

Antimicrobial resistance and the non-accountability effect on consumers' behaviour

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Abstract

Purpose – A status quo situation has occurred among actors, policymakers, producers, retailers and consumers where no one takes the lead on the antimicrobial resistance (AMR) fight. Common theoretical approaches to behaviour including awareness, understanding and use are insufficient in the AMR context. In this paper, the authors suggest the application of accountability literature to fully understand the status quo situation with AMR.

Design/methodology/approach – AMR in food has become an alarming problem in the past decade and is an increasing threat to global health. The knowledge about AMR often comes from a medical context where the perspective is completely different. Therefore, it is difficult for consumers to apply this to a grocery store context purchasing food.

Findings – This paper uses the concept of accountability and the significant other within the accountability field and discusses how this could help overcome the non-action state of mind of consumers and other actors.

Practical implications – Enhanced accountability could significantly improve One-Health solutions for combating AMR. By fostering a culture of shared responsibility and transparent communication among stakeholders, the silo effect may be mitigated, promoting collaborative efforts. Accountability mechanisms should ensure that roles and responsibilities are clearly defined and communicated across sectors, such as health care, agriculture and policymaking. Educational initiatives can increase AMR awareness, enabling stakeholders to make informed decisions. Integrating perspectives from various domains will facilitate the development of holistic strategies, thus improving the overall effectiveness of efforts to address AMR and ensuring a sustainable approach to public health.

Social implications – Enhanced accountability in AMR management can lead to significant social benefits. By promoting transparency and collective responsibility, communities can foster greater trust and cooperation among various stakeholders, including health-care providers, policymakers and consumers. Increased awareness of AMR can empower individuals to make informed decisions, thereby promoting public health and safety. Socially, this could lead to more sustainable practices in antibiotic use and a reduction in the spread of resistant infections. In addition, fostering a culture of accountability ensures that efforts to combat AMR are more inclusive, equitable and effective, ultimately benefiting society as a whole.

Originality/value – The proposal to create strategies according to a basis of accountability can be applied at all levels of the AMR problem and for all actors. This therefore provides important knowledge about how AMR can be approached in a more long-term way where initiatives to prevent the spread of AMR do not take place in parallel or become difficult to access.

Keywords Antimicrobial resistance, Behaviour change, Sustainable consumer behaviour, Sustainable health, Accountability

Paper type Conceptual paper

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1. Introduction

In recent years, the global community committed to curbing antimicrobial resistance (AMR) has increasingly recognised the intricate interplay between human, animal and

environmental health, prompting the emergence of a paradigm known as One Health (European Commission, 2017; AVMA, 2008; FAO, UNEP, WHO, WOA, 2022). This holistic approach acknowledges the interconnectedness of ecosystems and the health of all living organisms, emphasising that the well-being of humans, animals and the environment are intimately linked. AMR refers to the ability of microorganisms to withstand the effects of antimicrobial drugs, rendering them ineffective in treating infections. The intersection of food and AMR is a critical area of concern within the broader One Health framework (Larsson *et al.*, 2023; Lebov *et al.*, 2017) and poses significant challenges to food safety, public health and agricultural sustainability.

Addressing AMR in the food context within the One Health framework requires a concerted effort and shared responsibility among various stakeholders, from policymakers and health-care professionals to veterinarians, food producers and consumers (European Commission, 2017; WHO, 2021). Even if the importance of the One Health approach is emphasised by several international organisations such as WHO, European Union, FAO, UNEP and WOA, the transdisciplinary collaboration between sectors is difficult to achieve. Here, accountability plays a pivotal role in ensuring that all parties are actively engaged in combating the threat of AMR and promoting responsible antimicrobial use (see Commission, e.g. European Commission, 2017; FAO, UNEP, WHO, WOA, 2022; UNEP, 2023). Accountability in the context of AMR within the food systems involves various stakeholders, including food producers, agricultural industry players, regulatory bodies, consumers and public health organisations. Each group plays a significant role in managing and mitigating the risks associated with antibiotic use in food production systems. Some critical components of accountability in this specific context are, for example, establishing effective regulatory frameworks by governments and regulatory agencies, veterinary oversight, responsible farming practice, consumer awareness and actions, global collaboration, standards, traceability and transparency within and between stakeholder organisations, thereby protecting the environment from antibiotic pollution and both human and animal health while maintaining the efficacy of critical antimicrobial drugs. Ancillotti *et al.* (2022a) assert that there appears to be a status quo situation among policymakers, food producers, retailers and consumers regarding who should take responsibility for the global AMR problem. This situation may have arisen due to a lack of accountability among stakeholders, where none feels a responsibility beyond the scope of their respective domains. This hinders interdisciplinary solutions to the issue of AMR.

An often overlooked stakeholder in the context of AMR is the consumer. However, consumers could play a catalytic role in creating awareness and inspiring purchase behaviour actions. Ancillotti *et al.* (2022b) stressed the importance of more effective communication resonating with consumers' values to educate and empower them to take action. Empowered consumers can act as a grassroots force, engaging other stakeholders to advance an efficient One Health approach to tackling the AMR issue.

In our view, even worse than the blame game is the idea that responsibility for producing more sustainable food is a kind of zero-sum game, meaning that if one party holds or assumes more responsibility (typically authorities), then the responsibility of others (producers, retailers and consumers) diminishes or vanishes (Grill and Nihlén Fahlgren, 2012). This happens either because such responsibility is somehow regarded as a finite entity that can be divided into larger and smaller shares or because, essentially, there is a belief that collective problems can only be handled by top-down initiatives. This in turn, leads to little trust in the capacity of consumers to engage in judicious behaviours. It is fair to assume that securing antibiotic effectiveness through stewardship and coordinated actions, including regulating food production, is the duty of national governments and international bodies. However, consumers, individually and collectively, have a responsibility to choose, within the boundaries of their political, economic and socio-cultural contexts, to adopt more sustainable food habits.

This conceptual article explores the multifaceted dimensions of consumer accountability in the context of AMR within the food chain. Drawing upon existing literature and theoretical frameworks of accountability, the paper examines the role of actors, particularly consumers as end-users, in driving demand for responsibly produced food, promoting sustainable agriculture practices and advocating for prudent antimicrobial use in food production. Furthermore, it discusses the challenges and opportunities associated with empowering consumers with the knowledge and tools to make informed decisions that contribute to AMR mitigation efforts and action-taking.

2. Methodology

2.1 *Research design*

This paper uses a conceptual research design to investigate the intricate interactions and accountability mechanisms in the context of AMR, explicitly emphasising the consumer's role. The methodology aligns with [Jaakkola's \(2020\)](#) approach of using literature-based research to construct theories and gain new insights into complex phenomena. One method through which a conceptual paper can contribute to existing knowledge is by serving as a theory synthesis paper that integrates multiple theories or literature streams ([Jaakkola, 2020](#)). This study identifies and analyses key themes and interactions among stakeholders within the One Health framework through an extensive literature review and theory synthesis.

2.2 *Data sources and collection*

The study predominantly relies on secondary data sourced from peer-reviewed journal articles, reports from international organisations (e.g. WHO, FAO and UNEP) and publications by regulatory and public health agencies. The publications from international organisations give the framework of general initiatives necessary on a global level, emphasising the need for a One-health approach to combat AMR. These sources also provide insights into existing frameworks, stakeholder roles and accountability mechanisms in the context of AMR. Key literature includes AMR challenges across various sectors (e.g. [Caniça et al., 2019](#); [Lee, 2021](#)) related to the food chain from producers to consumers. We chose this groundwork to give insights into different challenges actors face and how they deal with them, emphasising how addressing AMR through siloed, specialised solutions within individual fields can hinder the development of cohesive, collaborative strategies necessary for tackling the problem effectively.

Furthermore, key literature also contains studies on consumer behaviour (e.g. [Ji and Wood, 2007](#); [Verplanken and Wood, 2006](#)). Consumer behaviour is of utmost importance in this paper as their role in the AMR context is often overlooked. Not much literature has been found regarding consumer behaviour linked to AMR. Instead, literature on more general sustainable consumer behaviour has been used in this paper to give insights into the challenges consumers face related to sustainability issues such as AMR. Finally, literature about theoretical accountability models (e.g. [Tetlock, 1998](#); [Bovens, 2007](#)) has been used. The concept of accountability has mainly been applied in organisational settings, and this has also been considered in the context of AMR.

The literature review started by exploring the pivotal role of actors' accountability in the food chain in the context of AMR. We established search strategies by identifying keywords relevant to the paper topic, starting broadly with food production and identifying relevant actors within the food chain using databases such as JSTOR, PubMed, Scopus, Google Scholar and library catalogues. When finding relevant articles, we reviewed them and their reference lists to identify additional sources. We gathered and thematically organised the chosen literature using Endnote. The literature was coded into broader themes based on the actors in the food chain, consumer behaviour and accountability. The papers and

reports were evaluated based on the publication's reputation and the study's methodology and involved analysing how different codes related to each other and how they could be gathered under common headings. On gathering this information, we synthesised the essential findings and themes.

Furthermore, we compared and contrasted different studies to identify patterns or gaps in the research. Due to the complexity of AMR, the problem being a wicked problem, we kept the literature search and focus very narrow, in line with [Snyder's \(2019\)](#) request in literature reviews to enhance the rigour and relevance of the paper focus. Otherwise, it is easy to take in too many dimensions and perspectives that need to be in focus.

2.3 Analytical framework

The analysis is based on the One Health framework, emphasising the interconnectedness of human, animal and environmental health in the context of food. It evaluates stakeholder roles, with a focus on consumers as key influencers in addressing AMR. The paper provides insights into how accountability shapes stakeholder actions and interactions through literature and case examples.

2.4 Data analysis

Step 1 in the data analysis involved literature synthesis to identify key concepts, challenges and opportunities associated with accountability and consumer behaviour in AMR contexts. This process was guided by [Jaakkola's \(2020\)](#) recommendation to iteratively assess and connect theoretical constructs with empirical findings to generate meaningful insights. The analysis highlights consumer influence on market dynamics and stakeholder decisions, exploring structural challenges and opportunities for fostering accountability. Step 2 involved a coding process, where we continuously reflected on our themes and codes to ensure that they truly represented the collected literature. We have conducted rounds of review and adjustment of the themes to ensure they are consistent and meaningful to the following analysis.

2.5 Methodological alignment and limitations

The chosen methodology aligns well with the study's objectives, offering a robust framework for exploring AMR within the One Health paradigm (see [Agarwal et al., 2024](#); [Destoumieux-Garzón et al., 2018](#)). By adopting a conceptual approach, the paper effectively integrates diverse perspectives and disciplines to address the multifaceted nature of AMR. However, limitations include reliance on existing literature, which may not capture the latest empirical trends or innovations in the rapidly evolving AMR landscape. In addition, while the study identifies consumer roles, it does not empirically test interventions, suggesting an area for future research.

Therefore, the methodology adopted in this paper provides a comprehensive framework for understanding accountability in AMR contexts. It highlights the crucial role of consumers as change agents, bridging gaps among stakeholders to develop more resilient One Health solutions to AMR. In the following section, the potential of accountability is discussed within the AMR context, challenges that need to be overcome connected to improving the conditions consumers need to be able to effectively act as promoters and catalysts, as well as suggestions for enhancing the One Health initiatives with consumers as instigators and promoters for collective AMR actions.

3. Theoretical framework and context

AMR in food has become an alarming problem in the last decades and is an increasing threat to global health ([Kraemer et al., 2019](#)). AMR could be compared in severity and

complexity to climate change (Jasovsky *et al.*, 2016). As the latter, it involves ethical and social questions of global justice and unequal exposure to its consequences (Ancillotti, 2021). The use of antibiotics in the food industry contributes to antibiotic pollution in the environment. It threatens animals' health, as well as being a cause of resistant diseases in human medicine (Chang *et al.*, 2015). Despite WHO's recommendations to reduce the use of antibiotics in food production (WHO, 2017), the global consumption of antibiotics within the food sector is expected to absorb two-thirds of all antibiotics by 2030 (Van Boeckel *et al.*, 2015). Every year, about 1.3 million people die from infections caused by antimicrobial-resistant bacteria, which is predicted to increase to 10 million around 2050 (World Bank, 2017; Murray *et al.*, 2022).

3.1 One Health

With the One Health approach, where transdisciplinary collaboration between sectors occurs in a common strategy – working at local, regional, national and global levels – with the goal of achieving optimal health outcomes by recognising the interconnection between people, animals, plants and their shared environment (AVMA, 2008; Lebov *et al.*, 2017), AMR could be approached in a more effective way to prevent its further development. The need to consider connections between humans, animals and the environment in managing the global AMR crisis is increasingly emphasised in action plans developed by the United Nations Quadripartite, regional actors (such as the European Union) and countries worldwide. The next section describes some instances of action plans taken across stakeholders.

3.2 AMR initiatives across various stakeholders

Policymakers play a crucial role in establishing regulations and policies to promote antimicrobial stewardship and mitigate the spread of resistance. Furthermore, they confront various challenges in addressing AMR, from navigating regulatory complexities to fostering global cooperation and public engagement. Overcoming these challenges requires concerted efforts and collaboration across sectors and stakeholders to develop and implement evidence-based policies that mitigate the threat of AMR and safeguard public health and policies to address this pressing global health issue (Shabangu *et al.*, 2023). Challenges from different stakeholders are presented below to provide an overview of the complexity of the AMR action plan and the need for cross-sectional accountability.

3.2.1 Agriculture initiatives. One of the primary contributors to AMR in the food system is the widespread use of antimicrobial agents in agriculture, particularly in livestock farming. The transmission of antimicrobial-resistant bacteria from animals to humans through the food chain is a significant concern. Consuming contaminated food products can introduce resistant pathogens into the human gastrointestinal tract, increasing the risk of antibiotic-resistant infections. In addition, food handlers and workers in the food production industry can be exposed to resistant bacteria, further contributing to the spread of AMR. Caniça *et al.* (2019) emphasise the danger of foodborne bacteria developing resistance to antibiotics and the importance of promoting responsible antibiotic use in animal agriculture and enhancing food safety measures along the production and distribution chain. To reduce the need for antimicrobial interventions in food production, implementing good agricultural practices, such as proper hygiene, sanitation and animal husbandry techniques, is vital. There is tension between veterinarians and livestock producers since they face different challenges in tackling AMR according to their different practices. Veterinarians often face a dilemma between prescribing antimicrobials to uphold animal health, productivity and welfare while adhering to antimicrobial stewardship principles while livestock producers have a responsibility to ensure the safety and integrity of the food supply chain (Cobo-Angel *et al.*, 2023; Padda *et al.*, 2021). Both livestock producers and veterinarians report economic pressures and may, therefore, prioritise short-term financial

gains over long-term sustainability (Ritter *et al.*, 2020). Sustainable husbandry would entail adopting practices that reduce antibiotic use, such as investing in improved animal husbandry or implementing disease prevention measures (Grotelueschen *et al.*, 2022). However, research has shown a reluctance to change by livestock producers (Albernaz-Gonçalves *et al.*, 2021). There is a significant gap between the necessary practices for reducing antimicrobial interventions in food production and the regulations that vary by country. In addition, there are differences in what consumers and livestock producers are willing to adopt, which creates further complications. For example, some countries in the global south, face challenges in adapting to antibiotic resistance and improving food production due to limited resources, weak infrastructure and insufficient regulations. However, international support, education and local innovations can enhance their capacity for sustainable changes. Global collaboration is essential to address these interconnected issues effectively (Pokharel *et al.*, 2019). The discrepancy between what is needed for a good agricultural practice to reduce antimicrobial interventions in food production and the rules that apply (which are different in each country), and what consumers and livestock producers are willing to do, is problematic.

3.2.2 Retailing initiatives. Retailers can play a significant role in addressing AMR through their influence on the food supply chain and consumer behaviour. Unfortunately, retailers also face several challenges in contributing to AMR mitigation efforts. Examples of common challenges include the following:

- Retailers often source food products from a wide range of suppliers, including farms and food processors. Ensuring responsible antimicrobial use throughout the supply chain can therefore be challenging, particularly when dealing with complex, global supply networks where transparency and traceability may be limited because of suppliers' unwillingness to share this information (Van der Vorst and Beulens, 2002).
- Retailers must comply with relevant regulations and standards related to food safety and labelling, including those pertaining to antibiotic use in animal agriculture. Ensuring compliance across their supply chain and navigating regulatory requirements in different jurisdictions can be complex and resource-intensive (Hacker and Binz, 2021).
- Retailers have a responsibility to provide consumers with accurate information about the products they sell, including details about antibiotic use in food production. However, achieving transparency in labelling practices and providing clear information to consumers about antibiotic use in animal agriculture can be complex and requires coordination with suppliers (Patel *et al.*, 2020).
- Retailers operate in a competitive market environment where factors such as price, convenience and product availability influence consumer purchasing decisions. Consequently, even if retailers can play a crucial role in educating consumers about the importance of responsible antibiotic use in food production and the potential risks associated with AMR, they often struggle with balancing consumer demand for affordable, high-quality products with responsible sourcing practices, including antibiotic stewardship (Lee, 2021). Effectively communicating this information to consumers and encouraging behaviour change can be challenging, particularly given the diverse consumer preferences and priorities.

3.2.3 Health-care initiatives. Crucial strategies used within the health-care sector to address the spread of AMR focus on policies, stewardship programmes and educational efforts aimed at health-care professionals and the public. WHO's (2015) AMR global action plan is a fundamental blueprint for countries worldwide to develop strategies to combat AMR. Overall, there is a unanimous view on how AMR should be approached within health care, emphasising the need for coordinated international efforts, improved surveillance, stewardship programmes to optimise antibiotic use in medicine and the importance of public and health worker education (Dellit *et al.*, 2007; Goff *et al.*, 2017; Laxminarayan *et al.*, 2013;

Murray *et al.*, 2022). Health-care professionals are on the front lines of managing antimicrobial use in clinical settings and are responsible for prescribing antibiotics judiciously, adhering to evidence-based guidelines and promoting alternative treatments where appropriate. In addition, health-care professionals play a vital role in educating patients about the importance of completing antibiotic courses as prescribed and the risks associated with misuse. A major challenge is getting the patients to understand the risks associated with AMR, typically due to low knowledge, misperceptions, exaggerated antibiotic expectations and over-use (Davis *et al.*, 2020; Hawkings *et al.*, 2008; McNulty *et al.*, 2013; Spicer *et al.*, 2020; Ventola, 2015).

3.2.4 Towards a holistic approach. As shown, the primary challenge with interdisciplinary collaboration is the diversity of perspectives, interests and priorities among stakeholders. Policymakers may prioritise regulatory measures to control antimicrobial use, while health-care professionals focus on clinical guidelines and patient care. Veterinarians may emphasise animal welfare concerns, while food producers are concerned with maintaining profitability and meeting consumer demand. Such divergent interests can lead to conflicts and hinder the development of cohesive strategies for addressing AMR. In addition, communication barriers often impede effective collaboration among stakeholders, and different disciplines may use specialised terminology and jargon, making it challenging to convey key messages and share information effectively (WHO, 2014). Furthermore, miscommunication or misunderstandings can lead to disjointed efforts and undermine the collective response to AMR.

Resource constraints pose another significant challenge to interdisciplinary collaboration. Limited funding, time and personnel can hinder stakeholders' ability to actively engage in collaborative initiatives aimed at combating AMR (O'Neill, 2016). Policymakers face budgetary constraints when allocating resources for surveillance, research and education programmes (WHO, 2015). Similarly, health-care facilities and veterinary practices often lack the necessary infrastructure and personnel to implement antimicrobial stewardship programmes effectively (CDCP, 2018). Furthermore, the complex nature of AMR requires interdisciplinary collaboration not only within human health but also across animal health, agriculture, retail and consumers. Bridging these diverse domains necessitates overcoming institutional silos and fostering cross-sectoral partnerships. However, institutional inertia, bureaucratic hurdles and jurisdictional boundaries can impede collaboration and prevent stakeholders from working together effectively. To effectively combat AMR and ensure long-term effectiveness of antimicrobial drugs, stakeholders must adopt holistic approaches that not only integrate diverse perspectives and expertise but also prioritise behavioural change and accountability across all sectors involved in the food system.

Achieving behavioural change and fostering accountability among stakeholders requires sustained efforts in education, training and advocacy. Indeed, the WHO has declared a strategy to promote behavioural change by improving awareness and understanding of AMR through effective communication, education and training (WHO, 2015). Health-care professionals, veterinarians, food producers and consumers must be empowered with the knowledge and tools to make informed decisions and adopt best practices for antimicrobial use, to assist consumers play a catalytic role in taking responsibility for the use of antimicrobial drugs either directly or indirectly through the food chain. Changing entrenched behaviours and practices requires a long-term investment in awareness campaigns (targeting, e.g. food producers, pet owners, consumers and health-care professionals), training programmes (targeting, e.g. doctors, pharmacists, veterinarians, animal care providers, consumers and food producers) and policy incentives. Our suggestion includes several potential interventions: implementing tax breaks for farmers and food producers who adhere to antibiotic-free production, establishing stricter regulations governing the use of antibiotics in livestock, allocating government funds for research and development of alternative treatments and diagnostic tools to reduce antibiotic usage and collaborating with non-profits to support local initiatives and fund awareness campaigns.

Despite these challenges, addressing AMR demands collective action and shared responsibility among all stakeholders. Overcoming barriers to interdisciplinary collaboration requires fostering mutual trust, building effective communication channels and establishing mechanisms for shared decision-making and accountability. By working together towards common goals, stakeholders can develop holistic approaches to AMR and safeguard the effectiveness of antimicrobial drugs for future generations. Here, consumers serve a critical function in driving demand for responsibly produced food and advocating for sustainable agriculture practices. By making informed choices and supporting producers who prioritise animal welfare and environmental stewardship, consumers can contribute to reducing the need for antimicrobial use in food production. In addition, consumers can help combat AMR by following appropriate food safety practices, such as proper food handling and cooking methods, to minimise the risk of foodborne infections. Changing consumer behaviour and making them aware of their responsibility is easier said than done. The following section addresses the challenges and obstacles to sustainable consumer behaviour and suggests why consumers play a crucial role in combating AMR.

3.3 Consumer behaviour in food purchase

Consumers' automated unconscious behaviour in food purchasing makes it difficult for them to seek, process and consider new information (Ji and Wood, 2007; Verplanken and Wood, 2006). The problem is further compounded by the fact that changing habits is challenging and requires time and commitment from consumers. However, this should not be equated with a lack of consumers' intention to behave sustainably in general and towards antibiotic sustainability in specific. Consumers understand the connection between various health threats and their food consumption behaviour, as well as the ethical and social values at stake (Ancillotti *et al.*, 2021), and they often display good intentions to act according to these principles, but their actual behaviour does not reflect this (Gleim and Lawson, 2014). This is called the intention-behaviour gap, which means that consumers often have a positive attitude towards sustainability issues, such as environmental or health-related issues, where they intend to purchase products that reflect this attitude but do not follow through on the intention once in the store. Empirical evidence suggests that this is not due to a lack of interest in food production and food purchase issues but rather a consequence of consumers feeling inadequate as they cannot or do not have the conditions, for example, feeling of involvement and attention (Celsi and Olson, 1988), habitual behaviour and unconscious information processing (Tversky and Kahneman, 1974) and money and knowledge to buy more sustainable and healthy food products (Vermeir and Verbeke, 2006). Instead of starting from their own conditions and doing their best, consumers might abstain altogether (Ertz *et al.*, 2016) when feeling inadequate due to a lack of knowledge or resources.

Furthermore, the methods used to bridge the intention-behaviour gap and promote consumer behaviour change assume that all consumers have similar behaviours and perceive, consider and interpret information similarly, which is not the case (Stampa *et al.*, 2020). Nudging is one method that has adopted a more individualised approach and gained significant ground in promoting consumer behaviour change. Nudging involves pushing consumers in a direction that gets them to act in a desirable, sustainable manner, for example, through various product offers in the grocery store and strategic placement of specific items on shelves near the checkout. However, studies also show that enforced behaviour change does not tend to lead to long-term change (Van Kleef *et al.*, 2019). One explanation for why nudging initiatives in stores have not worked is that they do not promote autonomy in consumer behaviour and undermine their freedom of action and engagement (Schubert, 2017). For consumers, this means that their low engagement in food purchasing decisions might be maintained, and they do not need to consider different product options actively. This low engagement can also result in consumers continuing to place the responsibility for sustainable consumption on other actors, such as the government, producers and grocery retailers. Consumer freedom of action is also limited by the assortment of product offerings that grocery retailers offer.

Thus, consumers can put themselves in the passenger seat and act as passive actors (Ancillotti *et al.*, 2022a). To get consumers to act actively and consciously about their consumption (Trudel, 2019), there is a need to fill gaps in their knowledge about sustainable public health (Grunert and Wills, 2007; Nagaraj, 2021) and food properties that appeal to/deter purchases (Ergönül, 2021). There is a need to create the conditions for an environment where consumers have the opportunity to learn new knowledge that they can implement in their everyday activities (Ancillotti *et al.*, 2022b), while also feeling freedom of action and, at the same time, being accountable for their actions. In other words, empower them and develop their action awareness and knowledge about AMR.

The review study by Barrett *et al.* (2021) found human health and animal welfare as the main reasons for concern about antibiotic use for consumers. Furthermore, several studies show that low knowledge about AMR, misconceptions and false beliefs about how AMR is widespread in meat production (Gillespie and King, 2021; Antwi *et al.*, 2020). Such false beliefs include “all antibiotic use in livestock is unnecessary”, “using antibiotics in animal feed is a safe and effective way to promote AMR growth” or “consumer choices have no impact on antibiotic use in agriculture”. These misconceptions are perpetuated by the actors in the food chain (food producers, veterinarians, retailers and consumers), emphasising the need for the development and implementation of transferable policies and public education in fighting AMR (Gualano *et al.*, 2015). Empowering consumers and enhancing their knowledge about sustainable public health and food properties can help encourage active and conscious consumption (Grunert and Wills, 2007; Nagaraj, 2021; Ergönül, 2021). Ensuring that they have opportunities for continuous learning can foster autonomy (Ancillotti *et al.*, 2022b) and accountability for their actions, especially concerning AMR.

Consumers have the ability to act as catalytic actors in combating AMR due to their unique ability to influence both market dynamics and stakeholder decisions. Despite facing challenges like limited access to responsibly produced foods and confusion over labelling, consumers' purchasing choices exert significant pressure on producers and retailers to adapt their practices towards sustainability. By driving demand for responsibly produced products, consumers can directly impact how food is produced and marketed, leading to more sustainable agricultural practices. Moreover, consumers play a critical role in advocacy and awareness, as their preferences and demands can spark broader conversations about sustainable practices and AMR issues, influencing public perception and policy. This ability to catalyse change through market influence and advocacy places consumers in a powerful position relative to other stakeholders, such as producers, retailers and policymakers, who need to respond to consumer pressure to uphold sustainable and responsible practices.

Consumers' actions and the social ripple effects of their choices mark them as essential players in the AMR battle – even with prevalent misinformation and misconceptions, as highlighted by Barrett *et al.* (2021), Gillespie and King (2021), Antwi *et al.* (2020) and Gualano *et al.* (2015) perpetuated by a lack of dialogue between the actors in the food chain (e.g. producers, veterinary, retailers and consumers). Consumers' dual role in both shaping the market and advocating for change makes them a pivotal force capable of driving systemic progress in combating AMR, acting as the link that motivates realignment among producers and policymakers towards more sustainable and informed practices. However, even if consumers are suggested to potentially have a crucial role in combating AMR, the lack of a shared accountability model for the problem, as well as the absence of a sense of responsibility among different actors, burden the efforts to slow down the spread of AMR. Promoting social responsibility and empowering the population would instead positively contribute to slowing down AMR, while the influencing role of consumers would still be of great importance.

3.4 Accountability in the context of AMR

Accountability has long been an important part of the social sciences as a mechanism of justification and answerability (see, e.g. Aleksovska *et al.*, 2019; Bovens, 2007;

DeZoort *et al.*, 2006; Frink *et al.*, 2008; Hall *et al.*, 2017; Hornbach, 2023; Tetlock, 1998). Tetlock (1998) provided a foundational theory in the study of accountability, introducing the concept of “accountability systems”, which he defined as a social mechanism that requires individuals to explain and justify their actions to others. He argued that these systems can significantly influence decision-making processes, particularly by anticipating potential questioning. Gibbins and Newton (1994) extend the discussion by examining the psychological underpinnings of accountability. Their work highlighted how accountability affects the cognitive processes involved in decision-making, stressing that accountability expectations can alter how information is processed and, ultimately, how decisions are made. Frink *et al.* (2008) delve into the organisational aspect, exploring how accountability influences managerial behaviour. Their research indicates that clear accountability structures improve job performance by clarifying expectations and aligning individual actions with organisational goals. Merchant and Otley (2006) addressed the role of accountability in performance measurement systems. They examined how different metrics and frameworks are used to ensure that individuals and teams are accountable for their performance, contributing to the literature on management control systems. Bovens (2007) offered a broader perspective by categorising accountability into political, legal and administrative dimensions. His work delineated how accountability mechanisms are structured within public governance, stressing the importance of transparency and the role of checks and balances in ensuring effective governance. Koch *et al.* (2012) studied accountability within educational settings, focusing on teacher accountability. They found that stringent accountability requirements can both motivate and pressure educators, impacting their teaching practices and interactions with students.

Accountability operates both implicitly and explicitly by identifying how the individual perceives and interprets demands, meets standards, justifies and copes if those are not reached, with the purpose of maintaining positivity regarding other important actors (Koch *et al.*, 2012) in different settings, for example, health care (Hall *et al.*, 2017), public services (Ehren *et al.*, 2020) or business (Di Vaio *et al.*, 2021).

Accountability for addressing AMR extends across multiple actors in line with the One Health approach, including governments, the health-care sector, the pharmaceutical industry, agricultural sectors and the general public. Each actor, from government bodies to individual citizens, has a part to play in ensuring these life-saving drugs remain effective for future generations. Accountability is not only a matter of implementing specific actions but also involves creating a culture of responsibility and cooperation among all stakeholders involved. For example, relevant features would involve the anticipation of potential questioning (Tetlock, 1998), how accountability influences managerial decision-making and behaviour (Flink, 2008; Gibbins and Newton, 1994; Asbahr and Ruhnke, 2019; Bartlett *et al.*, 2014; Kadous and Sedor, 2004) and the importance of transparency (Bovens, 2010) within the AMR focused sectors. Consumers, therefore, serve a critical function, leveraging their purchasing power not only to enact change but also to raise awareness among other stakeholders and spur collective action.

4. How the status quo situation in AMR can turn into improved One Health solutions

The status quo situation caused by the actors' incapacity to cooperate effectively in spite of their interconnection and interdependence is a hard nut to crack, especially given the need to approach the AMR question from multiple angles due to its complexity. This paper suggests that enhanced accountability has the potential to mitigate the silo effect within the context of AMR. This is done through better collaboration that leads to better communication, clearer roles and shared responsibility among stakeholders. Overall, accountability encompasses a wide array of perspectives and findings, indicating the complexity and multifaceted nature of AMR operating both within and between

organisations and actors. Applying accountability to the AMR actors contributes to a deeper understanding of how these mechanisms can be designed and implemented effectively across different sectors and contexts. [Tetlock \(1998\)](#) argues that accountability serves as a social mechanism where individuals are required to explain and justify their actions to others. Within this context, accountability may act both as a motivating force and as a factor perpetuating the silo effect. The motivational aspect arises as actors assist in maintaining a collective responsibility for addressing AMR issues. However, the same accountability may prevent these actors from engaging with one another due to fear of mutual judgement, consequently leading to a lack of initiative among them and decision-making ([Gibbins and Newton \(1994\)](#)).

An essential aspect of breaking this status quo would be highlighting and leveraging the role of consumers. As pivotal players in the AMR landscape, consumers hold significant influence. Their purchasing decisions can compel producers and retailers to shift towards sustainable and responsible practices, making them important catalysts for change. By using their consumer power, they help shape market trends and advocate for collective action, thus influencing broader stakeholder behaviours and policies.

In the accountability literature, the concept of “significant others” is interwoven with theories from psychology, sociology and organisational behaviour. [Bandura’s \(1986\)](#) work on social cognitive theory provides foundational insights into how individuals learn from their environment and significant others through observation, imitation and modelling. [Bovens \(2007, 2010\)](#) discusses how different actors are held accountable by those around them, implicitly including “significant others” in the context of social accountability mechanisms. Furthermore, [Tyler and Blader \(2003\)](#) examined how social identities and perceptions of fairness and justice within groups influence individual behaviours, highlighting the role of significant others in shaping group norms and expectations. Significant others affect organisational settings by building and maintaining trust ([Kramer and Tyler, 1996](#)). Furthermore, how communication affects functionality and success is highlighted ([O’Reilly and Roberts, 1977](#)). Significant others are also assumed to contribute to forming social capital in organisational performance ([Adler and Kwon, 2002](#)), and previous research has shown how their expectations influence decision-making and risk assessment ([Lerner and Tetlock, 1994, 1999](#)).

In the AMR context, significant others possess the potential to meaningfully influence how actors can extricate themselves from the status quo, where relevant organisations have no mandate on AMR but usually undertake more distant AMR-sensitive activities in areas such as sustainable development ([Wernli et al., 2022](#)). Consumers can serve as significant others by setting expectations for producers and policymakers, demanding sustainable practices and influencing public perceptions and behaviours. This influence can create an environment ([Ackert et al., 2019](#)) where responsibility for AMR is communicated and emphasised, subsequently influencing attitudes and strengthening social capital towards the issue. Furthermore, significant others – such as consumers for retailers or producers, play pivotal roles in shaping actions and policies. [Lerner and Tetlock \(1994\)](#) show that significant others can impose sanctions, rewards or punishments, which can foster joint responsibility, encouraging actors to support rather than undermine each other. This collaborative approach can enhance transparency, align with Bovens’ deliberation ([Bovens, 2010](#)) and foster an environment where each actor – including consumers – is empowered and accountable in the joint effort against AMR.

The challenges presented in this paper highlight the limited knowledge existing among the various actors and within their respective professional domains, as well as the importance of “significant others” ([Tetlock, 1998](#)) and transparency ([Bovens, 2007](#)) in the context of the existence of isolated initiatives. Currently, the actors prioritise and address short-term issues within their area rather than collaborate to solve the larger, long-term problem of AMR. Here, consumers can also contribute significantly by demanding transparency and

accountability across the supply chain, thereby encouraging stakeholders to move beyond isolated efforts. In this case, where general knowledge about AMR is low, all actors – including consumers – need to learn more about AMR and how each domain addresses the issue, along with understanding the regulations and limitations that exist within the domains. This expanded understanding would facilitate greater collaboration and accountability, aiding in the development of unified One Health solutions.

Consumer accountability represents a pivotal aspect of the multi-faceted approach required to combat AMR. Consumers are the end-users of antibiotics through both medical prescriptions and use (Khan *et al.*, 2022), animal husbandry (Barrett *et al.*, 2021) and agricultural products. However, one of the primary challenges in fostering consumer accountability is the general lack of awareness and knowledge about AMR. By promoting accountability in terms of consumer awareness, behaviour change and informed product choices, societies can enhance the effectiveness of strategies aimed at controlling and eventually reducing the threat of AMR. In this paper, we argue that in the consumer context, the significant others are other consumers working as the social driving force and that this dynamic requires a higher degree of transparency between consumers. Transparency is intended in terms of supporting and influencing each other to more sustainable AMR behaviour, ensuring everyone's well-being and at the same time showing and daring to show and tell about one's preferences, attitudes and insecurity. Addressing consumer accountability in AMR requires substantial public education efforts to foster social identities, perceptions and consumer norms associated with the importance of defeating AMR, similar to what Tyler and Blader (2003) demonstrate. Ancillotti *et al.* (2022b) argue that equipping consumers with the knowledge and tools to make informed decisions could be a way forward to contribute to the fight against AMR collectively.

Maintaining a balance between accountability and autonomy is crucial. A demand for too stringent accountability can lead to a lack of innovation and risk-taking, as individuals and organisations might perform to meet specific accountability metrics rather than focusing on broader objectives. The challenge remains in balancing the beneficial aspects of accountability with its potential downsides, ensuring that it serves as a tool for enhancement rather than a source of constraint. One argument against the significant others is that actors, from politicians to consumers, are reluctant to take action for fear of being criticised, punished or sanctioned by the significant other. Could a solution be establishing shared platforms or systems among actors where consumer power is included, thereby increasing transparency and awareness among them? If so, how should these systems be designed to facilitate the reporting of initiatives and decisions taken within the organisations of various actors concerning AMR? One unintended consequence of accountability systems is the potential for gaming the system, where individuals manipulate information or behaviour to meet accountability criteria superficially.

5. Concluding remarks and future directions

This paper has delved into the intricate interplay of accountability mechanisms within the context of AMR, where the interdependence and interconnectedness of various actors present significant challenges. Enhanced accountability is essential to mitigate the silo effect, promote integrative efforts among stakeholders and drive more holistic One Health solutions. Here, highlighting the essential role consumers can play as change agents through their purchasing power and advocacy is of major importance. As we look towards the future, several critical considerations emerge regarding how consumers can become more accountable and engaged in combating AMR.

Equipping consumers with improved knowledge and tools is crucial for enabling effective antibiotic use and sustainable decision-making. However, this requires a systemic approach to assembling and channelling complex information. Educational programmes must be designed to demystify AMR and convey actionable insights in a way accessible to

diverse consumer demographics. An example from another sector where shared responsibility is important and where efforts have been made to ensure that all stakeholders are involved in developing a consensus on the problem is the issue of renewable energy, where municipalities form cooperatives that support renewable energy initiatives. These cooperatives provide education on energy conservation to consumers, shared investment in energy technologies for companies and cooperative decision-making among the actors, promoting collective responsibility for sustainable energy use at different levels (Caramizaru and Uihlein, 2020; Hoppe *et al.*, 2015). Another example is from the water management sector, which involves how municipal water restrictions, combined with public awareness campaigns, have encouraged collective efforts among residents and policymakers to conserve water, demonstrating the potential for shared understanding and coordinated action in addressing complex challenges (Fielding *et al.*, 2012).

This approach should also acknowledge the need to challenge existing regulations and guidelines that define industry practices, ensuring that consumers are informed and empowered to act within and against the structures that influence their choices. Multi-channel strategies should be used to communicate complex AMR-related information effectively. This includes the development of digital platforms, clear and meaningful labelling on products and collaboration with educational and advocacy groups to maintain a consistent and impactful public message. However, the success of these initiatives relies on overcoming the inherent disparities in power and access between individual consumers and larger institutions.

Future initiatives must prioritise fostering cross-sectoral collaborations that transcend traditional boundaries between disciplines and to further investigate the disparities in power as well as the responsibility for individual stakeholders from a power perspective. By incorporating insights from health care, agriculture, policymaking and consumer behaviour, we can develop a comprehensive approach to curb AMR. Organisations should establish clear accountability frameworks that define roles and responsibilities (especially other stakeholders) and ensure effective communication across all levels, thereby cultivating an environment where accountability is a shared commitment. One of the suggestions discussed above was to develop joint platforms for stakeholders. One suggestion to ensure the use of shared platforms is to address the power dynamics that limit consumer influence. Partnerships between public organisations and consumer groups can help manage and maintain these platforms, facilitating the equitable spread of information both within and between different groups and removing some of the sinkhole effects. Also, the platforms would need constant updates and improvements based on user feedback (both consumers and other stakeholders) to ensure relevance and usability in consumers' daily lives and decision-making processes. In turn, this would increase their accessibility and relevance. One challenge is how to foster consumer trust and clearly communicate data sources. One way forward is to engage consumers in discussions to encourage participation and loyalty to increase transparency for consumers in areas where they previously had poor visibility.

While transparency and holistic thinking are acknowledged as critical, broader considerations of systemic change are necessary. Moving towards an integrated approach to AMR demands dismantling siloed perspectives that currently hinder collaborative efforts across stakeholders. This involves not only fostering greater interdisciplinary collaboration but also rethinking the way accountability systems incentivise behaviours among both consumers and institutions. However, there exist systematic challenges that need to be addressed. First, to start this process and create the best conditions for the development of accountability for consumers and stakeholders, there is a need to coordinate with regulators to develop guidelines and regulations that facilitate access to information about product sourcing and antibiotic use and advocate for regulatory changes promoting greater transparency within industries. In the retail sector, initiatives in this direction have been made, for example, The Sustainable Food Chain initiative, a unique collaboration where the

largest food companies in Sweden collaborate with each other and with WWF to increase the transition to a more sustainable food chain (hållbarlivsmedelskedja.se). Second, silo breaking is of the utmost importance. One way to make this break happen could be to host forums to facilitate dialogue among stakeholders, encouraging shared understanding and commitment. Through the dialogue, the shared responsibility and accountability can increase and lead to bigger changes than if the different stakeholders continue to work on the issue in silos.

Given these complexities, further research is needed to refine and implement the mechanisms discussed. Research should further explore how consumers as significant others could influence accountability and behaviour change among stakeholders, examining the roles of managers, policymakers and other consumers and their influence on antibiotic usage patterns and public health campaigns. There is also a need to further investigate how consumer choices influence antibiotic usage patterns and the effectiveness of public health campaigns to modify those choices. Future studies should also explore how to balance the need for accountability with the need to encourage innovation and risk-taking. Research could examine how different accountability structures are impacting organisational behaviour and decision-making processes in the context of AMR. Building on this study, future research could empirically examine the impact of consumer-driven accountability measures on AMR outcomes. Longitudinal studies could evaluate the effectiveness of consumer education initiatives and digital information platforms in influencing behaviour and reducing AMR. In addition, research into the balance between accountability and innovation could provide insights into optimising accountability structures within organisations. Furthermore, future studies might work on developing models that equalise the power that exist between individual consumers and large institutions. This includes looking for ways to enhance consumer empowerment through education and advocacy, creating better avenues for consumers to obtain relevant information and resources and establishing integrity in the flow of communication. Furthermore, the research could focus on community participation and organisations working together to increase consumer control over institutional policy and practice.

In conclusion, this paper has shown that empowering consumers to take an active role in the fight against AMR is a multifaceted challenge that requires concerted efforts across sectors. By empowering the consumers, they can play a critical role through their purchasing power and hence create a bottom-up influence on antibiotic use in food production. There is a need for effective communication strategies to bridge the gap between consumer intentions and actual purchasing behaviours by focusing on empowering consumers and enhancing education about AMR, alongside implementing stringent policies for antibiotic use in food production. The study shows that there is a need for clear roles and responsibilities across various sectors, including health care, agriculture, pharmaceuticals and consumers. Also, by breaking the silos and collaborating between the different stakeholders, a more holistic approach to solving AMR could be taken. By addressing systemic barriers and promoting shared accountability, a collaborative framework can be built where all stakeholders – consumers, policymakers, producers and health-care providers – work together effectively to safeguard public and environmental health for future generations.

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Further reading

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