

University of Glasgow

Institute of Biodiversity, Animal Health & Comparative Medicine

**Discussion Papers in Environmental and One Health Economics**

Paper Number 2023 – 03

**Understanding decision-making around human and livestock health in sub-Saharan Africa: A review**

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**Abstract**

The health, livelihoods and wellbeing of subsistence farming communities in sub-Saharan Africa (SSA) are closely linked to the health and productivity of their livestock. Understanding decision making processes related to human and animal health, and the broad range of factors that influence these decisions is critical to identifying interventions that optimise health outcomes and food security. We use the Household Production of Health (HPH) framework, which recognize the importance of the broader social, economic and health system environment on health-related behaviors and decisions, to examine the linkages between decision-making behaviours, resource allocation and health outcomes in the context of human and livestock health in SSA. We consider two alternative modes of household decision-making: unitary, where the preferences of a single decision-maker predominate; and collective, where preferences from several household members are considered. We review 135 primary studies from five databases, namely Embase, Scopus, PubMed, Web of Science and Google Scholar. To summarise this evidence, we expand the HPH approach, originally developed to examine issues around human health, to incorporate livestock health. The unitary model predominates decision-making which exposes gender imbalances with men making most decisions related to both human and animal health. Livestock health decisions in particular are largely unitary, whereas some decisions related to maternal, neonatal and child health are made collectively. Male decision-making power is greater overall, especially in rural contexts where women have fewer opportunities to contribute to household economies through education and employment. We then show that human and livestock HPH models are intertwined: for example, behaviours aimed at improving livestock health and productivity can benefit household members at various levels, from improved nutrition and health to better livelihoods and education. We recommend interventions that promote gender, income and wealth equality within households, and progress towards universal health coverage and functioning health insurance schemes.

**Keywords:** Decision-making, Household, Human Health, Livestock Health, Inequalities, Gender, Production of Health

1. **Introduction**

Subsistence farming communities in sub-Saharan Africa (SSA) continue to experience high levels of morbidity and mortality in both humans and livestock due to the substantial burden of infectious and non-infectious diseases, and malnutrition. Deaths resulting from human diseases such as malaria, tuberculosis, human immunodeficiency virus infection/acquired immune deficiency syndrome (HIV-AIDS), diabetes, cancer and cardiovascular diseases are common. For example, SSA accounts for about 29% of tuberculosis (Zumla et al., 2015), 69% of HIV-AIDS (WHO, 2016) and 93% of malaria (WHO, 2019) cases in the world. Non-communicable diseases are also rising and, according to recent projections, are estimated to cause 27% of deaths (Yaya et al., 2020). Moreover, livestock production losses resulting from high disease burdens are common, leading to serious impacts on regional and national economies as well as household income and wealth, particularly in impoverished communities. In the region, livestock contributions to the economy amount to about 25% of gross domestic product (GDP) (FAO, 2002). At the household level, livestock provide food and income, and are held as a store of wealth (Zvinorova et al., 2017). Here, livestock are not only important agricultural assets but also a symbol of prestige, culture and religion (Mayala et al., 2019). Livestock diseases threaten this socioeconomic value. For instance, contagious bovine pleuropneumonia (CBPP) causes an average annual income loss of around $3,933 per household in Kenya (Kairu-Wanyoike et al., 2017). Foot-and-mouth disease (FMD) is responsible for direct production losses of $2.3 billion/year in Africa (Knight-Jones and Rushton, 2013) which is over 0.001% of SSA’s entire GDP (World Bank, 2020), but also restricts national and household economies (Casey-Bryars et al., 2018). Further losses associated with livestock keeping may be connected to human disease arising from zoonoses (i.e. diseases transmitted between animals and humans) (Salmon et al., 2020). As such, livestock disease causes human suffering, loss of identity and cultural autonomy, and affects personal relationships between people and their animals (Davis & Sharp 2020).

Understanding household decision-making related to human and livestock health is important for identifying interventions that can help reduce infections and associated costs (e.g. morbidity and mortality), and therefore improve human and livestock health outcomes. There are several existing studies (e.g. Chuma and Molyneux, 2009; Danforth et al., 2009; Oraro et al., 2018; Davis et al., 2021) on decisions around access to health facilities, reproductive health, nutrition, health investment and expenditure, as well as treatment and prevention of diseases in humans and livestock in SSA region. However, there is limited literature demonstrating how health is “produced”, and who “consumes” or benefits from it within the household, considering both economic and broader (e.g. socio-cultural) perspectives. Most studies show that decision-making is gender-biased, i.e. dominated by men (e.g. Mugisha et al., 2008; Stern et al., 2017; Somé et al., 2018). Overall, there is a limited understanding of joint decision-making on health as a whole in the SSA region, as most studies focus on a single health issue, e.g. on the use of family planning (e.g. Hollos and Larsen, 2004; Wegs et al., 2016; Dadi et al., 2020).

To understand the situation further, we start by defining a *household* as the most basic economic unit around which decision-making and well-being can be understood (Bourguignon and Chiappori, 1992). This definition is founded on Becker’s (1965) theory of the household production model which we use here to frame household decisions and resource allocations over health. Becker’s model was first extended to health capital by Grossman (1972), an approach that Berman et al. (1994) later used to develop a conceptual framework that helps describe health status and health change. We use this framework to describe household decision-making on livestock and human health in SSA in the context of existing literature.

This “Household Production of Health” (HPH) approach is defined as a behavioural process in which households combine social, economic and health inputs to “produce” and maintain the health that household members require (Berman et al., 1994).

HPH is a single comprehensive framework that brings together several approaches to describe health problems in the sociocultural and economic environments (Berman et al., 1994). Placing the household at the centre of health outcomes, the HPH approach explains the behaviour of individuals resulting from their interaction with the social, economic and health system settings within which the household operates. However, we recognize that health spans beyond economic modalities, and encompasses bio-physical, spiritual, emotional, and cultural aspects of life, as a household is made up of people with different behaviours and personalities.

The key assumption is that a household is made up of individuals who know how to produce health outcomes, and who also demand (and value) these outcomes. The individuals producing health in the household do so through decision-making around health issues that relate to disease treatment and prevention. Health decision-making does expand beyond issues centred around disease, as health is more than just the absence of disease (Davis & Sharp 2020; Duff 2014). However, a focus on disease prevention and treatment is valuable in this setting where structural issues around hygiene, inequalities and infrastructure are common (Caudell et al., 2020). The rationale behind the approach is a recognition of the ability of members to join together or individually produce health using the resources available in the household. Produced health is then available to, and valued by, any household member.

The HPH approach has proven valuable in a range of contexts in both developing and developed countries. For example, it has been used by Agbo et al. (2019) to evaluate the impact of Buruli ulcer in Benin, West Africa. Tipper et al. (2010) to explain the link between marriage and good health status within this framework. Moreover, the HPH approach enabled the identification of determinants of neonatal mortality in Iran (Amini-Rarani et al., 2010) and the functionality of elderly people in the USA (Nandinee, 2000). However, the use of the HPH approach in our study is novel in that it is the first to systematically draw data from existing studies on decisions around the *joint* production of human and livestock health in the SSA region. Our approach identifies the inputs into separate human and livestock health production models, and then establishes the relationship between them. We demonstrate how health producers, and those that demand health, interact with the environment (the social, economic and health systems) within which they operate. This helps in the identification of resulting gender and intra-household resource allocation inequalities. It also enables us to demonstrate that the resulting inequalities can be partly resolved through the re-allocation of resources within the household and the trade of health between its members. Overall, our aim is to link decision-making behaviours and resource allocation with health outcomes in human and livestock in SSA. This is critical to demonstrate the value of linking resource allocation to health in areas where demand and need is high and where historically and contemporarily, they are low and where decisions/policies are made based on household health outcomes. To the best of our knowledge, no previous study analyses household decision-making using the HPH approach in the same depth for this region.

* 1. **Household, family and gender roles in sub-Saharan Africa**

In Africa, most economic activities still take place within traditional settings (i.e., peasant and less stratified societies with highly socialised households) characterised by a sociocultural dimension, an understanding of which is important in the analysis of data and the interpretation of research (Guyer, 1981). Best practice dictates that we use a standard definition when referring to the term “household”, as who makes the production and consumption decisions depends mainly on culture and composition of the household. Ideally, the definition of a traditional household includes the interaction of terminologies that point to a group of people living within the same compound who are likely related to each other through blood or marriage, preparing and sharing a common meal and combining resources (including income) or making income-related decisions together (Beaman and Dillon, 2012).

However, having a common meal and living together does not include a husband or a member of the family residing in urban areas (Berman et al., 1994). For instance, in a household in rural areas of the SSA region, it is common to find a household head living and working away from his wife and children, but still participating in major decisions in the household. According to the United Nations (2019), the definition of a household should be flexible and be based on the household size, composition and socioeconomic processes such as childbirth (population growth), demand for health care, housing and schooling, and setting of priority on expenditure needs. Household structure is influenced by marriage type, the number of children, intergenerational norms, employment type and costs of housing among other factors (United Nations, 2019). Anthropologists have long explored marriage in relation to lineage, with a long history of exploration of marriage and household systems across Africa. Common across Africa, as in much of the world, marriage often follows either patrilineal lineage, where a woman moves to her husband’s home, or matrilineal lineages, where a man moves to his wives’ home (Meekers, 1992). In matrilineal marriage, mothers own children, and traditionally women have high decision-making power, while in patrilineal marriage fathers’ own children and men have the final say on decisions (Mbweza et al., 2008).

It is worth noting that the terms household and family are not synonymous. A family is a household with kinship between individuals which implies some collective responsibility, whilst a household denotes a functional economic unit (Tipper, 2010). In the SSA region, a family is a subgroup of a household, made up of either a nuclear unit (husband and wife, husband and wife-with-children and a father/mother-with-children) or an extended unit (nuclear unit with in-laws), who engage in common production and consumption decisions (United Nations, 2019). However, these decisions are also influenced by the social, economic and health system environments, and the definition of a household as an institution also needs to be considered. From an institutional perspective, a family is defined as a unit consisting members who are related through kinship or by law through adoption or by marriage (Monticelli et al., 2017). A household as an institution goes beyond the production and consumption processes to include the social and political order which to a larger extent manifests in the context of intra and inter-household interactions (Berman et al., 1994; Bruton et al., 2010). Members of a household are governed by a set of rules and informal agreements that define their behaviour and gender roles. For instance, most societal norms across SSA place men in the highest position of society such as a community leader, the primary decision-maker, the breadwinner or the head of the household and income provider (Simiyu et al., 2013). Women are mainly care givers or home-keepers (Simiyu et al., 2013), responsible for activities such as feeding children, matters involving sanitation and health-seeking activities (Abraha et al., 2019), and fetching water and firewood (Ahmed et al., 2019). These roles were refined during colonial times where the status of men in the household and rights to inheritance were strengthened (Morgan and Warren, 2014). However, there has been consistent efforts over the years though the feminism movement in Sub-Saharan Africa to modernise gender roles including attempts to address the economic and political dimensions that inform gender roles (Aniekwu, 2006).

**2.** **Critiques and expansion of the household production of health approach**

In the mid-1990s, Berman et al (1994) argued that most public health programs in developing countries focused on solutions to specific diseases and excluded the broader household environment within which decisions and choices on health are made. The authors proposed the HPH approach as an integrative framework drawing from economic models and the grounded theory of anthropology (Berman et al., 1994). At the time, the scope of their discussion was limited to the production of health which the authors admitted fell short of fully addressing all the expectations of social scientists (e.g., economists, anthropologists, psychologists, etc.) and epidemiologists. Owing to the limitations on scope in their work, the authors proposed four main issues that require further research to broaden the applicability of the HPH approach. The first issue to consider is the household dynamics, including its structure and functions, and how these influence treatment seeking behaviours and ultimately health outcomes. Second, the perception, and how individuals define ill health should be taken into account, including an understanding of how intrahousehold processes interact with the health care systems. Third, health producing and sustaining behaviours in the household and how these affect the health of individuals is important to take stock of. The final issue is to identify and describe the different factors influencing health producing behaviours in relation to the general welfare of the household.

Berman et al. (1994) also recognized the possible inability of the HPH approach to provide practical guidance towards health interventions at community level. Cognizant of this, Pattanayak and Wendland (2007) reiterated that aggregating health determinants at community level would result in loss of information and narrow the focus into too specific an approach. They proposed that health determinants could be aggregated at individual and household levels, broadly within three main categories: direct (e.g. nutrition and health care), indirect and mediating factors (e.g. socioeconomic and cultural factors), and linking direct and indirect factors (e.g. maternal health).

Possibly due to the limitations articulated above, the framework proposed by Berman et al. (1994) was not widely applied to public health matters until 2001, when Simon et al. (2001) reiterated the concept of health production as a function of the family system. A family is a group of people not necessarily biologically related, who assume the responsibility of the health of an individual in a way that resonates with the kinship and household patterns broadly recognized in the world (Simon et al., 2001). Similarly, Crandall et al. (2019) highlighted the central role of families and their settings in public health. Specifically, they emphasised that families play a major role in producing health, encouraging healthy choices and supporting behaviour change in health policy and interventions (Crandrall et al., 2019). The assumption here is the interaction of one individual with a another by virtue of their relationship within a family setting which can contribute to health decisions (Saarela et al., 2019). Certain family members have the capacity to combine knowledge, attitudes, and behavioural norms with social factors, such as age, income and education among others, to make decisions on health (Yvonne and Yousey, 2006). There are, however, other members, particularly children and older individuals (e.g. with chronic health conditions and mental health issues), who require care and are likely to benefit from rather than contribute to health-related decision making at the family level (Crandrall et al., 2019).

**2.1** **Application of the** **household production of health approach in our study context**

While recognising the limitations of the HPH approach discussed above, we use the HPH framework to define health outcomes from several perspectives depending on whether the focus is on the internal (production and consumption decisions) or external (sociocultural, economic and health system context) processes of the household. Specifically, we look at the internal processes and describe health outcomes using two models - unitary and collective decision making (Tipper, 2010). External processes entail looking at the household from an institutional perspective, which considers the social, economic and health system environment within which the household operates (Berman et al., 1994). Internal processes are inherent in the household and its dynamics.

Let us first distinguish between the unitary and collective models of household decision-making. A unitary household is one in which a dominant person – either husband or wife - makes all decisions in the household (Bernard et al., 2020). The dominant individual can be considered a “dictator” (Berman et al., 1994) when making decisions that maximise household welfare subject to a given budget and specified production function whose inputs include time (Tipper, 2020). The dictator assumes the household has a single utility function that is to be maximised under two main assumptions. First, income is pooled together from all working members of the household to form a single budget. Second, each person in the household has the same preferences which are defined by a single household aggregate utility function ([Bá](https://www-sciencedirect-com.ezproxy.lib.gla.ac.uk/science/article/pii/S0264999318317425?via%3Dihub" \l "!)rcena-Martín et al., 2020). This type of household is somehow over-simplistic as it resembles a single decision-making unit similar to individual-based models of choice (Chiappori, 1992). It does not account for the existence of unbalanced decision-making power and ownership of resources and income, and it ignores differences in preferences among members in the household ([Bá](https://www-sciencedirect-com.ezproxy.lib.gla.ac.uk/science/article/pii/S0264999318317425?via%3Dihub" \l "!)rcena-Martín et al., 2020) arising from gender disparities and cultural norms of patriarchy and familial hierarchies linked to patriarchy, ancestors and religion among others.

Collective models overcome this challenge, at least in theoretical terms, by accounting for the heterogeneous nature of preferences which are represented by individual utility functions of different household members, and a household resource allocation system (Chiappori, 1992). In the collective model, decisions are made by several members of the household each of whom have their own preferences that are important in achieving desirable decision outcomes (Cherchye et al., 2018). Thus, decisions represent the outcomes of within-household bargaining (for more details on bargaining models see Himmelweit et al. (2013) and Doss (2013)). A joint resource allocation system is more efficient compared to unitary resource allocation (Tipper et al., 2020), implying that the aggregate of household utility can be higher in the collective model than in the unitary model.

The HPH approach does not need to be mathematically (although we provide its mathematical formulation as supplementary material 1) specified to describe the gender and intra-household decision-making process (Cherchye et al., 2018). The approach is, therefore, well suited for providing conceptual perspectives similar to the studies of Agbo et al. (2019) and Tipper (2010). In particular, we can use it to describe health decision-making within households based on the following assumptions: (1) households engage in different behaviours to generate health defined by the decisions they make in relation to disease treatment, prevention etc. (2) major decision makers in the households are health producers while those for whom decisions are made are receivers of health; (3) health producers operate within a social, economic and health system context specific to each household, community or broader environment; and (4) health producers in the household know how to make decisions and the decisions they make depend on how much they value those who demand health, the resources at their disposal, the skills or education level they have, and the time available among other factors. We acknowledge that these assumptions may not fully account for the wide range of complexities associated with these processes. However, we find this a useful framework within which to review and discuss the evidence base on livestock and human health decision-making in SSA, which we describe in the following sections.

**3 Literature search**

**3.1 Sources of data and search terms**

We searched and reviewed the literature following PRISMA guidelines for systematic reviews (Moher et al., 2009). We focused on primary studies from five databases, namely Embase, Scopus, PubMed, Web of Science and Google Scholar. We restricted ourselves to articles with the following search terms and Boolean combinations:((Household) AND ((decision-making) OR (choice experiment) OR (choices) OR (financial resource allocation) OR (resource allocation) OR (health) OR (gender roles) OR (decision-making power) OR (livestock) OR (livestock decisions) OR (health care expenditure decisions) or (out-of-pocket expenditure)) AND health) in sub-Saharan Africa OR Africa. The search terms were uniformly applied in all selected databases. Snowballing was also applied to obtain any additional relevant references within the bibliography of selected studies.

**3.2 Study inclusion and exclusion criterion**

The studies we selected met the following inclusion criteria. First, household decision-making, choices, gender, resource allocation and out-of-pocket expenditure in health were explicit terms in the primary studies selected. Second, the studies were based on primary data generated, among other methods, through surveys, in-depth interviews and focus group discussions involving households, community members or health providers living in rural and urban areas of any country within the sub-Saharan Africa (SSA) region. Third, the studies had to have been published in the English language after January 1/2000. Fourth, the decisions had to be in the areas of human and/or livestock health, e.g. nutrition, feeding, maternal health care and child delivery, health expenditure etc. We excluded systematic reviews, studies not focusing on decision-making at household level (e.g. teenage pregnancies in schools) studies not from a country in the SSA region or those unrelated to health in human and livestock. We also excluded studies that were conducted outside the range of our time frame i.e., January/2000 to May 2020.

**3.3 Data extraction**

Studies selected were first screened by title in all databases and the relevant ones were transferred into the Endnote online software. From the Endnote software, duplicates were removed, and a further examination of studies relevant to decision-making and resource allocation in health was done by reviewing the abstracts. The studies that fully met our selection criteria were moved into a separate folder in the software for in-depth review of the full text and information extraction. The review process used included two steps: a quality assessment of the qualitative or quantitative studies selected and information extraction (Fig.1). Such information was summarised using the framework of the household production of health approach described above. Additional information extracted from the studies is available in supplementary material 2. Information obtained from each study was compiled into themes and recorded for further evaluation and interpretation.

**Review process**

Qualitative studies

Quantitative studies

**Primary studies**

Newcastle -Ottawa Quality Assessment scale – adapted for cross sectional studies

(Sisay et al., 2018)

**Quality assessment**

* Primary decision maker(s)
* Decision types
* Decision description
* Factors that influence the decision outcomes
* Health outcomes

**Relevant information extracted**

Fig. 1: Schematic of the review process used to extract information on decision-making related to human and animal health in sub-Saharan Africa we describe and discuss in this article.

**3.4 Quality assessment of selected studies**

We used the Newcastle – Ottawa Quality Assessment Scale (NOS) adapted for cross-sectional studies to grade the studies selected for review out of 10 stars. We used the three quality indicators described by Sisay et al. (2018) for cross-sectional studies. The first indicator assesses the quality of the methodology in each of the selected studies and is represented by a weight of a maximum of five stars. The second indicator represents the degree of comparability, which amounts to a weight of a maximum of two stars. The third indicator determines whether study outcomes were subjected to quality checks, such as independent blind review, and the distinctness and appropriateness of statistical outcomes (for quantitative studies) and has a maximum score of three stars. Similar to Desyibelew and Dadi (2019), studies that scored points overall in our case were considered of sufficient quality for inclusion.

**3.5 Literature synthesis**

From the selected papers, we sought to find out what the decisions were, who made them, how they were made, why they were made, for whom and the factors influencing the decision-makers. Themes from different studies were pooled together to draw interpretations and analytical conclusions linking household decision-making and resource allocation with health outcomes.

**4. Results**

We identified a total of 3,774 articles from the five databases using the search strategy described above (Fig. 2), out of which 135 fulfilled the inclusion criteria.

Total number of publications identified (n =3774)

Articles selected after removing duplicates, commentaries, books and book chapters (n = 3415)

Abstract screening (n=3415)

Articles excluded based on the abstract (n=2874) because there was no mention of health, household and decision-making in either human or livestock health

Full-text screening to check for article eligibility (n=541)

Full text articles excluded and reasons for exclusion (n=406)

* No primary data used to write the article
* Article (s) was/were published before January / 2000
* Article(s) was/were systematic review(s)
* Articles did not focus on household decision making and resource allocation on health at the household level
* Articles not from a country within the SSA region

Number of studies included in the full text review and information extraction (n= 135)

Fig. 2: Flow diagram showing the number of studies included and excluded at various stages of the review process described in this study.

**4.1 Characteristics of the selected studies**

Here, we highlight some of the main features of the selected studies (for more details see supplementary material 2). The spatial distribution of countries where the studies were carried out is shown in Fig. 3 (a) and (b). Approximately 70% (94) of the studies related to human health and 30% (41) to livestock health. Human health studies reviewed were from 24 countries in the SSA region. Most of them were from East Africa followed by West Africa, southern Africa and central Africa (Fig. 4).

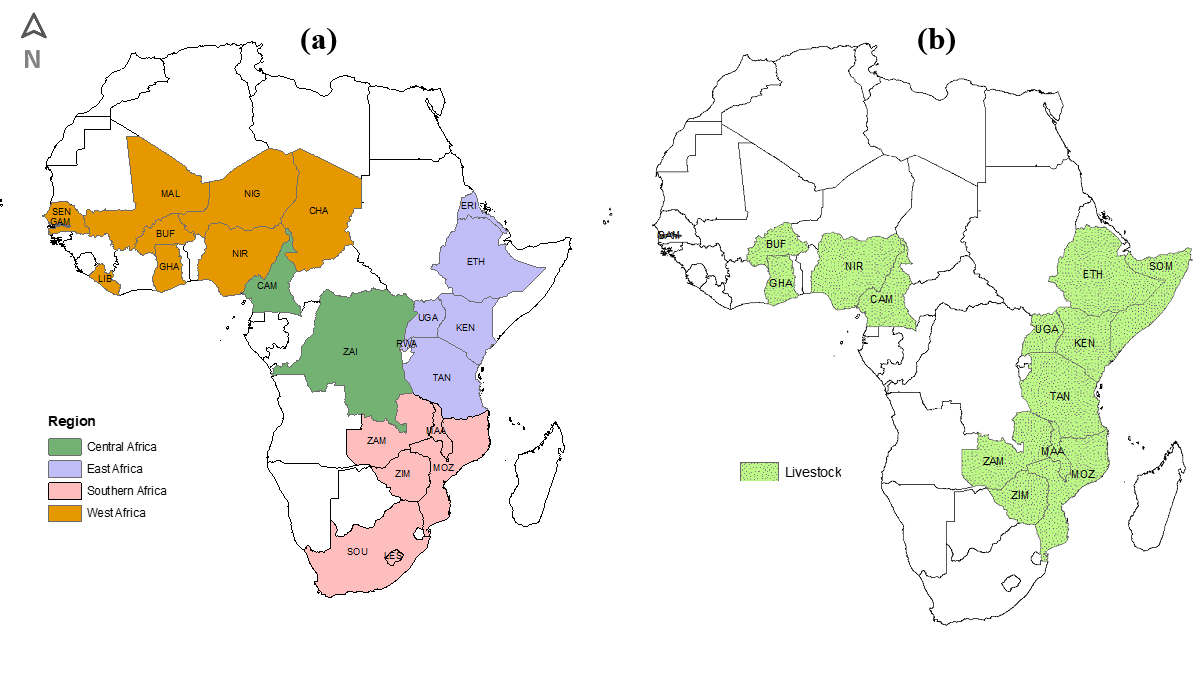


Fig. 3: Spatial distribution of countries where the studies relating to health decision-making in (a) humans and (b) livestock included in this review were conducted.

Fig. 4: Number of primary studies on decision-making related to human health by country included in the review we describe and discuss in this article.

Fig. 4: Number of primary studies on decision-making related to human health by country included in the review we described and discuss in this article.

Studies describing livestock health decisions (Fig. 5) were from 15 countries, predominantly within East Africa followed by West Africa and southern Africa. Only one study was from central Africa.

Fig. 5: Number of primary studies on decision-making related to livestock health by country we describe and include in this review.

For most of the studies reviewed, data were generated in rural or both rural and urban areas (Table 1). However, there were more studies related to human health in urban and peri-urban settings compared to livestock health.

Table 1: Location (rural or urban) where the studies reviewed in this paper were conducted.

|  |  |  |
| --- | --- | --- |
| **Place of residence** | **Human health**  **% studies (N = 94)** | **Livestock health**  **% studies (N = 41)** |
| Rural | 51 | 83 |
| Rural and urban | 34 | 10 |
| Urban | 4 | 2 |
| Rural and peri-urban | 4 | 2 |
| Urban and peri-urban | 2 | - |
| Urban, rural and peri-urban | 2 | - |
| Peri-urban | 2 | 2 |

We identified nine types of decisions related to human and ten decisions related to livestock health (Table 2). Six types of decisions were common in both humans and livestock, namely disease prevention, treatment, household expenditure (e.g. school fees and food), nutrition, health investment (e.g. health insurance) and health expenditure (i.e. out-of-pocket health care costs). Decision making on maternal health care, childbirth, contraception and fertility as well as decision-making power were exclusively related to human health. Breeding, livestock ownership, and decisions around market and resource (income and assets) transfer were exclusive to livestock.

Table 2: Types of decisions identified in studies on decision-making related to human and livestock health we reviewed for this article.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Human health** | | | **Livestock health** | | | |
| **Decision types** | **% studies**  **(N = 94)** | | | **Decision types** | | **% studies**  **(N = 41)** |
| Disease prevention | 10 | | | Disease prevention | 22 | |
| Disease treatment 26 | |  | | Disease treatment | 12 | |
| Contraception and fertility | 18 | | | Breeding | 20 | |
| Household expenditure | 1 | | | Household expenditure | 2 | |
| Maternal health care and childbirth | 17 | | | Livestock ownership | 15 | |
| Nutrition | 9 | | | Nutrition | 2 | |
| Health investment | 3 | | | Market | 12 | |
| Decision-making power | 4 | | | Health investment | 2 | |
| - | - | | | Resource transfer | 10 | |
| Health expenditure | 13 | | | Health expenditure | 2 | |

**4.2 Household production of health approach: human health decision-making**

Below, we summarise the evidence gathered through our review from the perspectives of unitary versus collective decision-making and considering the institutional dimension we described above. Based on the 135 studies reviewed, 71% of the studies were classified as either unitary or collective. It was not possible to determine who the main decision maker(s) was/were in 29% of the studies reviewed and thus we used these proportion of studies to obtain information relevant in the institutional approach of health decisions.

**Unitary model**

The majority of household decisions related to human health identified in this review can be classified as unitary (44% of studies) since decisions were made by either household head/spouse/mother-in-law. This implies that most human health choices are based on the preferences of an individual decision-maker, rather than on those of other household members who may be impacted by this decision. For instance, men/husbands prefer to dictate the contraception method that a wife should use which she is expected to accept without interrogating his preferred choice (Mosha et al., 2019). Women still seek contraception outside of their husbands’ knowledge, although we identified differences between rural and urban settings. In rural areas, if a woman chooses to limit the family size of the household through contraception use without the approval of her husband, her behaviour is said to be covert (Sundararajan et al., 2019) and an indicator of adultery (Mosha et al., 2013). However, in urban areas, some wives/women are free to express these preferences (Bogale et al., 2011; Mosha et al., 2013; Atake and Ali, 2019). Men/husbands rarely use contraception to achieve a preferred family size except in special cases where a health care provider has instructed them to use condoms, for example to prevent HIV infection/re-infection (Harrington et al., 2016). A health care provider (HCP) is a formally trained person providing care, e.g. treatment, diagnosis, and medicines in a hospital, clinic or community, but is a term also used to refer to attendants in pharmacies and dispensers, shopkeepers and informal vendors (Rowe et al., 2018). HCPs make collective decisions with patients while considering the patients’ health problems, choices and expectations. Although an HCP gives advice and evidence, they also, together with the patient, make decisions and provide an action plan (Gower et al., 2020).

Another example relates to treatment decisions for newborns and children. For instance, mothers choose their preferred medicine sources to treat febrile illness in new-borns. Here we consider a febrile illness a type of new-born syndrome characterised by high fever, catarrh, loss of appetite and coughing (Charles et al., 2008). The sources of medicines to treat febrile illness can either be a shop, hospital or traditional healer (Kazembe et al., 2006; Nalwadda et al., 2015) subject to the household’s financial resources (Onarheim et al., 2017). Sometimes grandmothers of a sick child choose preferred treatment options which can either be a visit to a hospital, traditional healer or a religious leader (Haskins et al., 2017). However, in the case of treatment-seeking for malaria, the child’s father or the oldest male individual in the household frequently decides on the type of health care to be sought (Okoko and Yamuah, 2006).

Maternal health care and childbirth decisions are made either by husbands or grandmothers of sick children. Most pregnant women do not get to choose how and where they access health care. Instead, their husbands choose for them the type of health facility, time when they should visit and the transport they should use (Mohammed et al., 2019). Most husbands also choose when their pregnant wives seek medical care (Mohammed et al., 2019), and sometimes accompany them during antenatal visits for HIV tests (Magoma et al., 2010) and hospital visits to provide any support required, e.g. medical supply purchases (Adjiwanou and LeGrand, 2014; Abraha et al., 2019; Greenspan et al., 2019). In some cases, paternal grandmothers make choices for first-time mothers during the period of pregnancy, after childbirth and when seeking traditional treatment options (Gupta et al., 2015).

Women typically make decisions on disease prevention for under-fives (Fantahun et al., 2006). For instance, they determine HIV testing preferences to prevent mother-child transmission (Ford et al., 2018) and, if the household has HIV-positive infants (Thairu et al., 2005), women choose their preferred diets (Beyene et al., 2015).

**Collective model**

In 27% of the studies reviewed, decisions were collectively made by husband and wife/husband and male elders/husband and in-laws/husband, in-laws and health care providers/husband and female friends/neighbours. For human health issues, collective (joint) decision-making among married couples is common depending on the decision-making power of women (Dadi et al., 2020), the amount of income they have (Wegs et al., 2016) and the degree of economic dependence on men (Blanc and Wolff, 2001). For example, husband and wife jointly determine the choice of family size which is subject to the contraception method preferred by the woman to achieve it (Hollos and Larsen, 2004) and the efficacy of the method (Wegs et al., 2016). Another example relates to disease prevention decisions, such as allocation of mosquito nets to available bed spaces. A couple collectively (jointly) allocates nets to individuals in the household based on their biological vulnerability to malaria, age and their economic position in the household (Lam et al., 2014). During collective decision-making processes, women bargain, and their bargaining power in urban areas is typically higher compared to those in rural areas (Lamidi, 2015).

Collective decision-making for treatment is not limited to a couple’s preferences only. For instance, for a child who has fever and convulsions, treatment preferences were found to be drawn from the advice of fellow female friends, relatives and neighbours and financial support from husbands and elders (Molyneux et al., 2002; Franckel and Lalou, 2009). Sometimes, the preferred treatment options for a pregnant woman are chosen by a husband and a neighbour, who assess the severity of the illness to determine the type of care she needs, the time the care should be sought, the means of transport and how costs at the health facility will be covered (Munguambe et al., 2016). Due to the scarcity of resources and unbalanced decision-making power in the household, wives bargain by demonstrating good behaviour to their husbands and negotiating indirectly with him through seeking support from their mothers, brothers and uncles who influence decisions to their favour (Nikièma et al., 2008).

The choices of a pregnant woman with respect to maternal health care are determined by the husband, in-laws and traditional birth attendants (TBAs), subject to the amount of income the household has to cover associated costs (Ganle et al., 2015; Somé et al., 2018; Ahmed et al., 2019). According to Gurara et al. (2020), a Traditional Birth Attendant (TBA) is an old, respected woman in the community with informally acquired home birth attendant skills. Her main role is to help a pregnant woman during the childbirth process. Pregnant women trust TBAs because their care meets the community’s cultural and traditional expectations. When a woman gives birth, her preferences and those of the newborns are based on the choices of her husband and female friends subject to the financial resources the husband provides (Iganus et al., 2015). After childbirth, a couple makes collective decisions on nutrition, childcare, cleaning and cooking (Mkandawire and Hendriks, 2019). In some occasions, a pregnant woman together with her husband defines her preferred nutrition and childcare before as well as after childbirth (Mkandawire and Hendriks, 2019).

Decisions on nutrition in the household are made by husbands, wives, in-laws and health care providers collectively. For instance, to prevent chronic energy deficiency, a husband and wife determine the diet diversity preferences for individual members in the household (Hindin, 2005). Husbands, wife and mothers-in-law express their preferences on food acquisition, cooking and consumption at different phases of the food preparation process (Pilla and Dantas, 2016). If nutrition decisions are on diets for young children, health care providers, grandmothers of children and mothers choose the preferred food for children while the father provides money to purchase the preferred food (Faye et al., 2019).

**Institutional approach**

The institutional approach demonstrates how the internal and external processes of the household interact during the decision-making process. Berman et al. (1994) use three components, 1) the social; 2) economic; and 3) health system environments. We add a fourth component that encompasses individual- and household-level characteristics largely associated to demographic factors.

The first is the social component which describes how religion, culture, norms and tradition influence decision-making around health. Some religious beliefs of the household determine whether a child is immunised or not (Singh et al., 2012). For instance, Singh et al. (2012) found out that women who practised Islamic religion were less likely to let their children go through the full immunisation process. Religious beliefs of the primary decision-maker also determine whether the choice of maternal health care provider is a modern medical facility or a traditional birth attendant (Ahmed et al., 2019). This means that religion influences the acceptability of the choice of health facility for childbirth by pregnant women (Ganle et al., 2015; Yarney, 2019).

Gender norms and intergenerational relations influence decisions on resource allocation (Franckel and Lalou, 2009). For instance, it is expected that a child’s father will provide financial support for the treatment of a sick child based on his role as a father (Haskins et al., 2017). It is also expected that a wife will seek permission from her husband before accessing maternal health care (Ganle et al., 2015). Societal norms determine the community’s perception of childhood illness and the time period a child is considered a new-born (Nalwadda et al., 2015). This is important in determining the implication of death and value of the child based on birth order, gender and priority to allocate money for treatment (Onarheim et al., 2017). Some societal norms also encourage communal decision-making (Ganle et al., 2015) and membership to social networks with friends, neighbours and relatives from whom money is borrowed to cover health care cost (Onah and Govender, 2014). Further, cultural beliefs determine whether the carer’s perception of a child’s illness requires traditional or modern medicine treatment approaches (Haskins et al., 2017). Cultural beliefs also restrict pregnant women from delivering a child outside of the home in contexts where women are not allowed to be seen naked especially by male doctors during childbirth (Abraha et al., 2019). They instead strengthen their trust in traditional birth attendants and practices before and after childbirth (Ahmed et al., 2019). For instance, in the pastoralist communities in Afar region of Ethiopia childbirth is seen as a natural process deeply rooted in traditional and religious practices of the pastoralists’ lifestyle (Ahmed et al., 2019). Women are encouraged to give birth at home by their husbands and mothers in-law as a delivery at the health facility would mean exposing their bodies to male medical attendants which is prohibited, as well as, make it hard to perform prayers and rituals on the newborn immediately after birth (Ahmed et al., 2019).

The second component is the economic environment comprising factors such as wealth, income, education and employment. For example, the purchase of mosquito nets to prevent malaria depends on the price of the net and the perceived benefits of using treated nets, including improvements in health outcomes for those using the nets and financial benefits for those supplying them (Gebresilassie and Mariam, 2011; Gingrich et al., 2017). The number of nets bought depends on the average monthly income and forgone benefits resulting from time lost due to malaria illness (Biadgilign et al., 2015). The allocation of financial resources for the treatment of infant illness depends on the cost of treatment (Molyneux et al., 2002) and the amount of money the father has (Nalwadda et al., 2015). Other economic factors that determine the choice of treatment include the cost of consultation, price of medicines, transport cost and waiting time at health centres (Charles et al., 2008).

The literacy level of primary decision-makers determines whether the household acquires a treated mosquito net or not in the southern part of Ethiopia (Gebresilassie and Mariam, 2011). The absence of a literate person in the household is likely to cause a potential failure to seek health care which can lead to under-5 mortality (Fantahun et al., 2006). More broadly, the level of education of caregiver(s) partly determines whether a child is immunised or not, the choice of health care provider (Habtom and Ruys, 2007) and the choice of treatment (Kazembe et al., 2006). It also influences childbirth (Mrisho et al., 2007; Beyene et al., 2015; McKenna et al., 2019), family planning (Lamidi, 2015) and health investment decisions, e.g. acquisition of health insurance (Kirigia et al., 2004; Nakovics et al., 2019).

Similarly, the value of wealth (assets) in the household determines whether a child is delivered at home or health facility (Ahmed et al., 2019), is immunised or not (Singh et al., 2012) and whether they develop chronic malnutrition (Agadjanian and Jansen, 2018). Formal employment is important in determining the ability of men to support women in the use of contraception (Belay et al., 2016) and to invest in health insurance (Kirigia et al., 2004). Women’s ability to earn income and having paid employment also plays a role (Atake and Ali., 2019) in determining contraception use and fertility.

The third component is the health system and its availability, which influences the choice of health care sought. For instance, accessibility of a hospital is determined by distance (Biadgilign et al., 2015) as a result of its geographical location from the household, as well as weather coupled with the quality of roads (Greenspan et al., 2019). A well-equipped hospital and the attitude of hospital staff partly determine the acceptability of care (Lungu et al., 2008) and perceived quality of service (Habtom and Ruys, 2007) by household members. Other factors that influence the choice of hospital include the availability of medicines (Kazembe et al., 2006), severity of symptoms (Molyneux et al., 2002), timing of decision to seek care (Okoko and Yamuah, 2006), time spent at the hospital and financial resources available to meet basic needs in the household such as food and housing versus enabling access to high quality health care (Charles et al., 2008).

The fourth component includes factors related to demographic and other characteristics of the individual and household that interact with the social, economic and health system environment during the decision-making process. For example, in malaria prevention decisions, household size, age (Lam et al., 2014) and gender play an important role in the allocation of treated nets (Gebresilassie and Mariam, 2011; Gingrich et al., 2017). In maternal health care and neonatal decisions, age and ethnicity of the mother are important (Fantahun et al., 2006; Singh et al., 2012). Decisions on contraception and fertility are influenced by a woman’s marital status and attitude towards family planning (Dadi et al., 2020).

**4.3 Household production of health approach: livestock health decision-making**

**Unitary model**

About 49% of decision-making for livestock matters, including acquisition, management and health, are classified as unitary. Most of the studies (44%) were exclusively carried out in rural areas where reliance on livestock is the greatest. Unitary decisions in livestock are mostly made by men compared to women. However, women own, control and determine breed preferences for sheep and goats, and pigs and poultry kept in the household (Simiyu and Foeken, 2013; Assa et al., 2014). In addition, women choose preferred prevention and treatment options of Newcastle disease in poultry (Campbell et al., 2018a; Campbell et al., 2018b; Otiang et al., 2020). Women also make decisions that relate to the care of calves (Mugisha et al., 2008) and milk consumption in the household (Onono et al., 2013). However, if women make market decisions intending to generate cash, men contest them because they are responsible for these decisions and budgeting the income generated from livestock sales (Duma et al., 2018). For example, in some cases men from pastoral communities limit migration patterns to places that are far from the market as a way to stop their wives from selling milk to generate cash (McPeak and Doss, 2006). In such cases, the only time women choose preferred markets for livestock is when they are selling livestock that have been given to them as gifts by their fathers or husbands (Price et al., 2018).

Overall, men own, control and make decisions on the health of livestock in the household. For example, they determine choices for the prevention of vector-borne diseases (Mugisha et al., 2008). The decision is subject to a household budget that in some cases prioritises livestock health financial resource allocation over human health (Mugisha et al., 2008) and education investment (Kazianga, 2012). Men also determine the actions over the prevention of avian influenza outbreaks in poultry subject to a given set of biosecurity measures (Kirunda et al., 2014). They also choose preferred treatment options for gastro-intestinal nematodes in goats by purchasing medicines from drug vendors (Onono et al., 2013; Zvinorova et al., 2017). Other decisions made by men include investment in cattle insurance (Bishu et al., 2018) and education of male members of the household who are expected to engage in paid employment instead of inheriting livestock (Lesorogol et al., 2011). Decisions on keeping different livestock types are determined by men subject to the amount of land available, credit and market information (Asante et al., 2017).

**Collective model**

Regarding livestock decisions, 22% were collective. For example, a couple collectively allocate labour resources to production activities on the farm to maximise total household income (Bjornlund et al., 2019). During periods of intense milk production, a couple collectively agree to share milk such that women control milk sales in the evening while men control milk sales in the morning (Njuki et al., 2016). When selecting a livestock breed, a couple collectively determine their preferences for each livestock type based on traits such as expected yield of animal products (e.g. milk), body size and colour, and its adaptability and ease to sell (Marshall et al., 2016; Chawala et al., 2019). Although collective decision-making involves men and women, men allocate and control the amount of decision-making power that women have (Anderson et al., 2016).

**Institutional approach**

Similar to decision-making around human health matters, here we identified four components within the institutional approach: social, economic, health system and demographic factors.

The social component consists of the cultural values, norms and religious beliefs governing livestock. Social benefits may relate to cultural practices, for example livestock slaughtering to feed visitors during holidays and wedding seasons, and mourners during funerals (Duma et al., 2018). Further, the allocation of decision-making authority to women in the household depends on the husband’s symbolic capital (Anderson et al., 2016). Symbolic capital represents the amount of economic, social and cultural capital in possession of an individual that gives them the ability to legitimately claim honour, respect, prestige, esteem and recognition (Conway et al., 2016). In most cases, culture permits men to make all household decisions except in crop marketing (Ajadi et al., 2015). The ability of women to generate cash from livestock sales and participate in decision-making varies with culture (Duma et al., 2018; Mugisha et al., 2008). In some communities e.g. pastoralists, cattle keeping is considered a man’s domain and the treatment of vector-borne diseases is subject to his availability in the household, acaricide supply and his ability to self-treat sick cattle (Mugisha et al., 2008). Culture also plays a major role in determining the use of traditional medicines in the treatment of livestock, (e.g. Newcastle disease in poultry) which in turn limits uptake of the respective vaccine (Campbell et al., 2018a). Other than culture, religion could also play a role in practices related to livestock handling and health. For instance, some bird keepers in Uganda who practise Islamic religion compared to the Pentecostals may engage in risky practices such as irregular cleaning of water and feed troughs leading to the spread of Avian Influenza (Kirunda et al., 2014).

The second (economic) component includes education, wealth, income and market factors that influence health decisions in livestock. Education level is important in determining the enrolment rate into livestock insurance to help overcome morbidity and mortality through transfer of losses to a third party (Bishu et al., 2018) and paid employment as a form of inheritance (Lesorogol et al., 2011). It also helps determine the choice of livestock breed to be kept (Assa et al., 2014), choice of a health provider and ability to adopt a breed, e.g. indigenous chicken (Onono et al., 2013; Kamau et al., 2019). Educated farmers are more likely to choose open slaughter for their birds to control avian influenza virus compared to their counterparts (Kirunda et al., 2014). A farmer’s ability to adopt artificial inseminationdepends on his/her experience in dairy farming, record keeping and use of good management practices, such as water provision and availability of feeds (Mwanga et al., 2019).

Furthermore, the amount of wealth that a household owns depends on whether they have large livestock (Simiyu and Foeken, 2013), durable goods, farm equipment and a large farm size (Kalinda, 2000; Kazianga, 2012). The amount of wealth helps determine whether the household participates in vaccination programs, e.g. against peste des petits ruminants (Acosta et al., 2019) and the choice of health provider (K’Oloo et al., 2015). In addition to wealth, the amount of income generated from livestock (e.g. chickens) sales depends on the amount of time, labour (Duma et al., 2018) and health investments (Bishu et al., 2018). Women generate cash from the sale of milk (McPeak and Doss, 2006), subject to the amount of market information available, distance to the market and market location (local or urban) (Ojango et al., 2018; Akidi et al., 2018).

The third componentis the health system, which is characterised by factors such as illness type, availability and accessibility of livestock drugs and vaccines, drug quality (Holt et al., 2016) and type of health care provider available (K’Oloo et al., 2015). Other important factors include the distance to vaccination points (Mutua et al., 2019) and source of livestock health information (Caudell et al, 2020).

The fourth component consists of livestock demographic factors which, when considered in conjunction with the social, economic and health system components, influence decisions made. For instance,the selection of livestock breed is determined byage, body condition, weight (Ojango et al., 2018) and livestock type (Simiyu and Foeken, 2013).Thegender of the livestock type is important in determining the number of cattle insured, production system (Bishu et al., 2018) and the culling process applied (Marshall et al., 2016). The production system depends on the scale of production, e.g. whether large, medium or small, and time (Njuki et al., 2016).

**4.4 Joint examination of decision-making behaviours around human and livestock health**

Here we show that behaviours related to human and livestock health decisions in SSA are driven by a range of interacting factors, including the social, economic and health system environments within which households are embedded as well as the demographic (and other) characteristics of households and herds. Husbands, wives, in-laws, health care providers and neighbours are primarily responsible for decision making in human health-related matters, while ill infants, children and pregnant mothers are the main beneficiaries of these decisions. Husbands and wives make decisions on health issues that benefit livestock, i.e. cattle, sheep and goats, poultry and pigs. If we assume that households will benefit from improving the health of infants, children and mothers, then the main decision makers will seek to optimise these benefits by accounting for the preferences of different household members. For infants, children and mothers to be healthy, the inputs include healthy diet, quality medicines, contraceptives, vaccines, well-equipped hospitals, treated mosquito nets, income, wealth, cost of treatment, education and reduced waiting time at a health facility. The decision makers use their skills, experiences, time, perception of the severity of the disease, religious and cultural beliefs and the value they place on the health beneficiaries to combine different levels of these inputs to attain desired health outcomes. Similarly, households benefit from healthy cattle, sheep and goats, poultry and pigs. Those who make decisions around livestock health matters generate positive health outcomes by providing inputs such as quality breeds, livestock markets, drugs, vaccines, vaccination points, artificial insemination, biosecurity measures, access to veterinary services, income and wealth. They use their skills and time (while taking into account the production system type, age and gender of the livestock type) to combine different levels of these inputs to produce desired livestock health outcomes.

As we summarise in Fig. 6, decision making around human and livestock health is intertwined by the resource transfers and the trade-offs across multiple health outcomes in the household (Fig. 6). Household well-being derives both from human and livestock health outcomes (leading to well-being or utility trade-offs). Similarly, the relationships around the generation of positive human and livestock health outcomes are inter-related (leading to production-related trade-offs). Human and livestock health production approaches are linked in two main ways. First, ownership of livestock is part of a household’s wealth. This is also an input to the human health model as livestock can be converted into cash to finance health expenditure. Second, expenditure on livestock health may be prioritized over human health and education investment due to livestock’s role as a store of wealth in the household (Kazianga, 2012; Husøy et al., 2018). Livestock is also a source of nutrition and decision-making power in the household. For instance, livestock ownership is a key source of protein and income to prevent malnutrition in pregnant women (Kedir et al., 2014) and children (Njuki et al., 2016). Livestock ownership is a source of decision-making power for women in nutrition and income use (Price et al., 2018).

Overall, to explore the relationship between the human and livestock models two steps should be followed. The first step defines the required inputs into the separate health models for human and livestock to produce health. The second step shows the technical relationship between the two models which can be demonstrated using the inputs into a production function. Understanding both steps is necessary if effective interventions are to be designed which can improve collective health outcomes.

**Health system component** e.g., type of health provider, drugs, vaccines, distance to service provider, vaccination points, health information

**Social component** e.g. cultural values, religion, social benefits

**Economic component e.g.** wealth, income, education, market

**Livestock demographic factors** e.g., age, gender, body size, colour weight, livestock type, production system

**Health producing behaviours:**

* Prevention
* Treatment
* Breeding
* Health investment
* Household expenditure
* Health expenditure
* Livestock ownership
* Market
* Resource transfer
* Nutrition

**What are we producing?**

* Healthy cattle
* Healthy sheep and goats
* Healthy poultry
* Healthy pigs

**Health outcomes**

* Increased survival
* Reduced mortality
* Reduced infections
* Quality breeds

**Health system component** e.g. type of health provider, distance to the facility, waiting time, availability of equipment, quality of service, geographical location, perception of health system

**Social component** e.g. religion, gender norms and traditions

**Economic component e.g.** wealth, income, education and employment

**Demographic and household level component:** e.g. age, gender, marital status, ethnicity, household size, place of residence

**Health producing behaviours:**

* Prevention
* Treatment
* Contraception and fertility
* Maternal health care and childbirth
* Nutrition
* Household expenditure
* Health investment
* Health expenditure

**Relationship**

Transfer of income from human health and education to livestock health

**Health outcomes**

* Increased survival
* Reduced mortality
* Reduced infections

**-Relationship**

Source of income for human health care and education

-Source of nutrition

**What are we producing?**

-Healthy children

-Healthy mothers

-Healthy household members

-Smaller household sizes

**(a)**

**(b)**

Fig. 6: Schematic adapted from Berman et al (1994) that expands the household production of health approach to link together behavioural processes related to both human and livestock health.

**5. Discussions and conclusions**

The objective our study was to examine the multifaceted dimensions of household decision-making around human and animal health matters within the SSA region. Using the household health production framework applied to human and livestock health separately, we reviewed studies conducted across eastern, central, western and southern Africa over the past 20 years. Decision types ranged from disease prevention and treatment to generic health improvements (e.g. nutrition and breeding choices in livestock) as well as allocation of resources for household-level and health-specific issues. We found that most of these decisions (human health, 44%; and livestock health, 49%) were unitary, i.e. involving one main decision maker, and power dynamics that favour men compared to women. Some studies (human health, 27%; and livestock health, 22%) reported that decisions were collectively made by husbands and wives, or by men and in-laws/neighbours/health care providers, although men tended to have the ultimate decision-making authority also in these instances. We subsequently examined how, in a SSA context, these processes are interlinked due to the important contributions of livestock health and productivity towards household health and nutrition, livelihoods, and healthcare and other costs (e.g. education). Women play an important role in local economies in subsistence farming communities and supporting their empowerment in livestock production is an important pathway to improving overall household health and food security.

This is the first review that comprehensively describes decision-making processes around human and livestock health in the SSA region, and how these are interlinked. We expand Berman et al. (1994)’s conceptual framework to include a demographic component in addition to the social, economic and health system environments, and demonstrate how these factors interact with each other. For example, decision-making outcomes are influenced by gender, available resources, decision-making power, individual’s education, and wealth and income among other factors. We also highlight the importance of the choice of appropriate decision-making structure, i.e. who drives the process in households. Our findings confirm the perception that, in SSA, household decision-making happens within a ‘black box’ as argued by Becker (1981) - which means men dominate most of the decision-making processes at the household level. More specifically, we identify high levels of unitary decision-making which disregards individual preferences within the household. This unitary model conceals intra-household bargaining and distribution of resources with a dominant (male) individual pooling together income to form a single budget. This individual allocates income to decisions single-handedly and the outcome is only visible from the outside world (Donni and Ponthieux, 2011).

We assumed the existence of an organised household which involves division of labour and resources between men and women. However, we found that gender systematically influences the relationship between income, wealth and health outcomes. Societal and cultural norms give men the ability to control and own income and household resources leading to gender inequality. For example, the human health studies we reviewed (e.g. Okoko and Yamuah, 2006; Iganus et al., 2015; Munguambe et al., 2016; Mohammed et al., 2019; Mosha et al., 2019) show that men dominate all decisions in the household except on a few occasions where women’s choices have greater influence. For example, in relation to contraception use (in urban areas), treatment of children and infants, disease monitoring and prevention (e.g. HIV testing and mother-child transmission), and generic health improvements (e.g. nutrition). In livestock health-related matters, women make decisions on breed selection, milk production and market sales (Simiyu and Foeken, 2013; Assa et al., 2014; Duma et al., 2018). However, when women are involved in the decision-making process, men always have the final say because they typically own and control wealth and income in the household. The bargaining power of women in household decision-making is subject to whether they are educated or have paid employment or control over household income. In the absence of these factors, women ought to demonstrate ‘good behaviour’ to gain some favour from the husband and in-laws.

Identifying solutions to these intra-household inequalities in the SSA region is difficult due to the dominance of an individual (man) who owns, controls and determines how most resources are allocated to health. An approach involving collective decision-making would provide women with bargaining power and account for their individual preferences. In addition, intra-household financial resource allocations could be enhanced through transfers and trade amongst household members. For instance, transferring a proportion of household assets and income to women would improve health outcomes as women tend to be involved in maternal and neonate/child healthcare, and, in some instances, decisions around contraception and certain treatments. Given the synergistic interactions between processes related to human and livestock health, further resource re-allocations could be considered between human and livestock.

We identified a number of limitations of our study. First, we focused on publications in the English language. This might explain the overrepresentation of studies from East Africa in our literature search, as in most countries in the western and central African regions French is the official language. Another explanation is that higher livestock numbers in East Africa might motivate more efforts in livestock health research and publications. Specifically, the East African region keeps the highest number of Tropical Livestock Units (TLUs) (98,524), followed by the West African region (53,016 TLUs), southern African region (16,731 TLUs) and central Africa (9,843 TLUs). Nthambi et al (2021) defines a Tropical Livestock Unit (TLUs) as a standard unit to measure the number of livestock owned. Second, most of the primary studies retrieved through the literature search are qualitative in nature and therefore we chose to use the conceptual approach described above to discuss household decision-making, inequalities and health outcomes. A quantitative approach would have given us an opportunity to measure the extent of the inequalities caused by decision-making behaviours in the household. Third, while we are generalising the different determinants of health based on the relevant literature we review in this study, we recognise the specific place and cultural contexts where the interaction of the social, economic, health, demographic and household level factors may vary and are not necessarily consistent across countries in the sub-Saharan region.

This study calls for a more careful understanding of household-level dynamics, roles and inequalities in relation to decisions relevant to the health of people and livestock, and of the main beneficiaries of these decisions. However, a number of recommendations arise from our review. First, health interventions that promote gender equality and empowerment of women in SSA should be encouraged. Such interventions may include educational and awareness programmes focusing on the importance of women’s participation in health decisions, hence household health and productivity. In addition, women’s contributions to the household in terms of income and wealth should be acknowledged as this would improve their bargaining power in decision-making. To achieve this, policies that promote income and wealth equity, e.g. women’s ownership of land and access to education and employment, should be encouraged. Finally, given that such gender and health inequalities are embedded in cultural and social norms and therefore challenging to change in the short term, individual governments in SSA must ensure steady progress towards universal health coverage and functioning health insurance schemes.

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