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A review of the roles of men, women, and youth in ensuring food safety in the smallholder poultry value chain in Kenya

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Smallholder poultry production is a significant source of food and income for many rural households in Kenya, but poultry products can be contaminated with *Salmonella* and *Campylobacter* spp. Household members have different roles in poultry production, with women and youth more actively involved in the earlier steps of the value chain, such as poultry production and processing, particularly at the farm level. This literature review summarizes current knowledge and practices on the roles of women and youth in food safety in the smallholder poultry value chain in Kenya. Of the 19 articles identified, a majority referenced gender roles in the poultry value chain but few referenced youth or the roles of women and youth in ensuring food safety. Women and youth were found to be the primary smallholder poultry producers on-farm. Due to their direct involvement in poultry handling and production, women and youth may have higher potential risk of exposure to foodborne pathogens. Men, women, and youth were all found to participate in slaughtering and transportation of poultry products. It was also found that, although women may be the owners and caretakers of chickens, they may not have decision-making power on the use of income from the poultry, and poultry product sales. Therefore, women and youth may have limited decision-making power or access to resources, such as training, to increase food safety. Further research is needed to address the factors important to women and youth empowerment to ensure food safety in the smallholder poultry value chain and reduce the risks of foodborne disease (FBD) in Kenya.

KEYWORDS

youth, poultry, Kenya, food safety, value chains, gender

Introduction

In Kenya, poultry farming contributes to income, food security, and nutrition of many households, particularly in rural and peri-urban areas, and accounts for about 30% of the national agricultural GDP and about 7.8% of the total GDP (Kenya National Bureau of Statistics, 2014; Macharia et al., 2020). While important for livelihoods,

poultry products may be contaminated with foodborne pathogens and, as such, the handling and consumption of poultry can lead to foodborne disease (FBD). A systematic literature review of contamination of poultry with *Salmonella* and *Campylobacter* spp. in 27 African countries, including Kenya, estimated the prevalence to be 24.6% (95% CI: 18.0–32.7) and 13.1% (95% CI: 9.3–18.3), respectively (Thomas et al., 2020). The incidence of FBD due to poultry in the East African region has been estimated to be 96 disability adjusted life years (DALYs or the amount of years of health lost) per 100,000 people, which is at least double the burden in all non-African regions of the world (Li et al., 2019).

Gender roles have been associated with health risks in poultry production in informal markets in Africa. In livestock value chains such as poultry, men have been found to have greater injuries as a result of their occupational activities while women have greater exposure to foodborne pathogens (Grace et al., 2015). Further, men and women have different levels of decision-making ability and access to resources to ensure food safety. Women head more than 30% of households in Kenya, but frequently receive less income than males because of gender stereotypes in livestock value chains, and having multiple other responsibilities that minimize their ability to raise larger numbers of poultry (Winrock International, 2011). This statement was reinforced by a recent study in Burkina Faso with gender and poultry (Leight et al., 2021). In addition to gender, age also influences the roles and responsibilities of poultry production (Kryger et al., 2010). Poultry production offers significant economic opportunities for youth, which the United Nations defines as individuals between 15 and 24 years of age (United Nations, 1981), but they are often overlooked. Youth are both producers and consumers of poultry as well as a growing part of the population. For example, about 80% of Kenya's population is under 35 years of age with the median age in Kenya being 19 years old (Nkomo and Mwaura, 2018). To ensure food security (i.e., access to sufficient, safe, and nutritious food) for the growing population, young men and women need to be trained in safe poultry production practices in order to produce food that is safe to consume.

Smallholder poultry production is an important source of both protein and income for rural women in the world, particularly African countries. Previous literature on food safety interventions in the poultry value chain in Kenya focus on important challenges such as vaccination. Unfortunately, the majority of these articles do not take into consideration who is doing the particular task being studied (Ochieng, 2012). Training women on managing and marketing chickens can assist with reducing the risk of contamination of poultry products. Gendered data collection on who is conducting which activity in the value chain can aid in determining who to target interventions to so that resources can be used effectively and foodborne illness can be reduced (Grace et al., 2015). This review of literature emphasizes the connections between poultry

production, gendered responsibilities, and the need to recognize who is most at risk for exposure to foodborne pathogens in the poultry value chain. The purpose of this literature review was to summarize current knowledge and identify future research priorities on how age and gender relate to ensuring food safety in smallholder poultry value chains in Kenya. Information from this literature review can be used to identify appropriate interventions for reducing FBD resulting from smallholder poultry value chains in these regions.

Methods

A literature review was conducted between April and August 2021. A total of 14 electronic data bases were searched for key literature in the fields of food safety, gender, and youth, poultry production, and smallholder poultry producers in Kenya (Table 1).

Titles and abstracts were reviewed by one of the authors to determine the relevance. Articles were included if they focused on either gender or youth, food safety interventions in the poultry value chain in Kenya, or a combination of those topics. The literature was synthesized, and results were categorized according to distinct steps in the poultry value chain: production, processing, transportation, retail and sales, and consumption. Interventions were categorized as farm management practices, government, and behavioral interventions (Figure 1, Table 2).

Results

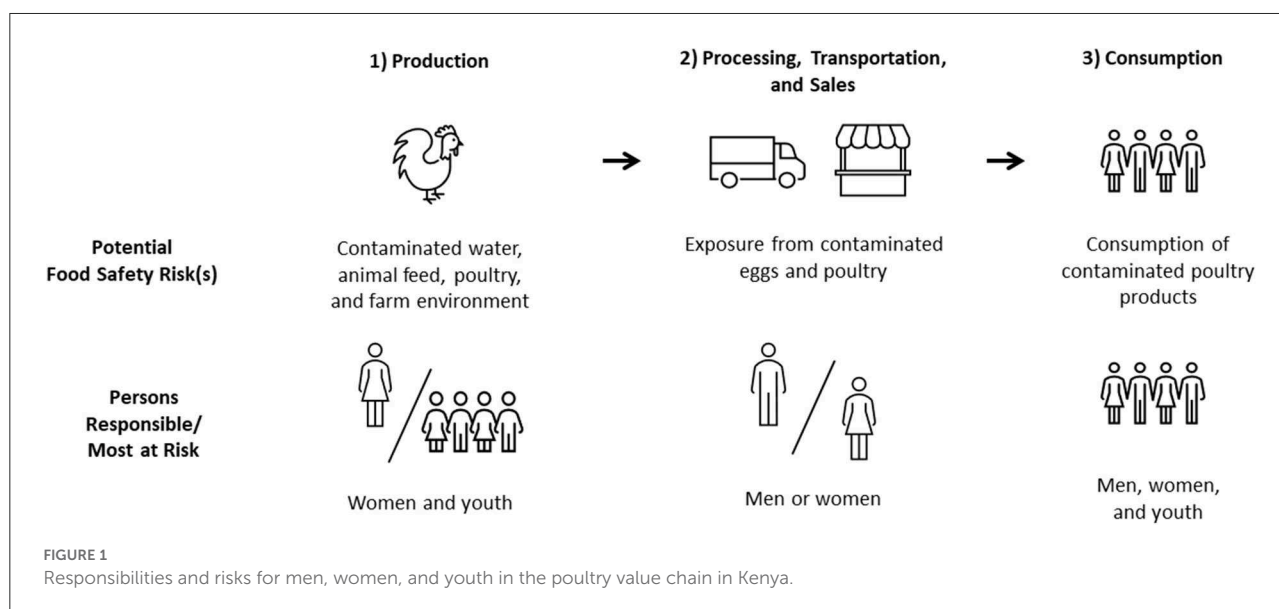
Of the 19 articles identified in this review, 13 included the production of poultry, two included the processing of poultry, three included the transportation of poultry, five included the retail and sales of poultry, and four included the consumption of poultry (Figure 1, Table 2). The studies were conducted in Kenya (14), Ethiopia (4), and Tanzania (1) (Table 2). The results are presented by steps in the poultry value chain including production, processing, transportation, retail and sales, and consumption.

Production

Poultry production practices vary by region which can lead to differences in risks for exposure to pathogens. Women are primarily responsible for poultry rearing on farm. Of the women involved in poultry production in Kenya, the most common production practice was free-range poultry (35% women) followed by chicken kept in fences (34%) and then commercial poultry (30%) (Waithanji et al., 2020). Most traditional poultry farmers in rural areas use free-range production systems with <30 adult birds (Magothe et al., 2012; Odhiambo, 2020). During

TABLE 1 Databases and key words used for literature search.

Search category	Keywords	Databases searched
Roles and responsibilities of gender and youth in the poultry value chain in Kenya and East Africa	“gender AND poultry” “Kenya AND poultry” OR “gender AND youth AND East Africa” OR “gender AND food safety AND East Africa”	EBSCO host Gender Studies Database EBSCO host Women’s Studies International ProQuest GenderWatch Web of Science CAB Direct International Livestock Research Institute (ILRI) International Food Policy Research Institute (IFPRI) World Bank Food and Agriculture Organization of the United Nations (FAO) United States Agency for International Development (USAID)
Food safety interventions used in the poultry value chain in Kenya and East Africa	“Kenya AND poultry” OR “food safety AND poultry” OR “food safety intervention” OR “education AND poultry”.	PubMed Google Scholar Center for Agriculture and Bioscience International (CABI) WebMD



the rainy seasons, birds are placed in a confined space, and fed other feed sources such as kitchen leftovers. During the remainder of the year, birds scavenge for food such as grass, insects, earthworms, and seeds from around the farm (Magothe et al., 2012). The type of chicken produced can also vary by urbanicity. For example, in Kenya, indigenous chickens were more common in rural areas whereas layers and broilers were more common in peri-urban areas (Odhiambo, 2020).

Chickens in rural Kenyan households are primarily owned by women, although both women and youth participate equally in poultry production (Odhiambo, 2020). For example, in southern Kenya, ownership of smallholder chicken production assets is divided by gender with women being the primary

owners of flocks of indigenous chicken for household consumption (39%) and men primarily owning the land (35–50%) (Mutua, 2018). In Western Kenya, women were reported to be the primary owners of poultry (63%) followed by youth (18%) (Okitoi et al., 2007). The number of chickens owned also differs by gender. A cross-sectional study of poultry keeping and management practices in Ethiopia concluded that female-headed households had statistically significantly less birds than male-headed households (Aklilu et al., 2008). Poultry can be shared between farms due to lack of feed for chickens. Sharing of poultry was reported to be more common in female-headed households (23%) than male-headed households (16%) (Aklilu et al., 2008).

TABLE 2 Overview of articles on gender, youth, and food safety in the poultry value chain in East Africa.

Categorization	Reference	Title	Study aim	Location
Gender	Aklilu et al., 2008	How resource poor households value and access poultry: Village poultry keeping in Tigray, Ethiopia	Examine socioeconomic factors for poultry keeping in rural homes.	Ethiopia
	Ochieng, 2012	Determinants of adoption of management interventions in indigenous chicken production in Kenya	Determine socioeconomic factors for adoption of management, feed, and vaccination interventions on smallholder farms.	Kenya
	Mutua, 2018	Challenges facing indigenous chicken production and adoption levels of biosecurity measures in selected areas of Makueni County, Kenya	Evaluate socioeconomic status, chicken production practices, and adoption of biosecurity measures on smallholder poultry farms.	Kenya
	Hailemichael et al., 2016	Analysis of village poultry value chain in Ethiopia: Implications for action research and development	Establish a baseline of poultry production practices, management, and marketing smallholder households.	Ethiopia
	Riang'a et al., 2017	Food beliefs and practices among the Kalenjin pregnant women in rural Uasin Gishu County, Kenya	Investigate the relationship between food consumption practices of women and birth outcomes.	Kenya
	Mulema et al., 2019	Can chickens empower women: Perceptions from chicken producers in peri-urban and rural Ethiopia (ILRI Project Report)	Describe livelihoods, what types of chickens are preferred, and empowerment.	Ethiopia
	Leight et al., 2020	The effects of poultry and unconditional cash transfers on livelihoods outcomes	Determine effectiveness of poultry and cash transfer interventions for poultry and livestock farms from rural households.	Ethiopia
	Waithanji et al., 2020	Insects as feed: Gendered knowledge attitudes and practices among poultry and Pond Fish farmers in Kenya	Determine knowledge, attitudes, and practices during poultry and Pond Fish farming.	Kenya
Youth	Okitoi et al., 2007	Gender issues in poultry production in rural households of Western Kenya	Determine roles of family members in poultry production in rural households.	Kenya
	Odhiambo, 2020	Hatching Hope: Gender and Youth Analysis Report	Determine roles of family members in poultry production in urban and peri-urban households.	Kenya
	MoALFC, 2021	Kenya County Climate Risk Profile: Narok County	Assess roles and responsibilities in agriculture value chains and how they relate to climate change.	Kenya
Food safety	Winrock International, 2010	Partnership for Safe Poultry in Kenya	Train women's groups on food safe poultry production practices as well as connecting them to buyers and financing.	Kenya
	Winrock International, 2011	Helping women feed their families in rural Kenya	Promote safe poultry production and create marketing systems that generate higher incomes and improve nutrition for smallholder families.	Kenya
	Nyaga, 2008	Poultry Sector Country Review	Determine roles and food safety risks of poultry value chain actors in farming, slaughtering, transporting, and marketing.	Kenya
	Kiambi et al., 2021	Understanding Antimicrobial Use Contexts in the Poultry Sector: Challenges for Small-Scale Layer Farms in Kenya	Discussion of growing antimicrobial resistance in poultry and other sectors.	Kenya
	Magothe et al., 2012	Indigenous chicken production in Kenya: I. Current status	Characterization of poultry management in rural households.	Kenya
	Ringo and Mwenda, 2018	Poultry Subsector in Tanzania: A Quick Scan	Describe the poultry value chain in Tanzania and identify future interventions.	Tanzania

Poultry sharing poses food safety and biosecurity concerns due to transmission of biological contaminants from one farm to another.

In countries identified in this study, women are primarily responsible for the care and keeping of chickens. For example, in Kenya, women are primarily involved in cleaning of poultry houses (75%), feeding (75%), and treating chickens for illness (60%) (Okitoi et al., 2007). Men were primarily responsible for construction of sheds for chickens (85%), although children also helped (10%) (Okitoi et al., 2007). Decisions regarding type of poultry raised (54.6%) and type of feed used (57%) were mainly made by women (Waithanji et al., 2020). Similarly, in Ethiopia, women were primarily responsible for the care and keeping of poultry on smallholder farms (64%) (Hailemichael et al., 2016). In Ethiopia, women and children were primarily responsible for the care and keeping of chickens including feeding, cleaning, and taking care of sick birds while men were found to be primarily responsible for making housing for poultry and, depending on the location, bringing chickens and eggs to the market (Mulema et al., 2019).

Women also spend more time engaged in daily activities around poultry production than men. For example, in Kenya, women spent 70.2% of their waking hours during the dry season on chores related to poultry whereas men only spent 39.9% of their waking time on these activities (Waithanji et al., 2020). Similar differences were seen during the wet season with women spending a greater percentage of their time focused on chores related to poultry than men (Waithanji et al., 2020). Due to these differences in time allocation for poultry production between men and women, poultry farming interventions need to consider women's time burden.

Farm management interventions vary in their adoption by gender. In 2008, a cross-sectional survey of 120 smallholder farm households in western Kenya was conducted to assess the relationship between household socio-demographic and poultry farm characteristics and the effectiveness of intervention packages that included feed supplements, vaccinations, and housing for chickens (Ochieng, 2012). Women were found to be less likely than men to adopt the full intervention package potentially due to women having limited access to resources such as land and finances (Ochieng, 2012). These limitations should be considered when interventions are being developed to meet the needs of women farmers.

There are multiple constraints faced by smallholder poultry farmers, especially women, that influence their ability to raise chickens and ensure food safety on the farm. Disease outbreaks and lack of access to biosecurity measures are two of these constraints (Wong et al., 2017). A program in Kenya was developed to train women's groups on safe poultry production practices as well as connect them to buyers and financing (Winrock International, 2011). This program promoted safe poultry production and marketing systems that generated higher incomes and improved nutrition for smallholder

families. Technical training on safe poultry production practices was provided to 1,815 women poultry producers (Winrock International, 2010). As a result of this program, a reduction of chicken mortality of >15% was found indicating adoption of training practices (Winrock International, 2010). Other interventions such as poultry and cash transfers targeted to women in Ethiopia resulted in an increase in ownership of poultry from about 40 to 94%. The cash transfer package also resulted in an 8% increase in household poultry keeping from 54 to 62% (Leight et al., 2020). This demonstrates that it requires more than simply cash to increase poultry production amongst women smallholder farmers.

Smallholder poultry farmers, and particularly women, also lack access to veterinary services and appropriate extension services for improving farming methods and techniques (Wong et al., 2017). This is important, as studies show that there is a misuse of antimicrobial drugs for prevention and elimination of diseases at low-cost which is putting the poultry sector in Kenya at risk for the emergence and spread of antimicrobial resistance (Kiambi et al., 2021).

Development of food safety interventions needs to consider who is conducting the activity in the poultry value chain. Women are frequently engaged in other activities throughout the day which influences their ability to participate in trainings. Determinants of adoption are also important considerations since such factors may influence women's willingness to adopt new management practices, including food safety measures (Mutua, 2018). To increase safe poultry production, trainings are needed on food safety management practices in a format accessible to the target populations, and at a time when women and youth are available for trainings.

Processing

Poultry processing typically includes slaughter, scalding, defeathering, evisceration, cutting and, in some cases, deboning and/or grinding. Individuals engaged in poultry processing can be exposed to foodborne pathogens as well as other zoonotic diseases. In Kenya, women, men, and youth participate in slaughtering of poultry products (MoALFC, 2021). Chicken processing on smallholder farms typically includes the chicken being slaughtered, immersed in hot water, defeathered, and removal of internal organs. Smallholder farmers commonly lack access to hygienic slaughtering facilities, which can lead to cross-contamination of the carcasses and the surrounding environment. Slaughtering is commonly conducted at the home which could potentially expose individuals to foodborne pathogens through cross contamination (Nyaga, 2008). Wastes from processing are commonly buried on the home's property or fed to dogs. Burying wastes from processing could potentially cause environmental contamination including contaminating drinking water (Nyaga, 2008). To increase food safety practices

during processing and establish slaughterhouses, a poultry producer association was formed in Makueni county, Kenya. A small group of individuals delivered birds from rural households to the Makueni slaughterhouse facility. The birds were inspected, and acceptable birds were harvested and delivered to be sold (Nyaga, 2008). This producer association increased food safety knowledge and oversight of poultry processing in the community.

Transportation

Transportation of poultry may lead to increased bacterial contamination of both live birds and poultry products and potential exposure to these contaminants for the individuals transporting them. The role of women and youth in transportation of poultry varies by region in Kenya. In Kenya, women primarily transport chicken and eggs to the market. In Narok county, it was found that women, men, and youth all transported poultry (MoALFC, 2021). As in many agricultural enterprises, once poultry production becomes commercial, men are primarily involved and often take over from women (Odhiambo, 2020). Transporting chicken and eggs provides additional opportunities for youth to be involved in marketing of these products. However, unsanitary transportation vehicles and baskets may contaminate poultry products and birds. Additionally, densely packing and mixing of sick birds with other animal species creates a significant risk for the spread of diseases such as highly pathogenic avian influenza (HPAI) (Winrock International, 2010). Lack of feeding of birds before sales may decrease body mass, increase illnesses in birds, or result in the death of birds. Increasing food safety practices during transportation could increase profits earned by smallholder poultry producers.

Retail and sales

If products are not handled safely, retail and sales of poultry and poultry products can lead to increase bacterial contamination. Retail and sales of poultry and poultry products is an important source of income and livelihoods for women and youth in low- and middle-income countries (Randolph et al., 2007; Alders and Pym, 2009; Wong et al., 2017; Ngongolo et al., 2021; Wilson, 2021). Poultry production provides a way to empower youth and women in rural households. The individual who controls the income from poultry production determines who has the power to make decisions on how income is spent (Colverson et al., 2020). Empowerment includes increasing women and youth's ability to manage poultry production through training, access to capital, and increased decision-making power. Increased decision-making power could include the ability for individuals to decide when chickens or eggs are

sold or eaten, and/or control of the resources generated from these sales. For example, management of chickens can empower women, because chickens can be assets used to increase women's income (Mulema et al., 2019).

Although women may be the owners and caretakers of chickens, they may not have decision-making power on the use of income from the poultry, and poultry product sales (Ringo and Mwenda, 2018). In western Kenya, women are primarily responsible for selling chickens (60%) and eggs (95%). Men primarily control the income generated while women control the access of food and gifts for guests (Okitoi et al., 2007). In the Kirinyaga, Kisii, and Nakuru counties in Kenya, men were found to be primarily in charge of selling poultry (Waithanji et al., 2020). Control of income may be dependent on who is the head of the household. In Ethiopia, the majority (90%) of the income from selling poultry was controlled by women in female-headed households. In contrast, in male-headed households, 57% of the income was jointly controlled with women controlling 30% of the remaining income and men controlling the remaining 13%. In contrast, women were primarily responsible for selling eggs (85%) and controlled 50% of the income from egg sales (Hailemichael et al., 2016).

Consumption

Storing poultry at proper temperatures and cooking poultry can prevent bacterial growth and inactivate bacterial pathogens. Women are primarily responsible for deciding when poultry and eggs produced by the household are consumed. In western Kenya, women were primarily responsible for distribution of chicken (60%) and eggs (100%) for consumption as well as giving gifts to visitors (60%) (Okitoi et al., 2007). In Ethiopia, it was found that women make the decisions of when poultry and eggs are consumed in the home (Mulema et al., 2019).

Division of animal meat according to age and gender is also a common cultural practice. Women and female youth frequently receive the lowest quantity and quality of meat. For example, a study in Ethiopia found the drumstick, breast, and gizzard are customarily eaten by men whereas the skin, neck, and wings are eaten by women and children. Since pregnant and lactating women and growing female youth require greater quantities of protein in their diet, the distribution of poultry meat is a concern for nutrition interventions (Akililu et al., 2008). In the Luhya community in Kenya, women and children eat eggs while men and guests eat chicken meat.

There are also multiple myths associated with consumption of poultry products by pregnant women. In some parts of Kenya, pregnant women are forbidden to consume eggs for fear that the child may become fat. Similarly, chicken gizzards are not permitted to be eaten by pregnant women because they are believed to make women infertile (Kariuki et al., 2017). Among the Kalenjin community in Kenya, pregnant women are not

allowed to eat organs of poultry (except the liver), such as the tongue and the heart. When a chicken is slaughtered, its liver is preserved for pregnant woman in the home to consume (Riang'a et al., 2017). Nutrition interventions should primarily include women due to the importance of proper nutrition during pregnancy and its relationship to the growth and development of children as well as their primary responsibility for deciding who eats what meat products when.

Conclusion

This review demonstrates that women and youth play a central role in smallholder poultry value chains in Kenya. There are multiple strategies for increasing productivity of farms. One is increasing access to credit for women and youth. Also, the formation of cooperatives can aid in decreasing risks in business. Education regarding food safety knowledge and its application to poultry production in developing countries plays a critical role in improving productivity and profitability in small-scale poultry producers.

Youth also experience barriers to poultry production due to limited knowledge of business opportunities of poultry farming, which includes access to financing. Youth need training on the production and management of poultry but their attendance at existing training programs tends to be low. Utilizing technology (e.g., creation of digital trainings) can make training more accessible and appealing to youth. For example, including pictures improves accessibility for individuals with low literacy levels. Trainings also need to address social norms around which activities women and youth can engage in and ways to access financial capital and policies to support women and youth businesses.

Key activities to improve the success of women and youth in raising poultry and reducing FBD include delivering trainings on hygienic practices that target women and youth, considering their available times and locations; providing financial support for women and youth poultry production; empowering women in decision making around poultry sales; and addressing inequitable distribution of poultry meat and eggs in household consumption.

Policy implementation to support gender and youth equality and empowerment is needed at ministry, local, and national levels. Additionally, there is an increased need for

sex-disaggregated data collection in order to design and implement interventions effectively. Due to their central role in poultry production, gender and youth perspectives need to be included when developing future interventions aimed at reducing foodborne pathogens in poultry production.

Author contributions

AG, EK, and KC were responsible for analysis of resources and writing. SI, CK, AB, and BK were responsible for manuscript review. All authors contributed to the article and approved the submitted version.

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