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Intra-Household Handling and Consumption Dynamics of Milk in Peri-Urban Informal Markets in Tanzania and Kenya: A Gender Lens

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Abstract: Milk, provided it is safe, provides important micronutrients that can combat hidden hunger (undernutrition). Many peri-urban poor people in Tanzania and Kenya use informal markets to purchase milk in order to provide nutritional benefits to their families. Household decision-making processes play an influential role in how much milk to buy and how it is treated. This exploratory qualitative study, conducted in peri-urban Nairobi and Dar es Salaam, examined how access to milk, control over milk handling and safety, and intra-household milk distribution are affected by gender dynamics and by changes in milk availability and price. Focus group discussions with 48 women and 45 men and key informant interviews with 8 men and 8 women, all of whom were parents or caretakers to young children, were conducted. The results indicate that gender roles in milk purchase and handling vary. Generally, providing enough milk is a man's responsibility, whilst a woman is expected to ensure a nutritious diet. Yet women's limited decision-making power regarding milk purchase can restrict their ability to provide sufficient milk. Interventions to promote safe milk consumption need to consider gender norms, strengthen intra-household collaborative decision-making, include men in nutrition programming, and increase women's control over food expenditures.

Keywords: sustainable development goals; peri-urban; milk safety; nutrition; gender

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1. Introduction

The United Nation's Sustainable Development Goal (SDG) 2 is "Zero Hunger". This is a commitment to "end hunger, achieve food security and improved nutrition, and promote sustainable agriculture" [1]. It is increasingly understood that achieving this goal requires integrating the sectors of production, processing, trade, consumption, environmental assessment and health, as well as knowledge systems into the concept of food systems [2]. In this article, we explore in detail one pathway towards achieving SDG 2, namely, strengthening nutrition through animal source proteins. Our ultimate research interest is in understanding how gendered intra-household decision-making processes affect the ability of families to provide safe and sufficient milk to their children. Our empirical focus is consumers of raw milk in the informal sector in peri-urban Tanzania and Kenya. Our aim is to understand the current dairy purchasing and consumption practices of participant peri-urban consumers, the challenges they face in ensuring the safety of the milk they consume, milk allocation practices within the household, and how the interplay of women's and men's decision-making in these processes affects each one of these domains of inquiry.

A number of governments in East Africa are considering a ban of informal milk markets, largely justified on the grounds of public health concerns about the safety of raw milk, which is sold unpacked and often unpasteurized [3]. Such a ban would undoubtedly result

in an increase in milk prices, which could in turn reduce the amount of milk consumed in a household, including by young children [4]. We therefore inquire into how intra-household milk purchasing and allocation patterns might change should such a ban be imposed.

The study was conducted in two countries specifically to provide comparative gendered data on the research topics. It relies on exploratory small number (small-N) research to produce rich and complex data. We foregrounded respondents' explanations for their behaviors and attitudes. The ways in which women and men explain and rationalize their purchasing and consumption behaviors at an intra-household level can help development actors to avoid simplistic interventions based on untested assumptions around "who decides". Our analysis and discussion aim to provide entry points for improving levels of milk consumption, which can empower women without disempowering men.

Literature Review

It is estimated that more than 2 billion people globally are affected by micronutrient deficiencies—also called hidden hunger or undernutrition [5]. In 2019, the prevalence of undernutrition was 22% in sub-Saharan Africa (SSA), and up from 20.3% in 2014, an increase of 46 million people [6]. Kenya and Tanzania, the focus countries of this study, are classified by the World Bank as lower middle-income countries [7]. Kenya's gross domestic product (GDP) per capita was USD 1817, and Tanzania's was USD 1122 in 2019 [8]. Despite their lower middle-income status, food insecurity and undernutrition are widely prevalent in both countries among peri-urban poor people, and especially among children and pregnant and lactating women due to their higher physiological requirements [9–11]. Micronutrient deficiency impairs the physical growth and cognitive development of unborn and young children. This can have negative impacts on health outcomes, neurocognitive performances, and disease risks [12,13]. Milk is valuable because it makes an important contribution to meeting the body's needs for calcium, magnesium, selenium, riboflavin, vitamin B12, and vitamin B5 [14]. Milk is particularly useful in addressing hidden hunger in countries like Kenya and Tanzania, where base diets are based on maize, wheat, and cassava and can lack nutritional diversity [15,16]. Recommendations for milk consumption vary by country, but they average out at around 500 mL per person per day [14]. Milk consumption is particularly recommended for young children aged between 6 and 48 months. This age bracket is particularly vulnerable to undernutrition.

The Global Hidden Hunger Index notes that micronutrient deficiency is "alarmingly high" in Kenya, and "severe" in Tanzania [17]. In Tanzania milk consumption stands at an average 47 liters per capita per year placing Tanzania as the third highest East African milk consumer after Uganda (62 liters) and Kenya (110 liters) [18–20]. These data indicate that per capita milk consumption is below the recommended average of 500 mL per day. Among poor households in peri-urban areas it is lower still [21–23]. One study showed that milk intake by children in peri-urban Nairobi is around 100 mL per day in low-income households (36.5 L per year), with household milk expenditure decreasing proportional to income [24]. A second study conducted in peri-urban households in Nakuru showed children consumed around 215.7 $\pm$ 85.6 ml a day [25]. In Tanzania, International Livestock Research Institute (ILRI) data (2018) found that per capita consumption of milk in peri-urban households averaged 50 mL of milk per day, with large differences between men- and women-headed households [3]. In Kenya and Tanzania milk is typically consumed in the morning or twice a day in form of plain milk, mixed with a beverage like tea, added to porridge [26], or as part of a meal—for instance, with ugali (a maize-based food with a function like rice or potato in the diet), sweet potatoes, or in cooked vegetables.

A primary reason for low milk consumption by low-income families is that milk is often more expensive than less nutritionally rich foods such as starches. Buying raw (unpasteurized) milk in informal markets offers a partial solution since it is generally 20–50% cheaper than the pasteurized, packaged milk sold in the formal sector [27,28]. In Kenya, ATM milk (raw milk from informal sector vending machines) retails at KES 60–70 per liter, whilst pasteurized, packaged milk retails at KES 100–120 (USD 1–1.2) per

liter [29]. In Tanzania, observed raw milk prices in the informal market range from Tshs 1000 to Tshs 2000 per liter, while local processed milk prices range from Tshs 3000 to Tshs 5000 [30]. In peri-urban Nairobi the majority of households that purchase milk in the informal sector are low-income households earning below KES 30,000 per month [24,31].

Turning now to purchasing options in the informal sector, in Tanzania, low-income peri-urban consumers typically purchase unprocessed milk from retail shops, milk kiosks, milk bars, and directly from peri-urban dairy farmers. Farmers sell milk to immediate neighbors, milk vendors and "hawkers" (a broker who buys bulk milk from farmers and sells it informally to others) [32]. In Kenya, consumers mostly purchase milk from retail shops, milk ATMs (an automated milk dispensing machine), milk bars, small supermarkets, farmers, and street milk vendors [22,33,34]. Factors influencing consumer decisions about the type of milk purchased and the place of purchase include milk quality (e.g., smell, thickness), taste, price, availability, cleanliness of milk-selling premises, consumer income, and family size [35].

Food safety risks in informal milk markets can be high. Milk sold in informal markets does not undergo industrial pasteurization and is usually sold unpacked. Some traders use traditional processing practices, for instance, boiling milk on charcoal stoves before selling it. More recently in Kenya, though, the pasteurization of milk in small plants has become increasingly common in the informal sector. Studies on milk-related health hazards in Kenya report the presence of aflatoxins [36], toxin-producing bacteria [22], and antibiotic residues in milk, both in the formal and informal sectors [15]. Other studies indicate that milk sold in the informal sector can be adulterated and contaminated with pathogens. Pathogens can cause foodborne-related illnesses including diarrhea. Diarrhea decreases the ability of the body to absorb nutrients, yielding negative nutrition consequences. Moreover, diarrhea is a major cause of death in young children [16]. Ensuring the safety of the milk sold in the informal system is therefore essential to safeguarding the nutritional status of low-income peri-urban households [37]. Some studies suggest that consumers in Kenya and Tanzania are poorly informed about food safety risks from milk consumption [38,39]. Other studies show that consumers are informed and attempt to reduce these risks by boiling milk after purchase [40]. Consumers with fridges typically refrigerate milk after purchase, whilst those without fridges store milk in clean containers. These practices respectively aim to reduce microbial growth and contamination [41].

SDG 2 emphasizes the importance of empowering women and promoting gender equality in achieving zero hunger. Empowering women in decision-making around food and nutrition is widely accepted to strengthen overall food and nutrition security. This is partly because men are frequently—though not always—less likely than women to spend their money on household food provisioning [42–46] Increasing women's direct control over income has a stronger impact on child nutritional status, associated health outcomes, and educational attainments than improving household incomes, increasing access to credit, and other assets [24,25]. It is therefore valuable to obtain a better understanding of how women's and men's decision-making abilities affect family nutrition through access to and control over milk, milk handling and safety, and intra-household milk distribution. Such information can help to inform the direction of future research as well as interventions aimed at improving household nutrition outcomes [2,17,18,20,47].

The following sections provide an overview of our methodological approach followed by the findings. These are presented in the following sequence: (i) intra-household management of milk purchasing and handling; (ii) milk safety issues faced by consumers; (iii) nutritional considerations associated with milk; (iv) potential impacts of milk scarcity and increased prices on milk management; and (v) what might change in milk management if women's decision-making power were to increase. We conclude with a discussion on the implications of our findings for milk safety and nutrition development interventions for further gender research on food and nutrition security, and for attempts to empower women within household settings.

2. Materials and Methods

Research Sites: In Kenya, research was carried out in Dagoretti North (Kawangware, Gatina, and Kabiro wards) and Dagoretti South (Mutuini, Riruta, Uthiru, and Waithaka wards), two sub-counties of Nairobi, Kenya. The study areas are characterized by informal settlements, low incomes, a lack of clean water, poor road infrastructure, and general insecurity. In Tanzania, the study took place in the Mlandizi, Kilangalanga, and Janga wards in the Kibaha District (Pwani Region), a low-income peri-urban area. Field research was conducted in March 2018 in Kenya and in July 2018 in Tanzania.

Research methodology: The study was designed as exploratory small-N (small number) research. Small-N research is helpful in situations where few studies have been conducted on a given topic (as in our case) because it opens up lines for inquiry [48], which can then be analyzed further in qualitative and quantitative studies. Critics of this approach contend that generalizations from such small numbers are not possible, divergent conclusions can be drawn from the same data, there are no scientific controls, and that findings can be open to observer and interpretation bias [49]. However, such critiques fail to appreciate the primary "exploratory" purpose of small-N research. Of particular relevance to our work is the fact that the outputs of small-N research can provide thick descriptions and understandings of specific issues, help to identify new issues, highlight complexity, provide new frames for thinking of about specific problems, and generate questions that can then be examined in large-N studies. Erickson suggests that small-N research can draw out the specific mechanisms "that influence social action to proceed in certain directions rather than others" [50]. To achieve these aims, the strategic selection of a few case studies and an in-depth analysis of these can provide a larger amount of information than most random samples are capable of doing [48]. The principle of saturation is followed in identifying the number of respondents. Saturation is reached when new incoming data produces little or no new information to address the research question [51]. We note that, with caution, small-N studies can be "extrapolated" to similar settings and inform development interventions subject to further testing and analysis [52,53].

Two well-established qualitative research methods were used in our study: focus group discussions (FGDs) and key informant interviews (KIIs). A focus group discussion (FGD) is a qualitative research method, facilitated by a professional, external moderator, in which a selected group of people convene to discuss a specific topic. FGDs are used to elicit respondent "attitudes and perceptions, knowledge and experiences, and their practices. The method is based on the assumption that the group processes activated during an FGD help to identify and clarify shared knowledge among groups and communities. The method does not assume that all the knowledge is shared equally among a studied group, or that in each community there is a common, underlying, homogeneous knowledge". Rather, an FGD allows the investigator to elicit shared narratives as well as differences among participants in terms of experience, opinions, and worldviews [54]. We conducted four single-sex FGDs (two with women and two with men) per country, resulting in eight FGDs. Each FGD had between six and eight respondents.

Through individual discussions, KIIs permit a deeper exploration of gender dynamics, and in particular, they can encourage respondents to share their own views and experiences rather than seeking to conform to gender norms—which is sometimes a problem in group settings [55]. KII respondents were identified by the FGD facilitators during the FGDs as providing information that appeared to be particularly informative and nuanced. These individuals were then asked to attend follow-up interviews. Finally, 4 men and 4 women KIIs were conducted in each country, resulting in a total of 16 KIIs: 8 with men and 8 with women. Taken together, the study utilizes the insights of 56 women and 53 men. An overview is provided in Table 1.

Table 1. Focus group discussions (FGDs) and key informant interviews (KIIs).

Peri-Urban Nairobi	**Number Women Participants**	**Number Men Participants**
FGDs	24	23
KIIs	4	4
Peri-urban Dar Es Salaam		
FGDs	24	22
KIIs	4	4

In each country, a field team of three enumerators (one facilitator, one note-taker, and one translator) conducted the field research. They were fluent in Kiswahili and English and had extensive qualitative research experience. The enumerators were supervised by a gender scientist and a gender research associate. This ensured that the fieldwork outputs were of high quality. Written consent for participation and recording the discussions was obtained from the respondents using a consent form in English and Kiswahili. Anonymity was guaranteed to the respondents by assigning each respondent a numerical value. This number was used as identifier during the discussions, the recording of the discussions, and during the data analysis.

Community mobilizers received lunch and compensation (KSH 2000, roughly USD 20) for each day of work. Their expenses for airtime and transport were also covered. Refreshments were offered to respondents during the KIIs and FGDs, but not monetary compensation. Transportation costs were covered in cases where respondents incurred them. Such compensation is considered to not bias responses because the exploratory nature of the study was made clear—vis-à-vis, for example, an evaluation of project effectiveness. The study was approved by the ILRI Institutional Research Ethics Committee (Ref. ILRI-IREC2017-15/1).

Research Respondents: Respondents were recruited by a community facilitator according to the following criteria: (i) buyer or consumer of milk sold in the informal sector, and (ii) a parent or caretaker of children. Participants were between 21 and 74 years old and all were primary caretakers of children. In some cases, the mother had died, which is why grandparents had taken on the role of primary caretaker. Table 2 shows the average number of children in the respondents' households.

Table 2. Average number of children in the respondents' households.

		Kenya				**Tanzania**			
		Mean	**Std. Dev.**	**Min**	**Max**	**Mean**	**Std. Dev.**	**Min**	**Max**
No. of Children	Total Number	2.6	1.66	1	11	3.22	1.82	1	9
	Number—Girls	1.39	1.18	0	6	1.67	1.51	0	8
	Number—Boys	1.26	1.04	0	5	1.54	1.07	0	4

The women participants in Kenya and Tanzania were generally younger (29 and 34 years average age, respectively) than the men participants (37 and 40 years average age, respectively). Most women and men participants had attained at least primary education, and in some cases up to secondary levels. More Kenyan women and men respondents had achieved higher educational levels than their counterparts in Tanzania. The majority of women (77%) and men (98%) participants in both countries were married. Five respondents (two men in Kenya and three women in Tanzania) were milk traders, although they were included in the study as milk consumers. Two women and seven men respondents produced their own milk in Tanzania (Table 3).

Table 3. Descriptive respondent data. Gender, marital status, and own milk production.

Variable			Kenya		Tanzania	
			No.	**%**	**No.**	**%**
Gender	Women		24	51.06	24	52.17
	Men		23	48.94	22	47.83
Marital Status	Women	Married	17	70.83	20	83.33
		Divorced	3	12.50	2	8.33
		Single	4	16.67	1	4.17
		Widower	0	0	1	4.17
	Men	Married	22	95.65	22	100
		Divorced	0	0	0	0
		Single	0	0	0	0
		Widower	1	4.35	0	0
Education Level	Women	Primary	11	45.83	17	70.83
		Secondary	9	37.50	6	25
		College	2	8.33	1	4.17
		University	1	4.17	0	0
		None	1	4.17	0	0
	Men	Primary	10	43.48	14	63.64
		Secondary	9	39.13	6	27.27
		College	4	17.39	2	9.09
		University	0	0	0	0
		None	0	0	0	0
Produce Own Milk	Yes		0	0	2	8.33
	No		24	100	22	91.67

Respondents were engaged in a range of occupations. Some ran their own business (17 women, 13 men), whilst others worked as casual laborers (14 women, 15 men). Other women worked as hairdressers, tailors, community development officers, and teachers. A few men worked as drivers, artists, army officers, and pastors. One respondent was a student, and another was from a household where all members were unemployed.

Data analysis and interpretation: Following the fieldwork, the recorded interviews were transcribed and translated into English. Transcripts were uploaded into a qualitative analysis software package (NVivo). Coding was done by two experienced qualitative researchers based on a codebook of deductive codes developed by the team on the basis of our research questions. We also used open coding, whereby common themes are identified and assigned codes. Decisions on which emerging themes should become new codes were taken by all team members on the basis of determining which of these themes most meaningfully contributed to our analysis. Interviews and coding schemes were reviewed multiple times, and divergent interpretations were discussed to achieve consensus. The data were then synthesized by theme and interpreted for this paper. The respondent responses are cited to illustrate the selected themes, and also to indicate divergent views.

3. Results

The results are presented as follows: (i) milk purchasing practices, (ii) milk safety practices, (iii) milk consumption and nutritional awareness, (iv) potential impacts of milk scarcity and increased prices, and (iv) what might change in milk management if women's decision-making power increased. For each theme, we start with the Kenyan data followed by Tanzanian data.

3.1. Milk-Purchasing Practices

Most Kenyan respondents buy milk from local shops, with around one-quarter purchasing from local dairy farmers. Men and women alike placed great emphasis on the importance of buying either directly from the producer, or from shops known to be sup-

plied directly by a producer. Tanzanian respondents all sourced their milk directly from milk producers. A few had their own dairy cows. In some cases, farmers bring milk to customers, and a few respondents buy milk from Maasai vendors, particularly in the dry season. Several respondents purchased regularly from one supplier with whom they have a good personal relationship. This makes it easier for them to get milk on credit when times are difficult, and to secure good quality milk.

The Kenyan respondents provided a nuanced picture regarding the person responsible for purchasing milk in the household. In around one-third of households, both women and men buy milk. In another third, the man does, and in the final third, the woman does. In a few cases, children are tasked on an ad hoc basis with purchasing milk. By way of contrast, Tanzanian women and men respondents agreed that it is strongly normative for men to buy milk. This is not only conceptualized as a duty, but as a personal commitment by some men. For example, one man commented, "I will do everything I can to get milk for my child." In just three cases men said that they shared this responsibility with their wife.

Respondents were asked about which type of milk and the quantities of milk that they buy. In both countries, all respondents strongly preferred what they call "raw milk" (Raw milk, in the strictest sense, refers to milk that has not been heat-treated (e.g., not boiled, not pasteurized). Traditionally, the informal sector sold only unpasteurized raw milk. Today, milk in the informal sector is sometimes sold boiled or pasteurized, so it is not necessarily always raw. However, consumers tend to refer to the milk in the informal sector as "raw milk" to distinguish it from the packed milk from the formal sector, which is known to be pasteurized. In Kenya, respondents bought packed milk only when raw milk was not available. They considered that packed milk contains additives and avoid it for this reason. Also, packed milk comes in a standard size, whereas respondents prefer to precisely buy the amount of milk they need, including in cups (275 mL approximately). This suits small budgets and limited safe storage capacity, particularly a lack of fridges. Men in Kenya generally reported purchasing one to three liters of milk a day while women reported buying between two cups and one liter. In Tanzania, respondents' preference for raw milk was even more strongly pronounced than in Kenya. Respondents hardly ever purchased packed milk, though one woman purchased dried milk. Fermented milk (i.e., not industrial) is also widely available and many respondents made it at home. The quantities of milk purchased were higher in Tanzania than in Kenya, with women reporting purchases of between less than one liter and three liters a day, and men between one and four liters, with most buying between one and two liters. A few women noted, however, that their household frequently did not have enough money to buy milk.

Turning to the question of "who pays", in Kenya, this was a relaxed affair. It seems to depend on who goes to buy milk, and who has money. One man said, "I pay but if I can't then my wife pays." A woman explained that she "chips in" if her husband does not have enough money. In Tanzania, the story is very different, with respondents overwhelmingly reporting that men pay for milk. Men said, "This is the 'husbands' responsibility.". Only three women reported having a more open arrangement, with two saying that if their husbands had insufficient money they would pay, and a third saying "Either he or I pay. We cooperate."

The picture is nuanced with respect to who decides how much milk to buy and where. In Kenya, some women claim that they took all the decisions, whereas most men asserted that the decisions are joint. One man said, "She has work and I don't, so she decides", and another man reported that "Mostly it's me but sometimes I'm not at home. When I travel she is the owner of the house." In Tanzania, almost every respondent said that men took these decisions. Men link their decision-making status explicitly to their status as head of the household. One man said, "I am the father of the household and I control everything that is done in my household." Several Tanzanian respondents noted that male domination of decision-making can lead to insufficient milk purchases. Indeed, a few men openly stated that they did not consider milk a dietary priority. Sometimes milk is scarce yet obtainable, but they do not make a special effort to procure it, and "Even if it is not

scarce, my money is insufficient and there are other priorities" said one man. Further scope for tension arises because, although men control how much money is allocated to milk provisioning and they also buy the milk, it remains the responsibility of women to ensure that there is enough milk for everyone in the household. This is considered part and parcel of a woman's effective management of household expenses. We discuss further results on this topic in more depth below.

3.2. Milk Safety Practices

Safety considerations emerged in both countries as soon as we asked respondents about sources of milk. A Kenyan male respondent reported that, "Our neighboring farmer keeps good milk for us", and a woman said, "I watch the farmer milk." One man from Tanzania commented that "I go to the farm early and see the farmer milk the cow. I witness step by step whether the milk produced is safe."

Despite the efforts respondents make to choose a milk trader who sells good quality milk, some Kenyan respondents—particularly women—expressed disillusionment about milk quality. Several alleged that vendors sell old milk. This only becomes clear when the milk is boiled because it coagulates if it is too old. Others argued that vendors stretch the milk by adding flour and water. This adulteration is visible sometime after letting the milk rest because the flour or other solid products collect at the bottom of the pot. A common response to an experience of poor quality milk is to start buying from another shop—Kenyan women do not need to request permission from their spouse to do so. Satisfaction with milk quality was considerably higher in Tanzania, particularly among men. One man reported that "My children are healthy, and the milk tastes good." As in Kenya, Tanzanian women were more likely than men to complain that vendors had adulterated the milk, though complaints in Tanzania were rarer. This is not surprising since milk is mostly bought from producers. Respondent women in Tanzania stated that if a woman wants to select another vendor, she must inform her husband and get his support.

The study inquired into how milk is handled from the moment it is purchased to the moment it is consumed, how it is prepared and stored, who does this work, and who is responsible for the milk chain safety. The descriptions of the handling practices within the household rotated around the safety concerns just outlined.

Most respondents, women and men, were keenly aware that a series of actions, from purchase to consumption, are required to ensure that milk is safe. People bring their own containers to the point of sale. Women and men emphasized that containers had to be washed thoroughly with water and soap prior to purchasing milk. This is a woman's job. One man said, "A clean container is the most important step." Several respondents in Kenya, both women and men, emphasized that containers used to purchase milk had to be kept separate from other kitchen utensils in a clean place. In Tanzania, though, very few respondents commented on the importance of taking clean containers to purchase milk.

Respondents in both countries invested considerable effort into boiling milk. Whether or not the milk was boiled by the vendor, milk is generally boiled as soon as it enters the home. This is primarily a woman's task. They sieve the milk to remove any flour, insects, and other pollutants, and then boil it for around 15 min. In Kenya, all respondents said they had a special saucepan just for boiling milk, either because they do not want the taste of onions or other vegetables in their milk, or because respondents felt this would keep the pan cleaner. In Tanzania, women and men talked at length about how to boil milk effectively. Men were more likely than their counterparts in Kenya to boil milk, though this remains primarily a woman's task. In most cases, milk is boiled in the morning for consumption during the day, and then again if more milk is needed. Men in both countries referred to preparing milk in the evening if they—or other family members—have done "dusty work", meaning they wanted to drink milk to sluice away the dust. A Tanzanian man explained, "After I have purchased the milk, I find my wife has already prepared a clean pot. She puts it in the pot and boils it and then she puts it in a clean thermos flask ready for consumption." A second Tanzanian man who prepares milk himself said "First,

I make sure that the vessels used for milk are clean. I wash them using hot water and then I filter the milk before boiling it. Afterwards I put the milk into the thermos flask. Everything about milk is handled with a high level of hygiene."

A few respondents in Kenya reported tensions around milk storage. It appears that in some households, carefully boiled milk is then spoiled because storage containers have not been cleaned properly. Several men reported family members failing to adhere to their instructions. This is "the biggest challenge. I don't clean the container but tell the family to clean it. If they do it badly the milk is spoiled." In both countries, to help prevent spoilage, many respondents drink the milk as quickly as possible. The majority do not have a fridge and store the milk in a thermos, or in a clean container that is covered to stop insects falling in and "cats drinking it." Respondents with fridges use them to store milk. A notable difference between the Kenyan and Tanzanian respondents was that many Tanzanians prepare fermented milk. In a very few cases, respondents boil milk prior to fermenting—"because cows have many diseases", but the majority do not.

Women in Kenya are generally responsible for managing the milk safety chain. This has less to do with milk management itself and more to do with the normative perception, held by women and men, that women exert decision-making power in the kitchen. One man noted that the "kitchen department belongs to the wife and she decides everything." Another woman noted that "Men don't come to the kitchen." In Tanzania, understandings around who is ultimately responsible for milk safety are more nuanced. Women and men generally agreed that women are responsible for maintaining hygienic practices around milk purchase, boiling and storage. Several men argued that since men are the head of the household, they consider themselves responsible for ensuring hygiene in all its dimensions—milk safety is just part of this. "The man as head of the household is responsible for making sure everything is clean. I give orders which must be followed" said one, and another added, "I, as the owner of the house, am clean, and so everything is clean".

3.3. Milk Consumption and Nutritional Awareness

Differences in milk consumption between the Kenyan and Tanzanian respondents emerged. Milk is almost universally consumed by the Kenyan respondents all year round, whereas milk consumption is more intermittent among the Tanzanian respondents. The latter finding is partly due to the low availability—and high cost—of milk in the dry season, partly because it is considered expensive by several respondents even when milk is widely available and cheaper, and in some cases because milk is not considered nutritionally important by a few respondents (even though they occasionally consume milk). One of the Tanzanian vendors in the study estimated that only around 50–60% of people in his catchment area consume milk.

Respondents were asked to discuss the different ways they consume milk. In both countries they settled on three key ways—mixed with porridge (a term describing a legume and grain-based dish made from a wide variety of ingredients), in tea, and as a pure milk drink. Almost no respondents cook vegetables or ugali with milk. Women are generally responsible for allocating milk between potentially competing uses. One Tanzanian woman said, "Women decide milk allocation because a woman is everything in the house.".

In both countries, porridge—with varying quantities of milk added—is normally prepared by women and served to babies and young children (aged under two, but up to 3.5 years reported by some participants). For some Tanzanian mothers, adding milk to porridge is a strategy to ensure a child who rejects milk as a drink consumes it in hidden form. Tea is consumed in many, but not all, Kenyan respondent households. In some households it is drunk by everyone apart from young children. In others, just the wife and husband drink tea. The Tanzanian respondents consume considerably less tea than their Kenyan counterparts, and milk is not necessarily added. Tea, and particularly milky tea, is treated as a luxury by many respondents with several women reporting that "If we have enough money we drink tea.".

We did not discuss how much milk is consumed per capita in each household. However, we did ask who is prioritized for milk consumption. In Kenya, respondents explained that boiled milk is consumed much more frequently by children—at weaning from the age of six months onwards—than by adults. Babies and young children in particular are encouraged to drink milk—at times diluted with water—and are provided with around 1 cup a day. In Tanzania boiled milk is consumed in many respondent households by the whole family. However, in some households only children are given milk. Several respondents said that children as young as two to three months are provided with milk if they seem unhealthy or have difficulties consuming breast milk. Fermented milk is widely consumed by all household members and is prepared by women and men. There are no gender differences in either country regarding whether boys or girls are prioritized for milk.

Respondents were asked which discussed how norms around milk consumption have shifted. In Kenya, the consumption of milk was associated with Maasai (a pastoralist ethnic group in East Africa whose livelihood traditionally relies on extensive cattle farming). However, milk consumption, regardless of ethnic community, is now fully normative. A man remarked that, "Everyone needs the nutritional value that is in the milk, so I think all of us should take milk." There was a slight tendency to favour men above women for milk consumption, including for men who work in construction—which creates dust—or bakeries which are very hot. Several women remarked that they sip milk when preparing foods using milk for their child (this could be a means of securing some milk without openly allocating milk to themselves, but we did not inquire into this issue). All women and men agreed that childrens need for milk should take priority over that of adults because children need the calcium and protein in milk to develop strong bones and to grow. A woman said, "We are supposed to try and give small children milk because if they do not get nutrients when they are young, there is no way they as an adult can be assisted.".

Many Tanzanian respondents expressed similar views to their Kenyan counterparts. Some explained that everyone should consume milk "because it is good for health", as one man put it. Men and women alike agreed that children need milk. A man dairy producer said, "Since it is said that milk is very important for children, I have decided to help some of my relatives by giving them free milk for their kids." The slight preference evidenced in Kenya, that men take priority over women for milk, was more strongly expressed in Tanzania. A woman remarked, "I give my husband milk, even if it is just a small amount—unless he refuses it by himself for the sake of the child." Another woman explained that "If you see someone not giving her husband milk it is easy to tell they are not getting on—there must be a problem somewhere.".

The respondents were asked to determine who was ultimately responsible for ensuring that children drink sufficient milk. In Kenya, women are mostly responsible for allocating milk carefully between, for example, porridge for the baby and drinking milk or tea for all. In Tanzania, women likewise allocate milk between family members (although as noted above, men are normatively responsible for purchasing it, though not in every case as seen in the following remark). "The woman is the one who is responsible for making sure that milk is always available in the house. She is the guardian of the whole family, so it is up to her to know what to buy when her husband leaves money for household consumption: how much milk to buy, how to store the milk, whether to mix the milk in porridge or give children fresh milk." Tanzanian men generally agreed that women hold authority in the kitchen, over both who is entitled to drink milk and how much. "For me, everything concerning milk consumption is done by my wife because that is related to the kitchen. She is the one who decides how much everyone should drink, for example how much should be consumed by the children and how much reserved for me. I cannot decide for her because if I do so I will be making a big mistake.".

Regarding knowledge on nutrition, several men in both countries argued that women should be trained. "She's the one in charge of that department." Other men argued that, since they are in charge of the home overall, men should be trained too. This would help

men obtain the best quality milk possible. Men further argued they should be trained in case the wife falls ill, and indeed in some cases, women do train their husbands and other family members about safe milk handling and use for this eventuality.

3.4. Potential Impact of Milk Scarcity and Increased Prices

A ban on milk sold in the informal sector is expected to reduce the availability of raw milk, resulting in more expensive, formally processed milk in the market. We explored the probable impact on household milk management of a hypothetical decrease in raw milk availability in the informal system, and the inevitable increase in milk prices that would result. Respondents clarified that, from time to time in both countries, milk is indeed in short supply and is, as a consequence, more expensive. The hypothetical scenario was thus easy for them to imagine because it occurs in reality from time to time.

Most Kenyan women said that if the price of milk increased, they would have to reduce their overall consumption, including for the young children. Some said they would stop buying milk altogether. In general, men seemed less concerned about the price of milk. Those men who found milk important said that they would buy milk on credit. In Tanzania, women said, "Regardless of whether the price of milk increases or not, we will still consume milk no matter what. What normally happens when the prices increase is that we tend to reduce the amount of milk purchased and consumed, but we make sure that milk is always available in the house." At times of shortage, some women go to local Masaai villages where milk costs half the price that they normally pay.

When milk is scarce, all Kenyan respondents agreed that the nutritional needs of children trump those of adults, and that adults should reduce or abandon their own milk consumption. Women argued that it would be impossible to prioritize their husband's need for milk above that of their child. "I don't think in your home you can give your husband a cup of milk and the child will not have any. People couldn't accept that a husband can take milk and the child does not", said one woman. When milk is unavailable, men said they usually try and replace the nutritional value of milk with some meat or fish to make sure that their children consume proteins. Women try to find eggs or pulses, adding an egg or margarine to porridge, for instance. Other respondents make bone soup. Babies and young children are also offered fruit juice, and sometimes fruits. In a few cases, babies are given strong tea.

For the Tanzanian respondents, milk is always in short supply during the dry season. Some respondents stop purchasing milk at this time because of the increase in prices and general unavailability. A woman commented that "During the dry season, my children fight for milk because there is little milk from September through October. It is a difficult season." Women were generally emphatic that when milk is scarce, they engage in many strategies to obtain milk. A few women buy packed or powered milk (availability of which is more stable throughout the year) and others borrow milk from neighbors when possible. The Tanzanian respondents had various solutions to managing without milk, should it be impossible to obtain. Key among these were to make a nutritious porridge, ungawalishe. The ingredients vary. One man describes how his wife "purchases cereals, such as finger-millet, bulrush-millet, beans, groundnuts, maize, and rice, which she uses to make nutritious flour that can be used to make porridge for the kids." Other respondents mentioned making porridge from soya, maize, groundnuts, and rice, or simply from maize flour and margarine. As in Kenya, several respondents mentioned targeting animal proteins like meat and fish to create soups or to mix with ugali, and others mentioned providing fruits, juice, and vegetables. One man explained that, when milk is scarce, "I buy fruits like avocado, mangoes, and passion fruits, which I use to make juice. Sometimes I make potato and beef soup for the kids, if we can we get leafy vegetables and sardines to supplement beef." Overall, it appeared that, when milk is literally unobtainable for most people, great care is taken by most respondents to provide diverse alternative foods. Overall, Tanzanian respondents spoke much less about securing protein or calcium for their children than in Kenya, though many references were made to "nutritious flour".

3.5. What Might Change in Milk Management If Women's Decision-Making Power Increased?

A further hypothetical change that we discussed was that of a change of primary decision-maker in relation to household expenditures. Based on research evidence that strengthening women's decision-making power often improves household nutrition outcomes, we asked what would happen to households' milk management if women had more decision-making power regarding household expenditure.

Quite a few Kenyan women thought that if they became the main decision-maker regarding household expenditure, then less money would be spent on milk. This is because "most women want to save money"—particularly through savings groups called chamaa—with several women agreeing that "I would reduce the amount, I don't need milk. But if it was up to the man, the amount [bought] would go higher." A woman explained that, should she become the main decision-maker, "If my husband says one liter I would reduce it. That money will do development (i.e., will be used for other important goals). Other things can help grow the family. I know the right amount of milk for the children." However, some women said that the amount of milk purchased would not change because they had already agreed with their spouses how much milk was to be bought.

Kenyan men's opinions were divided. A few men thought that if women had more decision-making power, they would be more likely than men to buy milk. However, many men echoed the women, believing that women would indeed buy less milk because they often try to reduce some forms of expenditure and reallocate money to other priorities. "If it was the wife deciding on expenditure, definitely there will be a lot of savings. She will cut on costs on expenditures and save her own money. Women like chamaas!" A milk vendor said, "I strongly say the women would cut the cost of milk. They would save or buy something else." Men provided a partial explanation for women's spending, explaining that some men spend carelessly, buying a belt or beer, for example, even to the extent of a few men "not caring much if children go hungry." This said, some men repeated that they agree on expenditures with their wife.

In Tanzania, both women and men appeared to associate decision-making power with the person who earns the income. In the study sites, men were perceived as breadwinners who provide money to their wives for household purchases. One woman stated, "Milk consumption in the household would definitely change, because, if the woman has her own income source, she will also be able to contribute to the expenditures in the house, and so, she may even decide to increase the amount of milk purchased." Another agreed with this and suggested that milk consumption would increase. Other women focused on the idea that a wider variety of foods would be bought if women could decide upon expenditures.

Some Tanzanian women respondents noted that the norm that men buy and pay for milk had disadvantages, because some men do not value or prioritize milk. One man shared similar feelings and argued forcefully that if women had more income and decision-making, power dietary outcomes would improve. "Milk consumption would change a lot, not only for the kid, but generally for the whole family. The mother is normally the one who knows most of the things about food in the house rather than the father. So, if these decisions were handed to her, she would be able to arrange dietary needs for each meal in the house as she sees fit—contrary to now, where most things are pre-decided by the father. Things would change".

However, many women respondents were concerned that if a woman's income increased, the husband would stop contributing to the expenditures. It was therefore necessary to promote collaboration as a strategy to achieve a nutritional win-win. A woman said, "If the wife's income increases and both the spouses collaborate, everything in the household would change. Even the foods consumed would change." In one FGD, women explicitly associated milk purchases with collaboration. "What is highly needed is cooperation between men and women, because things cannot be the responsibility of one person. In order to make sure that milk is obtained every day, everyone must know the importance of drinking milk".

The great majority—though not all—of Tanzanian men were resistant to women taking on stronger decision-making roles. One man said, "If a woman has power, she still can't make a decision on her own to make her own money. She must involve me, because if she decides alone, that means all the regulations which are in the household will be destroyed, she will be taking me as a child who has no decision-making power ... we must cooperate." Another man in a different FGD echoed these words almost precisely, including the wording "take me as a child." Several men, though, said it would be good if the wife could take more responsibility for children's nutrition, including the cost, but most men concurred that they would expect the wife to report back to the husband on how this is being achieved and how money is being spent.

4. Discussion

Our discussion of the findings follows the same format as the results section. Turning to question 1 about the intra-household management of milk purchasing, in Kenya both women and men respondents buy milk, whilst in Tanzania, it is more common for men to buy milk. In both countries women generally purchase smaller quantities than men. The reasons behind this did not emerge clearly from the interviews. It is possible that it relates to women generally having more limited financial means, and the perception that it is men's responsibility to ensure enough milk is available in the house.

Regarding question 2 on milk safety issues faced by consumers, men and women respondents from both countries were aware of the potential safety hazards of unpasteurized milk. Where possible, respondents source milk directly from the farmer, or from vendors known to purchase their milk straight from the farmer, as this milk is perceived to be safer. Respondents who do not have the option of buying from farmers risk finding that their milk has been adulterated. All respondents are mindful of good milk-handling practices at home to ensure milk safety, but they face practical limitations implementing these practices, for instance, an inability to refrigerate. This is a common problem for low-income households [56]. Respondents overwhelmingly agreed that boiling milk is sufficient to remove pathogens. Unfortunately, this perception is not accurate, due to high chances of recontamination [55]. Indeed, one study conducted in Tanzania showed that the levels of contamination in raw and boiled milk were the same [57]. Gender roles and responsibilities in relation to ensuring milk safety vary by responsibility, though not by role. In Kenya, women are primarily responsible for maintaining the entire milk safety chain, from cleaning containers for purchase, to boiling the milk, all the way through to storage. Occasionally men claim oversight of this process, but in most cases, women take on this role as part of their responsibility—acknowledged by both women and men—as a wife and mother. In Tanzania, whilst women are also tasked with maintaining the milk safety chain, Tanzanian men respondents typically considered that it is a man's responsibility, as in his capacity as the head of the household, to supervise hygiene procedures.

In both countries, men and women respondents emphasized that women are the "authority" in the kitchen, which suggests more than a role, it indicates responsibility. However, our findings show that the ability of women to enact their responsibility can be compromised by men taking overall responsibility for managing the household and women's work. This gives rise to a problematic disjuncture: it is women's responsibility to put milk on the table and ensure that everyone is well nourished; yet, the same women are not necessarily able to decide how much milk is needed or where to source it. The ability of women to ensure that everyone has enough milk can be trumped by men failing to allow them sufficient decision-making space, and money, to meet their responsibility. Similar findings emerged from another Tanzanian study, where men were considered to be responsible for food security for the whole household, and women for ensuring adequate nutrition for all household members. Women similarly expressed frustration over the difficulty of providing adequate nutrition without having the decision-making power over the food being provided by their husbands [58]. These findings point out the need to continue studying how the gender division of roles and responsibilities in "food

security vis-à-vis nutrition security", and in "household management vis-à-vis nutrition management" can affect the food security of the household.

Turning to question 3, nutritional considerations associated with milk, overall awareness among respondents regarding the importance of milk to the diet, and particularly for infants and young children, was generally strong. Kenyan men and women respondents were particularly aware of the nutritional importance of milk, particularly for children. They go to great efforts to source milk and to make sure that children consume it in some form, although they acknowledged being forced to reduce household consumption when milk prices are high. In such cases, respondents attempt to provide healthy substitutes ranging from meat to fruit, but these items do not provide the same nutrients as milk. In Tanzania, women and men respondents also find milk important, but are more likely to find it expensive, with milk considered by many to be unaffordable in the dry season. Furthermore, Tanzanian respondents also seemed to consider that they already consume a nutritionally adequate diet, particularly porridge (which includes legumes and grains, thus proteins), and hence, they may see less incentive to include milk in the household food basket. Given the high levels of undernutrition in Tanzania (and Kenya), this perception is unfortunately likely to be erroneous. The wider literature suggests that the predominance of maize-based agriculture since colonization has culturally biased food preferences in both countries away from diverse food baskets, thereby undermining nutrition. Although a wide range of indigenous fruits and vegetables may be locally available, they are rarely utilized sufficiently [59,60]. This is partly because indigenous vegetables are stigmatized as "poor people's food" and "weeds", and because their preparation, conducted by women, can be laborious [60]. The prevalence of early weaning in both countries introduces children to nutrient-poor cereal-based foods—particularly porridge without milk, and bulky solid foods that are hard for the child's developing gut to digest [61,62]. Our respondents likewise appear to consider porridge-based diets as ideal for young children, suggesting that they are generally poorly informed about securing nutritious diets and the role milk may play in these. These concerns about the need to better inform parents and caretakers about good nutrition practices, particularly for children, are echoed in the Kenya National Nutrition Action Plan 2018–2022 [63] and the Tanzania National Multisectoral Nutrition Action Plan 2016–2021 [64].

Our findings in relation to question 4, impacts of milk scarcity and increased prices on milk management, confirm the importance of informal markets to low-income households. Women and men in both countries source milk from informal markets because it is cheaper relative to packaged milk from the formal sector, because it is available in small quantities, and because raw milk is considered to be high quality (particularly because it is perceived to not have additives). A ban on milk sold in the informal markets is likely to negatively impact the amount of milk respondents will be able, or willing, to buy. Our findings indicate that this may be particularly relevant for women, who seem to spend, or be willing to spend, less than men on milk. This is of concern given that our respondents are already not consuming sufficient quantities of milk.

We now consider question 5, what might change in milk management if women's decision-making power were to increase. Respondents to our study provided intriguing responses to the scenario of women having more decision-making power in relation to milk. Some argued that this would result in more milk becoming available to the household, because women are more likely to consider making sure everyone eats well and healthily. Several Tanzanian men expressed this particularly strongly. They acknowledged the dissonance between culturally ascribing women the responsibility for ensuring everyone eats healthily, and men not necessarily providing them with the means to do so. The actual identification of women with the kitchen was not challenged. However, the limited scope of women's decision-making power was agreed to be a problem.

By way of contrast, other respondents argued that, if were women to have more decision-making power, they would actually buy less milk. This is because many women—regardless of the cultural norm that indicates men are the head of the household and

the breadwinners—feel men are not living up to their responsibilities to strengthen development outcomes for the whole family. Ultimately (and this is particularly clear in the Kenyan data), women appear to feel personally responsible for the development of the whole household, and they aspire to do things differently. Women see a whole host of things that need to be done and paid for, in order to actively "do development". In this light, securing sufficient milk is one of several competing development priorities for the home that women try to balance. Our findings indicate that women understand the importance of milk to children's development and value this, but for them buying milk can represent a trade off against another valuable development priority for their family. The factor, which unites both responses to our scenario, is that men are not providing sufficient space and money to allow women to maximize their capacity. There is an implied, though not clearly articulated, critique of how men run households.

The fraught of issue of who is ultimately responsible for raising healthy children was indirectly broached, for instance, in cases where men do not appear to earn enough, or where women are potentially able to earn enough money to support their family alone. However, some women run the risk of men halting their contributions to household expenses when women earn more. To avoid this risk, they emphasized the importance of "collaboration" and "shared responsibilities". Although some men welcomed the idea that women could earn more, and thereby contribute more to household expenses, they generally added the condition that their wives would need to report back on their purchases. In this way, it appears that men ultimately wanted re-confirmation of the traditional role of the man as the main decision-maker. This leads us back to the situation that women cannot normatively make key decisions around household nutrition.

Perhaps for this reason, women and men alike associated strengthened women's decision-making to women having more control, specifically over money they have earned themselves. Nobody referred to women having more decision-making over household income overall. This meant that the idea that a man should control the overall household income was not challenged, and that women's space for agency was still conceived of within gendered normative roles. Some men reported that they feared "being treated like children" in scenarios where the woman had more decision-making power and did not consult their husbands on household matters. This suggests that men feel their masculinity is diminished when women take more overt responsibility for household-level, rather than kitchen-level, decision-making. Based on evidence from Kenya, Syria, and Tanzania, Galiè and Farnworth [42] articulate the concept of a "gender norms façade", which helps describe what is happening in these situations. In certain cultural settings, families need to demonstrate to the wider community that they abide by culturally relevant local norms—regardless of actual day-to -day arrangements on, for example, who decides on income utilization—to avoid social marginalization and potential ostracization. Our study indicates that, an exploration of the agentic component involved in the "gender norms façade" would help broaden both an understanding of the strategies purposefully enacted by women to create or maintain a new decision-making space, and the concept of "power through agency" within the empowerment discourse. One related research question that emerged from our findings is, for example: "what does the utilization of the gender norms façade imply in terms of women's and men's ability to enhance their empowerment by leveraging the perception their community has of their intra-household gender dynamics?".

5. Conclusions

We highlight three implications of our findings in relation to progressing towards SDG 2 on zero hunger.

First, external efforts directed towards improving levels of safe milk consumption need to address women in their normative capacity as the manager of the kitchen, and men in their normative capacity as the head of the household. This helps to ensure that the gender norms façade is maintained, regardless of the reality of decision-making arrangements in the household. Acknowledging and working carefully around the delicate balance of roles,

responsibilities, and power within the household is important. This said, change is clearly necessary. This can happen through the sensitive use of gender-transformative approaches (GTAs). These provide ways of discussing gender norms in the community and can create a conducive environment for strengthening women as decision makers. GTAs seek to engage men for change in non-threatening ways. This is because GTAs understand gender as interactive, dynamic, and co-produced constantly between women and men [65].

Second, and as part of this, including men in nutritional programming is very important. Our study shows that, by virtue of their power and privilege, men are critical to food and nutrition security in their own homes. Men often make key decisions at household level: what crops to sell, how much to store, and what foods to buy. All too often, women are trained in good nutrition, yet lack the agency to enact the lessons they have learned. Experience is growing globally on how to support men to change their behaviors and to take on fuller responsibility for ensuring that all family members eat healthily and well [66]. Working with men's organizations for gender transformation can be a valuable way to strengthen men's ability to change in the face of peer pressure [67]. Training both women and men on ensuring sufficient supplies of milk, understanding the different nutritional needs of household members, ways of treating milk to ensure it is safe, etc., is essential.

A third associated implication is that strengthening intra-household collaboration is important. Over the past decade or so, a suite of household methodologies (HHM)—one form of GTA—has been developed in sub-Saharan Africa and worldwide. They are different to most interventions, which target households as undifferentiated units. Rather, they intervene directly in intra-household decision-making processes with the aim of strengthening women's agency. Strengthening women's agency is one mechanism for progressing towards collaborative, systemic household and farm management. Improving collaboration using such methodologies has been shown to strengthen asset development (improved households, purchase of ploughs, livestock, etc.), resulting in a more equitable sharing of household tasks, and an increase in social standing because of these effects. This is particularly important for women, including women in female-headed households [68].

We conclude by commenting on the limitations of the study. The primary limitation is that our study is not statistically valid. We worked with very few respondents because our purpose was to develop, as we described in the methods section, rich descriptions and understandings of specific issues. We aimed to identify new issues, to highlight complexity, to provide new frames for thinking of about specific problems, and to generate questions that can then be examined in large-N studies. We hope that other researchers may take this work forward.

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