 doi:10.20944/preprints202205.0059.v1

Article

Informal Institutional Barriers to Access and Utilisation of Newcastle Disease Vaccines among Women Smallholder Chicken Farmers in Makueni, Kenya

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Abstract: Institutional barriers can hinder effective access and utilisation of Newcastle disease vaccines among smallholder chicken farmers. Many studies have focused on formal institutional barriers with minimal focus on informal institutions - unwritten rules and regulations that govern access and utilisation of Newcastle vaccines. However, informal institutions are more profound and enculturated in individuals' daily activities. This study sought to investigate informal institutional barriers to access and utilisation of Newcastle disease vaccines among women smallholder chicken farmers in Makueni, Kenya. The cross-sectional qualitative study employed in-depth interviews, key informant interviews and focus group discussions as data collection methods. Study informants were conveniently and purposively sampled. Informal institutional barriers to access and utilisation included: fear of Newcastle disease vaccine as a new technology, use of herbal remedies, mistrust of community vaccinators, gender division of labour, ownership of household resources and beliefs that indigenous chickens do not need vaccines. The study concludes that women chicken farmers are constrained by unwritten rules, norms, regulations and gender roles that hinder their access to and utilisation of the Newcastle disease vaccines. The need to examine informal institutions to identify and eradicate barriers to access and utilisation of Newcastle disease vaccines by farmers is recommended.

Keywords: smallholder women farmers; Newcastle disease vaccines; informal institutional barriers

1. Introduction

Chicken keeping is an essential and widespread economic and subsistence activity worldwide (1). Weil et al. (2) aver that rural women and girls play over 80% of chicken production activities in rural and peri-urban Asia, Sub-Saharan Africa and other developing countries. Women have both control and access to chicken and chicken products as many cultures perceive chicken farming as a feminine activity. Additionally, chicken farming in many African countries acts as a source of income that enhances women empowerment in rural and peri-urban areas (3). Nutritionally, chicken meat and eggs provide high-quality protein to many food-insecure households. FAO (4) reported that eggs and meat from indigenous chicken are vital for pregnant women and young children's nutrition. Therefore as described by Desta (3) chickens are significant assets to women especially in rural areas and can act as a mitigating strategy to poverty eradication in Sub-Saharan Africa.

However, women smallholder chicken farmers face several challenges in their production pursuits which include chicken diseases, high cost of quality chicken feeds, poor markets for chicken and chicken products, inaccessibility to veterinary services among others (5). Chicken diseases, especially Newcastle disease (ND) (6) present great threats

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to chicken farmers in Eastern Africa. Studies in Ethiopia and Tanzania show that ND is the deadliest among all chicken diseases which kills millions of chickens yearly (7,8). Despite the availability of ND vaccines, chicken farmers have reported minimal uptake and adoption (9). Chicken farmers in rural households are faced with varied barriers to access to ND vaccines. Ranging from ND vaccine costs, supply issues, distance to Agrovets, cultural barriers, poor infrastructure especially the absence of cold chain boxes to institutions that guide and govern distribution and delivery of ND vaccines, contribute to minimal uptake by farmers (10,11).

Attempts to analyze and describe barriers that women smallholder chicken farmers face in accessing and using ND vaccines show that many barriers are beyond the control of farmers (8,12,13). Barriers to access and use of ND vaccines may be rooted in policies and politics, religious beliefs, cultural norms, traditions, values and expectations of societies (14) as well as delays by vaccine distributors to supply the vaccines (15). Distribution and delivery of ND vaccines are guided by international and local rules, regulations, protocols that are laid down by producers, veterinary officers as well as governments and actors in the ND vaccine value chain. Such rules and regulations are instituted into the systems to sustain the demand and supply of ND vaccines. Many governments champion for farmers to get quality and affordable ND vaccines by regulating prices and providing necessary support to farmers and distributors (16). As opined by Casson et al. (17) rules, regulations, traditions and laws constitute humanly devised institutions.

Ostrom & Crawford (18) define institutions as prescribed rules and regulations used by humans to organize all forms of repetitive and structured activities at family, community, national and global levels. North (19) further states that humans devise institutions to create order and reduce uncertainty in social, economic and political sectors of society which can be formal or informal. Informal institutions comprise sanctions, taboos, customs, traditions, and unwritten codes of conduct, while formal institutions are made up of constitutions, laws, and documented property rights. Institutions provide incentive structures of an economy that shapes the direction of economic change towards growth, stagnation, or decline of production, distribution and delivery of products (20).

Several studies have focused on formal institutions and their impact on the distribution and delivery of ND vaccines in Eastern Africa. For instance, Eze et al. (21), stress on written rules, protocols and regulations which guide the ND vaccine production, efficacy and handling of the vaccine. Chuma et al. (22) inform on the importance of ND vaccine distributors and community vaccinators to adhere to prescriptions and proscriptions written by ND vaccine producers as well as veterinary officers. Moreover, Leslie (23) describes the control measures that governments inform ND vaccine suppliers and chicken farmers to enable positive results after vaccination. To set up ND vaccine distribution outlets such as an Agrovet outlet, there are institutions (laws, rules and regulations) that should be followed to ensure that the vaccine reaches consumers while still in good quality and conditions. Additionally, it has been noted that many governments devise laws to enable fair distributions of ND vaccines within villages (11,24).

In spite of many efforts to enable chicken farmers especially in the rural areas to prevent ND by the use of vaccines, minimal uptake is recorded. Many rules and regulations have been written by relevant actors and organizations within ND vaccine value chain directing how to handle the vaccine. Besides, governments spend a huge amount of money to import and/or produce and establish ND vaccine distribution centres but the adoption by chicken farmers is reported to be low. As explained by Desta (3), there exists a disconnect between ND vaccine producers and consumers in the villages. The focus has been on the quality and efficacy of ND vaccines with minimal attempts to address barriers of access at the local level. Undocumented rules and regulations are in most cases left out as variables of concern in ND vaccine value chain. However, these unwritten rules, traditions and regulations are rooted in daily activities of societies. They even exert more influence on individuals because they are built-in people's minds during enculturation and socialization processes (25). It has been noted that most informal institutions or traditions

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are designed to oppose new technologies from outside individual society (19). This makes many farmers take long to access, use and adopt ND vaccines.

Informal institutions are equally known but not laid down in writing and they tend to be more persistent than formal rules (19). Many communities in Sub-Saharan Africa consider chicken farming as a women activity. Gender roles, expectations, division of labour, women status, as well as access and control over household resources, are pronounced informal institutions in many communities (26). As described by Ostrom (27), women are burdened by enacted informal recurrent domestic duties linked to their gender roles. Besides, gender division of labour creates limited spaces for women to attend public and community meetings where important chicken management training is conducted. As opined by Campbell et al. (10), women in rural Tanzania face pronounced constraints in accessing ND vaccines. It was reported that women have access to household resources, however, control is in the hands of men. This restricts women from selling household assets to buy ND vaccines without seeking permission from men.

Additionally, Chingonikaya et al. (9) explain that communities in Tanzania perceive women community vaccinators as less competent as compared to men. Such attitudes enrooted in patriarchal societies create barriers for qualified women vaccinators to venture into a "men dominated game". The implications of such established informal rules and regulations derail women who want to champion distribution and delivery of ND vaccines. Key functions of informal rules and regulations concerning ND vaccines include limiting women to go outside the domestic spheres, hence finding less or no time to get access to vaccines (28). It is, therefore, crucial to note that enacted informal institutions, especially gender norms, gender division of labour, and women decision making pose barriers to access to ND vaccines.

Wyatt et al. (29) explain that women farmers in Eastern Kenya, face enormous challenges to get access to extension services, especially ND vaccines. Such challenges are embedded in cultural and community norms, values, worldviews towards women's position, space and agency. Therefore, unwritten rules and regulations can contribute to minimal uptake of ND vaccines by chicken farmers. Ostrom and Crawford (18) pointed out that it is important to understand the full contexts of what these informal institutions are, why they exist and are sustained, to address their limiting capacity for women access to ND vaccines. This study sought to examine the informal institutional barriers to access and utilisation of ND vaccines by women in Makueni County.

2. Materials and Methods

2.1. Study site

The study was conducted in Makueni County, located in the Eastern part of Kenya between Latitude 1° 35′ and 3° 00' South and Longitude 37° 10′ and 38° 30′ East. The county is in a semi-arid area where crop farming is not a reliable economic activity. The county has one of the highest poverty levels in the country (64%) compared to the national absolute poverty level (47%) (30). The Study site was selected purposively; it has over 80% of women who keep chicken on a smallholder basis. Chicken farming has been on the increase in Makueni given that crop farming yields unpredictable harvest as the county is located in semi-arid areas (30). Besides, the county government has devised ways of supporting women groups whose agenda is rearing indigenous chicken (31). The study defines smallholder chicken farmers as those who rear 10-300 chickens.

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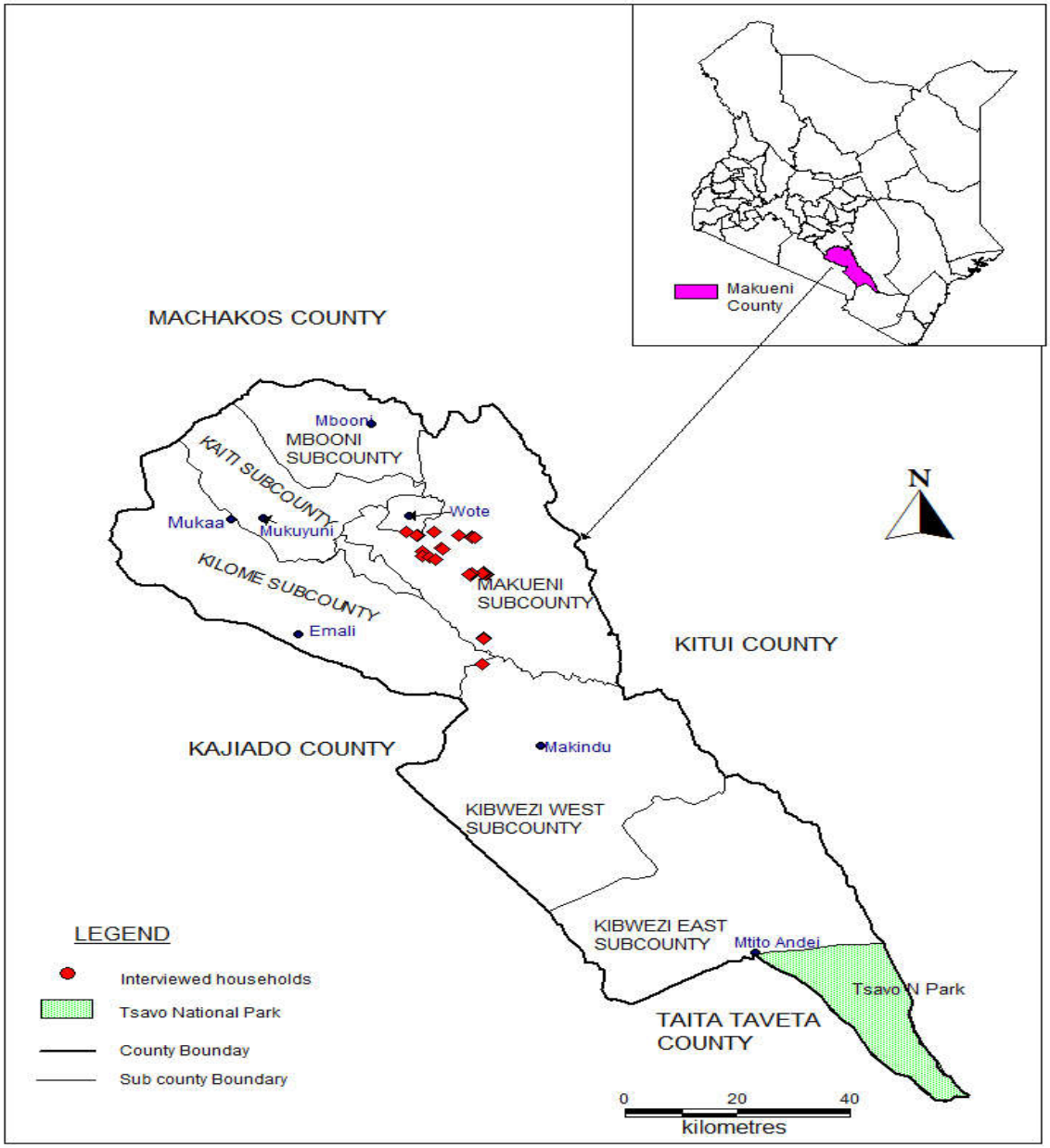

Figure 1. Map of Makueni County. (Source: Authors, 2022).

2.2. Study design, sampling procedure and data collection

The study adopted a cross-sectional research design. Qualitative methods were employed during data collection and analysis processes. The study targeted women who practice smallholder chicken farming in Muvau and Kathonzweni locations of Makueni County. Purposive sampling was used to recruit 30 participants, for in-depth interviews, that comprised of women smallholder chicken farmers segregated by age; to capture intergenerational experiences on informal institutional barriers to access and use of ND vaccines at the household level.

10 key informants were also purposively selected from Makueni Sub County based on knowledge on chicken husbandry, ND vaccines distribution and delivery as well as community norms, values, rules and traditions on access and use of ND vaccines. They

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provided expert knowledge on unwritten rules, traditions and regulations that hinder women to get access to and use ND vaccines. Key informants comprised of four women group leaders, two community elders, two community vaccinators, one Sub-County veterinary officer and one Sub-County gender officer.

Moreover, four focus group discussions (FGDs) that comprised eight women each were selected to provide community consensus on informal institutional barriers to access and use of ND vaccines by women chicken farmers. The FGDs were conducted in two wards namely; Kathonzweni (rural location) and Muvau (peri-urban location).

Before conducting the actual fieldwork, study tools (IDI, KII and FGD guides) were pretested in Wote Ward on four IDIs, two KIIs and one FGD to test the suitability of questions and ability of participants to comprehend guiding questions, and necessary adjustments were made. Pretesting the study tools ensured that terms and names for informal institutional barriers, ND and ND vaccines were clear to farmers and there was no confusion. The pretest site was excluded from actual data collection. All IDIs, KIIs and FGDs were audio-recorded after seeking consent from study participants. Field notes were jotted for reference.

2.3. Data management and processing

Recorded qualitative interviews and discussions were transcribed verbatim and translated to English by the researcher, who had a good command of both English and Swahili. Field notes were typed and edited in line with the emerging themes and subthemes. The transcripts were reviewed for clarity and data cleaning was done at the end of the transcription exercise. Codes and themes were developed and analyzed thematically, checking recurrences within and across data. Direct verbatim quotes reflecting major themes were extracted and presented in reporting of the findings.

2.4. Ethics

Approval and clearance from National Commission for Science, Technology, and Innovation (NACOSTI) referenced NACOSTI/P/19/1207 was sought and obtained before data collection began. Permission from the county government of Makueni was sought to enhance smooth data collection. Informed consent was obtained from each participant after the nature and purpose of the study were explained to them. Voluntary participation and the right of participants to pull out of the study at any point was stressed while their privacy and confidentiality was assured during the consenting process. Permission to audio record the interviews and discussion was also sought from the informants. Pseudonyms were used to ensure anonymity, and information from the data collected was treated confidentially. All study participants were aged 18 years and above which is the legal consenting age in Kenya. The study was conducted prior to Covid-19 restrictions.

3. Results

Study results are organized into two sections. The first section (3.1) focuses on demographic characteristics of study participants; the second section (3.2) presents informal institutional barriers of access and utilization of ND vaccines by women smallholder chicken farmers.

3.1. Demographic Characteristics of Study Informants

A total of 30 women for IDIs, 32 women for FGDs and 10 key informants participated in the study as summarized in Table 1.

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Table 1. Demographic Characteristics of Study Informants.

Variables	Frequency	
In-depth Interviewees		
Number of In-depth Interviews	30	
Average age	51	
Average years as chicken farmers	23	
Education level of In-depth interviewees		
Tertiary	2	
Secondary	8	
Primary	19	
No Formal Education	7	
Marital Status of In-depth Interviewees		
Married	21	
Single	2	
Widowed/Separated	7	
Household Head		
Man	21	
Woman	9	
Focus Group Discussants		
Number of FGDs	4 (each with 8 women farmers)	
Key Informants	**Role**	**Frequency**
Women Group Leaders	Manage groups activities	4
Community Vaccinators	ND vaccine distributors/deliverers	2
Community/Village Elders	Community gatekeepers/leaders	2
Sub County Veterinary Officer	Provide veterinary services	1
Sub County Gender Officer	Women empowerment expert	1

Demographics of informants indicate that many women chicken farmers are elderly with an average of 51 years. Besides, many informants reported having kept chicken for many years, 23 years on average, even before the ND vaccine was introduced to the county. It was also noted that many women (21/30) had up to primary school level of education thereby having basic knowledge about new technology like ND vaccines. However, many women have an understanding of informal institutions that were encultured during the process of socialization. Furthermore, households with men regarded men as household heads who are entrusted with many decision making on household resources. Women in such households were reported to have access to resources as opposed to control on the same.

3.2. Informal institutional barriers to Access and Utilisation of Newcastle Disease Vaccines

Women chicken farmers in Kathonzweni and Muvau Wards identified nine informal institutional barriers to access and utilisation of Newcastle disease vaccines. Informants in in-depth interviews (IDIs) reported barriers that were confirmed and supported by the discussions in Focus Group Discussions (FGDs) and Key informant interviews (KIIs). Farmers in Kathonzweni ward reported more barriers as compared to those in Mavau. The following are the main informal institutional barriers identified by the study;

3.2.1. Fear of ND vaccine as a new technology:

Study informants indicated that ND vaccines are a recent technology in the study site. Many informants reported being hesitant to use the vaccine on chicken as pointed out by one IDI participant … *"I have never used ND vaccines on my chicken… I have some reservations given that it is a new technology. Maybe I will use it in the future once I get to know more about it"* (**IDI-18, Kathonzweni Ward**).

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Farmers in the FGDs discussed that ND vaccination is a recent activity in the area. According to their discussions, some farmers are adopting ND vaccines on their chicken as time goes by even though the adoption is slow as supported by the following excerpt;

"As you are aware, ND vaccines started like a few years ago, let us say 8 years ago especially in this village. Farmers have started to use it, but being a new technology, people take some time to accept and adopt…" (**FGD_03, Muvau Ward**).

Information from a community vaccinator (CV) corroborated this information indicating that many farmers fear ND vaccines and raise many questions about the quality and efficacy during vaccination and are reluctant to use them, "*Chicken farmers in this ward do not use ND vaccines as recommended by our county veterinary officers and livestock experts. Many fear using ND vaccines on their chicken because it is a new technology…, one farmer said that she has been rearing chicken for more than 30 years and she fears introducing ND vaccines being new to her*" (**KII_05, Community Vaccinator, Kathonzweni Ward**).

3.2.2. Use of herbal remedies:

Many farmers reported using herbal remedies to treat and prevent chicken diseases. The study informants unanimously agreed that the following herbs and trees are used to treat and/or prevent chicken diseases in the study site: *Neem* tree, *aloe vera*, pepper, tobacco among other herbs and indigenous trees. Farmers also amplified the ease of acquiring such herbal remedies with minimal or no cost. This is as illustrated by the following excerpts;

"In most cases, I crush different herbs and give them to my chicken to prevent diseases. I make sure that I keep on changing the herbs every morning. They [herbs] are very helpful in preventing different diseases in my chicken. You see how they are healthy?... yes, I use aloe vera, pepper, uthunga (local wild herb) among others… so when you tell me about buying the ND vaccines, I rarely do that, all these herbs are free of charge and you can get them from the bush or a friend's homestead" (**IDI_16, Kathonzweni Ward**).

"I have kept chicken since 1978 and I use herbal remedies. The new technology is very recent and I have no interest in testing it on my chicken… I am okay and when I want to use it maybe I will, but I am not sure" (**IDI_8, Muvau Ward**).

Through FGDs, women agreed that nearly all chicken farmers in the study area use herbal remedies. As pointed out in all FGDs … "*we all use herbal remedies on our chicken, aloe vera is good for chicken and can prevent many diseases, even ND can be prevented by the use of aloe vera*" (**FGDs_ 01, 02, 03 & 04**).

A veterinary official reported that the use of herbal remedies by chicken farmers is one of the barriers that hinder utilisation of ND vaccines. The veterinary officer explained that many farmers are not aware of the quantity and quality of herbal mixtures that they use to treat, as well as prevent chicken diseases hence they are educating chicken farmers on the importance of ND vaccines as opposed to the widely used herbal remedies as explained in the following excerpt;

"Chicken farmers in this county use herbal remedies to a larger extent. Many farmers get herbs from the nearby bushes and crush them, then mix with water and give their chicken. They even do not know the quantity but it has been the case for many years. We [county livestock officers] are educating farmers to use ND vaccine because it has sure returns and our farmers are adopting it" (**KII_09, Sub-County Veterinary Officer**).

3.2.3. Fear of perceived Newcastle disease vaccine side effects:

Study informants indicated that from their perspective, ND vaccines have negative side effects on chicken and human beings. They reported several perceived side effects which include increased deaths of chicken after vaccination, sterilization of chicken, hens may stop laying eggs when vaccinated and that vaccinated chicken can be harmful for human consumption as illustrated by the following excerpts;

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"There was a point when my chickens were sick and I called a community vaccinator who vaccinated my chicken against Newcastle disease and all of them died. Since that time, I have never used Newcastle disease vaccines" (**IDI_22, Kathonzweni Ward**).

My hen was about to start laying and I called the community vaccinator who gave it ND vaccines. The hen took more than two months before it could show signs of laying eggs. … I believe that ND vaccines can make miela (hens) infertile and/or stop laying eggs" (**FGD_01, Kathonzweni Ward**).

"The reason I don't vaccinate my chicken is I know the constituents of the ND vaccines and my chicken are for subsistence. I don't want to vaccinate them and later when we eat them…, one gets affected or even gets cancer" (**IDI_03, Muvau Ward**).

A community vaccinator informed us that many farmers raise complaints about the side effects of ND vaccines. It was identified that many complaints are people's perceptions and farmers need to know that ND vaccines are helpful. He explained that many farmers request ND vaccines when their chickens are already infected and at a critical stage, yet ND vaccines are meant for healthy chickens. He stressed that "*farmers call us when chickens are sick and at a critical stage and if the community vaccinator fails to recognize the disease because farmers hide information, in many cases after vaccination chicken can die… and also farmers have wrong perceptions about ND vaccines*" (**KII_06, Community Vaccinator, Muvau Ward**).

3.2.4. The shame of having few and/or unhealthy chickens:

Informants reported that many farmers fail to call community vaccinators because they have one or two chickens. It was identified that chickens were vital assets for women and the more one has, the more she will be respected. Study informants said that having few chickens, especially unhealthy ones may attract shame and therefore, many farmers in such scenarios forgo buying ND vaccines or call the community vaccinator. One informant said that "*having one or two chickens and my neighbour has more than one hundred will make me neither call a community vaccinator nor buy ND vaccines. This is shameful…*" (**IDI_12, Muvau Ward**).

Through FGDs, informants discussed that the number of chickens can make one buy ND vaccines or not. "… farmers with many chicken use ND vaccines regularly, but those with one or two chicken find it difficult to call a community vaccinator or go to the market to buy ND vaccines" (**FGD_03, Muvau Ward**).

Mistrust of community vaccinators:

Study informants unveiled that many farmers from the study site do not trust community vaccinators. During the study farmers reported varied opinions about CVs' services including high charges, the poor quality of ND vaccines, the duration that community vaccinators move around with ND vaccines as well as the tools used to carry the ND vaccines as illustrated by the following excerpts;

"Many community vaccinators are in business; their prices are high and I am not confident with the quality of the medicine (ND vaccines) they use. Last year (2019), one CV vaccinated my chicken but most of them died. I do not trust them" (**IDI_24, Kathonzweni Ward**).

"I was told that Newcastle disease vaccines are supposed to be stored in refrigerators, but many of community vaccinators in our villages do not have refrigerators… they walk around with thermos flask and I am aware that thermos flask is for keeping hot tea or water. It has been a while since I vaccinated my chicken, like two years since I lost my trust in community vaccinators" (**IDI_16, Kathonzweni Ward**).

A key informant, one of the community vaccinators lamented that many farmers accuse them of using substandard and/or counterfeit vaccines and tools. He said that "*many of us have been accused of using water and/or low-quality vaccines by farmers. This may be the case with few CVs, but many of us vaccinate using the recommended quantity and quality*" (**KII_05, Community Vaccinator, Kathonzweni Ward**).

3.2.5. Beliefs that indigenous chickens do not need vaccination:

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Many informants unveiled the belief that local type or indigenous chicken do not require vaccination as hybrid types do. This was an interesting finding as one informant said "*I do not vaccinate my chicken because all of them are local types… as I know vaccines are for the hybrid type*" (**IDI_19, Kathonzweni Ward**). This was the case for many farmers in Kathonzweni Ward.

Through FGDs, many discussants asked if it was important to vaccinate indigenous chicken. Many discussants perceived that vaccination is for improved and hybrid chicken as opined by FGD discussant at Kathonzweni, "*we normally know that indigenous chickens do not require vaccines, do they? ... As for me, I am aware of vaccinating improved and hybrid types*" (**FGD_01, Kathonzweni Ward**).

A leader of one of the women groups informed us that many women fail to vaccinate indigenous chicken on the basis that they are resistant to diseases. She stressed that "*in our group, many farmers forgo vaccinating indigenous chicken, they only vaccinate hybrid chicken if they have some. Farmers who only have the indigenous chicken vaccinate at a minimal rate* (**KII 02, Women Group Leader, Muvau Ward**).

Fear that Newcastle disease can be spread by CVs during the vaccination period:

Informants indicated that the movement of community vaccinators from one household to the next can spread the ND virus. Many farmers reported that instead of vaccinating their chicken during the grand vaccination period, they would rather wait and vaccinate later. This is as detailed in the following excerpt;

"ND virus can spread during massive vaccination of chicken in this area. There was a year I requested a community vaccinator to come and I am sure he carried the virus from my neighbour's place and I lost many chickens. From that moment, I wait until massive vaccinate is complete, then I call a community vaccinator at my home" (**IDI_05, Muvau Ward**).

There was consensus throughout FGDs that community vaccinators can accelerate the spread of ND viruses from one household to the next. Many study discussants said that "*we were informed that an individual can carry ND virus in his/her foot or clothes and spread to other places… I will say that community vaccinators can spread ND virus too and we are always careful not to call them regularly*" (**FGDs_1&2, Kathonzweni Ward; FGDs_3&4, Muvau Ward**).

3.2.6. Gender division of labour:

Informants singled out that many gender roles and expectations act as barriers to women given that household chores were too many and recurrent allowing them less or no time to go to places where they can get access to ND vaccines and relevant information on vaccine and vaccination. One participant said that "*women in this community have many tasks including, household chores now that we are the managers in our households… we do a lot of work every day that we have no time left to go to the market to buy the vaccines for our chicken*" (**IDI_28, Kathonzweni Ward**).

Discussions from all FGDs supported the fact that women have many recurring domestic tasks. It is perceived by the Akamba community that all domestic chores should be handled by women with the help of children. Men are the ones to go to the public space and earn income for the family. FGD discussants agreed that women have limited time to attend chicken farming workshops to find crucial information about the ND vaccine and other chicken management skills. FGD discussants said that "*We have much work to do at home. Even when we are called to attend workshops and training on chicken farming, we sometimes fail to go so we get limited knowledge on ND vaccines. This prevents us to use the vaccine*" (**FGDs_1&2, Kathonzweni Ward; FGDs_3&4, Muvau Ward**).

A key informant, women group leader elaborated that women have limited time to go to market because of many domestic chores. She said that "… *as women we are left at home to make sure that everything is done. We work until evening and then we don't get time to go to town or big markets where we can buy the ND vaccine. Because you cannot get the vaccine at our local market*" (**KII_04, Women Group Leader, Muvau Ward**).

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Another key informant, gender officer informed us that women domestic chores hinder women from attending important meetings and training organized by the county government for farmers. She explained that unpaid domestic chores make women less empowered hindering them from getting money to buy ND vaccines.

3.2.7. Ownership of household resources:

Study informants indicated that men own household assets while women have access to such assets. Therefore, women do not have control over many household resources. Informants reported that women in most cases consult their spouses before selling household assets to buy ND vaccines which delays the process. One informant said, "*I have to ask permission from my husband to sell household assets (maize or beans) to buy ND vaccines. But I will say that in most cases, he says no and I forgo vaccinating chicken. You know he is the head of the house*" (**IDI_07, Muvau Ward**).

FGD discussants narrated that men own household resources while women have limited control and decision-making capacity. Discussants at Kathonzweni unveiled that men may instruct chicken to be slaughtered rather than being asked finances to buy ND vaccines. Discussants opined that "*sometimes when we ask money for ND vaccines, men say that we should slaughter the sick chicken… as women we just obey because we do not have our money to buy the vaccine. Men own household resources* "(**FGD_02, Kathonzweni Ward**).

4. Discussions

This study sought to find out informal institutional barriers to access and utilisation of Newcastle disease vaccines by women smallholder chicken farmers in Makueni. The study established that access and use of ND vaccines are constricted by myriad unwritten rules and regulations as well as traditions that exist in Makueni. The fear of ND vaccines as new technology was seen as a key concern to farmers. Farmers displayed their doubt of using a technology that has been introduced in the recent past. Diffusion and adoption of ND vaccines can be described as an innovation that requires promoters to educate farmers to use as pointed out in the diffusion of innovation theory (32). Many farmers displayed disinterest in ND vaccines pointing to the fact that chicken rearing has been in existence for ages while ND vaccines can be traced to less than 15 years by farmers. Many farmers are therefore hesitant to fully accept this new technology. Farmers especially at Muvau ward displayed a higher usage of ND vaccines which is attributed to their peri-urban locality. As explained by Rogers (1983) cited by Shang et al. (33), ND vaccines as new technology and innovation diffuse to farmers of different geographical locations and cultures at a slower rate. To incorporate the idea of ND vaccines requires a long time to allow farmers to adjust their beliefs, norms, traditions and values as well as cognitive strategies that are part of daily life (34)(34). The fear of farmers using ND vaccines as new technology, however, will be countered by continuous exposure to it. This will allow farmers to learn the importance of ND vaccines as in the case at Muvau ward where a good number of farmers use ND vaccines regularly.

The use of herbal remedies was presented as an informal barrier to access and use of ND vaccines by chicken farmers. There is no standard measure and method of using herbal remedies on chicken for disease prevention and treatment. However, farmers believe that herbal remedies, especially *aloe vera* and neem tree can prevent many chicken diseases including ND. Moreover, farmers explain that the use of herbal remedies as chicken disease prevention strategy has been in existence for decades with recommendable outcomes. Therefore, all farmers express the need of using both conventional ND vaccines alongside herbal remedies to county ND in chicken. Research conducted by Mutua et al. (35) on the gendered barriers to livestock vaccines uptake in Uganda and Kenya reported similar findings on how the use of herbal remedies prevents farmers from using conventional vaccines. Using herbs as an alternative prevention measure for ND contributes to minimal uptake of ND vaccines. It was also explained by farmers that the use of

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herbal remedies makes chickens more nutritious and sweet for consumption as similar to the study by Akib et al. (36) on herbal for increasing immunity and weight of poultry.

Farmers perceive that ND vaccines can have negative side effects on chicken. It is noteworthy that some farmers have had negative experiences of ND vaccines in the past or heard from other farmers. It was established that death rates of chicken increased after vaccination of already infected chicken. Farmers with such experiences reported being hesitant to use ND vaccines again. Moreover, farmers explained that ND vaccines can affect egg production for hens. Farmers could therefore fail to vaccinate hens. Eggs for many farmers have both economic and nutritional values and actions (vaccination) that may interrupt with hens laying eggs were rejected by farmers (13). Farmers also raised concerns about the safety of vaccinated chicken for human consumption. Farmers believe that ND vaccines can be transferred to people who after eating vaccinated chicken thereby causing diseases like cancer. This scares many farmers who rear chicken for home consumption. As pointed out by Chingonikaya et al. (9), farmers are sceptical to use ND vaccines on chicken when they do not know the outcomes which lead to their sluggishness and reluctance.

Farmers expressed their concern about allowing CVs to see their unhealthy chicken and/or few birds. Coupled with economic status that women map using the number of chickens she rears, many farmers with less than 5 chickens consider it shameful to call a CV. The outcome of such shameful thoughts and beliefs prevents many farmers to vaccinate their chicken against ND. Studies conducted by Enahoro et al. (16) in Egypt and Mutua et al. (35) in Kenya and Uganda reveal similar findings that the number of livestock, especially farmers owning one or two chickens and cows find it shameful to call a veterinary officer or buy vaccines.

Farmers expressed their deep fear that CVs overcharge and use substandard ND vaccines. The efficacy of ND vaccines is therefore diluted by CVs as perceived by farmers. Moreover, farmers are hesitant to pay money for vaccination services that they perceive as sub-standard. The quality of ND vaccines is a key concern among chicken farmers and previous experience can ruin their next vaccination round. Chicken farmers in Sekong Province Lao PDR in 2018 also display similar mistrust to community vaccinators and veterinary officers in a study on the potential for improved surveillance and management in endemic regions (37). Therefore, trust and mistrust play key roles in farmers' uptake of vaccination for their chicken.

Farmers indicated that indigenous chickens barely need ND vaccines. Many farmers rear indigenous chickens without offering vaccines which is perceived as normal for local chickens. Mutua et al. (35) found similar findings in a study on gendered barriers to livestock vaccine uptake in Kenya and Uganda and their implications on rift valley fever control. Farmers were resistant to vaccinating Zebu cattle (local indigenous) on the belief that such cattle are resistant to rift valley fever. Beliefs around the immunity of livestock especially indigenous chicken prevent many farmers to use ND vaccines. It was established that many farmers hold this belief which led to irregular vaccination. Farmers reported vaccinating chicken against ND annually and some once after two years due to the belief that indigenous chickens are immune to many diseases and viruses. However, in the Democratic Republic of Congo, Lwapa et al. (38) found contrary findings where village chicken farmers were committed to vaccine their indigenous chicken against ND after three months to boost chicken immunity.

The belief that ND can spread during vaccination season was singled out to be a barrier to utilizing ND vaccines by farmers. The movement of ND virus from one location to another presents farmers with the fear that CVs can introduce ND as they move from one household to the next. This biosecurity concern could limit the number of people who could be reached when there is an outbreak of ND. CVs are therefore perceived to be a threat during such periods and farmers especially in Kathonzweni forgo vaccinating chicken. People's perceptions of the avenues that can spread certain chicken diseases make them forgo such pathways, in this case, CVs (Johnson, 2019). It is important to understand that farmers who depend on CVs for vaccinations are most affected when such

 doi:10.20944/preprints202205.0059.v1

perceptions circulate in the community. However, it is important to also take notice of such perceptions because they would hold especially because of biosecurity measures. Otte et al. (40) indicate that moving from one chicken house to another without due consideration of the biosecurity measures can transmit disease from one farm to another.

Gender division of labour confers women with a high burden of domestic chores and though the roles of women and men sometimes interlink, women were at the forefront of making sure that the household domestic chores are done. Given that most of these domestic chores are recurrent, women spend much of their time doing the same tasks over and over (41). Such competing household chores make it difficult for women to go outside the homestead and engage in other self-empowering activities like knowledge on chicken farming or get access to the ND vaccines. Campbell et al. (10) reported similar occurrences in rural Tanzania where women were engaged in numerous domestic activities which provided limited time for engaging in vaccination.

This present study also established that women smallholder chicken farmers have limited decision making powers on household resources including those sourced from the sale of chicken. Women agreed that other than chicken, selling household resources to buy the ND vaccines was not easy. Gumede et al. (42) reported similar responses on analyzing gender dynamics within small-scale farming and narratives of smallholder livestock farmers in South Africa.

Although the decision-making process in household resource utilization is informal and household-specific, it affects the extent to which women smallholder chicken farmers can access and utilise the ND vaccines on their chicken. Otiang et al. (11) found that decision making was critical on the uptake of the ND vaccines within the rural small scale chicken farmers. Men also perceive chicken keeping as low-valued and women's activity that is largely purposed for subsistence. This makes men accord fewer resources to the management and taking care of chicken including vaccination and other health-related maintenance needs. Such was the case in Ethiopia, in a study done between 2014 and 2015 on the use of ND vaccines (43).

5. Conclusions

The study findings show that the production, distribution and availability of ND vaccines do not equate to access and utilization by chicken farmers at the community level. This is because of a myriad of informal rules, regulations and traditions that are established by individuals. ND vaccine use is therefore a complex value chain that requires an understanding of local beliefs, values, attitudes, gender expectations and division of labour as well as traditions and perceptions of farmers. ND vaccines utilisation at the community level is influenced by inter and intra-household relations, value systems and decision-making capacity, especially for women chicken farmers. The willingness and adoption capacity of women smallholder chicken farmers is deeply impacted by the unwritten rules, regulations, norms and traditions commonly known as informal institutions. For smallholder farmers to have increased access and utilization of ND vaccines, informal institutional barriers should be prioritized and tackled to facilitate the design, distribution, delivery and adoption of ND vaccines among women farmers.

6. Limitations

The study employed a cross-sectional study design that informed about the influence of informal institutional barriers to access and utilisation of ND vaccines. The information collected is based on farmers recalled experiences. However, findings are useful to enable us to understand how informal institutions hinder women from using ND vaccines. This study is context-specific and limited on external validity and generalization to all chicken farmers across the globe. However, the information from the study provides in-depth information on the informal barriers to access and utilization of ND vaccines and can be useful in addressing informal barriers that are presented as rules, traditions and regula-

tions in many developing countries among women smallholder chicken farmers. This information is not only applicable to ND vaccines but can also be applied to understand barriers of access to other agricultural technologies among women in other similar contexts similar to Makueni.

7. Recommendations

The study recommends additional studies to quantify variables of informal institutions at the community level that may hinder the access and utilisation of not only ND vaccines among women chicken smallholder farmers but may also be applicable to agricultural technologies in general. The study also recommends development of policies and programmes that not only focus on formal institutions but also include informal institutions in addressing barriers of access and utilization of ND vaccines among chicken farmers.

***Acknowledgments*:** I acknowledge the Gender Inclusive Vaccine Ecosystems (GIVE) project for support and research training, and the study participants who unconditionally provided the data.

Funding: This study was funded by the Livestock Vaccine Innovation Fund, supported by the Bill and Melinda Gates Foundation (BMGF), Global Affairs Canada (GAC), and Canada's International Development Research Center (Grant No. 109063).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on reasonable request from the corresponding author. The data are not publicly available due to privacy reasons.

Conflicts of Interest: The Authors declare no conflict of interest.

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