objects come to be as a result of negotiations between the involved subjects (Uden, 2010). To build a translation model it is important that the focus be on understanding how actor-networks are constructed, made strong and weakened. The configuration of an actor-network involves the enrolment of both human and non-human entities, and this is mainly done through a sequence of negotiations in a process of re-definitions, in which an actor translates the resources in what fits their network (Woolgar, 1992). It involves one entity consenting to a diversion that leads it along a route predetermined by another entity (Callon, 1986a). The process of translation takes place in four distinct phases or moments where actors are identified and possible interactions and boundaries for activities are set and negotiated (Callon, 1986). These phases include, problematization, interessement, enrolment, and mobilization (Callon, 1986).

The first moment is the problematization phase. The term refers to actors or a group of actors defining and exploring a problem, which is mutually recognized by all actors as their own problem

(Callon, 1986 as cited by Boudewijns, 2016). The actors realize they need to align their interests through various associations with other actors, and acknowledge that they cannot attain their respective goals by themselves as a result of obstacles (Hu, 2011). A key element in the problematization phase is the obligatory passage point. This refers to the situation through which the actor or group of actors establish themselves as the prime actors, and therefore all parties involved must pass through them, making them indispensable (Callon, 1986 as cited by Boudewijns, 2016). Using the term 'problematization' as a verb instead of the noun 'problem' alludes to two things. One, that the problem comes from an action rather than a perspective, and two, that the process of problematization is not a single event, but is dynamic and is done over and over again (Broer, Nieboer et al. 2010).

The second phase is the interessement and in this moment, the actors that are redefined during the problematization phase have to be interested in adopting their new roles within the networks (Callon, 1986). It entails acquiring the actors' interests, locking them into the proposed roles and negotiating the terms of their involvement (Hu, 2011). In this phase, it is simply not enough to redefine and ascribe roles to others. These roles have to be voluntarily accepted. Interessement has been defined as actions imposed by an entity to other actors in an attempt to stabilize the identity of other actors as prescribed during problematization (Callon, 1986). The network-facilitator achieves interessement by cutting and weakening links between the targeted actors and other entities, since the latter has the ability to influence its identity (Callon, 1986).

The third moment is the enrolment phase, and this "refers to the negotiations that are necessary to make other entities accept the definitions and roles that are ascribed to them." (Callon, 1986:211). This phase is characterized by a set of strategies through which the prime actors utilize to redefine and interrelate the numerous roles it has ascribed to other actors (Boudewijns, 2016). A successful

interessement phase achieves enrolment, which is to say that sometimes the device might not be successful and may not lead to an alliance or actual enrolment into the network (Hu, 2011). To achieve a successful enrolment, different sets of actors are required to impose their will on other actors, and those actors should be willing to accept the imposition (Singleton and Michael, 1993 as cited by Hu, 2011). The process of enrolment involves multilateral transactions and negotiations which lead to acceptance of new roles and definitions and a place in a new technological network (Callon, 1986). Actors are enrolled into a network using four possible ways: seduction, physical violence, transaction or consent without discussion (Callon, 1986).

The final and last phase of translation is mobilization. In this phase, the few individual actors who participated in the process of translation leading to enrolment are now deemed spokespersons, who represented the other actors in the negotiations (Callon 1986). After enrolment, it is still not certain that the other actors who did not participate in the negotiations, but were implied in them, will follow their chosen representatives (Callon 1986). It entails the strategies used by the prime actors to maintain commitment to and maintenance of the network to ensure that the entities represent the collective (Boudewijns, 2016). If the masses do not follow their representatives, or those who claim to represent them, then the last few phases of translation will be rendered useless (Callon, 1986). Mobilization phase therefore is interested in the representativeness of the actors, and just because an actor has been selected as a spokesperson, does not mean that the masses will follow. This is the main reason why networks are better understood when observed rather than assumed (Callon 1986). Another important aspect in actor-network is framing, and this delineates the boundaries of the network. These boundaries are however never fixed, and overflows may occur.

2.7.1 Relevance of the theory to the study

Proponents of actor-network posit that we can use this theory to describe how the 'social' can be understood as an actor-world, made up of human and non-human heterogeneous relationships. Methodologically, the theory follows the different actors and finds out how they impose worlds upon each other, and also to explain the changes and structure of these actor-worlds. To this end, the theory provides a lens through which we can analyze CVs as an actor-world, and using the concept of ANT we can describe such actor-worlds through the translation process. This theory explains how CVs have been accepted as the obligatory point of passage in the context of the NCD vaccine delivery and distribution network by understanding how and why they operate as an actor-network. The theory is interested in how the CVs actor-network became bigger, changed and became stable over time. It offers an insight into the heterogeneous materials that make up the CVs network, and in addition to describing the inner workings of the network it also explains why they perform the way they do. It identifies the actors involved in this network, the roles they play, the nature of connection that binds them, as well as their size and efforts. Other actors include both human and non-human entities involved in the distribution chain like the vaccines itself, the vaccines manufacturers and distributors, cold chain infrastructures, vehicles, farmers, chicken policy framework, and the stakeholders responsible for selection, supervision and training of the CVs.

The process of translation is important in offering an analytical look into the gradual development of the CVs network. The first phase of problematization helps the prime actor to define the role, identity and interest of other actors, which aligns with their own interests. In this moment, the prime actors engage other actors to form an alliance to solve a common problem. These problems are solved by the prescription of different roles to the different actors and stakeholders involved in

the network. This concept helps to contextualize the roles of CVs in the vaccine's distribution chain, and the implications that these roles have for other actors in the network. The second phase of interessement involves the prime actors securing the interest of other actors, and getting the actors to accept the roles proposed for them in the problematization phase. It involves the prime actor detaching actors from other networks and trying to impose and persuade them to accept the definition of their situation and their solution to the problem. This concept helps contextualize the ways CVs and other stakeholders convene around the problem of vaccines inaccessibility and use, and how they strengthen their drive towards moving through the established obligatory point of passage. It involves persuasions and compromises to make farmers accept the CVs as an obligatory point of passage to acquiring affordable, accessible vaccines, and also accepting vaccines as the solution to the prevalent NCD pandemic.

The third phase of translation is enrolment, and this moment happens as a result of a successful problematization and interessement phase. Actor-networks grow as a result of enrolling different and new entities into the network. It involves a series of negotiations, tricks and strategies used by the prime actors to define and interrelate the roles it has assigned other actors. It involves the use of both human and non-human entities to enroll actants, and later on establishing themselves as the spokesperson of those who are associated. This concept helps to contextualize the strategies or means of persuasions used by CVs to secure clients who may require their vaccination services. It explains the ways through which CVs convince the farmers to adopt the use of vaccines, and the strategies that make the farmers yield their requests. The fourth phase is mobilization, and this moment is important for the establishment of the spokesperson's legitimacy. It points to the ways through which actors maintain and sustain the network. During translation, not all actors participate in the negotiation process leading to enrolment. These spokespersons can be elected

representatives of the actors and can merely speak on behalf of other actors. Therefore, mobilization is interested in whether all those other entities will follow their representatives. This concept helps to contextualize how CVs maintain their networks and ensure sustainability of the entire actor-network.

This theory is additionally important in explaining the challenges faced by CVs in the context of vaccine delivery and distribution. The theory posits that all the entities pool together and organize so that they come to be seen as one network, whose performance is streamlined. This is what ANT refers to as punctualization. The structure of a network in this instance only becomes apparent when one actor is not performing its assigned role or has been removed altogether. In this sense, the delivery and distribution of NCD vaccines becomes difficult when either of the different constellations of actors involved fail to perform their assigned role. This concept explains the different challenges faced by CVs in their roles delivering and distributing NCD vaccines, and how this affects their services and further hinders vaccine access. The table below shows some of the most significant human and non-human actors involved in the CVs actor-network.

Table 2. 1: Definition of human actors

Human actors	Identity	Role
Project funders	This includes aid or government agencies operating community vaccinator projects in Kibwezi West Sub-County area	This actor is responsible for high-level planning of CVs projects and they are in-charge of initiating, funding, selection, training and supervision of community vaccinators.
Chicken farmers	Chicken keepers residing in the Kibwezi West Sub-County area	This actor makes up the community, and are both the vaccine consumers and vaccinators.
Local administrators	Local chiefs, and assistant chiefs in Kibwezi West Sub-County area	This actor is responsible for mobilizing chicken farmers in their areas and assisting the projects and community in selection of community vaccinators.
Private veterinary pharmacy	Local *agrovet* shops in the Kibwezi West Sub-County area	This actor is responsible for supplying vaccines and technical support to community vaccinators
Government veterinary officials	Government veterinarians in Kibwezi West Sub-County area	This actor is responsible for distributing vaccines, as well as supervising and regulating community vaccinators operating in the area.

Table 2. 2: Definition of non- human actors

Non-human actors	Identity	Role
NCD vaccines	Non-thermostable NCD vaccines	This actor is responsible for offering immune protection and decreasing chicken mortality.
Chicken	Indigenous and improved chicken	This actor acts as a source of livelihood for many farmers in the community.
Cold-chain facilities	Means of storage	This actor is responsible for preserving non-thermostable NCD vaccines during movement
Transportation	Means of movement and can include both bicycles and motorcycles	This actor is responsible for ferrying community vaccinators to and from their homes. The actor also aids in transporting the vaccines plus the CVs quickly from the pharmacies to the clients' homes.
Legal, institutional and policy framework	This includes any laws, regulations and policies developed by the government to regulate the conduct of animal health workers.	This actor is responsible for making laws, regulations and policies which affect the workings of community vaccinators.

2.8 Conceptual Framework

The conceptual framework used in this study shows the main entities, human actors and non-human actors placed side by side. This is aimed to show that they possess equal agency, and none is more important or exerts more agency than the other. In the middle of this network are community vaccinators, and they are essentially the core of this network. With the help of the prime actors, they enroll different actors and entities into this chain to help them achieve their collective goals. These actors include the chicken farmers, the vaccines, the chicken, money, cold-

chain facilities, local administrators, as well as transport and communication systems. All these actors are enrolled to facilitate the role of CVs in delivering and distributing NCD vaccines. In the event that any of these actors fail to perform their role effectively, the CVs face different consequences and challenges in their role also. The CVs actor-network therefore requires every entity performing their assigned roles to achieve a more streamlined network. A streamlined network will mean efficient and effective delivery of NCD vaccines by community vaccinators, not forgetting that this may trigger increased awareness and uptake of NCD vaccines among chicken farmers. (Figure 2.1).

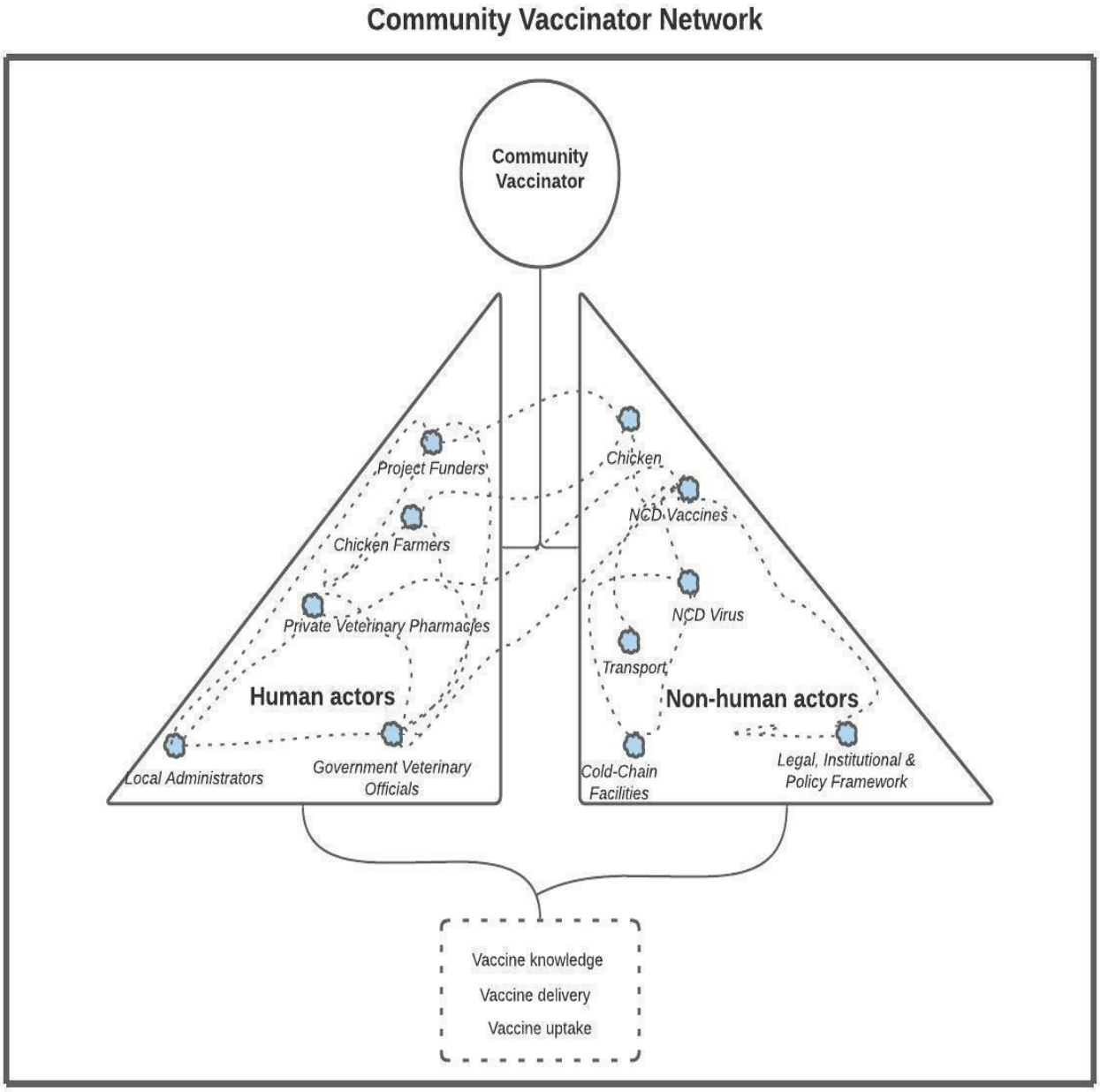

Figure 2. 1: Conceptual framework

Source: Author.

CHAPTER THREE: METHODOLOGY

3.1 Introductions

This chapter entails a description of the methodology in which the study was conducted. It contains the research site, the study design, study population, sample size, and sampling procedures, as well as data collection methods and analysis. The chapter ultimately concludes by highlighting the ethical considerations that were observed during the study.

3.2 Research Site

3.2.1 Location, population size, and climate

The site for this study was Kibwezi West Sub-County (Figure 3.2), of Makueni County (Figure 3.1). The area comprises six wards, namely; Emali, Kikumbulyu North, Kikumbulyu South, Makindu, Nguu and Nguumo. Kibwezi West has an approximate population size of 107,000 people and it covers a total area of 1506.4 per square kilometer (GOK, 2015). Kibwezi West Sub-County lies in the lower midlands area of Makueni County, and it usually receives about 550m of rainfall (Mutua et al., 2016). The general area is largely arid and semi-arid, with highly erratic and unreliable seasonal rainfall. It also experiences spells of drought when it receives little rainfall. Crop farming in the area is mainly for subsistence, and it is common to see farmers practicing small-scale mixed crop and livestock farming (Mutua et al., 2016). The dominant tribe here is the Akamba community, a Bantu speaking group of individuals accounting for 11% of the total population of Kenya (GOK, 2015).

The main economic activities in Kibwezi West Sub County include livestock rearing, crop farming, and sand harvesting. Cattle, poultry and small ruminants such as sheep and goats are

important agricultural commodities for the people in the area (MoALF, 2016). Over 80% of the population in Makueni County is involved in the poultry value chain, and in Kibwezi West, local indigenous chicken is usually the most preferred livestock kept because of its low acquisition cost, and their ability to survive such climatic conditions (MoALF, 2016). Chicken farmers are often faced with numerous challenges like predation, lack of information, diseases, and climate change and variations, which have led to increased frequencies of pest attacks and disease prevalent in both crops and livestock (Kabuage, 2019). Diseases that have affected chicken the most in this area include, NCD, Coccidiosis, Fowl pox, and Gumboro for chicken. The mortality and morbidity rate of these diseases are usually high and they cause devastating losses to the farmers following their outbreaks. Most of the chicken farmers in Kibwezi tend to be small-scale, and this may be the reason why vaccine adoption is low among individuals in these communities.

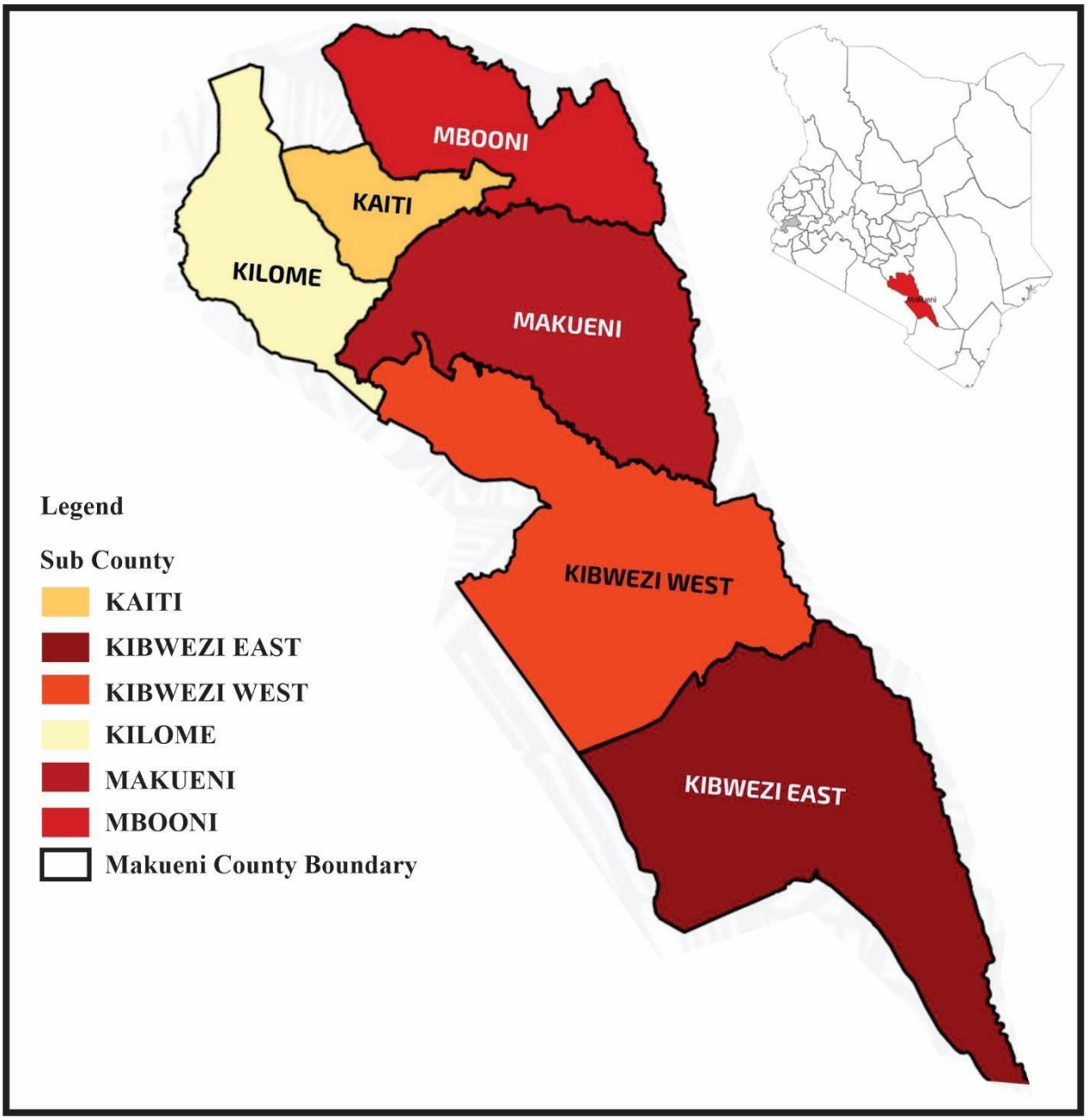

Figure 3. 1 : Map of Makueni County

Source: GOK (2014).

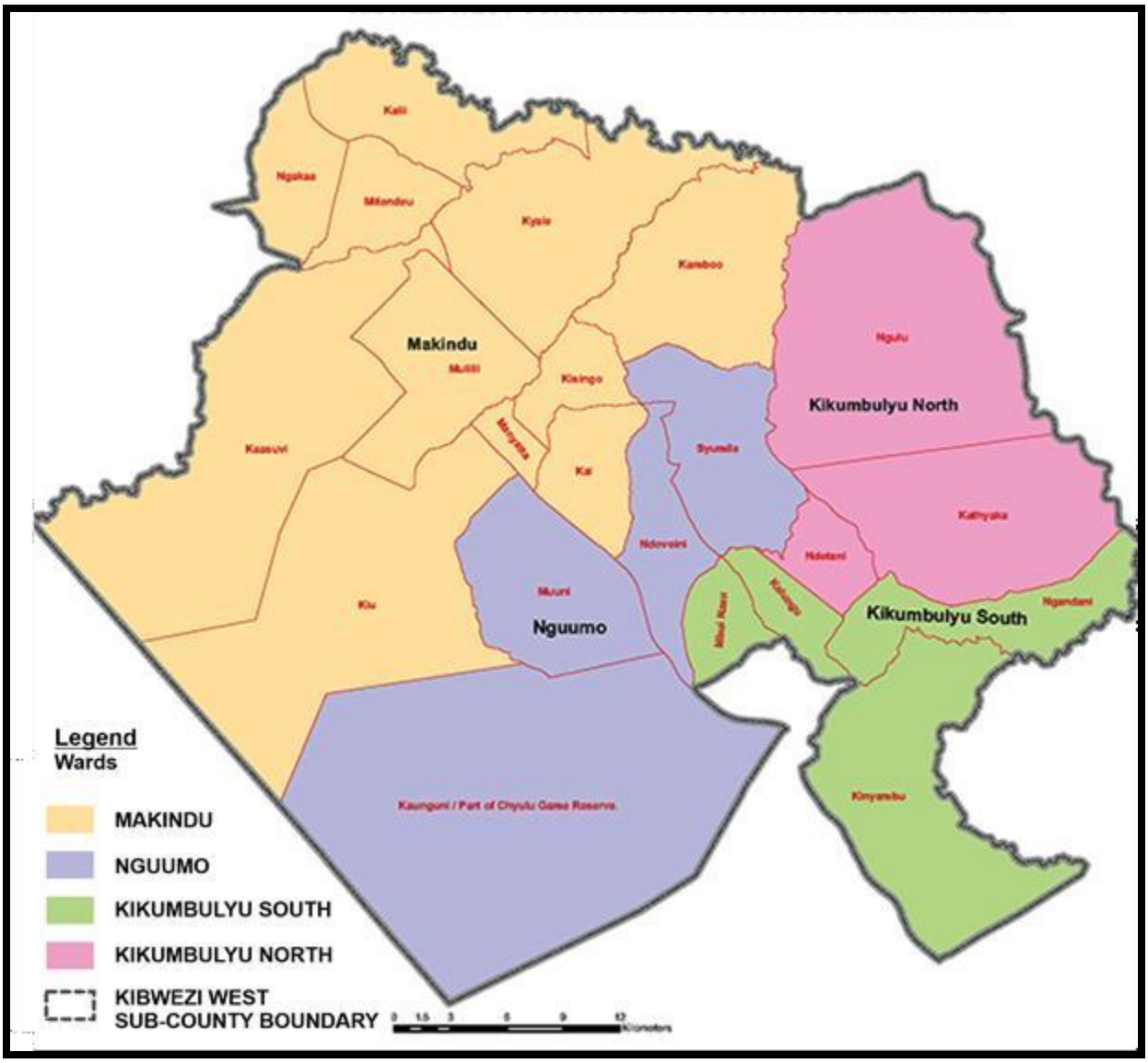

Figure 3. 2: Map of Kibwezi West Sub-County

Source: https://informationcradle.com/kenya/kibwezi-west-constituency/

3.3 Study Design

The study employed a cross-sectional descriptive study design. Qualitative data collection methods were used to capture key data that adequately answers the three objectives. These methods included in-depth interviews, focus group discussions and key informant interviews. Using all three methods was key in the triangulation of the data collection methods.

The study began with in-depth interviews of CVs who were selected purposively from a list of trained community vaccinators in Kibwezi West Sub County. The inclusion criteria for their selection included community vaccinators who were trained, had sold NCD vaccines and provided vaccination services to chicken farmers in the Kibwezi West area. The in-depth interview provided deep insight into the day-to-day activities and roles of CVs, their experiences in the job, and their challenges. The data collected helped redesign the other data collection tools to maximize the quality of information collected.

After that, focus group discussions were administered to chicken farmers purposely selected because they resided in the area, and have also utilized the services of CVs before in terms of vaccination. The FGDs were important in highlighting the perceptions and opinions of the farmers on the roles of CVs in the vaccine chain. It also painted a picture of how the CVs operate on the ground, but from the viewpoint of the farmers.

Ultimately, key informant interviews were administered to purposely selected individuals from the community, who have worked or interacted with CVs, and had first-hand knowledge and experience regarding their day-to-day activities and roles and their challenges. The key informants were able to address some of the issues raised from the two previous collection tools, and it also provided expert opinion on the questions at hand.

3.4 Study population and Unit of Analysis

The study population consisted of all CVs of NCD vaccines in Kibwezi Sub-County, spread across all the six locations of Emali, Kikumbulyu North, Kikumbulyu South, Makindu, Nguu and Nguumo regions. The unit of analysis was the individual CV defined as a person selling and providing vaccination services in Kibwezi West sub-county. In this region, farmers primarily adopt two main types of chicken farming: free-range indigenous chicken production and commercial breeds. However, indigenous chicken farming stands out as the more popular and prevalent practice. This is primarily attributed to the fact that indigenous free-ranging chicken require minimal inputs and labor compared to commercial breeds.

3.5 Sample size and Sampling procedure

The CVs were selected from a list of trained community vaccinators from the Kibwezi West Sub-County veterinary office. To recruit the CVs to this study, the researcher paid a visit to the sub-county veterinary offices where a list of trained farmers was registered. On the basis of this sample frame, 50 NCD vaccines community vaccinators from Kibwezi West Sub-County were drawn and clustered based on their locales where they operate with the help of the Sub-County veterinary officer. This number was based on the finite population of 85 NCD vaccines community vaccinators trained and registered at the Kibwezi West Sub-County veterinary offices.

The researcher then called the CVs through the phone numbers on the registry, and those who were conveniently available were invited to participate in the in-depth interviews, for those who agreed, a date, time and location of the meeting was arranged. As an inclusion-exclusion criterion, trained NCD vaccines community vaccinators who had not provided their services to the community for more than a year (13 in number) were left out of the study. For the rest of the remaining seven

cases, withdrawal came within the first month of fieldwork. This group was largely made up of individuals who were expecting some kind of remuneration if they consented to participate in the study. The researcher however explained that their participation was voluntary, and the study was for academic purposes. To get the remaining cases (10 in number), the researcher employed a snowball sampling technique, where they were referred to more NCD vaccine CVs operating in the area through their colleagues. In the end, 30 community vaccinators, over a period of three months were reached for interviews for this study.

FGDs were conducted to obtain different opinions on the experience's farmers have had with NCD vaccines community vaccinators in Kibwezi West Sub-County. To get the farmers, the sampled community vaccinators in the study were able to link the researcher with these farmers through snowballing sampling. As an exclusion-inclusion criterion, only farmers (13 in number) who had kept chicken for more than a year were included in the study. Ultimately, 13 women and men farmers, who agreed to participate in the study, were selected to take part in two (2) focus group discussions. Finally, the key informants were purposely selected and they included individuals such as the County veterinary officer, the sub-county livestock production officer, the sub-county agricultural officer, private veterinarian, Trainer of Trainees, and an assistant chief. The key informants were vetted to meet the inclusion-exclusion criteria for the study, which included an age range, deep knowledge, and experience working and interacting with CVs, and years of experience.

3.6 Data Collection Methods

3.6.1 In-depth Interviews

This was the primary data collection method. It gave a detailed insight into the day-to-day roles and activities, including the experiences and challenges of CVs. Thirty (30) in-depth interviews were conducted with CVs purposely selected in Kibwezi West Sub- County. The inclusion-exclusion criteria included CVs who were trained and sold NCD vaccines or provided vaccination services in their community. In-depth interviews were important because they helped to capture the roles and activities of CVs and the challenges they are faced with while undertaking these roles. It further captured contributions that CVs play towards poultry vaccine delivery and distribution. An in-depth interview guide was used to aid the study (Appendix 2).

3.6.2 Focus Group Discussion

To get different opinions on what makes a good community vaccinator, as well as their selection, training and the roles they perform in relation to NCD vaccines, the study conducted two focus group discussions with men and women smallholder chicken farmers from Kibwezi West Sub-County. FGD with the men had 7 participants and the one with the women had 6 participants, an ideal number that was not too small or too big to be unmanageable. In total, we interviewed 13 small-holder farmers and conducted the discussions in 5 wards, that is Makindu, Nguu, Emali, Kikumbulyu North, and Kikumbulyu South as illustrated in table 3.1 below.

Table 3. 1: Farmers reached by locations in Kibwezi West Sub-County

Location	**No. of Male farmers interviewed for FGDs**	**No. of female farmers interviewed for FGDs**
Makindu	2	2

Nguu	1	1
Kikumbulyu South	1	1
Kikumbulyu North	1	1
Emali	2	1
Total	**7**	**6**

The FGD participants were purposely selected through referrals from CVs, and their inclusion-exclusion criteria included small-scale chicken farmers who had purchased NCD vaccines and or vaccination services from CVs. One FGD was entirely made up of male participants and the other entirely female. The homogeneity with respect to gender was necessary to expel any potential fear the participants may have had to express their opinions given the existing unequal gender dynamics in Kibwezi West. The main aim of this tool was to elicit discussion on the roles of CVs, what they think about the CVs program, their willingness to pay for vaccines and vaccination services from CVs, and the challenges they still face as small-scale farmers in the vaccine's delivery chain. To guide the discussions, an FGD guide was used (Appendix 3).

3.6.3 Key Informant Interviews

The key informant interviews were conducted in the form of semi-structured interviews with key stakeholders and informants, among them; the county veterinary officer, the Sub-County livestock production officer, the sub-county agricultural officer, a private veterinarian, a trainer of trainees, and an assistant chief. These individuals were selected purposely because they have information about CVs and their roles.

The key informants helped provide objective views on the importance of poultry farming in Kibwezi West, and the steps being taken by the County Government to increase participation of smallholder farmers in this venture. They similarly helped to shed light on the methods of selection and training of community vaccinators from the context of projects led by the County government. The key informants were also key in providing information on the observed challenges community vaccinators' face which threaten their sustainability, and the policies and guidelines that impede or facilitate their success. A key informant guide was used to conduct the interviews (Appendix 4).

3.6.4 Secondary data

The study relied on secondary data throughout the process of developing this thesis to provide background information on the important issues under review in the study objectives. This data was collected from numerous sources, with scientific journals providing the most help. Some key materials used in this study include: Catley (2001; 2004), Leyland (2002; 2014), Callon (1986a), VSF (2016; 2018), and Law (1992; 2007). Other sources include; government publications, official NGO publications, and online articles.

3.7 Data Processing and Analysis

Audio-tape recorders and notes were used to capture data from the FGDs, in-depth interviews, and key informant interviews. The data obtained was then transcribed. Data transcription, translation and analysis was done concurrently with the data collection to see if the tool was obtaining new insight neglected by the other tools, and also to improve the tools and questions as the data collection advanced. This was done in order to get feedback from the data being collected and to add new and pertinent information that was raised on the instruments being used and adjust accordingly as the data collection progressed. For example, in our inquiry we discovered various strategies employed by vaccinators to market vaccines, along with unforeseen challenges particular to Makueni context. To capture these insights and elicit opinions from participants, we incorporated these questions as probes in the subsequent tools.

The transcribed data was first stored on a Microsoft document after which they were imported to ATLAS.ti, a qualitative data analysis software. A codebook was then developed, based on the three thematic categories emerging from the objectives. The software provided an opportunity for the researcher to create code categories based on the objectives of the study. Analysis was done focusing on the role of community vaccinators, particularly their selection, training, and tasks they perform, as well as the strategies and challenges of community vaccinators. Coding of the data involved going through each transcript and extracting excerpts from particular text, interpreting their meaning, and then assigning a code that speaks to the research objectives. These excerpts were then analyzed both inductively and deductively to establish the relationship between them. The results were then presented using themes and key quotes captured in verbatim.

3.8 Ethical Considerations

Prior to embarking on the research, certain ethical considerations were undertaken to ensure that the study was up to par with standard for research principles and guidelines. To begin with, ethical clearance from Strathmore Review Board was obtained under license SU-IERC0561/19. In addition to this, the study also sought approval from the National Commission for Science and Technology and Innovation under license number, NACOSTI/P/20/8246. Upon arrival at the field, County Administrators in Kibwezi West were informed of the study's presence, purpose and duration in the community. During data collection, participants were informed of the purpose of the study, who the study is targeting, and what the study seeks to accomplish with the results afterwards. After this participant would sign an informed consent (Appendix 1) to show that they have understood what we have discussed and are willing to participate in the study. Before the interviews began, the researcher sought the consent of the participants to record the conversation. The researcher explained that note taking may fail to capture some things from their conversation, and hence the need to have audio recordings to cross-check the information they provided.

The participants were given surety that the information provided in the study would be handled with extreme confidentiality, the researcher explained that the data would be stored on a secure Google Drive and only the study team would have access to this Drive. The researchers assured that the anonymity of the study participants would be protected, and at no one time would their names or any identifiers be taken down. For purposes of disseminating the findings, the results from the study will be communicated back to the community through the local administrative channels. Publications through peer-reviewed journals will be made available through online scholarly articles, and copies of the unpublished thesis will be available at the University of Nairobi library.

3.9 Problems encountered during the study and their solutions

A major problem encountered in the field was the language barrier among the older participants. The younger participants understood and responded in Swahili but the older participants would hear Swahili but find it hard to express their answers in Swahili. To resolve this problem, the researcher hired an assistant who understood both the local language and English to assist in conducting the interviews involving older participants. The assistant was hired based on their prior experience conducting qualitative research particularly in a rural set-up. In addition to this, they were also taken through a one-day training covering the various aspects of the study's current research objectives and research ethics and conduct.

Another problem encountered was distance that the researcher had to cover to get to participants. Villages are very far from one another and the only means of transport is either a bicycle or a motorbike. Apart from the villages being far away, there were also little to no identifiers of the name of the villages. The researchers solved this by always taking a motorbike and letting the participants give directions to the motorbike person. This greatly reduced the instances of getting lost.

CHAPTER FOUR: ROLES OF COMMUNITY VACCINATORS

4.1 Introductions

This chapter presents the findings on the roles played by community vaccinators to the delivery and distribution of vaccines in Kibwezi West, generally, while teasing out how these roles may have implications on the NCD vaccine delivery system as a whole. The investigation of roles was necessary in this study for understanding the level of involvement of CVs in the NCD vaccines delivery and distribution chain, and how this involvement leads to increased vaccine demand and adoption among smallholder poultry farmers. In the context of actor-network theory, this study explores the intricacies of community vaccinator programs, including how and why they perform like actor-networks, the evolution of the network, as well as the actors involved, their interests and their roles.

The assessment of roles in the study was premised on the understanding that within the role of vaccination, community vaccinators also perform other additional tasks that promote the general health and well-being of the animals in the community such as disease surveillance and advising farmers. In relation to vaccination, community vaccinators perform tasks such as mobilization and vaccine delivery with the aim of increasing vaccine coverage. The findings and discussions under this objective are presented under the following three main sub-headings: Socio-demographics of community vaccinators, structure of community vaccinators and roles of community vaccinators.

4.2 Socio-demographics of the community vaccinators

Social demographics like age, gender and level of education remains important in understanding who community vaccinators are, what are some of their qualities, and how these characteristics play a role in their selection and their roles as vaccinators.

***Age*:** In the study, the age of the CVs was of particular interest, given its varied links with the rate of attrition among community vaccinators, and eventually the sustainability of these projects. The findings indicate that the average age of CVs was 46 years of age, and none was below the age of 30. The oldest CV interviewed was 64 years old, as summarized in table 4.1 below. Age was interestingly a unique aspect in this study, as most of the participants were quite old. Findings in this study indicate that during selection there are no particular restrictions on the age of people who can apply. However, many young people, particularly those between the ages of 18 to 35 drop out of the program largely because of a lack of guaranteed income or remuneration. Older individuals, on the other hand, have been raising chickens for quite some time, and they have acquired a passion for the enterprise, hence, the attrition rate among the more elderly population trained as CVs is less compared to that of the younger ones, as in the interviews below:

> "…a few young people run away because the remuneration may not be that big to really sustain them. If you are not a practicing farmer, you may not see the economic value of you being a service provider." **(KII, Livestock Production Officer).**

Age of informants	Range (Years)	Number
	30-35	1
	36-40	5
	41-45	8
	46-50	6
	51-55	3
	56-60	4
	61-65	3

Table 4. 1: Age of informants

An evaluation of age in the context of community health workers in previous studies reveal that community members typically prefer individuals thought of as an elder, because they have lived in the community longer, they are more respected and can be trusted (Flanagan, (2015). On the other hand, (Hüttner, 2000) posits that it is imperative that the workers are not too old, so that they can be able to meet the physical demands of the job. To this end, some studies recommend the selection of animal health workers across a wide range of ages to account for the loss of personnel brought about by young workers who are looking for better job opportunities, and the older workers who are moving towards retirement.

***Gender*:** Understanding the gender of community vaccinators was important in assessing community acceptance and societal preferences between males and females' CVs. Women vaccinators were more than men in this study, with men making up 30% and women taking up the rest. None of the women in the study were single, and only 14% were widowed, and 9% divorced. In the study, married women (77%), particularly those between the ages of 35 to 65 made up the majority of the vaccinators. In Kibwezi West, the informants reported that chicken scopes beyond its symbolic-cultural value to a disposable asset in meeting emergency cash demands within the homesteads. Culturally, indigenous smallholder chickens belong to women, and their proximity to the homestead places means that they perform a majority of the labor as well. Findings from this

study show that married women's position in poultry farming puts them at a higher probability of being accepted and selected by their community to be trained as CVs due to this proximity and consistent engagements in the enterprise, as in the interview below:

> "...the majority of the people who were trained were women. You know chicken belongs to women. Goats belong to the men because you cannot go and sell the goats without notification. Also, most of the men are not around. You will find that they left for work and that it is the women at home taking care of the chicken. So, the men are few." **(IDI, male, 47 years).**

It is important to point out however, that as vaccine adoption and use increases, smallholder indigenous household chicken rearing often tends to veer towards commercialization. In the study, men's participation in household chicken management and vaccination appeared to increase as the enterprise grew. The crossover of men into a traditionally women sphere shows that men are changing their perceptions and attitudes towards indigenous smallholder chicken rearing because of financial inducements. Indeed, Okitoi et al., (2007) while writing on gender issues in rural Western Kenya, contends that in poultry production, men only performed tasks when it was considered as an economic activity. Typically, selection, training and support of community-based animal health workers have in the past, been primarily aimed towards men (Flintan, 2011 as cited by VSF, 2018). By implication, the influx of men into this enterprise may mean in future the number of male vaccinators may surpass that of women. In the current study, women were found to be the dominant vaccinators. However, the trickling of men into the enterprise threatens to diminish women's influence over this domain, as highlighted in the interviews below:

> "...we were taught the benefits of vaccines, and we came to know what kills our flocks. After that we began vaccinating and our chicken no longer perished from diseases. They continued to increase, and that is when we began doing it commercially." **(FGD with men).**

Time-poverty was identified as another aspect that hinders women from fully participating and benefitting in the NCD vaccine value chain in Kibwezi West. Among the Kamba community, roles

and responsibilities between males and females are socio-culturally defined, thereby perpetuating rigidity on what men and women can do in the community. This practice is driven by traditional gender norms which position women as the homemakers and the caretakers. Findings in the study show that women's defined roles in the household means that they have to wake up extra early so that they can easily catch up with both their domestic chores and their professional duties. These commitments entail cleaning the house, making breakfast for the family, preparing children for school, as well as taking care of their livestock. Since they have to fulfil both these reproductive and plus other numerous productive roles, women tend to suffer significant time poverty as they participate in the NCD vaccine value chain, while also enduring unequal share of domestic duties, as highlighted in the interviews below:

> "I wake up very early in the morning, I do house chores as my husband prepares to leave for work. I have to be at the client's house at six in the morning. I usually pick the vaccines on my way there. It is not that far." (**IDI, female, 48 years).**

> "Sometimes you can have so much work in the house that needs to be accomplished but you had promised a client you will go vaccinate for them. You then have to put your things on hold to go and do that job. You don't want to make an enemy of your clients. Even if it's raining you have to go." (**IDI, female, 54 years).**

As implied by the above informants, it is evident that socio-cultural norms which dictate men's and women's roles and duties, place women at the center of household responsibilities in Kibwezi West sub-county. While examining women's participation in the global agro-commodity value chain, Nakazibwe and Pelupessy, (2014) concluded that relying on women's unpaid labor preserves and exploits gender inequalities. These findings are similarly echoed by Lyon et al., (2016) reiterating that gender-segregated division of labor remains critical in increasing women's time poverty, which hinders them from fully participating in the coffee production value chain.

Level of Education: The education level of the community vaccinators was of particular interest in this study, given its potential influence on the retention of information concerning chicken management and vaccination provided during their training. Findings indicate that the majority of the vaccinators (44%) had attended and completed high school, while 27% did not complete. None of them however, reported having never attended school at all, and those who completed primary school were 7%, with those who did not complete primary comprising 20%. Only 2% of the vaccinators had some form of tertiary education, as summarized in figure 4.1 below.

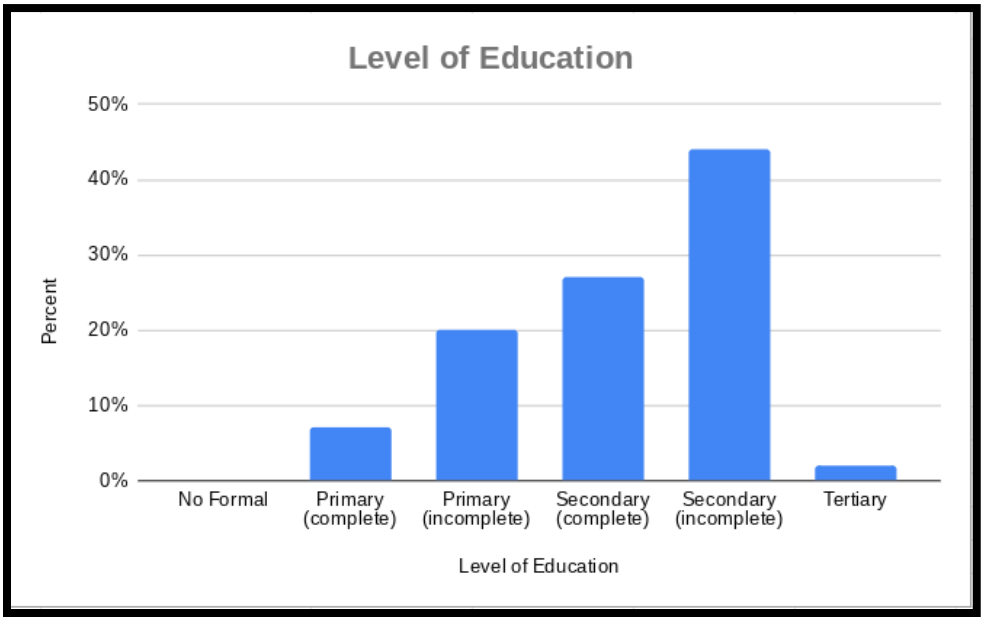

Figure 4. 1: Education level of community vaccinators

From these findings, the study established that there was a positive association between level of education and the efficacy of the vaccinators. Having at least a primary level education was reported by the experts in the study as helpful for the vaccinators to aid the retention of information.

> "...at least someone who has gone to primary or a form four leaver...It is good to select someone who can be able to understand the training." (**KII, Veterinary Officer**).

Policy-makers and veterinarians have had a long-standing debate on the need for vaccinators having some basic form of education, with cases being made on both sides of the argument (Catley et al., 2002). On one hand, if the vaccinators are too literate, then they are less likely to be involved in rural ways of rearing livestock, and if they are too illiterate then they may be less able to understand written material and may only benefit from pictorial training (Mugunieri et al., 2001).

4.3 Structure of community vaccinators

Findings from the study indicate that the CVs network is made up of different heterogeneous entities. All the actors are brought together by one main purpose, which was to collectively increase delivery, awareness and use of NCD vaccines among smallholder chicken farmers in Kibwezi West. In the current study, upwards of 4 different projects facilitating CVs programs in Kibwezi West were identified, some of these projects being government-led, while others are NGO-led. The project facilitators, together with the community, problematized the poor access and uptake of NCD vaccines in Kibwezi West, and this led to the establishment of community vaccinators programs. The high level of involvement from both stakeholders, can be attributed to the high number of chicken farmers in Kibwezi West. Makueni County is a famine-prone, semi-arid area, hence livestock keeping is a big economic enterprise. The County Government as well as the different Non-Governmental Organizations have recognized the significance of chicken farming in the area and have been a big supporter of this venture. Speaking with County officials, the experts revealed that:

> "Makueni County has four value chains that were selected by the local farmers and the local communities through public participation. They chose local chickens, they chose dairy, and they chose green grams, and they chose mangoes. So, chicken and poultry are one of the four value chains and we are doing extension services, that is capacity building of the farmers, and we are also training these service providers for them." (**KII, Livestock Production Officer**).

In actor-network theory, these two entities, the Government and NGOs would make up the prime actors. Findings from the study indicate that they successfully persuaded other actors into accepting that community vaccinators were necessary for making vaccines accessible to farmers both financially and physically. The prime actors brought together different entities such as chicken farmers, NCD vaccines, village elders, trainers, and private veterinary pharmacies. They facilitated the selection, training and supervision of the vaccinators, and encouraged farmers to use them, thereby rendering the vaccinators an Obligatory Point of Passage (OPP). In this sense, they became an OPP to various entities, as it was only through them, they would all achieve their respective goals and solutions, as defined by the prime actor. The establishment of CVs as OPPs makes them indispensable in this network. The animal health services in Kibwezi West are severely under-funded, and one of their biggest challenges remains to be the lack of adequate staff. These key informants in the study summed up the need for trained farmers to fill this gap as follows:

> "… the veterinary staff are very few and they cannot cover every homestead in Makueni. So, the County Government thought if they informed these farmers who are educated to be trained on vaccination, it will help these farmers a lot, and it will also give them morale of rearing more chicken because they will be knowing people just nearby who can vaccinate their poultry and prevent the common diseases that kill their birds." (**KII, Veterinary Officer**).

> "It is because of a shortage of veterinary services. Shortage of vaccines reaching the very grassroots areas. And that being where the demand is for disease control, for vaccination, then a way had to be found, a link person between the *agrovet*, the veterinary department and the farmer. And those happen to be service providers." (**KII, Agricultural Officer**).

The OPP presents a solution to the obstacles facing the different entities enrolled into the network. The project funders for instance, by training the farmers, would increase NCD vaccine knowledge, access and thereby adoption among small-scale farmers. The farmers on the other hand, would benefit as a result of increased knowledge and vaccine use, as well as decreased rate of NCD

infections among their chickens. The private veterinary pharmacies would benefit by having vaccinators playing the role of middlemen, and helping them resell the vaccines to customers they would not have previously had access to. The County veterinary office would benefit by acquiring trained staff who are on the ground to provide both vaccination and surveillance services amidst a lacking system. The vaccines would benefit from efficient delivery and distribution in the hands of the community vaccinators.

4.3.1 Interessement

After problematization, the second moment in translation in actor-network, involves the actors accepting the roles and definition given to them by the prime actors, and moving towards resolving the issue proposed during the first moment of translation (Knight et al., 1993). This study identified several stages in this phase, and they each involve the prime actors attempting to lock in farmers into their proposed roles as vaccinators. The first stage of interessement begins with the project facilitators, which may be the County Government or an NGO, accumulating all the necessary resources needed to initiate the projects. These resources include funding for the project, qualified and willing farmers, and qualified trainers, in addition to the community's support. The next stages are selection and training of community vaccinators, the first steps towards imposing this role onto the farmers.

4.3.2 Modes of selecting CVs

Selection of CVs is crucial in understanding community acceptance of CVs services, and how acceptance leads to adoption and uptake of NCD vaccines. Similarly, it represents the first step towards persuading farmers into the role of vaccinators in the CV network. In Kibwezi West, there

are 4 dominant training organizations, whose trainees are still operational to date, as summarized in figure 4.2 below.

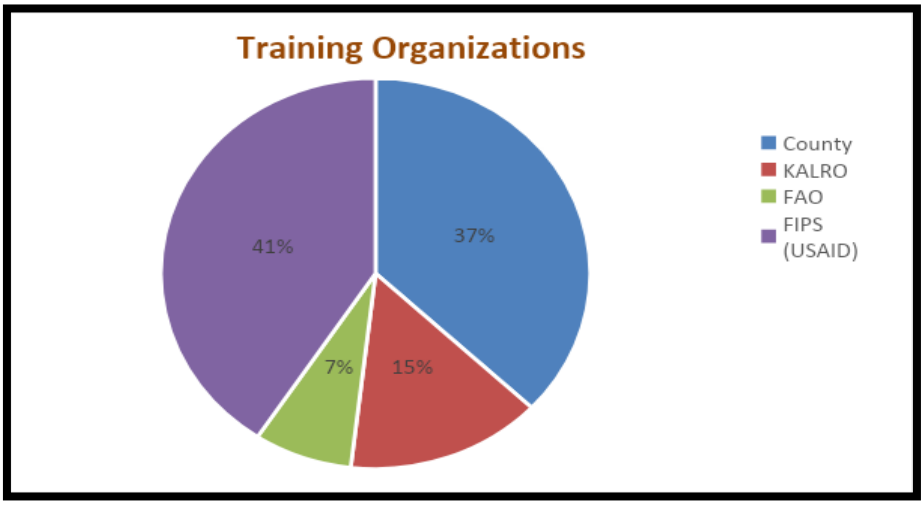

Figure 4. 2: Project facilitators operating in Kibwezi West Sub-County

The process of selection was found to differ based on these training organizations at the time of the recruitment. The study identified two main modes of selection, that is, community-based selection and administrator appointed.

Community-based selection: The study established that in this mode, the community members were responsible for selecting individuals whom they deemed the most 'suitable' for the job. The County Government is one training organization that utilizes this method and typically targets villages and farmers group meetings for selection of farmers to be trained as CVs. In the study, farmers were instructed to select individuals from the community and from their farmers' groups, who are known to be hardworking and passionate about chicken rearing to be trained as NCD vaccinators. They reported that after they were trained, they were invited to participate in a mass vaccination campaign for NCD across the entire sub-county. They were provided with cool-boxes and vaccines for the entire period of the campaign, and afterwards, decided whether to continue

vaccinating as a service to their neighbors and community members. Experts in the study expressed the following about community-led selection in the interview below:

> "They are selected from a group of farmers. These are groups of poultry farmers, so within the group, the group offers one or two or three of their own choice whom they see as likely candidates to be trained to offer that service to them…" (**KII, Veterinary Officer**).

Recruitment of quality community-based animal health workers is important in determining the success or demise of a project (Flanagan, 2015). A bottom-up approach in the selection of community-based health workers has been described as the foundation for the long-term sustainability of CV projects. Community-led selection, Situnayake (2018) argues, often gives the farmers some feeling of ownership and investment in these programs, as well as some sense of accountability and responsibility to the members of their community, and will therefore have stronger community ties.

Administrator appointed selection: The study also identified administrator appointed selection as the other mode of selecting CVs. Several training organizations like the County Government and private training organizations, like FIPS-Africa utilize this method to select CVs. Here, the training organizations routinely appoint a representative who would be responsible for identifying and selecting farmers from their locales, whom they feel will be a good fit for the role of vaccinators. The County Government for example, usually engages local administrators like assistant chiefs in different wards to help them identify local farmers from their communities, who had history and passion for rearing chicken. The local administrators would then nominate an individual whom they believe holds these qualities, and the community would eventually have the last say on who they want to select to be trained as vaccinators. Further findings show that administrator appointed selection was also implemented by Farm Inputs Promotions Africa – USAID (FIPS- USAID). This organization hired community-based trainers of trainees who recruit vaccinators and offer them a

short training on NCD vaccination. This method of selection is elaborated further by a participant in the quotes below:

> "I was nominated by the chief in my area, then the people from my village selected me. I had been a practicing chicken farmer for a very long time, and people knew that I have a passion for it. Also, I worked as a Community Health Worker, and my community members saw that I can handle this job." **(IDI, female, 50 years).**
>
> "...they [FIPS-USAID] would pick five Village-Based Service Providers Per sub-location. Every one of us were assigned three villages. So, five VBSP were to serve fifteen villages. And people would call us and we would go and do vaccination for them." **(IDI, female, 56 years).**

The cases above point to a top-bottom approach in the selection of CVs, whereby the appointment is initiated by a figure in authority. It is evident that the community members hardly have a say on whom they would much rather prefer for the job. This mode of selection may be detrimental to the sustainability of the projects when the administrators appoint individuals based on personal relationships rather than selecting the most suitable individuals (Situnayake, 2018). Indeed, Catley et al., (2004), warn against favoritism towards a particular tribe or class, which may be brought about as a result of this type selection process. Contextualized to the study in Kibwezi West, many of the vaccinators selected through this method happened to be influential people in the community. By implication, the vaccinators selected through administrator-appointed have less community ties and little accountability to the members in the community, which may hinder them from being fully accepted by the farmers, and fully motivated for the job.

It was observed that CVs possess particular qualities and characteristics which may make them more likely to be selected and accepted by their community, and more likely to be motivated for this job. In the study some of the characteristics and qualities that are desirable in a CV include having history practicing chicken rearing, and having passion for it, being a local resident, having an entrepreneur spirit, and finally possessing strong community ties.

Farmer: Being a poultry farmer was one of the characteristics reported as necessary for being an effective and motivated vaccinator. Talking with the participants, all of them mentioned that they were practicing chicken farmers. This characteristic guided the selection of CVs for a majority of the training organizations operating in Kibwezi West. Further findings indicate these projects often scout villages together with farmer groups and cooperatives to find new recruits. They would usually visit registered farmers' groups in the area and provide free training and information on general poultry husbandry including vaccination, treatment and deworming. At the end of the training, the groups or village members would be requested to volunteer a few members who would proceed to receive further training to become CVs for their village or group. The farmers were encouraged to volunteer individuals who are passionate about poultry farming, and with vast knowledge on poultry and acumen for entrepreneurship.

> "A practicing farmer is the first qualification. The criteria for selecting them was they must be a farmer, a practicing farmer, keeping poultry, amongst a group or within a village. So, as you serve others, you start with your own. That is how we consider them." (**KII, Livestock Production Officer).**

Situnayake (2018), analyzed the characteristics of animal health workers and found that 98% of CVs in their study had experience dealing with animals. For many of the participants in the study, their initial knowledge on poultry keeping comes from their day-to-day experiences as farmers and livestock keepers, which is usually supplemented by the training they receive later on after selection.

Local resident: This study found that the other characteristics required one to be a local resident of the village or areas on which they are appointed to operate. This is important because of a number of factors. First of all, CVs are supposed to be an effective way in which farmers can access vaccines easily. It would only make sense therefore, that they be in close proximity to the

farmers. Additionally, such a job requires a high level of trust from the farmers, and this is easily achieved if there is prior familiarity. For a CVs, trust is a very important factor. The farmers have to have unwavering faith in their services for there to be a good working relationship.

> "Her name is *Lianna, she is just my neighbor. I never used to vaccinate because I didn't trust matters to do with vaccines. But after I saw her chicken had survived an outbreak whereas all of mine had died, I called her to vaccinate the next time I had chicken. Since then they are doing ok." **(FGD with men).**

A study by Riviere-Cinnamond & Eragae (2003), analyzing the selection and sustainability of community animal health workers supports these findings. The authors found that there was a high level of familiarity between the vaccinators and the farmers, due to the fact that they were village-mates and neighbors. Similarly, a study by Situnayake (2018), found that when CVs are local residents of areas in which they are operating, they feel more motivated to perform their roles. The reason for this, the author posits, is that the CVs feel a great sense of responsibility and accountability due to the fact that they have been elected by members of their community.

Community ties: Social ties and networks were repeated by the participants as being the backbone of their business. Apart from being from the village, our findings indicate one other characteristic that was common among the participants was that they held key positions in the village, and had amassed them a great deal of social networks. Some of the mentioned positions include, women's farmers' group member and leader, village elder, and community health volunteer. CVs with deep social ties in the community are able to have a wide network of people with whom they associate with on a regular basis. In our interviews with the participants, they mentioned they use their networks to reach other village members and educate them on vaccines, and this often leads to them establishing a new clientele base. Some of the networks and social ties that came out from this study emerge from school, churches, *barazas* (meetings), merry-go-round groups, and also

other farmers and cooperative groups. In addition, their clients usually refer them to other fellow farmers when they offer satisfactory services, as captured in the interviews below:

> "Yes, they call me chairlady. I vaccinate for the women in my group and church also. Some jobs require someone with a big mouth and I have one." **(IDI, female, 41 years).**

> "They came to know me through their fellow farmers. Like for example me. I was a farmer before I was employed by the government. There was an NGO that was working with orphans and vulnerable children where I worked as a Community Health Volunteer. They had sponsors who would visit the guardians in their homes to find out what they could help with in the household. If you wanted to keep chicken or goats they would gladly help you. One day they visited me in my homestead and a woman called *Paula came to see me. When she saw how passionate I was about chicken rearing, she introduced me to the veterinary offices in the county who would train me how to vaccinate against NCD." **(IDI, female, 40 years)**.

Indeed, a study evaluating the effectiveness of community-based animal health workers in East Africa showed that social ties were considered a useful incentive in reaching more farmers and gaining more clients. As a result, those with wider social relationships tend to have high chances of being selected as CVs, as they are more likely to be accepted by the members of their community.

Entrepreneur: The CVs programs in Kibwezi West, as the study found, is mainly aligned towards a business kind of model, whereby the CV provides a service, and the farmer pays for this particular service. In this perspective, the CVs are operating as independent entrepreneurs, where they get to dictate their working hours and days. The study however, found that this model has some advantages and disadvantages to it. What came out was that after the selection, some of the project facilitators provided equipment, such as cool boxes to store their vaccines, white lab coats, some NCD vaccines, and training manuals in written copies. From there, the CVs were encouraged to look for farmers who they can vaccinate their chicken for and using the profit from these

services, they should be able to afford more vaccines. A key informant expressed the following about this particular model:

> "We give them in terms of cool boxes and starter vaccines. So, they are supposed to be charging two shillings or three shillings to cater for the cost of the vaccines and the logistics. These are the service providers." (**KII, Agricultural Officer).**

Many of the training organizations cannot afford to pay the CVs a monthly wage, nor provide them with free vaccines. Based on results from our study, the only occasion when CVs received some form of stipend was during a vaccination campaign conducted by the County whereby, they carried out a few days of free mass vaccination for NCD. After that campaign the CVs received certificates and were directed to continue vaccinating for their village members. They never received a stipend again, and from there began operating independently as vaccine service providers. CVs who do not possess that entrepreneurial drive often burn out after training and do not practice at all afterwards. Some due to capital, while others lack the drive. Participants in the study mentioned that many trained CVs who didn't have the entrepreneur drive left the program.

> "Yes, I was trained by the County, and was paid 500 shillings for two days. It was in 2018, the chickens were dying because of the disease, but after the training and the vaccination they never came again but I still continue to vaccinate but mostly it depends on someone's interest." **(IDI, Male, 34 years).**

The shift of NCD vaccines from a public good to a private good caused a lot of confusion around the area. The farmers who were engaged in the current study felt the vaccines ought to be free, and the burden shouldn't be on the farmer to pay. The County often carries out routine mass vaccination campaigns for various animals' diseases such as lump skin in cattle, and these services are usually free for the farmers. In Comparison, free poultry vaccination campaigns are much rarer than small and large ruminants' vaccinations campaigns which typically happen every year. The classification of NCD vaccines as a private good affects the farmers' willingness to pay for the

services. These results are echoed by Bugeza et al. (2018), who found that one of the key challenges faced by CVs is government's lack of clarification on what entails a private good, and how farmers perceive these categorizations. Their lack of willingness to pay for their services greatly affects the entire business model of CVs. The Kibwezi West area is generally semi-arid and very little vegetation thrives here. Many of the farmers are impoverished, and hence not very accepting of vaccines as an extra expense.

> "I would also like it if there were more service providers, and they were paid. I think it is unfortunate charging a poor farmer that much money. Many farmers can't afford these vaccines and they lose their flocks as a result. If they had the money they would not hesitate to vaccinate. Also, this money is still too small for the vaccinator. They need to move the financial burden from the farmer." **(FGD with men).**

Interest: The work of a CVs was described to be a challenging one, and many of them indicated that one must be passionate about it. From our findings, CVs describe their experiences as very difficult. They reported having to wake up before dawn to travel many kilometers in the arid sun with very little profit as compensation. The sentiments of the participants were similar all across when they explained why they continue to be involved in the vaccine delivery chain. Many CVs described this work as volunteer work, and if they didn't have interest in poultry farming, they would have abandoned the program. It is important to note that some of the CVs reported that vaccination services were not their main source of income, and that this was just a side income to them.

> "You have to have passion. You might have studied for a specific thing but it was not for you and you were forced by your parents or relatives to do it and you didn't want to. Since you have joined you change your mind set and create the passion, now that is what motivates you in the job." **(IDI, Male, 61 years)**.

4.3.3 Training

The next stage of interessement happens during the training. The project initiators attempt to lock the farmers further into the network. After selecting the farmers who bear the above characteristics, they go a step further and provide training opportunities for them to learn more about their proposed roles. Our recent study found that the training provided by these projects usually does not last very long, and the longest was around one week, and the shortest was only one day. Flanagan (2015) posits that these trainings range between a span of a few days and several months, and that the amount of training usually depends on several factors like their roles and availability of funding. Below is a breakdown of their duration, in table 4.3.

Training Organization	Length of Training
County	1 week
FIPS (USAID)	1 day
KALRO	1 week
FAO	3 days (Different months each)

Table 4. 2: Duration of training for community vaccinators

Despite diverse projects and training duration, the content of the training was similar in most of the cases. All the participants reported to have been trained on how to properly reconstitute and administer the NCD vaccines. They also mentioned being taught on how to practically vaccinate a chicken and from there doing it practically under the supervision of the trainer. The training entailed lessons on how to build a chicken house and how it is supposed to be cleaned and maintained thereafter. In addition, there were also lessons on how and what to feed chicken. Other lessons include how the feeding and drinking equipment are supposed to be placed and cleaned,

even the color the equipment is meant to be. Ultimately, all these lessons in addition to disease identification and vaccinations were aimed at helping the farmers maintain healthy birds, while also preventing them from falling sick. All of our participants admitted having received similar training. A vaccinator and key informant observed the following about the training curriculum:

> "We were taught how a chicken house is supposed to look, how to detect when a chicken has a problem, how NCD vaccines are packaged and sold. We were also taught about a disease called *Wenzi*, Gumboro, NCD, and chick feeds." (**IDI, Male, 65 years)**.

> "Yes … we do that it is a complete training. It is actually two-three days. And the three days we take them through a package, a package that will help them identify the disease, the signs, the symptoms and even how to treat. We even go to the level of giving them some extension messages, which they can give to the farmers. Things like housing, improved housing. Things like feeding, things like biosecurity, you know, those small farmer interventions at the farm level, so that as they treat them they are comfortably telling them one or two other messages to improve on their enterprise." (**KII, Livestock Production Officer).**

It is evident from the findings in this study that training is a particularly important aspect towards cementing the identity of the vaccinators. While analyzing the nature of these trainings, Frankel, (1992, as cited by Catley et al., 2002), indicated that the features and contents are mainly based on the role and responsibilities of the community animal health workers. Catley et al., (2002) argues that when working with adults, it is important to create an optimal participatory learning environment for them. To achieve this, the authors encourage that the content ought to be relevant to everyday life and fits with their local culture. Additionally, they should also be given the chance to share their own experiences and to analyze problems, and come up with their own solutions (Catley et al., 2002). Retraining was found to be necessary in this study, and refresher courses were requested and encouraged not only by the vaccinator themselves, but also by the experts in the study. After training, the farmers are officially considered vaccinators, and they are mandated to provide services to their neighbors and community members. They often go by different titles, depending on the project they were trained by. For example, those vaccinators trained by FIPS go

by Village-Based Service Providers (VBSPs), while those trained by the County go by Service Providers (SPs).

4.4 Roles of community vaccinators

The two devices of interessement (selection and training) were significant in persuading farmers into their proposed roles as vaccinators, as was the objective during the problematization phase. It is important to note, however, that the devices of interessement may not be entirely successful all the time, and may sometimes fail to lead to enrolment. Findings in the current study show that sometimes, the prime actors may fail to lock in actors into the network, and this can be used to explain the reasons why farmers leave the projects after the training. Successful devices of interessement on the other hand, eventually leads to the next stage of translation and the actors begin taking up their proposed roles, in this case, vaccination.

4.4.1 Vaccination

In this study, findings indicate that CVs perform different roles and activities in relation to the vaccination of NCD. These roles include:

4.4.1.1 Mobilization

This study was particularly interested in understanding how community vaccinators spend their time while at work and the roles they perform in relation to vaccination while there. One of the roles identified was mobilization. Prior to conducting a home visit for vaccination, our findings indicate the vaccinator usually has to pre-plan their day. This means they have to contact their client's days before to remind them that their vaccination schedule is fast while approaching. When one of the farmers called to book an appointment, the vaccinator will have to call around to other

farmers near his first client and mobilize more farmers who may require similar services. On average, a vaccinator will usually purchase a 100-dose vial and look for clients who will collectively add up 100 chickens. Booking an appointment with the vaccinator was particularly crucial, and it served two important purposes. One, it guarantees the farmer does not leave home and the vaccinator does not make other plans on that particular day. And two, to remind the farmers not to let out the chicken from their coop as they normally did every morning. The CVs reported their clients usually didn't live far away from each other, and most reported finishing by around 9 – 12 pm.

> "I would do mobilization in the villages, and we would go and vaccinate together. I would tell the villagers that we were coming to vaccinate for them, and usually we went with a 500-dose vaccine. We would count the number of chickens per homestead. Let's say my neighbor had 20, another had 10 and so on. I would make sure I have gathered enough people to reach the required number. Then I would go and vaccinate after I have mobilized them." (**IDI, female, 61 years)**.

Mobilization was a significant factor in this study for more reasons besides this one. This type of mobilization was the first step towards identifying potential clients, and sensitizing them about vaccines and the services they offer. Efforts towards increasing vaccine use have been hindered heavily by lack of awareness about vaccination exercises happening around their villages. An evaluation study by Leyland et al., (2014) found that community vaccinators received special acknowledgment for their involvement in mobilization during the rinderpest eradication exercises. They were especially effective towards bringing together livestock owners and handling the animals.

4.4.1.2 Delivery and distribution

Community Vaccinators main role is transporting NCD vaccines from the retailers to the farmer. Findings from our study, point to the fact that CVs are involved in the distribution and delivery of

vaccines as middlemen. Private pharmacies (agro-vets) that stock the vaccines are very few and sparsely populated in Kibwezi West. The vaccinators reported procuring the vaccines from these agrovet shops, and then transporting it to the farmer's home. The vaccine is sold at a slightly higher price to cater for his transport and a small profit on top of that. The participants indicated they were trained on how NCD vaccines are packaged and sold, and subsequently how to transport them safely to their destination.

Our findings show that CVs are able to properly identify an NCD vaccine vial in an agro-vet store, and they are also well aware of the current retail price in the market. The average price as reported by some of our informants was 250 shillings for a 100-dose vial. The most common vaccine available around was a live attenuated one that comes in a 100-dose vial. The vaccine also comes in a 50-dose vial, but this specific one was very rarely found and hence the 100-dose vial was a more common alternative. A shared sentiment among both the farmers and the vaccinators was that 250 shillings was quite an expensive price to pay for vaccines, considering the vaccination schedule needs to be repeated after every 3-6 weeks. One informant had this to say:

> "The price is not okay because you hear the farmers find it to be expensive. The dosage for 100 chicken is usually 250 shillings and that is expensive." (**IDI, female, 61 years)**.

When the vaccines are expensive, it means the vaccinators have to increase the amount of money they typically charge for their services. The current study found the price of vaccines fluctuates from 3 shillings to 10 shillings, usually averaging around 5 shillings, but this also depends on the level of familiarity, distance and number of chicken vaccinated. The participants mentioned that when they've had a client for an extensive amount of time, the number of flocks tend to increase. When this happens, usually they will offer a base price to the farmer that will cater for the vaccines and their transport. However, when the number of chickens is low, especially lower than 50, the

participants indicated that's when they will be charged 3 or 5 shillings per chicken. A farmer had this to say about the prices:

> "You can negotiate. It is not a must for it to be 5 shillings all the time. Sometimes they don't even count the chicken and just give you a base price." **(FGD with men).**

The role of delivery and distribution is particularly important in promoting vaccine access in terms of proximity and affordability among smallholder chicken farmers. Prior to these projects, vaccine uptake was particularly low among poultry farmers due to its expensive nature and issues to do with physical proximity. Community vaccinators have been influential in restructuring the vaccine delivery and distribution system in a way that makes vaccine delivery both sustainable and cost-effective. These findings concur with a study done in Zimbabwe where the involvement of CBAHWs in the delivery of veterinary services improved the general efficiency and effectiveness of the entire system (Mutambara et al., 2013). In that study, CBAHWs were observed to be cost-effective, easy to establish and access, and a right move towards empowerment of the community, especially in the animal health sector.

4.4.1.3 Vaccination

The other critical role that community vaccinators perform is actual inoculation of chicken against NCD. Many of the vaccinators we spoke to reported starting their day early in the morning between the hours of 5 to 7 am, while others reported vaccinating in the evening between the hours of 5-6 pm. These working hours are absolutely crucial because they coincide with the hours when chickens are usually let out and brought back into their coop. Some vaccines are administered by mixing them in the drinking water. Hence, to make sure all the chickens drink this water, it is best that they are given first thing in the morning.

Our findings show that vaccinations are best done during these hours mainly due to the fact that it makes it easy to manage the birds while they are in their coop as opposed to when they are wandering freely. Additionally, inoculating one chicken at a time as they come in or out of their pen ensures the vaccinator gets a better chance at getting all of them. If the chickens are already out of their coop by the time the vaccinator arrives, it poses several challenges. First, chickens are very hard to capture. Consequently, a significant amount of time is wasted as CVs engage in extensive efforts to capture and vaccinate each individual chicken within the homestead. The vaccines which are not thermostable will risk expiry as time wastes away causing unnecessary loss. Additionally, the vaccinator may lose track of the vaccinated chicken against the ones they haven't vaccinated yet.

> "This medicine expires after 2 hours. Sometimes when you arrive you can find that they have been let out. So, it requires you to run after the chicken and gather them while there is another farmer who is waiting to get the vaccination from you. You will find that there is a problem there. When the chickens are locked in such a house, vaccinating will not take 15 minutes because when you get in there you are vaccinating and letting them out." (**IDI, female, 61 years)**.

The inoculation process was described as easy by our participants, and anyone with proper training can be able to perform it. Our findings indicate that CVs vaccinate chickens through two main ways. The most common method described was one where the vaccine comes in a tablet form inside a vial. This vaccine is stored in a refrigerator and sold from an agro-vet shop, and when purchasing it is mostly packaged with a block of ice to maintain the cold chain. The vaccinators are encouraged to have a cool box where the ice and vaccine can be stored to prevent the ice from melting during transportation. To reconstitute this mixture, the CV has to buy a diluting agent, which is typically 10 milliliters of mineral water, equally sold in most agro-vet shops. Additionally, the vaccinator also needs a syringe to inject this water into the vial.

The other vaccines mentioned in this study were one that didn't require a cold-chain, and this type of vaccine could only be sourced from one location. The training organization called FIPS-Africa relied on village coordinators whom they had appointed from the area to store NCD vaccines at a central location which had a source of electricity to power the refrigerators. The coordinator revealed that these vaccines were sourced from a manufacturing company called New Life Africa. The NGO would then resell these vaccines to the farmers and vaccinators at a subsidized price. These vaccines are different because they do not require dilution nor a cold-chain facility while in transit. A key informant working for the organization mentioned the following:

> "Our vaccines do not require a cold-storage once you take it out of the fridge. As long as it is used on the same day, you can vaccinate in the morning and still use it in the evening. It also does not require any dilution. It comes ready-made." **(KII, Trainer of Trainees).**

Ultimately, farmers expressed community vaccinators were quite effective when carrying out this particular role. Since they began vaccinating against NCD, the rate of death for the flock has greatly reduced, and the number of chickens has increased. Admittedly, CVs are the cheapest and most convenient providers through which farmers can access these services. In the discussions from the focus group, farmers indicated that despite having contacts to the veterinary officers around their area, vaccinators tend to be easily accessible especially for services like inoculation. Such statements were captured as shown below:

> "Most people do not know those who work for the County. They only know about those who we call for vaccinations." **(FGD with men).**

4.4.1.4 Disease identification and surveillance

The community's contacts with the local veterinary offices were reportedly very low. Therefore, even in the event of a sick bird, many farmers admitted to calling their vaccinators first. CVs are more accessible and available to respond to the farmer's questions compared to the other animal

health service providers in the area. During training, CVs are taken through a course on disease identification where signs and symptoms of various diseases are discussed. The diseases here include, but are not limited to, NCD, Gumboro, Coccidiosis and Fowl Pox. Easy identification of diseases in poultry helps CVs in cases when farmers experience a medical emergency and require immediate attention. A quick diagnosis will aid the farmer make quick medical decisions regarding their flock. When called upon by their clients in need of help, they often respond with advice on their next steps. In instances where they do not know what disease they are dealing with, the CVs reported requesting help from their colleagues and others. In the current study the following statements were provided regarding communication in times of a medical emergency:

> "I call my fellow vaccinators. If they don't know they refer me to someone who does. There is also an agro vet who I call and describe the symptoms to them. They usually give me the medicine I need." **(IDI, female, 36 years).**
>
> "We usually go and advise them to buy medicine, or we pick up the medicine from the agro-vet and bring it to them." **(IDI, male, 48 years).**
>
> "First I call the service provider and they tell me what medicine to buy. If it is Fowl Pox you buy and come give it to them." (**FGD with men).**
>
> "Yes, and they came and looked at the chicken and they sent me to the chemist to buy medicine. I then called the doctor and he came and injected the chicken." (**FGD with women).**

In terms of diagnosis of NCD, CVs were found to be aware of the signs and symptoms and they are capable of identifying an outbreak of the same when it appears. Many indicated NCD was a very easy disease to identify, and it is unique and different from any other diseases they usually encounter. The most common symptom flagged was a special sneezing or coughing sound that could easily be spotted and a unique color of the feces, identified to be a mix of white and or green. These symptoms were accompanied by general weakness and sleepiness from the birds, and

drooping wings. In the local language the disease was referred to commonly by its symptoms. The description of symptoms is illustrated in the interviews below:

> "First, that chicken will look very weak. They also put their heads down. There is also a sound they make like they are sneezing. Their nostrils are also wet sometimes." (**IDI, female, 51 years).**
>
> "Apart from coughing, the chicken starts shivering and if it starts in the morning, the next day it will not be there. Because of those white feces, which has some green mixture sometimes." **(FGD with women).**

These findings paint CVs as being significantly crucial actors in disease surveillance and identification. They help link farmers to both private veterinary services pharmacies and public veterinary services. The findings compare closely with those from VSF (2018), which points to this role as one of the key functions played by CVs. In this sense, the authors argue they are crucial in detecting infectious diseases in livestock, and ultimately reporting to the relevant authorities (VSF, 2018). CVs are often in close contact with their clients since they reside in the same locality and whenever a farmer experiences any abnormalities in their flock, they are habitually the first individuals they call to. CVs are conveniently accessible through the phone and can provide diagnosis from a call away. Due to their deep social ties in the community, they are usually among the first individuals to respond to farmer's needs. Bugeza et al., (2017) argue that CVs are the most locally available service health providers, and they typically respond in 12 hours or less when called upon by farmers. Catley et al. (2004), similarly agreed and found the probability of recovery following a quick diagnosis by a CVs increased drastically due to their proximity to the community.

4.4.1.5 Teach and advice

In our current study, CVs were instrumental in sharing their knowledge and skills on farming practices, vaccination and disease identification, with their fellow farmers and neighbors. After undergoing their training, most of them reported that they frequently shared their knowledge and skills freely with farmers willing to learn. Due to the lack of available training opportunities for farmers, the need to learn was expressed by the CVs as farmer-driven. Farmers in the study admitted that they frequently asked for advice and lessons on how to perform vaccination from their CVs, this being a way for them to cut costs spent on vaccination services. The farmers also learn how to perform vaccination by watching the vaccinators at work. These farmers therefore, usually do not require NCD vaccination from the vaccinators, and often procure vaccines from the CVs and do the actual vaccination by themselves, as evidenced in the interviews below.

> "There are those customers who after you vaccinate for them once or three, the next time they just send you for vaccines and they do it themselves. They are not that many however. I'd say about 1% of my clients." (**IDI, male, 35 years).**
>
> "I usually walk in the villages. When I'm done vaccinating I visit their neighbors and tell them about vaccines. Other times, when I go to vaccinate and find their neighbors around they usually ask me questions and I inform them about NCD vaccines. I take the time to explain what I do and why I do it." (**IDI, female, 45 years).**
>
> "If you want to learn, you call them and you go buy the vaccine together. When vaccinating you can watch what they are doing and after two or three times, you can vaccinate by yourself. Even if the chicken dies, you will know you made a mistake and where and next time you won't get it wrong. That is the one I'm calling copy and paste. But the service providers never refuse to teach you, if you ask them. As long as you can read the package, and observe how they are mixing the vaccines, in what quantities, and how exactly they vaccinate, you will not get it wrong." **(FGD with men).**

In our study, CVs not only offered farmers advice on medicine, they also taught their clients on proper chicken rearing practices that should prevent their chickens from falling prone to diseases.

Part of the responses included teaching them how to clean and keep a tidy chicken house. How to properly choose and clean the chicken feeding equipment, and also what to feed them to maintain a balanced diet. CVs acknowledged their visits to farmers' groups, particularly those dedicated to poultry keeping, where they actively impart knowledge about vaccines and other essential animal husbandry practices. In support of this, Leyland et al., (2014) confirmed that they appreciate and treasure the skill and knowledge they received during training, and they utilized the same to attend to their livestock and also advise their neighbors. Similarly, a study by Bugeza et al., (2017) also observed that community-based health workers in their study reported having offered advice to farmers. Some of the advice included daily check-ups on the animals, feeding and in some cases, post-operative care.

Community vaccinators perform all these roles, plus some other minor roles including deworming and sometimes treatment, as well as participating in government vaccination campaigns. This study established that CVs are instrumental in the provision of other preventive health care such as deworming when they conducted a community-wide deworming exercise. These findings are consistent with findings by Catley et al., (2004) who showed that CVs are instrumental during deworming campaigns, and they help to identify individuals who own livestock and might therefore require such services.

To achieve all these roles and objectives, CVs persuade different actors into its network. The CVs then distributes roles where these actors are reinvented to play other particular roles determined by them (Law & Callon, 1988). The farmers are reinvented from neighbors and community members to become clients and vaccinators, as similarly as the vaccines are reinvented from just a drug into a commodity. This process of translation, as Callon et al. (1983), described, explains the means through which an actor gives roles to others. The vaccinators take up these roles as a

result of successful interessement. Their main role, however, involves the delivery and distribution of NCD vaccines. The other roles apart from this main one can be conceptualized as overflows in the CVs actor-network frame. The establishment of a frame helps to visualize boundaries around a particular actor-network. Callon (1998) argues that these boundaries only separate the actors from the rest of the world, but outside connections are still recognized to be present. In this case, we can view such outside connections outside of the network as merely overflows that will happen as long as the process of ordering is ongoing.

CHAPTER FIVE: STRATEGIES USED BY CVS TO INCREASE UPTAKE OF VACCINES

5.1 Introductions

This chapter introduces the strategies employed by community vaccinators which lead to increased demand and adoption for NCD vaccines in Kibwezi West Sub-County. This chapter looks at the ways through which vaccines are made available and accessible by CVs and how these eventually translate to increased demand and adoption thereafter. Understanding these strategies will help respond to objective two of this study and it will further speak to their relevance in the NCD vaccine supply chain. The findings and discussions are under the following major sub-themes: enrolment of vaccinators and farmers, mediating physical access to vaccines, co-scheduling vaccine calendars, using community networks, mobilization of allies, vaccine adoption.

5.2 Enrolment of vaccinators and farmers

The study established that after a successful problematization and interessement phase, the farmers have fully been locked into their roles as vaccinators. The next phase is the enrolment of different actors into the community vaccinator network. Enrolment involves the network initiators persuading and convincing other actors to join and grow their network. It entails a set of strategies employed by the initial actors of the network to interrelate the various roles prescribed to each of the actors. For enrolment to be successful, it requires one set of actors imposing their will on other actors. And the other actors yield as a result of these impositions. It is a two-way street where some actors are enrolled with little resistance, while others require a little more nudging and tough negotiation tactics before they accept to join the network (Hu, 2011). Therefore, for CVs to increase the chances of vaccine adoption among smallholder farmers they must employ a mix of strategies to be successful at persuading more farmers. The strategies identified in the study come

in the form of persuasion (Rhodes, 2009), multilateral negotiations and transactions (Boudewijns, 2016). On enrolment Callon (1986) states the following:

> "Why speak of enrolment? In using this term, we are not resorting to a functionalist or culturalist sociology, which defines society as an entity, made up of roles and holders of roles. Enrolment does not imply, nor does it exclude, pre-established roles. It designates the device by which a set of interrelated roles are defined and attributed to actors who accept them. 'Interessement' achieves enrolment if it is successful. To describe enrolment is thus to describe the group of multilateral negotiations, trials of strength and tricks that accompany the 'interessements' and enable them to succeed." (Callon, 1986:211).

In the context of the current study, the vaccinators using various strategies and negotiations in order to persuade more farmers into the network as clients. To enroll farmers into this network, CVs adopt a set of strategies that make vaccines both accessible and available, in a way that increases demand and leads to an increase in vaccine awareness and adoption. The entities enrolled however, like the farmers, cold-chain facilities, vaccines and means of transport, must agree to join the vaccinators in accomplishing this role, for there to be successful delivery of NCD vaccines and information, which may translate into increased vaccine use among smallholder farmers in Kibwezi West.

5.3 Mediating physical access to vaccines

One of the key strategies employed by CVs that aid them during enrolment of farmers into the network is their proximity to their clientele base. Findings from this study show that CVs act as great access points for vaccines, and vaccination services in cases where farmers are unable to reach the local retailers and animal health personnel. Kibwezi Sub-County has a few existing

vaccine retailers and even fewer animal health care providers. Such issues further weaken the existing links in the vaccine supply chain. Stakeholders are unable to connect with the end consumers, this being farmers living in remote areas of the town. CVs in this network act as middlemen, linking farmers with retailers and animal health providers, thus eliminating problems associated with vaccine availability and access in the remote areas of Kibwezi West. From the findings many of the CVs indicated that due to their proximity to their clients, they are usually in close contact and were key in providing the last mile delivery of vaccines. This close working relationship enables the CVs to know the vaccination needs of their neighbors in addition to any other health problem they may be facing in regards to their poultry, and therefore able to deliver services at a moment's notice as illustrated in the quotes below:

> "...yes, because I live just here close by. Sometimes farmers find it easy to come and tell me anytime they want their chicken vaccinated." **(IDI, female, 57 years).**

The principal reason why vaccine demand is very low especially in rural areas and marginal communities is due to the lack of a supply chain. Donadeu (2013), contends that access to vaccines must be paired with supply and logistics where the farmer has easy access to the product in question. In this study, it was found that CVs provide an easy and convenient means of supply to the members of their villages, and this has an immense impact towards its subsequent adoption. For the adoption of vaccines to take place, according to the author, the vaccines have to be accessible first and foremost. The author emphasizes that accessibility is crucial for vaccine adoption, which can be achieved through proper stock management at local agro-vet stores or veterinarians, as well as through the involvement of community vaccinators.

One of the concerning issues raised is the occasional unavailability of vaccines when purchasing them from agro-vet stores in town. This situation poses a problem as it results in delays in

vaccinating animals. Consequently, animals may remain unprotected for several days. This inconsistency in vaccine availability negatively affects animal health and contributes to the low demand for vaccines.

> Something that really bothers us is when you go to buy that medicine from the agrovet in town, sometimes you find the vaccine is not in stock. So, if that chicken was to be vaccinated that day, that will not happen and sometimes this might be for two three days before it is vaccinated.

These results also confirm findings from a recent study which established that 150 farmers out of 215 reported CVs as the most readily available animal health care provider (Bugeza et al., 2017). Moreover, the findings of the study indicate that over 50% of the animal health workers surveyed reported being able to respond to farmers' calls within a 12-hour timeframe (Bugeza et al., 2017). This demonstrates a commendable level of promptness and efficiency in addressing the needs of farmers in the area, and confirms that indeed accessibility is a considerable factor in creating demand and thus adoption of vaccines.

5.4 Co-scheduling vaccine calendars

The study identified co-scheduling of vaccines as another strategy used by community vaccinators to increase vaccine adoption among smallholder farmers. Some study participants reported having a vaccination diary and calendar. This means that they typically visit their respective villages on one specific day after every three months. Co-scheduling chicken vaccination was found to be particularly crucial in the study because of two things. One, the vaccinators would save time and vaccinate for all his clients at once. Two, the farmers would be able to cost-share the price of the vaccines, and save on the cost of transportation for the CV, which greatly reduces the price of the services. CVs in this regard are pivotal in keeping track and helping remind the farmers about their next vaccination schedule and this was evidenced in the interview below:

> "When I begin vaccinating I can vaccinate here and do it at my neighbors and do it at another person's home and like that. There are only a few people with 100 chickens so sharing vaccines among the farmers is easy." **(IDI, female, 40 years).**
>
> "I usually have a list of all my clients together with a record of all their flock size. I have already counted how many chickens they have and I often visit them every three months on one particular day. I don't go around the entire village. Only to those who accepted my services." **(IDI, female, 37 years).**

In the specific context of Makueni County, the issue of vaccine supply becomes even more significant due to the economic vulnerabilities faced by a majority of the local population. The livelihoods of many farmers in this region depend heavily on livestock, and they often encounter challenges related to limited resources and restricted access to essential services. For smallholder chicken farmers, in particular, the issue of vaccine supply is of great concern. These farmers typically have smaller flocks, and purchasing a 100-dose vial of vaccine does not make economic sense when they only have 20 chickens, for example. The cost and wastage associated with such large vials pose a significant barrier to vaccine adoption for these farmers. Recognizing the importance of community vaccinators and implementing co-scheduling strategies can greatly improve vaccine adoption rates among smallholder farmers in Makueni County and similar regions. Coordinating vaccination schedules allows community vaccinators to optimize their time and resources by vaccinating multiple farmers' flocks at once. This not only saves time and reduces costs for both the vaccinator and the farmers but also ensures that livestock receive timely and comprehensive vaccination coverage, which is crucial for disease prevention and overall animal well-being.

By enhancing the vaccine supply chain and empowering community vaccinators to cater to the specific needs of smallholder farmers, Makueni County can contribute to the economic resilience of its farming community. Improving vaccine accessibility and affordability will not only protect

livestock health but also uplift the livelihoods of farmers, enabling them to better manage their resources and improve their overall economic well-being.

Co-scheduling as a strategy is not a particularly new concept, and has been employed in many animals' vaccination campaigns and across the continent. Usually, whenever Governments or non-governmental organizations plan for vaccination campaigns oftentimes, they prefer to have a schedule so as to save on resources. Similarly, CVs adopt an almost identical type of strategy. While analyzing the factors that contribute to a successful NCD vaccine campaign, Bagnol (2009) reiterates how proper scheduling and timing helps to save man-power, cost and time.

5.5 Using community networks

Working on the ground with the community helps the vaccinators build social networks and these are important for their roles, especially when they are seeking out new clients. Using these networks, they gain new clients from various ways including referrals from existing customers, their neighbors, the church, group members as well as community meetings and *barazas*.

Churches: From the study, findings indicate that one of the ways through which CVs increase demand for vaccines is through promoting them in social gatherings such as churches. The CVs reported taking advantage of the time allocated for announcements at the end of church services to advertise their work as vaccinators and teach them the need for vaccines for every poultry keeper in the community. Religion in Kibwezi West is an extremely essential factor and it influences the perception and behavior of many individuals. The church is a place that is highly regarded, and religious leaders are important individuals who can effectively mobilize a community into participating in development projects. The CVs indicated they typically use religious gatherings to educate their community about the importance of vaccines. This way, CVs get to reach farmers

who have never heard about vaccines, or they didn't appreciate the benefits. Many CVs in this study reported to have acquired many new clients by adopting this strategy. One CV indicated the following about promoting vaccines in church:

> "Yes, I am especially lucky because I hear them in churches. Every time we go to church, you hear even Regina telling us. When she gets some little information, she comes and shares in the church." (**FGD, women, 50 years).**

This strategy is completely effective considering many individuals in rural areas attend church regularly. Religion in African societies is a key aspect where social change is involved. In this sense the promotion of vaccines in churches as something meaningful and necessary is better received and adopted. The promotion of agricultural extension services in religious places is not a recent concept. Mwangi et al., (2003) confirm that many religious organizations around Kenya, both Christian and Islam are actively involved in the promotion of agricultural extension delivery services and the socioeconomic development of their members through working with the community.

Groups: The other way through which CVs utilize their social networks to increase demand for vaccines is through visiting various kinds of groups and promoting the use of vaccines among its members. In Kibwezi West, there are several types of groups with diverse objectives and participants. In the findings, the groups included table banking groups, farmer's cooperatives and even merry go round groups. The CVs reported that there existed several farmers' cooperative groups in the area, and most of their members kept poultry. They admitted to visiting these groups and requesting permission to address the members at the end of the meetings. The vaccinators reported using these kinds of opportunities to introduce the members to vaccines in hopes of increasing awareness. This strategy was similarly effective for farmers' cooperative groups as well. In fact, farmer groups that specifically deal with poultry farming actually invited CVs to their

meetings to talk about vaccines and demonstrate to the members the importance of vaccinating their flock.

> "You know women are usually in many groups and when we go to a specific place and we train them on vaccines and they like the information, they tell you so and so I have another group that is at a certain place and so you will find that because they are in this and other groups. So, when you go there you will find that there are others who are in other groups so by doing that you are well connected." **(IDI, male, 41 years).**

Like religious institutions, group meetings also represent places where farmers frequently visit. Here strong social networks exist where the vaccinators have a high number of links to and from various members of the community. This helps create many greater opportunities to receive and disseminate information (Johnson et al., 2017). Proper and efficient dissemination of information is key when discussing awareness creation in vaccines. This strategy works towards targeting farmers in groups and promises to increase demand among that particular section of individuals.

Barazas: Findings from the study also reveal that CVs utilizes public participation spaces like *barazas* to spread awareness about vaccines and their role in the supply chain. Kibwezi West Sub-County values community engagement and they implement it in many of their projects. The villages customarily hold many public participation meetings through the assistant chief's office and invite the villagers to participate. CVs reported talking to the chief and seeking permission to talk about their business during the meetings. The chiefs in the areas are big advocates for vaccines, and even one assistant chief interviewed in the study was a vaccinator herself prior to becoming the local administrator. Furthermore, local administrators were reported to engage in the selection process. *Barazas* are therefore utilized for both recruitment of vaccinators as well as promotion of vaccines to the community. Farmers and vaccinators indicated the following about the local *barazas*:

> "I have heard them speak at meetings like *barazas* only. He stood up and explained where he works and what he does." **(FGD with women).**
>
> "I like going to public participation meetings and telling them about vaccines. If there is a *baraza* meeting that has been called I arrive early and when you see the quorum is better, you take over and it is as if you are in charge of the meeting or *baraza*. Now you start talking about poultry." **(IDI, male, 42 years).**

These findings resonate with those of (Kingiri & Nderitu, 2014) in Kenya where *barazas* have been identified as useful for the promotion of agricultural extension services. Further, the findings indicate that they offer a quick and efficient way for transferring messages aimed at sensitizing the farmers. The dissemination of agricultural information through *barazas* is not a new phenomenon. In a related study examining agricultural extension officers in Kenya, Oduol (1990) concluded that *barazas* are quite effective in the dissemination of agricultural information, the only downside being that these *barazas* are usually male-dominated. The present study however disputes this, and can confirm that many women attend *barazas* nowadays in Kibwezi West Sub-County, unlike in the past.

Door to door and referrals: The other strategy employed by CVs, as the study suggests, is promotion by going door to door. In this instance, CVs revealed that oftentimes after they are completed with vaccinations, they visit the neighbors around their main client's house inquiring whether they keep poultry and whether they know about NCD vaccines. Most of the time, their current clients were the ones responsible for connecting the CVs to other farmers, usually their neighbors who may never have heard about vaccines and its benefits, and may need vaccination services. This strategy, however, was effective only if the previous farmer was satisfied with the efficacy of the vaccines during their previous sessions. Once the clients have trust that the vaccines indeed work, they refer their families, friends and neighbors to their vaccinator, as illustrated in the quotes below:

> "As long as I have come to this area or a certain village you have called me. You are the one who is going to help me find some other customers and if it is possible, I sacrifice a day we go from door to door as I educate them to know the importance of vaccines." **(IDI, female, 55 years).**

In this way they get to identify farmers who have never heard about vaccines or those who thought they were inaccessible. CVs in this study reported to have gained many new clients through this strategy, and it was important in contacting individuals who would have not have been reached by such information otherwise. Door to door strategy, in this study, was found to be more effective than the other mentioned strategies because it grants an interpersonal communication between the farmer and CVs. These findings resonate with those in Zimbabwe, where village agents were effective in selling farm inputs, where they would provide door-to-door extension services to the farmers in their villages (Walters and Ulbrich, 2017). This approach allows the CVs to assess the farmer's current situation and package their sales pitch accordingly. Additionally, farmers are free to ask questions and inquire further in case they fail to recognize certain aspects.

Cost-effective service provisions: Vaccine affordability has been highlighted as one of the most key challenges facing its demand among farmers. One strategy used by CVs that increases both access and demand of vaccines as identified in the study, is cost-effectiveness. Arguably, they provide the most affordable means through which farmers can access vaccines at a considerably reduced price compared to any other means. The strategy employed by CVs is their ability to deliver the vaccines at an appropriate and affordable packaging to smallholder farmers. Typically, vaccines are packaged in large quantity vials that range from 100 doses to 200 to 500. Sometimes 25 and 50 dose vials can be purchased, but these are typically hard to find in retailers' stock. Vaccinators therefore employ a system where they sell the vaccines in doses to the farmers and this makes them the most economical and most convenient means of vaccination for NCD in Kibwezi West.

For farmers who had a few numbers of flock, the CVs reported to use mobilization strategy on the day of vaccination whereby they would gather interested neighbors and vaccinate for them as a group. This way they are guaranteed the entire vial is utilized, and nothing goes to waste. Those who similarly cannot afford to pay for transportation can equally benefit from this system. This strategy encourages farmers who have a few flocks of chicken to afford the vaccines. Purchasing vaccines from CVs turns out to be the cheapest and most common method of accessing vaccines. CVs increase the demand in such instances.

> "I tell them usually, do this, do you have neighbors who have chicken, because if I vaccinate mine alone, it will not be beneficial to me. So, we have to protect the others so that yours can be safe. When you tell them that and since they know one another they will call the mother to this one and say "how many chicken do you have because I wanted to have mine vaccinated." They do the cost sharing and when you go there, you visit the homestead and when you leave their place, they tell you "Go to house one and when you leave there you can go here and here." **(IDI, male, 37 years).**

Cost effectiveness however does not equate to cheap. Farmers in the study felt different about the price of these services. They may offer the most cost-effective means of NCD vaccination in the area but this does not make them affordable to every single farmer. Some farmers felt that the price of using CVs is not cost-effective to them and would prefer it being much cheaper. They felt that the price was still a bit too high especially for smallholder farmers who have fewer flocks and no close relationship with a vaccinator. CVs expressed that their prices were fine, and making a profit would be virtually impossible when the farmer does not cater for their transportation. Farmers in the study indicated the following about the cost-effectiveness of CVs and affordability of vaccines:

> "I think it should be cheaper. That five shillings is a lot of money if you count how many chickens you have." **(FGD with women).**
>
> "It is not easy. You see if you have 200 chickens and to vaccinate costs 5 shillings, then that will be 1000. In such cases the service provider will not charge you for transport because the profit margin is big. But if you call them to vaccinate 50 chicken or less they

> will charge you around 150 shillings for transport. Unless he is coming to vaccinate chicken for a large group, then it is not cost-effective for a small farmer." (**FGD with men).**

This study established that CVs are indeed cost-effective compared to any other service provider in the area. These findings are supported by a study investigated in Kenya analyzing farmer's preferences for animal health service providers. The study concluded community-based animal health workers were reported to be the most affordable service providers in marginal areas, partly due to the low cost of transaction as a result of proximity (Irungu et al., 2007). In contrast, Mockshell et al. (2017), provide a unique take on the subject. In their findings, community-based animal health workers in Ghana were more expensive than government para-veterinary personnel. The authors indicated that farmers preferred using government para-veterinaries because community-based health workers rarely had any drugs available, and they likewise had to pay for their transportation to and from the most adjacent towns, and they additionally had to pay for the drugs and the treatment charges as well. In our study however, farmers cost-shared the prices of both the vaccines and sometimes would pay transport if he lived some distance away. Key informants in the study tend to believe otherwise, and feel that community vaccinators are cost-effective. They had the following to say about affordability of vaccines:

> "Definitely. You see, if I had fifty chickens that's a big loss to the farmer. But if it costs five shillings per bird then that will be a big save." **(KII, Private Veterinarian).**

> "Uh affordability, yes. But the costs are high, you know these are impoverished farmers so cost is an issue. These are rural women, rural youth, they are ignorant so you take a lot of time telling them why they need to vaccinate. Of course, every year they lose their chicken in big numbers but out of desperation as an extension officer, you must sensitize them continuously, so that they see the value of vaccinating the birds." **(KII, Livestock Production Officer).**

Flexibility: The study found flexibility is another strategy employed by CVs in a bid to increase demand and access of vaccines among smallholder farmers. Findings from this study show that because of familiarity, farmers have some form of flexibility in terms of payment for services

received. This means that; farmers can pay for the vaccines through other means apart from money, and also sometimes, they can even pay on credit. Farmers who require these services are typically small scale and oftentimes lack the financial means to afford vaccination. In this study it was established that CVs are flexible when it comes to payment methods and would often accept payment in the form of chicken, farm produce like chickpeas, eggs, and even mangoes. Moreover, because of the aspect of familiarity, it was not uncommon for the CVs to carry out these services on credit. The CVs reported that due to their familiar relationship with their neighbors, they trusted their money would be paid ultimately even if it's not through monetary cash. They indicated they typically advised farmers who were unable to pay for their services to sell them one or two chickens out of their flock, and use them to protect the rest of the flock. This type of flexibility in payment encourages the farmers to carry out vaccination more often without thinking about it being too much of an added expense. This strategy increases both access and demand of vaccines and farmers usually utilize these advantages as evidenced in the interviews below.

> "Sometimes you just call and explain that you need your chicken vaccinated and you will pay them back when you get money. They know you are their customer and you must vaccinate your chicken so they usually have no problem." (**FGD with women).**
>
> "I have experienced this before. I did not have money and I explained it to him and he said give me one chicken. I gave him and he vaccinated the chicken for me. But it was not a big chicken." **(FGD with women).**

Building Trust: Community vaccinators promote the demand for vaccines by proving to farmers that they are getting their money's worth by purchasing vaccines. So, for this to happen when the vaccinator must establish that the vaccines, he is selling are genuine and work. Many people are usually a bit skeptical about any new technology when they are first introduced to it. This trust is typically earned through interactions involving either the farmers' own chickens or those belonging

to their neighbors. In the study, the vaccinators talked about many clients who doubted the legitimacy of vaccines, and refused to vaccinate their flocks. They instead opted for traditional remedies. During NCD outbreaks however, those who refused to vaccinate their chicken would usually complain about their flocks being wiped out, as they would witness their neighbors surviving the epidemic. This, the vaccinators described, provided them with some form of legitimacy and trust to vaccines as illuminated in the quotes below:

> "There was one day I vaccinated chickens for a farmer, and his neighbor refused to engage my services. He had 80 chickens and they all died during the next outbreak, while his neighbors' chickens were all fine. That person became a very good advocate of vaccines from then on." **(IDI, male, 55 years).**

Trust appears to be a very important aspect that affects vaccine adoption in this study. Trust, not only in the individual performing the vaccination, but also trust in the vaccines being administered. The need therefore to select vaccinators who are familiar to the farmers seems like the first step towards establishing some form of trust between the vaccinator and the farmer. Trust in the vaccine is tied to trust in the vaccinator, however this instance is guided mainly by individual perceptions and knowledge about efficacy. Farmers in the focus group discussions emphasized the importance of trust and value for money, and indicated the following, as captured in the quotes:

> "It was a service provider who explained to me in detail what vaccines are and what they do. So, I put my trust in her and invited her to my home." **(FGD with men).**

> "If someone comes to vaccinate for you he should open the vial in your house, and dilute it there if I have too much chicken. If he does that, at least you will be assured that the vaccine will work. But if it has been opened and he opened it in the morning, and the three hours of vaccine viability has passed then the vaccine won't work. That vaccine will just be water." **(FGD with women).**

These findings echo some of the lessons learnt from a study undertaken by Donadeu (2013). In this research, farmers were found unwilling to pay for vaccines, if they don't trust the vaccinator or see any value for their money. The author emphasized that value for money is key for most

livestock farmers, and most of them would benefit by seeing vaccines in use first hand. This situation will harness trust not only in the vaccinators and their services, but also in the efficiency of the vaccines as well.

5.6 Mobilization of allies

Community vaccinators in Kibwezi West were found to use their power in mobilization to rally a group of farmers towards a particular course. In the study, the community vaccinators reported being activists and advocates for vaccines, and this means at the core of their duties is also persuading the farmers to be advocates for NCD vaccines also. This strategy is pivotal in ensuring that the farmers who have adopted the use of vaccines have also started to convince other people the value of vaccines and they too are enrolled into the network and they too adopt the use of NCD vaccines, as illustrated by the quotes below:

> "I have many farmers who have gone on to bring me more clients after I have vaccinated them. Once someone sees you have done a job they refer you to their neighbors and friends." **(IDI, female, 50 years).**

At this point the community vaccinators have entered the last moments of the process of translation in actor-network theory, and that is mobilization of other allies. In this phase the prime actors use strategies to sustain commitment to the network and ensure the enrolled entities represent those collective objectives and do not betray the network (Callon, 1986). In the context of Kibwezi West, the community vaccinators seek to establish legitimacy through providing quality vaccines that work, which might trigger farmers linking them to other farmers for vaccination services. In the study, farmers who have been enrolled in the network, both as vaccinators and clients, therefore take the position of the spokesperson, and help promote it to other farmers who lack the awareness. The stability of both the actor-network and the OPP, according to Rhodes (2009), depends

principally on the strength of the associations between the spokesperson and the other actors. Mobilization, therefore, aims to contextualize the strengths in the relationship between the farmers, the vaccinators, the County government, the vaccines, as well as the NGOs.

Ultimately, all the strategies discussed above are aimed at convincing the farmers into the CVs network. Farmers being aware of, and adopting the use of vaccines are clear indicators of their persuasive negotiations. The persuasion of farmers into the network and vaccine adoption only takes place as a result of these successful negotiations. However, parties equally interested in the actors could attempt to disrupt this process of the relationship forming. In this context, private pharmacies which also sell vaccines could convince some farmers to vaccinate with them instead of the community vaccinators. Boudewijns (2016) therefore indicates enrolment is an endeavor, and not something that takes place, it may or may be unachieved. In the context of Kibwezi West, this may help to explain the challenges community vaccinators face while attempting to increase the adoption of vaccines among smallholder farmers.

CHAPTER SIX: CHALLENGES FACED BY COMMUNITY VACCINATORS

6.0 Introductions

In this chapter the challenges faced by CVs in Kibwezi West are discussed. Understanding this aspect about CVs is important in formulating policies and intervention tailored for the needs of Kibwezi West. To guide this discussion, the section has been divided into the sub-themes following themes: inadequate training, poor remuneration, distance and transport issues, mistrust in the community, and lack of equipment.

6.1 Training challenges

One thing that was common among all the vaccinators was the fact that they all had undergone some form of training. This capacity building is vital for the role and sustainability of the program. In the study, both CVs and key experts in the study observed that training represents an important aspect for the roles performed by CVs and an integral part of the program. The training organizations differed in terms of duration, content and objectives. This presents a challenge where there are notable variations in terms of the capabilities of the CVs. In Kibwezi West alone, there were more than three training organizations whose content, duration, and consistency in regards to refresher trainings greatly differed.

6.1.1 The training content

The training curriculum for some, encompassed both practical and theoretical components, providing participants with a well-rounded learning experience. Interviews with stakeholders involved in the recruitment and training of CVs emphasized that the program included practical demonstrations and on-the-job training, allowing participants to apply their knowledge in real-

world settings. This combination of theory and practice ensured a comprehensive and immersive training approach.

> "It is a practical training, it is both theory and practical demonstrations, sort of on the job trainings. We use a vaccine, we do it practically, so it is both practical, theory and practice." **(KII, Livestock Production Officer).**

While this was the case for a few, it was not the norm for all the vaccinators. We noted that some training organizations would include practical lessons while others only focused on theoretical sessions. Many CVs lamented that they did not receive practical training and they felt that what was provided was insufficient and expressed a desire for longer and more intense sessions. The feedback received from participants echoed their perception that the initial training, while valuable, did not fully meet their learning needs. They highlighted the need for extended and more in-depth training to further enhance their skills and knowledge, particularly in poultry management and practical vaccinations, and vaccine storage.

> "No, the training was not okay for me. I felt it was too short and then it was shallow. They also did not cover all the important topics." **(IDI, female, 35 years**).

> "At that time, they took us and trained us in the class, afterwards we started vaccinating…they didn't show us using chicken." **(IDI, female, 37 years).**

In a comparable study in Ethiopia, Terfa et al., (2018) sufficient training for CVs was found to be critical in equipping vaccinators with the relevant skills, while at the same time assuring farmers equal services from all the providers.

6.1.2 Regularity of training

Another area of concern regarding the training program is the lack of regularity in conducting training sessions. The intermittent nature of the training sessions poses challenges for participants who require ongoing support and skill development. Many participants have expressed that the

gaps between training sessions hinder their progress and limit their ability to fully grasp and retain the knowledge and skills imparted during the training. CVs we interviewed highlighted that the trainings are not conducted on a consistent or frequent basis.

> "It was only one day for four months, on different days. The training began in the morning till in the evening." **(IDI, female, 40 years**).

The gaps between sessions may result in a loss of momentum and hinder the development of a strong foundation for long-term knowledge retention and skill enhancement. A participatory evaluation of CVs by Bugeza et al. (2017), additionally reflected the same sentiments on training durations and they concluded that since education qualifications is not one of the criteria necessary for selection, then it is imperative animal health workers receive sufficient capacity and skill building regularly for them to perform better at their job.

6.1.3 Consistency of refresher trainings

This training additionally, only happened once and our recent study shows that there hasn't been any refresher training since the initial ones. Additionally, those who were trained by both FAO and KALRO received these training around six to seven years ago and they expressed it would be helpful if they received refresher training. Experts had the following sentiments regarding the challenges involved with the training procedure.

> "… there may be a need for forums for these vaccinators to meet and exchange ideas. Maybe refresher courses or something like that. There is a need for refresher, organization and in some places where people failed to practice, they can recruit new ones." **(KII, Agricultural Officer).**

These findings are supported by Riviere-Cinnamond & Eragae (2003), where data from their study likewise indicated that CVs could be effective if they received more refresher training. Furthermore, findings from our current study indicate the training was not only necessary for CV

only. It was expressed by some of the farmers that they too would benefit from some of these training. The study identified farmers who had been trained as a CV, but they instead chose to use that knowledge for their household and next-door neighbors, not as a business activity. This shows a great demand from the farmers to learn how to carry out basic animal health care techniques on their poultry. It was expressed by the farmers that such capacity building would help them save the money they typically spend when visited by the CVs.

> "More training should be added. But not just them, even for us as farmers we need that training and education. In fact, I would propose those who are trained to be farmers who live close to me. That area will benefit a lot if they receive different types of training. It would also be cheaper because they would not need to travel very far." **(FGD with men).**

6.2 Distance and transport issues

The other challenge that was identified in the study was the issue of transportation. Distance was reiterated by many participants as being a daunting challenge that hinders them from fulfilling their primary role effectively. During our look at the causes of price fluctuations in vaccination services, distance was identified as a key factor. Kibwezi West is a big sub-county with a rural setting. This means the houses are sparsely populated, and the vaccinators may need to travel upwards of 30 kilometers to see clients. Distance not only affects the demand of vaccines; it equally affects the accessibility and efficacy of the vaccine. When travelling long distances to see clients, sometimes CVs have to factor in the cost of transportation on top of the service charges so as to make some profit. This affects their cost-effectiveness, as it increases their transaction charges. Additionally, distance may affect the efficacy of vaccines, and CVs reported that without proper means of transport, travelling considerable distances may affect the quality of vaccines, since some of them have like around two hours of thermos ability. A key expert in the study indicated the following in their interview about distance and transportation as a challenge.

> "Sometimes they walk a long distance to come here for the vaccines if we have stocked some here. And if it can be put nearer, it will be easier for them. It will make their work easier. Maybe they can establish a center where there is electricity, it will make their work easier and in case they go to the field and finish, they will be able to come and pick more. The distance affects the efficacy of the vaccine. In fact, even after we trained them, they have been asking for that, a motorbike. That they be supplied with a motorbike that can make their work easier. So that they can do that vaccination in one day or two days, they can cover a very large area because they just walk from one homestead to another." **(KII, Veterinary Officer).**

A study by Randolph and Ndungu (2000, as cited by Irungu et al., 2006) published similar findings, where distance was linked to significant costs of transaction for medical services as a result of increased cost of travel. In our current study, only four vaccinators possessed their own means of transport. Two had motorbikes, (a man and a woman), while the other 2 (both men) used a bicycle. The rest of the participants admitted to using public transport in the form of motorbikes (*bodabodas)* when the distance is too remote, while other times they resorted to walking on foot. This interview with a vaccinator noted the following:

> "I charge five shillings but it usually depends. You might take a motorbike and travel thirty kilometers. In that case, you have to charge more, either seven or ten. So, it depends on distance." **(IDI, female, 61 years).**

> "Yes, I use a bicycle to transport me back and forth. A motorbike is faster than a bicycle so that was a challenge because we travel far and the vaccines might go bad if you don't hurry. With no means of transport, you can only mobilize and vaccinate a few people." **(IDI, female, 52 years).**

While analyzing the distribution of human vaccines in Uganda, PATH (2016) discovered that lack of funds to transport the vaccines during the last mile delivery was a huge impediment to the supply chain. In this present study, farmers attributed their high cost of services to transportation. These findings are echoed by Village health workers in Southern Ethiopia who also experienced similar challenges and often lacked proper means of transportation in an area where the most local veterinarian was almost 360 kilometers away (Admassu et al., 2005). Similarly, Owango et al., (1998 as cited by Irungu et al., 2006) identified long distances and limited infrastructure as a chief

hindrance to both farmers' demand and the service providers' supply of services. The distance, lack of transportation, lack of supportive structure and poor infrastructure all feed into this challenge. It comes as no surprise therefore that village health workers bear the most excessive transactional cost compared to the other service providers (Campbell et al., 2019).

6.3 Lack of remuneration and poor profits

CVs work as independent businesses, and this means they do not have any salary and their livelihoods depend on the number of vaccinations they perform. Like any business, CVs typically suffer from losses and slow businesses. The study established that most CVs retain a primary job and they routinely perform vaccination services on the side. Vaccination offers a secondary source of income in most cases, and the activities around this job only occupy half of their day several times a month. Some of the jobs that came up during the study include full-time farmers, carpenters, teachers, shoemakers, mechanics and some business owners. The profit margins CVs obtain from selling the vaccines are exceptionally low and this often cannot manage to sustain them. Therefore, vaccination as a side job for CVs makes more sense from a financial standpoint.

> "Of course, a few run away because the remuneration may not be that big to really like…if you are not a practicing farmer, you may not see the economic value of you being a service provider." **(KII, Livestock Production Officer).**

> "There is nothing we are provided for. This work is like volunteering to serve others. In the evening you find someone is very tired because we travelled on foot. Then going for the vaccines in town is very expensive and sometimes you do not have the money." **(IDI, female, 52 years).**

Poor profits and a lack of salary represent the two critical issues that affect sustainability and effectiveness of the vaccinators program. Many vaccinators reported their colleagues to have abandoned the program because of this reason. Riviere-Cinnamond & Eragae (2003) observed that in West Pokot, seventy-five percent of the village health workers suggested receiving salaries as

an incentive for retaining the job. In the same study, lack of profits was cited as the number one reason why CVs abandon the job.

6.4 Unfavorable legal and policy framework

The study findings point to the fact that community vaccinators in Kibwezi West lack the formal definition of a legal status. They are considered as farmers first and foremost, who have been selected to receive training to perform vaccination services for their neighbors. The vaccinators lack a formal definition not only in their roles, but also in name. Because of this reason, the project initiators and facilitators (both NGOs and County Government) do not provide them with any type of identification or professional cards supposed to help them authenticate themselves to their clients. Lack of this formalization status equally makes it harder to detect untrained individuals who provide these services to unsuspecting farmers. Key informants in the study reported that the reason for not issuing the vaccinators with an identity or certificate slip was because the farmers may go beyond the scope of practice and perform roes they have not been trained on as illustrated in the quotes below:

> "We used to give them certificates earlier on but nowadays we consider them as farmers but I think we will go in the direction of giving them certificates but we consider them farmers first and foremost." **(KII, Livestock Production Officer).**

> "Yea they don't have anything to show. You know the government trains them to save the birds for the farmers. They cannot go ahead and give them a certificate, because they may go beyond their limits. That one is also not very good for the government. You know the issue of disease is very important." **(KII, Private Veterinarian).**

This challenge is not an isolated event, because it causes a ripple effect of other problems. Lacking an effective policy environment affects the sustainability of the entire CVs network in general. It presents a challenge during training and refresher training (or lack thereof), as explained above, and it also presents a challenge during monitoring and supervision. The projects are usually poorly

regulated and funded, therefore most of them lack effective supervision programs. A study analyzing the role of community-based programs in disease surveillance found that community-based health service providers face a challenge in establishing efficient monitoring programs, and this affects their roles and the quality of service (Catley et al., 2004).

The study established that the ones trained by the County are still recognized for their roles by the veterinary office and they are also registered under the same office. However, key informants in the study revealed that the County ceased the recruitment of more community vaccinators when other projects began offering sub-standard training and supervision of more farmers who operate as vaccinators in the community. Lack of a defined policy framework also leads to the mushrooming of different project initiators who enter the field with diverse selection, training and supervising methods hence causing a significant variation among the CVs projects. VSF (2018) reflects these findings and warns that having a multitude of projects bearing different names, training and supervision of CVs will lead to variations in knowledge, skills and the quality-of-service provision. The report indicates that this problem is however affecting many other countries who have failed to formalize their official status of the community vaccinators (VSF, 2018).

6.5 Mistrust in the community

The vaccinators reported that due to lack of a formal status and the existence of many ‘quacks’ in the community, there has been heightened sense of mistrust. In the study, trust remains a key issue especially on the farmer’s side, whereby they had no possible way of establishing trust in the vaccinators and the vaccines. This affected their willingness to pay and subsequent adoption of vaccines. The study found that there was very minimal sensitization about vaccines, vaccine use and vaccinators going on in Kibwezi West. The vaccinators provided no form of identification,

and therefore many of the farmers depended on referrals from their neighbors or engaged the services of a vaccinator whom they knew previously from the village. Farmers in the focus group discussion shared the following concerning their trust in the community vaccinators:

> "I have not dealt with many of them. The one recommended by my mother is the one I usually use. I trust them because they were recommended by someone I trust." **(FGD with men).**

> "I don't know who has been trained or not. I just have faith and trust that they know what they are doing. Sometimes they carry around a diary and that is how you know they are vaccinators. Usually, their diaries have vaccination schedules." **(FGD with men).**

In the present study, CVs encountered significant challenges related to mistrust when attempting to deliver and convince certain farmers to purchase vaccines. One notable factor contributing to this challenge was the influence of cultural beliefs, traditional knowledge, and perceptions among smallholder farmers in Kibwezi West. Additionally, their low socio-economic status further complicated the process. These farmers often rely on traditional herbal remedies for preventive and curative healthcare, instead of seeking conventional medical interventions. This group of farmers, characterized by their reliance on traditional practices, proved to be particularly resistant to purchasing vaccines. Their skepticism and hesitancy towards modern healthcare interventions were evident, as highlighted in the following interview excerpt:

> "...there are those who usually refuse. You find that such people have 2 or 3 chickens and they usually use herbal remedies to treat their chickens but those with 6 chickens and above usually use the vaccines." **(IDI, male, 52 years).**

The market for vaccines has increased and this has brought about challenges when it comes to trust. Community vaccinator projects which are NGO-led do not receive proper supervision or regulations and this allows a loophole for unscrupulous business owners to enter the market. Leyland et al. (2014) highlighted instances of a high level of mistrust for private pharmacies in

Kenya and Sudan, where informants reported issues of substandard products. Experts in the study elucidated their concerns over the safety of particular vaccines in the interview below:

> "Maybe these NGOs, like the one I was telling you about called FIPS-Africa. I had a problem with one of the guys because he was carrying the vaccine without a cool-box then when I asked they say they were told it was not a must they use one. And you know now due to the liberalization of extension services, you may not really have the authority to question a lot." **(KII, Assistant Chief).**

6.6 Lack of equipment

Community vaccinators reported lacking the proper equipment essential for them to perform their roles. The participants indicated that they required lab coats and proper work shoes that will prevent the parasites in the chicken house from transferring onto the vaccinator's clothes. Furthermore, the vaccinators reported having old cool-boxes, while others lacked them all together and resorted to using a tea flask as a cold-chain facility. Equipment like the cool-box for instance is necessary for maintaining the cold-chain and ensuring that farmers are getting quality vaccines. The vaccinators indicated that after the training they were equipped with most of these cool-boxes, but through the years they have severely dilapidated and no longer work in mint condition.

> "The cool boxes they gave us were few and so there were others who didn't get any. I can suggest that they give us a cool box and icebox because an iceberg is not the same as normal ice. The one they give us at the agrovet melts very fast even when it is inside the cool box. It's not like an iceberg which lasts longer. So even on days when I go too far it sustains me for a long time and I don't have to go back and forth to get more ice." **(IDI, female, 61 years).**

> "Most of them have cool-boxes, but we have some who don't. Some use rudimentary means like going to the agrovet and being given an ice block in a bottle. So that depending on the distance they are going, the ice has melted." **(KII, Agricultural Officer).**

As a result, CVs report that they often suffer losses due to this, and a profit is not always guaranteed. Vaccines are goods that are easily perishable and once opened the only options

possible is using it all up or it deteriorates. Participants indicated that there were situations where there would be leftover vaccines. This happens when the farmer overestimates the number of flocks they have in their homesteads. Or when farmers call the vaccinators for services, only for them to find the chicken is already sick. When this happens, many reported that they had to give out the rest of the vaccine to the neighbors for free or pour it out if there was no one available. This puts a dent in their business as they usually end up suffering from losses as a result.

> "There were many challenges. Sometimes you go vaccinated and the farmer tells you they have no money. They might have 20 chickens but only 100 shillings in their pocket. You will just vaccinate them for the farmer and take the loss because you cannot let their chicken die." **(IDI, female, 61 years).**

> "Sometimes when there is an outbreak, some farmers call you to come vaccinate only for you to find them already sick. They don't know that when the chicken is already sick you cannot vaccinate. You see you're then left with a vaccine that you don't know what to do with." **(IDI, female, 56 years).**

This is a recurrent problem among many of the interviewed vaccinators. This, the study presumes, stems from severe underfunding in the projects. Similar findings were reported by research evaluating the work of community-based health service providers. The study concluded that one of the biggest challenges facing most of the projects was inadequate resources, which was aimed at supporting cold chain facilities and transport allowances. Comparably, a study by Bugeza et al., (2017) determined that community-based animal health services providers were found lacking not only in aspects of vaccine administration but also in their cold-chain management skills. Bagnol et al. (2017), indicates that one of the key challenges facing the widespread control of NCD disease by community vaccinators in rural areas is the absence of a viable cold-chain facility.

Overall, these findings and discussions on the challenges faced by community vaccinators affect their roles as vaccinators and their general contribution towards broadening awareness on vaccines and promoting vaccine uptake. In the context of actor-network theory, these challenges threaten

the stability and continuation of the CVs network. If they are not addressed, they may be the cause of the disintegration and unraveling of this actor-network. All the actors must perform their assigned roles, if they hope to appear as a single streamlined entity. Law (1992), indicates that an actor is considered punctualized when the networks run wide and deep and its performance becomes routine. This concept expects all the entities in this network to work in an aligned manner, however, this may not always be the case in many networks patterning. Punctualization is unpredictable and may face resistances (Law, 1992), as in the case of the delivery and distribution of vaccines by CVs, and may degenerate into a failing network. These challenges, therefore, expose the weak links and associations within the network that prevents it from being successful and routinized.

CHAPTER SEVEN: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 Summary

This study sought to establish the contributions that community vaccinators make in the NCD vaccine delivery and distribution in Kibwezi West sub-county, Makueni County. The study especially sought to assess the roles the vaccinators play in this supply chain, how they contribute to increased awareness and subsequent uptake of vaccines. The study also sought to assess the challenges facing the vaccinators in their roles. The study established that community vaccinators operated as a vast network in various villages across the sub-county. NGOs and government agencies in Kibwezi West sub-county are responsible for the establishment of these projects, and they also take charge of their selection, training, and supervision. Community vaccinators mainly receive training on vaccination of Newcastle disease, plus other pieces of training related to poultry diseases and rearing. Vaccinators perform various roles concerning vaccination like delivery, mobilization and actual inoculation of poultry.

These roles are, however, not the sole tasks performed by community vaccinators. As a result of these associations with farmers, CVs can engage in other roles outside of vaccination such as advising and teaching, diagnosis and surveillance, as well as deworming. Vaccinators were established to use multiple strategies to enroll farmers into the network as clients and vaccine consumers. The vaccinators resorted to strategies such as their social capital, as well as proximity to the community to increase awareness, availability, and access for vaccines among smallholder farmers. To increase demand, vaccinators in the study were established to be both cost-effective and flexible in terms of payment methods. Clients who utilized the services of CVs and saw the value of vaccines among their flock were instrumental in mobilizing other farmers into the

network. They were critical in recommending vaccine use and its benefits to other farmers in the community. These strategies were determined to be unique only to community vaccinators and not any other animal health service providers operating in Kibwezi West. These strategies were instrumental in promoting vaccine uptake among the farmers.

Community vaccinators described lacking adequate resources such as cool-box equipment and proper means of transport that would be beneficial in their roles as vaccines distributors. Moreover, the vaccinators reported institutional failures emerging from lack of unfavorable policy and legal environments which translates to inadequate training and lack of refresher courses. These failures have also resulted in poor supervision, and this greatly hinders their performance at work. Other challenges come about as a result of poor remuneration and lack of salary, and this affects their routine operations. This challenge has been cited as the most leading cause of rising cases of attrition in the vaccinator programs.

7.2 Conclusion

There exists a huge gap and several barriers in access to NCD vaccines in Kibwezi West Sub-County. This has caused low levels of information regarding vaccines, and uptake of the said vaccines proves to be still low. By evaluating the roles performed by the community vaccinators, this study established that CVs are crucial in the last mile delivery of not only vaccines, but also other curative basic health care services in addition to deworming and disease surveillance and community mobilization. Furthermore, the study concluded that CVs use strategies such as cost effectiveness, proximity and community networks to enhance the supplemental roles they perform in addition to enhancing vaccine reach to farmers in rural and remote areas.

The formation of CV networks, as observed through an actor-network approach in the study, is dependent on associations between various actors. The strength of these linkages plays a crucial role in determining the success or failure of CV projects. Weak links and associations between actors in CV networks contribute to numerous challenges experienced by CVs, including issues of mistrust, distance, and transportation. These challenges arise due to the lack of robust connections and partnerships among the actors involved in CV projects. While community vaccinators have been shown to increase availability, access, demand, and adoption of vaccines, the legal and regulatory framework surrounding their operations remains largely unsupported. Furthermore, discussions on their impact and contribution towards supplementing a debilitating and severely understaffed animal health delivery system continues to miss from debates touching on animal healthcare provision in marginalized areas.

7.3 Recommendations

Emerging from our above findings, and to streamline the work of community vaccinators in the delivery and distribution of NCD vaccines in rural and marginalized areas, particular actions need to be implemented:

- There is a need for recognition and formalization of community vaccinators as official para-veterinary professionals. This should be supported by the veterinary statutory board as well as senior policymakers.

- NGOs and Government officials responsible for initiating CV projects should be harmonized in a way that they are providing a standardized way of selecting, training, and supervising the vaccinators. This could look like:

1. Creating a body or association where all the trained community vaccinators in the area are registered. Providing them with harmonized and frequent training and supervision as they undertake their work.

2. Ensuring that the community is sensitized on who the vaccinators are, which vaccinators have received training, and those who will be operating in their respective locales.

3. Providing some form of identification to the community vaccinators as a means to prove that they have received training. The farmers can then differentiate those who have undergone training and received refresher training from the quacks.

- There is need for establishing a more structured and consistent training schedule. Regular training sessions would enable participants to build upon their existing knowledge and skills, ensuring a more continuous and progressive learning experience. By providing frequent training opportunities, participants would have the opportunity to reinforce their understanding, address any gaps in knowledge, and stay updated with industry developments.

- The County veterinary offices together with the other stakeholders should consider broadening the scope of their training given to community vaccinators. They should include skills essential such as mobilization, teaching and business development skills.

- To capture the cultural and underlying nuances that may have been missed in the current study, we recommended to include ethnographic research methods in future studies of this

nature. Ethnography allows researchers to immerse themselves in the local context, observe social interactions, and engage in in-depth interviews and participant observations, which will provide valuable insights into the cultural beliefs, values, practices, and social dynamics surrounding vaccine adoption within communities.

- We recommended that future studies embrace the integration of a One Health holistic research agendas through collaboration between veterinary and biological scientists, anthropologists, and other social scientists. Similarly, anthropologists can contribute to the development and implementation of One Health projects by employing interdisciplinary approaches that involve non-social scientists.

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APPENDIX 1: Informed Consent

Introduction

I am from the University of Nairobi and KARLO and I am conducting a study on contributions of community vaccinators to the delivery and distribution of NCD disease vaccines in Kibwezi West sub-county, Makueni County.

Purpose

The study seeks to explore the contribution of community vaccinators to the delivery and distribution of NCD vaccines here in this region. This is through examining the roles community vaccinators play in this sector, the strategies they use to increase awareness and uptake of these vaccines, and the challenges they face while undertaking these roles.

The answers you give will be recorded through an audio recorder. This is a device that will capture both your voice and mine during discussion. This will only be used for analysis within the research team and there be assured of the safety of your information. This discussion will take approximately one (1) hour, but we can take breaks from time to time.

Risks and benefits

There are no foreseeable risks if you decide to take part in this study besides the time taken during the interview which will not be compensated. The data gathered during this process will be given to policy makers and development agencies for implementation. However, there will be no direct benefits for you as a participant.

Voluntary participation

Participation in this study is voluntary and if you choose not to take part there will be no fear of victimization. You also have the right to refuse or withdraw at any point during the study. If you

feel a question is too personal and cannot answer, feel free to skip it. However, your participation will be of great contribution to this study.

Confidentiality

The information you give will not be revealed to any other person apart from the research team. All the research materials will be kept under a lock and key and all the data will be encrypted in a computer software. During publications and report writing, there will be no use of names or any possible identifier that may lead back to you or your household.

Contact information

In case of any concern or question you have regarding this study, you may contact Dalmas Ochieng Omia on phone +254724239868 or email dalmas.ochieng@gmail.com. Your participation will be highly appreciated

Participant's agreement

I have understood the information that I have read/explained to me concerning the study, all my questions have been answered satisfactorily and I may ask more questions at any given time. I therefore agree to take part in this study.

Researcher's Signature: …… Date: .....

Thank You

APPENDIX 2: In-depth Interviews

Contributions of CVs in Kibwezi West Sub-County, Makueni County.

SECTION ONE: Demographic Background of the participants

Name of the informant (Optional) _____

1. Age of the CV

☐ < 18yrs ☐ 18-35yrs ☐ 36-53yrs ☐ 54 years and above

2. Gender of the informant

☐ Male ☐ Female

3. Education Background

	Complete	Incomplete
Primary:	☐	☐
Secondary:	☐	☐
College/University:	☐	☐

SECTION TWO: Roles

Experience with Vaccine Delivery and Distribution

Introduction: I am going to ask you about your work delivering and distributing vaccines to farmers. In the first section I would like to know about your job and how you were chosen and trained.

1. When did your job as CV begin (**Probe**: previous job, selection process, training, what was their opinion on the trainings)
2. Take me through your day, what activities do you do daily in your work as a CV (**Probe**: allow narrator to respond, ask them which role do you consider most important, who assigns the roles, any supervision)

3. Have you ever treated any animal (**Probe**: how many animals have you treated, how many have you sent for referral, how do you identify diseases in animals)
4. Have you ever sold vaccines to farmers (**Probe**: what vaccines do you sell, where do you get them, who buys most)?
5. Where do you get your vaccines?
6. How far is the nearest agro-vet or veterinary office from where you live? (Probe on supervision, vaccine supply, making referrals)
7. Have you ever vaccinated any animal (**Probe:** what diseases require vaccination, how many have you vaccinated)?
8. How do you administer vaccines (**Probe**: how do you mix, what equipment do you use)?

SECTION THREE: Strategies

Introductions: I am going to ask you about the strategies and techniques you use in your work delivering and distributing vaccines to farmers, in this second section I would like to know about what you do to increase awareness and uptake of vaccines.

1. How do you make people buy vaccines (**Probe**: how do they help people know what vaccines are, what makes them buy)?

SECTION FOUR: Challenges

Introductions: I am now going to ask you about the challenges you face in your work while delivering and distributing vaccines to farmers. In this third section I would like to know about the difficulties you face while undertaking this job.

2. What do they like and not like about their jobs (**Probe**: best part about their jobs or worse)?

3. What is your relationship with other CVs, community members, farmers, and vaccine suppliers and distributors (**Probe**: who offers you more support)?
4. How do you cope with these challenges (**Probe**: what do you do to help ease the stress from work)?

APPENDIX 3: Focus Group Discussion Guide

Contribution of CVs in Kibwezi West Sub-County, Makueni County

1. Who are CVs?
2. What do they do?
3. How are they selected?
4. How are they trained? (**Probe:** what are they trained on)
5. Have you ever utilized their services?
6. What kind of services do they offer the community? (**Probe:** types of health services offered e.g. vaccination, community mobilization, visits)
7. What services are most in demand?
8. How far is the nearest agro-vet or veterinary office from where you live? (**Probe:** access in terms of distance)
9. Would you be willing to pay for vaccines and vaccination services for your animals? Why?
10. What could make getting the vaccines even easier and cheaper to attain? (**Probe:** on what they would like to change)
11. What challenges exist in the vaccine distribution chain?

APPENDIX 4: Key Informant Interview Guide

Contributions of CVs in Kibwezi West Sub-County, Makueni County

1. How are the CVs selected in Kibwezi West Sub- County? (**Probe:** selection criteria and process)
2. How are they trained? (**Probe**: NGOs, government, funding, during of training)
3. What are the roles of CVs? (**Probe**: treating, prevention, mobilization)
4. What are their contributions in vaccine distribution and delivery? (**Probe:** cost effectiveness, access, utilization)
5. What challenges do CVs face in vaccine distribution and delivery chain? (**Probe**: at the policy level, community level, individual level)
6. Is your office/organization well equipped to facilitate the work of CVs?
7. Are there any challenges that might hinder your office or organization from carrying out this mandate?
8. Are there any challenges that you face with the procurement and storage of NCD vaccines and how does the department address them?
9. Are there any challenges that you face in the delivery of NCD vaccine to the livestock farmers? How are they currently addressed? (**Probe:** for affordability, accessibility, cultural acceptability, gender, efficacy, safety/side effects, security)
10. Who are the different stakeholders in the NCD vaccine in the county? (**Probe:** for the different roles they play)
11. What are some of the changes that you would like to see happen in the CVs program (**Probe:** possible resolution strategies)